



Prosper is a place where everyone matters.

Agenda
Prosper Town Council Meeting
Council Chambers
Prosper Town Hall
250 W. First Street, Prosper, Texas
Tuesday, July 28, 2020
5:45 PM

Notice Regarding Public Participation

Governor Greg Abbott has granted a temporary suspension of certain rules to allow for telephone or videoconference public meetings in an effort to reduce in-person meetings that assemble large groups of people, due to the COVID-19 public health emergency.

Individuals may attend the Prosper Town Council meeting in person, or access the meeting via videoconference, or telephone conference call.

Join the Zoom Meeting by clicking on the following link:

<https://us02web.zoom.us/j/87047432329>

Enter Meeting ID: 87047432329

To request to speak, click on “Participants” at the bottom of the screen, and click “Raise Hand.” The meeting moderator will acknowledge your request and allow you to speak.

To join the meeting by phone, dial (346) 248-7799

Enter Meeting ID: 87047432329

To request to speak, enter *9, and *6 to mute/unmute yourself. The meeting moderator will acknowledge your request and allow you to speak.

If you encounter any problems joining or participating in the meeting, please call our help line at 972-569-1191 for assistance.

Call to Order/ Roll Call.

Invocation, Pledge of Allegiance and Pledge to the Texas Flag.

Announcements of recent and upcoming events.

Presentations.

1. Presentation of a Proclamation to Dr. Drew Watkins in honor of his service to the Prosper Independent School District. **(RB)**

CONSENT AGENDA:

Items placed on the Consent Agenda are considered routine in nature and non-controversial. The Consent Agenda can be acted upon in one motion. Items may be removed from the Consent Agenda by the request of Council Members or staff.

2. Consider and act upon the minutes from the July 14, 2020, Town Council Meeting. **(ML)**

3. Consider and act upon approving the purchase of computer hardware, from Centre Technologies, Inc., through the Texas Department of Information Resources (DIR) Purchasing Contract; and authorizing the Town Manager to execute the same. **(LJ)**
4. Consider and act upon an ordinance amending Section 12.09.004 "School Traffic Zones" of Chapter 12 "Traffic and Vehicles" of the Town's Code of Ordinances by modifying the limits and hours of operation of such zones. **(DH)**
5. Consider and act upon authorizing the Town Manager to execute a Development Agreement between Monte Kauffman and the Town of Prosper, Texas, related to the redevelopment of 208 E. First Street. (MD20-0011) **(AG)**
6. Consider and act upon whether to direct staff to submit a written notice of appeal on behalf of the Town Council to the Development Services Department, pursuant to Chapter 4, Section 1.5(C)(7) and 1.6(B)(7) of the Town's Zoning Ordinance, regarding action taken by the Planning & Zoning Commission on any Site Plan or Preliminary Site Plan. **(AG)**

CITIZEN COMMENTS

The public is invited to address the Council on any topic. However, the Council is unable to discuss or take action on any topic not listed on this agenda. Please complete a "Public Meeting Appearance Card" and submit it to the Town Secretary prior to the meeting, or request to address the Council via videoconference or telephone.

REGULAR AGENDA:

Pursuant to Section 551.007 of the Texas Government Code, individuals wishing to address the Council for items listed as public hearings will be recognized when the public hearing is opened. For individuals wishing to speak on a non-public hearing item, they may either address the Council during the Citizen Comments portion of the meeting or when the item is considered by the Town Council.

Items for Individual Consideration:

7. Conduct a Public Hearing, and consider and act upon a request for a Sign Waiver for Cook Children's Medical Center, located on the northeast corner of US 380 and Windsong Parkway, regarding Construction Fence Signage. (MD20-0012). **(AG)**
8. Conduct a Public Hearing, and consider and act upon a request to rezone 27.4± acres from Planned Development-65 (PD-65) to Planned Development-Single Family (PD-SF), located on the south side of Prairie Drive, east of Legacy Drive. (Z20-0014). **(AG)**
9. Consider and act upon an ordinance amending Ordinance No. 19-65 (FY 2019-2020 Budget) and Capital Improvement Plan. **(BP/HW)**
10. Consider and act upon authorizing the Town Manager to execute Contract Amendment #1 to the Professional Services Agreement between Freese and Nichols, Inc., and the Town of Prosper, Texas, related to the design of the Custer Road Pipeline and Meter Vault Relocation project. **(HW)**
11. Consider and act upon awarding Bid No. 2020-62-B to Wilson Constructors, Inc., related to construction services for the Custer Road Pump Station Meter Vault Relocation project; and authorizing the Town Manager to execute a construction agreement for same. **(HW)**

- [12.](#) Consider and act upon authorizing the Town Manager to execute a Standard Utility Agreement (SUA) U-Number U16097 between the Texas Department of Transportation and the Town of Prosper, Texas, for the reimbursement of costs incurred in adjustment, removal and relocation of the Town's water facilities along Custer Road (FM2478), up to the amount of eligibility for State participation. **(HW)**
- [13.](#) Discussion and Presentation on the Continuous Process Improvement (CPI) Program. **(CS)**
- [14.](#) Budget Work Session Follow-Up Discussion. **(BP)**

EXECUTIVE SESSION:

Recess into Closed Session in compliance with Section 551.001 et seq. Texas Government Code, as authorized by the Texas Open Meetings Act, to deliberate regarding:

Section 551.087 – To discuss and consider economic development incentives.

Section 551.072 – To discuss and consider purchase, exchange, lease or value of real property for municipal purposes and all matters incident and related thereto.

Section 551-074 - To discuss and consider personnel matters and all matters incident and related thereto.

Section 551.071 - Consultation with the Town Attorney regarding legal issues associated with alcoholic beverage local option elections and all matters incident and related thereto.

Section 551.071 - Consultation with the Town Attorney regarding legal issues associated with short term rentals of property, and all matters incident and related thereto.

Section 551.074 – To discuss appointments to the Board of Adjustment/Construction Board of Appeals, Parks & Recreation Board, Library Board, Prosper Economic Development Corporation Board, and Planning & Zoning Commission.

Reconvene in Regular Session and take any action necessary as a result of the Closed Session.

Possibly direct Town staff to schedule topic(s) for discussion at a future meeting.

Adjourn.

CERTIFICATION

I, the undersigned authority, do hereby certify that this Notice of Meeting was posted at Prosper Town Hall, located at 250 W. First Street, Prosper, Texas 75078, a place convenient and readily accessible to the general public at all times, and said Notice was posted by 5:00 p.m., on Friday, July 24, 2020, and remained so posted at least 72 hours before said meeting was convened.

Melissa Lee, Town Secretary

Date Notice Removed

Pursuant to Section 551.071 of the Texas Government Code, the Town Council reserves the right to consult in closed session with its attorney and to receive legal advice regarding any item listed on this agenda.

NOTICE

Pursuant to Town of Prosper Ordinance No. 13-63, all speakers other than Town of Prosper staff are limited to three (3) minutes per person, per item, which may be extended for an additional two (2) minutes with approval of a majority vote of the Town Council.

NOTICE OF ASSISTANCE AT PUBLIC MEETINGS: The Prosper Town Council meetings are wheelchair accessible. For special services or assistance, please contact the Town Secretary's Office at (972) 569-1011 at least 48 hours prior to the meeting time.



Prosper is a place where everyone matters.

Minutes
Prosper Town Council Meeting
 Council Chambers
 Prosper Town Hall
 250 W. First Street, Prosper, Texas
 Tuesday, July 14, 2020

Call to Order/ Roll Call.

The meeting was called to order at 5:45 p.m.

Council Members Present:

Mayor Ray Smith
 Mayor Pro-Tem Curry Vogelsang, Jr.
 Deputy Mayor Pro-Tem Jason Dixon
 Councilmember Marcus E. Ray
 Councilmember Craig Andres
 Councilmember Jeff Hodges
 Councilmember Meigs Miller

Staff Members Present:

Harlan Jefferson, Town Manager
 Terry Welch, Town Attorney
 Melissa Lee, Town Secretary
 Robyn Battle, Executive Director of Community Services
 Chuck Springer, Executive Director of Administrative Services
 Betty Pamplin, Finance Director
 January Cook, Purchasing Manager
 Rebecca Zook, Executive Director of Development & Infrastructure Services
 John Webb, Development Services Director
 Hulon Webb, Engineering Services Director
 Dan Heischman, Assistant Director of Engineering Services - Development
 Alex Glushko, Planning Manager
 Frank Jaromin, Director of Public Works
 Leigh Johnson, Director of Information Technology
 Dudley Raymond, Director of Parks and Recreation

Invocation, Pledge of Allegiance and Pledge to the Texas Flag.

Alex Gonzales led the invocation. The Pledge of Allegiance and the Pledge to the Texas Flag were recited.

Announcements of recent and upcoming events.

The water tank on the new Fishtrap Elevated Storage Tank was raised last Thursday. The storage tank holds 2.5 million gallons of water, and is expected to be online by the end of 2020. For more information on the Town's infrastructure projects, please visit the Engineering page on the Town website.

July is Parks and Recreation Month, and the Prosper Parks and Recreation Department encourages residents to enjoy the variety of parks, trails, and recreation programs that the Town

has to offer. Visit the Parks and Recreation Facebook page, or www.prosperparksandrec.org for more information.

July is also Smart Irrigation Month, and the Town of Prosper's Water Education Program offers several ways to save money and conserve water during the hot summer months. More information is available on the Water Conservation page on the Town Website.

The Town Secretary's Office is accepting applications for the Town's various Boards and Commissions. Applications and information are available on the Town website, or by contacting the Town Secretary.

The Town Council would like to express our condolences to the family of Greg Dyer, a well-known Prosper resident who passed away recently. A memorial service was held for Greg at Frontier Park on Saturday. Special thanks to the Police Department, Fire Department, and Parks and Recreation staff for helping to coordinate the service. Our thoughts and prayers are with Greg's family. He will be missed.

The Town Council would also like to congratulate Prosper Superintendent Dr. Drew Watkins, who recently announced his upcoming retirement. Dr. Watkins has served the children and families of Prosper ISD for 18 years, and we thank him for his service to the community.

Presentations.

1. Update from Neighbors Nourishing Neighbors. (RB)

Pat Jones, Interim Executive Director for Neighbors Nourishing Neighbors, provided a 2020 year-to-date recap that included the impact of COVID-19 on their operations. Through facility optimization, Neighbors Nourishing Neighbors has been able to meet the increased needs of our community. Cash and food donations are always needed as there is an expected sustained need in August 2020, after the stimulus and extra unemployment payments end.

2. Recognition of participants in the Mayor's Fitness Challenge. (DR)

Mayor Smith congratulated the 2020 Mayor's Fitness Challenge finishers. This year 65 participants logged a combined 15,623 miles through walking, running and cycling. Mayor Smith announced Jennifer Gordon as the Fitbit drawing winner.

Discussion Items.

3. Bond Committee Presentation. (CV)

David Bristol, Prosper Economic Development Corporation's Vice President and 2020 Bond Committee Chairman, began by thanking Council for giving the Bond Committee the opportunity to look at projects that are meaningful for the Town in the next ten years. Chairman Bristol also thanked the Bond Committee members for their time and dedication, thanked Mayor Pro-Tem Vogelsang for his leadership as the Bond Committee's Vice Chairman, and thanked Committee Member George Dupont for his institutional knowledge regarding the previous bond election.

Mayor Pro-Tem and Bond Committee Vice Chairman Vogelsang continued with an overview of the Bond Committee charge and a tentative bond election timeline. The

Committee unanimously recommended that the Town Council call a bond election for the citizens of Prosper to include \$150 million for Streets and Roadways, \$30 million for Public Safety, and \$30 million for Parks and Recreation. The Committee reviewed and edited the proposed ballot language for the bond election and is unanimously agreed with the charge from the Town Council for a November 2020, election date.

Deputy Mayor Pro-Tem Dixon questioned the growth rate calculation used, and Mayor Pro-Tem Vogelsang discussed the growth rate stating it was conservative. Councilmember Miller questioned the list of project priorities. Mayor Pro-Tem Vogelsang responded in looking to the future, the recommendations of the Bond Committee are a general framework but with the flexibility of bond funds. Deputy Mayor Pro-Tem Dixon requested clarification on if there were three separate propositions on the election and if each required a separate vote. Mayor Pro-Tem Vogelsang confirmed there were three propositions, each requiring a separate vote. Councilmember Andres had questions on the increase in interest rates and the trajectory used. Mayor Pro-Tem Vogelsang discussed the projections and stated they were conservative. The Town Council will consider an ordinance ordering a Bond Election to be held in November 2020 at the August 11, 2020, Town Council meeting.

CONSENT AGENDA:

Items placed on the Consent Agenda are considered routine in nature and non-controversial. The Consent Agenda can be acted upon in one motion. Items may be removed from the Consent Agenda by the request of Council Members or staff.

4. Consider and act upon the minutes from the June 18, 2020, Budget Work Session. (ML)
5. Consider and act upon the minutes from the June 23, 2020, Town Council Meeting. (ML)
6. Consider and act upon Resolution 2020-53 authorizing the Collin County Tax Office to calculate the voter-approval tax rate for tax year 2020 in the manner provided for a special taxing unit at 8 percent. (BP)
7. Receive the May Financial Report. (BP)
8. Consider and act upon Ordinance 2020-54 amending Subsection (a) of Section 10.01.001, "Engineering Design Standards," of Article 10.01, "General Provisions," of Chapter 10, "Subdivision Regulation," of the Town's Code of Ordinances by adopting new Roadway Design Requirements. (DH)
9. Consider and act upon awarding CSP No. 2020-60-B to Reynolds Asphalt & Construction Company, related to construction services for the Fishtrap Road at FM 1385 Roadway Improvements project; and authorizing the Town Manager to execute a construction agreement for same. (FJ)
10. Consider and act upon awarding CSP No. 2020-66-B to Pavecon Public Works, LP, related to construction services for Miscellaneous Asphalt Improvements; and authorizing the Town Manager to execute a construction agreement for same. (FJ)

11. **Consider and act upon whether to direct staff to submit a written notice of appeal on behalf of the Town Council to the Development Services Department, pursuant to Chapter 4, Section 1.5(C)(7) and 1.6(B)(7) of the Town's Zoning Ordinance, regarding action taken by the Planning & Zoning Commission on any Site Plan or Preliminary Site Plan. (AG)**

Dan Heischman, Assistant Director of Engineering Services – Development, clarified an error on the staff report for Item 8.

Councilmember Hodges made a motion and Councilmember Miller seconded the motion to approve all items on the Consent Agenda.

The motion was approved by a vote of 7-0.

CITIZEN COMMENTS

Prosper resident Lorenzo Henry, 721 Texana Drive, Prosper, commented on the need for a pedestrian overpass at US 380 and Coit Road to protect the safety of school children trying to cross US 380.

REGULAR AGENDA:

Items for Individual Consideration:

12. **Consider all matters incident and related to the issuance and sale of the Town of Prosper, Texas Combination Tax and Surplus Revenue Certificates of Obligation, Series 2020, including the adoption of Ordinance 2020-55 authorizing the issuance of such Certificates, appointing a representative of the Town and delegating to the representative certain matters with respect to the sale of the Certificates; establishing parameters for the approval of such delegated matters; approving an Official Statement, a Paying Agent/Registrar Agreement and an engagement letter of bond counsel; ordering the levy of an annual ad valorem tax for the payment of the Certificates; and enacting other provisions relating to the issuance and sale of the Certificates. (BP)**

Betty Pamplin, Finance Director, presented Council information on the issuance of the Town of Prosper Combination Tax and Surplus Revenue Certificates of Obligation, Series 2020. Proceeds from the sale of the Certificates will fund roadway and intersection improvements in the amount of \$12,040,000, park and trail improvements in the amount of \$347,000, and the costs of issuing the Certificates in the amount of \$113,000. The ordinance would authorize the issuance of the Certificates and delegate to the Town Manager the final pricing within 90 days. It is anticipated that the sale of the Certificates will occur the last week of July after receipt of the 2020 certified taxable values for the Town.

After discussion, Mayor Pro-Tem Vogelsang made a motion, and Councilmember Ray seconded the motion to authorize the issuance and sale of the Town of Prosper, Texas Combination Tax and Surplus Revenue Certificates of Obligation, Series 2020, including the adoption of Ordinance 2020-55 authorizing the issuance of such Certificates, appointing a representative of the Town and delegating to the representative certain matters with respect to the sale of the Certificates; establishing parameters for the approval of such delegated matters; approving an Official

Statement, a Paying Agent/Registrar Agreement and an engagement letter of bond counsel; ordering the levy of an annual ad valorem tax for the payment of the Certificates; and enacting other provisions relating to the issuance and sale of the Certificates.

The motion was approved by a vote of 7-0.

13. Discussion on Thoroughfare Screening. (JW)

John Webb, Development Services Director, discussed the Visioning Committee's desire of maintaining the "open feel" along the Town's roadways and the official Vision Statement was provided. Director Webb discussed recent deviations from the required open thoroughfare screening requirements. The Subdivision Ordinance requires that masonry walls, wood fences, solid metal fences, or any other type of solid fencing shall not be constructed parallel to the required ornamental metal fence within the landscape buffer or on an adjacent lot, within a distance of 25 feet from the ornamental metal fence

Director Webb reviewed the installation of "black meshing" by residents on the ornamental fencing to provide visual screening, as well as noise reduction from the vehicles on the thoroughfares. Staff provided four options for consideration including permitting all evergreen shrubs to obtain a height of six feet adjacent to the ornamental fencing and requiring minimum 40-foot wide landscape buffers with additional landscaping adjacent to minor and major thoroughfares in future subdivisions.

Council expressed a preference for the use of greenery as a visual screen and in the reduction of noise. Deputy Mayor Pro-Tem Dixon recommended returning to variant setbacks. Councilmember Andres discussed landscaping maintenance standards and requested it be an agenda item for the next quarterly HOA Presidents meeting.

At this time Mayor Smith allowed Bond Committee Member Ken Weaver to speak on Item 3. Committee Member Weaver thanked the Council for forming the bond committee. He thanked Prosper Economic Development Corporation Board Member and Bond Committee Member David Bristol, Executive Director of Administrative Services Chuck Springer and staff for organized and focused meetings. Additionally, he thanked all the Bond Committee Members for a job well done. Committee Member Weaver stated he fully supports the bond issuance and the associated tax increase.

EXECUTIVE SESSION:

Recess into Closed Session in compliance with Section 551.001 et seq. Texas Government Code, as authorized by the Texas Open Meetings Act, to deliberate regarding:

Section 551.087 – To discuss and consider economic development incentives.

Section 551.072 – To discuss and consider purchase, exchange, lease or value of real property for municipal purposes and all matters incident and related thereto.

Section 551.074 - To discuss and consider personnel matters and all matters incident and related thereto.

Section 551.074 – To discuss and consider employment of Municipal Judge and all matters incident and related thereto.

Section 551.071 - Consultation with the Town Attorney regarding legal issues associated with alcoholic beverage local option elections and all matters incident and related thereto.

Section 551.074 – To discuss appointments to the Board of Adjustment/Construction Board of Appeals, Parks & Recreation Board, Library Board, Prosper Economic Development Corporation Board, and Planning & Zoning Commission.

The Town Council recessed into Executive Session at 7:27 p.m.

Reconvene in Regular Session and take any action necessary as a result of the Closed Session.

The Town Council reconvened the Regular Session at 8:59 p.m.

Councilmember Miller made a motion and Councilmember Hodges seconded the motion to authorize the Town Manager to execute the following:

The Municipal Court Judge Agreement between the Town of Prosper, Texas, and Judge David Moore.

The motion was approved by a vote of 7-0.

Councilmember Miller made a motion and Councilmember Hodges seconded the motion to authorize the Town Manager to execute the following:

The Fourth Amended Economic Development Incentive Agreement between the Town of Prosper, Texas, and Northeast 423/380 Ltd., and Northwest 423/380 L.P.

The motion was approved by a vote of 7-0.

Possibly direct Town staff to schedule topic(s) for discussion at a future meeting

There were no topics identified.

Adjourn.

The meeting was adjourned at 9:02 p.m. on Tuesday, July 14, 2020.

These minutes approved on the 28th day of July 2020.

APPROVED:

Ray Smith, Mayor

ATTEST:

Melissa Lee, Town Secretary

DRAFT



INFORMATION TECHNOLOGY

To: Mayor and Town Council

From: Leigh Johnson, Director of Information Technology

**Through: Harlan Jefferson, Town Manager
Chuck Springer, Executive Director of Administrative Services**

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Consider and act upon approving the purchase of computer hardware, from Centre Technologies, Inc., through the Texas Department of Information Resources (DIR) Purchasing Contract; and authorizing the Town Manager to execute the same.

Description of Agenda Item:

In order to obtain the maximum possible discount from the Town's computer hardware vendor, I.T. intends to place an order for computer hardware (laptops, monitors, and accessories) requested by departments in compliance with CARES act funding projects and approved by the Town Attorney. This purchase includes items from lines 20, 21, and 29 in the CARES Act Projects spreadsheet.

Local governments are authorized by the Interlocal Cooperation Act, V.T.C.A. Government Code, Chapter 791, to enter into joint contracts and agreements for the performance of governmental functions and services, including administrative functions normally associated with the operation of government (such as purchasing necessary materials and equipment).

The Town of Prosper entered into an interlocal agreement with the Texas Comptroller of Public Accounts Cooperative Purchasing Program (formerly, Texas Building and Procurement Commission) on March 14, 2006. Participation in the program allows our local government to purchase goods and services through the cooperative contract, DIR contracts included, while satisfying all competitive bidding requirements.

Budget Impact:

The purchase cost is \$106,443.40, and will be funded from 675-5225-10-00-2022-EM (CARES Act Expense).

Legal Obligations and Review:

The Town Attorney reviewed the items for CARES Act funding eligibility.

Attached Documents:

1. Centre Technologies quote

Town Staff Recommendation:

Town staff recommends approving the purchase of computer hardware from Centre Technologies, through the Texas Department of Information Resources (DIR) Purchasing Contract; and authorizing the Town Manager to execute the same.

Proposed Motion:

I move to approve the purchase of computer hardware from Centre Technologies, through the Texas Department of Information Resources (DIR) Purchasing Contract; and authorize the Town Manager to execute the same.



BUSINESS TECHNOLOGY SOLUTIONS FOR:

CARES act

Quote # 044542
Version 1

PREPARED FOR:

Town of Prosper

Leigh Johnson
leigh_johnson@prospertx.gov

100 N. Central Expressway
Suite 200
Richardson, TX 75080
www.centrotechnologies.com
(214) 550-3574



Item 3.

CARES act

Prepared by:

Centre Technologies - Dallas
Bryan Bender
on behalf of Justin Webster
(214) 550-3574
bbender@centrotechnologies.com

Prepared for:

Town of Prosper
Leigh Johnson
Ship To:
P.O. Box 307
Prosper, TX 75078
(972) 569-1150
leigh_johnson@prospertx.gov

Quote Information:

Quote #: 044542
Version: 1
Delivery Date: 07/24/2020
Expiration Date: 08/03/2020

DIR-TSO-3763

Products

Description	Qty	Price	Ext. Price
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Products

Description	Qty	Price	Ext. Price
SI# C49601 Dell Latitude 7200 2-in-1 (i5 Processor, 8GB RAM & 256GB SSD) Dell Latitude 7200 2-in-1 XCTO 210-ASRG 8th Generation Intel(R) Core(TM) i5-8365U Processor (4 Core, 6MB Cache, 1.6GHz, 15W, vPro-Capable) 379-BDKM Win 10 Pro 64 English, French, Spanish 619-AHKN Windows AutoPilot 634-BRWG Microsoft(R) Office 30 Days Trial 658-BCSB 8th Generation Intel Core i5-8365U and 8GB memory 338-BRHX No Out-of-Band Systems Management - vPro Disabled 631-ACCK Intel Sensor Solution 631-ACCT 8GB LPDDR3 2133MHz 370-AFRL M.2 256GB 2230 PCIe Class 35 Solid State Drive 400-BCEC 12.3" FHD (1920 x 1280) Anti-Glare Anti-Smudge 391-BEHY No Additional Keyboard 580-ABIS Intel 9560AC Wireless Driver with Bluetooth 555-BEWD Intel Dual Band Wireless AC 9560 (802.11ac) 2x2 + Bluetooth 5.0 555-BESD Mobile Broadband Verizon 556-BCBG 2 Cell 38Whr ExpressCharge Capable Battery 451-BCLQ 65W E5 Type-C Power Adapter 492-BBXR No Anti-Virus Software 650-AAAM OS-Windows Media Not Included 620-AALW E5 US Power Cord 450-AAEJ Quick Reference Guide 340-CLXK US Order 332-1286 No Carrying Case 460-BBEX No Docking Station 452-BBSE Safety/Environment and Regulatory Guide (English/French Multilanguage) 340-AGIK Custom Configuration 817-BBBB Intel Wireless 9560 Label 389-DQLE Additional Software Windows 10 658-BETP Mix Config SHIP Material 340-CMMF Intel(R) Core(TM) i5 Processor Label 389-CGBD No Option Included 340-ACQQ No Mouse 570-AADK No Resource DVD / USB 430-XXYG ENERGY STAR Qualified 387-BBIT BTO Standard Shipment (VS) 800-BBQK No UPC Label 389-BCGW RGB Camera 319-BBFS LCD Bezel 325-BDKU Latitude 7200 2-in-1 without FPR/SmartCard/NFC, with uSIM 320-BCZD Dell Limited Hardware Warranty Plus Service 807-7362 ProSupport: Next Business Day Onsite, 3 Years 807-7386 ProSupport: 7x24 Technical Support, 3 Years 807-7402 CFI Routing SKU 365-0257 Basic Deployment for Client, Configuration Services 366-0493 ProDeploy Client Suite Imaging Services, Configuration Services 366-0496 CFI, Information, WIN 10 PRO, 64B IT, Original Equipment Mfgr., Factory Install 378-2291 Basic Deployment for Client Basic Information, Configuration Services 380-6311 ProDeploy Client Suite Imaging Services, Information, Configuration Services 380-6314 Basic Deployment Dell Client PC 810-1356	6	\$1,995.96	\$11,975.76
Dell Latitude 7200 2-in-1 Keyboard Keyboard for the Latitude 7200, US English, Customer Kit 580-AIBC	6	\$118.05	\$708.30

Products

Description	Qty	Price	Ext. Price
Dell Adapter 65-Watt Type-C with 1M Power Cord Kit-65W, Type-C, US, 1m cord 492-BCBI	6	\$47.21	\$283.26
Dell USB-C Mobile Adapter - DA300 Dell USB-C Mobile Adapter - DA300 470-ACWN	6	\$78.69	\$472.14

Products

Description	Qty	Price	Ext. Price
SI# C49601 Dell Latitude 7200 2-in-1 (i7 Processor, 16GB RAM & 1TB NVME SSD) Dell Latitude 7200 2-in-1 XCTO 210-ASRG 8th Generation Intel(R) Core(TM) i7-8665U Processor (4 Core, 8MB Cache, 1.9GHz, 15W, vPro-Capable) 379-BDKO Win 10 Pro 64 English, French, Spanish 619-AHKN Windows AutoPilot 634-BRWG Microsoft(R) Office 30 Days Trial 658-BCSB 8th Generation Intel Core i7-8665U and 16GB memory 338-BRHU No Out-of-Band Systems Management - vPro Disabled 631-ACCK Intel Sensor Solution 631-ACCT 16GB LPDDR3 2133MHz 370-AESY M.2 1TB PCIe NVMe Class 35 Solid State Drive 400-BFCO 12.3" FHD (1920 x 1280) Anti-Glare Anti-Smudge 391-BEHY No Additional Keyboard 580-ABIS Intel 9560AC Wireless Driver with Bluetooth 555-BEWD Intel Dual Band Wireless AC 9560 (802.11ac) 2x2 + Bluetooth 5.0 555-BESD Mobile Broadband Verizon 556-BCBG 2 Cell 38Whr ExpressCharge Capable Battery 451-BCLQ 65W E5 Type-C Power Adapter 492-BBXR No Anti-Virus Software 650-AAAM OS-Windows Media Not Included 620-AALW E5 US Power Cord 450-AAEJ Quick Reference Guide 340-CLXK US Order 332-1286 No Carrying Case 460-BBEX No Docking Station 452-BBSE Safety/Environment and Regulatory Guide (English/French Multilanguage) 340-AGIK Custom Configuration 817-BBBB Intel Wireless 9560 Label 389-DQLE Additional Software Windows 10 658-BETP Mix Config SHIP Material 340-CMMF Intel(R) Core(TM) i7 Processor Label 389-CGBE No Option Included 340-ACQQ No Mouse 570-AADK No Resource DVD / USB 430-XXYG ENERGY STAR Qualified 387-BBIT BTO Standard Shipment (VS) 800-BBQK No UPC Label 389-BCGW RGB Camera 319-BBFS LCD Bezel 325-BDKU Latitude 7200 2-in-1 without FPR/SmartCard/NFC, with uSIM 320-BCZD Dell Limited Hardware Warranty Plus Service 807-7362 ProSupport: Next Business Day Onsite, 3 Years 807-7386 ProSupport: 7x24 Technical Support, 3 Years 807-7402 CFI Routing SKU 365-0257 Basic Deployment for Client, Configuration Services 366-0493 ProDeploy Client Suite Imaging Services, Configuration Services 366-0496 CFI, Information, WIN 10 PRO, 64B IT, Original Equipment Mfgr., Factory Install 378-2291 Basic Deployment for Client Basic Information, Configuration Services 380-6311 ProDeploy Client Suite Imaging Services, Information, Configuration Services 380-6314 Basic Deployment Dell Client PC 810-1356	6	\$2,611.60	\$15,669.60
Dell Latitude 7200 2-in-1 Keyboard Keyboard for the Latitude 7200, US English, Customer Kit 580-AIBC	6	\$118.05	\$708.30

Products

Description	Qty	Price	Ext. Price
Dell Adapter 65-Watt Type-C with 1M Power Cord Kit-65W, Type-C, US, 1m cord 492-BCBI	6	\$47.21	\$283.26
Dell USB-C Mobile Adapter - DA300 Dell USB-C Mobile Adapter - DA300 470-ACWN	6	\$78.69	\$472.14
Dell 97 WHr 6-Cell Primary Lithium-Ion Battery for Precision 7530/7730 Dell 97 WHr 6-Cell Primary Lithium-Ion Battery for Precision 7530/7730 451-BCGI	2	\$110.04	\$220.08
Sl# C49601 Mobile Precision 7750 Mobile Precision 7750 CTO BASE 210-AVUS Intel Core Processor i7-10750H (6 Core, 12MB Cache, 2.60 GHz to 5.0 GHz, 45W) 379-BDXD Win 10 Pro 64 English, French, Spanish 619-AHKN Microsoft(R) Office 30 Days Trial 658-BCSB Intel Core i7-10750H (6 Core, 12MB Cache, 2.60 GHz to 5.00 GHz, 45W) 329-BEWZ NVIDIA Quadro RTX 3000 w/6GB GDDR6 490-BFUZ Thermal pad for for Quadro RTX 3000 490-BFVD FHD Panel Cover, 500 Nits, Non-Touch 320-BDUD Bezel, RGB Cam, Mic, Non-Touch 325-BDSQ 17.3-inch, FHD, 1920 x 1080, 60 Hz, Anti-Glare, Non Touchscreen, 100% DCIP3, 500 Nits, WVA391-BFW 16GB, 2X8GB, DDR4 2933Mhz Non-ECC Memory 370-AFFD M.2 512GB PCIe NVMe Class 40 Solid State Drive 400-BDWU No Additional Hard Drive 401-AAGM No Additional Hard Drive 401-AAGM No Additional Hard Drive 401-AAGM No RAID 780-BBFE Keyboard Lattice for 99 key and 100 key keyboard 583-BGIK Internal Single Pointing Backlit Keyboard, US English 583-BGIN Palmrest with Smart Card only 346-BGIV Bottom Cover with Smart Card Door Opening 354-BBCM Intel Wi-Fi 6 AX201 Wireless Card 555-BFTF Verizon SIM Card 556-BCEZ Qualcomm Snapdragon X20 LTE (DW5821e) 556-BCGJ 6 Cell 95Whr ExpressCharge Capable Battery 451-BCQE Not ENERGY STAR Qualified 387-BBDO 240W E5 Power Adapter (EPEAT) 492-BCXD Resource Media not Included 430-XYGV OS-Windows Media Not Included 620-AALW Quick Setup Guide for Mobile Precision 7750 340-CPYE Custom Configuration 817-BBBB E5 C13 Power Cord 1M for North America 450-AHDL SERI Guide (ENG/FR/Multi) 340-AGIK Intel(R) Core(TM) i7 Processor Label 340-CNBW Intel AX201 2x2 + Bluetooth 5.1 Driver 555-BFSH No Mouse 570-AADK Windows AutoPilot 634-BRWG No UPC Label 389-BCGW US Order 332-1286 No Out-of-Band Systems Management 631-ACMT No Security Software 650-AAJS Not EPEAT Registered 389-DVNR SupportAssist 525-BBCL System Driver for Mobile Precision 7750 631-ACMV Dell(TM) Digital Delivery Cirrus Client 640-BBLW Dell Optimizer for Precision 640-BBSC	2	\$3,529.82	\$7,059.64

Products

Description	Qty	Price	Ext. Price
Dell Client System Update (Updates latest Dell Recommended BIOS, Drivers, Firmware and Apps) 658-BBMR Waves Maxx Audio 658-BBRB Dell Power Manager 658-BDVK Dell SupportAssist OS Recovery Tool 658-BEOK Intel Sensor Solution 658-BESN Mix Model Packaging 340-CRET BTO Standard Shipment (EL) 800-BBGH Regulatory Label included 389-BEYY FCC Label 389-DQBW Dell Limited Hardware Warranty Plus Service 823-3810 ProSupport: Next Business Day Onsite, 3 Years 823-3822 ProSupport: 7x24 Technical Support, 3 Years 823-3832 Not selected in this configuration 817-BBBC CFI Routing SKU 365-0257 Basic Deployment for Client, Configuration Services 366-0493 ProDeploy Client Suite Imaging Services, Configuration Services 366-0496 CFI, Information, WIN 10 PRO, 64B IT, Original Equipment Mfgr., Factory Install 378-2291 Basic Deployment for Client Basic Information, Configuration Services 380-6311			
Dell USB-C Mobile Adapter - DA300 Dell USB-C Mobile Adapter - DA300 470-ACWN	2	\$78.69	\$157.38
Pelican - 1490 Notebook Hard Case Black w/Foam Fit 1490 NOTEBOOK HARD CASE BLACK W/FOAM FITS UP TO 17.3X11X3.3 A7730151	2	\$172.00	\$344.00
SI# C49601 Dell Latitude 5500 (i5 Processors) Latitude 5500 XCTO Base 210-ASJH I5-8365U Processor 379-BDLC Win 10 Pro 64 English, French, Spanish 619-AHKN Windows AutoPilot 634-BRWG Microsoft(R) Office 30 Days Trial 658-BCSB N-1 Approved use only i5-8365U, Integrated Intel UHD 620 Graphics 338-BRKL No Out-of-Band Systems Management - vPro Disabled 631-ACBK 8GB, 1x8GB, DDR4 Non-ECC 370-AECX M.2 256GB PCIe NVMe Class 35 Solid State Drive 400-BDXG 15.6" FHD WVA (1920 x 1080) Anti-Glare Non-Touch, Camera & Mic, WLAN/WWAN Capable, Privacy Shutter 391-BEJJ Dual Pointing, No Fingerprint and No SmartCard Reader, Displayport over Type-C 346-BFKZ Dual Pointing Backlit US English Keyboard 583-BFBO Intel Wi-Fi 6 AX200 Wireless Driver, Bluetooth 5.0 555-BFKG Intel Wi-Fi 6 AX200 2x2 .11ax 160MHz, Bluetooth 5.0 555-BEQW Intel XMM 7360 Global LTE-Advanced for Verizon 556-BCBX 3 Cell 51Whr ExpressCharge™ Capable Battery 451-BCIQ 65W AC Adapter, 7.4mm Barrel 492-BBXF No Anti-Virus Software 650-AAAM OS-Windows Media Not Included 620-AALW E5 US Power Cord 450-AAEJ Setup and Features Guide 340-CMFK US Order 332-1286 Safety/Environment and Regulatory Guide (English/French Multilanguage) 340-AGIK Custom Configuration 817-BBBB Regulatory Label, FCC 389-DPGZ SupportAssist 525-BBCL	25	\$1,753.96	\$43,849.00

Products

Description	Qty	Price	Ext. Price
Dell(TM) Digital Delivery Cirrus Client 640-BBLW Dell Client System Update (Updates latest Dell Recommended BIOS, Drivers, Firmware and Apps) 658-BBMR Waves Maxx Audio 658-BBRB Dell Power Manager 658-BDVK Dell Latitude 5500 SRV 658-BEGF Dell SupportAssist OS Recovery Tool 658-BEOK Direct Ship Info 340-AAPP MIX SHIP Config (DAO/BCC) 340-CMEO Intel Core(TM) i5 Processor Label 389-CGBB No Option Included 340-ACQQ No Mouse 570-AADK No Resource DVD / USB 430-XXYG No ENERGY STAR Qualified 387-BBCE BTO Standard Shipment (S) 800-BBQN No UPC Label 389-BCGW No Removable CD/DVD Drive 429-AATO Latitude 5500 bottom door 321-BELH Dell Limited Hardware Warranty Extended Year(s) 975-3461 Dell Limited Hardware Warranty 997-8317 ProSupport: 7x24 Technical Support, 3 Years 997-8344 ProSupport: Next Business Day Onsite, 1 Year 997-8349 ProSupport: Next Business Day Onsite, 2 Year Extended 997-8354 CFI Routing SKU 365-0257 Basic Deployment for Client, Configuration Services 366-0493 ProDeploy Client Suite Imaging Services, Configuration Services 366-0496 CFI, Information, WIN 10 PRO, 64B IT, Original Equipment Mfgr., Factory Install 378-2291 Basic Deployment for Client Basic Information, Configuration Services 380-6311 ProDeploy Client Suite Imaging Services, Information, Configuration Services 380-6314 Basic Deployment Dell Client PC 810-1356			
Dell Dock- WD19 90 PD Dell Dock- WD19 90 PD 210-ARIO Advanced Exchange Service, 3 Years 824-3984 Dell Limited Hardware Warranty 824-3993	57	\$197.89	\$11,279.73
Dell 23" Full HD Edge LED LCD Monitor - 16:9 - Black, Gray - In-plane Switching (IPS) Technology - 1920 x 1080 - 16.7 Million Colors - 250 Nit - 5 ms - DVI - HDMI - VGA - DisplayPort Dell 23 Monitor - P2319H210-AQCI Dell Limited Hardware Warranty 814-9381 Advanced Exchange Service, 3 Years 814-9382	60	\$209.21	\$12,552.60
Dell Stereo Soundbar – AC511M	11	\$37.11	\$408.21
		Subtotal:	\$106,443.40

Quote Summary

Description	Amount
Products	\$106,443.40
Total:	\$106,443.40

Customer hereby acknowledges that all of the Agreements and Orders contained herein are subject to the applicable taxes (e.g., international, federal, state and local), shipping, handling and other associated fees. The Uniform Commercial Code, as adopted by the Texas Business and Commerce Code, shall apply where appropriate. Centre reserves the right to cancel or amend orders arising from pricing or other errors contained in the attached Quote and will notify the Customer. Signing below constitutes acceptance of all of the items contained herein, including the Agreements, which are available for review and download at <https://centrotechnologies.com/agreements> and may include a Letter of Engagement, Business Associate Agreement, Service Time Agreement and/or Mutual Non-disclosure Agreement. Unless stated otherwise in the actual description of the Product or Service listed hereinabove, the pricing reflects Centre's good faith and reasonable efforts in calculating the estimated cost of Products and Services based on information supplied by the Customer. Actual charge(s) may vary and recur monthly based upon Agreements for the use of services. Please note that there is a Minimum Monthly Recurring Charge ("MMRC") for recurring services. Customer hereby represents that its electronic signature to this Agreement shall be relied upon and serves to bind it to the obligations stated within. Customer's representative hereby warrants and represents that he/she/it has the express authority to execute this Acknowledgement of the Agreement(s) on behalf of Customer.

E-Signature Confirmation for Town of Prosper

Signature: _____
Name: Harlan Jefferson
Title: Town Manager
Date: _____



ENGINEERING SERVICES

To: Mayor and Town Council

From: Dan Heischman, P.E., Assistant Director of Engineering Services - Development

Through: Harlan Jefferson, Town Manager
Rebecca Zook, Executive Director of Development & Infrastructure Services

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Consider and act upon an ordinance amending Section 12.09.004 "School Traffic Zones" of Chapter 12 "Traffic and Vehicles" of the Town's Code of Ordinances by modifying the limits and hours of operation of such zones.

Description of Agenda Item:

New school zones were recently created due to addition of new streets in various developments within the Prosper Independent School District (PISD). This ordinance will add new school zone locations for Stuber Elementary, Cockrell Elementary and Rushing Middle School.

Typical hours of operation for school zones are from approximately 30 minutes before to approximately 15 minutes after the start of school and from approximately 15 minutes before to approximately 30 minutes after the end of school. Because of the atypical end time for the high school, the school zone times for the high school are set up to be 14 minutes before end of high school time and 31 minutes after.

The elementary, middle and high school times remain unchanged from last year and are shown below:

Elementary School Hours	School Zone Hours
7:45 AM to 2:50 PM	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM
Middle School Hours	School Zone Hours
8:10 AM to 3:25 PM	7:40 AM to 8:25 AM 3:10 PM to 3:55 PM
High School Hours	School Zone Hours
8:30 AM to 3:59 PM	8:00 AM to 8:45 AM 3:45 PM to 4:30 PM

Previously approved deviations from the typical hours of operation include the following:

- July 23, 2019 – Town Council approved extending the afternoon school zone time along La Cima Boulevard at Amistad Drive to end 70 minutes after Folsom Elementary ends to allow students walking home from Rogers Middle School additional time to cross La Cima Boulevard. This corresponds to the July 25, 2017, approved deviation along La Cima Boulevard at Arrowhead Drive.
- December 9, 2014 – Town Council approved extending the morning school zone time for Rogers Middle School to start 45 minutes before school due to the significant volume of early pedestrian traffic.
- July 25, 2017 – Town Council approved extending the afternoon school zone time along La Cima Boulevard at Arrowhead to end 70 minutes after Folsom Elementary ends to allow students walking home from Rogers Middle School additional time to cross La Cima Boulevard.

Legal Obligations and Review:

Terrence Welch of Brown & Hofmeister, L.L.P., has reviewed the ordinance as to form and legality.

Attached Documents:

1. Ordinance

Town Staff Recommendation:

Town staff recommends that the Town Council approve an ordinance amending Section 12.09.004 "School Traffic Zones" of Chapter 12 "Traffic and Vehicles" of the Town's Code of Ordinances by modifying the limits and hours of operation of such zone.

Proposed Motion:

I move to approve an ordinance amending Section 12.09.004 "School Traffic Zones" of Chapter 12 "Traffic and Vehicles" of the Town's Code of Ordinances by modifying the limits and hours of operation of such zones.

TOWN OF PROSPER, TEXAS

ORDINANCE NO. 2020-xx

AN ORDINANCE OF THE TOWN OF PROSPER, TEXAS, AMENDING SECTION 12.09.004, "SCHOOL TRAFFIC ZONES," OF CHAPTER 12, "TRAFFIC AND VEHICLES," OF THE CODE OF ORDINANCES OF THE TOWN OF PROSPER BY MODIFYING THE LIMITS ON WHICH SCHOOL ZONES ARE ESTABLISHED; MODIFYING THE HOURS OF OPERATION OF SUCH ZONES; PROVIDING FOR REPEALING, SAVINGS AND SEVERABILITY CLAUSES; PROVIDING FOR A PENALTY FOR THE VIOLATION OF THIS ORDINANCE; PROVIDING FOR AN EFFECTIVE DATE OF THIS ORDINANCE; AND PROVIDING FOR THE PUBLICATION OF THE CAPTION HEREOF.

WHEREAS, the Town of Prosper, Texas ("Town"), is a home-rule municipal corporation duly organized under the laws of the State of Texas; and

WHEREAS, Section 541.302 of the Texas Transportation Code defines a "school crossing zone" as a reduced-speed zone designated on a street by a local authority to facilitate safe crossing of the street by children going to or leaving a public or private elementary or secondary school during the time the reduced speed limit applies; and

WHEREAS, Section 545.356 of the Texas Transportation Code provides that the governing body of a municipality may alter prima facie speed limits by ordinance based on the results of an engineering and traffic investigation; and

WHEREAS, the Town Council has investigated and finds that it is necessary for the protection and safety of children going to and leaving public elementary and secondary schools within Prosper to amend Section 12.09.004, "School Traffic Zones," of the Code of Ordinances to modify the reduced speed school zones on certain public streets as set forth herein.

NOW, THEREFORE, BE IT ORDAINED BY THE TOWN COUNCIL OF THE TOWN OF PROSPER, TEXAS, THAT:

SECTION 1

The findings set forth above are incorporated into the body of this Ordinance as if fully set forth herein.

SECTION 2

Existing Section 12.09.004, "School Traffic Zones," of Chapter 12, "Traffic and Vehicles," of the Code of Ordinances of the Town of Prosper, Texas, is hereby amended by modifying the limits on which school zones are established, and the hours of operation of such zones, to read as follows:

<u>Street Name</u>	<u>Limits</u>	<u>Hours of Operation</u>	<u>Speed Limit</u>
<u>Cockrell Elementary School</u>			
Cliff Creek Drive	From 130 feet southwest of school property line to Evergreen Drive.	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Escalante Trail	From Whitley Place Drive to Prosper Trail	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Evergreen Drive	From 130 feet southwest of Orchard Grove Dr.	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Fisher Road	From Escalante Drive to 205 feet east of Escalante Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Mesa Drive	From Escalante Drive to 200 feet east of Escalante Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Orchard Grove Drive	From Evergreen Drive to Escalante Trail	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Prosper Trail	From 750' west of Escalante Trail to 300' east of Escalante Trail	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Red Wing Drive	From Escalante Drive to 215 feet east of Escalante Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Whitley Place Drive	From 150 feet southwest of Escalante Trail to 150 feet northeast of Escalante Trail	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
<u>Folsom Elementary School</u>			
Amistad Drive	From La Cima Boulevard to 100 feet northwest of La Cima Boulevard	7:15 AM to 8:00 AM 2:35 PM to 4:00 PM	20
Amistad Drive	From La Cima Boulevard to 190 feet southeast of La Cima Boulevard	7:15 AM to 8:00 AM 2:35 PM to 4:00 PM	20
Arrowhead Drive	From La Cima Boulevard to 120 feet southeast of La Cima Boulevard	7:15 AM to 8:00 AM 2:35 PM to 4:00 PM	20
Arrowhead Drive	From 270 feet northwest of Sommerville Drive to Sommerville Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Buffalo Springs Drive	From 200 feet north of Cedar Lake Drive to 185 feet south of Cedar Lake Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Calaveras Court	From 260 feet northwest of Sommerville Drive to Sommerville Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Cedar Lake Drive	From 135 feet west of Buffalo Springs Drive to White River Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
La Cima Boulevard	From 255 feet southwest of Amistad Drive to 260 feet northeast of Amistad Drive	7:15 AM to 8:00 AM 2:35 PM to 4:00 PM	20
La Cima Boulevard	From 300 feet southwest of Arrowhead Drive to 300 feet northeast of Arrowhead Drive	7:15 AM to 8:00 AM 2:35 PM to 4:00 PM	20
Livingston Drive	From 180 feet northwest of Salada Drive to Twin Buttes Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Monticello Drive	From 130 feet northwest of La Cima Boulevard to La Cima Boulevard	7:15 AM to 8:00 AM 2:35 PM to 4:00 PM	20

Salada Drive	From Livingston Drive to 175 feet north east of Livingston Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Sommerville Drive	From White River Drive to Livingston Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Texana Drive	From Livingston Drive to 180 feet northeast of Livingston Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Twin Buttes Drive	From Livingston Drive to 170 feet northeast of Livingston Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
White River Drive	From 190 feet south of Cedar Lake Drive to 280 feet north of Sommerville Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
<u>Rucker Elementary School</u>			
Craig Road	From 100 feet north of Preston Road to 100 feet south of First Street	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
<u>Stuber Elementary School</u>			
Fishtrap Road	From 300 feet west of Village Park Lane to 610 feet east of Village Park Lane	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Village Park Lane	From Fishtrap Road to Highland Street	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Clearwater Drive	From 210 feet west of Village Park Lane to Village Park Lane	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Shadow Ridge Drive	From 215 feet west of Village Park Lane to Village Park Lane	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Highland Street	From 160 feet west of Village Park Lane to Village Park Lane	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Zilker Parkway	From 160 south of Highland Street to Highland Street	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
<u>Windsong Elementary School</u>			
Fishtrap Road	From 260 feet west of Windsong Parkway to 220 feet east of Windsong Parkway	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Windsong Parkway	From 120 feet north of Fishtrap Road to 120 feet south of Fishtrap Road	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Fishtrap Road	From 300 feet west of Redstem Drive to 300 feet east of Copper Canyon Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Paddock Lane	From 265 feet west of Redstem Drive to Redstem Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Porosa Lane	From 200 feet west of Redstem Drive to Redstem Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Copper Canyon Drive	From 115 feet south of Marigold Lane to Fishtrap Road	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Redstem Drive	From 125 feet south of Marigold Lane to Fishtrap Road	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Marigold Lane	From 145 feet west of Redstem Drive to 135 feet east of Copper Canyon Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Lantana Lane	From 200 feet east of Copper Canyon Drive to Copper Canyon Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20

Pine Leaf Lane	From 265 feet east of Copper Canyon Drive to Copper Canyon Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Prairie Clover Lane	From 265 feet east of Copper Canyon Drive to Copper Canyon Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
Sweet Clover Drive	From 265 feet east of Copper Canyon Drive to Copper Canyon Drive	7:15 AM to 8:00 AM 2:35 PM to 3:20 PM	20
<u>Reynolds Middle School</u>			
Church Street	From 30 feet north of Eighth Street to Prosper ISD Property Line	7:40 AM to 8:25 AM 3:10 PM to 3:55 PM	20
Coleman Street	From 160 feet north of Gorgeous Drive to 60 feet south of Wilson Drive	7:40 AM to 8:25 AM 3:10 PM to 3:55 PM	20
<u>Rogers Middle School</u>			
Coit Road	From 300 feet south of Richland Boulevard to 1,150 feet north of Richland Boulevard	7:25 AM to 8:25 AM 3:10 PM to 3:55 PM	20
Richland Boulevard	From 300 feet west of Coit Road to east end of roadway	7:25 AM to 8:25 AM 3:10 PM to 3:55 PM	20
First Street	From 330 feet west of Hidden Lakes Drive to 230 feet east of Hidden Lakes Drive	7:25 AM to 8:25 AM 3:10 PM to 4:00 PM	20
Hidden Lakes Drive	From 120 feet north of First Street to 100 feet south of First Street	7:25 AM to 8:25 AM 3:10 PM to 4:00 PM	20
<u>Rushing Middle School</u>			
Fishtrap Road	From 300 feet west of Chaucer Drive to 190 feet west of Winsor Dr.	7:40 AM to 8:25 AM 3:10 PM to 3:55 PM	20
Chaucer Drive	From Fishtrap Road to Clearwater Drive	7:40 AM to 8:25 AM 3:10 PM to 3:55 PM	20
Grove Vale Drive	From 30 feet south of Clearwater Drive to Clearwater Drive	7:40 AM to 8:25 AM 3:10 PM to 3:55 PM	20
Clearwater Drive	From 300 feet east of Chaucer Drive to Grove Vale Drive	7:40 AM to 8:25 AM 3:10 PM to 3:55 PM	20
<u>Prosper High School</u>			
Coleman Street	From 110 feet east of Talon Lane to 1,900 feet east of Talon Lane	8:00 AM to 8:45 AM 3:45 PM to 4:30 PM	20
Frontier Parkway	From 3,930 feet west of SH 289 (Preston Road) to 3,305 feet west of SH 289 (Preston Road)	8:00 AM to 8:45 AM 3:45 PM to 4:30 PM	20

SECTION 3

All provisions of any ordinance in conflict with this Ordinance are hereby repealed to the extent they are in conflict; but such repeal shall not abate any pending prosecution for violation of the repealed ordinance, nor shall the repeal prevent a prosecution from being commenced for any violation if occurring prior to the repeal of the ordinance. Any remaining portion of conflicting ordinances shall remain in full force and effect.

SECTION 4

If any section, subsection, sentence, clause or phrase of this Ordinance is for any reason, held to be unconstitutional or invalid by a court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of this Ordinance. The Town of Prosper hereby declares that it would have passed this Ordinance, and each section, subsection, clause or phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses, and phrases be declared unconstitutional.

SECTION 5

Any person, firm or corporation violating any of the provisions or terms of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction, shall be punished by fine not to exceed the sum of five hundred dollars (\$500.00) for each offense.

SECTION 6

This Ordinance shall become effective after its passage and publication, as required by law.

DULY PASSED AND APPROVED BY THE TOWN COUNCIL OF THE TOWN OF PROSPER, TEXAS, ON THIS 28TH DAY OF JULY, 2020.

APPROVED:

Ray Smith, Mayor

ATTEST:

Melissa Lee, Town Secretary

APPROVED AS TO FORM AND LEGALITY:

Terrence S. Welch, Town Attorney

PLANNING



To: Mayor and Town Council

From: Alex Glushko, AICP, Planning Manager

Through: Harlan Jefferson, Town Manager
Rebecca Zook, P.E., Executive Director of Development & Infrastructure Services

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Consider and act upon authorizing the Town Manager to execute a Development Agreement between Monte Kauffman and the Town of Prosper, Texas, related to the redevelopment of 208 E. First Street. (MD20-0011)

Description of Agenda Item:

The property owner of 208 E. First Street is proposing to construct a new single family home on his property, in order to replace the existing 672-square-foot house. The owner is requesting to remain in the existing structure throughout the construction process; however, the Zoning Ordinance only permits one primary building to be located on a single family lot, therefore issuance of a permit for a second primary structure would not be permitted. Below is a picture of the existing structure.



The proposed Development Agreement includes terms that would allow the Town to issue a permit and ensure that the existing structure is demolished prior to the new home being “finalized” for occupancy.

While the Future Land Use Plan recommends Office for this area along First Street, the property is zoned Single Family-15 (SF-15). The subject property is neither located in the Downtown Residential Revitalization area nor eligible for the Neighborhood Empowerment Program. However, the applicant is proposing to include regulations regarding the exterior building materials for the proposed structure, along with the conditions related to construction and occupancy. Elevations for the proposed structure are not available at this time; however the proposed home will be required to meet all SF-15 building material standards.

Legal Obligations and Review:

Town Attorney, Terrence Welch of Brown & Hofmeister, L.L.P., has reviewed the agreement as to form and legality.

Attached Documents:

1. Location Map
2. Development Agreement
3. Exhibit A-Property Description

Town Staff Recommendation:

Staff recommends the Town Council authorize the Town Manager to execute a Development Agreement between Monte Kauffman and the Town of Prosper, Texas, related to the redevelopment of 208 E. First Street.

Proposed Motion:

I move to authorize the Town Manager to execute a Development Agreement between Monte Kauffman and the Town of Prosper, Texas, related to the redevelopment of 208 E. First Street.

MD20-0011 - 208 East First Street

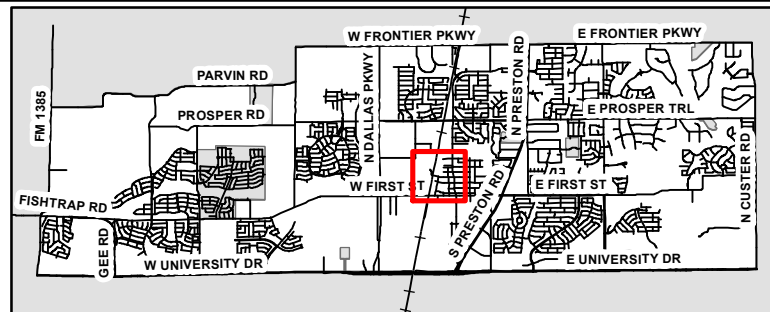
Item 5.



This map is for illustration purposes only.



0 250 500 Feet



DEVELOPMENT AGREEMENT

THIS DEVELOPMENT AGREEMENT (“Agreement”) is entered into by and between the Town of Prosper, Texas (“Town”), and Monte Kauffman (“Owner”) (individually, a “Party” and collectively, the “Parties”) to be effective (the “Effective Date”) on the latest date executed by a Party.

WHEREAS, the Town is a home-rule municipal corporation, located in Collin County, Texas, organized and existing under the laws of the State of Texas; and

WHEREAS, Owner owns property located at 208 E. First Street in the Town, consisting of approximately 0.65 acres of land in Collin County, more particularly described and/or depicted in Exhibit A, attached hereto and incorporated by reference (the “Property”); and

WHEREAS, Owner desires to auction, sell, demolish or otherwise remove an existing residential structure (“Existing Structure”) on the Property, approximately 672 square feet in size, and construct on the Property a new single-family residence (“Proposed Structure”); and

WHEREAS, the Town and Owner have agreed to certain conditions related to Owner occupying the Existing Structure during the construction of the Proposed Structure, as more fully described herein; and

WHEREAS, both the Town and Owner agree and acknowledge that the Proposed Structure shall be constructed in accordance with the provisions and standards reflected in this Agreement; and

WHEREAS, this Agreement seeks to incorporate the negotiated and agreed upon development and exterior materials construction standards and to recognize Owner’s reasonable investment-backed expectations.

NOW, THEREFORE, in consideration of the foregoing premises, and for other good and valuable consideration the receipt and adequacy of which are hereby acknowledged, the Parties to this Agreement agree as follows:

1. Exterior Building Materials for Proposed Structure. The Proposed Structure shall be constructed one hundred percent (100%) of masonry (*i.e.*, brick and stone only) and for purposes of this Agreement, cementitious fiberboard is considered masonry, but may only constitute fifty percent (50%) of stories other than the first story. Nothing in this Agreement shall be deemed to modify or otherwise amend any zoning regulation duly adopted by the Town, previously or in the future.

2. Conditions Related to Construction and Occupancy. The Parties hereby agree to the following provisions: (1) the Existing Structure shall be auctioned, sold, demolished or otherwise removed from the Property prior to a final electric release on the

Property; (2) at no time shall the Property have more than one (1) water meter; one (1) electric meter; or one (1) sewer connection; (3) the personal effects and contents in the Existing Structure may be secured in a rental storage pod on the Property between the date of auction, sale, demolition or removal of the Existing Structure and the final approval by the Town of the Proposed Structure; (4) no personal effects or contents in the Existing Structure may be stored or placed in the Proposed Structure until the final approval by the Town of the Proposed Structure; (5) if the Existing Structure is demolished, prior to the commencement of demolition Owner shall obtain a demolition permit from the Town, and an asbestos survey/inventory shall be required as part of the demolition permit application; and (6) Owner shall construct any and all structures on the Property (including any accessory structures) in accordance with all applicable Town ordinances and building/construction codes.

3. Venue. This Agreement shall be governed by and construed in accordance with the laws of the State of Texas, and all obligations of the parties created hereunder are performable in Collin County, Texas. Exclusive venue for any action arising under this Agreement shall lie in Collin County, Texas.

4. Notice. Any notices required or permitted to be given hereunder (each, a "Notice") shall be given by certified or registered mail, return receipt requested, to the addresses set forth below or to such other single address as either party hereto shall notify the other:

If to the Town: The Town of Prosper
250 W. First Street
P.O. Box 307
Prosper, Texas 75078
Attention: Town Manager

If to Owner: Mr. Monte Kauffman
208 E. First Street
Prosper, Texas 75078

5. Prevailing Party. In the event any person initiates or defends any legal action or proceeding to enforce or interpret any of the terms of this Agreement, the prevailing party in any such action or proceeding shall be entitled to recover its reasonable costs and attorney's fees (including its reasonable costs and attorney's fees on any appeal).

6. Entire Agreement. This Agreement contains the entire agreement between the Parties hereto with respect to the Property and supersedes all prior agreements, oral or written, with respect to the subject matter hereof. The provisions of this Agreement shall be construed as a whole and not strictly for or against any Party.

7. Savings/Severability. In the event any provision of this Agreement shall be determined by any court of competent jurisdiction to be invalid or unenforceable, the

Agreement shall, to the extent reasonably possible, remain in force as to the balance of its provisions as if such invalid provision were not a part hereof.

8. Binding Agreement. A telecopied facsimile of a duly executed counterpart of this Agreement shall be sufficient to evidence the binding agreement of each Party to the terms herein.

9. Authority to Execute. This Agreement shall become a binding obligation on the signatories upon execution by all signatories hereto. The Town warrants and represents that the individual executing this Agreement on behalf of the Town has full authority to execute this Agreement and bind the Town to the same. Owner warrants and represents that the individual executing this Agreement has full authority to execute this Agreement and bind any and all Owners of the Property to the same.

10. Mediation. In the event of any disagreement or conflict concerning the interpretation of this Agreement, and such disagreement cannot be resolved by the Parties, the Parties agree to submit such disagreement to non-binding mediation.

11. Notification of Sale or Transfer; Assignment of Agreement. Owner shall notify the Town in writing of any sale or transfer of all or any portion of the Property, within ten (10) business days of such sale or transfer.

12. Sovereign Immunity. The Parties agree that the Town has not waived its sovereign or governmental immunity from suit by entering into and performing its obligations under this Agreement.

13. Effect of Recitals. The recitals contained in this Agreement: (a) are true and correct as of the Effective Date; (b) form the basis upon which the Parties negotiated and entered into this Agreement; (c) are legislative findings of the Town; and (d) reflect the final intent of the Parties with regard to the subject matter of this Agreement. In the event it becomes necessary to interpret any provision of this Agreement, the intent of the Parties, as evidenced by the recitals, shall be taken into consideration and, to the maximum extent possible, given full effect. The Parties have relied upon the recitals as part of the consideration for entering into this Agreement and, but for the intent of the Parties reflected by the recitals, would not have entered into this Agreement.

14. Consideration. This Agreement is executed by the Parties hereto without coercion or duress and for substantial consideration, the sufficiency of which is forever confessed.

15. Counterparts. This Agreement may be executed in a number of identical counterparts, each of which shall be deemed an original for all purposes. A facsimile signature will also be deemed to constitute an original.

16. Waiver of Texas Government Code § 3000.001 et seq. With respect to the Proposed Structure to be constructed on the Property pursuant to this Agreement,

Owner hereby waives any right, requirement or enforcement of Texas Government Code §§ 3000.001-3000.005, as amended.

17. Time. Time is of the essence in the performance by the Parties of their respective obligations under this Agreement.

18. Third Party Beneficiaries. Nothing in this Agreement shall be construed to create any right in any third party not a signatory to this Agreement, and the Parties do not intend to create any third-party beneficiaries by entering into this Agreement.

19. Exactions/Infrastructure Costs. Owner has been represented by legal counsel in the negotiation of this Agreement and been advised or has had the opportunity to have legal counsel review this Agreement and advise Owner, regarding Owner's rights under Texas and federal law. Owner hereby waives any requirement that the Town retain a professional engineer, licensed pursuant to Chapter 1001 of the Texas Occupations Code, to review and determine that the exactions required by the Town are roughly proportional or roughly proportionate to the proposed development's anticipated impact. Owner specifically reserves its right to appeal the apportionment of municipal infrastructure costs in accordance with § 212.904 of the Texas Local Government Code; however, notwithstanding the foregoing, Owner hereby releases the Town from any and all liability under § 212.904 of the Texas Local Government Code, as amended, regarding or related to the cost of those municipal infrastructure requirements imposed by this Agreement.

20. Amendment. This Agreement shall not be modified or amended except in writing signed by the Parties.

21. Miscellaneous Drafting Provisions. This Agreement shall be deemed drafted equally by all Parties hereto. The language of all parts of this Agreement shall be construed as a whole according to its fair meaning, and any presumption or principle that the language herein is to be construed against any Party shall not apply.

IN WITNESS WHEREOF, the parties hereto have caused this document to be executed as of the date referenced herein.

(Remainder of Page Intentionally Left Blank)

TOWN:

THE TOWN OF PROSPER, TEXAS

By: _____

Name: Harlan Jefferson

Title: Town Manager, Town of Prosper

STATE OF TEXAS)

)

COUNTY OF COLLIN)

This instrument was acknowledged before me on the ____ day of _____, 2020, by Harlan Jefferson, Town Manager of the Town of Prosper, Texas, on behalf of the Town of Prosper, Texas.

Notary Public, State of Texas

My Commission Expires: _____

OWNER:

By: _____

Printed Name: Monte Kauffman

STATE OF TEXAS)
)
COUNTY OF COLLIN)

This instrument was acknowledged before me on the ____ day of _____, 2020, by Monte Kauffman, known to be the person whose name is subscribed to the foregoing instrument, and that he executed the same on behalf of and as the act of Owner.

Notary Public, State of Texas
My Commission Expires: _____

EXHIBIT A
(Property Description/Depiction)

All that certain lot, tract or parcel of land lying and being situated in the County of Collin, State of Texas and being in the Collin County School Land Survey, Abstract No. 147, Survey No. 12 being a resurvey of the lot described in a Deed from Lee Gilmer, et ux, to Price Stark and wife, Altha Stark dated April 13, 1976 recorded in Vol. 997, Pg. 794, Colling County Deed Records, being more fully described as follows:

BEGINNING at the Northwest corner of said Stark lot, a point on the South edge of First Street at the North extension of an established fence from the South;

THENCE East 95.0 feet with the South side of First Street to an iron pin set for a corner;

THENCE South 300.0 feet to an iron pin set for a corner in an East-West established fence;

THENCE West 95.0 feet to an existing iron pint set on the West side of a corner post for a corner;

THENCE North 300.0 feet with the West line of said Stark lot and with said established fence to the place of beginning, containing 0.654 acre.

This is the same tract of land that was conveyed to Joe Templin by Judy Boatright in Deed recorded in Vol. 1173, Pg. 161 of the Deed Records of Collin County, Texas, and the same land conveyed by Bernhart B. Schlachter to James Barton Tims, and wife, Judith Ann Tims by deed recorded in Vol. 1371, Pg. 798, Deed Records, Collin County, Texas.

PLANNING



To: Mayor and Town Council

From: Alex Glushko, AICP, Planning Manager

Through: Harlan Jefferson, Town Manager
Rebecca Zook, P.E., Executive Director of Development & Infrastructure Services

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Consider and act upon whether to direct staff to submit a written notice of appeal on behalf of the Town Council to the Development Services Department, pursuant to Chapter 4, Section 1.5(C)(7) and 1.6(B)(7) of the Town's Zoning Ordinance, regarding action taken by the Planning & Zoning Commission on any Site Plan or Preliminary Site Plan.

Description of Agenda Item:

Attached is the Site Plan that was acted on by the Planning & Zoning Commission at their July 21, 2020, meeting. Per the Zoning Ordinance, the Town Council has the ability to direct staff to submit a written notice of appeal on behalf of the Town Council to the Development Services Department for any Preliminary Site Plan or Site Plan acted on by the Planning & Zoning Commission.

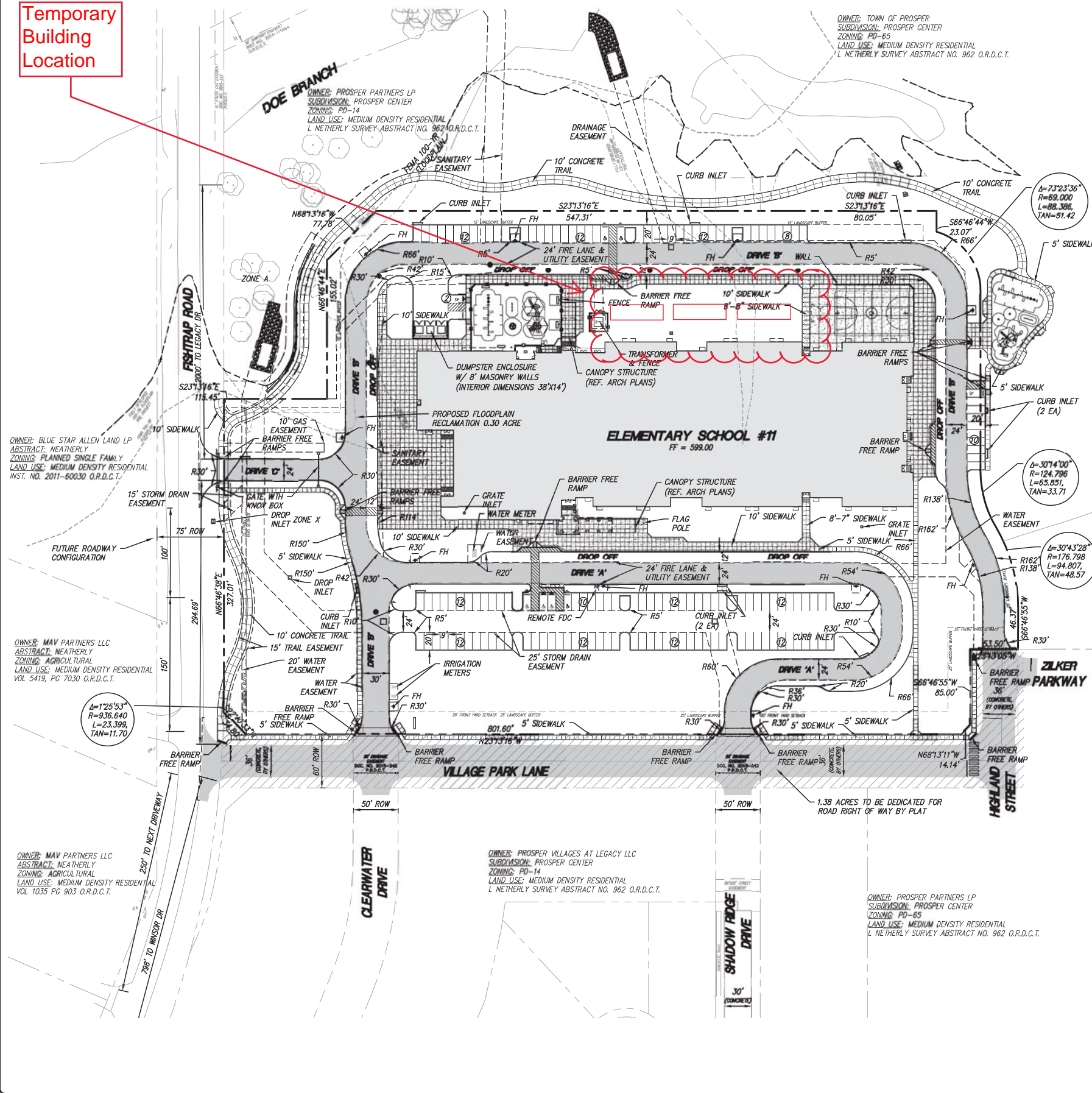
Attached Documents:

1. Site Plan for Stuber Elementary (Temporary Buildings)

Town Staff Recommendation:

Town staff recommends the Town Council take no action on this item.

Temporary Building Location



Site Plan Notes

- Any revision to this plan will require town approval and will require revisions to any corresponding plans to avoid conflicts between plans.
- 1) Dumpsters and trash compactors shall be screened in accordance with the Zoning Ordinance.
 - 2) Open storage, where permitted, shall be screened in accordance with the Zoning Ordinance.
 - 3) Outdoor lighting shall comply with the lighting and glare standards contained within the Zoning Ordinance and Subdivision Ordinance.
 - 4) Landscaping shall conform to landscape plans approved by the Town.
 - 5) All elevations shall comply with the standards contained within the Zoning Ordinance.
 - 6) Buildings of 5,000 square feet or greater shall be 100% fire sprinkled. Alternative fire protection measures may be approved by the Fire Department.
 - 7) Fire lanes shall be designed and constructed per town standards or as directed by the Fire Department.
 - 8) Two points of access shall be maintained for the property at all times.
 - 9) Speed bumps/humps are not permitted within a fire lane.
 - 10) Handicapped parking areas and building accessibility shall conform to the Americans with Disabilities Act (ADA) and with the requirements of the current, adopted Building Code.
 - 11) All signage is subject to Building Official approval.
 - 12) All fences and retaining walls shall be shown on the site plan and are subject to Building Official approval.
 - 13) All exterior building materials are subject to Building Official approval and shall conform to the approved facade plan.
 - 14) Sidewalks of not less than six (6) feet in width along thoroughfares and collectors and five (5) feet in width along residential streets, and barrier free ramps at all curb crossings shall be provided per Town standards.
 - 15) Approval of the site plan is not final until all engineering plans are approved by the Engineering Department.
 - 16) Site plan approval is required prior to grading release.
 - 17) All new electrical lines shall be installed and/or relocated underground.
 - 18) All mechanical equipment shall be screened from public view in accordance with the Zoning Ordinance.
 - 19) Temporary buildings will meet all the requirements of the Building Code.
 - 20) Temporary buildings will meet all the requirements of the Fire Code.
 - 21) Temporary buildings will be added to the existing fire alarm system and include one pull station and smoke alarm.
 - 22) Temporary buildings will have a minimum 10' building separation.
 - 23) Temporary buildings are approximately 24' x 64', and 1,536 sq ft.
 - 24) Temporary buildings connecting to plumbing of existing buildings shall submit for all necessary building permits, while temporary buildings requiring connections to public infrastructure shall require engineering plans to be submitted and approved at the time of building permit.

NOTES:

1. ALL PAVING DIMENSIONS SHOWN ARE TO FACE OF CURB WHERE APPLICABLE. ALL DIMENSIONS SHOWN AT PI CURB POINTS ARE AT THE INTERSECTION OF THE FACE OF CURB.
2. DRIVE 'C' CONNECTING TO FISHTRAP ROAD WILL BE EGRESS ONLY IF IT IS OPEN TO THE PUBLIC TO ASSIST WITH TRAFFIC FLOW.

SITE DATA

EXISTING ZONING:	PD 14
PROPOSED USE:	ELEMENTARY SCHOOL
GROSS LOT AREA:	11,523 ACRES (501,933 SF)
NET LOT AREA:	10.84 ACRES (472,073 SF)
BUILDING AREA:	94,744 SF
HEIGHT:	35' - ONE STORY
LOT COVERAGE RATIO:	20.1%
FLOOR AREA RATIO:	20.1%
TOTAL IMPERVIOUS AREA:	273,608 SF (6.28 AC)
REQUIRED PARKING: (1.5 SPACES PER CLASSROOM) 46 CLASSROOMS X 1.5 SPACES	69 SPACES
TOTAL PROVIDED PARKING: REQUIRED HANDICAP SPACES: STANDARD SPACES: (9'x20') HANDICAP SPACES:	150 SPACES 6 SPACES 142 SPACES 8 SPACES
OPEN SPACE REQUIRED (%):	10% (47,207 SF)
OPEN SPACE PROVIDED (%):	42% (198,465 SF)

DATE PREPARED:
MAY 2018

OWNER/APPLICANT:
PROSPER I.S.D.
605 E. SEVENTH STREET
PROSPER, TEXAS 75078
PHONE: 469.219.2000

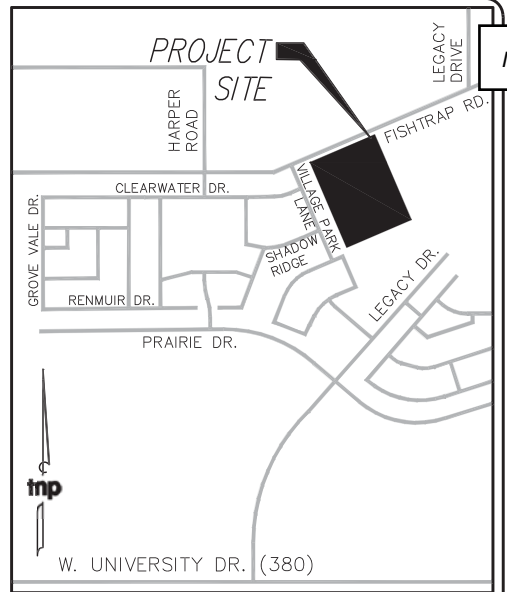
ARCHITECT:
HUCKABEE, INC.
801 CHERRY STREET, STE 500
FORT WORTH, TX 76102
972.292.7670
CONTACT: JOSH C. BROWN, AIA

PREPARED BY:
TEAGUE NALL & PERKINS, INC.
825 WATTERS CREEK BLVD., STE. M300
ALLEN, TEXAS 75013
214.461.9918
CONTACT: CRAIG M. CHONKO, P.E.

WATER METER TABLE

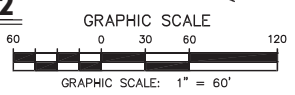
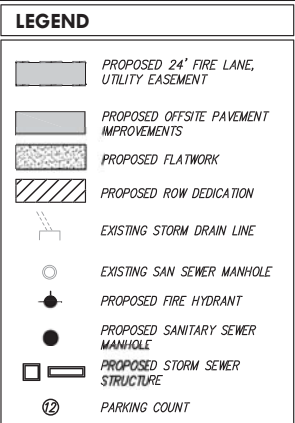
LOCATION	TYPE	SIZE	NUMBER
BUILDING	DOM	4"	1
LANDSCAPE	IRRIGATION	2"	2

**PROSPER CENTER
BLOCK A, LOT 8R
L. NETHERLY SURVEY, ABSTRACT NO. 962
SITE PLAN
ELEMENTARY SCHOOL #11
TOWN CASE #D20-0067**



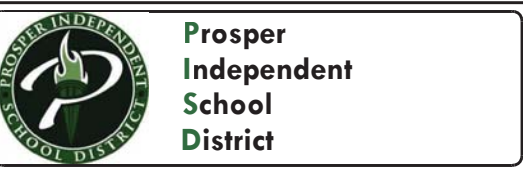
FEMA NOTE:

BASED ON THE FEMA FLOOD MAP SERVICE CENTER, THE MAJORITY OF THE SUBJECT TRACT OF LAND SHOWN HEREON LIES WITHIN ZONE 'X' UNSHADED, DEFINED AS 'AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE OF FLOODPLAIN' A PORTION OF THE SUBJECT TRACT OF LAND SHOWN LIES WITHIN ZONE 'A' WITH A 1% ANNUAL CHANCE FLOOD WITH NO ESTABLISHED BASE FLOOD ELEVATION, AS IDENTIFIED BY THE CURRENT FEDERAL EMERGENCY MANAGEMENT AGENCY, FLOOD INSURANCE RATE MAP, MAP NO. 48121C0430G, EFFECTIVE DATE OF APRIL 18, 2011, FOR DENTON COUNTY, TEXAS AND INCORPORATED AREAS.

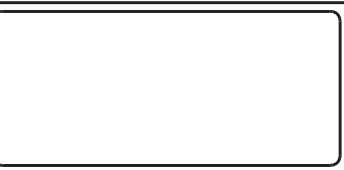


no.	revision	by	date

teague nall and perkins, inc
825 Watters Creek Blvd., Suite M300
Allen, Texas 75013
214.461.9867 ph 214.461.9864 fx
www.tnppinc.com
TBPE: F-230; TBPLS: 10011600, 10011601, 10194381



scale when bar is 1 inch long
horiz 1" = 60'
vert N/A
AUG 2018



Prosper, Texas
Improvements for
New Elementary School #11
OVERALL SITE PLAN

tnp project HUC18033
sheet **C2.03**
Page 41

PLANNING



To: Mayor and Town Council

From: Alex Glushko, AICP, Planning Manager

Through: Harlan Jefferson, Town Manager
Rebecca Zook, P.E., Executive Director of Development & Infrastructure Services

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Conduct a Public Hearing, and consider and act upon a request for a Sign Waiver for Cook Children’s Medical Center, located on the northeast corner of US 380 and Windsong Parkway, regarding Construction Fence Signage. (MD20-0012).

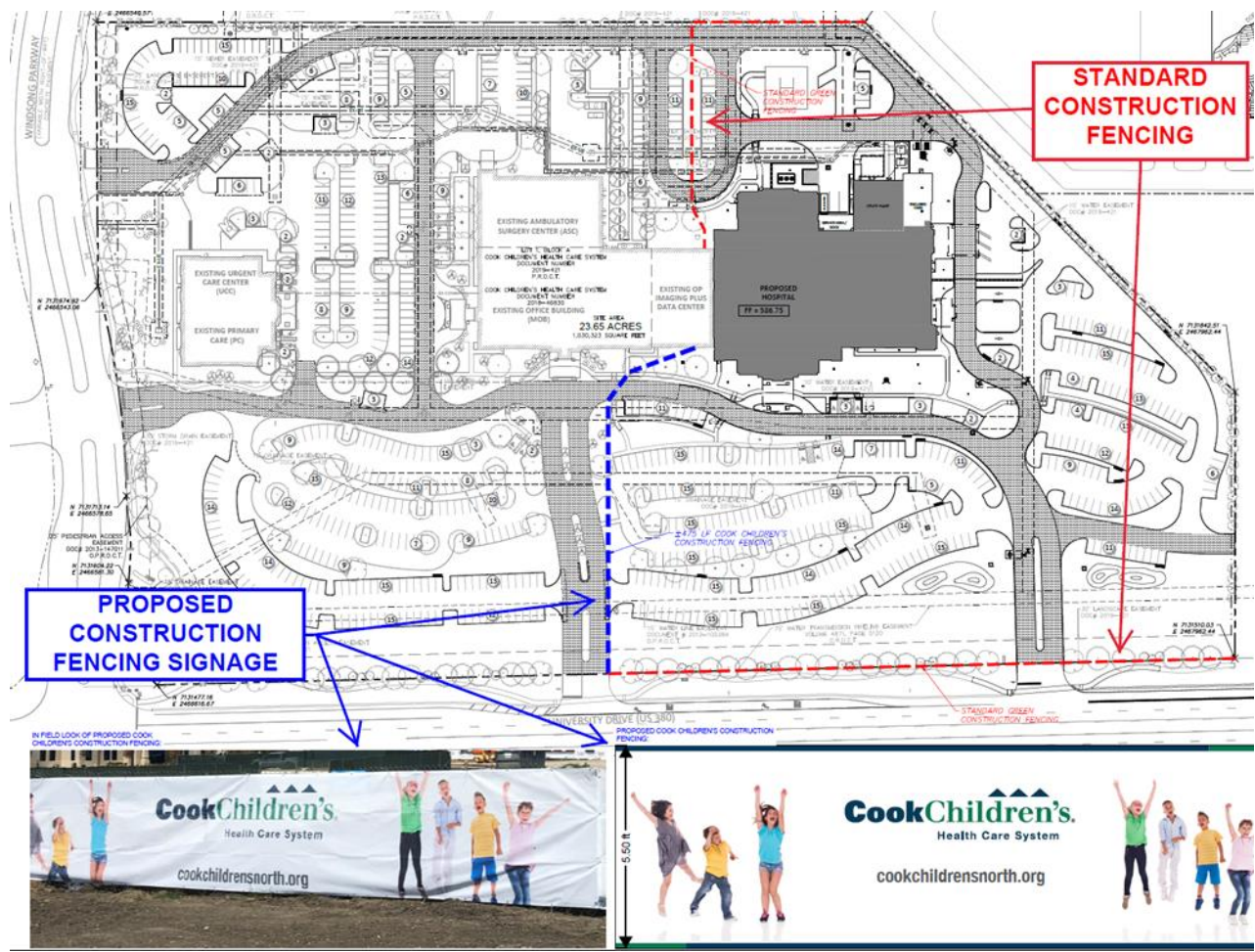
Description of Agenda Item:

The applicant is proposing Construction Fence Signage which exceeds the maximum allowable area. Construction fencing is commonly used on a voluntary basis by developers to shield the visual impact and securing the site during the construction process. Typical construction screening is a mesh material adhered to a fence, as shown on the picture below.



The Sign Ordinance permits signage to be printed on such fencing, but limits the maximum area of such signage to 128 square feet with a maximum height of eight feet (8’). Further, the ordinance permits properties with frontage on a major thoroughfare to have an additional sign, provided the signs are separated by a distance great than 200 feet.

The applicant is proposing continuous signage, approximately five and a half feet (5.5') in height to be located along the entry drive into the proposed hospital site for a length of approximately 475'. The applicant is also proposing standard green construction fencing along US 380 and at the north side of the hospital, in accordance with the Sign Ordinance. A depiction of the signage, as well as the proposed location of the construction fencing signage is shown below in blue.



The Sign Ordinance requires the Construction Fence Signage to be removed prior to the issuance of a Certificate of Occupancy. The applicant has indicated the expected completion of the hospital is in approximately 24 months.

The Sign Ordinance contains five (5) criteria to be considered in determining the validity of a Sign Waiver request. The applicant has provided a request letter addressing these criteria.

1. *The requirement for which the Waiver is requested imposes an undue hardship on the applicant;*
2. *The proposed sign shall be of a unique design or configuration;*
3. *The waiver is needed due to a hardship caused by restricted area, shape, topography, or physical features that are unique to the property or structure on which the proposed sign would be erected, and such hardship is not self-imposed;*
4. *Will substantially improve the convenience and welfare of the public and does not violate the intent of this Ordinance; and*
5. *The requirement or standard will not adversely impact an adjacent property owner.*

Legal Obligations and Review:

Notification was provided to neighboring property owners as required by the Sign Ordinance. Staff has not received any Notice Reply Forms in response to the request.

Attached Documents:

1. Location Map
2. Signage Exhibits
3. Request Letter

Town Staff Recommendation:

Staff recommends that the Town Council approve the request for the Sign Waiver for Cook Children's Medical Center, located on the northeast corner of US 380 and Windsong Parkway, regarding Construction Fence Signage.

Proposed Motion:

I move to approve a Sign Waiver for Cook Children's Medical Center, located on the northeast corner of US 380 and Windsong Parkway, regarding Construction Fence Signage.

MD20-0012 Cook Children's

Item 7.



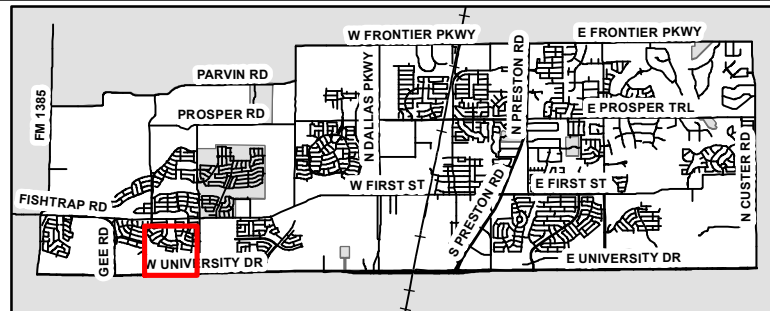
Legend

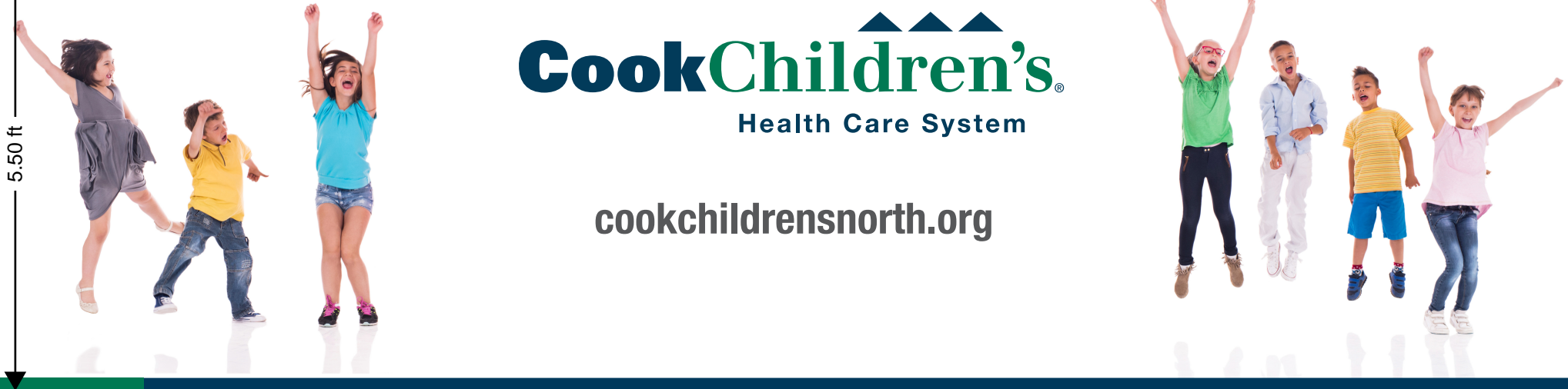
 Property Boundary



This map is for illustration purposes only.

0 500 1,000 Feet





IN FIELD LOOK OF PROPOSED COOK
CHILDREN'S CONSTRUCTION FENCING:





July 16, 2020

Town of Prosper
250 W. First Street
Prosper, TX 75078

Reference: Signage Ordinance Waiver Request – Construction Fencing

To Whom it May Concern:

Cook Children's is preparing for construction of the new Hospital at their north campus located in the Town of Prosper. Construction has started and their existing buildings (Urgent Care Center, Primary Care Center, Medical Office Building, and Ambulatory Surgery Center) are all open for business and seeing patients.

Attached is an exhibit indicating the proposed enhanced construction fencing with limits, dimensions and imagery. The proposed Cook Children's enhanced fencing will be contained within our own property and only focused around the main entry onto the Cook site.

While Cook Children's always strives to create a world class experience for visitors and patients, wayfinding and exterior environment are important factors as you enter the campus. In order to maintain this level of experience of our existing facilities while construction is underway of our new hospital, we desire for the construction fencing on the west side of the hospital to be non-standard and have a Cook Children's image. This would help screen the hospital construction, add a more solid barrier between the public and construction for enhanced public safety, make the drive into the campus from US 380 more aesthetically pleasing, and would also give people a website they can refer to for service information and updates.

The current Town of Prosper adopted signage ordinance allows for a maximum of 128 square feet of signage on construction fencing. We respectfully request a waiver from this maximum area requirement to provide an enhanced construction fencing. The enhanced fencing will be 5 feet 6 inches high and will span an approximate length of 475 feet. This would result in a total signage area of 2,615 square feet if the entire fence is considered signage. The duration that the fencing would be in place is estimated to be 24 months.

We believe this waiver request will not adversely impact an adjacent property owner and will improve the convenience and welfare of the public and does not violate the intent of the ordinance.

Sincerely,
COOK CHILDREN'S HEALTH CARE SYSTEM

Spencer Seals
Vice President, Construction & Real Estate

JTW/jtw
Document4
Enclosure

801 Seventh Avenue
Fort Worth, TX 76104-2796
682-885-4000
www.cookchildrens.org

RECEIVED
By Alex Glushko at 11:23 am, Jul 16, 2020

PLANNING



To: Mayor and Town Council

From: Alex Glushko, AICP, Planning Manager

**Through: Harlan Jefferson, Town Manager
Rebecca Zook, P.E., Executive Director of Development & Infrastructure Services**

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Conduct a Public Hearing, and consider and act upon a request to rezone 27.4± acres from Planned Development-65 (PD-65) to Planned Development-Single Family (PD-SF), located on the south side of Prairie Drive, east of Legacy Drive. (Z20-0014).

Description of Agenda Item:

The zoning and land use of the surrounding properties are as follows:

	Zoning	Current Land Use	Future Land Use Plan
Subject Property	Planned Development-65-Single Family	Undeveloped	US 380 District
North	Planned Development-65-Single Family	Single Family (Hills at Legacy)	Tollway District
East	Planned Development-98-Multifamily (Age-Restricted)	Undeveloped	US 380 District
South	Planned Development-85, Planned Development-92, and Planned Development-97 (Commercial)	Automobile Dealership (CDJR - under construction) and Undeveloped	US 380 District
West	Planned Development-65-Single Family	One Community Church	US 380 District

Requested Zoning – The purpose of this request is to rezone 27.4± acres from PD-65 to PD-SF, generally to modify the existing development standards. The developer is working with Perry Homes/Britton Homes to create a 105-lot subdivision to be developed in a single phase. The

prospective builder has indicated that a substantial number of the houses will be single-story in height as shown in the conceptual illustrations in Exhibit F. The development standards proposed in Exhibit C are necessary to facilitate the construction of larger single-story houses. In general, the developer is proposing to:

1. Decrease the overall permitted density of the subject property;
2. Reduce the required setbacks;
3. Commit to a minimum percentage of single-story homes; and
4. Enter into a development agreement related to masonry and architectural standards.

As outlined in Exhibit C, the applicant is proposing to modify the existing development standards as outlined below.

- *Density* - The conceptual development layout, Exhibit D, depicts 105 lots consisting of a maximum of 75 Type A lots (minimum 6,600 square feet) and a minimum of 30 Type B lots (minimum 7,800 square feet). Based on the current PD-65 lot allocation, the subject property, Tract 4R, could be developed entirely as Type A lots. The developer is proposing to provide a mixture of Type A and Type B lots.
- *Setbacks* – In order to be facilitate building areas that can accommodate current Perry Homes/Britton Homes’ single-story house designs, the developer is proposing to reduce the building setbacks, as follows:

Setbacks	Current	Proposed
Min. Front Yard	25 feet	20 feet
Min. Garage Door Setback (<i>No Change</i>)	25 feet	25 feet
Min. Side Yard	7.5 feet	5 feet
Min. Rear Yard	20 feet	20 feet (2-story house) 15 feet (1-story house)

- *One-Story Houses* – The developer and prospective builder are proposing reduced setbacks to accommodate their single-story home floorplans. As such, the developer is proposing a minimum percentage of the lots be developed with single-story homes. Staff supports establishing a minimum percentage of single-story homes.

The applicant originally proposed a minimum of forty percent (40%) of the homes be single-story. At the July 7, 2020, Planning & Zoning Commission meeting, staff recommended the applicant increase the minimum percentage to fifty percent (50%), in order to discourage adjacent two-story homes. The Planning & Zoning Commission supported the recommendation, and as a result, the applicant revised the request to require a minimum of fifty percent (50%) of the homes in the subdivision be single-story.

The subdivision will have a primary point of entry from Prairie Drive with a second gated access for emergency services as shown on Exhibit D.

Exhibit F illustrates the conceptual elevations for the Type A lots with 40-foot and 45-foot wide building pads and the Type B lots with 50-foot and 55-foot wide building pads. The developer has agreed to enter into a development agreement with the Town regarding masonry construction and architectural design consistent with the elevations shown below.



Future Land Use Plan – The Future Land Use Plan recommends US 380 District. The proposed zoning request conforms to the Future Land Use Plan.

Thoroughfare Plan – The property has direct access to Prairie Drive, an ultimate 90-foot, 4-lane divided thoroughfare. This request conforms to the Thoroughfare Plan.

Parks Master Plan – The Parks Master Plan does not indicate a park is needed on the subject property; however, a hike and bike trail will be required at the time of development.

Legal Obligations and Review:

Notification was provided to neighboring property owners as required by State law. To date, Town staff has not received any Public Hearing Notice Reply Forms.

Attached Documents:

1. Aerial and Zoning Maps
2. Proposed Exhibits A, B, C, D, E, and G

Staff Recommendation:

Staff recommends the Town Council approve the request subject to:

1. Approval of a Development Agreement by Town Council, which will include right-of-way and easement dedication and masonry and architectural standards consistent with Exhibit G.

Planning & Zoning Commission Recommendation:

At their July 7, 2020 meeting, the Planning and Zoning Commission recommended the Town Council approve the request, by a vote of 7-0, subject to the following:

1. Increasing the minimum percentage of single-story houses from 40 percent to 50 percent as agreed to by the applicant; and
2. Approval of a Development Agreement by Town Council, which will include right-of-way and easement dedication and masonry and architectural standards consistent with Exhibit G.

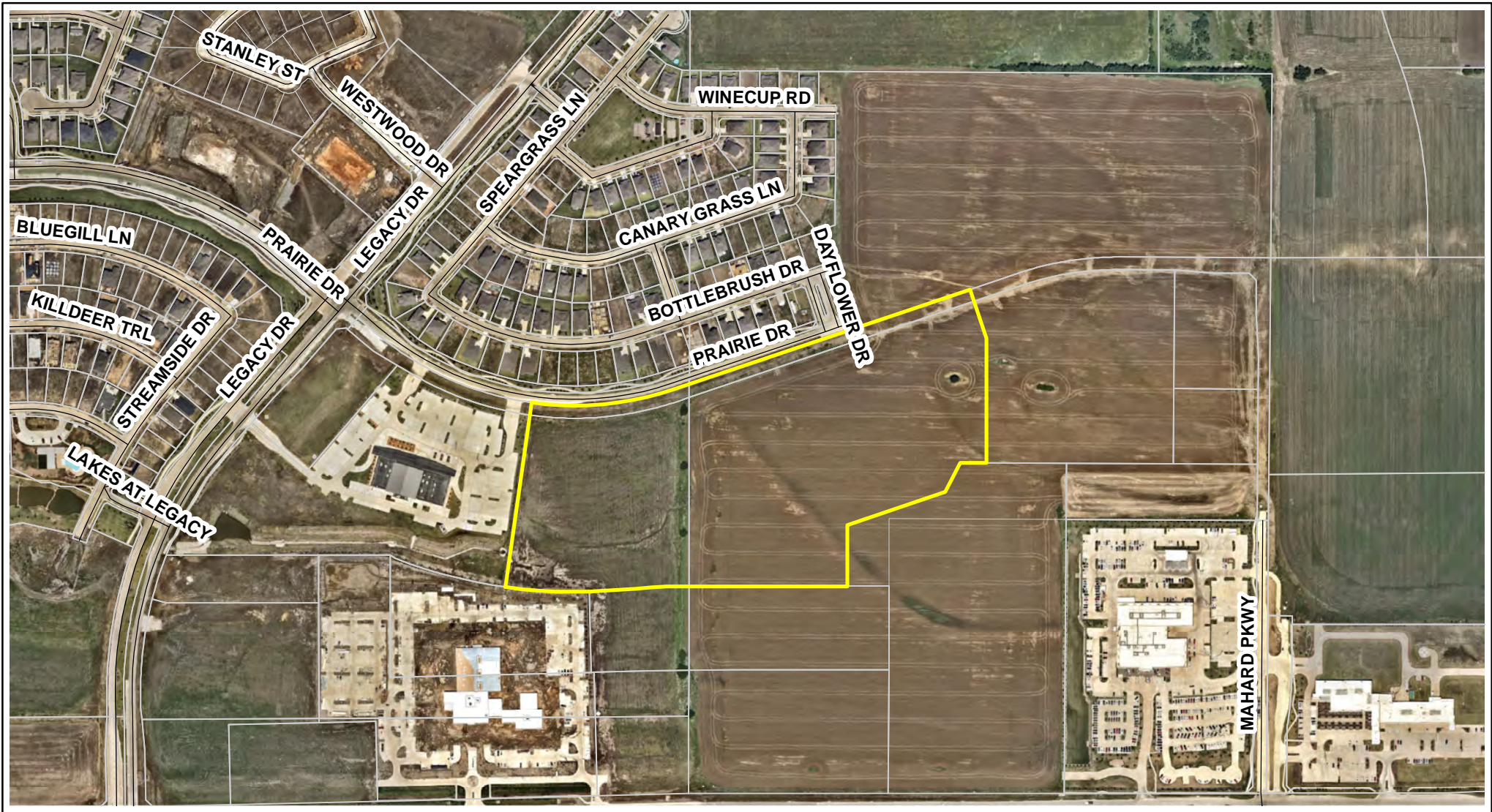
Since the meeting the applicant has revised the request to require a minimum of 50 percent (50%) of the homes be single-story.

Proposed Motion:

I move to approve the request to rezone 27.4± acres from Planned Development-65 (PD-65) to Planned Development-Single Family (PD-SF), located on the south side of Prairie Drive, east of Legacy Drive, subject to:

1. Approval of a Development Agreement, which will include right-of-way and easement dedication and masonry and architectural standards consistent with Exhibit G.

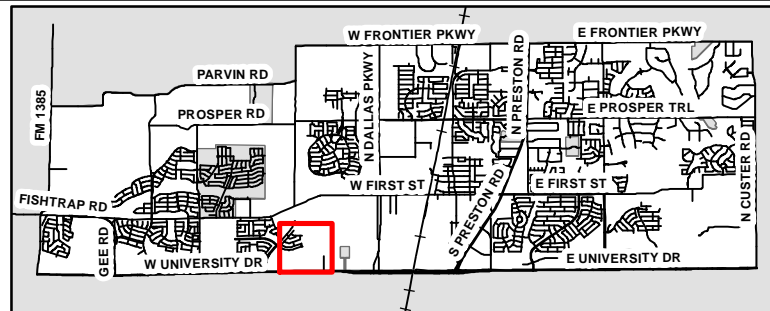
Z20-0014 Greens at Legacy

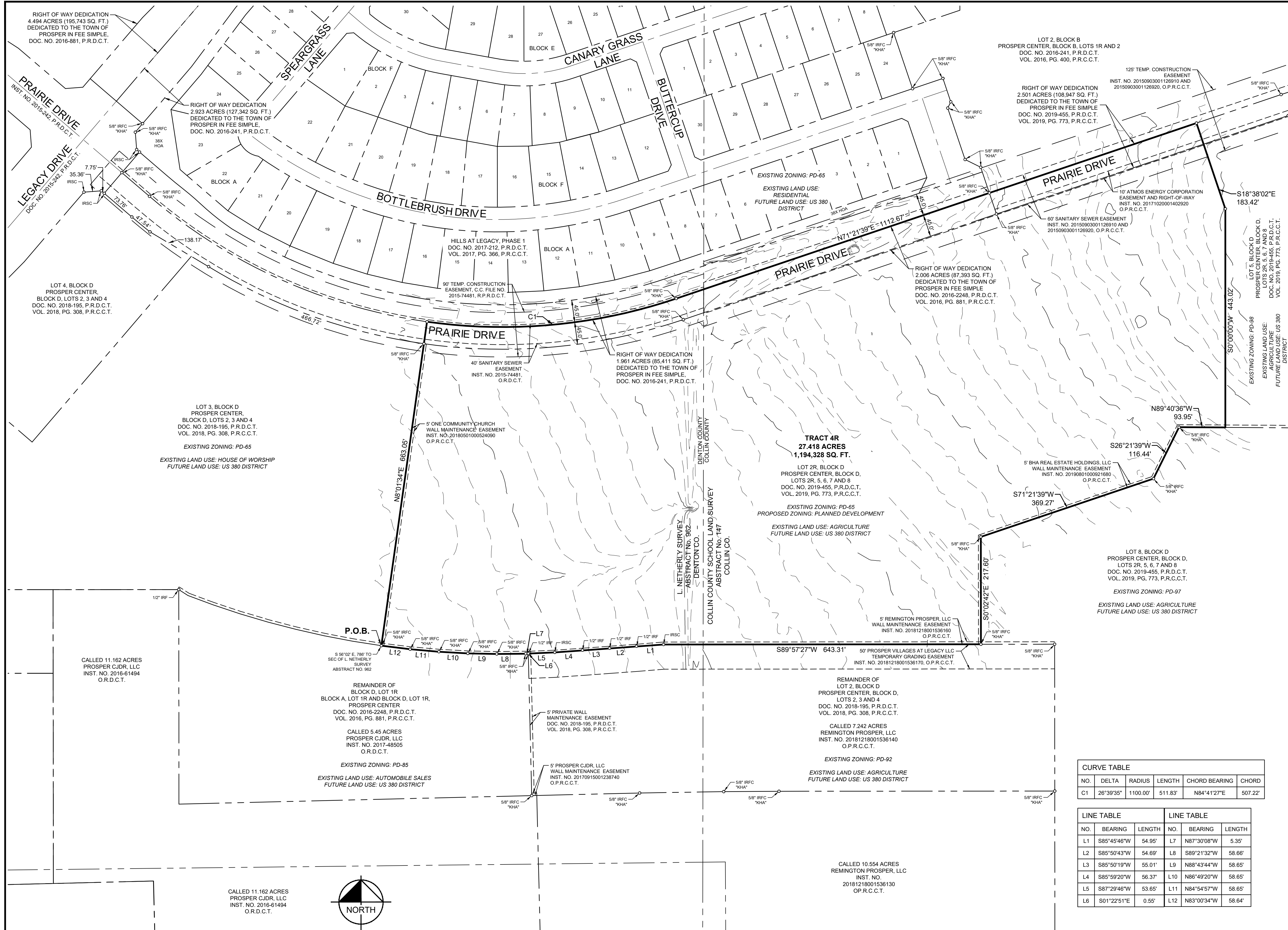


This map is for illustration purposes only.



0 500 1,000 Feet





DESCRIPTION OF PROPERTY:
BEING a tract of land situated in the L. Netherly Survey, Abstract No. 962 and the Collin County School Land Survey, Abstract No. 147, Denton County and Collin County, Texas, and being a lot of Lot 2R, Block D of Prosper Center, Lots 2R, 5, 6, 7 and 8, according to the Revised Conveyance Plat thereof recorded in Document No. 2019-455 of the Plat Records of Denton County, Texas, and also being a portion of Prairie Drive, a 90 foot wide right-of-way, as dedicated in the Revised Conveyance Plat of Block A, Lot 1R and Block D, Lot 1R, Prosper Center recorded in Document No. 2016-2248 of the Plat Records of Denton County, Texas, and in said Revised Conveyance Plat recorded in Document No. 2019-455 of the Plat Records of Denton County, Texas, and being more particularly described as follows:

BEGINNING a 5/8 inch iron rod with plastic cap stamped "KHA" found for the southwest corner of said Lot 2R, common to the southeast corner of Lot 3, Block D of Prosper Center, Block D, Lots 2, 3 and 4, according to the Revised Conveyance Plat thereof recorded in Document No. 2018-195 of the Plat Records of Denton County, Texas, same being on the northerly line of a called 5.45 acre tract of land described in a Special Warranty Deed to Prosper CJD, LLC, as recorded in Instrument No. 2017-48505 of the Official Records of Denton County, Texas;

THENCE North 8°01'34" East, departing the northerly line of said 5.45 acre tract, along the westerly line of said Lot 2R and the easterly line of said Lot 3, passing at a distance of 618.05 feet a 5/8 inch iron rod with plastic cap stamped "KHA" found for the northwest corner of said Lot 2R, common to the northeast corner of said Lot 3, being on the southerly right-of-way line of Prairie Drive, a variable width right-of-way, and continuing along the same course, departing the southerly right-of-way line of said Prairie Drive and crossing said Prairie Drive, for a total distance of 663.05 feet to a point for corner in the centerline of said Prairie Drive, and at the beginning of a non-tangent curve to the left having a central angle of 26°39'35", a radius of 1100.00 feet, a chord bearing and distance of North 84°41'27" East, 507.22 feet;

THENCE along the centerline of said Prairie Drive, the following:
 In a northeasterly direction, with said curve to the left, an arc distance of 511.83 feet to a point for corner;
 North 71°21'39" East, a distance of 1112.67 feet to a point for corner;

THENCE South 18°38'02" East, departing the centerline of said Prairie Drive and crossing said Prairie Drive, passing at a distance of 45.00 feet a 5/8 inch iron rod with plastic cap stamped "KHA" found for the northeast corner of said Lot 2R, common to the northwest corner of Lot 5, Block D of said Prosper Center, Lots 2R, 5, 6, 7 and 8, same being on the southerly right-of-way line of said Prairie Drive, and continuing along the same course and along the easterly line of said Lot 2R and the westerly line of said Lot 5, for a total distance of 183.42 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" set for corner;

THENCE South 00°00'00" West, continuing along the easterly line of said Lot 2R and the westerly line of said Lot 5, a distance of 443.02 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" set for the northerly southeast corner of said Lot 2R, common to the southwest corner of said Lot 5, being on the northerly line of Lot 8, Block D of said Prosper Center, Lots 2R, 5, 6, 7 and 8;

THENCE along the southerly and easterly lines of said Lot 2R and the northerly and westerly lines of said Lot 8, the following:

North 89°40'36" West, a distance of 93.95 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" found for corner;
 South 26°21'39" West, a distance of 116.44 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" found for corner;
 South 71°21'39" West, a distance of 369.27 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" found for corner;
 South 0°02'42" East, a distance of 217.60 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" found for the southerly southeast corner of said Lot 2R, common to the northerly southwest corner of said Lot 8, being on the northerly line of a called 7.242 acre tract of land described in a deed to a called 7.242 acre tract of land described in a deed to Remington Prosper, LLC, as recorded in Instrument No. 20181218001536140 of the Official Public Records of Collin County, Texas;

THENCE along the southerly line of said Lot 2R and the northerly and westerly lines of said 7.242 acre tract, the following:

South 89°57'27" West, a distance of 643.31 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" set for corner;
 South 85°45'46" West, a distance of 54.95 feet to a 1/2 inch iron rod found for corner;
 South 85°50'43" West, a distance of 54.69 feet to a 1/2 inch iron rod found for corner;
 South 85°50'19" West, a distance of 55.01 feet to a 1/2 inch iron rod found for corner;
 South 85°59'20" West, a distance of 56.37 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" set for corner;
 South 87°29'46" West, a distance of 53.65 feet to a 1/2 inch iron rod found for the northwest corner of said 7.242 acre tract;
 South 1°22'51" East, a distance of 0.55 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" found for an ell corner of said Lot 2R, common to the northeast corner of aforesaid 5.45 acre tract;

THENCE departing the westerly line of said 7.242 acre tract, continuing along the southerly line of said Lot 2 and along the northerly line of said 5.45 acre tract, the following:

North 87°30'08" West, a distance of 5.35 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" found for corner;
 South 89°21'32" West, a distance of 58.66 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" found for corner;
 North 88°43'44" West, a distance of 58.65 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" found for corner;
 North 86°49'20" West, a distance of 58.65 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" found for corner;
 North 84°54'57" West, a distance of 58.65 feet to a 5/8 inch iron rod with plastic cap stamped "KHA" found for corner;
 North 83°00'34" West, a distance of 58.64 feet to the **POINT OF BEGINNING** and containing 27.418 acres (1,194,328 square feet) of land, more or less.

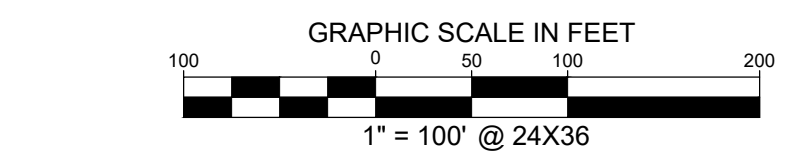
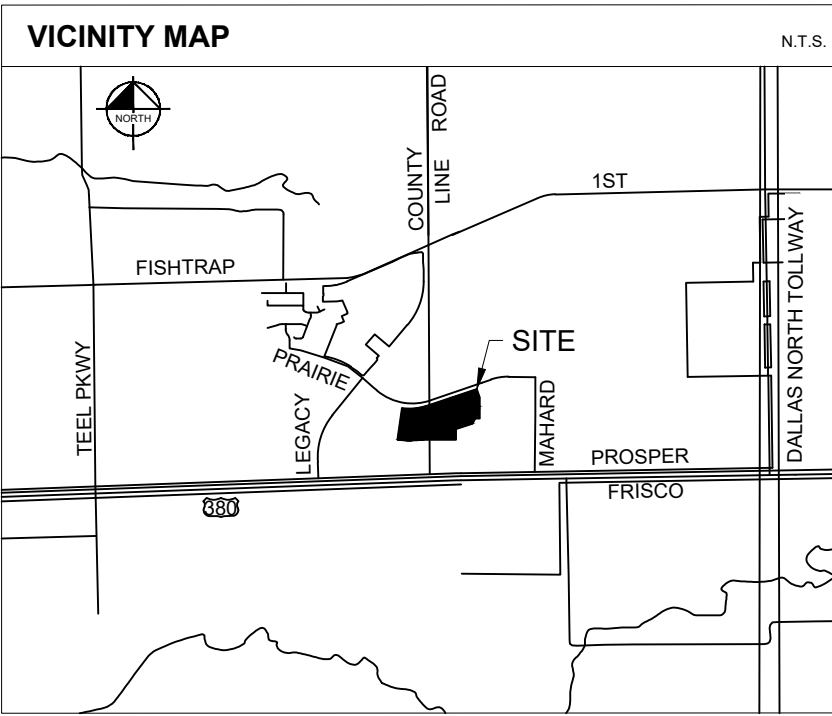
NO.	DELTA	RADIUS	LENGTH	CHORD BEARING	CHORD
C1	26°39'35"	1100.00'	511.83'	N84°41'27"E	507.22'

LINE TABLE			LINE TABLE		
NO.	BEARING	LENGTH	NO.	BEARING	LENGTH
L1	S85°45'46"W	54.95'	L7	N87°30'08"W	5.35'
L2	S85°50'43"W	54.69'	L8	S89°21'32"W	58.66'
L3	S85°50'19"W	55.01'	L9	N88°43'44"W	58.65'
L4	S85°59'20"W	56.37'	L10	N86°49'20"W	58.65'
L5	S87°29'46"W	53.65'	L11	N84°54'57"W	58.65'
L6	S01°22'51"E	0.55'	L12	N83°00'34"W	58.64'

EXHIBIT A
TRACT 4R
27.418 ACRES (GROSS)
25.729 ACRES (NET)

LOT 2R, BLOCK D OF PROSPER CENTER,
 BLOCK D, LOTS 2R, 5, 6, 7 AND 8

L. NETHERLY SURVEY, ABSTRACT NO. 962
 COLLIN COUNTY SCHOOL LAND SURVEY, ABSTRACT NO. 147
 TOWN OF PROSPER, DENTON AND COLLIN COUNTY, TEXAS
 CASE NO. Z20-0014



LEGEND
 P.O.B. = POINT OF BEGINNING
 IRSC = 5/8" IRON ROD W/ "KHA" CAP SET
 IPF = IRON PIPE FOUND
 INST. = INSTRUMENT
 DOC. = DOCUMENT
 NO. = NUMBER
 VOL. = VOLUME
 PG. = PAGE
 D.R.D.C.T. = DEED RECORDS, DENTON COUNTY, TEXAS
 O.R.D.C.T. = OFFICIAL RECORDS, DENTON COUNTY, TEXAS
 P.R.D.C.T. = PLAT RECORD, DENTON COUNTY, TEXAS
 P.R.C.C.T. = PLAT RECORD, COLLIN COUNTY, TEXAS
 O.P.R.C.C.T. = OFFICIAL PUBLIC RECORDS, COLLIN COUNTY, TEXAS

- NOTES:**
- Bearing system based on the south line of Prosper Center Block B, Lot 1R and 2 as recorded in Doc. No. 2016-241 P.R.D.C.T.
 - According to Map No. 48121C0230J, dated June 02, 2009 of the National Flood Insurance Program Map, Flood Insurance Rate Map of Collin County, Texas, Federal Emergency Management Agency, Federal Insurance Administration and Map No. 48085C0230J, dated June 2, 2009 of the National Flood Insurance Program Map, Flood Insurance Rate Map of Collin County, Texas, Federal Emergency Management Agency, Federal Insurance Administration, this property is located within Zone "X-Unshaded", which is not a special flood hazard area. If this site is not within an identified special flood hazard area, this flood statement does not imply that the property and/or the structures thereon will be free from flooding or flood damage. On rare occasions, greater floods can and will occur and flood heights may be increased by man-made or natural causes. This flood statement shall not create liability on the part of the surveyor.

Lots: 103
 Acreage: 25.729
 Density: 4.00 D.U./AC

SYLVIANA GUNAWAN
 REGISTERED PROFESSIONAL
 LAND SURVEYOR NO. 6461
 6160 WARREN PKWY., SUITE 210
 FRISCO, TEXAS 75034
 PH. 972-335-3580
 sylviana.gunawan@kimley-horn.com

PRELIMINARY
 THIS DOCUMENT SHALL
 NOT BE RECORDED FOR
 ANY PURPOSE AND
 SHALL NOT BE USED OR
 VIEWED OR RELIED
 UPON AS A FINAL
 SURVEY DOCUMENT

Kimley»Horn

6160 Warren Parkway, Suite 210
 Frisco, Texas 75034
 Tel. No. (972) 335-3580
 FIRM # 10193822

Scale	Drawn by	Checked by	Date	Project No.	Sheet No.
1" = 100'	SG	KHA	MAY 2020	067252018	1 OF 1

OWNER:
 Prosper Villages at Legacy LLC
 10950 Research Road
 Frisco, Texas 75033
 Ph: 214.387.3993
 Contact: Clint Richardson

ENGINEER:
 Kimley-Horn and Associates, Inc.
 6160 Warren Parkway, Suite 210
 Frisco, Texas 75034
 Ph: 972.335.3580
 Contact: Thomas Fletcher, P.E.

Z20-0014

EXHIBIT "B"

STATEMENT OF INTENT AND PURPOSE

This Planned Development District establishes the development standards to facilitate the development of a single-family community within Tract 4R of Greens at Legacy.

Z20-0014

EXHIBIT "C"

PLANNED DEVELOPMENT STANDARDS

Conformance with the Town's Zoning Ordinance and Subdivision Ordinance: Except as otherwise set forth in these Development Standards, the regulations of the Town's Zoning Ordinance (Ordinance No. 05-20 as it currently exists or may be amended) and the Subdivision Ordinance (Ordinance No. 17-41 as it currently exists or may be amended) shall apply.

1. Single Family Residential

- 1.1 General Description Conceptual Layout: ~~Single Family Residential uses shall be permitted in all locations as shown on Exhibit "D" that are not identified as Commercial. Retail uses may be permitted, but not required, to develop in accordance with Section 2 within the areas identified on Exhibit "D". The single-family detached development within Tract 4R shall be in general accordance with the attached conceptual layout set forth in Exhibit D.~~

Density: ~~A maximum of one hundred five (105) units shall be allowed within Tract 4R, of which, a minimum of thirty (30) units shall be Type B Lots and the remainder shall be Type A Lots.~~

One-Story Houses: ~~A minimum of 50 percent of the houses built in this development shall be one-story in height.~~

- 1.2 Permitted Uses: Land uses allowed within the Single Family Residential Tracts are as follows: Uses followed by an **S** are permitted by Specific Use Permit. Uses followed by a **C** are permitted subject to conditional development standards. Conditional development standards are set forth in Chapter 3, Section 1 of the Town's Zoning Ordinance.

- Accessory Building
- Antenna and/or Antenna Support Structure, Non-Commercial **C**
- ~~Athletic Stadium or Field, Private **C**~~
- ~~Athletic Stadium or Field, Public~~
- ~~Bed and Breakfast Inn **S**~~
- ~~Day Care Center, Adult **S**~~
- ~~Day Care Center, Child **C**~~
- Day Care Center, In-Home **C**
- ~~Farm, Ranch, Stable, Garden, or Orchard~~
- Garage Apartment
- ~~Golf Course and/or Country Club~~
- Guest House
- Home Occupation **C**
- Homebuilder Marketing Center **C**
- House of Worship
- Household Care Facility
- Model Home

- Municipal Uses Operated by the Town of Prosper
 - Park or Playground
 - Private Recreation Center
 - ~~Private Street Development C~~
 - Private Utility, Other Than Listed
 - ~~School, Private or Parochial S~~
 - ~~School, Public~~
 - Single Family Dwelling, Detached - as described herein
 - ~~Stealth Antenna, Commercial C~~
 - Temporary Building C
 - Utility Distribution/Transmission Facility S
- 1.3 Density: The maximum number of single family detached units shall be ~~nine-one~~ hundred ~~thirty-five~~ (~~930105~~).
- 1.4 Lot Types: The single family detached lots shall be in accordance with the following Lot Types:
- Type A Lots: Minimum 6,600 square foot lots
 - Type B Lots: Minimum 7,800 square foot lots
 - ~~Type C Lots: Minimum 8,400 square foot lots~~
- 1.5 Single Family Detached Residential Area and Building Regulations:
- 1.5.1 Type A: A maximum of ~~three hundred fifty~~ ~~seventy-five~~ (~~35075~~) total units of this type shall be allowed and shall only be located within Tracts ~~2, 3, or 4R~~. ~~The max amount allowed within Tract 2 shall be seventy (70) units. The max amount allowed within Tract 3 shall be one hundred (150) units. The remainder, up to the three hundred fifty (350) maximum total, shall be allowed in Tract 4.~~
- 1.5.1.1 Size of Yards:
- 1.5.1.1.1 Minimum Front Yard: ~~The minimum front yard shall be twenty (20) feet and t~~ Twenty-five (25) feet for the front façade of garages. Setbacks shall be staggered per Zoning Ordinance.
- 1.5.1.1.2 Minimum Side Yard: ~~Seven and one-half~~ Five (7.5) feet; fifteen (15) feet on corner adjacent to street.
- 1.5.1.1.3 Minimum Rear Yard: ~~Twenty-Fifteen (15 20) feet for a one (1) story house and twenty (20) feet for a two (2) story house.~~
- 1.5.1.2 Size of Lots:
- 1.5.1.2.1 Minimum Lot Area: Six thousand six hundred (6,600) square feet.
- 1.5.1.2.2 Minimum Lot Width: Fifty-five (55) feet; except for lots at the terminus of a cul-de-sac, on a corner, or along a curve may have a width of fifty (50) feet at the front building line; provided all other requirements of this section are fulfilled.
- 1.5.1.2.3 Minimum Lot Depth: One hundred twenty (120) feet; except for lots at the terminus of a cul-de-sac, on a corner, backing to a turn lane, or along a curve may have a depth of one hundred

ten (110) feet, measured at the midpoints of the front and rear lot lines provided all other requirements of this section are fulfilled.

1.5.1.3 Minimum Dwelling Area: Two thousand two hundred (2,200) square feet.

1.5.1.4 Maximum Building Height: Two and a half (2 ½) stories, no greater than forty (40) feet.

1.5.1.5 Lot Coverage: Fifty Five (55) percent.

1.5.2 Type B: Except for those lots developed per 1.5.1 and 1.5.3, the remainder of the units within the development shall be of this type.

1.5.2.1 Size of Yards:

1.5.2.1.1 Minimum Front Yard: ~~The minimum front yard shall be twenty (20) feet and twenty-five (25) feet for the front façade of garages. Twenty-five (25) feet. Setbacks shall be staggered per Zoning Ordinance.~~

1.5.2.1.2 Minimum Side Yard: ~~Seven and one-half Five (7.5) feet~~; fifteen (15) feet on corner adjacent to street.

1.5.2.1.3 Minimum Rear Yard: ~~Twenty-Fifteen (2015) feet~~ for a one (1) story house and twenty (20) feet for a two (2) story house.

1.5.2.2 Size of Lots:

1.5.2.2.1 Minimum Lot Area: Seven thousand eight hundred (7,800) square feet.

1.5.2.2.2 Minimum Lot Width: Sixty-five (65) feet; except for lots at the terminus of a cul-de-sac, on a corner, or along a curve may have a width of sixty (60) feet at the front building line; provided all other requirements of this section are fulfilled.

1.5.2.2.3 Minimum Lot Depth: One hundred twenty (120) feet; except for lots at the terminus of a cul-de-sac, on a corner, backing to a turn lane, or along a curve may have a depth of one hundred ten (110) feet, measured at the midpoints of the front and rear lot lines provided all other requirements of this section are fulfilled.

1.5.2.3 Minimum Dwelling Area: Two thousand five hundred (2,500) square feet.

1.5.2.4 Maximum Building Height: Two and a half (2 ½) stories, no greater than forty (40) feet.

1.5.2.5 Lot Coverage: Fifty Five (55) percent

1.6 Additional Standards: Residential development shall employ the following additional measures to promote a quality residential community.

1.6.1 Fencing: All fencing shall comply with the Town's fencing standards as they exist or may be amended. In addition, the following regulations shall apply:

1.6.1.1 Fencing shall not exceed (8) feet in height above grade.

- 1.6.1.2 All fencing located adjacent to open space, parks, or floodplain shall consist of ornamental metal.
- 1.6.1.3 All wood fencing facing a public street shall consist of cedar, board on board with a top rail, and supported by steel posts. A common wood fence stain color shall be established for the community by the developer.
- 1.6.1.4 Fences shall be located at least ten (10) feet behind the front elevation of the main building.
- 1.6.2 Exterior Lighting: All homes shall provide an exterior lighting package to illuminate front entrances and garages.
- 1.6.3 Garages:
- 1.6.3.1 Homes shall have a minimum of two (2) car garages, but not more than three (3). No carports shall be permitted.
- 1.6.3.2 A house with three (3) car garage/enclosed parking spaces shall not have more than two (2) garage doors facing the street. (Note that one double (approximately 20') door counts as two garage doors).
- 1.6.3.3 All garage doors shall have stamped reveals / texture or have a cedar cladding.
- 1.6.3.4 Type A and Type B Lots shall not be required to have swing-in driveways and/or side facing garages.
- 1.6.4 Driveways and Sidewalks:
All portions of driveways and sidewalks outside of the public ROW shall incorporate an enhanced paving treatment consisting of stained concrete, exposed aggregate concrete, salt finished concrete, and/or brick borders.
- 1.6.5 Building Facades:
Houses within Tract 4R shall be in general conformance with the conceptual facades shown in Exhibit F.

Z20-0014**EXHIBIT "C"****PLANNED DEVELOPMENT STANDARDS**

Conformance with the Town's Zoning Ordinance and Subdivision Ordinance: Except as otherwise set forth in these Development Standards, the regulations of the Town's Zoning Ordinance (Ordinance No. 05-20 as it currently exists or may be amended) and the Subdivision Ordinance (Ordinance No. 17-41 as it currently exists or may be amended) shall apply.

1. Single Family Residential

- 1.1 Conceptual Layout: The single-family detached development within Tract 4R shall be in general accordance with the attached conceptual layout set forth in Exhibit D.

Density: A maximum of one hundred five (105) units shall be allowed within Tract 4R, of which, a minimum of thirty (30) units shall be Type B Lots and the remainder shall be Type A Lots.

One-Story Houses: A minimum of 50 percent (50%) of the houses built in this development shall be one-story in height.

- 1.2 Permitted Uses: Land uses allowed within the Single Family Residential Tracts are as follows: Uses followed by an **S** are permitted by Specific Use Permit. Uses followed by a **C** are permitted subject to conditional development standards. Conditional development standards are set forth in Chapter 3, Section 1 of the Town's Zoning Ordinance.

- Accessory Building
- Antenna and/or Antenna Support Structure, Non-Commercial **C**
- Day Care Center, In-Home **C**
- Garage Apartment
- Guest House
- Home Occupation **C**
- Homebuilder Marketing Center **C**
- House of Worship
- Household Care Facility
- Model Home
- Municipal Uses Operated by the Town of Prosper
- Park or Playground
- Private Recreation Center
- Private Utility, Other Than Listed
- Single Family Dwelling, Detached - as described herein
- Temporary Building **C**
- Utility Distribution/Transmission Facility **S**

- 1.3 Density: The maximum number of single family detached units shall be one hundred five (105).

1.4 Lot Types: The single family detached lots shall be in accordance with the following Lot Types:

- Type A Lots: Minimum 6,600 square foot lots
- Type B Lots: Minimum 7,800 square foot lots

1.5 Single Family Detached Residential Area and Building Regulations:

1.5.1 Type A: A maximum of seventy-five (75) total units of this type shall be allowed and shall only be located within Tract4R.

1.5.1.1 Size of Yards:

1.5.1.1.1 Minimum Front Yard: The minimum front yard shall be twenty (20) feet and twenty-five (25) feet for the front façade of garages.

1.5.1.1.2 Minimum Side Yard: Five (5) feet; fifteen (15) feet on corner adjacent to street.

1.5.1.1.3 Minimum Rear Yard: Fifteen (15) feet for a one (1) story house and twenty (20) feet for a two (2) story house.

1.5.1.2 Size of Lots:

1.5.1.2.1 Minimum Lot Area: Six thousand six hundred (6,600) square feet.

1.5.1.2.2 Minimum Lot Width: Fifty-five (55) feet; except for lots at the terminus of a cul-de-sac, on a corner, or along a curve may have a width of fifty (50) feet at the front building line; provided all other requirements of this section are fulfilled.

1.5.1.2.3 Minimum Lot Depth: One hundred twenty (120) feet; except for lots at the terminus of a cul-de-sac, on a corner, backing to a turn lane, or along a curve may have a depth of one hundred ten (110) feet, measured at the midpoints of the front and rear lot lines provided all other requirements of this section are fulfilled.

1.5.1.3 Minimum Dwelling Area: Two thousand two hundred (2,200) square feet.

1.5.1.4 Maximum Building Height: Two and a half (2 ½) stories, no greater than forty (40) feet.

1.5.1.5 Lot Coverage: Fifty Five (55) percent.

1.5.2 Type B: Except for those lots developed per 1.5.1 and 1.5.3, the remainder of the units within the development shall be of this type.

1.5.2.1 Size of Yards:

1.5.2.1.1 Minimum Front Yard: The minimum front yard shall be twenty (20) feet and twenty-five (25) feet for the front façade of garages.

1.5.2.1.2 Minimum Side Yard: Five (5) feet; fifteen (15) feet on corner adjacent to street.

1.5.2.1.3 Minimum Rear Yard: Fifteen (15) feet for a one (1) story house and twenty (20) feet for a two (2) story house.

1.5.2.2 Size of Lots:

1.5.2.2.1 Minimum Lot Area: Seven thousand eight hundred (7,800) square feet.

1.5.2.2.2 Minimum Lot Width: Sixty-five (65) feet; except for lots at the terminus of a cul-de-sac, on a corner, or along a curve may have a width of sixty (60) feet at the front building line; provided all other requirements of this section are fulfilled.

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1.5.2.3 Minimum Dwelling Area: Two thousand five hundred (2,500) square feet.

1.5.2.4 Maximum Building Height: Two and a half (2 ½) stories, no greater than forty (40) feet.

1.5.2.5 Lot Coverage: Fifty Five (55) percent

1.6 Additional Standards: Residential development shall employ the following additional measures to promote a quality residential community.

1.6.1 Fencing: All fencing shall comply with the Town's fencing standards as they exist or may be amended. In addition, the following regulations shall apply:

1.6.1.1 Fencing shall not exceed (8) feet in height above grade.

1.6.1.2 All fencing located adjacent to open space, parks, or floodplain shall consist of ornamental metal.

1.6.1.3 All wood fencing facing a public street shall consist of cedar, board on board with a top rail, and supported by steel posts. A common wood fence stain color shall be established for the community by the developer.

1.6.1.4 Fences shall be located at least ten (10) feet behind the front elevation of the main building.

1.6.2 Exterior Lighting: All homes shall provide an exterior lighting package to illuminate front entrances and garages.

1.6.3 Garages:

1.6.3.1 Homes shall have a minimum of two (2) car garages, but not more than three (3). No carports shall be permitted.

1.6.3.2 A house with three (3) car garage/enclosed parking spaces shall not have more than two (2) garage doors facing the street. (Note that one double (approximately 20') door counts as two garage doors).

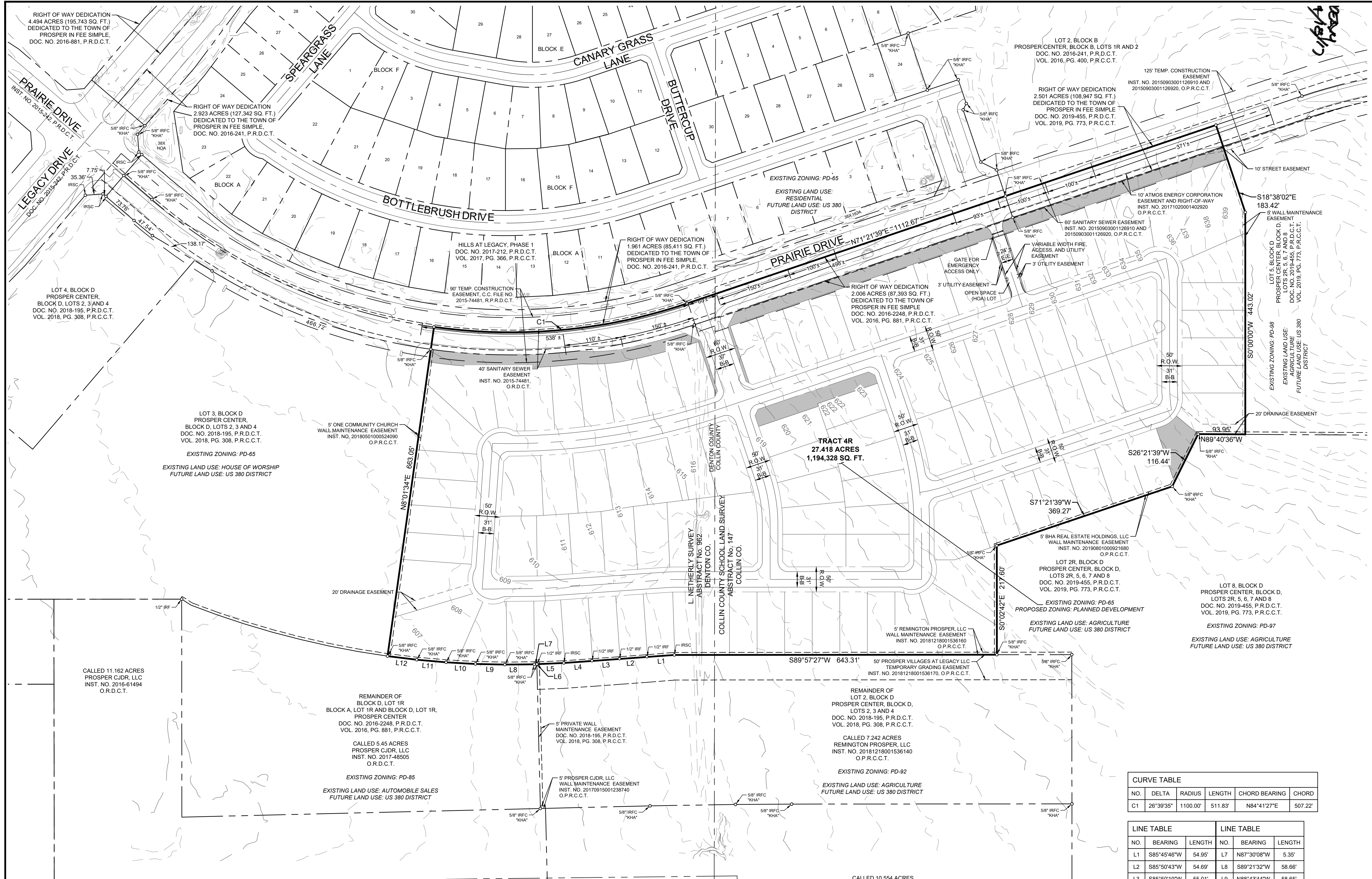
1.6.3.3 All garage doors shall have stamped reveals / texture or have a cedar cladding.

1.6.3.4 Type A and Type B Lots shall not be required to have swing-in driveways and/or side facing garages.

1.6.4 Driveways and Sidewalks:

All portions of driveways and sidewalks outside of the public ROW shall incorporate an enhanced paving treatment consisting of stained concrete, exposed aggregate concrete, salt finished concrete, and/or brick borders.

1.6.5 Building Facades: Houses within Tract 4R shall be in general conformance with the conceptual facades shown in Exhibit F.



- NOTES:**
- Bearing system based on the south line of Prosper Center Block B, Lot 1R and 2 as recorded in Doc. No. 2016-241 P.R.D.C.T.
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 O.P.R.C.C.T. = OFFICIAL PUBLIC RECORDS, COLLIN COUNTY, TEXAS
- = OPEN SPACE LOT

Land Use Table

Tract	4R
Type A SF Units	Max. of 75
Type B SF Units	Min. of 30
Total	Max of 105

CURVE TABLE

NO.	DELTA	RADIUS	LENGTH	CHORD BEARING	CHORD
C1	26°39'35"	1100.00'	511.83'	N84°41'27"E	507.22'

LINE TABLE

NO.	BEARING	LENGTH	NO.	BEARING	LENGTH
L1	S85°45'46"W	54.95'	L7	N87°30'08"W	5.35'
L2	S85°50'43"W	54.69'	L8	S89°21'32"W	58.66'
L3	S85°50'19"W	55.01'	L9	N88°43'44"W	58.65'
L4	S85°59'20"W	56.37'	L10	N86°49'20"W	58.65'
L5	S87°29'46"W	53.65'	L11	N84°54'57"W	58.65'
L6	S01°22'51"E	0.55'	L12	N83°00'34"W	58.64'

EXHIBIT D
TRACT 4R
27.418 ACRES (GROSS)
25.729 ACRES (NET)

LOT 2R, BLOCK D OF PROSPER CENTER,
 BLOCK D, LOTS 2R, 5, 6, 7 AND 8

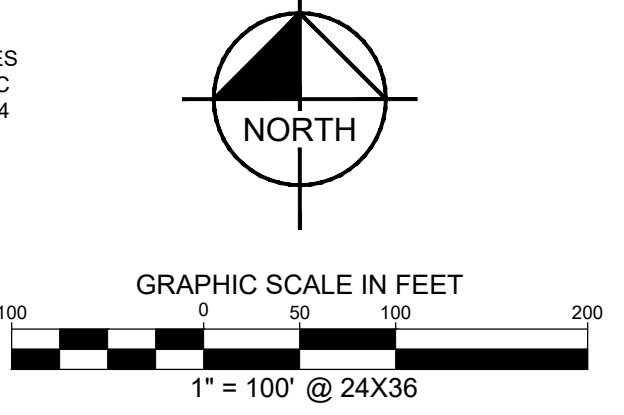
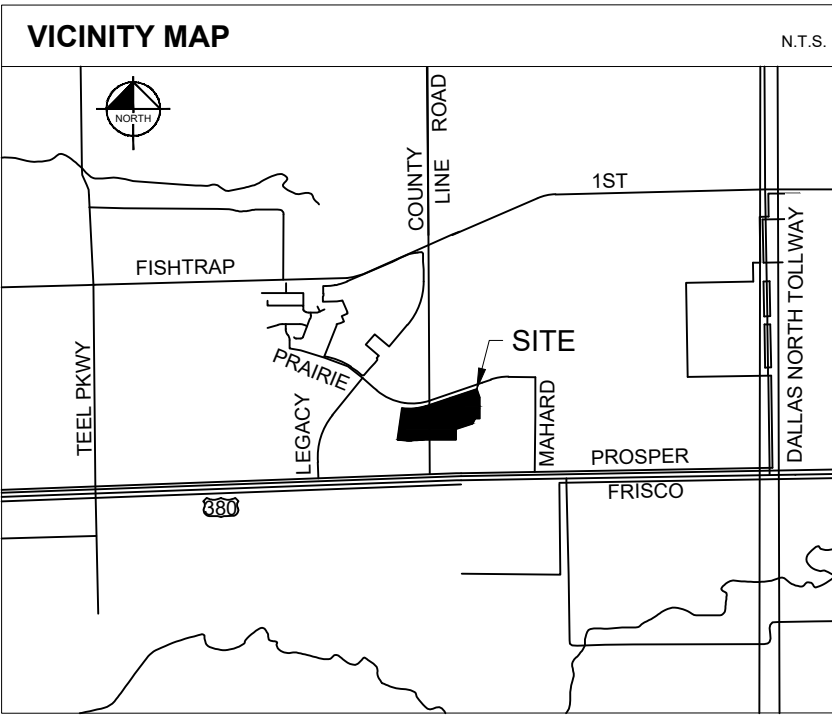
L. NETHERLY SURVEY, ABSTRACT NO. 962
 COLLIN COUNTY SCHOOL LAND SURVEY, ABSTRACT NO. 147
 TOWN OF PROSPER, DENTON AND COLLIN COUNTY, TEXAS
 CASE NO. Z20-0014

Kimley»Horn
 6160 Warren Parkway, Suite 210
 Frisco, Texas 75034
 Tel. No. (972) 335-3580
 FIRM # 10193822

Scale	Drawn by	Checked by	Date	Project No.	Sheet No.
1" = 100'	MMV	MMV	JUNE 2020	067252018	1 OF 1

OWNER:
 Prosper Villages at Legacy LLC
 10950 Research Road
 Frisco, Texas 75033
 Ph: 214.387.3393
 Contact: Clint Richardson

ENGINEER:
 Kimley-Horn and Associates, Inc.
 6160 Warren Parkway, Suite 210
 Frisco, Texas 75034
 Ph: 972.335.3580
 Contact: Thomas Fletcher, P.E.



Z20-0014

EXHIBIT "E"

DEVELOPMENT SCHEDULE

It is anticipated that the development of the single-family community within Tract 4R of Prosper Center will begin within 1 to 5 years after approval and signing of the zoning ordinance. During this time period, prior to the initial stages of development, it is foreseen that plans and studies will be prepared for development and marketing of the property.

Progress of development improvements will primarily depend on time frames established for construction of thoroughfares, utilities, and market trends/demands for the area.

Type A Lot (55' width) - 40' wide home



Type A Lot (55' width) - 45' wide home



Type B Lot (65' width) - 50' wide home



Type B Lot (65' width) - 55' wide home



FINANCE DEPARTMENT



To: Mayor and Town Council

From: Betty Pamplin, Finance Director

Through: Harlan Jefferson, Town Manager
Chuck Springer, Executive Director of Administrative Services

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Consider and act upon an ordinance amending Ordinance No. 19-65 (FY 2019-2020 Budget) and Capital Improvement Plan. **(BP/HW)**

Description of Agenda Item:

The proposed ordinance is amending the following balance for the FY 2019-2020 Budget and Capital Improvement Plan.

Coleman Street Median Landscaping (Talon – Victory) - (2018-PK)

The Tanner's Mill subdivision is completing the construction of the two eastbound lanes of Coleman Street adjacent to their development across from the Prosper High School. The completion of the paving for this section of Coleman Street will create a median, without landscaping, between Talon Lane and Victory Way. In order to design and install the Town's standard median landscaping and irrigation, along this section of Coleman Street, funding for the design and construction is being requested. The estimated cost for the design is \$30,000 and the construction is \$320,000. Per the direction from the Town Council at the January 31, 2020, Strategic Planning Work Session, the median improvement projects do not include the installation of street lights; however, staff is recommending that the construction of the median improvements include one (1) four-inch (4") PVC sleeve pipe in the median to allow future street lights to be installed without trenching the median to install the conduit in the future. The estimated cost for the PVC sleeve pipe is \$50,000 and is included in the \$320,000 estimated construction cost. The total budget for the project, in the amount of \$350,000, is to be funded from the East Thoroughfare Impact Fee Fund.

Custer Rd Water Line Relocations (1902-WA)

The Texas Department of Transportation (TxDOT) is preparing to widen Custer Road (FM 2478) through the Town of Prosper. The Town's existing 36-inch water line and meter vault are located within a separate utility easement parallel to the existing Custer Road Right-of-Way (ROW) north of US 380. Also within the utility easement, the Town's 36-inch water line connects to the North

Texas Municipal Water District's (NTMWD) 48-inch water line with a 24-inch tap. The proposed ROW of FM 2478 will extend past both the Town of Prosper's and NTMWD's existing easements. The construction plans for the relocation of the water line and meter vault includes upsizing the existing 36" water line to a 42" water line to accommodate the future ultimate capacity needs for the Town of Prosper. The Town budgeted expenses for this project in the current fiscal year of \$2,501,275 (and \$290,325 rolled forward from the prior fiscal year) with reimbursement from the state of \$2,491,600 for a net cost to the Town's utility fund of \$300,000. The following new estimated costs are associated with the meter vault relocation; Construction cost of \$3,454,363, Professional Service additional costs of \$68,900 (in addition to the \$290,325), and Land purchase costs of \$53,244. The total budget for the project is \$3,866,832. The cost associated with the upsizing of the water line will not be reimbursed by TxDOT. TxDOT's Standard Utility Agreement estimates the Town of Prosper's costs for the upsizing to be approximately \$282,750. The Town estimated reimbursement from the state is \$3,584,082 for a revised net cost to the Town of \$282,750.

Budget Impact:

The East Thoroughfare Impact Fee expenditures will increase by \$350,000 and the Water and Sewer fund expenditures will increase by \$1,075,232 with revenues increasing by \$1,092,482.

Legal Obligations and Review:

Terrence Welch of Brown & Hofmeister, L.L.P., has reviewed and approved the budget amendment ordinance as to form and legality.

Attached Documents:

1. Ordinance
2. CIP Amendment

Town Staff Recommendation:

Town staff recommends approval of amending Ordinance No. 19-65 (FY 2019-2020 Budget) and Capital Improvement Plan to provide funding increased expenditures for capital projects from appropriated funds.

Proposed Motion:

I move to approve amending Ordinance No. 19-65 (FY 2019-2020 Budget) and Capital Improvement Plan to provide funding increased expenditures for capital projects from appropriated funds.

TOWN OF PROSPER, TEXAS

ORDINANCE NO. 2020-xx

AN ORDINANCE OF THE TOWN OF PROSPER, TEXAS, AMENDING ORDINANCE NO. 19-65 (FY 2019-2020 BUDGET) TO FUND INCREASED EXPENDITURES OF \$350,000 IN THE EAST THOROUGHFARE IMPACT FEE FUND; AND INCREASED EXPENDITURES OF \$1,075,232 IN THE WATER AND SEWER FUND; PROVIDING FOR REPEALING, SAVINGS AND SEVERABILITY CLAUSES; AND PROVIDING FOR AN EFFECTIVE DATE OF THIS ORDINANCE.

WHEREAS, the Town Council of the Town of Prosper, Texas ("Town Council"), has investigated and determined that it will be beneficial and advantageous to the residents of the Town of Prosper, Texas ("Prosper"), to amend Ordinance No. 19-65 (FY 2019-2020 Budget) for the purposes listed in Exhibit "A," attached hereto and incorporated herein by reference; and

WHEREAS, the changes will result in budgeted funds being reallocated among different funds and departments and an overall net increase in the budget for funding from fund balance.

NOW, THEREFORE, BE IT ORDAINED BY THE TOWN COUNCIL OF THE TOWN OF PROSPER, TEXAS, THAT:

SECTION 1

Findings Incorporated. The findings set forth above are incorporated into the body of this Ordinance as if fully set forth herein.

SECTION 2

Amendment to Ordinance No. 19-65 (FY 2019-2020 Budget). Ordinance No. 19-65 (FY 2019-2020 Budget) is hereby amended to allow for reallocation of appropriations as shown in Exhibit "A," attached hereto and incorporated herein by reference.

SECTION 3

Savings/Repealing Clause. All provisions of any ordinance in conflict with this Ordinance are hereby repealed, but such repeal shall not abate any pending prosecution for violation of the repealed Ordinance, nor shall the repeal prevent prosecution from being commenced for any violation if occurring prior to the repeal of the Ordinance. Any remaining portions of conflicting ordinances shall remain in full force and effect.

SECTION 4

Severability. Should any section, subsection, sentence, clause, or phrase of this Ordinance be declared unconstitutional or invalid by a court of competent jurisdiction, it is expressly provided that any and all remaining portions of this Ordinance shall remain in full force and effect. Prosper hereby declares that it would have passed this Ordinance, and each section, subsection, sentence, clause, or phrase thereof irrespective of the fact that any one or more sections, subsections, sentences, clauses, or phrases be declared unconstitutional or invalid.

SECTION 5

Effective Date. This Ordinance shall become effective immediately upon its passage.

DULY PASSED AND APPROVED BY THE TOWN COUNCIL OF THE TOWN OF PROSPER, TEXAS, ON THIS 28TH DAY OF JULY, 2020.

TOWN OF PROSPER, TEXAS

Ray Smith, Mayor

ATTEST TO:

Melissa Lee, Town Secretary

APPROVED AS TO FORM AND LEGALITY:

Terrence S. Welch, Town Attorney

EXHIBIT "A"
BUDGET AMENDMENT
FISCAL YEAR 2019-2020
July 28, 2020

East Thoroughfare Impact Fee Fund	Original Budget	Current Budget	Amended Budget	Increase (Decrease)
Total Revenues:	1,157,438	1,157,438	1,157,438	-
Total	\$ 1,157,438	\$ 1,157,438	\$ 1,157,438	\$ -
Expenditures:				
Developer Agreements	300,000	300,000	300,000	-
Capital	654,168	1,291,024	1,641,024	350,000
Transfers	-	69,168	69,168	-
Total	\$ 954,168	\$ 1,660,192	\$ 2,010,192	\$ 350,000

Water and Sewer Fund	Original Budget	Current Budget	Amended Budget	Increase (Decrease)
Total Revenues:	24,953,626	24,953,626	26,046,108	1,092,482
Total	\$ 24,953,626	\$ 24,953,626	\$ 26,046,108	\$ 1,092,482
Expenditures:				
Administration	2,396,949	2,380,374	2,380,374	-
Debt Service	3,930,237	3,930,237	3,930,237	-
Water Purchases	5,690,642	5,590,642	5,590,642	-
Public Works	12,938,373	13,103,494	14,178,726	1,075,232
Total	\$ 24,956,201	\$ 25,004,747	\$ 26,079,979	\$ 1,075,232

Total Revenue	\$ 1,092,482
Total Expenditures	\$ 1,425,232
Net Effect All Funds	\$ (332,750)

**Summary of Capital Improvement Amendment - 07/28/2020
General Fund Projects**

Index	Park Projects		Prior Years	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2029	Total Cost	Other Sources	Funding Sources				Unissued Debt Schedule 2019-2020	Index
												Issued Debt Authorized	Unissued Debt Authorized	Unissued Debt Unauthorized	Reimbursement Resolution		
01	2018-PK	Coleman Street Median Landscaping (Talon - Victory): (Design)		30,000						30,000	30,000	A					01
02	2018-PK	Coleman Street Median Landscaping (Talon - Victory): (Construction)		320,000						320,000	320,000	A					02

Index	Water Projects		Prior Years	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2029	Total Cost	Other Sources	Funding Sources				Unissued Debt Schedule 2019-2020	Index
												Issued Debt Authorized	Unissued Debt Authorized	Unissued Debt Unauthorized	Reimbursement Resolution		
01	1902-WA	Custer Road Meter Station and WL Relocations: (Design)	290,325							290,325	290,325	B, E					01
01	1902-WA	Custer Road Meter Station and WL Relocations: (Design)	290,325	68,900						359,225	359,225	B, E					01
02	1902-WA	Custer Road Meter Station and WL Relocations: (Land/Easements)		53,244						53,244	53,244	B, E					02
03	1902-WA	Custer Road Meter Station and WL Relocations: (Construction)		2,501,275						2,501,275	2,501,275	B, E					03
03	1902-WA	Custer Road Meter Station and WL Relocations: (Construction)		3,454,363						3,454,363	3,454,363	B, E					03

LEGEND

	2019-2020 Adopted CIP
	CIP Amendment

INDEX LEGEND

	Design
	Land/Easements
	Construction

Description Codes - Other Sources	
A	Impact Fees
B	Grant and Interlocal Funds
C	Developer Agreements
D	General Fund
E	Water / Wastewater Fund
F	Stormwater Drainage Fund
G	Park Development Fund
H	TIRZ #1
J	TIRZ #2
K	Escrows
X	Non-Cash Contributions
Z	Other Sources (See Detail)



ENGINEERING SERVICES

To: Mayor and Town Council

From: Hulon T. Webb, Jr., Director of Engineering Services

Through: Harlan Jefferson, Town Manager
Rebecca Zook, Executive Director of Development and Infrastructure Services

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Consider and act upon authorizing the Town Manager to execute Contract Amendment #1 to the Professional Services Agreement between Freese and Nichols, Inc., and the Town of Prosper, Texas, related to the design of the Custer Road Pipeline and Meter Vault Relocation project.

Description of Agenda Item:

At the November 13, 2018, Town Council meeting, Freese and Nichols, Inc., was awarded a Professional Service Agreement, in the amount of \$290,325, for the design of the Custer Road Pipeline and Meter Vault Relocation project, related to the widening of Custer Road (FM 2478) through the Town of Prosper. The original design proposed to relocate the existing 36-inch water line and meter vault along Custer Road just outside the limits of the proposed TxDOT Right-of-Way (ROW). During the design phase, the original proposed relocation further west along the existing access road, was not approved because the distance from the tap to the proposed relocated meter vault exceeded the North Texas Municipal Water District (NTMWD) criteria. Freese and Nichols, Inc., continued to develop multiple conceptual options until a final approved location was agreed to by NTMWD and the Town.

The final approved location from NTMWD and the Town is a significant distance from the originally anticipated location. The new meter vault will be relocated from the eastern edge of the Custer Road Pump Station site adjacent to Custer Road, to the southern edge of the site. This location requires a new access road be extended from the Lowes property and extension of an existing retaining wall due to the steep grades at the back of the Custer Road Pump Station site. The existing supply line feeding the Ground Storage Tanks will also need to be replaced with a new line from the newly relocated meter vault.

The attached Contract Amendment #1, in the amount of \$68,900, is for the additional design services required for the redesign of the meter vault being relocated from the original proposed site along the existing access road to the new southern edge of the site. Additional survey information was required for the new pipeline alignment as well as new structural and geotechnical analysis performed based on the final approved location. The design includes the extension of the retaining wall, grading and paving plans for the new access road to the existing pump station. Additional coordination with TxDOT was required to substantiate the requested reimbursement amount for the required improvements.

Budget Impact:

The cost for the additional design work is \$68,900 and is 100% reimbursable from TxDOT through the Standard Utility Agreement. The FY 2019-2020 Capital Improvement Program includes \$290,325, in Water and Sewer Funds for the design of the Custer Road Pipeline and Meter Vault Relocation project. An amendment included in this agenda will increase the design budget for the project by \$68,900, for a total funding of \$359,225. The total funding for the design is 100% reimbursable. The funding source is Account No. 760-6610-10-00-1902-WA.

Legal Obligations and Review:

Terrence Welch of Brown & Hofmeister, L.L.P., has approved the standard Contract Amendment as to form and legality.

Attached Documents:

1. Contract Amendment #1
2. Relocation Exhibit

Town Staff Recommendation:

Town staff recommends that the Town Council authorize the Town Manager to execute Contract Amendment #1 to the Professional Services Agreement between Freese and Nichols, Inc., and the Town of Prosper, Texas, related to the design of the Custer Road Pipeline and Meter Vault Relocation project.

Proposed Motion:

I move to authorize the Town Manager to execute Contract Amendment #1 to the Professional Services Agreement between Freese and Nichols, Inc., and the Town of Prosper, Texas, related to the design of the Custer Road Pipeline and Meter Vault Relocation project.

**CONTRACT AMENDMENT #1
BETWEEN THE TOWN OF PROSPER, TEXAS, AND FREESE AND NICHOLS, INC.
FOR THE CUSTER ROAD PIPELINE AND METER VAULT RELOCATIONS PROJECT**

This Contract Amendment for Professional Engineering Services, hereinafter called "Amendment," is entered into by the **Town of Prosper, Texas**, a municipal corporation, duly authorized to act by the Town Council of said Town, hereinafter called "Town," and **Freese and Nichols, Inc.**, a Texas corporation, acting through a duly authorized officer, hereinafter called "Consultant," relative to Consultant providing professional engineering services to Town. Town and Consultant when mentioned collectively shall be referred to as the "Parties."

WITNESSETH:

WHEREAS, the Town previously engaged the services of the Consultant to provide additional construction services in connection with the **Custer Road Pipeline and Meter Vault Relocations**, hereinafter called "Project"; and

WHEREAS, the Parties previously entered into an professional services agreement regarding the Project on or about November 13, 2018, in the amount of Two Hundred Ninety Thousand Three Hundred Twenty-Five Dollars (\$290,325), hereinafter called the "Original Agreement"; and

WHEREAS, the Parties now desire to amend the Original Agreement to increase the scope of services and compensation provided to additional construction services.

For the mutual promises and benefits herein described, Town and Consultant agree to amend the Original Agreement as follows:

1. **Additional Services to be Performed by Consultant.** The Parties agree that Consultant shall perform such additional services as are set forth and described in **Exhibit A1 – Scope of Services** and incorporated herein as if written word for word. All references in the Original Agreement to "Exhibit A" are hereby amended to state "Exhibits A and A1."

2. **Additional Compensation of Consultant.** Town agrees to pay to Consultant for the satisfactory completion of all services included in this Amendment a total additional fee of Sixty-Eight Thousand Nine Hundred Dollars (\$68,900) for the additional services as set forth and described in **Exhibit B1 – Compensation Schedule** and incorporated herein as if written word for word. All references in the Original Agreement to "Exhibit B" are hereby amended to state "Exhibits B and B1."

3. **Revised Compensation for Consultant's Services.** Paragraph 4 of the Original Agreement is hereby amended to increase Consultant's total compensation by deleting "Two Hundred Ninety Thousand Three Hundred Twenty-Five Dollars (\$290,325)" and replacing it with "Three Hundred Fifty-Nine Thousand Two Hundred Twenty-Five Dollars (\$359,225)."

4. **Original Agreement.** All other provisions and terms of the Original Agreement shall remain in full force and effect and this Amendment to the Original Agreement shall in no way release, affect, or impair any other provision or responsibility contained in the Original Agreement.

IN WITNESS WHEREOF, the Parties, having read and understood this Amendment, have executed such in duplicate copies, each of which shall have full dignity and force as an original, on the _____ day of _____, 2020.

FREESE AND NICHOLS, INC.

TOWN OF PROSPER, TEXAS

By: Clayton C Barnard
Signature

By: _____
Signature

Clayton C. Barnard, PE
Printed Name

Harlan Jefferson
Printed Name

Principal/ Vice President
Title

Town Manager
Title

July 9, 2020
Date

Date

EXHIBIT A1 SCOPE OF SERVICES

CONTRACT AMENDMENT #1 BETWEEN THE TOWN OF PROSPER, TEXAS, AND FREESE AND NICHOLS, INC. FOR THE CUSTER ROAD PIPELINE AND METERVAULT RELOCATIONS PROJECT

I. PROJECT DESCRIPTION

FNI is currently under contract to relocate the existing Custer Road Meter Vault that is located along Custer Road. The original contract proposed to relocate the vault along Custer Road outside the proposed TxDOT right-of-way limits. During the design phase the original location along the existing access road was not approved through coordination with NTMWD. Additional options were developed to place the meter adjacent to NTMWD's supply line. Each option considered constructability, access, easement needs and construction cost. The preferred location from NTMWD and the Town places the meter along the southern property of the existing pump station site. This location requires an access road to be extended from the Lowes property to the south. Due to the steep terrain the existing retaining wall must be extended to continue the access drive. The exiting supply line feeding the Ground Storage Tanks will need to be replaced with a new line from the new meter vault. Additional survey information will be required for the new pipeline alignment. The structural and geotechnical analysis will need to be reviewed and revised based on the alternate location. The design will include the extension of the retaining wall, grading and paving plans to extend the existing access to the paving adjacent to the existing pump station. Additional coordination with TxDOT is required to determine justification for reimbursement for the required improvements.

II. TASK SUMMARY

Task 1 – Meter Vault Relocation Modifications

1. Prepare exhibits and opinion of probably construction cost for alternative meter locations adjacent to NTMWD's supply line. The exhibits shall consider the necessary grading and paving required to meet the Town's fire department access requirements.
2. Revised the 60% Design plans based on the preferred meter location along the southern property line.
 - a. Design survey files will be collected from on-going adjacent projects to be referenced in and combined to develop a topographical survey for the revised alignment.
 - b. Revised the pipeline alignment based on the new connection from the supply line to the ground storage tanks.
 - c. Prepare grading, paving and access plans necessary for the new meter location.
 - d. Revise the vault design based on depth and wall thickness necessary with the soil conditions at the revised location.
 - e. Review the geotechnical boring logs and analysis necessary for the retaining wall.
 - f. Prepare retaining wall plans and details necessary for the revised location.
 - g. Coordinate with Coserv for the revised meter vault location along the southern property line and updated power feed.
 - h. Revised electrical plans based on new power service location.
3. Since the revised location is not along Custer Road and requires additional improvements to meet the current design criteria, additional supporting documentation will need to be presented to

TxDOT for justification for reimbursement. FNI will collect design criteria from the Town of Prosper design standards and NTMWD Meter Vault Design standards to provide justification for reimbursement in the TxDOT Utility Agreement.

III. DELIVERABLES

Task 1 – Meter Vault Relocation Modifications Provide modified final design plans and specifications for the 42-inch supply pipeline, meter vault, electrical building and appurtenances.

**EXHIBIT B1
COMPENSATION SCHEDULE**

**CONTRACT AMENDMENT #1
BETWEEN THE TOWN OF PROSPER, TEXAS, AND FREESE AND NICHOLS, INC.
FOR THE CUSTER ROAD PIPELINE AND METERVAULT RELOCATIONS PROJECT**

I. COMPENSATION SCHEDULE

Task	Completion Schedule	Compensation Schedule
Notice-to-Proceed	October 2019	
<u>Task 1 – Meter Vault Relocation Modifications</u>	May 2020	\$68,900
Total Compensation		\$68,900

II. COMPENSATION SUMMARY

Basic Services (Lump Sum)	Amount
<u>Task 1 – Meter Vault Relocation Modifications</u>	\$68,900
Total Basic Services:	\$68,900

Special Services (Hourly Not-to-Exceed)	Amount
None	\$0,000
Total Special Services:	\$0,000

Direct Expenses	Amount
None	\$0,000
Total Direct Expenses:	\$0,000

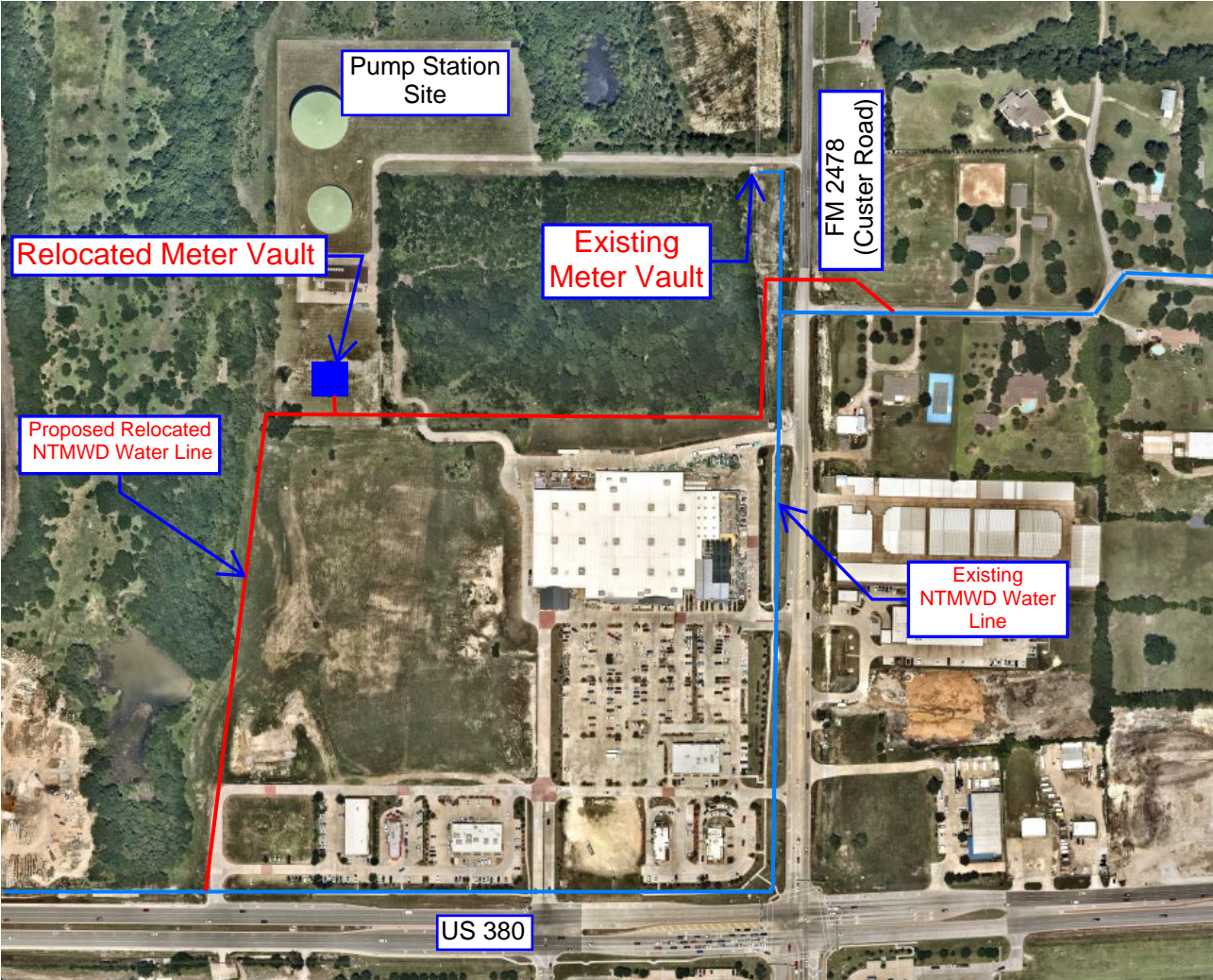
Basic Services Compensation Schedule	Original Contract	Amendment No. 1	Total Contract
Task 1 – General & Preliminary Design	\$29,525	-	\$29,525
Task 2 – Final Design	\$153,250	\$68,900	\$222,150
Task 3 – Bid Phase	\$14,600	-	\$14,600
Task 4 – Construction Phase	\$51,950	-	\$51,950
Total Basic Services	\$249,325	-	\$318,225

Special Services Compensation Schedule	Original Contract	Amendment No. 1	Total Contract
Task 5 – Topographical Survey	\$8,650	-	\$8,650
Task 6 – Easement Documents	\$5,300	-	\$5,300
Task 7 – Subsurface Utility Engineering	\$5,050	-	\$5,050
Task 8 – Environmental Services	\$9,350	-	\$9,350
Task 9 – Geotechnical Engineering	\$12,650	-	\$12,650
Total Special Services	\$41,000	-	\$41,000

LOCATION MAP



CUSTER ROAD PUMP STATION METER VAULT RELOCATION





ENGINEERING SERVICES

To: Mayor and Town Council

From: Hulon T. Webb, Jr., Director of Engineering Services

**Through: Harlan Jefferson, Town Manager
 Rebecca Zook, Executive Director of Development and Infrastructure Services**

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Consider and act upon awarding Bid No. 2020-62-B to Wilson Constructors, Inc., related to construction services for the Custer Road Pump Station Meter Vault Relocation project; and authorizing the Town Manager to execute a construction agreement for same.

Description of Agenda Item:

On June 5, 2020, at 2:00 PM, eight (8) bids were received for the Custer Road Pump Station Meter Vault Relocation project. The project includes the relocation of the Town’s existing 36-inch water line and meter vault along Custer Road outside the limits of the proposed Texas Department of Transportation (TxDOT) Right-of-Way (ROW). The construction plans for the relocation of the water line and meter vault includes upsizing the existing 36-inch water line to a 42-inch water line to accommodate the future ultimate capacity needs for the Town of Prosper. The new meter vault location will be on the southerly edge of the Custer Road Pump Station site. This location requires a new access road be extended from the Lowes property and extension of an existing retaining wall due to the steep grades. The existing supply line feeding the Ground Storage Tanks will need to be replaced with a new line from the newly relocated meter vault.

The project was advertised using the A+B Bidding alternative procurement method to allow the Town to award the project to the contractor that offers the best value, taking into consideration the number of days bid. The number of days bid is multiplied by the value of a calendar day as listed below, and added to each bidder’s base bid:

<u>Amount of Contract (\$)</u>	<u>Value of a Calendar Day(\$)</u>
\$1,500,000 to \$1,999,999.99	\$500 per day
\$2,000,000 to \$2,999,999.99	\$1,000 per day
\$3,000,000 to \$3,999,999.99	\$1,500 per day
\$4,000,000.00 or more	\$2,000 per day

The verified base bid totals ranged between \$3,401,513.33 and \$4,352,652.00. An allowance for CoServ Electrical Service of \$20,000 and for NTMWD inspections of \$32,850, resulted in revised

bids ranging from \$3,454,363.33 and \$4,405,502.00. The engineers estimate was \$3,551,352. The proposed final completion times ranged from 180 calendar days to 416 calendar days.

The bids were tabulated in accordance with the evaluation criteria to determine the contractor that offered the best value. Wilson Constructors, Inc., was the firm ranked the highest for the project after consideration of Costs and Time, with a cost of \$3,454,363.33 (with CoServ & NTMWD Allowances), and time of 180 days for final completion. Wilson Constructors, Inc., recently successfully completed a 30-inch water line for the City of Fort Worth. While Wilson Constructors have not performed any work for the Town of Prosper, staff checked the references provided and received positive feedback.

Budget Impact:

The cost for the construction of this project is \$3,454,363.33 (with CoServ & NTMWD Allowances). The FY 2019-2020 Capital Improvement Program includes \$2,501,275 in Water and Sewer Funds for the construction of the Custer Road Pump Station Meter Vault Relocation project. An amendment included in this agenda will increase the construction budget for the project by \$953,088, for a total funding of \$3,454,363. Under a separate agenda item, the Town will consider a Texas Department of Transportation Standard Utility Agreement that outlines the amount of reimbursement for this project from the Texas Department of Transportation. That agreement states that the Town of Prosper will be reimbursed for the costs associated with this project, minus the betterment of upsizing the 36-inch water line to a 42-inch water line, estimated at \$282,750. The funding sources is Account No. 760-6610-10-00-1902-WA.

Legal Obligations and Review:

Terrence Welch of Brown & Hofmeister, L.L.P., has approved the standard construction agreement as to form and legality.

Attached Documents:

1. Location Map
2. Bid Tabulation Summary
3. Construction Agreement

Town Staff Recommendation:

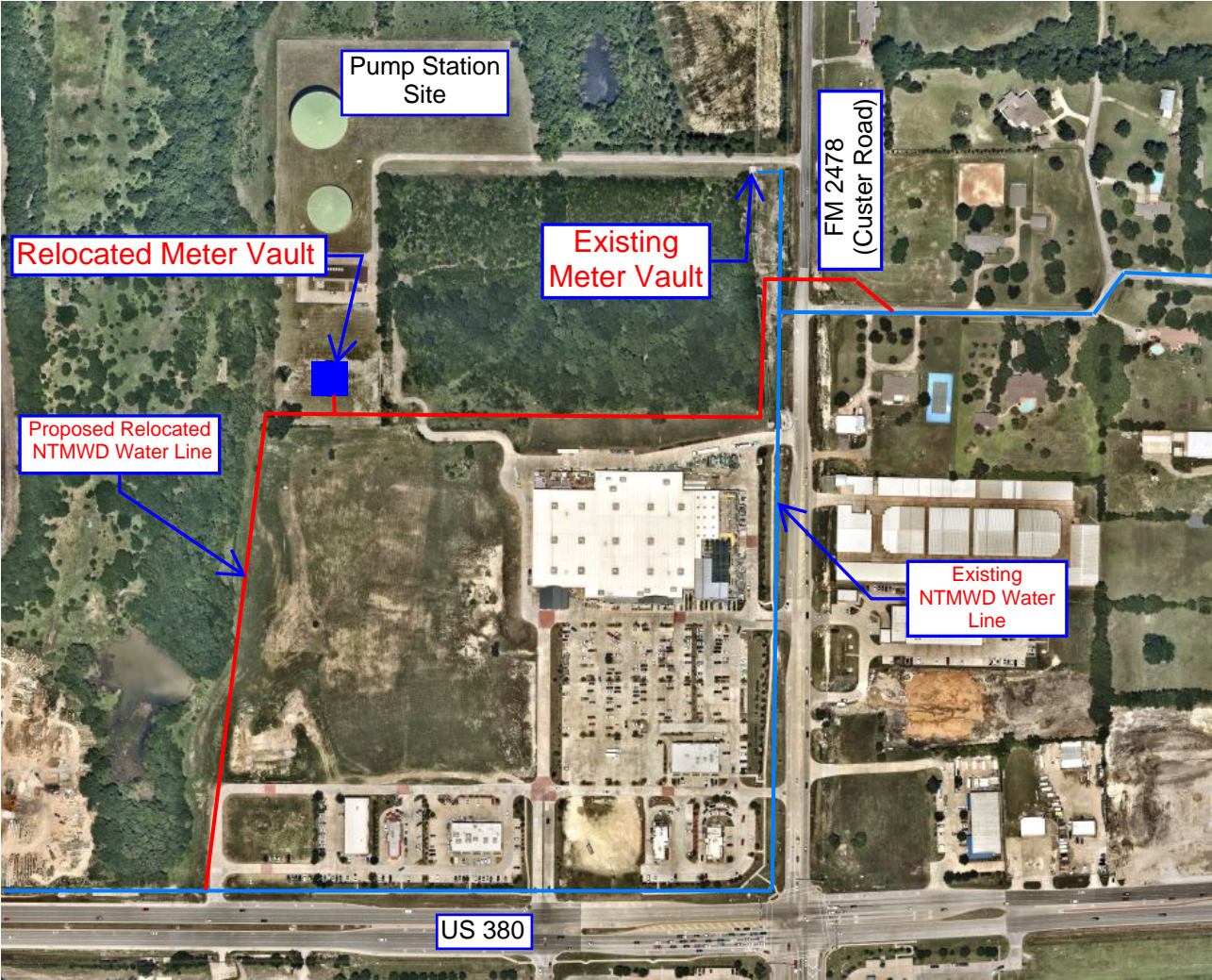
Town staff recommends that the Town Council award Bid No. 2020-62-B to Wilson Constructors, Inc., related to construction services for the Custer Road Pump Station Meter Vault Relocation project; and authorize the Town Manager to execute a construction agreement for same.


Proposed Motion:

I move to award Bid No. 2020-62-B to Wilson Constructors, Inc., related to construction services for the Custer Road Pump Station Meter Vault Relocation project; and authorize the Town Manager to execute a construction agreement for same.

LOCATION MAP

CUSTER ROAD PUMP STATION METER VAULT RELOCATION



	TOWN OF PROSPER		
	BID TABULATION SUMMARY		
	Solicitation Number	2020-62-B	
	Solicitation Title	Custer Road Pump Station Meter Vault Relocation	
Close Date	6/5/2020 2:00PM		
Responding Supplier			
	Base Bid (A)	Time Value (B)	Total Value
Wilson Constructors, Inc.	\$ 3,401,513.33	\$ 270,000.00	\$ 3,671,513.33
Crescent Constructors, Inc.	\$ 3,727,000.00	\$ 232,500.00	\$ 3,959,500.00
S.J. Louis Construction of Texas, Ltd.	\$ 3,743,876.09	\$ 225,000.00	\$ 3,968,876.09
Rey-Mar Construction	\$ 3,632,973.00	\$ 360,000.00	\$ 3,992,973.00
Flow-Line Construction, Inc.	\$ 3,627,588.00	\$ 456,000.00	\$ 4,083,588.00
MELA Contracting, Inc.	\$ 3,495,000.00	\$ 624,000.00	\$ 4,119,000.00
Archer Western Construction	\$ 3,758,838.00	\$ 364,000.00	\$ 4,122,838.00
Fort Worth Civil Constructors, LLC	\$ 4,352,652.00	\$ 360,000.00	\$ 4,712,652.00

*The following allowances will be added to the base bid at time of bid award:		
CoServ Allowance	\$ 20,000.00	
NTMWD Inspection Allowance	\$ 32,850.00	
	\$ 52,850.00	

Responding Supplier			
	Base Bid (A)	Allowances	Total Award
Wilson Constructors, Inc.	\$ 3,401,513.33	\$ 52,850.00	\$ 3,454,363.33
Crescent Constructors, Inc.	\$ 3,727,000.00	\$ 52,850.00	\$ 3,779,850.00
S.J. Louis Construction of Texas, Ltd.	\$ 3,743,876.09	\$ 52,850.00	\$ 3,796,726.09
Rey-Mar Construction	\$ 3,632,973.00	\$ 52,850.00	\$ 3,685,823.00
Flow-Line Construction, Inc.	\$ 3,627,588.00	\$ 52,850.00	\$ 3,680,438.00
MELA Contracting, Inc.	\$ 3,495,000.00	\$ 52,850.00	\$ 3,547,850.00
Archer Western Construction	\$ 3,758,838.00	\$ 52,850.00	\$ 3,811,688.00
Fort Worth Civil Constructors, LLC	\$ 4,352,652.00	\$ 52,850.00	\$ 4,405,502.00

CONTRACT DOCUMENTS AND SPECIFICATIONS
FOR

**CUSTER ROAD PUMP STATION METER
VAULT RELOCATION**

BID NO. 2020-62-B



TOWN OF PROSPER
COLLIN COUNTY, TEXAS

TOWN OFFICIALS

Ray Smith, Mayor
Curry Vogelsang, Jr., Mayor Pro-Tem
Jason Dixon, Deputy Mayor Pro-Tem
Marcus E. Ray, Place 1
Craig Andres, Place 2
Meigs Miller, Place 4
Jeff Hodges, Place 5

Harlan Jefferson, Town Manager

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LEGAL NOTICE

The Town of Prosper is accepting competitive sealed bids for **BID NO. 2020-62-B CUSTER ROAD PUMP STATION METER VAULT RELOCATION**. Bids will be accepted online through IonWave.net, the Town's e-procurement system, or in hard copy in the Purchasing Office located in the 3rd Floor Finance Suite of Town Hall, 250 W. First St., Prosper, Texas 75078 until **2:00 P.M. on Friday, June 5, 2020**. Any bids received after this time will not be accepted and will be returned unopened. **The bid opening will be held online on Friday, June 5, 2020 @ 2:30 P.M.** To participate in the bid opening, please use the following:

Join Zoom Meeting:	https://us02web.zoom.us/j/87609450087
Meeting ID:	876 0945 0087
Dial-in any of these numbers:	+1 929 436 2866, +1 312 626 6799, +1 669 900 6833, +1 253 215 8782, +1 301 715 8592 or +1 346 248 7799

The Project consists of furnishing all labor, equipment and materials (except as otherwise specified), and performing all work necessary for the construction of constructing a new meter vault with associated electrical, mechanical and piping, relocating the existing 16-inch sleeve valve, removal of the existing meter vault and piping along Custer Road and approximately 1,100 linear foot of 42-inch Bar-wrapped Concrete Cylinder pipe.

Each bid submitted shall be accompanied by a cashier's check in the amount of 5% of the maximum amount bid, payable without recourse to the Town of Prosper, or a Bid Bond in the same amount from a reliable surety company as a guarantee that, if awarded the contract, the successful Contractor will execute a Construction Agreement with the Town, including all required bonds and other documents.

The successful Contractor shall furnish a Performance Bond in the amount of 115% of the contract amount, and a Payment Bond in the amount of 100% of the contract amount, as well as evidence of all required insurance coverage within ten (10) calendar days of notice of award. The successful Contractor shall also furnish a Maintenance Bond in the amount of 100% of the contract amount covering defects of material and workmanship for two calendar years following the Town's approval and acceptance of the construction. An approved surety company, licensed in the State of Texas, shall issue all bonds in accordance with Texas law.

Copies of Plans, Specifications, and Contract Documents may be examined at **Town of Prosper Engineering Department, 250 W. First Street, Prosper, Texas, 75078, Phone: (972) 569-1198** without charge. These documents may be acquired from that office for the non-refundable purchase price of \$50.00 per set, payable to the Town of Prosper. Copies of Plans, Specifications, and Contract Documents may also be downloaded free of charge from Current Bidding Opportunities, at the following link: <http://www.prospertx.gov/business/bid-opportunities/>.

Questions and requests for clarifications in regards to this bid should be submitted in writing through IonWave.net, the Town's e-procurement system, or emailed directly to January Cook, CPPO, CPPB, Purchasing Manager, at january_cook@prospertx.gov. The deadline for receipt of questions and requests for clarifications is **12:00 P.M. on Friday, May 29, 2020**. After that day and time, no further questions or requests for clarifications will be accepted or answered by the Engineer or Town.

**BID NO: 2020-62-B
CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

INSTRUCTIONS TO BIDDERS

1. Submittal Deadline: Bids will be accepted until 2:00 P.M. on FRIDAY, JUNE 5, 2020.
2. Submittal Location: Bids will be accepted online through IonWave.net, the Town's e-procurement system, or in hard copy in the Purchasing Office located in the 3rd Floor Finance Suite of Town Hall, 250 W. First St., Prosper, Texas 75078.
3. Electronic Submittal Requirements: If submitting bid through IonWave.net, Bidder shall complete all requested information and submit all required documents.
4. Hard Copy Submittal Requirements: If submitting bid in hard copy, Bidder shall submit one (1) original and one (1) copy of their bid in a sealed envelope clearly marked with their name and **BID NO. 2020-62-B CUSTER ROAD PUMP STATION METER VAULT RELOCATION** Bidder shall complete all requested information and submit all required documents.
5. Bid Opening: The bid opening will be held online on FRIDAY, JUNE 5, 2020 @ 2:30 P.M. To participate in the proposal opening, please use the following:

Join Zoom Meeting: <https://us02web.zoom.us/j/87609450087>
Meeting ID: 876 0945 0087
Dial-in any of these numbers: +1 929 436 2866, +1 312 626 6799, +1 669 900 6833, +1 253 215 8782, +1 301 715 8592 or +1 346 248 7799
6. Bid Documents: Copies of Plans, Specifications, and Contract Documents may be examined without charge at the following location:

Town of Prosper Engineering Department
250 W. First Street
Prosper, TX 75078
Phone: 972-569-1198

or

Download free of charge from Current Bidding Opportunities, at the following link:
<http://www.prospertx.gov/business/bid-opportunities/>.

7. Questions and Requests for Clarification: Questions and requests for clarifications in regards to this bid should be submitted in writing through IonWave.net, the Town's e-procurement system, or emailed directly to January Cook, CPPO, CPPB, Purchasing Manager, at january_cook@prospertx.gov. The deadline for receipt of questions and requests for clarifications is 12:00 P.M. on FRIDAY, MAY 29, 2020. After that day and time, no further questions or requests for clarifications will be accepted or answered by the Engineer or Town.
8. Addenda: If it becomes necessary to provide additional information to potential Bidders, the Town of Prosper will issue an addendum containing the necessary information.

9. Pre-Bid Meeting: The pre-bid meeting will be held online on THURSDAY, MAY 28, 2020 @ 10:00 A.M. To participate in the pre-bid meeting, please use the following:

Join Zoom Meeting: <https://us02web.zoom.us/j/83827175253>
Meeting ID: 838 2717 5253
Dial-in any of these numbers: +1 929 436 2866, +1 312 626 6799, +1 669 900 6833, +1 253 215 8782,
+1 301 715 8592 or +1 346 248 7799

10. Site Visit: N/A

SAMPLE CONSTRUCTION AGREEMENT

THE STATE OF TEXAS)
)
COUNTY OF COLLIN) KNOW ALL MEN BY THESE PRESENTS:

This Construction Agreement (the "Agreement") is made by and between **Wilson Contractor Services, LLC**, a limited liability corporation, (the "Contractor") and the **Town of Prosper, Texas**, a municipal corporation (the "Owner"). For and in consideration of the payment, agreements and conditions hereinafter mentioned, and under the conditions expressed in the bonds herein, Contractor hereby agrees to complete the construction of improvements described as follows:

**BID NO. 2020-62-B
CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

in the Town of Prosper, Texas, and all extra work in connection therewith, under the terms as stated in the terms of this Contract, including all Contract Documents incorporated herein; and at his, her or their own proper cost and expense to furnish all superintendence, labor, insurance, equipment, tools and other accessories and services necessary to complete the said construction in accordance with all the Contract Documents, incorporated herein as if written word for word, and in accordance with the Plans, which include all maps, plats, blueprints, and other drawings and printed or written explanatory manner therefore, and the Specifications as prepared by Town of Prosper or its consultant hereinafter called Engineer, who has been identified by the endorsement of the Contractor's written bid, the General Conditions of this Contract, the Special Conditions of this Contract, the payment, performance, and maintenance bonds hereto attached; all of which are made a part hereof and collectively evidence and constitute the entire Contract.

A. Contract Documents and Order of Precedence

The Contract Documents shall consist of the following documents:

1. this Construction Agreement;
2. properly authorized change orders;
3. the Special Conditions of this Contract;
4. the General Conditions of this Contract;
5. the Technical Specifications & Construction Drawings of this Contract;
6. the OWNER's Standard Construction Details;
7. the OWNER's Standard Construction Specifications;
8. the OWNER's written notice to proceed to the CONTRACTOR;
9. the Contractor's Cost Bid;
10. any listed and numbered addenda;
11. the Performance, Payment, and Maintenance Bonds; and,
12. any other bid materials distributed by the Owner that relate to the Project.

These Contract Documents are incorporated by reference into this Construction Agreement as if set out here in their entirety. The Contract Documents are intended to be complementary; what is called for by one document shall be as binding as if called for by all Contract Documents. It is specifically provided, however, that in the event of any inconsistency in the Contract Documents, the inconsistency shall be

**BID NO: 2020-62-B
CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

resolved by giving precedence to the Contract Documents in the order in which they are listed herein above. If, however, there exists a conflict or inconsistency between the Technical Specifications and the Construction Drawings it shall be the Contractor's obligation to seek clarification as to which requirements or provisions control before undertaking any work on that component of the project. Should the Contractor fail or refuse to seek a clarification of such conflicting or inconsistent requirements or provisions prior to any work on that component of the project, the Contractor shall be solely responsible for the costs and expenses - including additional time - necessary to cure, repair and/or correct that component of the project.

B. Total of Payments Due Contractor

For performance of the Work in accordance with the Contract Documents, the Owner shall pay the Contractor in current funds an amount not to exceed **Three Million Four Hundred Fifty-Four Thousand Three Hundred Sixty-Three Dollars and Thirty-Three Cents (\$3,454,363.33)**. This amount is subject to adjustment by change order in accordance with the Contract Documents.

C. Dates to Start and Complete Work

Contractor shall begin work within ten (10) calendar days after receiving a written Notice to Proceed or written Work Order from the Owner. All Work required under the Contract Documents shall be substantially completed within **150** calendar days after the date of the Notice to Proceed for the base bid. Within **30** additional calendar days after Substantial Completion, all outstanding issues shall be addressed and ready for final payment. **The meter vault must be in service by December 4, 2020.**

Under this Construction Agreement, all references to "day" are to be considered "calendar days" unless noted otherwise.

D. CONTRACTOR'S INDEMNITY TO THE OWNER AND OTHERS

CONTRACTOR DOES HEREBY AGREE TO WAIVE ALL CLAIMS, RELEASE, INDEMNIFY, DEFEND AND HOLD HARMLESS THE TOWN OF PROSPER (OWNER) TOGETHER WITH ITS MAYOR AND TOWN COUNCIL AND ALL OF ITS OFFICIALS, OFFICERS, AGENTS AND EMPLOYEES, IN BOTH THEIR PUBLIC AND PRIVATE CAPACITIES, FROM AND AGAINST ANY AND ALL CITATIONS, CLAIMS, COSTS, DAMAGES, DEMANDS, EXPENSES, FINES, JUDGMENTS, LIABILITY, LOSSES, PENALTIES, SUITS OR CAUSES OF ACTION OF EVERY KIND INCLUDING ALL EXPENSES OF LITIGATION AND/OR SETTLEMENT, COURT COSTS AND ATTORNEY FEES WHICH MAY ARISE BY REASON OF INJURY TO OR DEATH OF ANY PERSON OR FOR LOSS OF, DAMAGE TO, OR LOSS OF USE OF ANY PROPERTY OCCASIONED BY ERROR, OMISSION, OR NEGLIGENT ACT OF CONTRACTOR, ITS SUBCONTRACTORS, ANY OFFICERS, AGENTS OR EMPLOYEES OF CONTRACTOR OR ANY SUBCONTRACTORS, INVITEES, AND ANY OTHER THIRD PARTIES OR PERSONS FOR WHOM OR WHICH CONTRACTOR IS LEGALLY RESPONSIBLE, IN ANY WAY ARISING OUT OF, RELATING TO, RESULTING FROM, OR IN CONNECTION WITH THE PERFORMANCE OF THIS CONTRACT, AND CONTRACTOR WILL AT HIS OR HER OWN COST AND EXPENSE DEFEND AND PROTECT TOWN OF PROSPER (OWNER) FROM ANY AND ALL SUCH CLAIMS AND DEMANDS.

CONTRACTOR DOES HEREBY AGREE TO WAIVE ALL CLAIMS, RELEASE, INDEMNIFY, DEFEND AND HOLD HARMLESS TOWN OF PROSPER (OWNER) TOGETHER WITH ITS MAYOR AND

TOWN COUNCIL AND ALL OF ITS OFFICIALS, OFFICERS, AGENTS, AND EMPLOYEES, FROM AND AGAINST ANY AND ALL CITATIONS, CLAIMS, COSTS, DAMAGES, DEMANDS, EXPENSES, FINES, JUDGMENTS, LIABILITY, LOSSES, PENALTIES, SUITS OR CAUSES OF ACTION OF EVERY KIND INCLUDING ALL EXPENSES OF LITIGATION AND/OR SETTLEMENT, COURT COSTS AND ATTORNEYS FEES FOR INJURY OR DEATH OF ANY PERSON OR FOR LOSS OF, DAMAGES TO, OR LOSS OF USE OF ANY PROPERTY, ARISING OUT OF OR IN CONNECTION WITH THE PERFORMANCE OF THIS CONTRACT. SUCH INDEMNITY SHALL APPLY WHETHER THE CITATIONS, CLAIMS, COSTS, DAMAGES, DEMANDS, EXPENSES, FINES, JUDGMENTS, LIABILITY, LOSSES, PENALTIES, SUITS OR CAUSES OF ACTION ARISE IN WHOLE OR IN PART FROM THE NEGLIGENCE OF THE TOWN OF PROSPER (OWNER), ITS MAYOR AND TOWN COUNCIL, OFFICERS, OFFICIALS, AGENTS OR EMPLOYEES. IT IS THE EXPRESS INTENTION OF THE PARTIES HERETO THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH IS INDEMNITY BY CONTRACTOR TO INDEMNIFY AND PROTECT TOWN OF PROSPER (OWNER) FROM THE CONSEQUENCES OF TOWN OF PROSPER'S (OWNER'S) OWN NEGLIGENCE, WHETHER THAT NEGLIGENCE IS A SOLE OR CONCURRING CAUSE OF THE INJURY, DEATH OR DAMAGE.

IN ANY AND ALL CLAIMS AGAINST ANY PARTY INDEMNIFIED HEREUNDER BY ANY EMPLOYEE OF THE CONTRACTOR, ANY SUB-CONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, THE INDEMNIFICATION OBLIGATION HEREIN PROVIDED SHALL NOT BE LIMITED IN ANY WAY BY ANY LIMITATION ON THE AMOUNT OR TYPE OF DAMAGES, COMPENSATION OR BENEFITS PAYABLE BY OR FOR THE CONTRACTOR OR ANY SUB-CONTRACTOR UNDER WORKMEN'S COMPENSATION OR OTHER EMPLOYEE BENEFIT ACTS.

INDEMNIFIED ITEMS SHALL INCLUDE ATTORNEYS' FEES AND COSTS, COURT COSTS, AND SETTLEMENT COSTS. INDEMNIFIED ITEMS SHALL ALSO INCLUDE ANY EXPENSES, INCLUDING ATTORNEYS' FEES AND EXPENSES, INCURRED BY AN INDEMNIFIED INDIVIDUAL OR ENTITY IN ATTEMPTING TO ENFORCE THIS INDEMNITY.

In its sole discretion, the Owner shall have the right to approve counsel to be retained by Contractor in fulfilling its obligation to defend and indemnify the Owner. Contractor shall retain approved counsel for the Owner within seven (7) business days after receiving written notice from the Owner that it is invoking its right to indemnification under this Construction Agreement. If Contractor does not retain counsel for the Owner within the required time, then the Owner shall have the right to retain counsel and the Contractor shall pay these attorneys' fees and expenses.

The Owner retains the right to provide and pay for any or all costs of defending indemnified items, but it shall not be required to do so. To the extent that Owner elects to provide and pay for any such costs, Contractor shall indemnify and reimburse Owner for such costs.

(Please note that this "broad-form" indemnification clause is not prohibited by Chapter 151 of the Texas Insurance Code as it falls within one of the exclusions contained in Section 151.105 of the Texas Insurance Code.)

E. Insurance Requirements

Contractor shall procure and maintain for the duration of the contract, insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the vendor, his agents, representatives, employees or subcontractors. The cost of such insurance shall be included in the contractor's bid. A certificate of insurance meeting all requirements and provisions outlined herein shall be provided to the Town prior to any services being performed or rendered. Renewal certificates shall also be supplied upon expiration. Certificate holder shall be listed as follows, with the project/contract number referenced:

Town of Prosper
Attn: Purchasing Manager
P.O. Box 307
Prosper, Texas 75078

re: BID NO. 2020-62-B
CUSTER ROAD PUMP STATION METER VAULT RELOCATION

1. Minimum Scope of Insurance

Coverage shall be at least as broad as:

- a. ISO Form Number GL 00 01 (or similar form) covering Comprehensive General Liability. "Occurrence" form only, "claims made" forms are unacceptable.
- b. Workers' Compensation insurance as required by the Labor Code of the State of Texas, including Employers' Liability Insurance.
- c. Automobile Liability as required by the State of Texas, covering all owned, hired, or non-owned vehicles. Automobile Liability is only required if vehicle(s) will be used under this contract.

2. Minimum Limits of Insurance

Contractor shall maintain throughout contract limits not less than:

- a. Commercial General Liability: \$1,000,000 per occurrence / \$2,000,000 in the aggregate for third party bodily injury, personal injury and property damage. Policy will include coverage for:
 - 1) Premises / Operations
 - 2) Broad Form Contractual Liability
 - 3) Products and Completed Operations
 - 4) Personal Injury

- 5) Broad Form Property Damage
 - 6) Explosion Collapse and Underground (XCU) Coverage.
- b. Workers' Compensation and Employer's Liability: Workers' Compensation limits as required by the Labor Code of the State of Texas and Statutory Employer's Liability minimum limits of \$100,000 per injury, \$300,000 per occurrence, and \$100,000 per occupational disease.
 - c. Automobile Liability: \$1,000,000 Combined Single Limit. Limits can only be reduced if approved by the Town. Automobile liability shall apply to all owned, hired and non-owned autos.
 - d. Builders' Risk Insurance: Completed value form, insurance carried must be equal to the completed value of the structure. Town shall be listed as Loss Payee.
 - e. \$1,000,000 Umbrella Liability Limit that follows form over underlying Automobile Liability, General Liability, and Employers Liability coverages.
3. Deductible and Self-Insured Retentions

Any deductible or self-insured retentions in excess of \$10,000 must be declared to and approved by the Town.

4. Other Insurance Provisions

The policies are to contain, or be endorsed to contain the following provisions:

- a. General Liability and Automobile Liability Coverage

- 1) The Town, its officers, officials, employees, boards and commissions and volunteers are to be added as "Additional Insured's" relative to liability arising out of activities performed by or on behalf of the contractor, products and completed operations of the contractor, premises owned, occupied or used by the contractor. The coverage shall contain no special limitations on the scope of protection afforded to the Town, its officers, officials, employees or volunteers.
- 2) The contractor's insurance coverage shall be primary insurance in respects to the Town, its officers, officials, employees and volunteers. Any insurance or self- insurance maintained by the Town, its officers, officials, employees or volunteers shall be in excess of the contractor's insurance and shall not contribute with it.

- 3) Any failure to comply with reporting provisions of the policy shall not affect coverage provided to the Town, its officers, officials, employees, boards and commissions or volunteers.
- 4) The contractor's insurance shall apply separately to each insured against whom the claim is made or suit is brought, except to the limits of the insured's limits of liability.

b. Workers' Compensation and Employer's Liability Coverage

The insurer shall agree to waive all rights of subrogation against the Town, its officers, officials, employees and volunteers for losses arising from work performed by the contractor for the Town.

c. All Coverages

Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled or non-renewed by either party, reduced in coverage or in limits except after 30 days written notice to the Town for all occurrences, except 10 days written notice to the Town for non-payment.

5. Acceptability of Insurers

The Town prefers that Insurance be placed with insurers with an A.M. Best's rating of no less than A- VI, or better.

6. Verification of Coverage

Contractor shall provide the Town with certificates of insurance indicating coverage's required. The certificates are to be signed by a person authorized by that insurer to bind coverage on its behalf. Certificates of Insurance similar to the ACORD Form are acceptable. Town will not accept Memorandums of Insurance or Binders as proof of insurance. The Town reserves the right to require complete, certified copies of all required insurance policies at any time.

F. Performance, Payment and Maintenance Bonds

The Contractor shall procure and pay for a Performance Bond applicable to the work in the amount of one hundred fifteen percent (115%) of the total proposed price, and a Payment Bond applicable to the work in the amount of one hundred percent (100%) of the total proposed price. The Contractor shall also procure and pay for a Maintenance Bond applicable to the work in the amount of one hundred percent (100%) of the total proposed price. The period of the Maintenance Bond shall be two years from the date of acceptance of all work done under the contract, to cover the guarantee as set forth in this Construction Agreement. The performance, payment and maintenance bonds shall be issued in the form attached to this Construction Agreement as Exhibits B, C and D. Other performance, payment and

maintenance bond forms shall not be accepted. Among other things, these bonds shall apply to any work performed during the two-year warranty period after acceptance as described in this Construction Agreement.

The performance, payment and maintenance bonds shall be issued by a corporate surety, acceptable to and approved by the Town, authorized to do business in the State of Texas, pursuant to Chapter 2253 of the Texas Government Code. Further, the Contractor shall supply capital and surplus information concerning the surety and reinsurance information concerning the performance, payment and maintenance bonds upon Town request. In addition to the foregoing requirements, if the amount of the bond exceeds One Hundred Thousand Dollars (\$100,000) the bond must be issued by a surety that is qualified as a surety on obligations permitted or required under federal law as indicated by publication of the surety's name in the current U.S. Treasury Department Circular 570. In the alternative, an otherwise acceptable surety company (not qualified on federal obligations) that is authorized and admitted to write surety bonds in Texas must obtain reinsurance on any amounts in excess of One Hundred Thousand Dollars (\$100,000) from a reinsurer that is authorized and admitted as a reinsurer in Texas who also qualifies as a surety or reinsurer on federal obligations as indicated by publication of the surety's or reinsurer's name in the current U.S. Treasury Department Circular 570.

G. Progress Payments and Retainage

As it completes portions of the Work, the Contractor may request progress payments from the Owner. Progress payments shall be made by the Owner based on the Owner's estimate of the value of the Work properly completed by the Contractor since the time the last progress payment was made. The "estimate of the value of the work properly completed" shall include the net invoice value of acceptable, non-perishable materials actually delivered to and currently at the job site only if the Contractor provides to the Owner satisfactory evidence that material suppliers have been paid for these materials.

No progress payment shall be due to the Contractor until the Contractor furnishes to the Owner:

1. copies of documents reasonably necessary to aid the Owner in preparing an estimate of the value of Work properly completed;
2. full or partial releases of liens, including releases from subcontractors providing materials or delivery services relating to the Work, in a form acceptable to the Owner releasing all liens or claims relating to goods and services provided up to the date of the most recent previous progress payment;
3. an updated and current schedule clearly detailing the project's critical path elements; and
4. any other documents required under the Contract Documents.

Progress payments shall not be made more frequently than once every thirty (30) calendar days unless the Owner determines that more frequent payments are appropriate. Further, progress payments are to be based on estimates and these estimates are subject to correction through the adjustment of subsequent progress payments and the final payment to Contractor. If the Owner determines after final payment that it has overpaid the Contractor, then Contractor agrees to pay to the Owner the overpayment amount specified by the Owner within thirty (30) calendar days after it receives written demand from the Owner.

The fact that the Owner makes a progress payment shall not be deemed to be an admission by the Owner concerning the quantity, quality or sufficiency of the Contractor's work. Progress payments shall not be deemed to be acceptance of the Work nor shall a progress payment release the Contractor from any of its responsibilities under the Contract Documents.

After determining the amount of a progress payment to be made to the Contractor, the Owner shall withhold a percentage of the progress payment as retainage. The amount of retainage withheld from each progress payment shall be set at five percent (5%). Retainage shall be withheld and may be paid to:

1. ensure proper completion of the Work. The Owner may use retained funds to pay replacement or substitute contractors to complete unfinished or defective work;
2. ensure timely completion of the Work. The Owner may use retained funds to pay liquidated damages; and
3. provide an additional source of funds to pay claims for which the Owner is entitled to indemnification from Contractor under the Contract Documents.

Retained funds shall be held by the Owner in accounts that shall not bear interest. Retainage not otherwise withheld in accordance with the Contract Documents shall be returned to the Contractor as part of the final payment.

H. Withholding Payments to Contractor

The Owner may withhold payment of some or all of any progress or final payment that would otherwise be due if the Owner determines, in its discretion, that the Work has not been performed in accordance with the Contract Documents. The Owner may use these funds to pay replacement or substitute contractors to complete unfinished or defective Work.

The Owner may withhold payment of some or all of any progress or final payment that would otherwise be due if the Owner determines, in its discretion, that it is necessary and proper to provide an additional source of funds to pay claims for which the Owner is entitled to indemnification from Contractor under the Contract Documents.

Amounts withheld under this section shall be in addition to any retainage.

I. Acceptance of the Work

When the Work is completed, the Contractor shall request that the Owner perform a final inspection. The Owner shall inspect the Work. If the Owner determines that the Work has been completed in accordance with the Contract Documents, it shall issue a written notice of acceptance of the Work. If the Owner determines that the Work has not been completed in accordance with the Contract Documents, then it shall provide the Contractor with a verbal or written list of items to be completed before another final inspection shall be scheduled.

It is specifically provided that Work shall be deemed accepted on the date specified in the Owner's written notice of acceptance of the Work. The Work shall not be deemed to be accepted based on "substantial completion" of the Work, use or occupancy of the Work, or for any reason other than the Owner's written Notice of Acceptance. Further, the issuance of a certificate of occupancy for all or any part of the Work shall not constitute a Notice of Acceptance for that Work.

In its discretion, the Owner may issue a Notice of Acceptance covering only a portion of the Work. In this event, the notice shall state specifically what portion of the Work is accepted.

J. Acceptance of Erosion Control Measures

When the erosion control measures have been completed, the Contractor shall request that the Owner perform a final inspection. The Owner shall inspect the Work. If the Owner determines that the Work has been completed in accordance with the Contract Documents and per TPDES General Construction Permit, it shall issue a written Notice of Acceptance of the Work. If the Owner determines that the Work has not been completed in accordance with the Contract Documents or TPDES General Construction Permit, then it shall provide the Contractor with a verbal or written list of items to be completed before another final inspection shall be scheduled.

K. Final Payment

After all Work required under the Contract Documents has been completed, inspected, and accepted, the Town shall calculate the final payment amount promptly after necessary measurements and computations are made. The final payment amount shall be calculated to:

1. include the estimate of the value of Work properly completed since the date of the most recent previous progress payment;
2. correct prior progress payments; and
3. include retainage or other amounts previously withheld that are to be returned to Contractor, if any.

Final payment to the Contractor shall not be due until the Contractor provides original full releases of liens from the Contractor and its subcontractors, or other evidence satisfactory to the Owner to show that all sums due for labor, services, and materials furnished for or used in connection with the Work have been paid or shall be paid with the final payment. To ensure this result, Contractor consents to the issuance of the final payment in the form of joint checks made payable to Contractor and others. The Owner may, but is not obligated to issue final payment using joint checks.

Final payment to the Contractor shall not be due until the Contractor has supplied to the Owner original copies of all documents that the Owner determines are reasonably necessary to ensure both that the final payment amount is properly calculated and that the Owner has satisfied its obligation to administer the Construction Agreement in accordance with applicable law. The following documents shall, at a minimum, be required to be submitted prior to final payment being due: redline as-built construction plans; consent of surety to final payment; public infrastructure inventory; affidavit of value for public infrastructure; and, final

change order(s). "Redline as-built construction plans" shall include, but are not limited to markups for change orders, field revisions, and quantity overruns as applicable. The list of documents contained in this provision is not an exhaustive and exclusive list for every project performed pursuant to these Contract Documents and Contractor shall provide such other and further documents as may be requested and required by the Owner to close out a particular project.

Subject to the requirements of the Contract Documents, the Owner shall pay the Final Payment within thirty (30) calendar days after the date specified in the Notice of Acceptance. This provision shall apply only after all Work called for by the Contract Documents has been accepted.

L. Contractor's Warranty

For a two-year period after the date specified in a written notice of acceptance of Work, Contractor shall provide and pay for all labor and materials that the Owner determines are necessary to correct all defects in the Work arising because of defective materials or workmanship supplied or provided by Contractor or any subcontractor. This shall also include areas of vegetation that did meet TPDES General Construction Permit during final close out but have since become noncompliant.

Forty-five (45) to sixty (60) calendar days before the end of the two-year warranty period, the Owner may make a warranty inspection of the Work. The Owner shall notify the Contractor of the date and time of this inspection so that a Contractor representative may be present. After the warranty inspection, and before the end of the two-year warranty period, the Owner shall mail to the Contractor a written notice that specifies the defects in the Work that are to be corrected.

The Contractor shall begin the remedial work within ten (10) calendar days after receiving the written notice from the Town. If the Contractor does not begin the remedial work timely or prosecute it diligently, then the Owner may pay for necessary labor and materials to effect repairs and these expenses shall be paid by the Contractor, the performance bond surety, or both.

If the Owner determines that a hazard exists because of defective materials and workmanship, then the Owner may take steps to alleviate the hazard, including making repairs. These steps may be taken without prior notice either to the Contractor or its surety. Expenses incurred by the Owner to alleviate the hazard shall be paid by the Contractor, the performance bond surety, or both.

Any Work performed by or for the Contractor to fulfill its warranty obligations shall be performed in accordance with the Contract Documents. By way of example only, this is to ensure that Work performed during the warranty period is performed with required insurance and the performance and payment bonds still in effect.

Work performed during the two-year warranty period shall itself be subject to a one-year warranty. This warranty shall be the same as described in this section.

The Owner may make as many warranty inspections as it deems appropriate.

M. Compliance with Laws

The Contractor shall be responsible for ensuring that it and any subcontractors performing any portion of the Work required under the Contract Documents comply with all applicable federal, state, county, and municipal laws, regulations, and rules that relate in any way to the performance and completion of the Work. This provision applies whether or not a legal requirement is described or referred to in the Contract Documents.

Ancillary/Integral Professional Services: In selecting an architect, engineer, land surveyor, or other professional to provide professional services, if any, that are required by the Contract Documents, Contractor shall not do so on the basis of competitive bids but shall make such selection on the basis of demonstrated competence and qualifications to perform the services in the manner provided by Section 2254.004 of the Texas Government Code and shall so certify to the Town the Contractor's agreement to comply with this provision with Contractor's bid.

N. "Anti-Israel Boycott" Provision

In accordance with Chapter 2270, Texas Government Code, a Texas governmental entity may not enter into a contract with a company for the provision of goods or services unless the contract contains a written verification from the company that it: (1) does not boycott Israel; and (2) will not boycott Israel during the term of the contract. Chapter 2270 does not apply to a (1) a company that is a sole proprietorship; (2) a company that has fewer than ten (10) full-time employees; or (3) a contract that has a value of less than One Hundred Thousand Dollars (\$100,000.00). Unless the company is not subject to Chapter 2270 for the reasons stated herein, the signatory executing this Agreement on behalf of the company verifies by its signature to this Contract that the company does not boycott Israel and will not boycott Israel during the term of this Contract.

O. Other Items

The Contractor shall sign the Construction Agreement, and deliver signed performance, payment and maintenance bonds and proper insurance policy endorsements (and/or other evidence of coverage) within ten (10) calendar days after the Owner makes available to the Contractor copies of the Contract Documents for signature. Six (6) copies of the Contract Documents shall be signed by an authorized representative of the Contractor and returned to the Town.

The Construction Agreement "effective date" shall be the date on which the Town Council acts to approve the award of the Contract for the Work to Contractor. It is expressly provided, however, that the Town Council delegates the authority to the Town Manager or his designee to rescind the Contract award to Contractor at any time before the Owner delivers to the Contractor a copy of this Construction Agreement that bears the signature of the Town Manager and Town Secretary or their authorized designees. The purpose of this provision is to ensure:

1. that Contractor timely delivers to the Owner all bonds and insurance documents; and
2. that the Owner retains the discretion not to proceed if the Town Manager or his designee determines that information indicates that the Contractor was not the lowest responsible

bidder or that the Contractor cannot perform all of its obligations under the Contract Documents.

THE CONTRACTOR AGREES THAT IT SHALL HAVE NO CLAIM OR CAUSE OF ACTION OF ANY KIND AGAINST OWNER, INCLUDING A CLAIM FOR BREACH OF CONTRACT, NOR SHALL THE OWNER BE REQUIRED TO PERFORM UNDER THE CONTRACT DOCUMENTS, UNTIL THE DATE THE OWNER DELIVERS TO THE CONTRACTOR A COPY OF THE CONSTRUCTION AGREEMENT BEARING THE SIGNATURES JUST SPECIFIED.

The Contract Documents shall be construed and interpreted by applying Texas law. Exclusive venue for any litigation concerning the Contract Documents shall be Collin County, Texas.

In the event of any disagreement or conflict concerning the interpretation of this Agreement, and such disagreement cannot be resolved by the signatories hereto, the signatories agree to submit such disagreement to non-binding mediation.

Although the Construction Agreement has been drafted by the Owner, should any portion of the Construction Agreement be disputed, the Owner and Contractor agree that it shall not be construed more favorably for either party.

The Contract Documents are binding upon the Owner and Contractor and shall insure to their benefit and as well as that of their respective successors and assigns.

If Town Council approval is not required for the Construction Agreement under applicable law, then the Construction Agreement "effective date" shall be the date on which the Town Manager and Town Secretary or their designees have signed the Construction Agreement. If the Town Manager and Town Secretary sign on different dates, then the later date shall be the effective date.

[Signatures continued on following page.]

WILSON CONTRACTOR SERVICES, LLC

TOWN OF PROSPER, TEXAS

By: _____

By: **HARLAN JEFFERSON**

Title: _____

Title: Town Manager

Date: _____

Date: _____

Address: 3985 Mingo Rd.
Denton, Texas 76208

Address: 250 W. First St.
P.O. Box 307
Prosper, Texas 75078

Phone: (940) 243-1174
Email: tony@wilsoncontractorservices.com

Phone: (972) 346-2640
Email: harlan_jefferson@prospertx.gov

ATTEST:

MELISSA LEE
Town Secretary

PERFORMANCE BOND

STATE OF TEXAS)
)
COUNTY OF COLLIN)

KNOW ALL MEN BY THESE PRESENTS: That _____ whose address is _____, hereinafter called Principal, and _____, a corporation organized and existing under the laws of the State of _____, and fully licensed to transact business in the State of Texas, as Surety, are held and firmly bound unto the **TOWN OF PROSPER**, a home-rule municipal corporation organized and existing under the laws of the State of Texas, hereinafter called "Beneficiary", in the penal sum of _____ Dollars (\$_____) plus fifteen percent (15%) of the stated penal sum as an additional sum of money representing additional court expenses, attorneys' fees, and liquidated damages arising out of or connected with the below identified Contract in lawful money of the United States, to be paid in Collin County, Texas, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents. The penal sum of this Bond shall automatically be increased by the amount of any Change Order or Supplemental Agreement, which increases the Contract price, but in no event shall a Change Order or Supplemental Agreement, which reduces the Contract price, decrease the penal sum of this Bond.

THE OBLIGATION TO PAY SAME is conditioned as follows: Whereas, the Principal entered into a certain Contract with the Town of Prosper, the Beneficiary, dated on or about the **28th day of July, A.D. 2020**, a copy of which is attached hereto and made a part hereof, to furnish all materials, equipment, labor, supervision, and other accessories necessary for the construction of:

**BID NO. 2020-62-B
CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

in the Town of Prosper, Texas, as more particularly described and designated in the above-referenced contract such contract being incorporated herein and made a part hereof as fully and to the same extent as if written herein word for word.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform and fulfill all of the undertakings, covenants, terms, conditions and agreements of said Contract in accordance with the Plans, Specifications and Contract Documents during the original term thereof and any extension thereof which may be granted by the Beneficiary, with or without notice to the Surety, and during the life of any guaranty or warranty required under this Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived; and, if the Principal shall repair and/or replace all defects due to faulty materials and workmanship that appear within a period of one (1) year from the date of final completion and final acceptance of the Work by Owner; and, if the Principal shall fully indemnify and save harmless the Beneficiary from and against all costs and damages which Beneficiary may suffer by reason of failure to so perform herein and shall fully reimburse and repay Beneficiary all outlay and expense which the Beneficiary may incur in making good any default or deficiency, then this obligation shall be void; otherwise, it shall remain in full force and effect.

PROVIDED FURTHER, that if any legal action were filed on this Bond, exclusive Venue shall lie in Collin County, Texas.

**BID NO: 2020-62-B
CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

AND PROVIDED FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder or the Plans, Specifications and Drawings, etc., accompanying the same shall in anywise affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract, or to the Work or to the Specifications.

This Bond is given pursuant to the provisions of Chapter 2253 of the Texas Government Code, and any other applicable statutes of the State of Texas.

The undersigned and designated agent is hereby designated by the Surety herein as the Resident Agent in Collin County or Dallas County to whom any requisite notices may be delivered and on whom service of process may be had in matters arising out of such suretyship, as provided by Article 7.19-1 of the Insurance Code, Vernon's Annotated Civil Statutes of the State of Texas.

IN WITNESS WHEREOF, this instrument is executed in two copies, each one of which shall be deemed an original, this, the _____ day of _____, 20____.

ATTEST:

PRINCIPAL:

By: _____
Signature

Typed/Printed Name

Title

Address

City State Zip

Phone Fax

Company Name

By: _____
Signature

Typed/Printed Name

Title

Address

City State Zip

Phone Fax

[Signatures continued on following page.]

ATTEST:

SURETY:

By: _____
Signature

By: _____
Signature

Printed Name

Printed Name

Title

Title

Address

Address

City State Zip

City State Zip

Phone Fax

Phone Fax

The Resident Agent of the Surety in Collin County or Dallas County, Texas, for delivery of notice and service of the process is:

NAME: _____
STREET ADDRESS: _____
CITY, STATE, ZIP: _____

NOTE: Date on Page 1 of Performance Bond must be same date as Contract. Date on Page 2 of Performance Bond must be after date of Contract. If Resident Agent is not a corporation, give a person's name.

PAYMENT BOND

STATE OF TEXAS)
)
COUNTY OF COLLIN)

KNOW ALL MEN BY THESE PRESENTS: That _____ whose address is _____, hereinafter called Principal, and _____, a corporation organized and existing under the laws of the State of _____, and fully licensed to transact business in the State of Texas, as Surety, are held and firmly bound unto the **TOWN OF PROSPER**, a home-rule municipal corporation organized and existing under the laws of the State of Texas, hereinafter called "Owner", and unto all persons, firms, and corporations who may furnish materials for, or perform labor upon the building or improvements hereinafter referred to in the penal sum of _____ DOLLARS (\$_____) (one hundred percent (100%) of the total bid price) in lawful money of the United States, to be paid in Collin County, Texas, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents. The penal sum of this Bond shall automatically be increased by the amount of any Change Order or Supplemental Agreement, which increases the Contract price, but in no event shall a Change Order or Supplemental Agreement, which reduces the Contract price, decrease the penal sum of this Bond.

THE OBLIGATION TO PAY SAME is conditioned as follows: Whereas, the Principal entered into a certain Contract with the Town of Prosper, the Owner, dated on or about the **28th day of July, A.D. 2020**, a copy of which is attached hereto and made a part hereof, to furnish all materials, equipment, labor, supervision, and other accessories necessary for the construction of:

**BID NO. 2020-62-B
CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

NOW THEREFORE, if the Principal shall well, truly and faithfully perform its duties and make prompt payment to all persons, firms, subcontractors, corporations and claimants supplying labor and/or material in the prosecution of the Work provided for in the above-referenced Contract and any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modification to the Surety is hereby expressly waived, then this obligation shall be void; otherwise it shall remain in full force and effect.

PROVIDED FURTHER, that if any legal action were filed on this Bond, exclusive venue shall lie in Collin County, Texas.

AND PROVIDED FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract, or to the Work performed thereunder, or the Plans, Specifications, Drawings, etc., accompanying the same, shall in anywise affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract, or to the Work to be performed thereunder.

This Bond is given pursuant to the provisions of Chapter 2253 of the Texas Government Code, and any other applicable statutes of the State of Texas.

The undersigned and designated agent is hereby designated by the Surety herein as the Resident Agent in Collin County or Dallas County to whom any requisite notices may be delivered and on whom service of process may

**BID NO: 2020-62-B
CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

be had in matters arising out of such suretyship, as provided by Article 7.19-1 of the Insurance Code, Vernon's Annotated Civil Statutes of the State of Texas.

IN WITNESS WHEREOF, this instrument is executed in two copies, each one of which shall be deemed an original, this, the _____ day of _____, 20__.

ATTEST:

PRINCIPAL:

By: _____
Signature

By: _____
Signature

Typed/Printed Name

Typed/Printed Name

Title

Title

Address

Address

City State Zip

City State Zip

Phone Fax

Phone Fax

[Signatures continued on following page.]

ATTEST:

SURETY:

By: _____
Signature

By: _____
Signature

Printed Name

Printed Name

Title

Title

Address

Address

City State Zip

City State Zip

Phone Fax

Phone Fax

The Resident Agent of the Surety in Collin County or Dallas County, Texas, for delivery of notice and service of the process is:

NAME: _____
STREET ADDRESS: _____
CITY, STATE, ZIP: _____

NOTE: Date on Page 1 of Performance Bond must be same date as Contract. Date on Page 2 of Performance Bond must be after date of Contract. If Resident Agent is not a corporation, give a person's name.

MAINTENANCE BOND

STATE OF TEXAS)
)
 COUNTY OF COLLIN)

KNOW ALL MEN BY THESE PRESENTS: That _____ whose address is _____, hereinafter referred to as "Principal," and _____, a corporate surety/sureties organized under the laws of the State of _____ and fully licensed to transact business in the State of Texas, as Surety, hereinafter referred to as "Surety" (whether one or more), are held and firmly bound unto the **TOWN OF PROSPER**, a Texas municipal corporation, hereinafter referred to as "Owner," in the penal sum of _____ DOLLARS (\$_____) (one hundred percent (100%) of the total bid price), in lawful money of the United States to be paid to Owner, its successors and assigns, for the payment of which sum well and truly to be made, we bind ourselves, our successors, heirs, executors, administrators and successors and assigns, jointly and severally; and firmly by these presents, the condition of this obligation is such that:

WHEREAS, Principal entered into a certain written Contract with the Town of Prosper, dated on or about the **28th day of July, 2020**, to furnish all permits, licenses, bonds, insurance, products, materials, equipment, labor, supervision, and other accessories necessary for the construction of:

**BID NO. 2020-62-B
 CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

in the Town of Prosper, Texas, as more particularly described and designated in the above-referenced contract, such contract being incorporated herein and made a part hereof as fully and to the same extent as if written herein word for word:

WHEREAS, in said Contract, the Principal binds itself to use first class materials and workmanship and of such kind and quality that for a period of two (2) years from the completion and final acceptance of the improvements by Owner the said improvements shall require no repairs, the necessity for which shall be occasioned by defects in workmanship or materials and during the period of two (2) years following the date of final acceptance of the Work by Owner, Principal binds itself to repair or reconstruct said improvements in whole or in part at any time within said period of time from the date of such notice as the Town Manager or his designee shall determine to be necessary for the preservation of the public health, safety or welfare. If Principal does not repair or reconstruct the improvements within the time period designated, Owner shall be entitled to have said repairs made and charge Principal and/or Surety the cost of same under the terms of this Maintenance Bond.

NOW, THEREFORE, if Principal will maintain and keep in good repair the Work herein contracted to be done and performed for a period of two (2) years from the date of final acceptance and do and perform all necessary work and repair any defective condition (it being understood that the purpose of this section is to cover all defective conditions arising by reason of defective materials, work or labor performed by Principal) then this obligation shall be void; otherwise it shall remain in full force and effect and Owner shall have and recover from Principal and its Surety damages in the premises as provided in the Plans and Specifications and Contract.

PROVIDED, however, that Principal hereby holds harmless and indemnifies Owner from and against any claim or liability for personal injury or property damage caused by and occurring during the performance of said maintenance and repair operation.

**BID NO: 2020-62-B
 CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

PROVIDED, further, that if any legal action be filed on this Bond, exclusive venue shall lie in Collin County, Texas.

AND PROVIDED FURTHER, Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work performed thereunder, or the Plans, Specifications, Drawings, etc. accompanying same shall in any way affect its obligation on this Bond; and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder.

The undersigned and designated agent is hereby designated by Surety as the resident agent in either Collin or Dallas Counties to whom all requisite notice may be delivered and on whom service of process may be had in matters arising out of this suretyship.

IN WITNESS WHEREOF, this instrument is executed in two copies, each one of which shall be deemed an original, on this the ____ day of _____, 20____.

ATTEST:

PRINCIPAL:

By: _____
Signature

By: _____
Signature

Typed/Printed Name

Typed/Printed Name

Title

Title

Address

Address

City State Zip

City State Zip

Phone Fax

Phone Fax

[Signatures continued on following page.]

ATTEST:

By: _____
Signature

Printed Name

Title

Address

City State Zip

Phone Fax

SURETY:

By: _____
Signature

Printed Name

Title

Address

City State Zip

Phone Fax

SPECIAL CONDITIONS

SC.01 PURPOSE: The Special Conditions contained herein set forth conditions or requirements particular to this Contract: **BID NO. 2020-62-B CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

The Special Conditions supplement the General Conditions and the Standard Specifications and take precedence over any conditions or requirements of the General Conditions and the Standard Specifications with which they are in conflict.

SC.02 DEFINITIONS: The following words and expressions, or pronouns used in their place, shall wherever they appear in this Contract, be construed as follows, unless a different meaning is clear from the context:

- **ENGINEER:** The Engineer of Record as shown on the Construction Drawings:
Clayton C. Barnard, P.E., Freese and Nichols, Inc., 5805 Main Street, Suite B, Frisco, TX 75034

SC.03 MINIMUM STANDARDS OF RESPONSIBILITY: A prospective vendor must affirmatively demonstrate responsibility. The Town of Prosper may request representation and other information sufficient to determine respondent's ability to meet the minimum standards, including but not limited to:

- A. Have adequate financial resources, or the ability to obtain such resources as required;
- B. Have a satisfactory record of performance on a minimum of three (3) completed projects of similar scope, quantities, and cost, within the past five (5) years;
- C. Ability to comply with the required or proposed delivery schedule;
- D. Have a satisfactory record of integrity and ethics; and
- E. Be otherwise qualified and eligible to receive an award.

SC.04 BID AWARD: The award shall be based on the lowest responsive and responsible bidder taking into consideration the number of days bid to complete the project.

A. For the purpose of award, each bid submitted shall consist of:

1. Base Bid (A) = The correct summation of the products and the quantities shown in the bid proposal, multiplied by the bid unit prices.
2. Time Bid (B) = (CD x Daily Value). The product of the total number of calendar days (CD) provided by the Contractor to complete the project and the daily value established in SC.04 B.
3. Total Bid = Base Bid (A) + Time Bid (B). The lowest Total Bid will be determined by the Town as the lowest sum of the Base Bid (A) + the Time Bid (B).

Note: The dollar value of the Time Bid (B) will be used for evaluation purposes only, and will not be included in the contract award. However, the successful Contractor will be responsible for completing construction within the number of calendar days bid.

B. Contractor will enter the number of days to complete the project in the appropriate Bid Line, with the corresponding value of a calendar day indicated in the matrix below, based on total of Contractor's Base Bid (A). The Town reserves the right to set a maximum value to the total number of days.

Amount of Contract (\$)	Value of a Calendar Day (\$)
\$1,500,000 to \$1,999,999.99	\$500 per day
\$2,000,000 to \$2,999,999.99	\$1,000 per day
\$3,000,000 to \$3,999,999.99	\$1,500 per day
More than \$4,000,000.00	\$2,000 per day

SC.05 PROJECT COMPLETION REQUIREMENT: The meter vault and pipeline must be complete and in operation by December 4, 2020.

SC.06 PROJECT ALLOWANCES: The following allowances for this project will be provided by the Town, and will be added to the total amount of the project at time of bid award:

- A. \$20,000 CoServ Allowance
- B. \$32,850 NTMWD Allowance (Inspection Services 730 hours @ \$45 per hour)

SC.07 SUBMITTALS: In order for your bid to be considered responsive, the following information should be submitted:

- A. Respond to all Bid Items listed for this project.
- B. Respond to all Bid Attributes listed for this project.
- C. Submit Bid Guarantee (Bid Bond or Cashier's Check)
- D. Complete and submit the Completed Projects and References Worksheet.
- E. Submit resumes for key personnel that will be assigned to the project (executive and management team, as well as on-site project manager).
- F. Submit a copy of an actual project schedule used during construction.

SC.08 SUBMISSION OR DELIVERY OF BID: Bids for the construction services specified will be received online, or in hard copy. The date/time stamp located in the Purchasing Office serves as the official time clock. Late Submissions will not be considered. Submissions received after the stated deadline shall be refused and returned unopened. The Town of Prosper is not responsible for issues encountered with methods of delivery.

A. Online Submission

Bids may be submitted online through IonWave.net, the Town's e-procurement system. Please ensure that you provide all required information, including attachments. Any additional response attachments must be uploaded and included with your submission in order to be considered.

B. Mailed/Delivered Submission

Bids must be submitted with the BID number and the respondent's name and address clearly indicated on the front of the envelope. Please submit one (1) unbound original and one (1) copy of your bid, in a sealed envelope or package to the address listed below:

Delivery Address:

Town of Prosper
 Attn: Purchasing Manager
 250 W. First St.
 3rd Floor Finance Suite
 Prosper, Texas 75078

Mailing Address (US Postal Service Only):

Town of Prosper
 Attn: Purchasing Manager
 P.O. Box 307
 Prosper, Texas 75078

TECHNICAL SPECIFICATIONS

TS.01 Technical Specifications

DIVISION 01 GENERAL REQUIREMENTS

Section	01 11 00	Summary of Work
	01 29 00	Payment Procedures
	01 31 00	Project Management and Coordination
	01 31 13	Project Coordination
	01 31 13.13	Forms
	01 32 16	Construction Progress Schedule
	01 32 34	Video and Photographic Documentation
	01 33 00	Document Management
	01 33 00.01	Table of Required Submittals
	01 34 00	Buy America Requirements
	01 35 00	Special Procedures
	01 40 00	Quality Requirements
	01 40 01	IBC Special Inspections
	01 45 16.16	Hydrostatic Testing
	01 50 00	Temporary Facilities and Controls
	01 57 00	Temporary Controls
	01 70 00	Execution and Close Out Requirements
	01 74 23	Final Cleaning
	01 75 00	Starting and Adjusting
	01 78 23	Operations and Maintenance Data
	01 78 23.01	Equipment List
	01 79 00	Contractor Safety Plan

DIVISION 03 CONCRETE

Section	03 11 00	Concrete Forming
	03 21 00	Reinforcing Steel
	03 30 00	Cast-In-Place Concrete
	03 41 19	Precast Reinforced Concrete Valve Vault

DIVISION 04 MASONRY

Section	04 20 00	Unit Masonry
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DIVISION 05 METALS

Section	05 05 13	Galvanizing
	05 12 00	Structural Steel Framing
	05 50 00	Metal Fabrications
	05 51 00	Metal Stairs
	05 52 13	Pipe and Tube Railings
	05 53 00	Metal Gratings

DIVISION 6 WOOD, PLASTICS AND COMPOSITES

Section	06 10 00	Rough Carpentry
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DIVISION 07 THERMAL AND MOISTURE PROTECTION

Section	07 11 13.01 07 27 26 07 52 00 07 62 00 07 92 00	Concrete Vault Bituminous Damping Fluid Applied Membrane Air Barriers SBS-Modified Bituminous Membrane Roofing Sheet Metal Flashing and Trim Joint Sealants
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DIVISION 8 OPENINGS

Section	08 11 10 08 71 00	Hollow Metal Doors and Frames Door Hardware
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DIVISION 9 FINISHES

Section	09 91 00 09 96 00 09 97 16	Painting High-Performance Coatings Pipeline Coatings and Linings
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DIVISION 23 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

Section	23 00 00 23 05 13 23 05 53 23 05 93 23 31 13 23 33 00 23 34 23 23 81 13	Heating, Ventilating, and Air Conditioning Common Motor Requirements for HVAC Equipment Identification for HVAC Piping and Equipment Testing, Adjusting, and Balancing for HVAC Metal Ducts Air Duct Accessories HVAC Power Ventilators Wall Mount Air Conditioners
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DIVISION 26 ELECTRICAL

Section	26 01 26 26 05 00 26 05 19 26 05 26 26 05 29 26 05 33 26 05 53 26 05 73.01 26 09 23 26 22 13 26 24 16.02 26 27 26 26 28 16 26 29 87 26 41 13 26 50 00	Testing Of Electrical Systems Common Work Results for Electrical Low Voltage Electrical Power Conductors & Cables Grounding & Bonding for Electrical Systems Hangers and Supports for Electrical Systems Raceways and Boxes for Electrical Systems Identification for Electrical Systems Electrical Power System Studies Lighting Control Devices Low Voltage Distribution Transformers Lighting and Branch Panelboards Wiring Devices Enclosed Switches And Circuit Breakers Electrical Control Panels Lightning Protection for Structures Lighting
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DIVISION 31 EARTHWORK

Section	31 05 13 31 05 16	Soils for Earthwork Aggregates for Earthwork
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- 31 23 10 Structural Excavation and Backfill
- 31 23 23.34 Flowable Fill
- 31 23 33.13 Trench Safety
- 31 23 33.16 Trenching and Backfill
- 31 25 13.13 Seeding for Erosion Control

DIVISION 33 UTILITIES

- Section 33 05 01.02 Ductile Iron Pipe and Fittings
- 33 05 01.05 Bar-Wrapped Concrete Cylinder Pipe and Fittings
- 33 10 13 Disinfecting of Water Utility Distribution Systems
- 33 11 13.13 Steel Pipe and Fittings
- 33 12 16.13 Miscellaneous Valves and Appurtenances
- 33 12 16.16 Air Release and Air and Vacuum Valves
- 33 12 16.23 Gate Valves 24" Diameter and Under
- 33 12 16.26 Butterfly Valves

DIVISION 40 PROCESS INTEGRATION

- Section 40 90 00 Instrumentation and Control for Process Systems
- 40 90 01 Instrumentation
- 40 90 02 Supervisory Control and Data Acquisition (SCADA) System
- 40 90 02.01 Input / Output List
- 40 95 43 Communication Interface Equipment

DIVISION 44 POLLUTION & WASTE CONTROL EQUIPMENT

- Section 44 42 60 Submersible Sump Pumps

APPENDICES

- Appendix A Buy America Requirements
- Appendix B Geotechnical Report
- Appendix C Prosper Lay Drawings

Please reference the Construction Plans for all other technical specifications

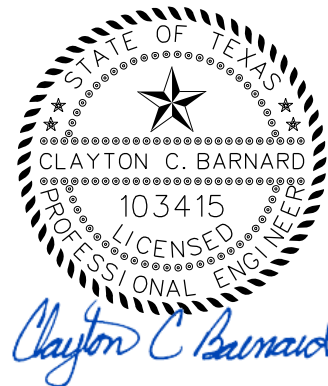
TECHNICAL SPECIFICATIONS

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TOWN OF PROSPER
CUSTER ROAD PUMP STATION METER VAULT RELOCATION

SPECIFICATION SEALS

DIVISION 01 GENERAL REQUIREMENTS	
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DIVISION 44 POLLUTION & WASTE CONTROL EQUIPMENT	
44 42 60	Submersible Sump Pumps



5/7/2020

FREESE AND NICHOLS, INC.
 TEXAS REGISTERED
 ENGINEERING FIRM
 F-2144

**TOWN OF PROSPER
 CUSTER ROAD PUMP STATION METER VAULT RELOCATION
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06 10 00	Rough Carpentry
DIVISION 07 THERMAL AND MOISTURE PROTECTION	
07 11 13.01	Concrete Vault Bituminous Dampproofing
07 27 26	Fluid-Applied Membrane Air Barriers
07 52 00	SBS-Modified Bituminous Membrane Roofing
07 62 00	Sheet Metal Flashing and Trim
07 92 00	Joint Sealants
DIVISION 08 OPENINGS	
08 11 13	Hollow Metal Doors and Frames
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**TOWN OF PROSPER
CUSTER ROAD PUMP STATION METER VAULT RELOCATION
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23 00 00	Heating, Ventilating, and Air Conditioning
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23 05 53	Identification for HVAC Piping and Equipment
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TEXAS REGISTERED
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F-2144

**TOWN OF PROSPER
CUSTER ROAD PUMP STATION METER VAULT RELOCATION
SPECIFICATION SEALS**

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05/07/2020

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F-2144

**TOWN OF PROSPER
CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

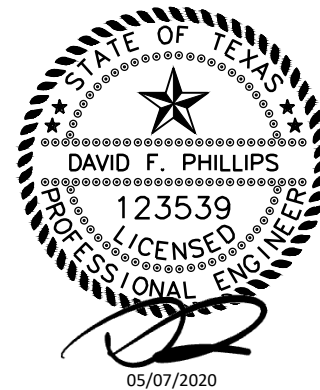
SPECIFICATION SEALS

DIVISION 26 ELECTRICAL

26 01 26	Testing of Electrical Systems
26 05 00	Common Work Results for Electrical
26 05 19	Low Voltage Electrical Conductors & Cables
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40 90 02.01	Input / Output List
40 95 43	Communications Interface Equipment



DIVISION 01

GENERAL REQUIREMENTS

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01 11 00 SUMMARY OF WORK

1.00 GENERAL

1.01 WORK INCLUDED

- A. Construct Work as described in the Contract Documents.
 - 1. Provide the materials, equipment, and incidentals required to make the Project completely operable.
 - 2. Provide the labor, equipment, tools, and consumable supplies required for a complete Project.
 - 3. Provide the civil, architectural, structural, mechanical, electrical, instrumentation and all other Work required for a complete and operable Project.
 - 4. Test and place the completed Project in operation.
 - 5. Provide the special tools, spare parts, lubricants, supplies, or other materials as indicated in Contract Documents for the operation and maintenance of the Project.
 - 6. Install Owner provided products and place in operation.
 - 7. Drawings and Specifications do not indicate or describe all of the Work required to complete the Project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Engineer.

1.02 JOB CONDITIONS

- A. The General Conditions, the Supplementary Conditions, and General Requirements apply to each Section of the Specifications.
- B. Comply with all applicable state and local codes and regulations pertaining to the nature and character of the Work being performed.

1.03 DESCRIPTION OF WORK

- A. Work is described in general, non-inclusive terms as:
 - B. Remove the existing meter vault
 - C. Relocate the existing the 16" sleeve valve to new meter vault
 - D. Relocate the section of Prosper's 36-inch Pipeline and Meter Vault outside the proposed Right-Of-Way on to the Custer Road Pump Station site.
 - E. Construction of new delivery point and piping
 - F. Construction of electrical room above the meter vault.
 - G. Electrical power, instrumentation and SCAD equipment installation
 - H. SCADA integration coordination

1.04 CONSTRUCTION OF UTILITIES

- A. Utility companies or their contractors will provide new or enhanced utilities for this Project. Coordinate with others performing work connected to this Project.
- B. Power and Electrical Services:
 - 1. Contractor shall provide permanent power connections for the Site through the power utility.
 - 2. Cost for providing permanent power will be paid in accordance with Section 01 29 00.
 - 3. Contractor is required to coordinate and cooperate with others performing this work.
 - 4. Power company will provide the construction to the point shown in drawings.
 - 5. Provide conduit, conductors, pull boxes, manholes, and other appurtenances for the installation of power cable between the property line and the transformer and between the transformer and the main power switch.
 - 6. Test conductors in accordance with Section 01 40 00 "Quality Requirements" and coordinate with the power company to energize the system when ready.
 - 7. Pay for temporary power, including but not limited to construction cost, meter connection, fees and permits.
 - 8. When permanent power is available at the Site, the Contractor may use this power source in lieu of temporary power source he has been using.
 - a. Notify Engineer and Owner of intent to use the permanent power source.
 - b. Arrange with the power utility and pay the charges for connections and monthly charges for use of this power.
 - 9. Pay for the power consumed until the Project has been accepted as substantially complete.

1.05 OCCUPANCY

- A. As soon as any portion of the structure and equipment are ready for use, the Owner shall have the right to operate the portion upon written notice to the Contractor.
- B. Testing of equipment and appurtenances including specified test periods, training, and startup does not constitute acceptance for operation.
- C. Owner may accept the facility for continued use after startup and testing at the option of the Owner. If acceptance is delayed at the option of the Owner, shut down facilities per approved Operation and Maintenance procedures.
- D. The execution of bonds is understood to indicate the consent of the surety to these provisions.
- E. Provide an endorsement from the insurance carrier permitting occupancy of the structures and use of equipment during the remaining period of construction.
- F. Conduct operations to insure the least inconvenience to the Owner and general public.

2.00 PRODUCTS

2.01 MATERIALS

- A. Provide materials and products per the individual Sections of the Specifications.

END OF SECTION

01 29 00 PAYMENT PROCEDURES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Payments for Work shall conform to the provisions of the General Conditions, the Supplementary Conditions, the Agreement, and this Section.
- B. Submit Applications for Payment at the prices indicated in the Agreement
 - 1. Prices for each item in the Agreement shall include but not be limited to cost for:
 - a. Mobilization, demobilization, cleanup, bonds, and insurance.
 - b. Professional services including but not limited to engineering and legal fees.
 - c. The products to be permanently incorporated into the Project.
 - d. The products consumed during the construction of the Project.
 - e. The labor and supervision to complete the Project.
 - f. The equipment, including tools, machinery, and appliances required to complete the Project.
 - g. The field and home office administration and overhead costs related directly or indirectly to the Project.
 - h. Any and all kinds, amount or class of excavation, backfilling, pumping or drainage, sheeting, shoring and bracing, disposal of any and all surplus materials, permanent protection of all overhead, surface or underground structures; removal and replacement of any poles, conduits, pipelines, fences, appurtenances and connections, cleaning up, overhead expense, bond, public liability and compensation and property damage insurance, patent fees, and royalties, risk due to the elements, and profits, unless otherwise specified.
 - 2. Provide Work not specifically set forth as an individual payment item but required to provide a complete and functional system. These items are a subsidiary obligation of the Contractor and are to be included in the Contract Price.
 - 3. Payment will be made for materials on hand.
 - a. Store materials properly on-Site per Section 01 31 00 "Project Management and Coordination."
 - 1). Payment will be made for the invoice amount less the specified retainage.
 - 2). Provide invoices at the time materials are included on the materials on hand tabulation.
 - b. Provide documentation of payment for materials on hand with the next payment request. Adjust payment to the amount actually paid if this differs from the invoice amount. Remove items from the materials on hand tabulation if this documentation is not provided so payment will not be made.
 - c. Payment for materials on hand is provided for the convenience of the Contractor and does not constitute acceptance of the product.

4. The Work covered by progress payments becomes the property of the Owner at the time of payment.

1.02 SCHEDULE OF VALUES AND PAYMENTS

- A. Submit a detailed Schedule of Values for the Work to be performed on the Project.
 1. Submit schedule within 10 days prior to submitting the first Application for Payment.
 2. Line items in the Agreement are to be used as line items in the schedule.
 3. Payment will be made on the quantity of Work completed per Contract Documents during the payment period and as measured per this Section.
 - a. Payment amount is the Work quantity measured multiplied by the unit prices for that line item in the Agreement.
 - b. Payment on a unit price basis will not be made for Work outside finished dimensions shown in the Contract Documents.
 - c. Partial payments will be made for lump sum line items in the Agreement.
 - 1). Lump sum line items in the Agreement are to be divided into smaller unit prices to allow more accurate determination of the percentage of the item that has been completed.
 - a). Provide adequate detail to allow more accurate determination of the percentage of Work completed for each item.
 - b). Provide prices for items that do not exceed \$50,000.00. An exception may be made for equipment packages that cannot be subdivided into units or subassemblies.
 - c). Separate product costs and installation costs.
 - (1). Product costs include cost for product, delivery and unloading costs, royalties and patent fees, taxes, and other cost paid directly to the Subcontractor or Supplier.
 - (2). Installation costs include cost for the supervision, labor and equipment for field fabrication, erection, installation, startup, initial operation and Contractor's overhead and profit.
 - d). Lump sum items may be divided into an estimated number of units.
 - (1). The estimated number of units times the cost per unit must equal the lump sum amount for that line item.
 - (2). Contractor will receive payment for all of the lump sum line item.
 - e). Include a directly proportional amount of Contractor's overhead and profit for each line item.
 - f). Divide principal subcontract amounts into an adequate number of line items to allow determination of the percentage of Work completed for each item.
 - 2). These line items may be used to establish the value of Work to be added or deleted from the Project.

- 3). Correlate line items with other administrative schedules and forms:
 - a). Progress Schedule.
 - b). List of Subcontractors.
 - c). Schedule of allowances.
 - d). Schedule of alternatives.
 - e). List of products and principal Suppliers.
 - f). Schedule of Submittals.
 - 4). Costs for mobilization shall be listed as a separate line item and shall be actual cost for:
 - a). Bonds and insurance.
 - b). Transportation and setup for equipment.
 - c). Transportation and/or erection of all field offices, sheds and storage facilities.
 - d). Salaries for preparation of submittals required before the first Application for Payment.
 - e). Salaries for field personnel assigned to the Project related to the mobilization of the Project.
 - (1). Mobilization may not exceed 3 percent of the total Contract amount. Cost for mobilization may be submitted only for Work completed.
 - 5). The sum of all values listed in the schedule must equal the total Contract amount.
4. Submit a schedule indicating the anticipated schedule of payments to be made by the Owner. Schedule shall indicate:
 - a. The Application for Payment number.
 - b. Date the request is to be submitted.
 - c. Anticipated amount of payment to be requested.
 5. Update the Schedule of Values quarterly or more often if necessary to provide a reasonably accurate indication of the funds that the Owner will need to have available to make payment to the Contractor for the Work performed.
- B. Provide written approval of the Schedule of Values, Application for Payment form, and method of payment by the Surety Company providing performance and payment bonds prior to submitting the first Application for Payment. Payment will not be made without this approval.

1.03 PAYMENT PROCEDURES

- A. Submit Applications for Payment per the procedures indicated in Section 01 33 00 "Submittal Procedures." Submit a Schedule of Values in the Application for Payment format to be used.
- B. Applications for Payment may be submitted on a pre-printed form as indicated in Section 01 31 13 13 "Forms" or may be generated by computer. Computer generated

payment requests must have the same format and information indicated in the pre-printed form and be approved by the Engineer.

1. Indicate the total Contract amount and the Work completed to date on the Tabulation of Values for Original Contract Performed (Attachment "A".)
 2. Include only approved Change Order items in the Tabulation of Extra Work on Approved Change Orders (Attachment "B".)
 3. List all materials on hand that are presented for payment on the Tabulation of Materials on Hand (Attachment "C".) Once an item has been entered on the tabulation it is not to be removed.
 4. Include the Project Summary Report (Attachment "D") with each Application for Payment. Data included in the Project Summary Report are to be taken from the other tabulations. Include a completed summary as indicated in with each Applications for Payment submitted.
 - a. Number each application sequentially and indicate the payment period.
 - b. Show the total amounts for value of original Contract performed, extra Work on approved Change Orders, and materials on hand on the Project Summary Report. Show total amounts that correspond to totals indicated on the attached tabulation for each.
 - c. Note the number of pages in tabulations in the blank space on the Project Summary Report to allow a determination that all sheets have been submitted.
 - d. Execute Contractor's certification by the Contractor's agent of authority and notarize for each Application for Payment.
 5. Do not alter the Schedule of Values and the form for the submission of requests without the written approval of the Engineer once these have been approved by the Engineer.
 6. Final payment requires additional procedures and documentation per Section 01 70 00 "Execution and Closeout Requirements."
- C. Progress payments shall be made as the Work progresses on a monthly basis.
1. End the payment period on the day indicated in the Agreement and submit an Application for Payment for Work completed and materials received since the end of the last payment period.
 2. At the end of the payment period, submit a draft copy of the Application for Payment for that month to the Owner. Agreement is to be reached on:
 - a. The percentage of Work completed for each lump sum item.
 - b. The quantity of Work completed for each unit price item.
 - c. The percentage of Work completed for each approved Change Order item.
 - d. The amount of materials on hand.
 3. On the basis of these agreements the Contractor is to prepare a final copy of the Application for Payment and submit it to the Owner for approval.
 4. The Engineer will review the payment request and if appropriate will recommend payment of the request to the Owner.

- D. Provide a revised and up-to-date Progress Schedule per Section 01 32 16 “Construction Progress Schedules” with each Application for Payment.
- E. Provide project photographs per Section 01 32 33 “Photographic Documentation” with each Application for Payment.

1.04 ALTERNATES AND ALLOWANCES

- A. No alternates are included in the Project.
- B. Allowances:
 1. The Sum of \$20,000.00 to be used for the payment to CoServ for the project. Reimbursement of utility installation costs and fees will require a copy of invoices paid to CoServ.
 2. The Sum of \$32,850.00 to be used for the payment to NTMWD for the project. Reimbursement of the inspection costs and fee will require a copy of the invoices paid to NTMWD.

1.05 MEASUREMENT PROCEDURES

- A. Measure the Work described in the Agreement for payment. Payment will be made only for the actual measured and/or computed length, area, solid contents, number and weight, unless otherwise specifically provided. No extra or customary measurements of any kind will be allowed.

1.06 BASIS OF PAYMENT

BID ITEM A – BASE BID

BID ITEM A1 – MOBILIZATION (Max 3% of Project)

There will be no measurement for Mobilization.

This item shall consist of the mobilization of personnel, equipment and supplies to the project site in preparation for the beginning of work on other contract items. Mobilization shall include, but is not limited to, the movement of equipment, personnel, materials, supplies, bonds and insurance, transportation and/or erection of any necessary field offices, sheds, sanitary and storage facilities, etc. to the project site. Measurement of the item will be per lump sum as the work progresses, and partial payments of the lump sum bid for mobilization will be as follows:

When 1% of the adjusted contract amount for construction items is earned, 50% of the mobilization lump sum bid will be paid.

When 5% of the adjusted contract amount for construction items is earned, 75% of the mobilization lump sum bid will be paid. Previous payments under this item will be deducted from this amount.

When 10% of the adjusted contract amount for construction items is earned, 90% of the mobilization lump sum bid will be paid. Previous payments under this item will be deducted from this amount.

When 50% of the adjusted contract amount for construction items is earned, 100% of the mobilization lump sum bid will be paid. Previous payments under this item will be deducted from this amount.

BID ITEM A2 – Meter Vault Facility

Payment for the meter vaults shall be made at the lump sum price bid and shall include relocation and installation of existing 16" sleeve valve, concrete vault, magnetic meter, butterfly valves, flow conditioner, and electric/manual actuators, pipe, vault and building appurtenances, pipeline appurtenances, grading, electrical components and wiring as shown in the Contract Documents as associated with the meter vault. The lump sum price shall include all overhead, profit, related costs, other necessary specials for the installation and restoration of the site.

BID ITEM A3 – Removal of Existing 36" Pipeline

Payment for removal of the existing water line shall be made at the unit price bid per linear foot. Payment shall be full compensation for removing all pipe, fittings, connection to existing lines, water line shutdowns, grading and sod restoration and establishment, hauling and disposal offsite, and all other items necessary to complete the work. Bid price for this item shall include all coordination during the construction.

BID ITEM A4– Removal of Existing Meter Vault

Payment for removal of the existing meter vault shall be made at the lump sum unit price. Payment shall be full compensation for removing the vault, all pipe, fittings, grading and sod restoration and establishment, and all other items necessary to complete the work. Bid price for this item shall include all coordination during the construction.

BID ITEM A5 – Removal of Existing Concrete Roadway

Measurement and Payment for this item shall be made at the unit price per square foot of concrete. The unit price shall include the removal of the existing pavement, disposal of pavement offsite, and all other items necessary to complete the work.

BID ITEM A6 – Removal of Existing Retaining Wall

Measurement and Payment for this item shall be made at the unit price per linear foot of retaining wall. The unit price shall include the removal of the retaining wall, disposal of debris offsite, and all other items necessary to complete the work..

BID ITEM A7 – 42" Butterfly Valve and Manhole

Butterfly valves shall be measured by the number of units complete in place. Payment shall be at the unit price bid for the size shown, and shall be full compensation for the assembly, including all appurtenances, concrete, vault, flowable fill, etc., all as specified and shown on the Contract Drawings.

BID ITEM A8 – 12-in Blowoff Valve and Manhole

Blowoff valves shall be measured by the number of units complete in place. Payment shall be at the unit price bid for the size shown, and shall be full compensation for the excavation, hauling, furnishing and jointing of valves, piping, fittings, blocking, concrete, manhole, etc., all as specified and shown on the Contract Drawings. Payment for all 12"

ductile iron pipe and fittings outside of the concrete manhole, discharging into the nearest creek or ground surface at the elevation.

BID ITEM A9 – 4" Combination Air Valve and Manhole

Air valves shall be measured by the number of units complete in place. Payment shall be at the unit price bid for the size shown, and shall be full compensation for the assembly, including all appurtenances, access outlet on main line, shut-off valve, concrete, manhole, etc., all as specified and shown on the Contract Drawings. Payment for the 4" ductile iron pipe and fittings outside of the concrete manhole is included in this bid item.

BID ITEM A10 – Connect to NTMWD 48" Pipeline

Payment for the connection shall be made at the lump sum price bid for all pipe, fittings, bypass, flowable fill or embedment backfill and welded butt-strap or insulated flange connections, miscellaneous joints and couplings, special coatings to the limits shown on the plans, mobilization, and all other work as specified and shown within the connection limits except for butterfly valves, blow off valves and combination air valves. Butterfly valves, blow off valves and air valves will be paid for under separate pay items. The lump sum price shall include costs of uncovering existing pipes prior to manufacturing new pipe to verify tie-in dimensions and requirements, welding of all new and existing pipe joint connections as required and removing temporary test plugs and bypass piping and delivery of materials following testing to the Owner. The lump sum price shall include all overhead, profit, and related costs and other necessary specials for the connection.

BID ITEM A11 – Connect to Ex. 36" Pipeline

Payment for the connection shall be made at the lump sum price bid for all pipe, fittings, bypass, flowable fill or embedment backfill and welded butt-strap or insulated flange connections, miscellaneous joints and couplings, special coatings to the limits shown on the plans, mobilization, and all other work as specified and shown within the connection limits except for butterfly valves, blow off valves and combination air valves. Butterfly valves, blow off valves and air valves will be paid for under separate pay items. The lump sum price shall include costs of uncovering existing pipes prior to manufacturing new pipe to verify tie-in dimensions and requirements, welding of all new and existing pipe joint connections as required and removing temporary test plugs and bypass piping and delivery of materials following testing to the Owner. The lump sum price shall include all overhead, profit, and related costs and other necessary specials for the connection.

BID ITEM A12 – Hydrostatic Testing of Pipeline

There will be no measurement for testing of the pipeline. Payment shall be made at the lump sum price bid, and shall include all materials necessary for hydrostatic testing.

BID ITEM A13 – Seeding

Payment for seeding shall be made at the unit price bid per acre and shall include all materials and labor necessary to furnish and install a mix in compliance with Section 31 25 13.13 in areas disturbed by the pipeline installation as indicated on the Contract Drawings and requested in writing by the Owner. Seeding and fertilizer shall be as specified in Section 31 25 13.13.

BID ITEM A14 – Storm Water Pollution Prevention Plan

No measurement for this bid item shall be made. Payment for “Storm Water Pollution Prevention Plan” shall be made at the lump sum price bid, which cost shall include plan design and implementation for the duration of the project. Plan shall be prepared in accordance with Section 01 57 00, TEMPORARY CONTROLS. Payment shall be allowed for 25% of the lump sum price bid upon receipt of the plan by the Owner. The remaining 75% of the lump sum bid price shall be paid in equal, monthly installments based on the time remaining to achieve substantial completion. This item only covers SWPPP required for the location in Item B. SWPPP at other locations is covered by additional items.

BID ITEM A15 – Concrete Pavement and Base

Payment for the concrete pavement per City building standards and details at the square yard unit price bid as shown in the Contract Documents. The square yard unit price shall include all overhead, profit, related costs, other necessary specials for the installation, removal, and restoration of the site.

BID ITEM A16 – 42" AWWA C303 Bar Wrapped Concrete Cylinder Pipe By Open Cut

Measurement for bar wrapped concrete cylinder pipe shall be per linear foot of pipe installed for the nominal diameter and at the pressure classes listed in the Proposal and shown on the Contract Drawings measured horizontally from center of fitting to center of fitting or end of pipe without any deduction for the length of intermediate fittings, specials or valves.

Payment made at the unit price bid for this item shall be for pipe and fittings as shown on the Contract Drawings. Payment for this bid item shall be made only for pipe having the pressure classes shown on the Contract Drawings. Payment will not be made for a different pressure class unless approved by the Owner. Payment shall include thrust calculations, thrust restraints and necessary welding as required on the existing line; furnishing, hauling and laying of pipe and fittings; fittings required for filling, draining, and disinfecting the pipeline; 4" outlets for welding leads, as required; trench excavation, shoring and pumping where necessary; backfilling of trench, including embedment material; clay collars; replacement of topsoil; replacing landscaping to a condition as good or better than existed prior to construction; protecting or replacing existing structures and utilities; relocation of existing utilities, including but not limited to water service connections, power poles and guy wires, buried electric service, buried telephone cable, buried fiber optic cable, etc.; protecting or replacing existing irrigation and sprinkler systems; disposal of surplus materials; constructing, maintaining and removing temporary fencing; cleaning up and maintenance; removal and replacement of brick, masonry, wood, or any other type of driveway entrance; installing new pavement markings as required; sign removal and replacement; mailbox replacement; surveying and replacement of monuments; dust control; removal of mud from roadways; installation of pipeline markers; as-built top-of-pipe survey; disinfection, and draining of line; temporary traffic control as required; and any incidental work and materials not otherwise provided for in this Section, all in strict accordance with the Contract Drawings and Project Specifications.

Construction and maintenance of required access roadways and driveways and test plugs used for testing the line shall also be included in the unit price bid for pipe.

Payment for pipe shall include any and all extra precautions or construction requirements necessary to adequately protect and support existing utilities and relocate existing utilities

as necessary for construction of main line pipe. The Contractor is responsible for all fees assessed by utility companies to provide utility support for existing utility lines, at no additional cost to the Owner. Payment shall include all costs required to have utility companies repair any damage to their lines caused by the Contractor's activities and any cleanup, property damages, fines, etc., resulting from damage caused by the Contractor to any utility.

No separate payment will be made for rock excavation, and the cost thereof shall be included in unit price bid. The Contractor is not responsible for crop damage inside the permanent and temporary easement. The Contractor is responsible for any crop or other property damage outside the easement, caused by his operation, and shall negotiate a settlement with the landowner that will ensure that no claim will be filed against the Owner. All special easement requirements as listed on the Contract Drawings or in the Project Specifications shall be made incidental to this bid item. If an existing utility, sidewalk or structure is damaged or must be relocated for construction, the cost of the repair or relocation shall be borne by the Contractor.

BID ITEM A17 – 42" AWWA C303 Bar Wrapped Concrete Cylinder Pipe By Other Than Open Cut

Measurement for bar wrapped concrete cylinder pipe shall be per linear foot of pipe installed for the nominal diameter and at the pressure classes listed in the Proposal and shown on the Contract Drawings measured horizontally from center of fitting to center of fitting or end of pipe without any deduction for the length of intermediate fittings, specials or valves.

Payment made at the unit price bid for this item shall be for pipe and fittings as shown on the Contract Drawings. Payment for this bid item shall be made only for pipe having the pressure classes shown on the Contract Drawings. Payment will not be made for a different pressure class unless approved by the Owner. Payment shall include thrust calculations, thrust restraints and necessary welding as required on the existing line; furnishing, hauling and laying of pipe and fittings; fittings required for filling, draining, and disinfecting the pipeline; 4" outlets for welding leads, as required; trench excavation, shoring and pumping where necessary; backfilling of trench, including embedment material; clay collars; replacement of topsoil; replacing landscaping to a condition as good or better than existed prior to construction; protecting or replacing existing structures and utilities; relocation of existing utilities, including but not limited to water service connections, power poles and guy wires, buried electric service, buried telephone cable, buried fiber optic cable, etc.; protecting or replacing existing irrigation and sprinkler systems; disposal of surplus materials; constructing, maintaining and removing temporary fencing; cleaning up and maintenance; removal and replacement of brick, masonry, wood, or any other type of driveway entrance; installing new pavement markings as required; sign removal and replacement; mailbox replacement; surveying and replacement of monuments; dust control; removal of mud from roadways; installation of pipeline markers; as-built top-of-pipe survey; disinfection, and draining of line; temporary traffic control as required; and any incidental work and materials not otherwise provided for in this Section, all in strict accordance with the Contract Drawings and Project Specifications.

Construction and maintenance of required access roadways and driveways and test plugs used for testing the line shall also be included in the unit price bid for pipe.

Payment for pipe shall include any and all extra precautions or construction requirements necessary to adequately protect and support existing utilities and relocate existing utilities as necessary for construction of main line pipe. The Contractor is responsible for all fees assessed by utility companies to provide utility support for existing utility lines, at no additional cost to the Owner. Payment shall include all costs required to have utility companies repair any damage to their lines caused by the Contractor's activities and any cleanup, property damages, fines, etc., resulting from damage caused by the Contractor to any utility.

No separate payment will be made for rock excavation, and the cost thereof shall be included in unit price bid. The Contractor is not responsible for crop damage inside the permanent and temporary easement. The Contractor is responsible for any crop or other property damage outside the easement, caused by his operation, and shall negotiate a settlement with the landowner that will ensure that no claim will be filed against the Owner. All special easement requirements as listed on the Contract Drawings or in the Project Specifications shall be made incidental to this bid item. If an existing utility, sidewalk or structure is damaged or must be relocated for construction, the cost of the repair or relocation shall be borne by the Contractor.

BID ITEM A18 – 60" Steel Casing by Other Than Open Cut

Payment for steel casing shall be made at the unit price bid per linear foot for each of the casings identified in the Bid Proposal, in accordance with the details shown in the Contract Drawings. Payment for casing shall include all costs for pits or shafts as required to construct the tunnel, bulkheads, liner plate, guide rails, casing spacers, special backfill, grouting, end seals, special insurance, flagmen, and all other items for the casing as shown on the Contract Drawings and required for installation. Payment for the carrier pipe inside the casing is not included in this bid item.

BID ITEM A19 – Trench Safety

Measure the methods used in trench excavation safety protection by the linear foot of trench deeper than five (5) feet and pay at the unit price in the Agreement, which is the total compensation for furnishing design, materials, tools, labor, equipment, and incidentals necessary, including removal of the system.

BID ITEM A20 – Removal of Existing Chainlink Fence

Payment will be made at the price bid per linear foot and shall be full compensation for supplying all material, labor, equipment for removing all fence materials, posts, post design and drawing preparation, post embedment and all other appurtenances and items related to the work and Contract Documents.

BID ITEM A21 – Installation of 8-ft Chainlink Fence

Payment will be made at the price bid per linear foot and shall be full compensation for supplying all material, labor, equipment for installing all fence materials, posts, post design and drawing preparation, post embedment and all other appurtenances and items related to the work and Contract Documents.

BID ITEM A22 – Installation of Chainlink Gate

Payment will be made at the price bid per linear foot and shall be full compensation for supplying all material, labor, installing all gate materials, posts, post design and drawing preparation, post embedment and all other appurtenances and items related to the work and Contract Documents.

BID ITEM A23 – Retaining Wall Extension

Payment for Concrete Retaining Wall Extension shall be the price bid per cubic yard for this item and shall include excavation, footing, connection to existing wall, backfill, and improved subgrade material, as well all pertinent materials and equipment required by contract plans and specifications. The unit price shall include all overhead, profit, related costs, other necessary specials for the installation and restoration of the site.

END OF SECTION

01 31 00 PROJECT MANAGEMENT AND COORDINATION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish equipment, manpower, products, and other items necessary to complete the Project with an acceptable standard of quality and within the Contract Time. Construct Project in accordance with current safety practices.
- B. Manage Site to allow access to Site and control construction operations.
- C. Provide labor, materials, equipment and incidentals necessary to construct temporary facilities to provide and maintain control over environmental conditions at the Site. Remove temporary facilities when no longer needed.
- D. Remove temporary controls at the end of the Project.

1.02 QUALITY ASSURANCE

- A. Employ competent workmen, skilled in the occupation for which they are employed. Provide Work meeting quality requirements of the Contract Documents as determined by the Construction Manager.
- B. Remove defective Work from the Site immediately unless provisions have been made and approved by the Construction Manager to allow repair of the product at the Site. Clearly mark the Work as "defective" until it is removed or allowable repairs have been completed.

1.03 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 "Submittal Procedures":
 - 1. Provide copies of Supplier's printed storage instructions prior to furnishing materials or products and installation instructions prior to beginning the installation. Maintain one copy of these documents at the Site until the Project is complete. Incorporate this information into submittals.
 - 2. Incorporate field notes, sketches, recordings, and computations made by the Contractor in record drawings.

1.04 STANDARDS

- A. Perform Work to comply with local, State and Federal ordinances and regulations.
- B. Provide materials and equipment that has National Science Foundation 60/61 approval for use in potable water supply systems. Advise the Construction Manager of any material requirements in these Contract Documents that conflict with National Science Foundation 60/61 requirements.

1.05 PERMITS

- A. Retain copies of permits and licenses at the Site and observe and comply with all regulations and conditions of the permit or license, including additional insurance requirements.

- B. Obtain and pay for all other necessary permits including any and all necessary highway, street and road permits for transporting pipe and/or heavy equipment necessary for construction of the Project.
- C. Obtain and pay for applicable Right-of-Way Permits for each City within the project limits.
- D. Obtain and pay for other permits necessary to conduct any part of the Work.
- E. Arrange for inspections and certification by agencies having jurisdiction over the Work.
- F. Make arrangements with private utility companies and pay for fees associated with obtaining services, or for inspection fees.

1.06 COORDINATION

- A. Coordinate the Work of various trades having interdependent responsibilities for installing, connecting to, and placing equipment in service.
- B. Coordinate requests for substitutions to provide compatibility of space, operating elements, effect on the Work of other trades, and on the Work scheduled for early completion.
- C. Coordinate the use of Project space and the sequence of installation of equipment, walks, mechanical, electrical, plumbing, or other Work that is indicated diagrammatically on the Drawings.
 - 1. Follow routings shown for tubes, pipes, ducts, conduits, and other items as closely as practical, with due allowance for available physical space.
 - 2. Utilize space efficiently to maximize accessibility for Owner's maintenance and repairs.
 - 3. Schematics are diagrammatic in nature. Adjust routing of piping, ductwork, utilities, and location of equipment as needed to resolve spatial conflicts between the various trades. Document changes in the indicated routings on the record drawings.
- D. Conceal ducts, pipes, wiring, and other non-finish items within construction in finished areas, except as otherwise shown. Coordinate locations of concealed items with finish elements.
- E. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in sequence required to obtain best results.
- F. Make adequate provisions to accommodate items scheduled for later installation, including:
 - 1. Accepted alternates.
 - 2. Installation of products purchased with allowances.
 - 3. Work by others.
 - 4. Owner-supplied, Contractor-installed items.

- G. Sequence, coordinate, and integrate the various elements of mechanical, electrical, and other systems, materials, and equipment. Comply with the following requirements:
1. Coordinate mechanical and electrical systems, equipment, and materials installation with other components.
 2. Verify all dimensions by field measurements.
 3. Arrange for chases, slots, and openings during progress of construction.
 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components as they are constructed.
 5. Install systems, materials, and equipment as permitted by codes to provide the maximum headroom possible where mounting heights are not detailed or dimensioned.
 6. Coordinate the connection of systems with exterior underground and overhead utilities and services. Comply with the requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to the greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Adjust routing of piping, ductwork, utilities, and location of equipment as needed to resolve spatial conflicts between the various trades at no additional cost. Document changes in the indicated routings on the record drawings.
 8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to structure's surfaces.
 9. Install systems, materials, and equipment to facilitate servicing, maintenance, and repair or replacement of components. As much as practical, connect for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to accessible locations.
 10. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

1.07 SAFETY REQUIREMENTS

- A. Assume sole responsibility for safety at the Site. Protect the safety and welfare of persons at the Site.
- B. Provide safe access to move through the Site. Provide and maintain barricades, guard rails, covered walkways, and other protective devices to warn and protect from hazards at the Site.
- C. Comply with latest provisions of the Occupational Health and Safety Administrations and other regulatory agencies in performing Work.
- D. Cooperate with accident investigations related to the Site. Provide two copies of all reports prepared concerning accidents, injury, or death on the Site to the Engineer as Record Data per Section 01 33 00 "Submittal Procedures."

1.08 CONTRACTOR'S USE OF SITE

- A. Limit the use of Site for Work and storage to those areas designated on the Drawings or approved by the Construction Manager. Coordinate the use of the premises with the Construction Manager.
- B. Repair or correct any damage to existing facilities, including contamination, caused by the Contractor's personnel, visitors, materials, or equipment.
- C. Do not permit alcoholic beverages or illegal substances on the Site. Do not allow persons under the influence of alcoholic beverages or illegal substances to enter or remain on the Site at any time. Persons on Site under the influence of alcoholic beverages or illegal substances will be permanently prohibited from returning to the Site. Criminal or civil penalties may also apply.
- D. Park construction equipment in designated areas only and provide spill control measures as discussed in Paragraph 1.21 "Pollution Control."
- E. Park employees' vehicles in designated areas only.
- F. Obtain written permission of the Owner before entering privately-owned land outside of the Owner's property, rights-of-way, or easements.
- G. Do not allow the use of loud radios, obnoxious, vulgar or abusive language, or sexual harassment in any form. These actions will cause immediate and permanent removal of the offender from the premises. Criminal or civil penalties may apply.
- H. Require Workers to wear clothing that is inoffensive and meets safety requirements. Do not allow sleeveless shirts, shorts, exceedingly torn, ripped or soiled clothing to be worn on the Project.
- I. Do not allow firearms or weapons of any sort to be brought on to the Site under any conditions. No exception is to be made for persons with concealed handgun permits. Remove any firearms or weapons and the person possessing these firearms or weapons permanently and immediately from the Site.

1.09 POINTS OF ACCESS TO THE SITE

- A. Restrict entry into Site to points where the easements cross state and county roads and highways or other publicly owned roads and streets. Keep operations within the easement.
- B. Use State, County, or City roadways for construction traffic only with written approval of the appropriate representatives of each entity. State, County, or City roadways may not all be approved for construction traffic. Obtain written approval to use State, County, City or private roads to deliver pipe and/or heavy equipment to the Site. Copies of the written approvals must be furnished to the Owner as Record Data before Work begins. No additional compensation will be paid because the Contractor is unable to gain access to the easement from public roadways.
- C. Maintain access to the facilities at all times. Do not obstruct roads, pedestrian walks, or access to the various buildings, structures, stairways, or entrances. Provide safe temporary walks or other structures to allow access for normal operations during construction.

- D. Provide adequate and safe access for inspections. Leave ladders, bridges, scaffolding and protective equipment in place until inspections have been completed. Construct additional safe access if required for inspections.
- E. Provide security at the construction Site as necessary to protect against vandalism and loss by theft.
- F. Maintain security of the Site and access leading to it.
 - 1. Close gates and keep locked.
 - 2. Obtain permission of any landowners whose property must be crossed in gaining access to the Site.
 - 3. Install a gate lock consisting of a chain with two locks. Give one lock and key to the landowner. Use one lock for the Contractor, Construction Manager and Owner. Provide keys to the Contractor's lock to Owner and Construction Manager.
 - 4. At the end of the Project, remove the Contractor's lock from the assembly.

1.10 PROPERTY PROVISIONS

- A. Make adequate provisions to maintain the flow of storm sewers, drains and water courses encountered during the construction. Restore structures which may have been disturbed during construction to their original position as soon as construction in the area is completed.
- B. Protect trees, fences, signs, poles, guy wires, and all other property unless their removal is authorized. Restore any property damaged to equal or better condition per Paragraph 1.11.
- C. Provide temporary fencing, with gates, to restrain livestock in areas where livestock are pastured unless the Contractor makes satisfactory arrangements with the property owner and/or tenant. Install temporary fence on the easement lines and removed after the trench has been backfilled. Pay damages for losses resulting from failure to maintain such barriers or failure of barriers to exclude livestock. Install temporary fencing on any tract in order to contain construction activities within easement limits if directed by the Owner.

1.11 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The Drawings show existing piping, valves, manholes, electrical conduits, utility poles, and other facilities based on information from available records. Examine the Site and review the available information concerning the Site.
 - 1. Verify the type, size and location of all existing piping, valves, electrical conduit, telephone cable, and other utilities in the construction area prior to preparation of pipe Shop Drawings. Advise the Construction Manager of any utilities not shown or incorrectly shown.
 - 2. Verify the type size and location of streets, driveways, fences, drainage structures, sidewalks, curbs, and gutters. Verify the elevations of the structures adjacent to excavations. Report discrepancies between these elevation and elevations shown on the Drawings to the Construction Manager before beginning construction.

- B. Determine if existing structures, poles, piping, or other utilities at excavations will require relocation or replacement. Prepare a Plan of Action per Section 01 35 00 "Special Procedures." Coordinate Work with Construction Manager, local utility company and others. Include cost of demolition and replacement, restoration or relocation of these structures in the Contract Price.
- C. Protect buildings, utilities, street surfaces, driveways, sidewalks, curb and gutter, fences, wells, drainage structures, piping, valves, manholes, electrical conduits, and other systems or structures unless they are shown to be replaced or relocated on the Drawings. Restore damage to items to be protected to the satisfaction of the Construction Manager, utility owner or governing city without additional compensation from the Owner.
- D. Carefully support and protect all structures and/or utilities so that there will be no failure or settlement where excavation or demolition endangers adjacent structures and utilities. Do not take existing utilities out of service unless show in the Contract Documents or approved by the Construction Manager. Notify and cooperate with the utility owner if it is necessary to move services, poles, guy wires, pipelines or other obstructions. Include the cost of relocation of existing utilities in the Contract Price.
- E. Protect existing trees and landscaping at the Site.
 - 1. Visit Site with Engineer to identify trees that may be removed during construction.
 - 2. Mark trees to be removed with paint.
 - 3. Protect trees to remain from damage by wrapping trunks with 2 x 4 timbers around the perimeter, securely wired in place, where machinery must operate around existing trees. Protect branches and limbs from damage by equipment.

1.12 DISRUPTION TO SERVICES / CONTINUED OPERATIONS

- A. Existing facilities are to continue in service as usual during the construction unless noted otherwise. Owner or utilities must be able to operate and maintain the facilities. Disruptions to existing utilities, piping, process piping, or electrical services shall be kept to a minimum.
 - 1. Do not restrict access to critical valves, operators, or electrical panels.
 - 2. Do not store material or products inside structures.
 - 3. Limit operations to the minimum amount of space needed to complete the specified Work.
 - 4. Maintain storm sewers and sanitary sewers in service at all times. Provide temporary service around the construction or otherwise construct the structure in a manner that the flow is not restricted.
- B. Provide a Plan of Action in accordance with Section 01 35 00 "Special Procedures" if facilities must be taken out of operation.

1.13 CLEARING AND GRUBBING

- A. Perform all clearing and grubbing necessary for the construction operations within the pipeline easements. Keep clearing of easements to within 250 feet of the pipe laying operation or as directed by Owner or indicated on the Drawings.

- B. Avoid damage to existing trees outside the permanent easement that are larger than 3 inches in diameter (measured 4 feet above the ground). Protect trees per Paragraph 1.11. Obtain approval from the Construction Manager before removing or trimming any tree larger than 3 inches in diameter located outside the permanent easement.
- C. Remove and dispose of trees, branches, limbs, and roots leaving the right-of-way in a neat and presentable condition. Perform clearing and grubbing without injury or damage to adjacent property. Maintain the blade of equipment used for clearing and grubbing slightly above the ground surface to protect grass roots.
- D. Remove all trees, stumps, slashing, grindings, brush or other debris removed from the Site before beginning construction. Select locations for dumping, acquire required permits and properly dispose of excess material. Do not allow burning without written approval of Construction Manager.

1.14 FIELD MEASUREMENTS

- A. Perform complete field measurements for products required to fit existing conditions prior to purchasing products or beginning construction.
- B. Verify property lines, control lines, grades, and levels indicated on the Drawings.
- C. Verify pipe class, equipment capacities, existing electrical systems and power sources for existing conditions.
- D. Check Shop Drawings and indicate the actual dimensions available where products are to be installed.
- E. Include field measurements in record drawings as required in Section 01 31 13 "Project Coordination."

1.15 REFERENCE DATA AND CONTROL POINTS

- A. The Construction Manager will provide the following control points:
 - 1. Base line or grid reference points for horizontal control.
 - 2. Benchmarks for vertical control.
 - 3. Designated control points may be on an existing structure or monument.
- B. Locate and protect control points prior to starting the Work and preserve permanent reference points during construction. Do not change or relocate points without prior approval of the Construction Manager. Notify Construction Manager when the reference point is lost, destroyed, or requires relocation. Replace Project control points on the basis of the original survey.
- C. Provide complete engineering layout of the Work needed for construction.
 - 1. Provide competent personnel. Provide equipment including accurate surveying instruments, stakes, platforms, tools, and materials.
 - 2. Provide surveying with accuracy meeting the requirements established for Category 5 Construction Surveying as established in the Manual of Practice of Land Surveying in Texas published by the Texas Society of Professional Surveyors, latest revision.
 - 3. Record Data and measurements per standards.

1.16 CHANGE OF PIPELINE LOCATION

- A. The alignment of the pipeline is shown on the Drawings, and no change is contemplated. It may be necessary to change the alignment due to utility conflicts, unanticipated variations in existing conditions, or for any other reason prior to the time pipe is actually installed.
- B. No additional compensation will be paid to the Contractor except as provided by unit prices, unless excessive cost is incurred that is directly applicable to such changes and this cost is documented in accordance with the General / Supplemental Conditions. No compensation will be paid for specials, field cuts, field welds, or other incurred cost resulting from failure to locate existing utilities prior to manufacture of pipe.

1.17 DELIVERY AND STORAGE

- A. Deliver products and materials to the Site in time to prevent delays in construction.
- B. Deliver packaged products to Site in original undamaged containers with identifying labels attached. Open cartons as necessary to check for damage and to verify invoices. Reseal cartons and store until used. Leave products in packages or other containers until installed.
- C. Deliver products that are too large to fit through openings to the Site in advance of the time enclosing walls and roofs are erected. Set in place, raised above floor on cribs.
- D. Assume full responsibility for the protection and safekeeping of products stored at the Site.
- E. Store products at locations acceptable to the Engineer and to allow Owner access to maintain and operate existing facilities.
- F. Store products in accordance with the Supplier's storage instructions immediately upon delivery. Leave seals and labels intact. Arrange storage to allow access for maintenance of stored items and for inspection. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
- G. Obtain and pay for the use of any additional storage areas as needed for construction. Store products subject to damage by elements in substantial weather-tight enclosures or storage sheds. Provide and maintain storage sheds as required for the protection of products. Provide temperature, humidity control and ventilation within the ranges stated in the Supplier's instructions. Remove storage facilities at the completion of the Project.
- H. Protect the pipe interior. Keep all foreign materials such as dirt, debris, animals, or other objects out of the pipe during the Work. Cap or plug ends of installed pipe in an approved manner when pipe is not being installed. Wash out pipe sections that become contaminated before continuing with installation. Take precautions to prevent the pipe from floating or moving out of the proper position during or after laying operations. Immediately correct any pipe that moves from its correct positions.
- I. Provide adequate exterior storage for products that may be stored out-of-doors.

1. Provide substantial platforms, blocking, or skids to support materials and products above ground; slope to provide drainage. Protect products from soiling or staining.
 2. Cover products subject to dislocation or deterioration from exposure to the elements, with impervious sheet materials. Provide ventilation to prevent condensation below covering.
 3. Store loose, granular materials on clean, solid surfaces, or on rigid sheet materials, to prevent mixing with foreign matter.
 4. Provide surface drainage to prevent erosion and ponding of water.
 5. Prevent mixing of refuse or chemically injurious materials or liquids with stored materials.
 6. Pipes and conduits stored outdoors are to have open ends sealed to prevent the entrance of dirt, moisture, and other injurious materials. Protect PVC pipe from ultraviolet light exposure.
 7. Store light weight products to prevent wind damage.
- J. Protect and maintain mechanical and electrical equipment in storage.
1. Provide Supplier's service instructions on the exterior of the package.
 2. Service equipment on a regular basis as recommended by the Supplier. Maintain a log of maintenance services. Submit the log as Record Data at the completion of the Project.
 3. Provide power to and energize space heaters for all equipment for which these devices are provided.
 4. Provide temporary enclosures for all electrical equipment, including electrical systems on mechanical devices. Provide and maintain heat in the enclosures until equipment is energized.
- K. Maintain storage facilities. Inspect stored products on a weekly basis and after periods of severe weather to verify that:
1. Storage facilities continue to meet specified requirements.
 2. Supplier's required environmental conditions are continually maintained.
 3. Surfaces of products exposed to the elements are not adversely affected.
- L. Replace any stored item damaged by inadequate protection or environmental controls.
- M. Payment may be withheld for any products not properly stored.
- 1.18 **BLASTING**
- A. Blasting for excavations is not allowed.
- 1.19 **ARCHAEOLOGICAL REQUIREMENTS**
- A. Cease operations immediately and contact the Owner for instructions if an historical or archaeological find is made during construction.

- B. Conduct all construction activities to avoid adverse impact on the Sites where significant historical or archaeological Sites have been identified at the Site.
 - 1. Obtain details for working in these areas.
 - 2. Maintain confidentiality regarding the Site.
 - 3. Adhere to the requirements of the Texas Historical Commission.
- C. Do not disturb archaeological Sites.
 - 1. Obtain the services of a qualified archaeological specialist to instruct construction personnel on how to identify and protect archaeological finds on an emergency basis.
 - 2. Coordinate activities to permit archaeological work to take place within the area.
 - a. Attempt to archaeologically clear areas needed for construction as soon as possible.
 - b. Provide a determination of priority for such areas.
- D. Assume responsibility for any unauthorized destruction that might result to such Sites by construction personnel, and pay all penalties assessed by the State or Federal agencies for non-compliance with these requirements.
- E. Contract Time will be modified to compensate for delays caused by such archaeological finds. No additional compensation shall be paid for delays.

1.20 STORM WATER POLLUTION CONTROL

- A. Comply with the current requirements of TPDES General Permit No. TXR15000 (General Storm Water Permit) set forth by the Texas Commission on Environmental Quality for the duration of the Project:
 - 1. Develop a Storm Water Pollution Prevention Plan meeting all requirements of the General Storm Water Permit.
 - 2. Submit of a Notice of Intent to the Texas Commission on Environmental Quality.
 - 3. Develop and implement appropriate Best Management Practices as established by local agencies of jurisdiction.
 - 4. Provide all monitoring and/or sampling required for reporting to the Texas Commission on Environmental Quality
 - 5. Submit reports to the Texas Commission on Environmental Quality as required as a condition of the permit
 - 6. Submit copies of the reports to the Construction Manager as Record Data in accordance with Section 01 33 00 "Submittal Procedures."
 - 7. Retain copies of these documents on-Site at all times for review and inspection by the Owner or regulatory agencies. Post a copy of the permit as required by regulations.
 - 8. Pay all costs associated with complying with the provisions of the General Storm Water Permit. Assume solely responsible for implementing, updating, and modifying the General Storm Water Permit per regulatory requirements the Storm Water Pollution Prevention Plan and Best Management Practices.

- B. Use forms required by the Texas Commission on Environmental Quality to file the Notice of Intent. Submit the Notice of Intent at least 2 days prior to the start of construction. Develop the Storm Water Pollution Prevention Plan prior to submitting the Notice of Intent. Provide draft copies of the Notice of Intent, Storm Water Pollution Prevention Plan, and any other pertinent Texas Commission on Environmental Quality submittal documents to Owner for review prior to submittal to the Texas Commission on Environmental Quality.
- C. Return any property disturbed by construction activities to either specified conditions or pre-construction conditions as set forth in the Contract Documents. Provide an overall erosion and sedimentation control system that will protect all undisturbed areas and soil stockpiles/spoil areas. Implement appropriate Best Management Practices and techniques to control erosion and sedimentation and maintain these practices and techniques in effective operating condition during construction. Permanently stabilize exposed soil and fill as soon as practical during the Work.
- D. Assume sole responsibility for the means, methods, techniques, sequences, and procedures for furnishing, installing, and maintaining erosion and sedimentation control structures and procedures and overall compliance with the General Storm Water Permit. Modify the system as required to effectively control erosion and sediment.
- E. Retain copies of reports required by the General Storm Water Permit for 3 years from date of final completion.

1.21 POLLUTION CONTROL

- A. Prevent the contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations. Provide adequate measures to prevent the creation of noxious air-borne pollutants. Prevent dispersal of pollutants into the atmosphere. Do not dump or otherwise discharge noxious or harmful fluids into drains or sewers, nor allow noxious liquids to contaminate public waterways in any manner.
- B. Provide equipment and personnel and perform emergency measures necessary to contain any spillage.
 - 1. Contain chemicals in protective areas and do not dump on soil. Dispose of such materials at off-site locations in an acceptable manner.
 - 2. Excavate contaminated soil and dispose at an off-site location if contamination of the soil does occur. Fill resulting excavations with suitable backfill and compact to the density of the surrounding undisturbed soil.
 - 3. Provide documentation to the Owner which states the nature and strength of the contaminant, method of disposal, and the location of the disposal site.
 - 4. Comply with local, State and Federal regulations regarding the disposal of pollutants.
- C. Groundwater or run-off water which has come into contact with noxious chemicals, sludge, or sludge-contaminated soil is considered contaminated. Contaminated water must not be allowed to enter streams or water courses, leave the Site in a non-contained form or enter non-contaminated areas of the Site.

1. Pump contaminated water to holding ponds constructed by the Contractor for this purpose, or discharge to areas on the interior of the Site, as designated by the Engineer.
2. Construct temporary earthen dikes or take other precautions and measures as required to contain the contaminated water and pump to a designated storage area.
3. Wash any equipment used for handling contaminated water or soil within contaminated areas three times with uncontaminated water prior to using such equipment in an uncontaminated area. Dispose of wash water used to wash such equipment as contaminated water.

1.22 EARTH CONTROL

- A. Remove excess soil, spoil materials and other earth not required for backfill at the time of generation within 4 weeks of completing excavation work. Control stock pile material to eliminate interference with Contractor and Owner's operations.
- B. Dispose of excess earth off the Site. Pay cost for disposal unless otherwise noted. Provide written approval by the property owner for all disposal on private property, and approval by the Owner if such disposal affects the use of the easements.
- C. Place excess excavated material and neatly spread on tracts of land on which the pipeline is being constructed and where the property owner requests such material and the Construction Manager approves.

1.23 MANAGEMENT OF WATER

- A. Manage water resulting from rains or ground water at the Site. Maintain trenches and excavations free of water at all times.
- B. Lower the water table in the construction area by acceptable means if necessary to maintain a dry and workable condition at all times. Provide drains, sumps, casings, well points, and other water control devices as necessary to remove excess water.
- C. Provide continuous operation of water management actions. Maintain standby equipment to provide proper and continuous operation for water management.
- D. Ensure that water drainage does not damage adjacent property. Divert water into the same natural watercourse in which its headwaters are located, or other natural stream or waterway as approved by the Owner. Assume responsibility for the discharge of water from the Site.
- E. Remove the temporary construction and restore the Site in a manner acceptable to the Engineer and to match surrounding material at the conclusion of the Work.

1.24 CLEANING DURING CONSTRUCTION

- A. Provide positive methods to minimize raising dust from construction operations and provide positive means to prevent air-borne dust from discharging into the atmosphere. Control dust and dirt from demolition, cutting, and patching operations.
- B. Clean the Project as Work progresses and dispose of waste materials, keeping the Site free from accumulations of waste or rubbish. Provide containers on the Site for waste collection. Do not allow waste materials or debris to blow off of the Site.

Control dust from waste materials. Transport waste materials with as few handlings as possible.

- C. Comply with codes, ordinances, regulations, and anti-pollution laws. Do not burn or bury waste materials. Remove waste materials, rubbish and debris from the Site and legally dispose of these at public or private dumping areas.

1.25 MAINTENANCE OF ROADS, DRIVEWAYS, AND ACCESS

- A. Maintain roads and streets in a manner that is suitable for safe operations of public vehicle during all phases of construction unless the Owner approves a street closing. Submit a written request for Owner's approval of a street closing. The request shall state:
 - 1. The reason for closing the street.
 - 2. How long the street will remain closed.
 - 3. Procedures to be taken to maintain the flow of traffic.
 - 4. Do not close public roads overnight.
- B. Construct temporary detours, including by-pass roads around construction, with adequately clear width to maintain the free flow of traffic at all times. Maintain barricades, signs, and safety features around the detour and excavations.
- C. Maintain road and driveway access to occupied buildings. Coordinate temporary closures or blockage with property owners, utilities, emergency service providers, Owner and Engineer. Property owners must be notified a minimum of 2 weeks or other time established by Owner prior to closure. Limit the time road or driveways are out of service to 4 hours.
- D. Maintain barricades, signs, and safety features around the Work in accordance with all provisions of the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD.)
- E. Assume responsibility for any damage resulting from construction along roads or drives.

1.26 CUTTING AND PATCHING

- A. Perform cutting, fitting, and patching required to complete the Work or to:
 - 1. Uncover Work to provide for installation of new Work or the correction of defective Work.
 - 2. Provide routine penetrations of non-structural surfaces for installation of mechanical, electrical, and plumbing work.
 - 3. Uncover Work that has been covered prior to observation by the Engineer.
- B. Submit written notification to the Engineer in advance of performing any cutting which affects:
 - 1. Work of any other contractors or the Owner.
 - 2. Structural integrity of any structure or system of the Project.
 - 3. Integrity or effectiveness of weather exposed or moisture resistant structure or systems.

4. Efficiency, operational life, maintenance, or safety of any structure or system.
 5. Appearance of any structure or surfaces exposed occasionally or constantly to view.
- C. The notification shall include:
1. Identification of the Project.
 2. Location and description of affected Work.
 3. Reason for cutting, alteration, or excavation.
 4. Effect on the work of any separate contractor or Owner.
 5. Effect on the structural or weatherproof integrity of the Project.
 6. Description of proposed Work, including:
 - a. Scope of cutting, patching, or alteration.
 - b. Trades that will perform the Work.
 - c. Products proposed for use.
 - d. Extent of refinishing to be performed.
 - e. Cost proposal, when applicable.
 7. Alternatives to cutting and patching.
 8. Written authorization from any separate contractor whose work would be affected.
 9. Date and time Work will be uncovered or altered.
- D. Examine the existing conditions, including structures subject to damage or to movement during cutting or patching.
1. Inspect conditions affecting installation of products or performance of the Work after uncovering the Work.
 2. Provide a written report of unacceptable or questionable conditions to the Engineer. The Contractor shall not proceed with Work until Engineer has provided further instructions. Beginning Work will constitute acceptance of existing conditions by the Contractor.
- E. Protect the structure and other parts of the Work and provide adequate support to maintain the structural integrity of the affected portions of the Work. Provide devices and methods to protect adjacent Work and other portions of the Project from damage. Provide protection from the weather for portions of the Project that may be exposed by cutting and patching Work.
- F. Execute cutting and demolition by methods which will prevent damage to other Work, and will provide proper surfaces to receive installation of repairs.
- G. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
- H. Cut, remove, and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to, the removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the modified Work.

- I. Restore Work which has been cut or removed. Install new products to provide completed Work per the Contract Documents.
- J. Fit Work air-tight to pipes, sleeves, ducts, conduit, and other penetrations through the surfaces. Where fire rated separations are penetrated, fill the space around the pipe or insert with materials with physical characteristics equivalent to fire resistance requirements of penetrated surface.
- K. Patch finished surfaces and building components using new products specified for the original installation.
- L. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to the nearest intersection.
 - 2. For an assembly, refinish the entire unit.

1.27 PRELIMINARY OCCUPANCY

- A. Owner may deliver, install and connect equipment, furnishings, or other apparatus in buildings or other structures. These actions do not indicate acceptance of any part of the building or structure and does not affect the start of warranties or correction periods.
- B. Protect the Owner's property after installation is complete.
- C. Owner or Engineer may use any product for testing or determine that the product meets the requirements of the Contract Documents. This use does not constitute acceptance by either the Owner or Engineer. These actions do not indicate acceptance of any part of the product and does not affect the start of warranties or correction periods.

1.28 INITIAL MAINTENANCE

- A. Maintain equipment until the Project is accepted by the Owner. Ensure that mechanical equipment is properly maintained as recommended by the Supplier.
- B. Remove and clean screens and strainers in piping systems.
- C. Clean insects from intake louver screens.

2.00 PRODUCTS

2.01 MATERIALS

- A. Provide materials in accordance with the requirements of the individual Sections.

3.00 EXECUTION

3.01 PERFORMANCE OF THE WORK

- A. Perform the Work per the Supplier's published instructions. Do not omit any preparatory step or installation procedure unless specifically exempted or modified by Field Order.

END OF SECTION

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01 31 13 PROJECT COORDINATION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Administer Contract requirements to construct the Project. Provide documentation per the requirements of this Section. Provide information as requested by the Construction Manager, Engineer, or Owner.

1.02 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 "Submittal Procedures."

1.03 COMMUNICATION DURING THE PROJECT

- A. The Construction Manager is to be the first point of contact for all parties on matters concerning this Project.
- B. The Contractor will be responsible for coordination with NTMWD's Construction Inspector for work within and upstream of the meter vault.
- C. The Engineer will coordinate correspondence concerning:
 - 1. Submittals, including Applications for Payment.
 - 2. Clarification and interpretation of the Contract Documents.
 - 3. Contract modifications.
 - 4. Observation of Work and testing.
 - 5. Claims.
- D. The Construction Manager and Engineer will normally communicate only with the Contractor. Any required communication with Subcontractors or Suppliers will only be with the direct involvement of the Contractor.
- E. Direct written communications to the Engineer at the address indicated at the Pre-Construction Conference. Include the following with communications as a minimum:
 - 1. Name of the Owner.
 - 2. Project name.
 - 3. Contract title.
 - 4. Project number.
 - 5. Date.
 - 6. A reference statement.
- F. Submit communications on the forms referenced in this Section or in Section 01 33 00 "Submittal Procedures."

1.04 PROJECT MEETINGS

- A. Pre-construction Conference:
 - 1. Attend a pre-construction meeting.

2. The location of the conference will be determined by the Engineer.
 3. The time of the meeting will be determined by the Engineer but will be after the Notice of Award is issued and not later than 15 days after the Notice to Proceed is issued.
 4. The Owner, Construction Manager, Engineer, representatives of utility companies, the Contractor's project manager and superintendent, and representatives from major Subcontractors and Suppliers may attend the meeting.
 5. Provide and be prepared to discuss:
 - a. Preliminary construction schedule per Section 01 32 16 "Construction Progress Schedule."
 - b. Preliminary submittal schedule per Section 01 33 00 "Submittal Procedures."
 - c. Schedule of values and anticipated schedule of payments per Section 01 29 00 "Payment Procedures."
 - d. List of Subcontractors and Suppliers.
 - e. Contractor's organizational chart as it relates to this project.
 - f. Letter indicating the agents of authority for the Contractor and the limit of that authority with respect to the execution of legal documents, contract modifications and payment requests.
- B. Progress Meetings
1. Attend meetings with the Construction Manager, Engineer and Owner.
 - a. Meet on a monthly basis or as requested by the Construction Manager to discuss the Project.
 - b. Meet at the Site or other location as designated by the Construction Manager.
 - c. Contractor's superintendent and other key personnel are to attend the meeting. Other individuals may be requested to attend to discuss specific matters.
 2. Provide information as requested by the Engineer or Owner concerning this Project.
 - a. Prepare to discuss:
 - 1). Status of overall Project schedule.
 - 2). Contractor's detailed schedule for the next month.
 - 3). Anticipated delivery dates for equipment.
 - 4). Coordination with the Owner.
 - 5). Status of submittals.
 - 6). Information or clarification of the Contract Documents.
 - 7). Claims and proposed modifications to the Contract.
 - 8). Field observations, problems, or conflicts.
 - 9). Maintenance of quality standards.

- b. Notify the Engineer of any specific items to be discussed a minimum of 1 week prior to the meeting.
 3. Review minutes of meetings and notify the Construction Manager of any discrepancies within ten days of the date of the memorandum.
 - a. Following that date, the minutes will stand as shown or as corrected.
 - b. Corrections will be reflected in the minutes of the following meeting. Issues discussed will be documented and old issues will remain on minutes of subsequent meetings until the issue is resolved.
- C. Pre-submittal and Pre-installation Meetings
 1. Attend pre-submittal and pre-installation meetings as required in the individual technical Specification Sections or as determined necessary by the Construction Manager (for example, instrumentation, roofing, concrete mix design, etc.).
 2. The location of the meeting will be determined by the Construction Manager.
 3. The time of the meeting will be determined by the Contractor when ready to proceed with the associated Work, subject to submission of a Notification by Contractor (NBC) on the form shown in Section 01 31 13.13 "Forms" and acceptance by the Construction Manager, Engineer and Owner of the proposed time.
 4. The Owner, Construction Manager, Engineer, the Contractor's project manager and superintendent, and representatives from affected Subcontractors and Suppliers shall attend the meeting.

1.05 REQUESTS FOR INFORMATION

- A. Submit Request for Information (RFI) to the Construction Manager to obtain additional information or clarification of the Contract Documents.
 1. Submit a separate RFI for each item on the form shown in Section 01 31 13.13 "Forms."
 2. Attach adequate information to permit a written response without further clarification. Construction Manager or Engineer will return requests that do not have adequate information to the Contractor for additional information. Contractor is responsible for all delays resulting from multiple submittals due to inadequate information.
 3. A response will be made when adequate information is provided. Response will be made on the RFI form or in attached information.
- B. Response to an RFI is given to provide additional information, interpretation, or clarification of the requirements of the Contract Documents, and does not modify the Contract Documents.
- C. Engineer will initiate a Contract Modification Request per Paragraph 1.07 if the RFI indicates that a Contract modification is required.

1.06 NOTIFICATION BY CONTRACTOR

- A. Notify the Construction Manager of:
 1. Need for testing.

2. Intent to work outside regular working hours.
 3. Request to shut down facilities or utilities.
 4. Proposed utility connections.
 5. Required observation by Engineer or inspection agencies prior to covering Work.
 6. Training.
- B. Provide notification a minimum of 2 weeks in advance in order to allow Owner, Construction Manager, and / or Engineer time to respond appropriately to the notification.
- C. Use "Notification by Contractor" form shown in Section 01 31 13.13 "Forms."

1.07 REQUESTS FOR MODIFICATIONS

- A. Submit a request to the Engineer for any change in the Contract Documents.
1. Use the "Contract Modification Request" (Contract Modification Request) form shown in Section 01 31 13.13 "Forms."
 2. Assign a number to the Contract Modification Request when issued.
 3. Include with the Contract Modification Request:
 - a. A complete description of the proposed modification.
 - b. The reason the modification is requested.
 - c. A detailed breakdown of the cost of the change (necessary only if the modification requires a change in Contract Price). The itemized breakdown is to include:
 - 1). List of materials and equipment to be installed.
 - 2). Man hours for labor by classification.
 - 3). Equipment used in construction.
 - 4). Consumable supplies, fuels, and materials.
 - 5). Royalties and patent fees.
 - 6). Bonds and insurance.
 - 7). Overhead and profit.
 - 8). Field office costs.
 - 9). Home office cost.
 - 10). Other items of cost.
 - d. Provide the level of detail outline in the paragraph above for each Subcontractor or Supplier actually performing the Work if Work is to be provided by a Subcontractor or Supplier. Indicate appropriate Contractor mark ups for Work provided through Subcontractors and Suppliers. Provide the level of detail outline in the paragraph above for self-performed Work.

- e. Provide a revised schedule indicating the effect on the critical path for the Project and a statement of the number of days the Project may be delayed by the modification.
 4. Submit a Contract Modification Request to the Engineer to request a field change.
 5. A Contract Modification Request is required for all substitutions or deviations from the Contract Documents.
 6. Engineer will evaluate the request for a Contract modification.
- B. Owner will initiate changes through the Engineer.
1. Engineer will prepare a description of proposed modifications to the Contract Documents.
 2. Engineer will use the Contract Modification Request form. Engineer will assign a number to the Contract Modification Request when issued.
 3. Return Contract Modification Request with a proposal to incorporate the requested change. Include a breakdown of costs into materials and labor in the detail outline above to allow evaluation by the Engineer.
- C. Engineer will issue a Field Order or a Change Order per the General Conditions if a contract modification is appropriate.
1. Modifications to the Contract can only be made by a Field Order or a Change Order.
 2. Changes in the Project will be documented by a Field Order or by a Change Order.
 3. Field Orders may be issued by the Engineer for Contract modifications that do not change the Contract Price or Contract Time.
 4. Any modifications that require a change in Contract Price or Contract Time can only be approved by Change Order.
 - a. Proposals issued by the Contractor in response to a Contract Modification Request will be evaluated by the Engineer.
 - b. If a Change Order is recommended, the Engineer will prepare the Change Order.
 - c. The Change Order will be sent to the Contractor for execution with a copy to the Owner recommending approval.
 - d. Change Orders can only be approved by the Owner.
 - 1). Work performed on the proposed contract modifications prior to the approval of the Change Order will be performed at the Contractor's risk.
 - 2). No payment will be made for Work on Change Orders until approved by the Owner.
- D. The Contractor may be informed that the Contract Modification Request is not approved and construction is to proceed in accordance with the Contract Documents.

1.08 RECORD DRAWINGS

- A. Maintain at the Site one complete record copy of:
1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Contract modifications.
 5. Approved Shop Drawings and Record Data.
 6. One set of construction photographs.
 7. Test records.
 8. Clarifications and other information provided in Request for Information responses.
 9. Reference standards.
- B. Store documents and Samples in the Contractor's field office.
1. Documents are to remain separate from documents used for construction. Do not use these documents for construction.
 2. Provide files and racks for the storage of documents.
 3. Provide a secure storage space for the storage of Samples.
 4. Maintain documents in clean, dry, legible conditions, and in good order.
 5. Make documents and Samples available at all times for inspection by the Construction Manager, Engineer and Owner.
- C. Marking Drawings:
1. Label each document as "Project Record" in large printed letters.
 2. Record information as construction is being performed.
 - a. Do not conceal any Work until the required information is recorded.
 - b. Mark drawings to record actual construction, including the following:
 - 1). Depths of various elements of the foundation in relation to finished first floor datum or the top of walls.
 - 2). Horizontal and vertical locations of underground utilities and appurtenances constructed and existing utilities encountered during construction.
 - 3). Location of internal utilities and appurtenances concealed in the construction. Refer measurements to permanent structure on the surface. Include the following equipment:
 - a). Piping.
 - b). Ductwork.
 - c). Equipment and control devices requiring periodic maintenance or repair.
 - d). Valves, unions, traps, and tanks.

- e). Services entrance.
 - f). Feeders.
 - g). Outlets.
- 4). Changes of dimension and detail.
 - 5). Changes made by Field Order and Change Order.
 - 6). Details not on the original Drawings. Include field verified dimensions and clarifications, interpretations, and additional information issued in response to Requests for Information.
- c. Mark Specifications and Addenda to identify products provided.
 - 1). Record product name, trade name, catalog number, and each Supplier (with address and phone number) of each product and item of equipment actually installed.
 - 2). Record changes made by Field Order and Change Order.
 - d. Mark additional Work or information in erasable pencil.
 - 1). Use red for new or revised indication.
 - 2). Use purple for Work deleted or not installed (lines to be removed).
 - 3). Highlight items constructed per the Contract Documents in yellow.
 - e. Submit record documents to Engineer for review and acceptance 30 days prior to final completion of the Project.
 - 1). Provide one set of marked up drawings.
- D. Applications for Payment will not be recommended for payment if record documents are found to be incomplete or not in order. Final payment will not be recommended without complete record documents.

END OF SECTION

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01 31 13.13 FORMS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Use the forms shown in this Section for Contract administration, submittals and documentation of test results. A disk with these forms in Microsoft Word or Excel will be provided to the Contractor before or at the pre-construction conference. Forms included are listed below:
- B. Contract administration forms:
 - 1. Request for Information.
 - 2. Notification by Contractor.
 - 3. Contractor's Modification Request.
- C. Application for Payment forms:
 - 1. Consent of Surety Company to Payment Procedures.
 - 2. Application for Payment forms.
- D. Submittal forms:
 - 1. Submittal Transmittal.
 - 2. Shop Drawing Deviation Request.
 - 3. Concrete Mix Design.
 - a. Attachment "A" – Basis for Mix Design – Field Strength Test Record.
 - b. Attachment "B" – Basis for Mix Design – Trial Mixture.
 - 4. Authorization Request for System Shut-Down and Tie-In.
- E. Testing forms:
 - 1. Pipeline Test Report Exfiltration Test Report.
 - 2. Pressure Pipe Test Report.
 - 3. Protective Coating Test Report.
- F. Equipment installation and documentation forms:
 - 1. Equipment Installation Report.
 - 2. O&M Manual Review Report.
 - 3. O&M Parts List (MAXIMO Parts Input List).
- G. Project closeout forms:
 - 1. Consent of Surety Company to Final Payment.
 - 2. Consent of Surety Company to Reduction of or Partial Release of Retainage.
 - 3. Contractor's Affidavit of Payment of Debts and Claims.
 - 4. Contractor's Affidavit of Release of Liens.

END OF SECTION



REQUEST FOR INFORMATION
(4.14 /)

PROJECT: _____	PROJECT NUMBER: _____
OWNER: _____	_____
CONTRACTOR: _____	_____
ENGINEER: Freese & Nichols, Inc.	_____

REFERENCE DATA:
 Specification Section No. _____ Page No. _____ Paragraph No. _____
 Drawing No. _____ Detail description: _____

CONTRACTOR REQUESTS: Information Interpretation Clarification
 for the items described below or in the attached material referenced below:

CONTRACTOR'S PROPOSED SOLUTION:

REQUESTED BY: _____ DATE: _____

ENGINEER'S RESPONSE: Information Interpretation Clarification
 for the items described above or in the attached material referenced:

RESPONSE BY: _____ DATE: _____

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PROJECT: _____	PROJECT NUMBER: _____
OWNER: _____	_____
CONTRACTOR: _____	_____
ENGINEER: Freese & Nichols, Inc.	_____

DESCRIPTION: _____	NO. _____
---------------------------	------------------

NOTIFICATION BY CONTRACTOR

The Contractor proposes to make the additions, modifications, or deletions to the Work described in the Contract Documents, as shown in Attachment "A" and requests that you take the following action:

- Notify us that you concur that this change does not require a change in Contract time or amount and issue a Field Order.
- Issue a Work Change Directive to authorize us to proceed with the described change with payment at the Contract unit prices.
- Issue a Work Change Directive to authorize us to proceed with the change under the time and materials provisions of the Contract Documents.
- Issue a Work Change Directive or Change Order for performing the described change. Proposed change in Contract amount is indicated in the attached detailed cost breakdown of labor, materials, equipment and all other costs associated with this change. Impacts on Contract time are shown in the attached revised schedule.

By: _____ Date: _____

CONSTRUCTION MANAGER'S RESPONSE

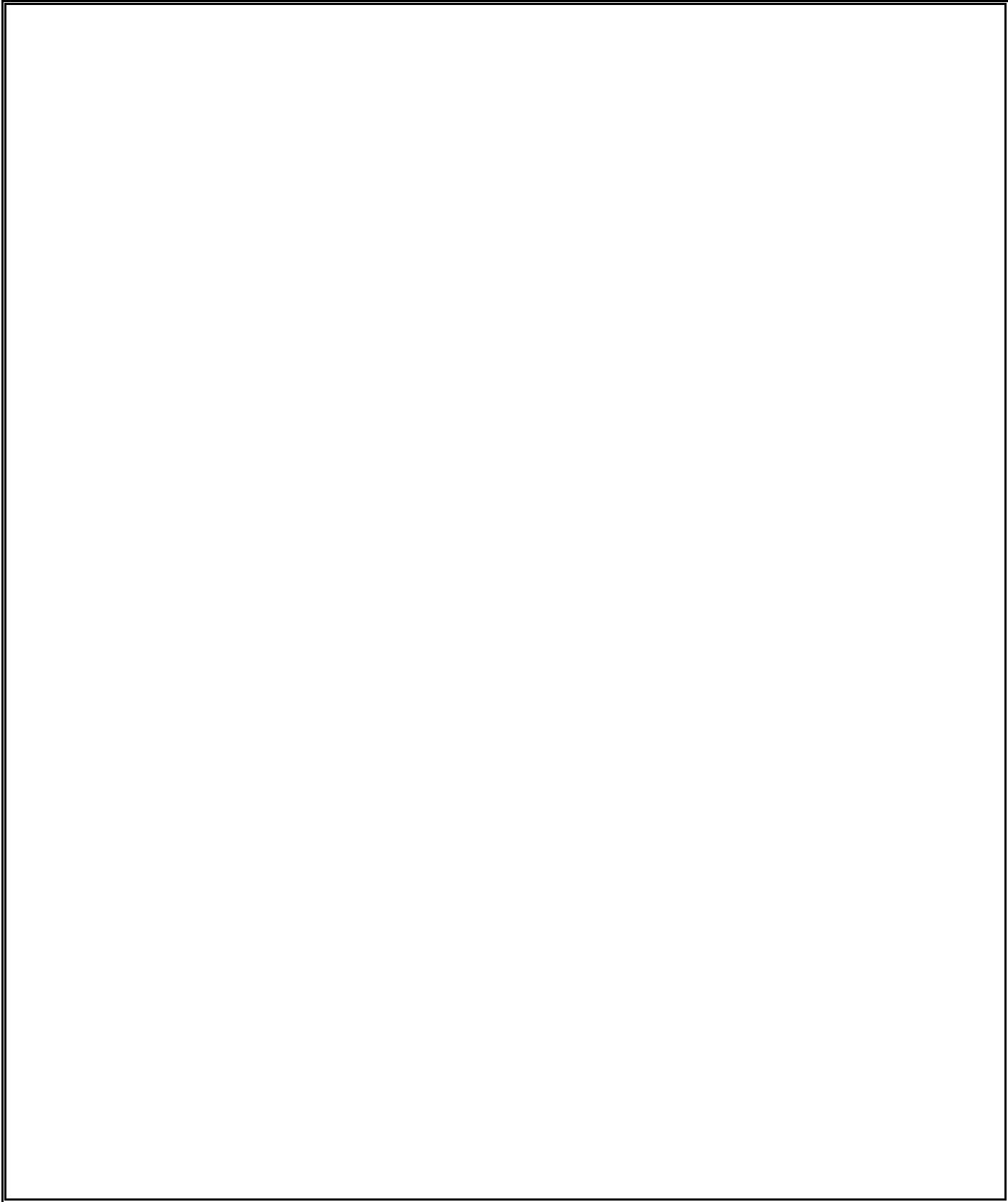
- We concur that this change does not require a change in Contract time or amount. A Field Order will be issued.
- We concur that you proceed with the change with payment to be made at the Contract unit prices. A Work Change Directive will be issued.
- We concur that you proceed with the change under the time and materials provisions of the Contract Documents. A Work Change Directive will be issued.
- A Change Order will be issued based on the attached proposal.
- Additional information is required to evaluate this request. Provide information as described in the attached comments and resubmit.
- Contract Modification Request is not accepted.

By: _____ Date: _____

For Contractors Use:

- Field Order _____ issued.
- Change Order _____ issued.
- Work Change Directive _____ issued.
- Contract Modification cancelled for the following reasons: _____

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CONSENT OF SURETY COMPANY TO PAYMENT PROCEDURES (4.86 /)

PROJECT: PROJECT NUMBER: OWNER: CONTRACTOR: ENGINEER: Freese & Nichols, Inc.

The Surety Company, on bond of the Contractor listed above for the referenced project, in accordance with the Contract Documents, hereby approves schedule of values, payment request form and method of payment for the referenced project.

In witness whereof, the Surety Company has hereunto set its hand this ___ day of ___ 20__.

Surety Company

By Authorized Representative

Title

Address:

Attach Power of Attorney

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CONTRACTOR'S APPLICATION FOR PAYMENT

PAY REQUEST NO: _____ **DATE:** _____

PERIOD FROM: _____ **TO:** _____

PROJECT: _____ **ENGINEER:** FREESE & NICHOLS, INC.
2711 N. HASKEL AVENUE, SUITE 3300
DALLAS, TEXAS 75204

OWNER: NORTH TEXAS MUNICIPAL WATER DISTRICT
P.O. BOX 2408
WYLIE, TEXAS 75098 **CONTRACTOR:**

BIDS RECEIVED: _____ **CONTRACT DATE:** _____ **NOTICE TO PROCEED:** _____

CONTRACT AMOUNT: _____ **CALENDAR DAYS:** _____ **COMPLETION DATE:** _____

ADJUSTMENTS: _____ **EXTENSIONS:** _____

REVISED AMOUNT: _____ **REVISED DAYS:** _____ **REVISED DATE:** _____

SUMMARY OF JOB STATUS:

Total Work Completed _____

Material Stored on Site _____

Subtotal _____

Less 5% Retained _____

Subtotal _____

Less Previous Payments _____

Amount Due This Period _____

SUBMITTED BY:

By: _____
Name Title

Date: _____

VERIFIED BY: NTMWD ENGINEERING FUNCTION

By: _____
Name Construction Mgr.

Date: _____

REVIEWED BY: FREESE & NICHOLS

By: _____
Name Project Engineer

Date: _____

APPROVED FOR PAYMENT BY: NTMWD

By: _____
Name Executive Director

Date: _____

WORK COMPLETED _____ %

TIME: _____ %

PROJECT: _____	PROJECT NUMBER
OWNER: _____	_____
CONTRACTOR: _____	_____
ENGINEER: _____	_____

PAYMENT PERIOD FROM:	TO	ESTIMATE NO.:
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CONTRACT TIME SUMMARY

Date of Notice to Proceed	_____	
Original Contract Duration	_____	Days
Original Date of Contract Substantial Completion	_____	
Original Date of Contract Final Completion	_____	
Approved Time Extensions	_____	Days
Current Contract Duration	_____	Days
Current Date of Contract Substantial Completion	_____	
Current Date of Contract Final Completion	_____	
Days Charged to Project to Date	_____	Days
Days Remaining in Contract	_____	Days
Percent of Current Project Duration	_____	%
Current Scheduled Completion Date	_____	
Project is (Ahead/Behind) Schedule	_____	

CONTRACT COST SUMMARY

Original Contract Amount	\$ -	
Approved Change Orders	\$ -	
Current Contract Amount	\$ -	
Contract Earnings to Date on Original Contract	\$ -	
Earnings on Approve Change Orders	\$ -	
Materials on Hand	\$ -	
Total Current Project Amount Earned	\$ -	
Percent of Contract Earned to Date	_____	%
Retainage	\$ -	
Amount Paid to Date	\$ -	
Percent of Contract Paid to Date	_____	%



SUBMITTAL TRANSMITTAL
(4. /)

PROJECT: _____ **PROJECT NUMBER:** _____
OWNER: _____
CONTRACTOR: _____
ARCHITECT/ENGINEER: Freese & Nichols, Inc. _____

REFERENCE DATA:
 Contractor's Submittal No. _____ Specification Section: _____
 Plan Sheet No.: _____ Description: _____

CONTRACTOR'S CERTIFICATION: *I hereby certify that this submittal has been reviewed by the Contractor and is in strict conformance with the Contract Documents as modified by Addenda, Change Orders and Field Orders.* **CERTIFIED BY:** _____ **DATE:** _____

TYPE	#	DESCRIPTION	#SENT	#RET'D	STATUS
CMR		Contractor's Modification Request			Approved
CTR		Certified Test Report			Approved As Noted
EIR		Equipment Installation Report			Not Approved
O&M		Operation & Maintenance Manual			Revise & Resubmit
NBC		Notification By Contractor			Filed As Received
PCM		Proposed Contract Modification			Final Distribution
PR		Payment Request			Change Order Issued
PP		Project Photographs			Field Order Issued
RD		Record Data			Recommended For Approval
RFI		Request For Information			Returned W/O Review
SAM		Sample			Add'l Information Required
SCH		Schedule Of Progress			Cancelled
SD		Shop Drawing			See Review Comments
					Pending Change Order

FOR ARCHITECT / ENGINEER'S USE ONLY

DATE RECEIVED _____ **BY** _____ **DATE RETURNED** _____ **BY** _____

COMMENTS:

DISTRIBUTION				REVIEW			
NO.	SENT TO.	NO.	SENT TO.	DEPT.	BY	DATE SENT	DATE RET=D

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SHOP DRAWING DEVIATION REQUEST
(4.31 / _____)

PROJECT: _____	PROJECT NUMBER: _____
OWNER: _____	_____
CONTRACTOR: _____	_____
ENGINEER: Freese & Nichols, Inc.	_____

Shop Drawing No. SD- _____	Reference Specification/Drawing: _____	Description: _____
--------------------------------------	---	---------------------------

With the exception of the deviations noted below, this Shop Drawing was reviewed by the Contractor and was determined to be in strict compliance with the Contract Documents. The Contractor requests that the following specific deviations to the Contract Documents be permitted.

Contractor's Signature _____ Date _____

For Engineer's Use Only

When executed here by the Engineer, this form becomes Field Order: FO - _____ on this project, and it is issued to document the deviations approved below by the Engineer.

Engineer's Signature _____ Date _____

To Be Completed By Contractor			Engineer's Signature _____ Date _____			
Deviation Item No.	Specification No.	Description	Not Approved	Approved By (signature)	Date	Change Order Required

The deviations to the Contract Documents listed above that are signed by the Engineer are approved. It is the Engineer's opinion that this approval supplements the Contract Documents pursuant to the provision of General Condition 3.04B in the Contract Documents and does not alter the Contract Price or Contract Time. The Contractor shall notify the Engineer prior to commencing the work should he disagree with the Engineer's opinion and a change order should be requested.

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Concrete Mix Design

PROJECT NAME: _____
 FNI PROJECT NUMBER: _____
 PROJECT LOCATION: _____
 OWNER: _____
 GENERAL CONTRACTOR: _____
 MIX NUMBER / CLASS: _____

A. Mix Design

Cement	=		lb/yd ³
Fly Ash	=		lb/yd ³
Other Cementitious Material: _____	=		lb/yd ³
Fine Aggregate (Dry Weight)	=		lb/yd ³
Coarse Aggregate (Dry Weight)	=		lb/yd ³
Water	=		lb/yd ³
Water Reducing Admixture	=		oz/yd ³
High Range Water Reducer	=		oz/yd ³
Air Entraining Admixture	=		oz/yd ³
Other Admixture: _____	=		oz/yd ³
Slump	=		inches
Gross Weight	=		lb/yd ³
Air Content	=		%
Water/Cement Ratio	=		

B. Materials

	SOURCE	ASTM	TYPE	REMARKS
Cement				
Fly Ash				
Other Cementitious Material: _____				
Fine Aggregate				
Coarse Aggregate				
Water				
Water Reducer				
High Range Water Reducer				
Air Entraining				
Other Admixture: _____				

C. Determination of Average Strength Required (f_{cr})

1. Test Records Available:

A. Summary of Test Records: (Provide supporting documentation.)

Test Group No.	No. of Consecutive Tests	Specified Strength (psi)	Standard Deviation (psi)

Average Standard Deviation:

B. Standard Deviation Modification Factor (ACI 301, Table 4.2.3.3.a) _____

C. Standard Deviation Used _____

Average Compressive Strength Required _____

2. Test Records Not Available:

A. Average Compressive Strength Required (ACI 301, 4.2.3.3.b, if required) _____

D. Documentation of Required Average Compressive Strength (Check One)

1. Field Strength Test Record (ACI 301, 4.2.3.4.a) _____
 ▪ Complete Attachment A.

2. Trial Mixtures (ACI 301, 4.2.3.4.b) _____
 ▪ Complete Attachment B.

I, _____ certify that the above information is correct and all gradations, cement certifications and test results are located at our place of business for review by the Engineer.

NAME: _____

DATE: _____

TITLE: _____

COMPANY: _____

Attachment A

**Documentation of Average Strength – Field Strength Test Record
(ACI 301, 4.2.3.4.a)**

A. Summary of test records: (Provide supporting documentation.)

Test Record No.	No. of Tests in Record	Duration of Record (days)	Water-Cementitious Materials Ratio	Average Strength (psi)

B. Interpolation used? _____
 ■ Provide an interpolation calculation or plot of strength versus proportions.

C. Submit the following data for each mix:

1. Brand, type and amount of cement.
2. Brand, type and amount of each admixture.
3. Source of each material used.
4. Amount of water.
5. Proportions of each aggregate material per cubic yard.
6. Gross weight per cubic yard.
7. Measured slump.
8. Measured air content.
9. Results of consecutive strength tests.

AUTHORIZATION REQUEST FOR SYSTEM SHUT-DOWN AND TIE-IN

SUBMITTED BY: _____ DATE: _____
Engineering Manager

REVIEWED BY: _____ DATE: _____
System Manager

APPROVED: _____ DATE: _____
Executive Director

1. PROJECT : _____

2. LOCATION & DESCRIPTION: _____

Note: _____

3. PROPOSED DATE & DURATION: _____

4. PROPOSED SCHEDULE:

TIME FRAME	ACTIVITY
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

5. SYSTEM DOWN TIME TOLERANCE:

A. WATER SYSTEM: **WASTEWATER SYSTEM:**

1. Latest Average Daily Flow: _____
2. Low Flow Time Period: _____

6. FACILITY AND TECHNICAL SERVICES PERSONNEL/EQUIPMENT REQUEST

1. Facility Services Valve Crew Requested: Yes _____ No _____
2. Technical Services Welders Requested: Yes _____ No _____
3. Equipment Requested: _____

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PROTECTIVE COATING TEST REPORT
(4. /)

PROJECT: _____	PROJECT NUMBER: _____
OWNER: _____	_____
CONTRACTOR: _____	_____
ENGINEER: Freese & Nichols, Inc.	_____
DATE: _____	_____

REFERENCE DATA:
Report No.: _____ Description: _____

APPLICATION AREA:
Item coated (from drawings): _____
Identification No.: _____ Unit No.: _____

LOCATION:
Structure: _____
N/S Coord.: _____ E/W Coord.: _____ Station: _____ Elev.: _____

SURFACE PREPARATION:

Shop Primer	Field Blast-Commercial Gray	Field Blast- Near White
Brush Blast	Power Tool & Solvent Cleaning	Field Blast-White Metal

COATING APPLICATION:

DRY FILM THICKNESS						
Coat	Type	Description (Brand, Series, Name/No.)	Color	Req=d	Test	Retest
Primer						
Interim						
Interim						
Finish						

CHECKED FOR HOLIDAYS

Not Required Tested and Defects Marked Date: _____

Tested and No Defects Discovered Date: _____

Testing By: _____ With: _____

Witnessed by: _____ With: _____

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EQUIPMENT INSTALLATION REPORT (4.36 /)

PROJECT: _____	PROJECT NUMBER: _____
OWNER: _____	_____
CONTRACTOR: _____	_____
ENGINEER: Freese & Nichols, Inc. _____	_____

REFERENCE DATA:
 EIR No.: _____ Description: _____
 Specification Section No.: _____ Page No.: _____ Par. No.: _____ Sheet No.: _____
 Entitled: _____
 Detail Designation: _____ Drawing Attached: Yes No

EQUIPMENT IDENTIFICATION:
 Name (from drawings): _____ Identification No.: _____ Unit No.: _____
 Manufacturer: _____ Capacity: _____ Model No.: _____ Serial No.: _____

LOCATION:
 Structure: _____
 N/S Coord.: _____ E/W Coord.: _____ Station: _____ Elev.: _____
 Date Installation Completed: _____

OPERATOR TRAINING HAS BEEN CONDUCTED ON:

Operation of Equipment	Routine Maintenance	Trouble Shooting
Emergency Procedures	Lubrication Procedures	Start up and Shutdown
Supplementary Instruction/Training Manuals		

Operator Training Conducted:
 Dates: _____ No. of Hours _____
 Firm/Instructor: _____

EQUIPMENT HAS BEEN CHECKED FOR:

- Installation Lubrication Alignment
- Stress Imposed by Piping and/or Anchor Bolts
- Operation under Full Load Conditions
- Other Conditions as Specified _____.

I hereby certify that I was present when the equipment described above was placed in operation and have inspected, checked and adjusted the equipment as necessary for its proper operation. As an authorized technical representative of the equipment manufacturer, I approve the installation and authorize operation of the equipment.

By: _____ Date: _____
 Representing: _____
 Witnessed by: _____

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O & M MANUAL REVIEW REPORT
(4.34 /)

PROJECT: _____	PROJECT NUMBER: _____
OWNER: _____	_____
CONTRACTOR: _____	_____
CONSTRUCTION MANAGER: Freese & Nichols, Inc.	_____

REFERENCE DATA:
 O&M No.: _____ Description: _____
 Specification Section No.: _____ Page No.: _____ Par. No.: _____ Sheet No.: _____
 Entitled: _____
 Detail Designation: _____ Drawing Attached: Yes No

EQUIPMENT IDENTIFICATION:
 Name (from drawings): _____
 Identification No.: _____ Unit No.: _____
 Manufacturer: _____
 Capacity: _____ Model No.: _____ Serial No.: _____

LOCATION:
 Structure: _____ N/S Coord.: _____
 E/W Coord.: _____ Station: _____ Elevation: _____

SUBMITTAL: Preliminary O & M Final O & M Revised Final

DESCRIPTION OF OPERATION		
Equipment Functions	Normal Operating Characteristics	
Engineering Data	Limiting Conditions	Safety Conditions

EQUIPMENT MANUFACTURER'S RECOMMENDED STEP BY STEP PROCEDURES FOR			
Start-up	Normal Operations	Shut Down	Regulation
Control	Emergency Conditions	Limiting Operating Conditions	

MAINTENANCE INSTRUCTION	
Preventive/Routine Maintenance Schedule	Guide to Troubleshooting

MAINTENANCE - LUBRICATION		
Lubricant Chart	Lubrication Schedule	Cross Reference

MAINTENANCE - ASSEMBLY		
Exploded View	Cross Sectional Views	Parts List and Number

EQUIPMENT MANUFACTURER'S RECOMMENDED STEP BY STEP PROCEDURES FOR		
Disassembly	Repair/Parts Replacement	Reassembly
Installation	Alignment/Adjustment/Calibration	Preventive Maintenance Procedures

PARTS		
Generic Name	Part ID Number	Predicted Life

By: _____



**CONSENT OF SURETY COMPANY
TO FINAL PAYMENT (4.86 /)**

PROJECT: _____	PROJECT NUMBER: _____
OWNER: _____	_____
CONTRACTOR: _____	_____
ENGINEER: <u>Freese & Nichols, Inc.</u>	_____

The Surety Company, on bond of the Contractor listed above for the referenced project, in accordance with the Contract Documents, hereby approves final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety Company of any of its obligations to the Owner under the terms of the Contract and as set forth in said Surety Company's bond.

In witness whereof, the Surety Company has hereunto set its hand this _____ day of _____ 20____.

Surety Company

By _____
Authorized Representative

Title _____

Address:

Attach Power of Attorney

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**CONSENT OF SURETY COMPANY TO REDUCTION
OF OR PARTIAL RELEASE OF RETAINAGE
(4.86 /)**

PROJECT: _____	PROJECT NUMBER: _____
OWNER: _____	_____
CONTRACTOR: _____	_____
ENGINEER: Freese & Nichols, Inc. _____	_____

The Surety Company, on bond of the Contractor listed above for the referenced project, in accordance with the Contract Documents, hereby approves a reduction of or partial release of retainage to the Contractor in the amount of _____ and agrees that payment of this amount to the Contractor shall not relieve the Surety Company of any of its obligations to the Owner under the terms of the Contract, and as set forth in said Surety Company's bond.

In witness whereof, the Surety Company has hereunto set its hand this _____ day of _____ 20____.

Surety Company

By: _____
Authorized Representative

Title: _____

Address:

Attach Power of Attorney

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**CONTRACTOR'S AFFIDAVIT OF
PAYMENT OF DEBTS AND CLAIMS**
(4. /)

PROJECT: _____	PROJECT NUMBER: _____
OWNER: _____	_____
CONTRACTOR: _____	_____
ENGINEER: Freese & Nichols, Inc.	_____

The Contractor, in accordance with the Contract Documents, hereby certifies that, except as listed below, all obligations for all materials and equipment furnished, for all work labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or his property might in any way be held responsible have been paid in full or have otherwise been satisfied in full.

EXCEPTIONS: (If none, write "NONE". The Contractor shall furnish a bond, acceptable to the Owner, for each exception.)

CONTRACTOR _____

BY _____

TITLE _____

Subscribed and sworn to before me this _____ day of _____, 20____.

Notary Public: _____

My Commission Expires: _____

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CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS
(4. /)

PROJECT: _____	PROJECT NUMBER: _____
OWNER: _____	_____
CONTRACTOR: _____	_____
ENGINEER: Freese & Nichols, Inc. _____	_____

The Contractor, in accordance with the Contract Documents, and in consideration for the full and final payment to the Contractor for all services in connection with the project, does hereby waive and release any and all liens, or any and all claims to liens which the Contractor may have on or affecting the project as a result of its contract(s) for the Project or for performing labor and/or furnishing materials in any way connected with the construction of any aspect of the project. The Contractor further certifies and warrants that all subcontractors of labor and/or materials for the Project, except as listed below, have been paid in full for all labor and/or materials supplied to, for, through or at the direct or indirect request of the Contractor prior to, through and including the date of this affidavit.

EXCEPTIONS: (If none, write "NONE". The Contractor shall furnish a bond, acceptable to the Owner, for each exception.)

CONTRACTOR

By _____

Title _____

Subscribed and sworn to before me this _____ day of _____, 20 _____

Notary Public: _____

My Commission Expires: _____

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01 32 16 CONSTRUCTION PROGRESS SCHEDULE

1.00 GENERAL

1.01 REQUIREMENTS

- A. Prepare and submit a Progress Schedule for the Work and update the schedule on a monthly basis for the duration of the Project.
- B. Provide schedule in adequate detail to allow Owner to monitor the Work progress, to anticipate the time and amount of Applications for Payment, and to relate submittal processing to sequential activities of the Work.
- C. Incorporate and specifically designate the dates of anticipated submission of submittals and the dates when submittals must be returned to the Contractor into the schedule.
- D. Assume complete responsibility for maintaining the progress of the Work per the submitted schedule.
- E. Take all requirements of Section 01 35 00 "Special Procedures" into consideration when preparing schedule.

1.02 SUBMITTALS

- A. Submit Progress Schedules in accordance with Section 01 33 00 "Submittal Procedures." Submit schedules within the following times:
 - 1. Preliminary schedule within 10 days after the Notice of Award. The schedule is to be available at the pre-construction conference.
 - 2. Detailed schedule at least 10 days prior to the first payment request.
- B. Submit Progress Schedules with Applications for Payment. Schedules may be used to evaluate the Applications for Payment. Failure to submit the schedule may cause delay in the review and approval of Applications for Payment.

1.03 SCHEDULE REQUIREMENTS

- A. Schedule is to be in adequate detail to:
 - 1. Assure adequate planning, scheduling, and reporting during the execution of the Work.
 - 2. Assure the coordination of the Work of the Contractor and the various Subcontractors and Suppliers.
 - 3. Assist in monitoring the progress of the Work.
 - 4. Assist in evaluating proposed changes to Contract Time and Project schedule.
 - 5. Assist the Owner in review of Contractor's Application for Payment.
- B. Provide personnel with 5 years minimum experience in scheduling construction work comparable to this Project.
- C. Provide the schedule in the form of a time scaled horizontal bar chart which indicates graphically the Work scheduled at any time during the Project. The graph is to indicate:

1. Complete sequence of construction by activity.
 2. Identification of the activity by structure, location, and type of Work.
 3. Chronological order of the start of each item of Work.
 4. The activity start and stop dates.
 5. The activity duration.
 6. Successor and predecessor relationships for each activity. Group related activities or use lines to indicate relationships.
 7. A clearly indicated critical path. Indicate only one critical path on the schedule. The subsystem with the longest time of completion is the critical path where several subsystems each have a critical path. Float time is to be assigned to other subsystems.
 8. Projected percentage of completion, based on dollar value of the Work included in each activity as of the day Applications for Payment are due of each month.
- D. Submit a separate submittal schedule indicating the dates when the submittals are to be sent to the Engineer.
1. List specific dates submittal is to be sent to the Engineer.
 2. List specific dates submittal must be processed in order to meet the proposed schedule.
 3. Allow a reasonable time to review submittals, taking into consideration the size and complexity of the submittal, the submission of other submittals, and other factors that may affect review time.
 4. Allow time for re-submission of the submittals for each item. Contractor is responsible for delays associated with additional time required to review incomplete or erroneous submittals and for the time lost when submittals are submitted for products that do not meet the requirements of the Specifications.
- E. Update the schedule at the end of each monthly partial payment period to indicate the progress made on the Project to that date.

1.04 SCHEDULE REVISIONS

- A. Submit a written report if the schedule indicates that the Project is more than 30 days behind schedule. The report is to include:
1. Number of days Project is behind schedule.
 2. Narrative description of the steps to be taken to bring the Project back on schedule.
 3. Anticipated time required to bring the Project back on schedule.
- B. Submit a revised schedule indicating the action that the Contractor proposes to take to bring the Project back on schedule.
- C. Revise the schedule to indicate any adjustments in Contract Time approved by Change Order.
1. Revised schedule is to be included with Contract Modification Request for which an extension of time is requested.

2. Failure to submit a revised schedule indicates that the modification shall have no impact on the ability of the Contractor to complete the Project on time and that the cost associated with the change of additional plant or work force have been included in the cost proposed for the modification.
- D. Updating the Project schedule to reflect actual progress is not considered a revision to the Project schedule.
- E. Applications for Payment will not be recommended for payment without a revised schedule and if required, the report indicating the Contractor's plan for bringing the Project back on schedule.

1.05 FLOAT TIME

- A. Define float time as the amount of time between the earliest start date and the latest start date of a chain of activities on the construction schedule.
- B. Float time is not for the exclusive use or benefit of either the Contractor or Owner.
- C. Contract Time cannot be changed by the submission of this schedule. Contract Time can only be modified by approved Change Order.
- D. Schedule completion date must be the same as the Contract completion date. Time between the end of construction and the Contract completion date is to be indicated as float time.

END OF SECTION

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01 32 34 VIDEO AND PHOTOGRAPHIC DOCUMENTATION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Provide a video recording of the Site prior to the beginning of construction.
 - 1. Record the condition of all existing facilities in or abutting the construction area (right-of-way) including but not limited to streets, curb and gutter, utilities, driveways, fencing, landscaping, etc. per Paragraph 2.02.
 - 2. Record after construction staking is complete but prior to any clearing.
 - 3. Provide one copy of the recording, dated and labeled to the Construction Manager before the start of construction. Provide additional recording as directed by the Construction Manager if the recording provided is not considered suitable for the purpose of recording pre-existing conditions. The submitted video must be approved by the Construction Manager prior to start of any clearing operations.
- B. Furnish an adequate number of photographs of the Site to clearly depict the completed Project.
 - 1. Provide a minimum of ten different views.
 - 2. Photograph a panoramic view of the entire Site.
 - 3. Photograph all significant areas of completed construction.
 - 4. Completion photographs are not to be taken until all construction trailers, excess materials, trash and debris have been removed.
- C. All photographs, video recordings and a digital copy of this media are to become the property of the Owner. Photographs or recordings may not be used for publication, or public or private display without the written consent of the Owner.

1.02 QUALITY ASSURANCE

- A. Provide clear photographs and recordings taken with proper exposure. View photographs and recordings in the field and take new photographs or recordings immediately if photos of an adequate print quality cannot be produced or video quality is not adequate. Provide photographs with adequate quality and resolution to permit enlargements.

1.03 SUBMITTALS

- A. Submit two DVDs of the video recording as Record Data in accordance with Section 01 33 00 "Submittal Procedures."
- B. Submit Photographic Documentation as Record Data in accordance with Section 01 33 00 "Submittal Procedures."

2.00 PRODUCTS

2.01 PHOTOGRAPHS

- A. Provide photographs in digital format with a minimum resolution of 1280 x 960, accomplished without a digital zoom.
- B. Take photographs at locations acceptable to the Construction Manager.
- C. Provide two color prints of each photograph and a digital copy on a DVD of the photographs taken.
- D. Identify each print on back with:
 - 1. Project name.
 - 2. Date, time, location, and orientation of the exposure.
 - 3. Description of the subject of photograph.
- E. Submit photograph in clear plastic sheets designed for photographs. Place only one photograph in each sheet to allow the description on the back to be read without removing the photograph.
- F. Final photographs are to include two 8-by-10-inch glossy color prints for each of ten photographs selected by the Owner. These photographs are in addition to normal prints.

2.02 VIDEO RECORDING

- A. Provide digital format on DVD that can be played with Windows Media Player in common format in full screen mode.
- B. Identify Project on video by audio or visual means.
- C. Video file size should not exceed 400 MB.
- D. Video resolution shall be 1080p.
- E. The quality of the video must be sufficient to determine the existing conditions of the construction area. Camera panning must be performed while at rest, do not pan the camera while walking or driving. Camera pans should be performed at intervals sufficient to clearly view the entire construction area (100-foot maximum interval).
- F. DVD shall be labeled with construction stationing and stationing should be called out, voice recorded, in the video.
- G. The entire construction area recording shall be submitted at once. Sections submitted separately will not be accepted.
- H. Pump Stations, Ground Storage tanks, water treatment plants and other Site components shall be video recorded in an organized sequential order with major components identified.
- I. Submit DVD in a hard plastic case, clearly label the date(s) the DVD was made, the project name and Owner's project number. If more than one DVD then indicate number as 1 of 2, 2 of 2, etc.

END OF SECTION

01 33 00 DOCUMENT MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Submit documentation as required by the Contract Documents and as requested by the Construction Manager.
- B. Use the Project Management Information System (PMIS) provided by the Owner. Software for the PMIS is FNiManager which has the following system requirements:
 - 1. Operating Systems: Windows 7 or later and OS X v10.8 or later.
 - 2. Supported Internet Browsers: Internet Explorer 11.0 or later, Google Chrome 70.0 or later, Firefox 63.0 or later, Safari 11.0 or later, and Microsoft Edge 17.0 or later.
 - 3. Screen Resolution: The recommended screen resolution is 1280 x 1024 or higher. The minimum screen resolution required to support all features is 1024 x 768.

1.02 QUALITY ASSURANCE

- A. Submit legible, accurate, complete documents presented in a clear, easily understood manner. Documents not meeting these criteria will be returned without review as "Not Approved."

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Review documents prior to submission. Make certifications as required by the Contract Documents and as indicated on Construction Manager provided forms.
- B. Provide a Schedule of Documents to list the documents that are to be submitted, the dates on which documents are to be sent to the Construction Manager for review. Use the form provided by the Construction Manager for this list.
- C. Incorporate the dates for processing documents into the Progress Schedule required by Section 01 33 05 "Construction Progress Schedule."
 - 1. Provide documents in accordance with the schedule so construction of the Project is not delayed.
 - 2. Allow a reasonable time for the review of documents when preparing the Progress Schedule. Assume a 14-day review cycle for each document unless a longer period of time is indicated in the Contract Documents or agreed to by Construction Manager and Contractor.
 - 3. Schedule delivery of review documents to provide all information for interrelated Work at one time.
 - 4. Allow adequate time for processing documents so construction of the Project is not delayed.

1.04 FORMS AND WORKFLOWS

- A. Use the forms or workflow process provided by the Construction Manager for project documentation.

1.05 DOCUMENT PREPARATION AND DELIVERY PROCEDURES

- A. Deliver documents in electronic format as directed by the Construction Manager.
 - 1. Do not leave any blanks incomplete. If information is not applicable, enter NA in the space provided.
 - 2. Deliver all documents in Portable Document Format (PDF).
 - a. Create PDF document using Bluebeam Revu software.
 - b. Create PDF documents from native format files unless files are only available from scanned documents.
 - c. Rotate pages so that the top of each document appears at the top of the monitor screen when opened in PDF viewing software.
 - d. Provide PDF document with adequate resolution to allow documents to be printed in a format equivalent to the document original. Documents are to be scalable to allow printing on standard 8-1/2 x 11 or 11 x 17 paper.
 - e. Submit color PDF documents where color is required to interpret the document.
 - f. Create or convert documents to allow text to be selected for comments or searched using text search features. Run scanned documents through Optical Character Recognition (OCR) software if necessary.
 - g. Flatten markups in documents to prevent markups made by Contractor from being moved or deleted. Flatten documents to allow markup recovery.
 - h. Use Bluebeam Revu software to reduce file size using default settings except the option for “Drop Metadata”. Uncheck the “Drop Metadata” box when reducing file size.
 - i. Add footers to each document with the name of the Project.
- B. Software Requirements:
 - 1. OPT and Contractor will each acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the following software formats:

Document	Document Format
Email	.htm, .rtf, or .txt without formatting that impairs legibility of content on screen or in printed copies
Submittals	Bluebeam PDF
Applications for Payment	Bluebeam PDF and Microsoft® Excel
Progress Schedules	PDF and Schedule in Native Format

Document	Document Format
Layouts and drawings to be submitted to Owner for future use and modification.	Autodesk® AutoCAD .dwg format
Document submitted to OPT for future word processing use and modification.	Microsoft® Word
Spreadsheets and data submitted to OPT for future data processing use and modification.	Microsoft® Excel

2. Software will be the version currently published at the time Contract is signed, unless a specific software version is listed in the Supplementary Conditions. Prior to using any updated version of the software required in this Section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or convert to comply with this Paragraph 1.05.B.

1.06 DOCUMENTATION

- A. Furnish documents as indicated in Section 01 33 01 “Document Register” or in the individual Specification Sections. Submit documents per the procedures described in the Contract Documents.
- B. Submit documents per the Specification Sections shown in the following table:

Document Type	Specification Section
Application for Payment	01 29 00
Certified Test Report	01 33 02 for approval of product 01 40 00 to demonstrate compliance
Change Management	01 26 00
Equipment Installation Report	01 75 00
Graphic Documentation	01 33 06
Notification by Contractor	01 31 13
Operation & Maintenance Manuals	01 33 04
Product Data	01 33 03
Progress Schedules	01 33 05
Record Data	01 31 13
Request for Information	01 31 13
Schedule of Values	01 29 00
Shop Drawing	01 33 02
Substitutions	01 26 00
Suppliers and Subcontractors	01 31 13 01 33 03

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

01 33 00.01 TABLE OF REQUIRED SUBMITTALS

1.00 GENERAL

1.01 REQUIRED SUBMITTALS

- A. The following table lists the submittals required for each Section of the Specifications. Each Section may provide more detailed information regarding the data to be provided for each product, materials, equipment or component required by the Specifications. Provide additional documentation as required by the Contract Documents in accordance with Section 01 33 00 "Submittal Procedures" and each Section and as reasonably requested by the Owner, Construction Manager and Engineer.
- B. Incorporate each submittal in the Construction Schedule and indicate the date each submittal is anticipated to be submitted.

SUBMITTAL SCHEDULE													
Spec Number	Description	Shop Drawing	Sample	Certified Test Report	Certification of Local Field Service	Extended Warranty	Extended Service Agreement	Certificate of Adequacy of Design	Certification of Applicator/Subcontractor	Record Data	Operation and Maintenance Manuals	Equipment Installation Report	Process Performance Bond
01 29 00	Payment Procedures									X			
01 35 00	Special Procedures	X											
03 11 00	Concrete Forming	X		X						X			
03 21 00	Reinforcing Steel	X		X						X			
03 30 00	Cast-In-Place Concrete	X		X						X			
03 40 00	Precast Concrete Manholes	X											
04 20 00	Unit Masonry	X											
05 50 00	Metal Fabrications	X											
05 51 00	Metal Stairs	X											
05 52 00	Pipe and Tube Railings	X											
05 53 00	Metal Gratings	X											
07 11 13.01	Concrete Vault Bituminous Dampproofing	X											
09 96 00	High-Performance Coatings	X											
09 97 16	Pipeline Coatings and Linings	X											

26 01 26	Testing of Electrical Systems			X					X				
26 05 00	Common Work Results for Electrical	X							X	X			
26 05 19	Low Voltage Electrical Conductors & Cables	X		X					X				
26 05 26	Grounding & Bonding for Electrical Systems	X		X									
26 05 29	Hangers and Supports for Electrical Systems	X											
26 05 33	Raceway and Boxes for Electrical Systems	X								X			
26 05 53	Identification for Electrical Systems									X			
26 05 73.01	Electrical Power System Studies	X		X							X		
26 09 23	Lighting Control Devices	X								X			
26 22 13	Low Voltage Distribution Transformers	X								X			
26 24 16.02	Lighting and Branch Panelboards	X											
26 27 26	Wiring Devices	X											
26 28 16	Enclosed Switches and Circuit Breakers	X										X	
26 29 16	Motor Operators for Valves	X								X			
26 29 87	Electrical Control Panels	X		X								X	
26 41 13	Lightning Protection for Structures	X		X									
26 50 00	Lighting	X								X			
31 05 13	Soils for Earthwork	X											
31 23 23.34	Flowable Fill	X		X							X		
31 23 33.13	Trench Safety										X		
31 23 33.16	Trenching and Backfill			X									
33 05 01.02	Ductile Iron Pipe and Fittings	X		X							X		
33 05 01.05	Bar-Wrapped Concrete Cylinder Pipe and Fittings	X		X							X		
33 10 13	Disinfecting of Water Utility Distribution	X											
33 11 13.13	Steel Pipe and Fittings	X		X							X		
33 12 16.13	Miscellaneous Valves and Appurtenances	X										X	
33 12 16.16	Air Release and Air and Vacuum Valves	X						X				X	

33 12 16.23	Gate Valves	X						X			X		
33 12 16.26	Butterfly Valves	X						X			X		
40 90 00	Instrumentation and Control for Process Systems	X								X	X		
40 90 01	Instrumentation	X		X							X		
40 90 02	Supervisory Control and Data Acquisition (SCADA) System	X		X							X		
40 90 02.02	Input/Output List	X											
40 95 43	Communications Interface Equipment	X								X	X		
44 42 60	Submersible Sump Pumps	X									X		

END OF SECTION

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01 34 00 BUY AMERICA REQUIREMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS TO BUY AMERICA

- A. Comply with the latest provisions of Buy America as listed at 23 CFR 635.410. Use steel or iron materials manufactured in the United States except when:
 - 1. The cost of materials, including delivery, does not exceed 0.1% of the total Contract cost or \$2,500, whichever is greater.
 - 2. The contract contains an alternate item from a foreign source steel or iron product and the Contract is awarded based on the alternate item, or
 - 3. The materials are temporarily installed.
- B. Manufacturing is any process that modified the chemical content, physical shape or size, or final finish of a product. Manufacturing begins with initial melting and mixing and continues through fabrication (cutting, drilling, welding, bending, etc.) and coating (paint, galvanizing, epoxy, etc.).

1.02 DOCUMENTATION

- A. Provide documentation of compliance with Buy America provisions. Submit a notarized original of the FORM D-9-USA-1 (Department Form 1818) with the proper attachments for verification of compliance.
- B. Provide a tabulation of the manufactured goods to be provided under this Project to indicate compliance with Buy America requirements.
- C. Provide information and certifications required by Section 01 33 02 "Shop Drawings" and Section 01 33 03 "Product Data" to demonstrate compliance with the Buy America requirements.

1.03 PROVIDING PRODUCTS

- A. Obtain certifications from Subcontractors and Suppliers to indicate that products offered for incorporation into the Project comply with Buy America Provisions. Submit a notarized original of the FORM D-9-USA-1 (Department Form 1818) with the proper attachments for verification of compliance for each Subcontractor and Supplier.

1.04 NONCOMPLIANT PRODUCTS

- A. Noncompliant products are Defective. Unless a Late Waiver is obtained, products are to be removed and replaced with products meeting the Buy America Provisions.
- B. Owner may elect to accept the Defective Work under provisions of the General Conditions, provided the Contract Price is reduced to reimburse the Owner for money lost from funding agencies.

END OF SECTION

01 35 00 SPECIAL PROCEDURES

1.00 GENERAL

1.01 CONSTRUCTION SEQUENCE

- A. Perform the Work as required to complete the entire Project within the Contract Time and in the sequence stipulated below:
- B. Consider the sequences, duration limitations, and governing factors outlined in this Section to prepare the schedule for the Work.
- C. Perform the Work not specifically described in this Section as required to complete the entire Project within the Contract Time.

1.02 SHUT DOWNS AND PLANS OF ACTION

- A. Shut downs of operations or equipment must be planned and scheduled.
 1. Submit a written plan of action for approval for shutting down essential services. These include:
 - a. NTMWD Pipelines.
 - b. Electrical power.
 - c. Control power.
 - d. Process piping.
 - e. Treatment equipment.
 - f. Communications equipment.
 - g. Other designated functions.
 2. Describe the following in the Plan of Action:
 - a. Construction necessary.
 - b. Utilities, piping, or services affected.
 - c. Length of time the service or utility will be disturbed.
 - d. Procedures to be used to carry out the Work.
 - e. Plan of Action to handle emergencies.
 - f. Contingency plan that will be used if the original schedule cannot be met.
 3. Plan must be received by the Owner 2 weeks prior to beginning the Work.

1.03 CRITICAL OPERATIONS

- A. The Owner has identified "Critical Operations" that must not be out of service longer than the designated maximum out of service time and/or must be performed only during the designated times. These have been identified in the table below:
 1. All shutdowns must take place between October 15, 2020 and March 15, 2021 (or contract completion date, whichever is earlier).

Item	Critical Operation	Maximum Time Out of Operation	Hours Operation Can be Shut Down	Liquidated Damages (Dollars per Hour)
1	Shutdown of NTMWD Line for Connection	8 hours	9:00 PM to 5:00 AM	\$1000

- B. Submit a written plan of action for approval for Critical Operation.
 - 1. Describe the following in the Plan of Action:
 - a. Construction necessary.
 - b. Utilities, piping, or services affected.
 - c. Length of time the service or utility will be disturbed.
 - d. Procedures to be used to carry out the Work.
 - e. Plan of Action to handle emergencies.
 - f. Contingency plan that will be used if the original schedule cannot be met.
 - g. List of manpower, equipment, and ancillary supplies. Identify backups for key pieces of equipment such as excavators and pumps and key personnel such as welders.
 - 2. Plan must be received by the Owner 2 weeks prior to beginning the Work.
- C. Work affecting "Critical Operations" is to be performed on a 24-hour a day basis until Owner's normal operations have been restored.
- D. Provide additional work force and equipment as required to complete the work affecting "Critical Operations" within the allotted time.
- E. Include the cost for work affecting "Critical Operations" in the Contract Proposal.
- F. Liquidated damages will be assessed if work on "Critical Operations" is not completed within the time indicated.
 - 1. These items are critical to the for operation of the existing distribution system.
 - 2. Loss of operation of the existing distribution system can subject the Owner to loss of revenue, additional operations cost, and fines from regulatory agencies.
 - 3. Liquidated damages have been established for each critical operation:
- G. Designated Critical Operations are described in more detail as follows:
 - 1. Contractor cannot connect to the NTMWD supply line until the proposed 42" pipeline and meter vault have been tested and accepted.
 - 2. The existing 16" sleeve valve located in the existing meter vault must be relocated to the proposed vault during the shutdown.
 - 3. The existing meter vault and pipeline cannot be removed until the proposed meter vault is in service.

1.04 OWNER ASSISTANCE

- A. The Owner will assist the Contractor in draining the existing pipelines as much as possible through existing blow-off valves. The Contractor will be responsible for providing dewatering pumps, etc. required to completely dewater the facilities and handle any leakage past closed valves.
- B. Due to the need to restore pipelines to service as quickly as possible, verification of welds is impractical. Therefore one of the following welders must be on-Site at all times during tie-ins to existing pipelines and must confirm all welds are adequate:

Thompson	972-262-3600
Rangeline Pipeline Services	682-250-2153
Darrel Fletcher	817-307-8750
Barry Fuller	817-477-3841
Scott Fowler	972-978-7865
Eddie Pierce	817-909-6089
Nash Williams	801-255-5959

END OF SECTION

01 40 00 QUALITY REQUIREMENTS

1.00 GENERAL

1.01 CONTRACTOR'S RESPONSIBILITIES

- A. Control the quality of the Work and verify that the Work meets the standards of quality established in the Contract Documents.
1. Inspect the Work of the Contractor, Subcontractors and Suppliers. Correct defective Work.
 2. Inspect products and materials to be incorporated into the Project. Ensure that Suppliers of raw materials, parts, components, assemblies, and other products have adequate quality control system to ensure that quality products are produced. Provide only products that comply with the Contract Documents.
 3. Provide and pay for the services of an approved professional materials testing laboratory acceptable to the Owner to ensure that products proposed for use fully comply with the Contract Documents.
 4. Provide all facilities and calibrated equipment required for quality control tests.
 5. Provide consumable construction materials of adequate quality to provide a finished product that complies with the Contract Documents.
 6. Perform tests as indicated in this and other Sections of the Specifications. Schedule the time and sequence of testing with the Construction Manager. All quality control testing is to be observed by the Construction Manager or designated representative.
 7. Maintain complete inspection and testing records at the Site and make them available to Owner, Engineer and Construction Manager.
- B. Provide and pay for the services of an approved professional materials testing laboratory acceptable to the Owner to ensure that Work fully complies with the Contract Documents. Provide services of a testing laboratory capable of performing a full range of testing procedures complying with the standards for testing procedures specified. Provide personnel certified to perform the test required. Obtain Owners' approval for the testing laboratory before testing is performed.
- C. Should requirements of this Section conflict with the requirements of the technical Specifications, the technical Specifications shall govern.

1.02 QUALITY ASSURANCE ACTIVITIES BY THE OWNER

- A. Owner may perform its own quality assurance test independent of the Contractor's Quality Control Program or as otherwise described in the Contract Documents. Provide labor, materials, tools, equipment, and related items for testing by the Owner including, but not limited to temporary construction required for testing and operation of new and existing utilities. Assist the Owner, Engineer, Construction Manager, and testing organizations in performing quality assurance activities.
1. Provide access to the Work and to the Supplier's operations at all times Work is in progress.
 2. Cooperate fully in the performance of sampling, inspection, and testing.

3. Furnish labor and facilities to:
 - a. Provide access to the Work to be tested.
 - b. Obtain and handle Samples for testing at the Site or at the source of the product to be tested.
 - c. Provide calibrate scales and measuring devices for the Owner's use.
 - d. Facilitate inspections and tests.
 - e. Provide adequate lighting to allow Owner observations.
 - f. Store and cure test Samples.
 4. Furnish copies of the tests performed on materials and products.
 5. Provide adequate quantities of representative product to be tested to the laboratory at the designated location.
 6. Give the Construction Manager adequate notice before proceeding with work that would interfere with testing.
 7. Notify the Construction Manager and the testing laboratory prior to the time that testing is required. Lead time is to be adequate to allow arrangements to be made for testing.
 8. Do not proceed with any Work until testing services have been performed and results of tests indicate that the Work is acceptable.
 9. Provide complete access to the Site and make Contract Documents available.
 10. Provide personnel and equipment needed to perform sampling or to assist in making the field tests.
 11. Quality assurance testing performed by the Owner will be paid for by the Owner, except for verification testing performed by the Owner, which shall be paid for by the Contractor as described in Paragraph 1.06.
- B. Quality assurance activities of the Owner, Engineer or Construction Manager through their own forces or through contracts with materials testing laboratories and survey crews are for the purpose of monitoring the results of the Contractor's work to see that it is in compliance with the requirements of the Contract Documents.
- C. Quality assurance activities of the Owner and Engineer or non-performance of quality assurance activities:
1. Do not relieve the Contractor of its responsibility to perform Work and furnish materials and products and constructed Work conforming to the requirements of the Contract Documents.
 2. Do not relieve the Contractor of its responsibility for providing adequate quality control measures.
 3. Do not relieve the Contractor of responsibility for damage to or loss of the material, product or Work before Owner's acceptance.
 4. Do not constitute or imply Owner's acceptance.
 5. Do not affect the continuing rights of the Owner after Owner's acceptance of the completed Work.

- D. The presence or absence of the Owner's Resident Representative or Engineer does not relieve the Contractor from any contract requirement, nor is the Owner's Resident Representative or Engineer authorized to change any term or condition of the Contract Documents without the Owner's written authorization in a Field Order or Change Order.
- E. Failure on the part of the Owner, Engineer or Construction Manager to perform or test products or constructed works in no way relieves the Contractor of the obligation to perform Work and furnish materials conforming to the Contract Documents.
- F. All materials and products are subject to Owner's quality assurance observations or testing at any time during preparation or use. Material or products which have been tested or observed or approved by Owner at a supply source or staging area may be re-observed or re-tested by Owner before or during or after incorporation into the Work, and rejected if they do not comply with the Contract Documents.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. A written Quality Management Plan that establishes the methods of assuring compliance with the Contract Documents. Submit this program as Record Data
 - 2. A Statement of Qualification for the proposed testing laboratory. The statement of qualifications is to include a list of the engineers and technical staff that will provide testing services on the Project, descriptions of the qualifications of these individuals, list of tests that can be performed, equipment used with date of last certification and a list of recent projects for which testing has been performed with references for those projects.
 - 3. Test reports per Paragraph 1.07. Reports are to certify that products or constructed works are in full compliance with the Contract Documents or indicate that they are not in compliance and describe how they are not in compliance.
 - 4. Provide Certified Test Reports on materials or products to be incorporated into the Project. Reports are to indicate that material or products are in full compliance with the Contract Documents or indicate that they are not in compliance and describe how they are not in compliance.

1.04 STANDARDS

- A. Provide a testing laboratory that complies with the ACIL (American Council of Independent Laboratories) "Recommended Requirements for Independent Laboratory Qualifications".
- B. Perform testing per recognized test procedures as listed in the various sections of the Specifications, standards of the State Department of Highways and Public Transportation, American Society of Testing Materials (ASTM), or other testing associations. Perform tests in accordance with published procedures for testing issued by these organizations.

1.05 DELIVERY AND STORAGE

- A. Handle and protect test specimens of products and construction materials at the Site in accordance with recognized test procedures.

1.06 VERIFICATION TESTING

- A. Provide verification testing when tests indicate that materials or the results of construction activities are not in conformance with Contract Documents.
- B. Verification testing is to be provided at the Contractor's expense to verify products or constructed works are in compliance after corrections have been made.
- C. Tests must comply with recognized methods or with methods recommended by the testing laboratory and approved by the Engineer.

1.07 TEST REPORTS

- A. Test reports are to be prepared for all tests.
 - 1. Tests performed by testing laboratories may be submitted on their standard test report forms. These reports must include the following:
 - a. Name of the Owner, Project title and number, equipment installer and general Contractor.
 - b. Name of the laboratory, address, and telephone number.
 - c. Name and signature of the laboratory personnel performing the test.
 - d. Description of the product being sampled or tested.
 - e. Date and time of sampling, inspection, and testing.
 - f. Date the report was issued.
 - g. Description of the test performed.
 - h. Weather conditions and temperature at time of test or sampling.
 - i. Location at the Site or structure where the test was taken.
 - j. Standard or test procedure used in making the test.
 - k. A description of the results of the test.
 - l. Statement of compliance or non-compliance with the Contract Documents.
 - m. Interpretations of test results, if appropriate.
 - 2. Submit reports on tests performed by Contractor or his suppliers or vendors on the forms provided in Section 01 31 13.13 "Forms."
 - 3. Engineer will prepare test reports on test performed by the Engineer.
- B. Distribute copies of the test reports to the Construction Manager within 24 hours of completing the test. Flag tests reports with results that do not comply with Contract Documents for immediate attention. Hard copies of test reports are to be distributed to individuals designated at the pre-construction conference:

Recipient	No. of Copies
Owner	2

Engineer	1
Construction Manager	1
Contractor	1

- C. Payment for Work subject to testing may be withheld until the Contractor's quality control test reports of the Work are submitted to the Owner's Resident Representative.

1.08 NON-CONFORMING WORK

- A. Immediately correct any Work that is not in compliance with the Contract Documents or submit a written explanation of why the Work is not to be corrected immediately and when corrective to the Work will be performed.
- B. Payment for non-conforming Work shall be withheld until Work is brought into compliance with the Contract Documents.

1.09 LIMITATION OF AUTHORITY OF THE TESTING LABORATORY

- A. The testing laboratory representatives are limited to providing consultation on the test performed and in an advisory capacity.
- B. The testing laboratory is not authorized to:
 1. Alter the requirements of the Contract Documents.
 2. Accept or reject any portion of the Work.
 3. Perform any of the duties of the Contractor.
 4. Stop the Work.

1.10 QUALITY CONTROL PLAN

- A. Submit Contractor's Quality Control Plan that identifies personnel, procedures, control, instructions, tests, records, and forms to be used. Construction will be permitted to begin only after acceptance of the Quality Control Plan or acceptance of an interim plan applicable to the particular feature of Work to be started. Work outside of the features of Work included in an accepted interim plan will not be permitted to begin until acceptance of a Quality Control Plan or another interim plan containing the additional features of Work to be started.
- B. Content of the Quality Control Plan: The Quality Control Plan shall include, as a minimum, the following to address all construction operations, both on-Site and off-Site, including Work by Subcontractors and Suppliers:
 1. A description of the quality control organization, including a chart showing lines of authority and acknowledgement that the quality control staff shall implement the quality control program for all aspects of the Work specified.
 2. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a quality control function.
 3. A copy of the letter to the Quality Control Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the Quality Control Manager,

including authority to stop Work which does not comply with the Contract Documents or will result in Work that does not comply with the Contract Documents. The Quality Control Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Construction Manager.

4. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of Subcontractors and Suppliers.
 5. Control, verification, and acceptance testing procedures for each specific test to include the test name, Specification paragraph requiring test, feature of Work to be tested, test frequency, person responsible for each test, applicable industry testing standards and laboratory facilities to be used for the test.
 6. Procedures for tracking phases of quality control, verification, and acceptance tests including documentation.
 7. Procedures for tracking construction deficiencies from identification through acceptable corrective action. Indicate how verification that identified deficiencies have been corrected is to be documented.
 8. Reporting procedures, including proposed reporting formats
 9. The name of the proposed testing laboratory along with documentation of qualifications, a list of tests that can be performed, and a list of recent projects for which testing has been performed with references from those projects.
- C. Notification of Changes: After submittal of the Quality Control Plan, the Contractor shall notify the Owner in writing of any proposed changes.
- D. Coordination Meeting: After the Pre-construction Meeting and before start of construction, the Contractor shall meet with the Owner, Engineer and Construction Manager to discuss the Contractor's Quality Control Plan. The Quality Control Plan shall be submitted a minimum of 14 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the Quality Control operations, testing, administration of the system for both on-Site and off-Site Work, and the interrelationship of Contractor's management and control with the Owner's Quality Assurance. Revise the Quality Management Plan to reflect comments and recommended changes resulting from this meeting.

2.00 PRODUCTS

2.01 TESTING APPARATUS

- A. Furnish testing apparatus and related accessories necessary to perform the tests.

3.00 EXECUTION

3.01 QUALITY CONTROL PROGRAM

- A. Perform quality control observations and testing as required in each Section of the Specifications and where indicated on the Drawings.

- B. Provide a quality control program that includes the following phases for each definable Work task. A definable Work task, one which is separate and distinct from other tasks, has separate control requirements, may be provided by different trades or disciplines, or may be work by the same trade in a different environment.
1. Planning Phase: Perform the following before beginning each definable Work task:
 - a. Review the Drawings.
 - b. Review submittals and determine that they are complete in accordance with the Contract Documents.
 - c. Check to assure that all materials and/or equipment have been tested, submitted, and approved.
 - d. Examine the work area to assure that all required preliminary work has been completed and is in compliance with the Contract Documents.
 - e. Examine required materials, equipment, and Sample Work to assure that they are on hand, conform to submittals, and are properly stored.
 - f. Review requirements for quality control inspection and testing.
 - g. Discuss procedures for controlling quality of the Work. Document construction tolerances and workmanship standards for the Work task.
 - h. Check that the portion of the plan for the Work to be performed incorporates submittal comments.
 - i. Discuss results of planning with the Construction Manager. Conduct a meeting attended by the quality control manager, the Construction Manager, superintendent, other quality control personnel as applicable, and the foreman responsible for the Work task. Instruct applicable workers as to the acceptable level of workmanship required in order to meet the requirements of the Contract Documents. Document the results of the preparatory phase actions by separate meeting minutes prepared by the quality control manager and attached to the quality control report.
 - j. Do not move to the next phase unless results of investigations required for the planning phase indicate that requirements have been met.
 2. Work Phase: Complete this phase after the Planning Phase.
 - a. Notify the Construction Manager at least 24 hours in advance of beginning the Work and discuss the review of the planning effort to indicate that requirements have been met.
 - b. Check the Work to ensure that it is in full compliance with the Contract Documents.
 - c. Verify adequacy of controls to ensure full compliance with Contract Documents. Verify required control inspection and testing is performed.
 - d. Verify that established levels of workmanship meet acceptable workmanship standards. Compare with required Sample panels as appropriate.
 - e. Repeat the initial phase for each new crew to work on-Site, or any time acceptable specified quality standards are not being met.

3. Follow-up Phase: Perform daily checks to assure control activities, including control testing, are providing continued compliance with Contract requirements.
 - a. Make checks daily and record observations in the quality control documentation.
 - b. Conduct follow-up checks to correct all deficiencies prior to the start of additional Work tasks that may be affected by the defective Work. Do not build upon nor conceal non-conforming Work.
 - c. Conduct a review of the Work 1 month prior to the expiration of the correction period prescribed in the General Conditions with the Owner and Construction Manager. Correct defects noted during the review.
 - C. Conduct additional planning and review if:
 1. The quality of on-going Work is unacceptable.
 2. Changes are made in applicable quality control staff, onsite production supervision or work crew.
 3. Work on a task is resumed after a substantial period of inactivity.
 4. Other quality problems develop.
- 3.02 CAST-IN-PLACE CONCRETE TESTING
- A. Test cast-in-place concrete in accordance with SECTION 03 30 00 "Cast-In-Place Concrete."
- 3.03 PROTECTIVE COATINGS
- A. Test protective coatings per Section 09 96 00 "High-Performance Coatings".
- 3.04 PIPING SYSTEMS
- A. Test Requirements:
 1. Perform test on piping systems including piping installed between or connected to existing pipe.
 2. Conduct tests on buried pipe to be hydrostatically tested after the trench is completely backfilled. If field conditions permit and if approved by the Engineer, partially backfill the trench and leave the joints open for inspection and conducting of the initial service leak test. Do not conduct the acceptance test until backfilling is complete.
 3. Pneumatically test the buried piping and expose joints of the buried piping for the acceptance test.
 4. Conduct the test on exposed piping after the piping is completely installed, including supports, hangers, and anchors, but prior to insulation and coating application.
 5. Do not perform testing on pipe with concrete thrust blocking until the concrete has cured at least 5 days.
 6. Determine and remedy the cause of the excessive leakage for any pipe failing to meet the specified requirements for water or air tightness.

7. Tests must be successfully completed and reports filed before piping is accepted.
8. Submit a comprehensive plan and schedule for testing to the Engineer for review at least 10 days prior to starting each type of testing.
9. Remove and dispose of temporary blocking material and equipment after completion and acceptance of the piping test.
10. Repair any damage to the pipe coating.
11. Clean pipelines so they are totally free flowing prior to final acceptance.
12. Test piping independently from tests on structures.
 - a. Test method and test pressure depend upon the application of the piping.
 - b. Pressure pipe is defined as piping that is part of a pumped or pressurized system. Perform test for pressure pipe per the procedures indicated in Paragraph 3.04.B.

END OF SECTION

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01 40 01 IBC SPECIAL INSPECTIONS

1.00 GENERAL

1.01 OVERVIEW

- A. The purpose of this Section is to provide the Owner and the Contractor with an understanding of what constitutes special inspections as defined by the International Building Code (IBC), Chapter 17, "Structural Tests and Special Inspections," the Contractor's requirements per IBC and role in enabling the Owner to perform the inspections, and provide the Owner with a Statement of Special Inspection specific to this Project's Special Inspection requirements.
1. IBC Special Inspections are not a substitute for other quality control testing required elsewhere in the contract documents.
 2. IBC Special Inspections may not be performed by the Contractor.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. Enable the Owner and Owner's Agent to conduct the required IBC Special Inspections as outlined below in "Special Inspection Activities by the Owner."
1. Set up pre-construction meeting and coordinate with Owner and Owner's Agent, prior to beginning construction, regarding the specific inspection needs and requirements that will be performed as part of these Special Inspections.
 2. Provide complete access to the Site and make Contract Documents available on-Site.
 - a. Provide and pay for all means necessary to enable inspection access at each location requiring inspection. This includes, but is not limited to, ladders, scaffolding, trench boxes/shielding, fall protection, adequate lighting, adequate ventilation, and designated area(s) for storing inspector equipment and test samples.
 - 1). All required access shall be conducted and constructed in accordance with OSHA.
 - b. Protect Special Inspection test specimens of products and construction materials at the Site in accordance with recognized test procedures.
 - c. Provide materials needed to perform sampling or field tests.
 3. Notify the Owner and Owner's Agent a minimum of 48 hours in advance of when construction activities requiring testing will be performed or when construction activities will limit and/or prevent inspector(s) from observing construction work already performed.
 - a. Provide adequate notice before proceeding with Work that would interfere with sampling, testing, or other required verification.
 - b. Notify the Owner and Owner's Agent prior to the time that testing is required. Lead time is to be adequate to allow arrangements to be made for testing.
 - c. Notify the Owner and Owner's Agent when schedules change. Be in communication with the Owner as soon as a delay is expected.

4. Provide adequate quantities of representative product to be tested to the laboratory at the designated location.
- B. Contractor shall submit the following submittals in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
1. A written schedule that establishes the approximate major and/or critical inspection milestones. Submit this schedule as Record Data. Any alterations to the schedule shall be resubmitted under the original Record Data tracking number with revision designation.
 2. Maintain a log of times and dates when notification is given for an inspection, delay, re-inspection, etc. and who was notified. Submit this log at the end of the job under the next consecutive revision designation as mentioned above.
- C. Special Inspection quality assurance activities are for the purpose of monitoring the results of the Contractor's Work to see that it is in compliance with the requirements of the Contract Documents.
- D. Special Inspection testing requirements mentioned in this Section do not release the Contractor from providing Contractor required testing specified elsewhere in the Contract Documents.
1. Contractor shall provide all testing documentation required in the Contract Documents based solely on Contractor paid testing, which shall be independent of Owner providing testing and testing documentation.
 2. As specified in Section 01 40 00, "Quality Requirements," provide and pay for any additional testing performed by the Contractor or by the Owner as a result of failed Special Inspection tests.
- E. Special Inspection activities or non-performance of Special Inspection activities:
1. Do not relieve the Contractor of its responsibility to perform Work and furnish materials and products and constructed Work conforming to the requirements of the Contract Documents.
 2. Do not relieve the Contractor of its responsibility for providing adequate quality control measures.
 3. Do not relieve the Contractor of its responsibility for damage to or loss of the material, product or Work before Owner's acceptance.
 4. Do not constitute or imply Owner's acceptance.
 5. Do not affect the continuing rights of the Owner after Owner's acceptance of the completed Work.
- F. All materials and products are subject to Owner's quality assurance observations or testing at any time during preparation or use. Material or products which have been tested or observed or approved by Owner at a supply source or staging area may be re-observed or re-tested by Owner before or during or after incorporation into the Work, and rejected if they do not comply with the Contract Documents.

1.03 SPECIAL INSPECTION ACTIVITIES BY THE OWNER

- A. According to the 2015 IBC, Chapter 17, Structural Tests and Special Inspections, the Owner shall employ a registered design professional to act as the Owner's Agent.

This registered design professional shall coordinate and fulfill all required IBC Special Inspection requirements, and as required, this registered design professional in responsible charge (RDPIRC) shall employ one or more approved agencies and/or inspectors to perform inspections during construction on the types of work listed below.

1. Unless not required by the building official or authority having jurisdiction (AHJ), the IBC requires that a Statement of Special Inspections be prepared by the RDPIRC for submittal by the applicant to the AHJ.
 2. The names of individuals and firms to perform the Special Inspections shall be compiled by the RDPIRC. Prior to beginning the Special Inspections, the RDPIRC shall forward a copy of the inspector qualifications to the AHJ.
 - a. Recommended special inspector qualifications for the structural portion of Special Inspection are listed in the Structural Statement of Special Inspection (Attachment A). However, each special inspector shall demonstrate competence, to the satisfaction of the AHJ, for the inspection of the particular type of construction or operation requiring special inspection.
 - b. If requested by the AHJ, each special inspector shall provide written documentation to the building official demonstrating his or her competence and relevant experience or training.
 3. The RDPIRC shall forward a copy of all reports, tests, and certifications, as a result of the Special Inspections to the AHJ and the Contractor.
 - a. Discrepancies shall be brought to the immediate attention of the Contractor and Owner.
- B. Statement of Special Inspections: The Structural Statement of Special Inspections, specific to this Project, is located at the end of this Section (Refer to Attachment A). All other required IBC required Special Inspections shall be determined by the RDPIRC and coordinated with Attachment A prior to submission to the RDPIRC.

2.00 PRODUCTS (NOT USED)

3.00 EXECUTION

3.01 CONTRACTOR TEST AND INSPECTION LOG

- A. Contractor Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date Owner was notified of impending construction work that requires testing and/or that would interfere with subsequent inspections.
 2. Date construction work in question was completed.
 3. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project Site. Post changes and revisions as they occur. Provide access to test and inspection log for Owner's Agent reference during normal working hours.

3.02 CONTRACTOR REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration in adjoining areas with durable seams that are invisible as possible.
- B. Protect construction exposed by or for special inspection activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for the Special Inspection activities.

END OF SECTION

ATTACHMENT A

STRUCTURAL STATEMENT OF SPECIAL INSPECTIONS

This Statement of Special Inspections has been prepared in accordance with 2015 International Building Code, Chapter 17, by the Structural Engineer of Record for the following Project:

Project Name: Custer Road PS Meter Vault Relocation

Location: Town of Prosper

Owner: North Texas Municipal Water District

Structural Engineer of Record: Prabin KC, P.E

Design Professional in Responsible Charge: TBD

Special Inspector for _____: TBD

Special Inspector for _____: TBD

Special Inspector for _____: TBD

Abbreviations

Inspectors

AWS-CWI: An American Welding Society/American Institute of Steel Construction certified welding inspector.

AWS/AISC-SSI: An American Welding Society certified structural steel inspector.

ACI: An American Concrete Institute certified technician, certified in the applicable construction type.

EIT: An Engineer-In-Training, a graduate engineer who has passed the Fundamentals of Engineering exam, and is under the direct supervision of a PE.

NICET: A National Institute for Certification in Engineering Technologies certified technician, certified in the applicable construction type.

PE: A licensed professional engineer and/or a structural engineer (SE) competent in the area of construction being inspected.

Specifications

ACI 318: American Concrete Institute Building Code Requirements for Structural Concrete.

AISC 360: American Institute of Steel Construction, Specification for Structural Steel Buildings.

ASTM: American Society of Testing and Materials.

AWS: American Welding Society

RCSC: RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts.

Common Words

C: Continuous observation of specified construction activity.

P: Periodic observation of specified construction activity.

CFSF: Cold formed steel framing.

CD: Contract Documents and/or Shop Drawings (if item is performance specified).

Special Inspectors minimum qualifications are listed below for each area of competency.

Special Inspector Qualifications		
Applicable IBC Section	Minimum Inspector Qualifications	Remarks
1704.2.5 Fabricators	N/A	Inspection of a fabrication facility is not required if the fabricator is exempt per IBC. Exemption typically requires a manufacturer is certified by an independent organization (e.g. AISC, IAS, SJI, or NPCA).
1705.2 Steel Construction	AWS-CWI AWS/AISC-SSI, PE, or EIT	All welds shall be inspected by an AWS-CWI.
1705.3 Concrete Construction	ACI or NICET, PE, or EIT AWS-CWI	All welds shall be inspected by an AWS-CWI.
1705.3 Post-Installed Concrete Anchors	PE	Professional engineer performing inspection shall have knowledge of post-installed anchor installation requirements and experience in the design and specifying post-installed anchors.
1705.4 Masonry Construction	ACI or NICET, PE, or EIT AWS-CWI	All welds shall be inspected by an AWS-CWI.
1705.5 Wood Construction	Inspector, PE, or EIT	Inspector must have a minimum of 5 years of related experience.
1705.6 Soils	ACI, NICET, PE, or EIT	
1705.7 Driven Deep Foundations	NICET, PE, or EIT	
1705.8 Cast-in-Place Deep Foundations	NICET, PE, or EIT	
1705.9 Helical Pile Foundations	NICET, PE, or EIT	

Concrete Construction

The inspection requirements for this type of construction include cast-in-place concrete.

Verification and Inspection	Frequency		Remarks
	C	P	
Formwork	-	X	Verify formwork for shape, location and dimensions of the concrete member being formed are in conformance with CD.
Reinforcing steel material and type	-	X	Verify size of bars and/or stressing strands, ASTM standard, and grade are in conformance with CD.
Reinforcing steel position	-	X	Verify quantity and spacing of bars and/or stressing strands, concrete clear cover on all sides. Verify lap splice type, location, and size. Verify no welding of reinforcing except where specifically noted.
Cast-in-Place anchors	-	X	Verify size, type, position, and embedment prior to concrete placement. Verify position after concrete placement.
Cast-in-Place anchors	X	-	Verify placement and consolidation of concrete around anchors.
Mix design	-	X	Verify batch plant tickets' mix number matches approved mix design for each mix design and application.
Fresh concrete samples	X	-	At the same time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete. Sample per ASTM C31, C143, C231 (or C173), C1064. Frequency shall be per ACI 318: 5.6
Placement technique	X	-	At the time of concrete or shotcrete placement, verify that proper application techniques are being implemented per the CD and ACI 301.
Curing technique	-	X	Verify that approved means of curing and extreme weather protection are implemented in accordance with the CD.

Post-Installed Concrete Anchors

The inspection requirements for this type of construction include adhesive and expansion type anchors installed in hardened concrete and masonry construction.

For each construction personnel, anchor type, diameter, and embedment the inspection of initial anchors placed shall be continuous based on the requirements below. After initial anchor placement inspections have been performed, then inspector may perform quality assurance on a periodic basis.

Any change in personnel or anchor type shall require an initial continuous inspection as indicated here.

Verification and Inspection	Frequency		Remarks
	C	P	
Inspection tasks prior to anchor hole drilling	-	X	Verify all personnel are qualified to install anchors. Installation of adhesive anchors horizontally or upwardly inclined shall be performed by personnel certified by an acceptable program.
	-	X	Verify contractor has manufacturer's printed installation instructions (MPII) on site and available for reference by construction personnel.
	-	X	If manufacturer does not have a representative on site, then special inspector shall review MPII with contractor personnel prior to beginning construction.
	-	X	Verify edge distance limitations indicated in CD's and existing reinforcing locations compared to proposed anchor hole locations.
	-	X	Verify drill bit diameter matches MPII for anchor diameter indicated in CD's. Special inspector does not need to be present during actual drilling of holes.
Inspection tasks after drilling prior to anchor placement	-	X	Verify every hole diameter is in accordance with MPII and verify embedment is in accordance with CD's and hole depth is in accordance with MPII (hole depth may need to exceed embedment depth, refer to MPII).
	-	X	Verify cleaning operations are in accordance with CD's and MPII.
	-	X	Verify anchor type, material, diameter, and length.
	-	X	Where adhesive anchors are specified: verify adhesive type is per CD's, adhesive expiration date, and adhesive dispensing equipment is per MPII.
	-	X	Verify that for horizontal and upwardly inclined adhesive anchors have all MPII required installation items (e.g. piston-plug)
Inspection tasks during anchor placement	-	X	Verify that all anchors are installed in accordance with MPII.

Masonry Construction – Level B

The inspection requirements for this type of construction include load bearing and reinforced concrete masonry construction.

Verification and Inspection	Frequency		Remarks
	C	P	
Grout and mortar mixes	-	X	Verify grout and mortar mixes on site match the CD and approved submittals.
CMU units	-	X	Verify CMU units on site match the CD and approved submittals.
Mortar joints	-	X	Verify application of mortar at head and bed joints, joint dimensions, and tooled joint surface are as specified in the CD.
Reinforcement	-	X	Verify the correct use of rebar positioners and the position of reinforcing bars matches what is specified in the CD. Verify the correct ASTM, grade, and spacing are being used.
Joint reinforcement	-	X	Verify joint reinforcement is of the type and size specified and is installed in accordance with the CD.
Member sizes	-	X	Verify size and location of structural elements per ACI 530.1 article 3.3F and CD.
Anchors	-	X	Verify anchor size, grade, type, location, and spacing. Verify grouted cells are provided where required for cast-in-place and post-installed anchors.
Reinforcement lap splices	-	X	Verify lap lengths being used. If laps are welded, then provide continuous observation, and verify personnel, equipment, materials, and welds per AWS D1.4. Provide 100% visual inspection of all welds.
Prior to Grouting	-	X	Verify grout space is clean, protrusions of mortar into cell cavity are less than 1/2", minimum grout space dimensions are provided, and reinforcing and connectors are correctly located as specified in CD.
Grouting	X	-	Verify compliance with code and construction documents.
Grout slump	-	X	Verify correct slump per ASTM C143 for each lift, but not less than one test per 2 cubic yards and grout is consolidated per ACI 530.1 article 3.5E.
Cold weather	-	X	Verify protection of masonry during cold weather in accordance with the CD.

Soils

The inspection requirements for this type of construction include structural fill and compacted fill.

Verification and Inspection	Frequency		Remarks
	C	P	
Subgrade for shallow footings	-	X	Verify that materials below shallow foundations are adequate to achieve the design bearing capacity, excavations are extended to the proper depth, and have reached the proper material.
Backfill materials	-	X	Perform classification and testing of compacted fill materials. Test per ASTM D422, D1140, and D698 as required to verify fill materials are in accordance with the CD.
Subgrade preparation	-	X	Verify the use of proper subgrade preparation per the CD, including but not limited to proof rolling and scarifying.
Compaction	X	-	Verify proper fill materials, densities, and lift thicknesses during placement and compaction of fill is in accordance with the CD. Test density of each lift per ASTM D698.

END OF ATTACHMENT A

01 45 16.16 HYDROSTATIC TESTING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Perform a hydrostatic pressure test on each valved or plugged section of newly laid pipe after the pipe has been backfilled. Perform hydrostatic pressure test by raising the pressure in the pipe section to the required test pressure for the duration defined in Paragraph 3.02.
- B. Plugs may be installed in concrete cylinder or steel pipe at intermediate locations for the purpose of testing shorter lengths of pipe at the Contractor's option. No additional compensation will be paid to the Contractor for testing at intermediate locations if Contractor uses this option.
- C. Obtain water from the Owner for filling the pipeline for the hydrostatic test. Provide the necessary piping, connection, pressure reducing and backflow prevention equipment required to conduct the test. Fill the new pipeline through a backflow prevention device. Leave the pipeline full of water upon completion of the hydrostatic test, unless internal test plugs must be removed to allow construction to continue or where pipe will gravity drain.
- D. Purchase water required for re-testing of the pipeline from the Owner. Water will be sold to the Contractor at published rates.

1.02 SUBMITTALS

- A. Submit Hydrostatic Pipe Test Reports per Section 01 33 00 "Submittal Procedures."

1.03 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. American Water Works Association (AWWA):
 - a. AWWA M9 – Concrete Pressure Pipe.
 - b. AWWA M11 – Steel Pipe - A Guide for Design and Installation.

2.00 PRODUCTS (NOT APPLICABLE)

3.00 EXECUTION

3.01 GENERAL

- A. Perform hydrostatic test on bar-wrapped, concrete cylinder pipe in accordance with AWWA M9 and the Supplier's recommendations.
- B. Perform hydrostatic test on steel pipe in accordance with AWWA M11 and the Supplier's recommendations.

3.02 TEST CONDITIONS

- A. Test pipe at the test pressure for the duration as indicated below for the various pipe materials:

Pipe Type	Duration (hours)	Test Pressure (psi)
Bar-wrapped concrete cylinder pipe	8	150
Steel pipe	8	150

3.03 PROCEDURE

- A. Bar-Wrapped Concrete Cylinder Pipe and Steel Pipe:
1. Hydrostatically test the pipe after backfill over the test section of pipe has been completed for 7 days. Slowly fill the line with water and vent all air from the pipeline during filling.
 2. Allow the pipe to stand under a slight pressure for at least 48 hours to allow the mortar lining to become saturated and/or to allow the escape of remaining air trapped in the line. Examine bulkheads, valves, manholes, flanges, and connections for leaks during this period.
 3. Stop leaks before continuing with the test.
 4. Measure water volume during the test if existing valves in the main line leak during the test. Measure the water volume leaking from the valve through a meter or by other means approved by the Construction Manager. Furnish all necessary equipment and include the cost for this effort in the Contract Price.
 5. Expel all air from the pipe before applying the specified test pressure. Provide taps in the line to expel air from high points where air valves are not provided. These taps must be made by the pipe manufacturer and approved by the Engineer. Tightly plug the tap after tests are complete. Include the cost for these taps in the Contract Price.

3.04 EXAMINATION UNDER PRESSURE

- A. Inspect the pipe during the test to locate any leaks or breaks, defective joints, cracked or defective pipe, fittings, or valves. Correct defective Work identified during the pressure test.
- B. Correct all identified leaks even if leakage is within the parameters for permissible make up water per Paragraph 3.05.
- C. Test the pipe again after defective Work has been corrected. Repeat the test and correction of defective Work until satisfactory test results are obtained.

3.05 PERMISSIBLE MAKEUP WATER

- A. Measure make up water required for the section of pipe being tested. Makeup water is the volume of water pumped into the test section of pipe necessary to maintain the specified test pressure after the pipe has been filled with water and the air expelled.
- B. The maximum acceptable volume of makeup water for steel or bar-wrapped pipe installations is 10 gallons per inch of pipe diameter per mile of pipe tested per 24

hours. Calculate the maximum acceptable volume of makeup water using the following equation:

$$V_m = \frac{10DL}{5280}$$

Where:

V_m is the maximum acceptable volume of makeup water in gallons for 24 hours

D is the nominal pipe diameter in inches

L is the length of the pipe test section in feet

As an example the allowable amount of makeup water for a test section of 2500 feet of 60 inch diameter pipe would be: $10 \times 60 \times 2500 / 5280 = 284$ gallons

END OF SECTION

01 50 00 TEMPORARY FACILITIES AND CONTROLS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Contractor may elect to furnish temporary facilities, including Resident Representative's field office and the Contractor's field offices, storage sheds, and temporary utilities needed to complete the Work.
- B. Furnish, install, and maintain temporary project identification signs. Provide temporary on-site informational signs to identify key elements of the construction facilities at all sites. Do not allow other signs to be displayed.

1.02 QUALITY ASSURANCE

- A. Design Criteria: Furnish a total electrical heating and cooling system for the Resident Representative's field office capable of maintaining the following minimum design criteria:
 - 1. Heating: Minimum 75 degrees ID temp @ 10 ambient.
 - 2. Cooling: Minimum 75 degrees ID temp @ 105 ambient.
 - 3. Relative humidity: 48 to 54 percent.
- B. Testing: Inspect and test each service before placing temporary utilities in use. Arrange for all required inspections and tests by regulatory agencies, and obtain required certifications and permits for use.

1.03 DELIVERY AND STORAGE

- A. Arrange transportation, loading, and handling of temporary buildings and sheds.

1.04 JOB CONDITIONS

- A. Locate buildings and sheds at the Site as indicated or as approved by the Owner.
- B. Prepare the Site by removing trees, brush, or debris and performing demolition or grubbing needed to clear a space adequate for the structures.
- C. Pay for the utilities used by temporary facilities during construction.
- D. Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in the performance of the Work. Provide Resident Representative's field office completely installed and ready for occupancy and use within 7 days of the Notice to Proceed.
- E. Maintain, expand as required, and modify temporary services and facilities as needed throughout the progress of the Work.
- F. Do not remove services and facilities until they are no longer needed.
- G. Operate temporary facilities in a safe and efficient manner.
 - 1. Do not overload temporary services or facilities.
 - 2. Do not let temporary services or facilities interfere with the progress of the Work.

3. Do not allow unsanitary conditions, public nuisance, or hazardous conditions to develop or exist at the Site.
4. Do not permit freezing of pipes, flooding, or the contamination of water.
5. Maintain Site security and protection of the facilities.

1.05 OPTIONS

- A. Construction offices may be prefabricated buildings on skids or mobile trailers.
- B. Storage sheds may be prefabricated buildings on skids or truck trailers.

2.00 PRODUCTS

2.01 SIGN MATERIALS

- A. Provide new or used signs, wood or metal with structure and framing in sound condition. Materials are to be structurally adequate and suitable for the indicated finish.
- B. Provide 3/4-inch exterior grade A/D face veneer plywood with medium density overlay for sign surface.
- C. Bolts, brackets, fasteners, and other hardware are to be galvanized or stainless steel.
- D. Provide exterior quality coatings.

2.02 TEMPORARY STORAGE BUILDINGS

- A. Furnish storage buildings of adequate size to store any materials or equipment delivered to the Site that might be affected by weather.

2.03 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities at the Site from the Notice to Proceed until Project conclusion. Maintain these facilities in a clean and sanitary condition at all times and comply with the requirements of the local health authority. On large sites, provide portable toilets at such locations that no point in the Site shall be more than 600 feet from a toilet.
- B. Use these sanitary facilities. Do not use rest rooms within existing or Owner-occupied buildings.

2.04 TEMPORARY HEAT

- A. Provide heating devices needed to protect the building during construction.
 1. Provide fuel needed to service the heating devices.
 2. Attend heating devices at all times.
 3. Do not allow heaters to operate overnight without someone in attendance.

2.05 TEMPORARY UTILITIES

- A. Provide all temporary utilities needed during construction, testing, disinfection, and startup of the Work, including electrical power, water, and telephone. Include costs associated with furnishing temporary utilities in the Contract Price.
 - 1. Provide a source of temporary electrical power of adequate size for the construction procedures.
 - a. Provide electrical pole and service that complies with OSHA and other safety requirements and the requirements of the power company.
 - b. Make the electrical power available to the trades as needed.
 - c. Provide extensions to the various parts of the buildings as needed.
 - d. Provide junction boxes in such an arrangement that distribution boxes are available within 75 feet of any part of the structure.
 - 2. Provide for temporary water. Extend water to the Site and maintain source until such time that the permanent water supply can be extended to the Site. Include the cost of water, costs for construction, testing, disinfection, and startup of the Work in the Contract Price.
 - 3. Provide telephone service to the Site and install telephones inside the Contractor's and the Engineer's office.
- B. Make arrangements with the local utility company, comply with utility company's requirements and pay for the utility costs during construction, testing disinfection, and startup of the Work.
- C. Make utilities available to the trades during construction, testing, disinfection, and startup.

3.00 EXECUTION

3.01 LOCATION OF TEMPORARY FACILITIES

- A. Locate all temporary facilities in an area that will not interfere with any Work to be performed under this Contract.
- B. Construct and install signs at locations as required by applicable regulatory agencies or as selected by the Owner. Install informational signs at the height of optimum visibility, on ground-mounted poles or attached to temporary structural surfaces.

3.02 PROJECT IDENTIFICATION AND SIGNS

- A. Provide Project identification signs of the size, lettering, and construction indicated by the Owner and in accordance with specified requirements.

3.03 TEMPORARY LIGHTING

- A. Once a building envelope is complete and waterproof, provide temporary lighting inside the building.
 - 1. Lighting shall be adequate to perform Work within any space.
 - 2. Lights shall be left in position in such a manner that every space has temporary light at all times.

3. Temporary lights may be removed once the permanent lighting is in service.
 - B. Provide portable flood lights at any time that Work will be performed outside the structure at night. Provide adequate lighting to provide sufficient light at any location Work is being performed.
- 3.04 DRINKING WATER
- A. Provide field offices with potable water for Owner's and Engineer's office. Bottled drinking water is to be provided with a dispenser and cooling apparatus.
 - B. Pay for services and maintain daily.
- 3.05 CONSTRUCTION FENCE
- A. Install and maintain a construction fence around the Site and/or around the storage yard as indicated. Fence may be wood picket or chain link construction. Provide gates with padlocks.
- 3.06 REMOVAL OF TEMPORARY FACILITIES
- A. Remove temporary buildings, sheds, and utilities at the conclusion of the Project and restore the Site to original condition or finished in accordance with the Contract Documents.
 - B. Remove informational signs upon completion of construction.
 - C. Remove Project identification signs, framing, supports, and foundations upon completion of the Project.
- 3.07 MAINTENANCE AND JANITORIAL SERVICE
- A. Provide janitorial service (sweeping/mopping) for the Owner's and Engineer's office on a weekly basis or as requested. Trash receptacles are to be emptied daily.
 - B. Maintain signs and supports in a neat, clean condition. Repair damage to structures, framings, or signs.
 - C. Repair any damage to permanent structures or finishes caused by placement or removal of temporary signage.

END OF SECTION

01 57 00 TEMPORARY CONTROLS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Provide labor, materials, equipment and incidentals necessary to construct temporary facilities to provide and maintain control over environmental conditions at the Site. Remove temporary facilities when no longer needed.
- B. Construct temporary impounding works, channels, diversions, furnishing and operation of pumps, installing piping and fittings, and other construction for control of conditions at the Site. Remove temporary controls at the end of the Project.
- C. Provide a Storm Water Pollution Prevention Plan in accordance with TCEQ General Permit TXR150000, file required legal notices and obtain required permits prior to beginning any construction activity.
- D. Provide labor, materials, equipment, and incidentals necessary to prevent storm water pollution for the duration of the Project. Provide and maintain erosion and sediment control structures as required to preventive sediment and other pollutants from the Site from entering any storm water system, including open channels. Remove pollution control structures when no longer required to prevent storm water pollution.

1.02 QUALITY ASSURANCE

- A. Construct storm water pollution prevention measures prior to the beginning of construction and maintain these during construction until final stabilization has been achieved for the area protected.
- B. Plan and conduct all land-disturbing activities to minimize the area to be exposed at any one time. Minimize the time of exposure, off-site erosion, sedimentation, and adverse water quality impacts.
- C. Manage surface water runoff originating upgrade of an exposed area to minimize erosion and sediment loss during the period of exposure.
- D. Install measures to control both the velocity and rate of release so as to minimize erosion and sedimentation of the receiving water body (i.e., ditch, channel, stream) in accordance with regulatory requirements and as directed by the Owner, Construction Manager or the Engineer.
- E. Periodically clean out and dispose of all sediment and other pollutants as necessary to maintain the treatment capacity of each pollution control feature. Clean out and properly dispose of all sediment and other storm water pollutants at the time of completion of the Work.

1.03 SUBMITTALS

- A. Provide copies of notices, records and reports required by Paragraph 1.05 as Record Data in accordance with Section 01 33 00 "Submittal Procedures."

1.04 STANDARDS

- A. Provide a storm water pollution prevention plan that complies with Local, State, and Federal requirements. Comply with all requirements of the Texas Commission on Environmental Quality General Permit (TXR150000) for storm water discharges from construction activities under the Texas Pollutant Discharge Elimination System (TPDES) program.
- B. Perform Work to comply with “Best Practice” as established by the North Central Texas Council Of Governments (NCTCOG) integrated Storm Water Management (iSWM) Design Manual for Construction or the local agency of jurisdiction.

1.05 PERMITS

- A. Submit a copy of the Construction Site Notice to the Operator of any Municipal Separate Storm Sewer System (MS4) receiving construction site discharge prior to beginning construction activity.
- B. Post a copy of the Construction Site Notice at the construction site in a location where it is readily available for viewing by the general public and Local, State, and Federal authorities prior to starting construction activities and maintain the posting until completion of the construction activities.
- C. Maintain copies of a schedule of major construction activities, inspection reports, and revision documentation with the storm water pollution prevention plan (SWPPP) required under the TPDES General Permit (TXR150000) for Storm Water Discharges from Construction Activities for all projects.
- D. Post a copy of the NOI at the Site in a location where it is readily available for viewing by the general public and Local, State, and Federal authorities prior to starting construction activities and maintain the posting until completion of the construction activities.
- E. Maintain copies of a schedule of major construction activities, inspection reports, and revision documentation with the storm water pollution prevention plan (SWPPP) required under the TPDES General Permit (TXR150000) for Storm Water Discharges from Construction Activities for all projects.

1.06 POLLUTION CONTROL

- A. Prevent the contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations. Provide adequate measures to prevent the creation of noxious air-borne pollutants. Prevent dispersal of pollutants into the atmosphere. Do not dump or otherwise discharge noxious or harmful fluids into drains or sewers, nor allow noxious liquids to contaminate public waterways in any manner.
- B. Provide equipment and personnel and perform emergency measures necessary to contain any spillage.
- C. Contain chemicals in protective areas and do not dump on soil. Dispose of such materials at off-site locations in an acceptable manner.
- D. Excavate contaminated soil and dispose at an off-site location if contamination of the soil does occur. Fill resulting excavations with suitable backfill and compact to the density of the surrounding undisturbed soil.

- E. Provide documentation to the Owner which states the nature and strength of the contaminant, method of disposal, and the location of the disposal site.
- F. Comply with local, State and Federal regulations regarding the disposal of pollutants.
- G. Groundwater or run-off water which has come into contact with noxious chemicals, sludge, or sludge-contaminated soil is considered contaminated. Contaminated water must not be allowed to enter streams or water courses, leave the Site in a non-contained form or enter non-contaminated areas of the Site.
- H. Pump contaminated water to holding ponds constructed by the Contractor for this purpose, or discharge to areas on the interior of the Site, as designated by the Engineer.
- I. Construct temporary earthen dikes or take other precautions and measures as required to contain the contaminated water and pump to a designated storage area.
- J. Wash any equipment used for handling contaminated water or soil within contaminated areas three times with uncontaminated water prior to using such equipment in an uncontaminated area. Dispose of wash water used to wash such equipment as contaminated water.

1.07 EARTH CONTROL

- A. Remove excess soil, spoil materials and other earth not required for backfill at the time of generation. Control stock pile material to eliminate interference with Contractor and Owner's operations.
- B. Dispose of excess earth off the Site. Pay cost for disposal unless otherwise noted. Provide written approval by the property owner for all disposal on private property, and approval by the Owner if such disposal affects the use of Site or other easements.
- C. Place excess excavated material and neatly spread on tracts of land on which the pipeline is being constructed and where the property owner requests such material and the Construction Manager approves.

1.08 MAINTENANCE OF WATER

- A. Manage water resulting from rains or ground water at the Site. Maintain trenches and excavations free of water at all times. Provide and maintain pumps as necessary to remove excess water. Direct water away from the Site to prevent damage to surrounding property.

1.09 WATER MAINTENANCE AT BORROW AREAS

- A. Maintain the borrow areas in a drainable condition or provide means for removal of accumulations of surface water.

2.00 PRODUCTS

2.01 MATERIALS

- A. Provide materials meeting regulatory requirements.

3.00 EXECUTION

3.01 CONSTRUCTING, MAINTAINING AND REMOVING TEMPORARY CONTROLS

- A. Construct temporary controls in accordance with regulatory requirements.
- B. Maintain controls in accordance with regulatory requirements were applicable, or in accordance with the requirements of the Contract Documents.
- C. Remove temporary control when no longer required, but before the Project is complete. Correct any damage or pollution that occurs as the result of removing controls before the point where they are no longer required.

END OF SECTION

01 70 00 EXECUTION AND CLOSEOUT REQUIREMENTS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Comply with requirements of the General Conditions and specified administrative procedures in closing out the Construction Contract.

1.02 SUBMITTALS

- A. Submit affidavits and releases on forms shown in Section 01 31 13.13 "Forms."

1.03 SUBSTANTIAL COMPLETION

- A. Submit written notification that the Work or designated portion of the Work is substantially complete to the Construction Manager when the Work is considered to be substantially complete per the General Conditions. Include a list of the items remaining to be completed or corrected before the Project will be considered to be complete.
- B. Construction Manager and Engineer shall visit the Site to observe the Work within a reasonable time after notification is received to determine the status of completion.
- C. Engineer shall issue notification to the Contractor that the Work is either substantially complete or that additional Work must be performed before the Project may be considered substantially complete.
 - 1. Engineer shall notify the Contractor in writing of items that must be completed before the Project can be considered substantially complete.
 - a. Correct the noted deficiencies in the Work.
 - b. Issue a second written notice with a revised list of deficiencies when Work has been completed.
 - c. Construction Manager and Engineer shall revisit the Site and the procedure shall begin again.
 - 2. Engineer shall issue a tentative Certificate of Substantial Completion to the Owner when the Project is considered to be substantially complete. Certificate shall include a tentative list of items to be corrected before final payment.
 - a. Owner will review and revise the list of items and notify the Engineer of any objections or other items that are to be included in the list.
 - b. Engineer shall prepare and send to the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be corrected or completed.
 - c. Review the list and notify the Engineer in writing of any objections within 10 days of receipt of Certificate of Substantial Completion.

1.04 FINAL INSPECTION

- A. Submit written certification in the form indicated in Section 01 31 13.13 “Forms” when the Project is complete and:
 - 1. Contract Documents have been reviewed.
 - 2. Work has been completed in compliance with the Contract Documents.
 - 3. Equipment and systems have been tested per Contract Documents and are fully operational.
 - 4. Final Operations and Maintenance Manuals have been provided to the Owner and all operators training has been completed.
 - 5. Specified spare parts and special tools have been provided.
 - 6. Work is complete and ready for final inspection.
- B. Construction Manager and Engineer shall make an inspection with the Owner and appropriate regulatory agencies to determine the status of completeness within a reasonable time after the receipt of the Certificate.
- C. Engineer shall issue notice that the Project is complete or notify the Contractor that Work is not complete or is defective.
 - 1. Submit the request for final payment with Closeout submittals described in Paragraph 1.07 if notified that the Project is complete and the Work is acceptable.
 - 2. Upon receipt of notification from the Engineer that Work is incomplete or defective, take immediate steps to remedy the stated deficiencies. Send a second certification to the Engineer when Work has been completed or corrected.
 - 3. Construction Manager and Engineer shall re-visit the Site and the procedure will begin again.

1.05 RE-INSPECTION FEES

- A. Pay fees to the Owner to compensate the Construction Manager and Engineer for re-inspection of the Work required by the failure of the Work to comply with the claims of status of completion made by the Contractor.
- B. Owner may withhold the amount of these fees from the Contractor's final payment.
- C. Cost for additional inspections will be billed to the Owner by the Construction Manager and Engineer for the actual hours required for the inspection and preparation of related reports in accordance with the rates in the Supplemental Conditions

1.06 CLOSEOUT SUBMITTALS TO THE ENGINEER

- A. Record drawings per Section 01 31 00 “Project Coordination.”
- B. Keys and keying schedule.
- C. Warranties and bonds.

- D. Evidence of payment or release of liens on the form indicated in Section 01 31 13.13 "Forms" and as required by the General Conditions.
- E. Releases from property owners of land outside the easement which were used by the Contractor.
- F. Consent from Surety to Final Payment.
- G. Equipment Installation Reports on equipment.
- H. Shop Drawings, Record Data, Operations and Maintenance Manuals, and other submittals as required by the Contract Documents.
- I. Specified spare parts and special tools.
- J. Certificates of Occupancy, operating certificates, or other similar releases required to allow the Owner unrestricted use of the Work and access to services and utilities.
- K. Evidence of final, continuing insurance, and bond coverage as required by the Contract Documents.
- L. Compile Equipment List on compact disc in Microsoft Excel format containing information indicated in Section 01 78 23 "Operations and Maintenance Data" for all equipment included in the Contract Documents. Equipment List shall be developed using Equipment List Form provided in Section 01 31 13.13 "Forms."

1.07 FINAL PAYMENT REQUEST

- A. Submit a preliminary final payment request. This request is to include adjustments to the Contract Amount for:
 - 1. Approved Change Orders.
 - 2. Allowances not previously adjusted by Change Order.
 - 3. Unit prices.
 - 4. Deductions for defective Work that has been accepted by the Owner.
 - 5. Penalties and bonuses.
 - 6. Deductions for liquidated damages.
 - 7. Deductions for re-inspection payments per Paragraph 1.05.
 - 8. Other adjustments.
- B. Engineer shall prepare a final Change Order, reflecting the approved adjustments to the Contract amount which have not been covered by previously approved Change Orders.
- C. Submit the final Application for Payment per the General Conditions, including the final Change Order.

1.08 TRANSFER OF UTILITIES

- A. Transfer utilities to the Owner when the Substantial Completion has been issued, final cleaning has been completed and the Work has been accepted by the Owner.
- B. Submit final meter readings for utilities and similar data as of the date the Owner occupied the Work.

1.09 WARRANTIES, BONDS, AND SERVICES AGREEMENTS

- A. Provide warranties, bonds, and service agreements required by Section 01 33 00 "Submittal Procedures" or by the individual Sections of the Specifications.
- B. The date for the start of warranties, bonds, and service agreements is established per the General Conditions.
- C. Compile warranties, bonds, and service agreements and review these documents for compliance with the Contract Documents.
 - 1. Each document is to be signed by the respective manufacturer, Supplier, and Subcontractor.
 - 2. Each document is to include:
 - a. The product or Work item description.
 - b. The firm, with the name of the principal, address, and telephone number.
 - c. Scope of warranty, bond or services agreement.
 - d. Date, duration, and expiration date for each warranty bond and service agreement.
 - e. Procedures to be followed in the event of a failure.
 - f. Specific instances that might invalidate the warranty or bond.
- D. Submit two copies of each document to the Engineer for review and transmittal to the Owner.
 - 1. Submit duplicate sets.
 - 2. Documents are to be submitted on 8-1/2 x 11 paper, punched for a standard three-ring binder.
 - 3. Submit each set in a commercial quality three-ring binder with a durable and cleanable plastic cover. The title "Warranties, Bonds, and Services Agreements", the Project name and the name of the Contractor are to be typed and affixed to the cover.
- E. Submit warranties, bonds and services agreements:
 - 1. At the time of final completion and before final payment.
 - 2. Within 10 days after inspection and acceptance for equipment or components placed in service during the progress of construction.

1.10 CLAIMS AND DISPUTES

- A. Claims and disputes must be resolved prior to recommendations of final payment. Acceptance and final payment by the Contractor will indicate that any outstanding Claims or disputed issues have been resolved to the full satisfaction of the Contractor.

END OF SECTION

01 74 23 FINAL CLEANING**1.00 GENERAL**

1.01 This section specifies administrative and procedural requirements for final cleaning at Substantial Completion.

1.02 WORK INCLUDED

- A. Perform a thorough cleaning of the Site, buildings, or other structures prior to Owner occupancy of the buildings, and prior to Final Completion. Leave the Project clean and ready for occupancy.

1.03 SUBMITTALS

- A. Provide data for maintenance per Section 01 78 23 "Operation and Maintenance Data."

1.04 QUALITY CONTROL

- A. Use experienced workmen or professional cleaners for final cleaning.

2.00 PRODUCTS**2.01 MATERIALS**

- A. Furnish the labor and products needed for cleaning and finishing as recommended by the Manufacturer of the surface material being cleaned.
- B. Use cleaning products only on the surfaces recommended by the Supplier.
- C. Use only those cleaning products which will not create hazards to health or property and which will not damage surfaces.

3.00 EXECUTION**3.01 FINAL CLEANING**

- A. Thoroughly clean the entire Site and make ready for occupancy.
 - 1. Remove construction debris, boxes, and trash from the Site.
 - 2. Remove construction storage sheds and field offices.
 - 3. Restore grade to match surrounding condition and remove excess dirt.
 - 4. Sweep all drives and parking lots clean of dirt and debris. Use water truck or hose down paved site to like new appearance.
- B. Clean floors and inspect for damage.
 - 1. Remove oil, grease, paint drippings, and other contaminants from floors, then mop repeatedly until thoroughly clean. Replace damaged flooring.
 - 2. Clean resilient flooring with an approved cleaner and provide one coat liquid floor polish as recommended by the flooring Supplier. Polish to a buffed appearance with powered floor buffer.

3. Vacuum all carpets with powered floor sweeper to remove dirt and dust.
Remove glue or other substances from nap of carpet.
- C. Clean and polish inside and outside glass surfaces. Wash with window cleaner and water, apply a coat of high quality glass polish and wipe clean. Do not scratch or otherwise mar glass surfaces.
- D. Clean wall surfaces to remove dirt or scuff marks. Remove excess adhesive along top edges of wall base. Remove adhesive from surfaces of vinyl wall coverings.
- E. Align tile to fit properly in grid and replace cracked or damaged tile. Remove smear marks and other dirt from tile and clean surface of grid system.
- F. Spot paint nicks and other damage. If spot-painting does not blend into the existing color and texture of the surrounding surfaces, repaint wall from inside corner to inside corner. Touch up damaged surfaces on factory finished equipment using special paint furnished by the Manufacturer.
- G. Clean plumbing fixtures, valves, and trim. Clean toilet seats and covers. Remove labels and adhesive from fixtures. Remove floor drains and clean baskets or buckets. Polish strainers and exposed chrome or brass.
- H. Remove dirt, oil, grease, dust and other contaminants from floors, equipment and apparatus in mechanical and electrical rooms with vacuum.
- I. Clean and polish ceramic tile floors and wall surfaces to remove mildew or other stains. Tuck point defective joints.
- J. Inspect exterior painted surfaces. Spot paint any damaged surfaces.
- K. Clean permanent filters and replace disposable filters on heating, ventilating, and air conditioning systems. Clean ducts, blowers, and coils if units were operated without filters during construction.
- L. Clean roof areas of debris; flush roof drainage systems with water until clear.
- M. Broom clean exterior paved surfaces and rake clean other surfaces of the grounds.
- N. Clean and polish all electrical equipment and exposed conduits. Remove paint overspray. Provide a blemish free appearance on all exposed equipment and conduits.

END OF SECTION

01 75 00 STARTING AND ADJUSTING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Provide step-by-step procedures for starting provided systems, including equipment, pumps and processes.
- B. Provide pre-startup inspections by equipment manufacturers.
- C. Provide instruction and demonstration of operation, adjustment, and maintenance of each system and the component parts.
- D. Place each system in service and operate the system to prove performance and to provide for initial correction of defects in workmanship, calibration, and operation.
- E. Provide for initial maintenance and operation.

1.02 SUBMITTALS

- A. Provide Submittals in accordance with Section 01 33 00 "Submittal Procedures."
 - 1. Provide a Plan of Action for testing, checking, and starting major equipment and process piping systems. Submit reports as required by this Section.
 - 2. Provide Equipment Installation Reports on form shown in Section 01 31 13.13 "Forms" per Section 01 33 00 "Submittal Procedures."
 - 3. Provide Operation and Maintenance Manuals per Section 01 78 23 "Operation and Maintenance Data."

1.03 STANDARDS

- A. Comply with any standards associated with the testing or startup of equipment, as listed in the various Sections of the Specifications.

1.04 SPECIAL JOB CONDITIONS

- A. Do not start or test any apparatus until the complete unit has been installed and thoroughly checked.
- B. Furnish the services of a representative of the Supplier to witness tests and startup procedures as required by the Specifications.

2.00 PRODUCTS

2.01 TESTING INSTRUMENTATION

- A. Furnish any instrumentation or other testing devices needed to conduct tests.

3.00 EXECUTION

3.01 SERVICES OF SUPPLIER'S REPRESENTATIVES

- A. Provide the services of a Supplier's representative for inspection, supervision of installation, and training. Supervisor's representative must be an experienced and competent technical (not sales) representative of the Supplier.
- B. Perform installation, adjustment, and testing of the equipment under the direct supervision of the Supplier's representative where specified.
- C. Provide the services of the Supplier's representative to instruct the Owner or his authorized personnel on operational procedures and maintenance requirements.
- D. Include the cost of the services of the Supplier's representative in the equipment price which is included in the Contract Price.

3.02 INSPECTION AND STARTUP

- A. Inspect equipment prior to placing any equipment or system into operation. Make adjustments as necessary for proper operation.
 - 1. Check for adequate and proper lubrication.
 - 2. Determine that parts or components are free from undue stress from structural members, piping or anchorage.
 - 3. Adjust equipment for proper balance and operations.
 - 4. Determine that vibrations are within acceptable limits.
 - 5. Determine that equipment operates properly under full load conditions.
 - 6. Determine that the equipment is in true alignment.
- B. Have the Supplier's representative present when the equipment is placed in operation.
 - 1. The Supplier is to be on-site as often as necessary for proper and trouble free operation.
 - 2. Ensure that the proper procedure is employed in startup of systems.
- C. Provide Equipment Installation Reports for Equipment on the form indicated in Section 01 31 13.13 "Forms."
 - 1. Certify that the equipment and related appurtenances have been thoroughly examined and approved for startup and operation.
 - 2. Include the date when Owner's personnel were instructed in the proper operation and maintenance of the equipment in the report.

3.03 STARTING REQUIREMENTS

- A. Refer to the individual Sections of the Specifications for specific startup procedures.

3.04 INITIAL OPERATION

- A. Start, test, and place equipment and systems into operation for 30 days to allow the Owner and Engineer to observe the operation and overall performance of the equipment and to determine that controls function as intended.
- B. Equipment which operates on a limited or part-time basis shall be operated in the presence of the Engineer to demonstrate that controls function as specified.

- C. Perform acceptance test as specified in individual Sections of the Specifications. Demonstrate that equipment and systems meet the specified performance criteria.
- D. Unless specifically stated otherwise in the individual equipment Specifications, equipment and systems are not Substantially Complete until the end of this initial operation period. If an exception to this requirement is specifically noted in an individual equipment Specification, the exception shall only apply to that particular piece of equipment and not to the remaining components provided under the Project.

3.05 OPERATOR TRAINING

- A. Provide instruction and demonstration of the care and operation of the equipment to the Owner and NTMWD's personnel. Instruction is to include classroom and hands-on training.
- B. Provide training in adequate detail to ensure that the trainees who complete the program will be qualified and capable of operating and maintaining the equipment, products, and systems provided.
- C. Operations training is to include but not be limited to:
 - 1. Orientation to provide an overview of system/subsystem configuration and operation
 - 2. Terminology, nomenclature, and display symbols.
 - 3. Operations theory.
 - 4. Equipment appearance, functions, concepts, and operation.
 - 5. Operating modes, practices and procedures under normal, diminished, and emergency conditions.
 - 6. Startup and shutdown procedures.
 - 7. Safety precautions.
 - 8. On-the-job operating experience for monitoring functions, supervisory, or command activities. Include functions and activities associated with diminished operating modes, failure recognition, and responses to system/subsystem and recovery procedures.
 - 9. Content and use of Operation and Maintenance manuals and related reference materials.
- D. Provide training for performing on-site routine, preventive, and remedial maintenance of the equipment, product, or system. Maintenance training is to include but not be limited to:
 - 1. Orientation to provide an overview of system/subsystem concept, configuration, and operation.
 - 2. Operations theory and interfaces.
 - 3. Instructions necessary to ensure a basic theoretical and practical understanding of equipment appearance, layout and functions.
 - 4. Safety precautions.
 - 5. Use of standard and special tools and test equipment.

6. Adjustment, calibration, and use of related test equipment.
 7. Detailed preventive maintenance activities.
 8. Troubleshooting, diagnostics, and testing.
 9. Equipment assembly and disassembly.
 10. Repair and parts replacement.
 11. Parts ordering practices and storage.
 12. Failure and recovery procedures.
 13. Cabling and/or interface connectors.
 14. Content and use of Operation and Maintenance Manuals and related reference materials.
 15. Procedures for warranty repairs.
 16. Lubrication.
 17. Procedures, practices, documentation, and materials required to commence system maintenance.
- E. Provide a training plan that indicates the schedule and sequence of the training programs. The training plan is to include for each course:
1. Number of hours for the course.
 2. Agenda and narrative description, including the defined objectives for each lesson.
 3. Draft copy of training handbooks.
 4. A descriptive listing of suggested reference publications.
 5. Audio-visual equipment required for training.
 6. Type and number of tools or test equipment required for each training session.
- F. Provide and use training aids to complement the instruction and enhance learning.
1. Provide training handbooks for use in both the classroom and the hands-on phases of training for each course.
 2. Provide instructional materials which include references to the Operation and Maintenance Manuals and identify and explain the use of the manual.
 3. Provide a copy of all audio/visual training materials used in the presentations.
- G. Provide qualified instructors to conduct the training.
1. Provide instructors with knowledge of the theory of operation and practical experience with the equipment, product, or system.
 2. Provide instructors that have successfully conducted similar training courses.
- H. Training may be recorded by the Owner or its consultants for use in future training. Provide legal releases or pay additional fees required to allow training by the Supplier to be recorded.
- I. Schedule for training is to be approved by Owner.

1. Schedule training and startup operations for no more than one piece of equipment or system at a time.
 2. Owner may require re-scheduling of training if operations personnel are not available for training on a scheduled date.
 3. Provide a minimum of 2 weeks' notice if training must be rescheduled.
 4. Training is to be limited to 4 hours per week.
 5. Time required for training is to be considered in the development of the Project schedule.
- J. Schedule and coordinate training for equipment, products, or systems which depend upon other equipment or systems for proper operation so that trainees can be made familiar with the operation and maintenance of the entire operating system.

3.06 INITIAL MAINTENANCE

- A. Maintain equipment until the Project is accepted by the Owner.
1. Insure that mechanical equipment is properly greased, oiled, or otherwise cared for as recommended by the Supplier.
 2. Operate air handling equipment only when filters are in place and are clean. Change filters weekly during construction.
- B. Service equipment per the Supplier's instructions immediately before releasing the equipment to the Owner.
1. Replace replaceable filters and clean permanent filters associated with air handling units or other packaged equipment.
 2. Remove and clean screens at strainers in piping systems.
 3. Clean insects from intake louver screens.

END OF SECTION

01 78 23 OPERATION AND MAINTENANCE DATA

1.00 GENERAL

1.01 WORK INCLUDED

- A. Prepare a complete and detailed Operation and Maintenance Manual for each type and model of equipment or product furnished and installed under this Contract.
- B. Prepare the manuals in the form of an instruction manual for the Owner.
- C. Provide complete and detailed information specifically for the products or systems provided for this Project. Include the information required to operate and maintain the product or system.
- D. Manuals are to be in addition to any information packed with or attached to the product when delivered. This information is to be taken from the product and provided as an attachment to the manual.
- E. Digital copies of the Operation and Maintenance Manuals including equipment lists, warranties, spare parts list, etc. shall be provided to NTMWD for all NTMWD operated and maintained infrastructure and equipment.

1.02 SUBMITTALS

- A. Submit manuals in accordance with Section 01 33 00 "Submittal Procedures." Attach to each manual a copy of the Operation and Maintenance Manual Review Form as shown in Section 01 31 13.13 "Forms" with pertinent information completed.

1.03 GUARANTEES

- A. Provide copies of the manufacturer's warranties, guarantees, or service agreements in accordance with Section 01 70 00 "Execution and Closeout Requirements."

2.00 PRODUCTS

2.01 MATERIALS

- A. Print manuals on heavy, first quality paper.
 - 1. Paper shall be 8-1/2 x 11 paper.
 - a. Reduce drawings and diagrams to 8-1/2 x 11 paper size.
 - b. When reduction is not practical, fold drawings and place each separately in a clear, super heavy weight, top loading polypropylene sheet protector designed for ring binder use. Provide a typed identification label on each sheet protector.
 - 2. Punch paper for standard three-ring binders.
- B. Place manuals in Wilson Jones 385 Line D-Ring Durllock Presentation Binders.
 - 1. Binders are to have clear front, back, and spine covers.
 - 2. Sheet lifters are to be provided.
 - 3. Minimum size is 2-inch capacity. Maximum size is 3-inch capacity.

- C. Provide tab indexes for each section of the manual.
 - 1. Indexes are to be constructed of heavy-duty paper with a reinforced binding edge and punched with 9/32-inch holes to fit the binders.
 - 2. Index is to have clear insertable tabs for a typed insert.
- D. Provide indexed PDF version of the manual on a compact disc.
- E. Provide an Equipment List using Equipment List form, Section 01 31 13.13 "Forms", on compact disc in Microsoft Excel format which includes all information required by Paragraph 3.03.

3.00 EXECUTION

3.01 MANUAL ORGANIZATION AND CONTENTS

- A. Provide a Table of Contents listing each section of the manual for each product or system.
 - 1. Identify each product or system using the nomenclature shown in the Contract Documents.
 - 2. Assign a number and letter to each section in the manual.
 - a. Assign a number to each product or system. The number is to correspond to the Owner's equipment numbering system or other system designated by the Engineer.
 - b. A cross reference is to be provided for the Owner's numbering system and designations for equipment indicated in the Contract Documents.
 - c. The letter assigned will represent the part of the manual, consistent with the manual contents as required by Paragraph 3.02, 3.03, and 3.04.
 - 3. Provide index tabs for each section in the manual.
 - 4. The designation on each index tab is to correspond to the number and letter assigned in the Table of Contents.
- B. Include only the information that pertains to the product described. Annotate each sheet to:
 - 1. Clearly identify the specific product or component installed.
 - 2. Clearly identify the data applicable to the installation.
 - 3. Delete reference to inapplicable information.
- C. Supplement manual information with drawings as necessary to clearly illustrate relations of component parts of equipment and systems, and control and flow diagrams.
- D. Identify each manual by placing a printed cover sheet in the front cover of the binder and as the first page in the manual. The first page is to be placed in a clear polypropylene sheet protector. The information on first page and the cover page are to include:
 - 1. Name of Owner.
 - 2. Project name.

3. Volume number.
 4. The Table of Contents for that volume.
- E. Insert the Table of Contents into the spine of each manual.
- F. Manuals for several products or systems may be provided in the same binder.
1. Sections for each product or system must be included in the same binder.
 2. Sections must be in numerical order from volume to volume.
- G. Correlate the data into related groups when multiple binders are used.
- H. Fill binders to only three/fourths of its indicated capacity to allow for addition of materials to each binder by the Owner.

3.02 EQUIPMENT AND SYSTEMS MANUAL CONTENT

- A. Manual shall provide the following information:
1. A description of the unit and component parts.
 2. Operating instructions for startup, normal operations, regulation, control, shutdown, emergency conditions, and limiting operating conditions.
 3. Maintenance instructions including assembly, installation, alignment, adjustment, and checking instructions.
 4. Lubrication schedule and lubrication procedures. Include a cross reference for recommended lubrication products.
 5. Troubleshooting guide.
 6. Schedule of routine maintenance requirements.
 7. Description of sequence of operation by the control manufacturer.
 8. Warnings for detrimental maintenance practices.
 9. Parts lists including:
 - a. Outline cross-section and assembly drawings, engineering data, test data, and performance curves.
 - b. Control schematics and point to point wiring diagrams prepared for field installation, including circuit directories of panel boards and terminal strips.
 - c. Other information as may be required by the individual sections of the Specifications.

3.03 EQUIPMENT LIST

- A. Provide Equipment List Form, Section 01 31 13.13 Forms, on compact disc in Microsoft Excel format containing the following information for all equipment included in the Contract Documents.
1. Asset Type
 2. Equipment Number complying with Owner's Tagging Standard. Contact NTMWD Project Manager for copy of standard.
 3. Description of Equipment including type, location, model number and serial number.

4. Location detail
 5. Manufacturer
 6. Model number
 7. Serial number
 8. Acceptance date
 9. List Price
 10. Warranty Expiration date
 11. Warranty coverage information
- 3.04 LIST OF SERVICE ORGANIZATIONS

- A. Provide a directory of authorized service organizations with company name, address, telephone number, and the contact person for warranty repair.

END OF SECTION

EQUIPMENT LIST

SYSTEM: _____

PROJECT NAME: PRP18708 – Custer Road PS Meter Vault Relocation

FACILITY: Custer Road Pump Station Meter Vault

PRIME CONTRACTOR: _____

NTMWD PROJECT #: N/A

<i>To Be Completed by Engineer</i>				<i>To Be Completed by Contractor</i>							
Asset Type	Tag # (alpha-numeric)	Description	Location Detail (Building, Room, Etc.)	Manufacturer	Model #	Serial # (alpha-numeric)	Acceptance Date	List Price	Warranty Expiration Date	Warranty Coverage Information	NTMWD Operation Staff Sign Off

01 79 00 CONTRACTOR SAFETY PLAN**1.0 GENERAL**

The Contractor shall provide the management, labor, material, equipment and related items to development, implement, enforce, manage, and report on a Site Specific Environmental Health and Safety Plan (EH&S) for this project.

The Contractor is responsible for addressing the safety concerns associated with construction activities, including potential hazards. Primary and ultimate responsibility for construction job site and activity safety shall remain with the Contractor in spite of documentation of this plan.

1.01 WORK INCLUDED

- A. Prepare a Site Specific Environmental Health and Safety (EH&S) Plan.
- B. Maintain a Site Specific EH&S Plan during the duration of construction including all staff, equipment, and materials needed.
- C. Provide the Site Specific EH&S plan to North Texas Municipal Water District (NTWMD) at the Preconstruction Meeting and be prepared to discuss major points of the submitted plan. (See 1.04-Submittals below)
- D. Host safety training for staff and subcontract staff on site as conditions require.
- E. Designate a safety officer to provide guidance and strategies on for safety site to NTMWD and contractors employees.
- F. Inspect equipment as needed to ensure safe operation
- G. Provide necessary training to employees as required by equipment, materials, or working conditions prior to risk related field activities

1.02 QUALITY ASSURANCE

- A. Plan and conduct all construction activities to minimize risk and ensure safety to staff, surroundings, and subcontractors.

1.03 STANDARDS

- A. The Contractor shall provide a Site Specific EH&S Plan that complies with and addresses compliance with:
 - i. Applicable Local, State, and Federal Requirements for all project specific hazards.
 - ii. All requirements of OSHA Title 29 CFR Part 1910 and OSHA Title 29 CFR PART 1910
 - iii. NTMWD Lock Out Program Control #382-018

1.04 SUBMITTALS

- A. Contractor shall submit one Site Specific EH&S Safety plan in accordance with Section 01 33 00 "Submittal Procedures" at the Preconstruction meeting and maintain one copy on the project site at all times. The document shall be updated in the Construction Management Software on a regular basis.

2.00 PRODUCTS

2.01 MATERIALS

- A. Print plan on heavy, first quality paper
 - 1. Paper shall be 8-1/2 X 11 paper.
 - a. Reduce drawings and diagrams to 8-1/2 X 11 paper size
 - b. When reduction is not practical, fold drawings and place each separately in a clear, super heavy weight, top loading polypropylene sheet protector design for ring binder use. Provide a type identification label on each sheet protector.
 - 2. Punch Paper for standard three-ring binders
- B. Place manuals in three ring binder
 - 1. Binders are to have clear front, back, and spine covers
 - 2. Sheet lifters are to be provided
 - 3. Minimum size is 2-inch capacity
- C. Provide tab indexes for each section of the manual
- D. Major Updates to the plan shall be provided to NTWMD on a regular basis via a PDF file.

3.00 EXECUTION

3.01 SITE SPECIFIC EH&S CONTENTS

The Site Specific EH&S Plan shall include at the minimum the following information:

- A. Background information including but not limited to
 - a. Contractor Name
 - b. Project Number
 - c. Project Name
 - d. Project Location(s)/Site(s)
 - e. Project Description
 - f. List of conditions of site/location that may or shall pose a hazard to contractor, owner or citizens.
- B. Objective of the Site Specific EH&S Plan
- C. Administration and Enforcement of the Plan
 - a. Assignment of Safety Officer(s)
 - b. Injury reporting approach
- D. Emergency Notification procedures based on hazard type
 - a. Who to notify in which situations
- E. Site Access Control Requirements
 - a. Contractor shall prohibit unauthorized persons from entering the project area during the performance of this Contract. Contractor shall be responsible for ensuring that applicable OSHA requirements and standards are met before any person is allowed to enter the project area.
- F. Contractor Safety Guidelines may include the following based on the project specific issues. but not limited to
 - a. Fire Prevention and Protection
 - b. Means of Egress
 - c. Hazardous Materials

- d. Hazardous waste operations
 - e. Bloodborne Pathogen Exposure
 - f. Solid wastes
 - g. Health Hazards
 - h. Confined Space plan
 - i. Electrical safety
 - j. Excavations
 - k. Fall Protection Plan
 - l. Equipment safety (scaffolding, vehicles, etc.)
 - m. Site safety housekeeping
 - n. Flammable/Combustible Liquids
 - o. Hot work activities (welding)
 - p. Hazard communication
 - q. Trench safety requirements
 - i. Reference trench safety plan
 - r. Ladders and Stairways
 - s. Machine and equipment guarding
 - t. Personal protective equipment
- G. Contractor's training program
- H. Job Hazard analysis
- a. Job site safety inspections and audit schedule/plan
 - b. Job safety checklist specific to the project (and phase)
- I. Contractor and subcontractor acknowledgement of the safety plan
- J. Appendix
- a. Accident Reporting documentation
 - b. Safety equipment checklists
 - c. Equipment Checklists
 - d. Safety Meeting sign in
 - e. List of Trained Individuals

3.02 SITE SPECIFIC EH&S PLAN ORGANIZATION

- A. Provide a Table of Contents listing each section of the manual for each product or system.
- B. Assign a number and letter to each section in the manual.
- C. Provide Index tabs for each section of the manual
- D. The designation on each index tab is to correspond to the number and letter assigned in the Table of Contents

END OF SECTION

DIVISION 03

CONCRETE

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03 11 00 CONCRETE FORMING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish material and labor to form, tie, brace and support wet concrete, reinforcing steel and embedded items until the concrete has developed sufficient strength to remove forms.

1.02 QUALITY ASSURANCE

- A. Design Criteria: Forms shall be designed for the pressure exerted by a liquid weighing 150 pounds per cubic foot. The rate of placing the concrete, the temperature of the concrete, and all other pertinent factors shall be taken into consideration when determining the depth of the equivalent liquid. An additional design live load of 50 pounds per square foot shall be used on horizontal surfaces.
- B. Alignment Control: True alignment of walls and other vertical surfaces having straight lines or rectangular shapes shall be controlled and checked by the following procedures:
 - 1. Forming shall be arranged with provisions for adjusting the horizontal alignment of a form, after the form has been filled with concrete to grade, using wedges, turn buckles, or other adjustment methods. Establish a transit line or other reference so that adjustments can be made to an established line while the concrete in the top of the form is still plastic.
 - 2. Adjusting facilities shall be at intervals which permit adjustments to a straight line. Concrete shall not be placed until adequate adjusting facilities are in place.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 “Submittal Procedures” and shall include:
 - 1. Record Data: Manufacturers’ literature for specified products.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:

- 1. American Concrete Institute (ACI) Specifications:

ACI 301	Specifications for Structural Concrete
ACI 318	Building Code Requirements for Structural Concrete

- 2. American Institute of Steel Construction (AISC) Publication:

AISC	Manual of Steel Construction
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- 3. American Iron and Steel Institute (AISI) Publication:

AISI	Cold Formed Steel Design Manual
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4. American Plywood Association (APA) Standards:

APA	Design/Construction Guide: Concrete Forming
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1.05 DELIVERY AND STORAGE

- A. Lumber for forms shall be stacked neatly on platforms raised above ground.

1.06 JOB CONDITIONS

- A. The Contractor shall notify the Engineer upon completion of various portions of the work required for placing concrete so that compliance with the plans and specifications may be monitored. The Engineer will authorize the Contractor to proceed with the placement after this has been completed and corrections, if required, have been made.
- B. In hot weather, both sides of the face forms may be required to be treated with oil to prevent warping and to secure tight joints.

2.00 PRODUCTS

2.01 MATERIALS

- A. Lumber: Properly seasoned and of good quality; free from loose or unsound knots, knot holes, twists, shakes, decay, splits, and other imperfections which would affect its strength or impair the finished surface of the concrete.
- B. Fiber Board Form Lining: Hardboard finished smooth on one side; minimum thickness of 3/16 inch thoroughly wet with water at least 12 hours before using.
- C. Plywood Form Lining: Conforming to APA HDO; exterior exposure waterproof adhesive, 3/8 inch thick.
- D. Form Oil: Light, clear oil; shall not discolor or injuriously affect the concrete surface, subsequent coatings, or delay or impair curing operations.

2.02 FABRICATIONS

- A. Lumber: Lumber for facing or sheathing shall be surfaced on at least one side and two edges, and sized to uniform thickness. Lumber of nominal 1-inch thickness or plywood of 3/4-inch thickness shall be permitted for general use on structures, if backed by a sufficient number of studs and wales.
- B. Special Form Lumber:
 - 1. Molding for chamfer strips or other uses shall be made of redwood, cypress, or pine materials of a grade that will not split when nailed, and which can be maintained to a true line without warping. The form shall be mill cut and dressed on all faces. Fillet forms at sharp corners, both inside and outside and at edges, with triangular chamfer strips at all non-contiguous edges exposed to view. Thoroughly oil chamfer strips before installation on forms.

2. Construct forms for railings and ornamental work to standards equivalent to first class mill work.
 3. All moldings, panel work, and bevel strips shall be straight and true with neatly mitered joints, and designed so that the finished work shall be true, sharp and clean cut.
- C. Forms:
1. Forms shall be built mortar tight and of material sufficient in strength to prevent bulging between supports.
 2. Reused forms or form lumber shall be maintained clean and in good condition as to accuracy, shape, strength, rigidity, tightness, and smoothness of surface.
 3. All forms shall be so constructed as to permit removal without damage to the concrete. Exercise special care in framing forms for copings, offsets, railing and ornamental work, so that there will be no damage to the concrete when the forms are removed.
- D. Metal Forms:
1. The specifications for "Forms" regarding design, mortar tightness, filleted corners, beveled projections, bracing, alignment, removal, re use, oiling, and wetting shall apply equally to metal forms.
 2. The metal used for forms shall be of such thickness that the forms will remain true to shape. Bolt and rivet heads on the facing sides shall be countersunk. Clamps, pins, or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete.
 3. Metal forms which do not present a smooth surface or line up properly shall not be used. Exercise special care to keep metal free from rust, grease, or other foreign material that discolors the concrete.
- E. Form Linings:
1. Timber forms for exposed concrete surfaces which are to be given a rubbed finish shall be face-lined with an approved type of form lining material.
 2. If plywood is used for form lining, it shall be made with waterproof adhesive and have a minimum thickness of 3/4 inch. It shall preferably be oiled at the mill and then re-oiled or lacquered on the job before using.
 3. If fiber board is used, apply water to the screen side on the board. Stack the boards screen side to screen side. Use the smooth hard face as the contact surface of the form. Such surfaces may be formed with 3/4-inch thick plywood made with waterproof adhesive if backed with adequate studs and wales. The greatest strength of the outer plies should be at right angles to the studding. In this case, form lining will not be required.
 4. Carefully align edges and faces of adjacent panels and fill the joints between panels with patching plaster or cold water putty to prevent leakage. Lightly sand with No. 0 sandpaper to make the joints smooth.
 5. Forms which are reused shall have all unused form tie holes filled and smoothed as specified above.
- F. Form Ties:

1. Metal form ties shall be used to hold forms in place and to provide easy metal removal. The use of wire for ties shall not be permitted.
 2. Leave no metal or other material within 1-1/2 inches of the surface, when removing form tie assemblies which are used inside the forms to hold the forms in correct alignment. The assembly shall provide cone-shaped depressions in the concrete surface at least 1 inch in diameter and 1-1/2 inches deep to allow filling and patching. Such devices, when removed, shall leave a smooth depression in the concrete surface without undue injury to the surface from chipping or spalling.
 3. Burning off rods, bolts, or ties shall not be permitted.
 4. Metal ties shall be held in place by devices attached to wales. Each device shall be capable of developing the strength of the tie.
 5. Metal and wooden spreaders which are separate from the forms shall be wired to top of form and shall be entirely removed as the concrete is placed.
 6. In the construction of basement or water bearing walls, the portion of a single rod tie that is to remain in the concrete shall be provided with a tightly fitted washer at midpoint to control seepage. Multi-rod ties do not require washers. The use of form ties which are tapered or encased in paper or other material to allow the removal of complete tie, and which leave a hole through the concrete structure, shall not be permitted.
- G. Falsework:
1. Falsework shall be designed and constructed so that no excessive settlement or deformation occurs. Falsework shall provide necessary rigidity.
 2. Timber used in falsework centering shall be sound, in good condition and free from defects which impair its strength.
 3. Steel members shall be of adequate strength and shape for the intended purpose.
 4. Timber piling used in falsework may be of any wood species which satisfactorily withstands driving and which adequately supports the superimposed load.
 5. When sills or timber grillages are used to support falsework columns, unless founded on solid rock, shale or other hard materials, place them in excavated pits. Backfill to prevent the softening of the supporting material from form drip or from rains that may occur during the construction process. Sills or grillages shall be of ample size to support the superimposed load without settlement.
 6. Falsework not founded on a satisfactory spread footing shall be supported on piling, which shall be driven to a bearing capacity to support the superimposed load without settlement.

3.00 EXECUTION

3.01 PREPARATION

- A. Before placing concrete, insure that embedded items are correctly, firmly and securely fastened into place. Embedded items shall be thoroughly clean and free of

oil and other foreign material. Anchor bolts shall be set to the correct location, alignment and elevation by the use of suitable anchor bolt templates.

3.02 INSTALLATION

A. Pre-Placement:

1. During the elapsed time between building the forms and placing the concrete, maintain the forms to eliminate warping and shrinking.
2. Treat the facing of forms with suitable form oil before concrete is placed. Apply oil before the reinforcement is placed. Wet form surfaces which will come in contact with the concrete immediately before the concrete is placed.
3. At the time of placing concrete, the forms shall be clean and entirely free from all chips, dirt, sawdust, and other extraneous matter at the time. Forms for slab, beam and girder construction shall not have tie wire cuttings, nails or any other matter which would mar the appearance of the finished construction. Clean forms and keep them free of foreign matter during concrete placement.

B. Placement:

1. Set and maintain forms to the lines designated, until the concrete is sufficiently hardened to permit form removal. If, at any stage of the work, the forms show signs of bulging or sagging, immediately remove that portion of the concrete causing this condition. If necessary, reset the forms and securely brace against further movement.
2. Provide adequate cleanout openings where access to the bottom of the forms is not otherwise readily attainable.
3. Carefully and accurately place and support reinforcement in concrete structures.

- C. Removal: Remove forms so that the underlying concrete surface is not marred or damaged in any way. Forms shall not be removed until the concrete has attained sufficient strength to safely carry the dead load, but in no case less than the number of curing days set forth in the following table:

Forms for concrete of minor structural load carrying importance	1 day
Forms for walls, columns, sides of drilled shafts, massive structural components and other members not resisting a bending moment during curing	1 day
Forms and falsework under slabs, beams and girders where deflections due to dead load moment may exist (for spans < or = 10 feet)	7 days
Forms and falsework under slabs, beams and girders where deflections due to dead load moment may exist (for spans > 10 feet and < or = 20 feet)	14 days

END OF SECTION

03 21 00 REINFORCING STEEL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor and reinforcing materials required to cut, bend, tie, splice, place and support the reinforcement in the material grades, sizes, quantities and locations specified.

1.02 QUALITY ASSURANCE

- A. Tolerances: Reinforcement shall be placed where specified, with the following maximum tolerances, plus or minus:
 - 1. Concrete Cover: 1/4 inch.
 - 2. Rebar Spacing: 1/4 inch in 12 inches.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Shop Drawings: Reinforcing bar layout drawing with bar lists clearly marked and referenced to the Drawings.
 - 2. Record Data: Manufacturers' literature for specified products.
 - 3. Certified Test Reports: Certification of steel quality, size, grade and manufacturer's origin.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. American Society for Testing and Materials (ASTM) Standards:

ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A615	Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

- 2. American Concrete Institute (ACI) Publications:

ACI 301	Specification for Structural Concrete
ACI SP-66	ACI Detailing Manual
ACI 318	Building Code Requirements for Structural Concrete

- 3. Concrete Reinforcing Steel Institute (CRSI) Publications:

CRSI	Manual of Standard Practice
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1.05 DELIVERY AND STORAGE

- A. Store steel reinforcement above the surface of the ground upon platform skids or other supports. Protect from mechanical and chemical injury and surface deterioration caused by exposure to conditions producing rust. When placed in the Work, steel reinforcement shall be free from dirt, scale, dust, paint, oil and other foreign material. Tag and store steel reinforcement for ease of correlation with Shop Drawings.

1.06 JOB CONDITIONS

- A. Proposed deviations from reinforcing indicated on the Drawings or Specifications shall be approved in writing by the Engineer prior to fabrication.
- B. Lap lengths shall be of the length shown on the Drawings or noted in lap and embedment table, and shall be in compliance with ACI 318.
- C. Specified cover for reinforcing shall be maintained throughout construction. Bars shall be cut to lengths necessary to allow for proper clearances. Cover of concrete shall be measured from face of forms to outside face of reinforcement.
- D. Stirrups shall be hooked.

2.00 PRODUCTS

2.01 MATERIALS

- A. Steel Reinforcing Bars: Billet-Steel bars for concrete reinforcement conforming to ASTM A615; Grade 60, with minimum yield strength of 60,000 psi. Steel reinforcing bars shall be produced in the United States of America.
- B. Welded Wire Fabric: Cold-drawn steel wire conforming to ASTM A1064; flat sheets fabricated in accordance with ASTM A1064.
- C. Supports (Chairs): Bar supports shall be of the proper type for the intended use. Bar supports shall be uniform high density polyethylene (plastic) or fiberglass reinforced plastic (FRP) conforming to CRSI Class 1, Maximum Protection.
- D. Spacers: Precast mortar blocks with a 28-day compressive strength that is greater than the specified concrete strength in which the blocks are being placed.
- E. Mechanical Bar Splices: Cadweld splices as manufactured by Erico Products, Inc., or approved equal, installed in strict accordance with the manufacturer's instructions and recommendations. The mechanical devices shall develop at least 125 percent of the specified yield of the spliced bars.
- F. Mechanical Threaded Splices: Mechanical threaded connections shall utilize a metal coupling sleeve with internal threads which engage threaded ends of the bars to be spliced and shall develop in tension or compression 125 percent of the specified yield strength of the bar.

2.02 FABRICATIONS

- A. Bending: Reinforcement shall be bent cold by machine to shapes indicated on the Drawings; true to shapes indicated; irregularities in bending shall be cause for

rejection. Unless otherwise noted, all hook and bend details and tolerances shall conform to the requirements of ACI SP-66 and ACI 318.

3.00 EXECUTION

3.01 PREPARATION

- A. Before any concrete is placed, all mortar blocks to be used for holding steel in position adjacent to formed surfaces shall be cast in individual molds, after which time the blocks shall be immersed in water for the remainder of at least a 4-day curing period. The blocks shall be cast with the sides beveled and in such a manner that the size of the block increases away from the surface to be placed against the forms. Blocks shall be in the form of a frustum of a cone or pyramid. Suitable tie wires shall be provided in each block for anchoring the block to the reinforcing steel, and to avoid displacement when placing the concrete. The size of the surface to be placed adjacent to the forms shall not exceed 2-1/2 inches square or the equivalent thereof when circular or rectangular areas are provided. Blocks shall be accurately cast to the thickness required, and the surface to be placed adjacent to the forms shall be a true plane free of surface imperfections.

3.02 INSTALLATION

- A. General: Place the reinforcement carefully and accurately in the concrete structures. Rigidly tie and support the reinforcement. Welding of any type of reinforcement shall not be permitted.
- B. Splices:
 1. Splicing of bars, except where indicated on the Drawings, shall not be permitted unless approved by the Engineer prior to fabrication. Splices shall be kept to a minimum. Splices shall preferably occur at points of minimum stress. Lap splices which are permitted shall have a lap in accordance with ACI 318. Rigidly clamp or wire the bars at all splices, in accordance with ACI. Overlap sheets of wire fabric sufficiently to maintain a uniform strength and securely fasten.
 2. Welding of reinforcing steel splices shall not be permitted.
 3. Make mechanical splices where shown on the Drawings using Cadweld splices or approved equal, installed in accordance with the manufacturer's instructions and recommendations. The mechanical device shall develop at least 125 percent of the specified yield strength of the bar.
- C. Placement:
 1. Place steel reinforcement, as indicated on the Drawings with the specified tolerances. Hold securely in place during the placing of the concrete. The minimum clear distance between bars shall be per ACI 318 unless noted otherwise. Always pass vertical stirrups around the main tension members and securely attach thereto. Wire reinforcing together at a sufficient number of intersections to produce a sound, sturdy mat or cage of reinforcement that will maintain the reinforcement in correct positions when the concrete is placed.
 2. Hold the reinforcing steel in concrete slabs firmly in place with wire supports or "chairs." Sizing and spacing of the chairs shall be sufficient to properly support

the steel, and shall be in accordance with CRSI Publications “Manual of Standard Practice in.”

3. Space the reinforcing steel in concrete walls the proper distance from the face of the forms, as indicated on the Drawings:
 - a. For wall surfaces exposed to view, use chairs.
 - b. For wall surfaces not exposed to view, use chairs or precast mortar blocks.
4. Where reinforcing conflicts with location of anchor bolts, inserts, etc., submit prompt notifications so that revisions can be made before concrete is placed. No cutting of reinforcing shall be permitted without the prior approval of the Engineer.
5. Welded wire shall be fabricated flat sheets, in longest practical lengths. Lap joints one mesh. Do not locate end laps over beams of continuous structures or midway between supporting beams. Offset end laps of adjacent widths to prevent continuous lap. Fasten ends and sides of welded wire fabric at 48 inches on centers with tie wire.
6. Reinforcing shall extend through construction joints.

3.03 FIELD QUALITY CONTROL

- A. Concrete shall not be placed until the Engineer has observed the final placing of the reinforcing steel, and has given permission to place concrete.

END OF SECTION

03 30 00 CAST-IN-PLACE CONCRETE

1.00 GENERAL

1.01 SUMMARY

- A. Furnish labor, materials, mixing and transporting equipment and incidentals necessary to proportion, mix, transport, place, consolidate, finish, and cure concrete in the structure.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Shop Drawings:
 - a. Mix design: For each concrete mix, complete the form "Concrete Mix Design" and one of the following forms: "Documentation of Required Average Strength – Field Strength Test Record" or "Documentation of Average Strength – Trial Mixtures."
 - b. Submit a schedule to the Owner's representative which shows the sequence of concrete placements.
 - 2. Certified Test Reports:
 - a. Materials used in the trial mix design.
 - b. Water: Verification that all potable mix water and curing water sources do not exceed the non-potable water limits listed in ASTM C1602 Table 2.
 - c. Aggregate, conforming to ASTM C33, including the test reports for soundness and abrasion resistance.
 - d. Aggregate:
 - 1). Verification that aggregate is not "potentially reactive" per ASTM C1260.
 - 2). Or a cement chemical analysis indicating that the total alkali content is acceptable per Paragraph 2.02.A.
 - 3). When mix water exceeds 50 percent of the chloride limit indicated in ASTM C1602 Table 2, then all aggregate sources shall be tested for chloride content in accordance with ASTM C1524.
 - e. 7-day and 28-day compressive strength tests results.
 - 1). When more than 15, 28-day compressive tests results are available from the current Project for a given class of concrete, include the 15-test

running average compressive strength versus the required average compressive strength (based on the previous 15 tests) in graphical form.

3. Record Data: Manufacturer's literature on specified materials.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications:
 1. A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.
 2. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Testing Agency Qualifications:
 1. An independent testing agency, acceptable to authorities having jurisdiction and the Engineer, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated.
 2. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. Pre-Submittal Conference:
 1. Conduct conference at the Site to comply with requirements in Section 01 31 00 "Project Management and Coordination."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cement in bulk or bags which are plainly marked with the brand and manufacturer's name. Immediately upon receipt, store cement in a dry, weather-tight, and properly ventilated structure which excludes moisture. Storage facilities shall permit easy access for inspection and identification. Cement not stored in accordance with the requirements shall not be used.
- B. Sufficient cement shall be in storage to complete placement of concrete started. In order that cement may not become unduly aged after delivery, maintain records of delivery dates. Use cement which has been stored at the Site for 60 days or more before using cement of lesser age. No cement shall be used which is lumped, caked, stored more than 90 days, or whose temperature exceeds 170 F.

1.06 STANDARDS

- A. Mixing, sampling, placing, curing and testing of concrete, and the materials used shall be in compliance with the latest revisions of the following standards, unless otherwise noted in the Contract Documents. The Contractor shall maintain one copy of each of the applicable standards at the construction field office.

1. American Society for Testing and Materials (ASTM) Standards:

ASTM Standards	
ASTM C31	Standard Practice for of Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Specification Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Standard Specification Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C87	Standard Specification Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
ASTM C94	Standard Specification of Ready Mixed Concrete
ASTM C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
ASTM C125	Terminology Relating to Concrete and Concrete Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C156	Standard Test Method for Water Retention by Concrete Curing Materials
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C191	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C293	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
ASTM C309	Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C579	Standard Test Methods for Compressive Strength of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM C580	Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM C595	Standard Specification for Blended Hydraulic Cements

ASTM Standards	
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C806	Standard Test Method for Restrained Expansion of Expansive Cement Mortar
ASTM C827	Standard Test Method for Change in Height at Early Stages of Cylindrical Specimens of Cementitious Mixtures
ASTM C845	Standard Specification for Expansive Hydraulic Cement
ASTM C878	Standard Test Method for Restrained Expansion of Shrinkage Compensating Concrete
ASTM C881	Standard Specification for Epoxy Resin Base Bonding Systems for Concrete
ASTM C1240	Standard Specification for Silica Fume used in Cementitious Mixtures
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1524	Standard Test Method for Water-Extractable Chloride in Aggregate (Soxhlet Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D570	Standard Test Method for Water Absorption of Plastics
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D746	Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D994	Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2240	Standard Test Method for Rubber Property Durometer Hardness
ASTM D6690-07	Standard Specification for Joint and Crack Sealant, Hot Applied, for Concrete and Asphalt Pavements
ASTM E96	Standard Test Methods for Water Vapor Transmission of Materials

2. American Concrete Institute (ACI) Standards:

ACI Standards	
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavy-weight, and Mass Concrete
ACI 214	Recommended Practice for Evaluation of Strength Test Results
ACI 223	Standard Practice for Use of Shrinkage Compensating Concrete
ACI 301	Specification for Structural Concrete
ACI 304	Guide for Measuring, Mixing, Transporting & Placing Concrete
ACI 304.2R	Placing Concrete by Pumping Methods

ACI Standards	
ACI 305.1	Hot Weather Concreting
ACI 306.1	Cold Weather Concreting
ACI 308.1	Standard Practice for Curing Concrete
ACI 309	Guide for Consolidation of Concrete
ACI 318	Building Code Requirements for Structural Concrete

3. Corps of Engineers, Department of the Army Specification:
 - a. CRD C621 83 - Corps of Engineers Specification for Non-Shrink Grout.
4. Federal Specification:
 - a. TT S 00227E - Type II, Class A or B, Expansion Joint Sealant.
5. Concrete Plant Manufacturers Bureau (CPMB) Standards:
 - a. Concrete Plant Standards.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 CONCRETE MATERIALS

- A. Cementitious Material; General: If the fine and/or coarse aggregates test "Potentially Reactive", in accordance with ASTM C1260, then a low alkali cementitious material shall be used. A low alkali cementitious material shall be such that, the total alkali content calculated as the percentage of sodium oxide (Na₂O) plus 0.658 times the percentage of potassium oxide (K₂O) shall not exceed 0.6 percent of the total cementitious material content.
- B. Cement; Type: Type I or I/II Portland cement, conforming to ASTM C150; used for all concrete, unless noted otherwise.
- C. Fly Ash/Pozzolans: Conforming to ASTM C618, Class C or F fly ash; used in all classes of concrete. A supplier's certificate of the analysis and composition of the fly ash shall be supplied.

D. Coarse Aggregate:

1. Crushed stone or gravel conforming to ASTM C33, in the gradation size specified.
2. For gradation size number 467, a maximum aggregate size of 1-1/2 inches is:

Sieve Size	Percent Retained	Percent Passing
2"	0	100
1-1/2"	0-5	95-100
3/4"	30-65	35-70
3/8"	70-90	10-30
No. 4	95-100	0-5

3. For gradation size number 57, the maximum aggregate size of 1 inch is:

Sieve Size	Percent Retained	Percent Passing
1-1/2"	0	100
1"	0-5	95-100
1/2"	40-75	25-60
No. 4	90-100	0-10
No. 8	95-100	0-5

4. For gradation size number 67, the maximum aggregate size of 3/4 inch is:

Sieve Size	Percent Retained	Percent Passing
1"	0	100
3/4"	0-10	90-100
3/8"	45-80	20-55
No. 4	90-100	10-10
No. 8	90-100	0-5

5. For gradation size number 8, the maximum aggregate size of 3/8 inch is:

Sieve Size	Percent Retained	Percent Passing
1"	0	100
3/8"	0-15	85-100
No. 4	70-90	10-30
No. 8	90-100	0-10
No. 16	95-100	0-5

E. Fine Aggregate:

1. Washed and screened natural sands or sands manufactured by crushing stones; conforming to ASTM C33. The gradation in ASTM C33 for air entrained concrete is:

Sieve Size	Percent Retained	Percent Passing
3/8"	0	100
#4	0-5	95-100
#8	0-20	80-100
#16	15-50	50-85
#30	40-75	25-60
#50	70-90	10-30

2. Fine aggregate shall have not more than 45 percent retained between any two consecutive sieves. Its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.

F. Water: Potable and complying with ASTM C1602.

2.03 ADMIXTURES

- A. Air Entraining Admixture: Conforming to ASTM C260.
- B. Water Reducing Admixtures: Conforming to ASTM C494; Types "A" or "D" only; accurately measured and added to the mix according to the manufacturer's recommendations.
- C. Set Retarding Admixtures: Conforming to ASTM C494; Types "B" and "D" only; accurately measured and added to the mix in according to the manufacturer's recommendations.
- D. Water Reducing Admixtures - High Range (HRWR): High Range Water Reducer shall comply with ASTM C494, Type F or G. HRWR shall be accurately measured in accordance with the manufacturer's recommendations. HRWR shall be added to the concrete mix at the concrete batch plant. HRWR may not be added at placement site except to redose a batch and only after approval of the HRWR manufacturer. The high range water reducing admixture shall be able to maintain the plasticity range without significant loss of slump or rise in concrete temperature for 2 hours. Other admixtures may only be used with the HRWR if approved by the HRWR manufacturer. A representative of the HRWR manufacturer shall be present during any large placement, placement of slabs, or during times of unusual circumstance which may require changes to the product formulation.
 1. Manufacturers:
 - a. BASF Corporation.
 - b. W. R. Grace & Co.
 - c. Sika Corporation.

2.04 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes. Unless indicated otherwise, provide the following configurations.
1. Construction Joints:
 - a. Profile: Ribbed without center bulb.
 - b. Width: 6 inches.
 - c. Minimum thickness: 3/8 inch.
 2. Expansion Joint:
 - a. Profile: Ribbed with center bulb.
 - b. Width: 9 inches.
 - c. Minimum thickness: 3/8 inch.
 3. Manufacturers:
 - a. Greenstreak.
 - b. Meadows: W. R. Meadows, Inc.
 - c. Murphy: Paul Murphy Plastics Co.
 - d. Progress Unlimited Inc.
 - e. Sternson Group.
 - f. Tamms Industries Co.; Div. of LaPorte Construction Chemicals North America, Inc.
 - g. Vinylex Corporation.
 - h. Westec Barrier Technologies; Div. of Western Textile Products, Inc.
- B. Self-Expanding Strip Waterstops (Hydrophilic): Self-expanding strip waterstops shall be used only where specifically indicated. Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.
1. Products:
 - a. Swellseal Joint; De Neef Construction Chemicals (U.S.) Inc.
 - b. Adeka Ultra Seal; Mitsubishi International Corporation.
 - c. Sika Hydrotite; Sika Corporation – U.S.

2.05 CURING MATERIALS

- A. Sheet Curing Material: Conforming to ASTM C171.
1. Waterproof paper.
 2. Polyethylene film.
 3. White burlap - polyethylene film.

- B. Membrane Curing Compounds: Membrane curing compound conforming to ASTM C309; having a color to indicate coverage when applied; non-staining; applied according to the manufacturer's recommendations. No curing compound shall be used on walls which are to receive a plaster mix finish. When tested according to ASTM C156, the curing compound shall provide a film which has retained, within the specimen, the following percentages of moisture present when the curing compound was applied:
1. At least 97 percent at the end 24 hours.
 2. At least 95 percent at the end of 3 days.
 3. At least 91 percent at the end of 7 days.
- C. Concrete Curing and Sealing Compound: Where a sealer is necessary, use a concrete curing and sealing compound. Application of this product shall be in accordance with the manufacturer's recommendations.
1. Available Products:
 - a. Interior Concrete Surfaces: MasterKure CC 200 WB by BASF Corporation.
 - b. Exterior Concrete Surfaces: MasterKure CC 1315 WB by BASF Corporation.
 - c. Concrete Surfaces Exposed to Chemicals: MasterKure HD 200 WB by BASF Corporation.
- D. Finishing Aid: Spraying material designed to form a monomolecular film on fresh concrete that reduces the rate of evaporation of surface moisture prior to finishing; conforming to Confilm, as manufactured by Master Builders, Inc. This material is not a curing compound. Concrete must be cured as specified.

2.06 RELATED MATERIALS

- A. Joint Materials for Water-Retaining Structures:
1. Pre-molded, resilient, non-bituminous expansion joint filler conforming to ASTM D1752, Type "II", in the thickness specified.
 2. Joint sealer conforming to ASTM D6690.
 3. Expansion joint sealant for non-potable water shall be a two-component, non-sag, polysulfide-base, elastomeric sealing compound. The material shall conform to Federal Specification TT S 00227E, Type "II", Class B; installed according to the manufacturer's recommendations. Backing material for sealant shall be a rod of a diameter and composition recommended by the sealant manufacturer.
 4. Expansion joint sealant for potable water shall be a two-component, non-sag, polysulfide sealant containing no lead or mercury; conforming to Fed. Spec. TT S 00227E, Type "II", Class A; applied according to the manufacturer's specifications. Backing material for sealant shall be a rod of a diameter and composition recommended by the sealant manufacturer.
 5. Where surface is to receive a swept in grout topping, a 3-inch wide, 1-mil polyethylene strip shall be placed above the joint sealant and held in place with 1-inch wide polyethylene tape spaced at 12-inch centers (maximum).

- B. Joint Materials for Non-Water-Retaining Structures:
1. Bituminous-type, preformed, expansion joint filler; conforming to ASTM D994.
 2. Pre-molded, resilient, non-bituminous expansion joint filler conforming to ASTM D1752, Type "II", in the thickness specified.
- C. Bonding Agents: Install according to the manufacturer's recommendations and written instructions.
1. Products:
 - a. Sika Armatec 110 EpoCem by Sika Corporation.
 - b. Sikadur 32, Hi-Mod by Sika Corporation.
- D. Non-Shrink Grout:
1. General: Non-shrink grout for grouting of pump, motor, and equipment baseplates or bedplates, column baseplates, other miscellaneous baseplates, piping block outs and other uses of grout. Grout shall meet the following requirements, as verified by independent laboratory tests:
 - a. No shrinkage from the time of placement, or expansion after set, under ASTM C827 and CRD C621 83 (Corps of Engineers). When non-shrink grouts are tested under CRD C621 83, the grout shall be tested in a fluid state. A fluid state shall be defined as flowing through a flow cone at a rate of 20 seconds, plus or minus 5 seconds.
 - b. An initial set time of not less than 45 minutes under ASTM C191.
 2. Non-Shrink Non Metallic Grout: Pre mixed, non-staining, non-shrink grout; minimum 28-day compressive strength of 5000 psi.
 - a. Do not use for vibrating equipment.
 - b. Products:
 - 1). Masterflow 713 Plus by BASF The Chemical Company.
 - 2). Five Star Grout by Five Star Products, Inc.
 - 3). SikaGrout 212 by Sika Corporation.
 3. Non-Shrink Epoxy Structural Grouts: Furnished in two components from the factory and mixed on the Site; conforming to ASTM C579, ASTM C580, and ASTM C827; chemical resistant, water resistant and a minimum 7-day compressive strength of 12,000 psi.
 - a. Use for vibrating equipment.
 - b. Products:
 - 1). Sikadur 42, Grout-Pak by Sika Corporation.
 - 2). Five Star HP Epoxy Grout by Five Star Products, Inc.
 - 3). Masterflow 648 CP by BASF The Chemical Company.
- E. Normal Shrinkage Grout: 1 part Portland cement, Type I or I/II, to 3 parts of clean, first quality sand; proportioning on a volumetric basis; used for non-structural applications for grouting areas as shown on the Drawings which do not require non-shrink grout.

- F. Foundation Waterproofing: Thoroseal Foundation Coating as manufactured by Thoro Systems Products. Foundation coating shall be used only on the exterior of concrete walls not exposed to view where indicated on the Drawings.
- G. Zinc Rich Primer: Aluminum surfaces which contact or are embedded in concrete shall be coated with zinc rich primer. Primer shall be Tneme-Zinc.

2.07 REPAIR MATERIALS

- A. Structural Concrete Repair Material: Non-shrink, non-slump, non-metallic, quick setting patching mortar; as approved by the manufacturer for each application and applied accordance with the manufacturer's recommendations.
 - 1. Products:
 - a. Sikatop 123 by Sika Corporation.
 - b. Sikatop 122 by Sika Corporation.
 - c. Five Star Structural Concrete by Five Star Products, Inc.

2.08 CONCRETE MIXTURES

- A. Design Criteria:
 - 1. Provide a mix design for each concrete application indicated. This may necessitate multiple mix designs for each class of concrete depending on HRWR, entrained air, and other requirements.
 - 2. All Concrete shall be normal weight concrete composed of Portland cement, fine aggregate, coarse aggregate, admixtures, and water, as specified.
 - 3. ACI 211.1 shall be the basis for selecting the proportions for concrete made with aggregates of normal and high density and of workability suitable for usual cast in place structures.
 - 4. The workability of any mix shall be as required for the specific placing conditions and the method of placement. The concrete shall have the ability to be worked readily into corners and around reinforcing steel without the segregation of materials or the collection of free water on the surface. Compliance with specified slump limitations shall not necessarily designate a satisfactory mix.
 - 5. In no case shall the amount of coarse material produce harshness in placing or honeycombing in the structure, when forms are removed.
 - 6. The maximum amount of coarse aggregate (dry loose volume) per cubic foot of finished concrete shall not exceed 0.82 cubic feet.
 - 7. In calculating water-cement ratio: The water content shall include the amount of water batched or to be added later, plus the free water in the aggregate, and minus the water content at SSD conditions.
 - 8. No allowance shall be made for the evaporation of water after batching. If additional water is required to obtain the desired slump, a compensating amount of cement shall also be added. In no case shall the maximum water cement ratio exceed the specified maximum or that of the approved mix design.

9. Air Entrainment: Provide the percent air entrainment in each concrete mix design as recommended by ACI 318 and ACI 350 for “Moderate Exposure” (Class F1), unless otherwise specified/restricted:
 - a. Do not provide air-entrainment and entrapped air shall not exceed 3 percent for the following applications:
 - 1). Interior slabs.
10. When job conditions dictate, water-reducing and set-controlling admixtures may be used. Only specified admixtures shall be used. Admixtures shall be batched at the batch plant.
11. High Range Water Reducer (HRWR): Provide HRWR in mix designs as indicated for specified applications. Slump of concrete with the addition of HRWR may be increased to 8 inches (+/- 1 inch).
 - a. Footings, walls, columns, and beams.
 - b. Do not provide HRWR in slabs and pavement (a water reducer is permitted provided performance requirements are met).
12. If fly ash is to be used in place of cement, no more than 25 percent of the cement may be replaced.
13. Concrete shall be capable of developing two-thirds of the required 28-day compressive strength in 7 days.
14. Maximum water-soluble chloride ion content in concrete, by percent weight of concrete, shall not exceed ACI 318 and ACI 350 limits for Exposure Class C1.

B. Concrete Classifications:

Class	Min. 28-Day Compressive Strength (psi)	Max. Size Aggregate (inches)	Max. Water: Cement Ratio	Slump +/-1 (inches)	Min. Sacks of Cement Per Cubic Yard **
A	4000	1.5 Size No. 467	0.45	3 (8*)	5.75
B	3000	1.5 Size No. 467	0.47	3	5.75
C	4000	1.0 Size No. 57	0.45	4 (8*)	5.75
E	1500	1.5 Size No. 467	0.70	4	4.00

* Slump shown is with HRWR
 ** Provide one additional sack of cement per cubic yard if concrete must be deposited in standing water.

C. Concrete Usage:

Class	Usage
Class A Use	Footings and slabs, and other unless noted otherwise
Class B Use	Pavement, gutters, and sidewalks unless governed by applicable City Construction standards.

Class	Usage
Class C Use	Walls, columns, beams
Class E Use	Cradling, blocking, mud slab, lean concrete backfill

D. Required Average Compressive Strength:

1. All concrete is required to have an average compressive strength greater than the specified strength. The required average compressive strength shall be established according to the requirements of ACI 301, 4.2.3.3.
2. Standard Deviation: If the production facility has records of field tests performed within the past 12 months and spanning a period of not less than 60 calendar days for a class of concrete within 1000 psi of that specified for the Work, calculate a standard deviation and establish the required average strength f_{cr}' in accordance with ACI 301, 4.2.3.2 and 4.2.3.3.a. If field test records are not available, select the required average strength from ACI 301, Table 4.2.3.3.b.

E. Documentation of Required Average Compressive Strength:

1. Documentation indicating the proposed concrete proportions will produce an average compressive strength equal to or greater than the required average compressive strength, shall consist of field strength records or trial mixture.
2. Field Strength Records: Document field strength records according to ACI 301, 4.2.3.4.a and including the following:
 - a. Field test data shall not be older than 1 year.
 - b. If field test data are available and represent a single group of at least 10 consecutive strength tests for one mixture, using the same materials, under the same conditions, and encompassing a period of not less than 60 days, verify that the average of the field test results equals or exceeds f_{cr}' . Submit for acceptance the mixture proportions along with the field test data.
 - c. If the field test data represent two groups of compressive strength tests for two mixtures, plot the average strength of each group versus the water-cementitious materials ratio of the corresponding mixture proportions and interpolate between them to establish the required mixture proportions for f_{cr}' .
3. Trial Mixtures:
 - a. Establish trial mixture proportions according to ACI 301, 4.2.3.4.b and including the following.
 - 1). Make at least three trial mixtures complying with performance and design requirements. Each trial mixture shall have a different cementitious material content. Select water-cementitious materials ratios that will produce a range of compressive strengths encompassing the required average compressive strength f_{cr}' .
 - 2). Submit a plot of a curve showing the relationship between water-cementitious materials ratio and compressive strength.

- 3). Establish mixture proportions so that the maximum water-cementitious materials ratio is not exceeded when the slump is at the maximum specified.
 - b. Laboratory Samples shall be taken in accordance with the trial mix designs for laboratory testing purposes.
 - c. The fresh concrete shall be tested for Slump (ASTM C143) and Air Content (ASTM C173 and ASTM C231). Strength test specimens shall be made, cured, and tested for 7-day and 28-day strength in accordance with ASTM C192, ASTM C39, and ASTM C293.
 - d. Suitable facilities shall be provided for readily obtaining representative Samples of aggregate from each of the weigh batchers for test purposes and for obtaining representative Samples of concrete for uniformity tests. The necessary platforms, tools, and equipment for obtaining Samples shall be furnished. Aggregates shall be tested in accordance with ASTM C1260.
 - e. The cement contents specified are minimum values. If additional quantities are required to obtain the specified strengths, supply the cement at no additional cost to the Owner.
 - f. A trial mix shall be designed by an independent testing laboratory, retained and paid by the Contractor and approved by the Owner. The testing laboratory shall submit verification that the materials and proportions of the trial concrete mix design meet the requirements of the Specifications.
 - g. From these trial mix tests, the ratios between 7-day and 28-day strengths shall be established. The 7-day strength which corresponds to the required 28-day strength shall be determined.
 - h. The final results of the trial mix design shall be submitted to the Engineer at least 10 days prior to the scheduled beginning of concrete placement and shall be approved by the Engineer prior to the placement of any concrete.
4. Revisions to concrete mixtures:
- a. When less than 15 compressive strength tests results for a given class of concrete are available from the current Project:
 - 1). If any of the following criteria are met, take immediate steps to increase average compressive strength of the concrete.
 - a). A 7-day compressive strength test result multiplied by 1.5 falls below the required 28-day compressive strength.
 - b). A 28-day compressive strength test result is deemed not satisfactory.
 - b. When at least 15 compressive strength test results for a given class of concrete become available from the current Project:
 - 1). Calculate the actual average compressive strength, standard deviation and required average compressive strength using the previous 15 consecutive strength tests. Submit results in graphical form with each 28-day test result for that class of concrete.
 - 2). If any of the following criteria are met, take immediate steps to increase average compressive strength of the concrete.

- a). A 7-day compressive strength test result multiplied by the average job-to-date ratio of 7-day to 28-day compressive strength falls below the required 28-day compressive strength.
 - b). A 28-day compressive strength test result is deemed not satisfactory.
 - c). The average compressive strength falls below the required average compressive strength.
- c. When revisions to the mix design are required, notify the Engineer in writing of the corrective actions taken.

2.09 OFF-SITE BATCH PLANT

- A. Batch plants shall be an established concrete batching facility meeting the requirements of the Concrete Plant Standards of the Concrete Plant Manufacturers Bureau.

2.10 CONCRETE MIXING

- A. Mixers may be stationary, truck, or paving mixers of approved design. They shall be capable of combining the materials into a uniform mixture and of discharging without mixture segregation. Stationary and paving mixers shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixers or mixing plant shall include a device for automatically counting the total number of batches of concrete mixed. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer on the name plate.
- B. The mixing time for stationary mixers shall be based upon the mixer's ability to produce uniform concrete throughout the batch and from batch to batch. For guidance purposes, the manufacturer's recommendations, or 1 minute for 1 cubic yard plus 1/4 minute for each additional cubic yard may be used. Final mixing time shall be based on mixer performance. Mixers shall not be charged in excess of the capacity specified by the manufacturer.
- C. When a stationary mixer is used for partial mixing of the concrete (shrink mixed), the stationary mixing time may be reduced to the minimum necessary to intermingle the ingredients (about 30 seconds).
- D. When a truck mixer is used, either for complete mixing (transit-mixed) or to finish the partial mixing in a stationary mixer and in the absence of uniformity test data, each batch of concrete shall be mixed not less than 70 nor more than 100 revolutions of the drum, at the rate of rotation designated by the manufacturer of the equipment as mixing speed. If the batch is at least 1/2 cubic yard less than the rated capacity, in the absence of uniformity test data, the number of revolutions at mixing speed may be reduced to no less than 50. Additional mixing shall be performed at the speed designated by the manufacturer of the equipment as agitating speed. When necessary for proper control of the concrete, mixing of transit-mixed concrete shall not be permitted until the truck mixer is at the Site of the concrete placement. Truck mixers shall be equipped with accurate revolution counters.
- E. Paving mixers may be either single compartment drum or multiple compartment drum type. A sled or box of suitable size shall be attached to the mixer under the bucket to catch any concrete spillage that may occur when the mixer is discharging

concrete into the bucket. Multiple compartment drum paving mixers shall be properly synchronized. The mixing time shall be determined by time required to transfer the concrete between compartments of the drum.

- F. Vehicles used in transporting materials from the batching plant to the paving mixers shall have bodies or compartments of adequate capacity to carry the materials and to deliver each batch, separated and intact, to the mixer. Cement shall be transported from the batching plant to the mixers in separate compartments which are equipped with windproof and rain proof covers.

3.00 EXECUTION

3.01 PREPARATION

- A. Notify the Owner's representative upon completion of various portions of the work required for placing concrete, so that inspection may be made as early as possible. Keep the Owner's representative informed of the anticipated concrete placing schedules.
- B. All items, including lines and grades, forms, waterstops, reinforcing, inserts, piping, electrical, plumbing and the Contractor's concreting materials and equipment shall be in compliance with the Contract Documents before proceeding.
- C. Do not place any concrete until formwork and the placing reinforcement in that unit is complete. Place no concrete before the completion of all adjacent operations which might prove detrimental to the concrete.
- D. Brilliantly light the Site so that all operations are plainly visible when concrete mixing, placing, and finishing, continues after daylight. Whenever possible, concrete finishing shall be completed in daylight hours.
- E. When placing concrete, the forms shall be clean and entirely free from all chips, dirt, sawdust and other extraneous matter. Forms for slab, beam and girder construction shall not have tie wire cuttings, nails, or any other matter which would mar the appearance of the finished construction. Clean forms and keep them free of any foreign matter during concrete placing.
- F. The concrete shall be mixed in quantities required for immediate use. Any concrete which is not in place within the time limits specified shall not be used. Concrete shall not be re-tempered.
- G. Concrete shall not be placed if impending weather conditions would impair the quality of the finished Work.
- H. Unless otherwise provided, the following requirements shall govern the time sequence on which construction operations shall be carried.
 - 1. Forms for walls or columns shall not be erected on concrete footings until the concrete in the footing has cured for at least 2 curing days. Concrete may be placed in a wall or column as soon as the forms and reinforcing steel placements are approved.
 - 2. Steel beams or forms and falsework for superstructures shall not be erected on concrete substructures until the substructure concrete has cured for at least 4 curing days. Falsework required for superstructures shall not be erected until the

substructure has cured for 4 curing days, and shall not be removed until the superstructure has cured.

3.02 EMBEDDED ITEMS

- A. Where aluminum anchors, aluminum shapes, or aluminum electrical conduits are embedded in concrete, paint aluminum contact surfaces with zinc rich primer. Allow the paint to thoroughly dry before placing the aluminum in contact with the concrete.
- B. Paint steel or other ferrous metal to be mounted on or placed in contact with dry/cured concrete, and coat in accordance with Section 09 96 00.01 "High-Performance Coatings" prior to installation.

3.03 JOINTS

- A. Expansion Joints and Devices:
 - 1. Workmanship: Exercise careful workmanship in joint construction to separate the concrete sections by an open joint or by the joint materials, and make the joints true to the outline indicated.
 - 2. Expansion Joints: Construct expansion joints and devices to provide expansion and contraction. Construct joints which are to be left open or filled with poured joint material with forms which are adaptable for loosening or early removal. In order to avoid jamming by the expansion action of the concrete and the consequent likelihood of injuring adjacent concrete, remove or loosen these forms as soon as possible after the concrete has initially set. Make provisions for loosening the forms to permit free concrete expansion without requiring full removal.
 - 3. Armored Joints: Carefully construct armored joints to avoid defective anchorage of the steel and porous or honeycombed concrete adjacent to same. Anchor pre-molded materials to the concrete on one side of the joint with approved adhesive. Anchor so that the material does not fall out of the joint.
- B. Construction Joints:
 - 1. Construction joints are formed by placing plastic concrete in direct contact with concrete which has attained its initial set. When concrete is specified as monolithic, the term shall be interpreted as the manner and sequence of concrete placement so that construction joints do not occur.
 - a. Unless noted otherwise, the maximum horizontal spacing of construction joints shall be 40 feet.
 - b. For slabs on grade, the maximum spacing between two construction joints or between a construction joint and a control joint shall be 15 feet, unless noted otherwise.
 - c. Unless noted otherwise or approved by the Engineer, the maximum vertical spacing of construction joints shall be 15 feet. If not detailed on the Drawings, construction joint details and locations shall be submitted to the Engineer for approval.
 - 2. Additional horizontal and vertical construction joints, when submitted and approved by the Engineer, may have an impact on reinforcing details. Revise reinforcing details to reflect additional joints.

3. Unless otherwise provided, construction joints shall be square and normal to the forms. Provide bulkheads in the forms for all joints except horizontal joints.
 4. At the proper time, clean horizontal construction joints for receiving the succeeding lift using air water cutting. The surface shall be exposed sound, clean aggregate. The air pressure supply to the jet shall be approximately 100 lb. per square inch, and the water pressure sufficient to bring the water into effective influence of the air pressure. After cutting, wash the surface until there is no trace of cloudiness in the wash water.
 5. In areas where air water cutting cannot be satisfactorily accomplished, or in areas where it is undesirable to disturb the surface of the concrete before it has hardened, prepare the surface for receiving the next lift by wet sand blasting to immediately remove all laitance and unsound concrete prior to placing of the next lift. Thoroughly wash the surface of the concrete after sand blasting to remove all loose material.
 6. Provide construction joints with concrete keyways, reinforcing steel dowels, and waterstops. The method of forming keys in keyed joints shall permit the easy removal of forms without chipping, breaking, or damaging the concrete.
- C. Existing Hardened Concrete: Where new concrete or grout is to be placed in contact with existing hardened concrete, texture the existing surface by chipping or other means so that an irregular surface having a height variance of not less than 1/4 inch is created. The existing concrete shall then be coated with a bonding agent and new concrete or grout placed.

3.04 WATERSTOPS

- A. PVC Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work.
1. At formed surfaces, a split form shall be used. The split form shall have a tight fit which prevents misalignment and concrete leakage.
 2. The embedded flange of the waterstop must be secured prior to concrete placement. The flange shall be secured at 12 inches on-center by factory installed hog rings or grommets at the outermost rib. Never place nails or screws through the body of the waterstop.
 3. All fittings and changes in direction shall be factory fabricated. Only straight butt splices shall be made in the field. Field splices shall be according to the manufacturer's written instructions and as follows:
 - a. Cut adjoining ends square to form matching edges.
 - b. Uniformly melt the ends at 380 F using a thermostatically controlled, Teflon coated splicing iron.
 - c. When a 1/8-inch diameter melt bead develops on each waterstop end, remove the splicing iron and firmly press the two ends together in proper alignment. Hold until the material has fused and cooled. Allow the splice to cool naturally; do not quench.

B. Self-Expanding Strip Waterstops:

1. Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place.
 - a. Waterstop shall be bonded to the substrate using a continuous bead of swelling sealant or adhesive as recommended by the manufacturer.
 - 1). ADEKA Ultra Seal P-201.
 - 2). Sika Leakmaster.
2. Install in longest lengths practicable.
3. Protect from moisture, oil, dirt, and sunlight prior to the placement of concrete. Coordinate with manufacturer for additional requirements.

3.05 CONCRETE PLACEMENT**A. Cold Weather:**

1. If air temperature has fallen to, or is expected to fall below 40 F during the protection period (a minimum of 48 hours unless longer time frame is recommended by ACI 306R), then cold weather concreting shall be performed in accordance with ACI 306.1.
2. In cases where the temperature drops below 40 F after the concreting operations have been started, sufficient canvas and framework or other type of housing shall be furnished to enclose and protect the structure, in accordance with the requirements of ACI 306R. Sufficient heating apparatus to provide heat shall be supplied, and heating source and protection from combustion gas shall be in accordance with ACI 306.1. The concrete shall be protected when placed under all weather conditions. Should concrete placed under such conditions prove unsatisfactory, remove and replace the concrete at no cost to the Owner.
3. When the air temperature is above 30 F:
 - a. The minimum concrete temperature at the time of mixing shall be 60 F unless other requirements of ACI 306.1 are met, which may allow for a lower mix temperature.
 - b. The minimum concrete temperature at the time of placement and during the protection period shall be 55 F unless other requirements of ACI 306.1 are met, which may allow for a lower temperature.
4. The means used to heat a concrete mix shall be in accordance with ACI 306.1.
5. Salts, chemicals, or other foreign materials shall not be mixed with the concrete to preventing freezing. Calcium chloride is not permitted.

B. Hot Weather:

1. Hot weather is defined as any combination of high air temperature, low relative humidity, and wind velocity that impairs the quality of the concrete. Hot weather concreting shall be in accordance with ACI 305.1. Concrete shall be placed in the forms without the addition of any more water than that required by the design (slump). No excess water shall be added on the concrete surface for finishing. Control of initial set of the concrete and extending the time for finishing

operations may be accomplished with the use of approved water reducing and set retarding admixture, as specified.

2. Maximum time intervals between the addition of mixing water and/or cement to the batch, and the placing of concrete in the forms shall not exceed the following (excluding HRWR admixture use):

Concrete Temperature	Maximum time From Water Batch to Placement
Non-Agitated Concrete	
Up to 80 F	30 Minutes
Over 80 F	15 Minutes
Agitated Concrete	
Up to 75 F	90 Minutes
75 F to 89 F	60 Minutes

- a. The use of an approved set-retarding admixture will permit the extension of the above time maximums by 30 minutes, for agitated concrete only.
 - b. The use of an approved high range water reducing (HRWR) admixture will allow placement time extensions as determined by the manufacturer.
3. The maximum temperature of concrete shall not exceed 90 F at the time the concrete is placed. The temperatures of the mixing water shall be reduced by the use of chilled water or ice.
 4. The maximum temperature of concrete with high range water reducing admixture shall not exceed 100 F at the time concrete is placed.
 5. Under extreme heat, wind, or humidity conditions, concreting operations may be suspended if the quality of the concrete being placed is not acceptable.
- C. Handling and Transporting:
1. Delivery tickets shall be required for each batch and shall be in accordance with ASTM C94, Section 16. Each delivery ticket must show plainly the amount of water, in gallons that can be added to the mixer truck at the Site without exceeding the maximum water cement ratio approved for that mix design. Amount of water added must be in proportion to contents of truck.
 2. Arrange and use chutes, troughs, or pipes as aids in placing concrete so that the ingredients of the concrete are not segregated. They shall be steel or steel lined. When steep slopes are necessary, equip the chutes with baffles or make in short lengths that reverse the direction of movement. Extend open troughs and chutes, if necessary, inside the forms or through holes left in the forms. Terminate the ends of these chutes in vertical downspouts.
 3. Keep chutes, troughs, and pipes clean and free from coatings of hardened concrete by thoroughly flushing with water before and after placement. Discharge water used for flushing away from the concrete in place.
 4. Concrete pumping is permitted and shall comply with ACI 304.2R.

5. Carting or wheeling concrete batches on completed concrete floor slab shall not be permitted until the slab has aged at least 4 curing days. Unless pneumatic tired carts are used, wheel the carts on timber planking so that the loads and impact are distributed over the slab. Curing operations shall not be interrupted for the purpose of wheeling concrete over finished slabs.

D. Depositing:

1. The method and manner of placing shall prevent segregation or separation of the aggregate or the displacement of the reinforcement. Use drop chutes of rubber or metal when necessary. Prevent the spattering of forms or reinforcement bars if the spattered concrete dries or hardens before it is incorporated into the mass.
2. Fill each part of the forms by directly depositing concrete as near its final position as possible. Work the coarse aggregate back from the face and force the concrete under and around the reinforcement bars without displacing them. Depositing large quantities at one point in the forms, then running or working it along the forms shall not be permitted.
3. After the concrete has taken initial set, the forms shall not be jarred. No force or load shall be placed upon projecting reinforcement.
4. Deposit the concrete through vertical drop chutes of rubber or metal of satisfactory size when operations involve placing concrete from above, such as directly into an excavated area, or through the completed forms, particularly in walls, piers, columns, and similar structures. Drop chutes shall be made in sections or provided in several lengths so that the outlet may be adjusted to proper heights during placing.
5. Except for drilled shafts, concrete shall not be dropped free more than 10 feet when HRWR admixture is used or 5 feet without HRWR. Place in continuous horizontal layers with a depth of from 1 to 3 feet, depending upon the wall thickness. Each layer shall be soft when a new layer is placed upon it. No more than 1 hour shall elapse between the placing of successive concrete layers in any portion of the structures included in continuous placement.
6. Place required sections in one continuous operation to avoid additional construction joints.
7. If excessive bleeding causes water to form on the surface of the concrete in tall forms, make the mix dryer to reduce the bleeding. In tall walls, place the concrete to a point about 1 foot below the top of the wall and allow to settle for 1 to 2 hours. Resume and complete concreting before set occurs.
8. For slopes greater than two percent, start concrete placement at low end and proceed upslope.

E. Consolidating:

1. Compact each layer of concrete and flush the mortar to the surface of the forms by continuous-working mechanical vibrators. Vibrators which operate by attachment to forms shall not be used. Apply the vibrator to the concrete immediately after deposit. Move vibrator throughout the layer of the newly placed concrete, several inches into the plastic layer below. Thoroughly work the concrete around the reinforcement, embedded fixtures and into the corners and angles of the forms until it is well-compacted.

2. Mechanical vibrators shall not be operated so that they penetrate or disturb previously placed layers which are partially set or hardened. They shall not be used to aid the flow of concrete laterally. The vibration shall be of sufficient duration to completely compact and embed reinforcement and fixtures, but not to an extent causing segregation.
 3. Keep vibrators constantly moving in the concrete and apply vertically at points uniformly spaced, not farther apart than the radius over which the vibrator is visibly effective. The vibrator shall not be held in one location longer than required to produce a liquified appearance on the surface.
 4. When submerged in concrete, internal vibrators shall maintain a frequency of not less than 6000 impulses per minute for spuds with diameters greater than 5 inches and 10,000 impulses for smaller spuds. The vibration intensity (amplitude) shall be sufficient to produce satisfactory consolidation.
 5. Provide one vibrator (powered pneumatically or electrically) for each 10 cubic yards of concrete per hour being placed. Provide at least one vibrator, which may be of the gasoline powered type, as a standby for each two vibrators in service. To produce satisfactory consolidation, and based upon the observed performance, the Owner's representative may require the use of a larger sized and powered vibrator.
 6. Check vibrators intended for regular service or standby service before beginning concreting operations.
- F. Placement in Water:
1. Deposit concrete in water only when dry conditions cannot be obtained. The forms, cofferdams, or caissons shall be sufficiently tight to prevent any water flowing through the space where concrete is to be deposited. Pumping of water shall not be permitted while the concrete is being placed, nor until it has set for at least 36 hours.
 2. Carefully place the concrete compact mass using a tremie, closed bottom dumping bucket, or another approved method which does not permit the concrete to fall through the water without protection. The concrete shall not be disturbed after being deposited. Regulate depositing to maintain horizontal surfaces.
 3. When a tremie is used, it shall consist of a tube constructed in sections having water-tight connections. The means of supporting the tremie shall permit the movement of the discharge end over the entire top surface of the work, and shall allow the tremie to be rapidly lowered to retard the flow. The number of times it is necessary to shift the location of the tremie shall be held to a minimum for any continuous placement of concrete. During the placing of concrete, keep the tremie tube full to the bottom of the hopper. When a batch is dumped into the hopper, slightly raise the tremie, but not out of the concrete at the bottom, until the batch discharges to the level of the bottom of the hopper. Stop the flow by lowering the tremie. Continue placing operations until the work is completed.
 4. When concrete is placed by means of the bottom dump bucket, the bucket shall have a capacity of not less than 1/2 cubic yard. Lower the bucket gradually and carefully until it rests upon the concrete already placed. Raise it very slowly

during the discharge travel to maintain still water at the point of discharge and to avoid agitating the mixture.

5. Use a sump or other approved method to channel displaced fluid and concrete away from the shaft excavation. Recover slurry and dispose of it as approved. Do not discharge displaced fluids into or in close proximity to streams or other bodies of water.
- G. Placement in Slabs:
1. Allow concrete in columns, walls and deep beams or girders to stand for at least 1 hour to permit full settlement from consolidation, before concrete is placed for slabs they are to support. Haunches are considered as part of the slab and shall be placed integrally with them.
 2. When monolithic slabs are placed in strips, the widths of the strips, unless otherwise specified or indicated, shall insure that concrete in any one strip is not allowed to lie in place for more than 1 hour before the adjacent strips are placed.
 3. Immediately before placing concrete, thoroughly dampen the earthen cushion to receive concrete to prevent moisture absorption from the concrete.
 4. As soon as concrete placing is complete for a slab section of sufficient width to permit finishing operations, level the concrete, strike off, tamp and screed. The screed shall be of a design adaptable to the use intended, shall have provision for vertical adjustment and shall be sufficiently rigid to hold true to shape during use.
 5. The initial strike off shall leave the concrete surface at an elevation slightly above grade so that, when consolidation and finishing operations are completed, the surface of the slab is at grade elevation.
 6. Continue tamping and screeding operations until the concrete is properly consolidated and free of surface voids. Bring the surface to a smooth, true alignment using longitudinal screeding, floating, belting, and/or other methods.
 7. When used, templates shall be of a design which permits early removal so satisfactory finishing at and adjacent to the template is achieved.
 8. While the concrete is still plastic, straightedge the surface using a standard 10-foot metal straightedge. Lap each straightedge pass one-half of the preceding pass. Remove high spots and fill depressions with fresh concrete and re-float. Continue to check with a straightedge during the final finishing operation, until the surface is true to grade and free of depressions, high spots, voids, or rough spots.
 9. Check the final surface with a straightedge. Ordinates measured from the face of the straightedge to the surface of the slab shall not exceed 1/16 inch per foot from the nearest point of contact. The maximum ordinate shall be 1/8 inch per 10 feet.
 10. Unless noted otherwise, where floor drains are shown in slabs and sloping the slab is not indicated, slope slab to drain on a grade of 1/16 inch per foot with a maximum total slope of 1-1/4 inches. The thickness of slab at floor drain shall be the thickness of slab, as indicated on the Drawings.

- H. Placement in Foundations: Place concrete in deep foundations so that segregation of the aggregates or displacement of the reinforcement is avoided. Provide suitable chutes or vertical pipes. When footings can be placed in dry foundation pits without the use of cofferdams or caissons, forms may be omitted and the entire excavation filled with concrete to the elevation of the top of footing. The placing of concrete bases above seal courses is permitted after the forms are free from water and the seal course cleaned. Execute necessary pumping or bailing during concreting from a suitable sump located outside the forms.

3.06 FINISHING FORMED SURFACES

- A. Forms for walls, columns, and sides of beams and girders shall be removed as specified in Section 03 11 00 "Concrete Forming." Patch, repair, finish, and clean concrete after form removal. Finish concrete within 7 days of form removal. Cure concrete as finishing progresses.
- B. Air voids, for all types of finishes, are defects and shall be removed by rubbing or patching.
- C. Finish Schedule:

Type of Finish	Location
No Finish	Surfaces which are not visible from the inside or outside of the completed structure or more than 12 inches below finish grade (i.e. back of retaining walls below embankment, etc.)
Smooth Finish	Surfaces exposed to view and areas below to a point 12 inches below grade

- D. No Finish: After forms are removed, repair or patch-tie holes and defects. Otherwise, no additional finish is required.
- E. Rough Finish: Surfaces for which rough finish is indicated or required shall have tie holes and defects larger than 1/4 inch in width or depth patched or repaired. Remove fins flush with the adjacent surface by rubbing or grinding and dress rough edges. Otherwise, leave surfaces with the texture imparted by the forms.
- F. Smooth Finish: Unless otherwise shown on the schedule above, provide smooth form finish for concrete surfaces to be exposed to view. Surfaces to receive a rubbed finish shall have a smooth form finish. The form facing material shall produce a smooth, hard, uniform texture on the concrete. The arrangement of the facing material shall be orderly and symmetrical with a minimum number of seams. Patch tie holes and defects and remove fins flush with the adjacent surface.
- G. Form Liner Finish: Finish shall be as specified in Section 03 11 00 "Concrete Forming."

3.07 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Finish slabs, platforms, and steps monolithically and apply as indicated on the Drawings and the following schedule of finishes:

Type of Finish	Location
Rough Finish	Floors that receive grout topping and slabs which receive additional concrete toppings.
Trowel Finish	Slab surfaces exposed to view or to be covered with resilient flooring, carpet, and ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
Broom Finish	Exterior concrete platforms, steps, and ramps.

1. Rough Finish: Provide a rough surface by screeding only without further finish.
 2. Float Finish: Finish surfaces using a float to a true, even plane with no coarse aggregate visible. In the initial floating, while the concrete is plastic, use sufficient pressure on the float to bring excess moisture to the surface for removal. Apply a final "light float" finish to the surface as the concrete hardens. The surface shall have a uniform granular texture and shall meet the straightness requirements.
 3. Trowel Finish:
 - a. After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - b. Finish and measure surface so gap at any point between concrete surface and an unlevelled freestanding 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed $\frac{1}{4}$ inch.
 4. Broom Finish: Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- C. Give sidewalks a brush finish, unless noted otherwise. Score sidewalks at a spacing equal to the width of the walk and edge on each side using a tool with a radius of approximately $\frac{1}{4}$ inch.
- D. Finishing in Hot, Dry Weather: During periods of high temperature and/or low humidity, take extreme care in finishing the slabs to eliminate initial shrinkage cracks. Following the initial set of concrete, but while the concrete is still "green" continue to finish as required to remove shrinkage cracks which may occur. In hot, dry weather, keep a cement finisher on the job following normal finishing operations for a sufficient length of time to insure the removal of initial shrinkage cracks.

3.08 MISCELLANEOUS CONCRETE ITEMS

- A. Normal Shrinkage Grouting:

1. Prior to grout application, thoroughly clean the surface of all foreign matter and wet down. Thoroughly clean the foundation and the forms set in place and securely anchor, with holes or cracks in forms caulked with rags, cotton waste or dry sand mixture to prevent the loss of grout. The necessary materials and tools

shall be on hand before starting grouting operations. Concrete shall be damp when the grout is poured, but shall not have excess water to dilute the grout.

2. After wetting and just prior to grouting, sprinkle the surface lightly with cement to improve the bond between the grout and the surface.
3. After mixing, quickly and continuously place the grout to avoid overworking, segregation and breaking down of the initial set. Mix and place the grout according to the manufacturer's recommendations. Cure grout using wet curing method for concrete. Grout shall receive a steel trowel finish.

B. Non-Shrink Grout:

1. Obtain field technical assistance from the Grout manufacturer, as required, to insure that grout mixing and installation comply with the manufacturer's recommendations and procedures.
2. Saturate the foundation for non-shrink grouts 24 hours before installation and clear of excess water. Free baseplates or bedplates of oil, grease, laitance and other foreign substances.
3. Place grout according to the manufacturer's directions so that spaces and cavities below the top of the baseplates and bedplates are completely filled. Provide forms where structural components of the baseplates or bedplates do not confine the grout. Where necessary and acceptable under the manufacturer's procedures, a round head pencil vibrator, 3/4-inch maximum diameter may be used to consolidate the grout.
4. Steel trowel finish the non-shrink grout where the edge of the grout is exposed to view and after the grout has reached its initial set. Cut off the exposed edges of the grout at a 45-degree angle to the baseplate, bedplate, member, or piece of equipment.
5. Wet curing should occur for at least 3 days, unless specified by manufacturer, with wet rags, wet burlap or polyethylene sheets. Keep cloths constantly wet for the curing cycle.
6. Clean and dry the foundation, baseplate or other surface of epoxy grouts prior to installation. Dry curing is acceptable for epoxy grouts.
7. Use epoxy non-shrink grout under all machinery, pumps, equipment, and where chemicals are present that would abate cementitious non-shrink grouts.
8. Mix, install, cure, and finish epoxy grouts according to the manufacturer's recommendations. Install grout in recommended lifts to prevent excess heat.

3.09 CONCRETE PROTECTION AND CURING

- A. General: Give careful attention to proper concrete curing. The curing methods shall be wet curing, sheet materials conforming to ASTM C171, or membrane curing compound conforming to ASTM C309. Membrane curing is not permitted on surfaces to be rubbed or on surfaces to which additional concrete, plaster mix mortar, or terrazzo is to be applied. Unless the curing method is specified otherwise, select the appropriate curing method.

B. Length of Curing Period:

1. A “curing day” shall be any day on which the atmospheric temperature taken in the shade, or the air temperature adjacent to the concrete, remains above 50 F for at least 18 hours.
2. Cure concrete for a period of 7 consecutive days. In cold weather, when curing may be retarded, extend this period to 7 “curing days”, up to a limit of 14 consecutive days.

C. Wet Curing:

1. Immediately following the finishing operations, cover concrete slabs, including roof slabs, with wet cotton mats or with a temporary covering of canvas or burlap. Keep thoroughly wet for a period of 4 curing days after the concrete is placed. The covering shall be held in direct contact with the concrete. A temporary covering shall be required when the size of slab, size of mats, or other factors dictate that the mats cannot be placed immediately after the finishing operations without marring the finishing of the slab.
2. Water used for curing shall be free from injurious amounts of oil, acid, alkali, salt, or other deleterious substances.
3. Canvas or burlap covering material shall weigh not less than 12 ounces per square yard. Place the sections with a lap at the edges of at least 8 inches. Saturate cover material with water previous to placing. Keep saturated as long as it remains in place. Use care in the placing of the cover material to prevent marring the concrete surface.
4. When temporary coverings are used, keep them in place only until the slab has sufficiently hardened so that a cotton mat covering can be substituted without marring or disturbing the slab finish. Thoroughly saturate cotton mats before placing and keep the mats on the slab in a saturated condition for a period of at least 4 curing days.

D. Sheet Curing: Sheet materials shall conform to ASTM C171. They shall be in contact with the entire concrete surface and applied according to the manufacturer’s recommendations. Patch all holes. Where pedestrian traffic is unavoidable, provide suitable walkways to protect the sheet material.

E. Membrane Curing:

1. Membrane curing shall not be used on surfaces which receive paint, floor hardener, or plaster mix finish or other finish which would be hindered by the use of the curing compound.
2. Cover the surface of the concrete with a continuous, uniform, water-impermeable coating, conforming to ASTM C309 “Liquid Membrane Forming Compounds for Curing Concrete” and apply according to ACI 308.
3. Immediately after the removal of the side and end forms, apply a coating to the sides and ends of all concrete. Apply the solution under pressure with a spray nozzle so that the entire exposed surface is completely covered with a uniform film. The rate of application shall insure complete coverage, but the area covered shall not exceed 150 square feet per gallon of curing compound.

4. The coating shall be sufficiently transparent and free of permanent color to not result in a pronounced color change from that of the natural concrete at the conclusion of the curing period. The coating shall, however, contain a dye of color strength to render the film distinctively visible on the concrete for a period of at least 4 hours after application.
5. After application and under normal conditions, the curing compound shall be dry to touch within 1 hour and shall dry thoroughly and completely within 4 hours. When thoroughly dry, it shall provide a continuous flexible membrane free from cracks or pinholes and shall not disintegrate, check, peel, or crack during the required curing period.
6. If the seal is broken during the curing period, immediately repair it with additional sealing solution.

3.10 CONCRETE SURFACE REPAIRS

- A. After the tie rods are broken back or removed, thoroughly clean the holes to remove grease and loose particles. Patch holes with structural concrete repair material. After the holes are completely filled, strike off flush excess mortar and finish the surface to render the filled hole inconspicuous.
- B. If the surface of the concrete is bulged, uneven, or shows honeycombing or form marks, which in the Engineer's opinion cannot be repaired satisfactorily, remove and replace the entire section.
- C. Patch honeycomb and minor defects in all concrete surfaces with structural concrete repair material. Cut back each defective area with a pneumatic chipping tool as deep as the defect extends, but in no case less than 1/2 inch. Prepare the existing concrete according to the recommendations of patching material manufacturer's. Apply repair material according to the manufacturer's recommendations. Finish the surface of the patches to match finish on surrounding concrete.

3.11 FIELD QUALITY CONTROL

- A. Testing:
 1. General:
 - a. Tests shall be required throughout the Work to monitor the quality of concrete. Samples shall be taken in accordance with ASTM C172.
 - b. The Engineer may waive these requirements on concrete placements of ten cubic yards or less. However, evidence shall be furnished showing a design mix which meets the Specifications.
 - c. Unless noted otherwise, testing of the materials, ready mix, transit mix, or central plant concrete will be by an independent testing agency. The independent testing agency will be approved by the Owner and paid by the Contractor. A summary of all tests performed will be available. No concrete shall be placed without a representative present at either the plant or at the Site.
 - d. Unless the Owner's laboratory is on the Site, provide housing for the curing and storage of test specimens and equipment.

2. Slump Test: Slump tests, in accordance with ASTM C143, shall be used to indicate the workability and consistency of the concrete mix from batch to batch. Generally, a slump test shall be made at the start of operations each day, at regular intervals throughout a working day, and at any time when the appearance of the concrete suggests a change in uniformity.
3. Air Content Test: Tests for the concrete's air content shall be made in accordance with ASTM C231 or ASTM C173, at the point of delivery of concrete, prior to placing in forms. The test shall be made frequently to monitor a proper air content uniform from batch to batch.
4. Temperature Test: Test for the concrete's temperature in accordance with ASTM C1064 and as follows: the temperature of the concrete to be placed shall be taken with a thermometer immediately before placement, with the point of measurement being in the chute or bucket. Temperature test shall be performed for each truck. Record temperatures on batch ticket.
5. Compression Test:
 - a. Compression test specimens shall be 6-by-12-inch concrete cylinders made and cured in accordance with ASTM C31. If the maximum aggregate size is no larger than 1 inch, 4-by-8-inch concrete cylinders are acceptable. No fewer than two 6-by-12-inch or three 4-by-8-inch specimens shall be made for each test Sample. Samples shall be taken at a minimum of every 50 cubic yards of concrete for each class placed. At least one set of test specimens per day shall be made for each class of concrete used that day. Specimens shall be cured under laboratory conditions specified in ASTM C31. Additional concrete cylinders may be required for curing on the job under actual job curing conditions. These Samples could be required when:
 - 1). There is a possibility of the air temperature surrounding the concrete falling below 40 F, or rising above 90 F.
 - 2). The curing procedure may need to be improved and/or lengthened.
 - 3). It is necessary to determine when the structure may be put into service.
 - b. Compression strength tests shall be made on the laboratory-cured and job-cured concrete cylinders at 7 and 28 days, in accordance with ASTM C39. The value of each test result shall be the average compressive strength of all of the cylinders in the test Sample. All cylinders within a test Sample shall be taken at the same time from the same batch of concrete. For the 28-day cylinders, the strength level shall be satisfactory if the averages of all sets of three consecutive strength test results exceed the required design compressive strength, and no individual strength test result falls below the required compressive strength by more than 500 psi.
6. Failure to Meet Requirements:
 - a. Should the 7-day strengths shown by the test specimens fall below the required values, additional curing shall be performed on those portions of the structures represented by the test specimens at the Contractor's expense. Test cores shall be obtained and tested in accordance with ASTM Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete, Designation C 42. If additional curing does not give the strength required, the Owner reserves the right to require strengthening, replacement

of those substandard portions of the structure, or additional testing, at the Contractor's expense.

- b. Upon receipt of the Contractor's written request, substandard concrete work may be reexamined in place by nondestructive testing methods or core Samples, in accordance with ACI 301. The services of an independent testing laboratory shall be retained and all expenses paid without compensation from the Owner. Laboratory results shall be evaluated by the Engineer, who shall make the final decision on acceptability of the concrete in question. Core Sample holes shall be repaired.
- B. The Owner may withhold payment for any section of concrete which does not meet the requirements of the Specifications. Withheld payment shall be based upon the unit prices established for concrete and reinforcing steel. Payment shall be withheld until the unacceptable concrete has been refinished, removed and replaced or otherwise brought into conformance with the Specifications.
- C. PVC Waterstops: Waterstops shall be observed by the Owner's representative prior to concrete placement. Unacceptable splicing defects include:
 1. Misalignment of center bulb, ribs, and end bulbs greater than 1/16 inch.
 2. Bond failure at joint deeper than 1/16 inch.
 3. Misalignment which reduces waterstop cross-section more than 15 percent.
 4. Bubble or visible porosity in the weld.
 5. Visible signs of splice separation when a cooled splice is bent by hand at a sharp angle.
 6. Charred or burnt material.

END OF SECTION

Concrete Mix Design

Project Name: _____
 FNI Project
 Number: _____
 Project Location: _____
 Owner: _____
 General
 Contractor: _____
 Mix Number /
 Class: _____

A. Mix Design:

Cement = _____ lb/yd³
 Fly Ash = _____ lb/yd³
 Other Cementitious
 Material: _____
 _____ = _____ lb/yd³
 Fine Aggregate = _____ lb/yd³
 Course Aggregate = _____ lb/yd³
 Water = _____ lb/yd³
 Water Reducing Admixture = _____ oz/yd³
 High Range Water Reducer = _____ oz/yd³
 Air Entraining Admixture = _____ oz/yd³
 Other Admixture: _____
 _____ = _____ oz/yd³
 Slump = _____ inches
 Gross Weight = _____ lb/yd³
 Air Content = _____ percent
 Water/Cement Ratio = _____

B. Materials:

	Source	ASTM	Type	Remarks
Cement				
Fly Ash				
Other Cementitious Material: _____				
Fine Aggregate				
Coarse Aggregate				
Water				
Water Reducer				
High Range Water Reducer				
Air Entraining				

	Source	ASTM	Type	Remarks
Other Admixture:				

C. Determination of Average Strength Required (fcr):

1. Test Records Available:

A. Summary of Test Records (Provide Supporting Documentation):

Test Group No.	No. of Consecutive Tests	Specified Strength (psi)	Standard Deviation (psi)
Average Standard Deviation:			

B. Standard Deviation Modification Factor (ACI 30 1, Table 4.2.3.3.a): ____.

C. Standard Deviation Used: ____.

D. Average Compressive Strength Required: ____.

2. Test Records Not Available:

A. Average Compressive Strength Required (ACI 30 1, Table 4.2.3.3.b, if required): ____.

D. Documentation of Required Average Compressive Strength (Check One):

1. Field Strength:

a. Field Strength Test Records (ACI 30 1, Table 4.2.3.3.a): ____ . *Complete Attachment A.

2. Trial Mixtures:

a. Trial Mixtures (ACI 301, Table 4.2.3.3.b, if required): ____ . *Complete Attachment B.

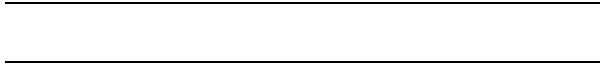
I, _____ certify that the above information is correct and all gradations, cement certifications, and test results are located at our place of business for review by the Engineer.

Name: _____ Date: _____

Title: _____

Company: _____

Address: _____



Attachment A
Documentation of Required Average Strength - Field Strength Records
(ACI 301, 4.2.3.4.a)

A. Summary of Test Records (Provide Supporting Documentation):

Test Record No.	No. of Tests in Record	Duration of Record (days)	Water-Cementitious Materials Ratio	Average Strength (psi)

B. Interpolation used? _____.

1. Provide an interpolation calculation or plot of strength versus proportions.

C. Submit the following data for each mix:

1. Brand, type, and amount of cement.
2. Brand, type, and amount of each admixture.
3. Source of each material used.
4. Amount of water.
5. Proportions of each aggregate material per cubic yard.
6. Gross weight per cubic yard.
7. Measured slump.
8. Measured air content.
9. Results of consecutive strength tests.

Attachment B
Documentation of Required Average Strength - Trial Mixtures
(ACI 301, 4.2.3.4.b)

A. Summary of Test Record(s):

Trial Mix No.	7-Day Tests		28-Day Tests		Water-Cementitious Materials Ratio	Slump (in)	Air Content (percent)	Temperature (F)
	No. of Test Cylinders	Strength (psi)	No. of Test Cylinders	Strength (psi)				

- B. Maximum water-cementitious materials ratio _____.
1. Provide an interpolation calculation or plot of strength versus water-cementitious materials ratio.
- C. Submit the following data for each mix:
1. Brand, type, and amount of cement.
 2. Brand, type, and amount of each admixture.
 3. Amount of water used in trial mixes.
 4. Proportions of each aggregate material per cubic yard.
 5. Gross weight per cubic yard.
 6. Measured slump.
 7. Measured air content.
 8. Compressive strength developed at 7 days and 28 days, from not less than three test cylinders cast for each 7-day and 28-day test.

END OF ATTACHMENTS

03 41 19 PRECAST REINFORCED CONCRETE VALVE VAULT**1.00 GENERAL****1.01 WORK INCLUDED**

- A. Furnish all labor, materials, equipment, incidentals and transportation necessary for placing precast reinforced concrete valve vault.

1.02 QUALITY ASSURANCE**A. Design Criteria:**

1. Precast reinforced concrete valve vault shall conform:
 - a. To the requirements of ASTM C857 and C858 for underground precast concrete utility structures.
 - b. Be designed for the specific site conditions and construction document requirements.
 - c. Be designed to resist buoyant forces due saturated soil.

B. Test Requirements:

1. For testing of precast (machine-made) valve vaults, a minimum of four test cylinders for design compressive strength shall be made for each day's production run of each size and class of culvert section. Strength tests for each production run will be based on the average strength of two cylinders which may be tested any time after completion of the specified curing period. When design strength is attained on the initial test, further tests on that run will not be required. Should the initial test fail to meet the design strength, subsequent tests shall be made at 28 days unless additional test cylinders were made during production of that run. Failure to attain design compression strength by the 28-day test will result in rejection of the run represented by the test. Equipment required for testing for precast (machine-made) valve vaults shall be furnished by the fabricator. Cylinders for compressive strength tests shall be made in accordance with ASTM C31.

C. Permissible Variations:

1. Tolerances for precast sections shall conform to ASTM C858.
 - a. Deviations from the above tolerances will be acceptable if the sections can be fitted at the plant or job site and it is determined that an acceptable joint can be made. For this condition an acceptable joint is:
 - 1). When two sections are fitted together on a flat surface, in proper alignment and in the position they will be installed, the longitudinal opening at any point shall not exceed 1 inch. Sections fitted together at the plant and accepted in this manner shall be match-marked for installation.

D. Inspection:

1. The quality of materials, the process of manufacture, and the finished valve vault shall be subject to inspection and approval by the Owner or an authorized representative at the manufacturing plant. In addition, the valve vault shall be subject to further inspection by the Owner at the Project Site prior to and during installation.

E. Cause for Rejection:

1. The valve vault shall be subject to rejection on account of failure to conform to any of the specification requirements. Individual sections of valve vault may be rejected because of the following:
 - a. Fractures or cracks in the vault.
 - b. Defects that indicate imperfect proportioning, mixing and molding.
 - c. Surface defects indicating honeycombed or open texture.
 - d. Damaged ends, where such damage would prevent making a structurally sound and water tight joint.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 “Document Management” and shall include:
 1. Manufacturer's product data sheets.
 2. Concrete mix and test results.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 1. American Society of Testing and Materials (ASTM) Standards:

ASTM C857	Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
ASTM C858	Standard Specification for Underground Precast Concrete Utility Structures
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field

2. American Association of State Highway and Transportation Officials (AASHTO) Standards:

AASHTO M198-08	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections using Preformed Flexible Joint Sealants
----------------	---

3. State Department of Highways and Public Transportation, Austin, Texas.

1.05 DELIVERY AND STORAGE

- A. Coordinate delivery with installation where possible to avoid unnecessary handling and equipment movement. When stockpiling is required, storage shall be made as close as possible to the point of installation.
- B. Store precast sections on level blocking in a manner acceptable to the Engineer. No load shall be placed upon them until design strength is reached and curing completed. Shipment of sections may be made when the design strength and curing requirements have been met.
- C. Store flexible gasket materials not on the box section, and joint lubricating compounds in a cool dry place. Gaskets and preformed plastic materials for pipe joint construction shall be kept clean, away from oil, grease, excessive heat and out of the direct rays of the sun.

2.00 PRODUCTS

2.01 MIXES

- A. Concrete: Mixed in a central batch plant or other approved batching facility from which the quality and uniformity of the concrete can be assured. Transit mixed concrete will not be acceptable. Concrete shall be 5000 psi minimum.

2.02 MANUFACTURED PRODUCTS

- A. Valve Vault: Materials, manufacture and curing of precast reinforced concrete valve vault shall conform to ASTM C858. Vault shall be a precast concrete structure in accordance with the Drawings and Specifications, and shall be manufactured by Oldcastle Precast, 1100 Heritage Pkwy, Mansfield, TX 76063-2759, or approved equal.
- B. Cold Applied Preformed Gaskets:
 - 1. Cold applied preformed gaskets shall be suitable for sealing joints of tongue and groove concrete box sections. The gasket sealing the joint shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes or obnoxious odors. The gasket joint sealer shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength, and shall be supplied in extruded rope-form of suitable cross-section. The size of the gasket joint sealer shall be in accordance with the manufacturer's recommendations and sufficient to obtain the squeeze-out as described in Paragraph 3.02.
 - 2. Gasket joint sealer shall be protected by a suitable removable two-piece wrapper. The two-piece wrapper shall be so designed that half may be removed longitudinally without disturbing the other half to facilitate application as noted below.
 - 3. The chemical composition of the gasket joint sealing compound shall conform to the requirements of AASHTO M198-08 1, Type B, Flexible Plastic Gasket (Bitumen).
- C. Workmanship and Finish: Valve Vault shall be substantially free from fractures, large or deep cracks and surface roughness. The ends of the valve vault shall be normal to the walls and centerline of the valve vault within the limits of Permissible Variations specified above. The vault exterior shall be coated with a bituminous coating for areas to be install below grade.

- D. Markings: The following information shall be clearly marked on each section. Markings shall be indented on the valve vault or painted thereon with waterproof paint.
1. The load rating and ASTM Designation No. of the valve vault.
 2. The date of manufacture.
 3. The name or trade name of the manufacturer.

3.00 EXECUTION

3.01 EXCAVATION AND EMBEDMENT

- A. Excavation and embedment shall conform to the requirements in Section 31 23 10 "Structural Excavation and Backfill."

3.02 INSTALLATION

A. Laying:

1. Valve vault sections shall be installed such that the bottom section(s) shall be full sections. Partial sections, if necessary, shall be utilized for the top most section only. Valve vault cover shall be separate from the vault walls.

B. Jointing:

1. Joints using cold applied preformed plastic gaskets shall be made as follows:
 - a. A suitable primer of the type recommended by the manufacturer of the gasket joint sealer shall be brush- applied to the tongue and groove joint surfaces and the end surfaces and allowed to dry and harden. No primer shall be applied over mud, sand, dirt or sharp cement protrusions. Clean and dry the surface to the primed when primer is applied.
 - b. Before laying the valve vault in the trench, attach the plastic gasket sealer around the tapered tongue or tapered groove near the shoulder or hub of each joint. Remove the paper wrapper from one side only of the two-piece wrapper on the gasket and press firmly to the clean, dry valve vault joint surface. Do not remove the outside wrapper until immediately before pushing the valve vault into its final position.
 - c. When the tongue is correctly aligned with the flare of the groove, remove the outside wrapper on the gasket and pull or push home the valve vault with sufficient force and power (Back Hoe shovel, chain hoist, ratchet hoist or winch) to cause the evidence of squeeze-out of the gasket material on the side of outside around the complex valve vault joint perimeter.
 - d. When the atmospheric temperature is below 60 F, plastic joint seal gaskets shall either be stored in an area warmed to above 70 F, or artificially warmed to this temperature in a manner satisfactory to the Engineer. Apply gaskets to valve vault joints immediately prior to placing valve vault in trench, followed by connection to previously laid box section.

3.03 BACKFILL

- A. After the valve vault has been placed, bedded and jointed as specified and approved by the Owner or his authorized representative, perform backfilling in accordance with Section 31 23 10 "Structural Excavation and Backfill." Take special precautions in placing and compacting the backfill to avoid any movement of the valve vault or damage to the joints.

END OF SECTION

DIVISION 04

MASONRY

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04 20 00 UNIT MASONRY

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

- 1. Concrete masonry units.
- 2. Decorative concrete masonry units.
- 3. Pre-blended Mortar and grout.
- 4. Steel reinforcing bars.
- 5. Masonry joint reinforcement.
- 6. Ties and anchors.
- 7. Embedded flashing.
- 8. Miscellaneous masonry accessories.
- 9. Cavity-wall insulation.

B. Related Sections:

- 1. Section 05 50 00 "Metal Fabrications" for furnishing steel lintels for unit masonry.
- 2. Section 07 19 00 "Water Repellents" for water repellents applied to unit masonry.
- 3. Section 07 27 26 "Fluid-Applied Membrane Air Barrier" for air barrier applied to unit masonry.
- 4. Section 07 62 00 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
- 5. Section 08 90 00 "Louvers and Vents" for wall vents (brick vents).

1.03 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.05 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C140 for compressive strength.

1.06 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Reinforced Wall Elevations, Scaled Drawings: For each reinforced CMU wall, load bearing or non-load bearing, provide scaled shop drawings which clearly indicate:
 - a. Reinforcing for all reinforced vertical cells, lintels, and bond beams.
 - b. All openings in walls and wall limits.
 - c. Reinforcing lengths, embedments, laps, hooks, and column ties.
 - d. CMU lintel block locations.
 3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
 4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection:
 1. Decorative CMUs, in the form of small-scale units.
 2. Colored mortar.
 3. Weep holes/vents.
- D. Samples for Verification: For each type and color of the following:
 1. Decorative CMUs.
 2. Pigmented mortar. Make samples using same sand and mortar ingredients to be used on Project.
 3. Weep holes and vents.
 4. Accessories embedded in masonry.

1.07 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include data on material properties
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include brand, type, and name of manufacturer.
 - 3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 4. Pre-blended, dry grout mixes. Include description of type and proportions of ingredients.
 - 5. Reinforcing bars.
 - 6. Reinforcing bar positioners.
 - 7. Grout screen.
 - 8. Joint reinforcement.
 - 9. Anchors, ties, and metal accessories.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.08 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for each type of exposed unit masonry construction in sizes approximately 60 inches high by 48 inches long by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in each exterior wall mockup.
 - b. Include lower corner of window opening framed at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include air barrier, cavity insulation, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
 2. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
 3. Protect accepted mockups from the elements with weather-resistant membrane.
 4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination."

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
 - 2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 F and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

2.00 PRODUCTS

2.01 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.02 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for building interior outside corners unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1). ACM Chemistries; RainBloc.
 - 2). BASF Aktiengesellschaft; Rheopel Plus.
 - 3). Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
- C. CMUs: ASTM C90.
1. Density Classification: Normal weight
 2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
- D. Decorative CMUs: ASTM C90.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Trenwyth industries
 - b. Featherlite
 - c. Johnson Concrete Products
 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
 3. Density Classification: Normal weight.
 4. Size (Width): Manufactured to dimensions specified in "CMUs" paragraph.
 5. Pattern and Texture:
 - a. Standard pattern, split-face finish.
 6. Colors: As indicated by manufacturer's designations
 7. Special Aggregate: Provide units made with aggregate matching aggregate in Architect's sample.

2.03 MASONRY LINTELS

- A. General: Provide one of the following:

- B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
1. Products: Provide face brick as indicated.

2.04 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A615 or ASTM A996, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A951.
1. Interior Walls: Hot-dip galvanized, carbon steel.
 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 3. Wire Size for Side Rods: 0.187-inch diameter.
 4. Wire Size for Cross Rods: 0.187-inch diameter.
 5. Wire Size for Veneer Ties: 0.148-inch diameter.
 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multi-wythe Masonry:
1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
 2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
 3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.05 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82; with ASTM A153, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008, Commercial Steel, with ASTM A153, Class B coating.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
 2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 3. Wire: Fabricate from 1/4-inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.
 4. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- D. Partition Top anchors: 0.105-inch thick metal plate with 3/8-inch diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- E. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
 2. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
 3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1). Dayton Superior Corporation, Dur-O-Wal Division; D/A 213 or D/A 210 with D/A 700-708.
 - 2). Heckmann Building Products Inc.; 315-D with 316 or Pos-I-Tie.
 - 3). Hohmann & Barnard, Inc.; DW-10HS or DW-10-X.
 - b. Anchor Section: Sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch wide by 5-1/2 inches long, stamped into center to provide a slot between strap and plate for inserting wire tie.

2.06 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
- B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.
- C. Anchor Bolts: Headed steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A153, Class C; of dimensions indicated.

- D. Post-installed Anchors: Torque-controlled expansion anchors or chemical anchors.
1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5 unless otherwise indicated.
 3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.07 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 2. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 3. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 4. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
- B. Flexible Flashing: Use the following unless otherwise indicated:
1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1). Advanced Building Products Inc.; Peel-N-Seal.
 - 2). Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - 3). Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
 - 4). Hohmann & Barnard, Inc.; Textroflash.
 - 5). W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
 - 6). Polyguard Products, Inc.; Polyguard 400.
 - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- C. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.

2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or elastomeric thermoplastic flashing with drip edge.
 4. Where flashing is fully concealed, use metal flashing or flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings:
1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.08 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use the following unless otherwise indicated:
1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1). Advanced Building Products Inc.; Mortar Maze weep vent.
 - 2). Blok-Lok Limited; Cell-Vent.
 - 3). Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
 - 4). Heckmann Building Products Inc.; No. 85 Cell Vent.
 - 5). Hohmann & Barnard, Inc.; Quadro-Vent.
 - 6). Wire-Bond; Cell Vent.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Building Products Inc.; Mortar Break II.
 - b. Archovations, Inc.; CavClear Masonry Mat.

- c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
 - d. Mortar Net USA, Ltd.; Mortar Net.
2. Provide one of the following configurations:
- a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.
 - b. Strips, not less than 1-1/2 inches thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
 - c. Sheets or strips full depth of cavity and installed to full height of cavity.
 - d. Sheets or strips not less than 1 inch thick and installed to full height of cavity with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.
- F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Wire-Bond; Core Lock Rebar Positioner.
- G. Grout Screen: Screen designed to fit in mortar bed joints and prevent grout from falling through block core while maintaining positive bond in mortar joint. Screen constructed of non-corrosive 1/4-inch square polypropylene monofilament screening.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Wire-Bond: Grout Stop.
 - b. Hohmann & Barnard, Inc.: MGS – Mortar/Grout Screen.

2.09 CAVITY-WALL INSULATION

- A. Exterior Wall Insulations: Closed-cell polyisocyanurate (POLYISO) foam core bonded to glass fiber reinforced aluminum foil facers on both sides. The printed side, exposed to the exterior, has a heavy and durable aluminum reflective surface.
1. Physical properties:
 - a. ASTM C1289 Type I, Class 1
 - b. Compressive Strength (ASTM D1621): 25 psi, minimum
 - c. Aged Thermal Resistance (ASTM C518, measured at Mean Temp of 75°F): [R-6.5 per 1 inch] of thickness with 15 year thermal warranty
 - d. Flexural Strength (ASTM C203): Minimum 40 psi
 - e. Water Absorption (ASTM C209): Maximum. 1.0 percent by volume
 - f. Water Vapor Permeance (ASTM E96): < 0.3 perms
 - g. Maximum Service Temperature: 250°F

2. Required Products: Rmax Operating, LLC ECOMAXci exterior wall insulation.

- a. Panel Size: 4 feet wide x 8-12 feet long, square edge panels
- b. Thickness and Stabilized R-Value: Nominal inch thickness 1.5 inch, R-10

B. Accessories:

1. Insulation Fasteners: Provide self-taping steel screws with minimum 2 inch diameter plastic plate/washer.

- a. Acceptable Products: Rodenhouse Inc. Plastic Grip CBW2 Low Profile Flat Plastic Washers and Grip Deck galvanized self-drilling screws or equivalent, as determined by component manufacturer.

2. Insulation Tape: Provide insulation manufacturer's recommended tape for sealing joints, fasteners, seams, and minor facer repair penetrations through the insulation layer.

- a. Required Products: Rmax R-SEAL 3000 aluminum foil tape, 4 inch wide.

3. Insulation Flashing: Provide insulation manufacturer's recommended flashing for sealing at corners, ceiling and floor transitions, windows, doors, and other through wall penetrations.

- a. Required Products: Rmax R-SEAL 6000 flashing with a butyl rubber adhesive, 12 inch wide.

4. Insulation Caulk: Provide insulation manufacturer's recommended caulk for sealing small penetrations and anchors.

- a. Acceptable Products: Henry HE925-BES or equivalent

2.10 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Diedrich Technologies, Inc.
- b. EaCo Chem, Inc.
- c. ProSoCo, Inc.

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use Portland cement-lime mortar unless otherwise indicated.

3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 1. For masonry below grade or in contact with earth, use Type S.
 2. For reinforced masonry, use Type S.
 3. For mortar parge coats, use Type S or Type N.
 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 5. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 1. Pigments shall not exceed 10 percent of Portland cement by weight.
 2. Mix to match Architect's sample.
 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Decorative CMUs.
- E. Grout for Unit Masonry: Comply with ASTM C476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Provide pre-blended, dry grout mixes proportioned in accordance with ASTM C476, Table 1.
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143.

3.00 EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.

- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.03 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross-section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
- C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
 5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 - 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.06 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 4.5 sq. ft. of wall area spaced not to exceed 36 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

- a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.
2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
- a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
 - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D. Apply air barrier to face of backup wythe to comply with Section 07 27 26 "Fluid-Applied Membrane Air Barriers."
- E. Installing Cavity-Wall Insulation: Starting at an end wall condition, where possible, the insulation boards should be placed on the wall with the long dimension horizontal and level to the floor/slab. Each row of insulation should be staggered to the row below. All boards must be tightly abutted together. Each insulation board shall be secured with a fastening pattern of 12 inches o.c. along the edge of each exterior wall facade and at the perimeter of each board. The pattern shall be 16 inch o.c. in the field. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry. 4 inch wide R-SEAL 3000 shall be used to seal all joints of adjacent insulation boards, as well as cover all insulation fasteners. It can also be used to repair minor damages to the foil facer of the ECOMAXci board.

3.07 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
1. Space reinforcement not more than 16 inches o.c.
 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.08 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
 - 1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.09 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached anchors to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 32 inches o.c. horizontally with not less than one anchor for each 3.5 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

- C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 "Joint Sealants," but not less than 3/8 inch.
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.11 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At multi-wythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
 - 3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under building paper or building wrap, lapping at least 4 inches.
 - 4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 - 5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
 2. Space weep holes 24 inches o.c. unless otherwise indicated.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in “Miscellaneous Masonry Accessories” Article.
- F. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.13 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor’s expense.
- B. Inspections: Special inspections according to the “International Building Code.”
1. Begin masonry construction only after inspectors have verified type of pre-blended mortar to be used.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified type of pre-blended grout to be used.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

3.15 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
 8. Clean stone trim to comply with stone supplier's written instructions.
 9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.16 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

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DIVISION 05

METALS

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05 05 13 GALVANIZING

1.00 GENERAL

1.01 SUMMARY

- A. This Section covers galvanic coatings or requirements for galvanizing and galvanizing of metal items as indicated on the Drawings or in the Specifications. This Section also covers galvanizing repairs as required.
- B. This Section covers all galvanized items. Such items shall be galvanized in accordance with relevant and appropriate manufacturing procedures in compliance with the referenced ASTM Standards and any special requirements as shown on the Drawings or in the Specifications. All referenced ASTM Standards apply to the Work.

1.02 REFERENCES

A. ASTM International (ASTM) Standards:

ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A143	Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A384	Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
ASTM A385	Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
ASTM A780	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM B6	Standard Specification for Zinc
ASTM B633	Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM B695	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM D6386	Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM E376	Standard Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods

- B. Research Council on Structural Connections:
 - 1. Specification for Structural Joints Using High-Strength Bolts.

- C. Federal Specifications:
 - 1. DOD-P-21035 Paint, High Zinc Dust Content, Galvanizing Repair.
 - 2. MIL-P-26915 Primer Coating, Zinc Dust Pigmented.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "SUBMITTALS" and shall include:
 - 1. Furnish notarized Certificate of Compliance with ASTM standards and specifications herein listed. The Certificate must be signed by the galvanizer and contain a detailed description of the material processed. The Certificate shall include information as to the ASTM standard used for the coating.

1.04 QUALITY ASSURANCE

- A. Galvanizer shall be a member of the American Galvanizers Association or as approved by the Engineer.
- B. Shop Drawing Review and Coordination:
 - 1. Shop Drawings produced for items requiring galvanizing shall be reviewed by and coordinated with the Galvanizer, prior to Shop Drawings submittal to the Engineer.
 - a. The Galvanizer shall review fabricator Shop Drawings for suitability of materials for galvanizing and coatings and coordinate any required fabrication modifications.
 - b. The Shop Drawings shall clearly indicate lifting, filling, vent and drain hole size and locations.
 - c. Materials: For steel to be hot-dip galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25%, phosphorous below 0.04%, manganese below 1.3%, and silicon below 0.04%. Notify the galvanizer if steel does not meet these requirements so that suitability for galvanizing may be determined and whether special processing techniques are required.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Load and store galvanized articles in accordance with accepted industry standards.

2.00 PRODUCTS

2.01 MATERIALS

- A. Thickness of Coating: The thickness of galvanized coating shall be determined according to ASTM A653 or as shown on the Drawings.
- B. Repairs: Unless otherwise specified herein, all exposed galvanized surfaces which have been damaged by shipping, handling, welding or other operations shall be repaired by one of the following methods, as shown in the Contract Documents, or as directed by the Engineer. All exposed metal items shall be repaired by one of the methods described below.
 - 1. Zinc-Based Solders: Zinc-based solders used for repair shall be of zinc-tin-copper alloys having liquidus temperatures in the range of 500 F to 600 F. The solders may be used in rod form or as powders.
 - a. Solder shall be compatible with the galvanized items being repaired and meet Federal Specifications A-A-51145.

2. Organic Zinc-Rich Paints: Zinc-rich paints based on organic binders, premixed and formulated specifically for use on steel surfaces and which will provide a dried film containing a minimum of 94 percent zinc dust, by weight. Zinc rich paint shall have a silvery-finish and closely match color of new hot dip galvanizing.
 - a. ZRC Galvilite Galvanizing Repair Compound.
 - b. Approved equal.
3. Sprayed Zinc (Metalizing): A zinc coating applied by spraying the surface with droplets of molten metal using wire, ribbon or powder processes.

3.00 EXECUTION

3.01 GENERAL

- A. Fabricated members or assemblies which are required to be hot-dip galvanized shall provide for proper filling, venting and draining during the cleaning and galvanizing operations. Drain holes or slots may be located as required except where prohibited by the Drawings.
 1. Lifting, filling, venting and drain holes shall be constructed at the steel fabricator's plant.
- B. Material 1/4 inch or greater in thickness shall have all sharp burrs removed and all edges to be exposed to human activity, such as railings, hand holes, and access holes, as well as electrical conductors, shall be chamfered approximately 1/16 inch to prevent injury or damage.
- C. Safeguard products against steel embrittlement in conformance with ASTM A143.
- D. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.
- E. Surface Finish: Continuous, adherent, and as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.
- F. Coating Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

3.02 QUALITY CONTROL

- A. Inspection and testing of hot-dip galvanized coatings shall be done under the guidelines provided in the AGA publication "Inspection of Products Hot-dip Galvanized After Fabrication."
- B. Include visual examination and tests in accordance with ASTM A123 or ASTM A153, as applicable, to determine the thickness of the zinc coating on the metal surface.
- C. Galvanized coatings shall be inspected as follows:
 1. Red Rust: Evidence of red rust on galvanized items indicates the presence of uncoated areas. Bare spots not greater than 1/8 inch across may be accepted, unless they are numerous, as determined by the Engineer. Larger bare spots shall be repaired in accordance with the repair process requirements outlined in this Section.

2. White Rust: A white powdery residue indicates the presence of moisture. Light coatings of white rust may be allowed to remain or be chemically removed when directed by the Engineer. White rust shall be removed from galvanized articles which will be in direct contact with soils. Heavy layers of white rust which have caused pitting of the coating shall be cause for rejection.
3. Alligator Cracking or Spider Webbing: Apparent dark lines resembling alligator skin are caused by the composition of the base metal. If the coating adhesion is sound, the coating is acceptable. Tapping with a small hammer will demonstrate coating adhesion. Lack of adhesion shall be cause for rejection.
4. Dull Gray Coating: Dull gray coatings may be caused by many factors but the coating is acceptable if the adhesion to the base metal is sound. Tapping with a small hammer will show if the coating is brittle. Scaling and flaking shall be cause for rejection.
5. Heavy Runs or Drips: Runs or drips of zinc coating are acceptable if they do not interfere with the intended use of the product. Excessive zinc (runs, lumps or heavy accumulations) may be carefully removed by hand filing.

3.03 REPAIR PROCESS

- A. Surfaces to be repaired with metalizing shall be dry, free of oil, grease, corrosion products and any welding slag or flux. The surface shall be cleaned to white metal. Apply the coating by metal-spraying pistols fed with either zinc wire or zinc powder. The sprayed coating shall be of uniform texture, free of lumps, coarse areas or loosely adhering particles.
- B. Surfaces to be repaired with zinc-based solders shall be free of moisture, oil, grease, dirt, corrosion products and welding slag or flux. Surfaces to be repaired shall be cleaned by wire brushing, light grinding or mild blasting extending into the surrounding undamaged galvanized coating. Preheat the cleaned areas to at least 600 F, but not more than 750 F, wire brush while heating and apply an evenly distributed layer of the zinc-solder. Do not direct flame on the solder rod but rather let heat from the base metal melt the alloy. Keep the base metal from overheating. When completed, flush the repaired area with water or wipe with a damp cloth to remove the flux residue.
- C. Surfaces to be repaired with zinc-rich paints shall be clean, dry and free of oil, grease, welding slag or flux and corrosion products. The surface preparation shall be by wire brushing, light grinding, or mild blasting and should extend into the undamaged galvanized coating to provide a smooth repair. Spray or brush apply the zinc-rich paint to the prepared area in accordance with the paint manufacturer's instructions to attain the required dry-film thickness.
 1. For ZRC Galvilite Galvanizing Repair Compound provide two coats of 1.5 mils DFT, total 3 mil DFT.
 2. For approved equal provide a minimum of two coats of 1.5 mils DFT, total 3 mil DFT, but not less than that recommended by the manufacturer.
- D. Galvanized items shall be field repaired and painted as per ASTM A780.
 1. The maximum area to be repaired is defined in accordance with ASTM A123, Section 6.2.

- E. After completion of the repair process, cooling or curing, the coating thickness in the repaired area shall be measured in accordance with ASTM A653. The minimum coating thickness for repairs shall be the same as that required for the specified galvanizing.

END OF SECTION

05 12 00 STRUCTURAL STEEL FRAMING

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel.

1.03 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.04 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand **ASD-service** loads indicated and comply with other information and restrictions indicated.
 - 1. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

1.05 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 5. Indicate size and location of all lifting, filling, vent and drain holes required for galvanizing. Lifting, filling, vent and drain holes shall be coordinated with the galvanizer.
 - 6. Galvanized items which will receive paint must be designated as such.
- C. Calculations: For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Submittal shall be for record purposes and shall be a separate submittal from the Shop Drawings.
- D. Welding Certificates:
 1. Provide the following welding certificates:
 - a. Weld Procedure Specifications (WPSs) for all welds indicated in the Contract Documents.
 - 1). If a WPS is not prequalified in accordance with AWS D1.1, then submit a performance qualification record (PQR) for each WPS that is not prequalified.
 - b. Personnel qualifications for each person performing welding on the Site.
- E. Qualification Data: For testing agency, installer and fabricator.
- F. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
 1. Structural steel including chemical and physical properties.
 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
- G. Source Quality-Control Test Reports.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer with a record of successfully performed projects of comparable size and complexity during the previous 5 years.
- B. Fabricator Qualifications: A qualified fabricator with a record of successfully performed projects of comparable size and complexity during the previous 5 years.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- D. Comply with applicable provisions of the following specifications and documents:
 1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
 3. AISC's "Specification for Structural Steel Buildings," ANSI/AISC 360.
 4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.

2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.08 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.
- B. Coordinate lifting, filling, venting and drain holes required for galvanized items with the galvanizer prior to shop drawing submittal. The fabricator shall consult with Architect/Engineer and hot-dip galvanizer regarding potential concerns during the galvanizing process that may require design modification before fabrication proceeds.

2.00 PRODUCTS

2.01 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992, Grade 50, unless noted otherwise.
- B. Channels, Angles, and miscellaneous shapes: ASTM A36, unless noted otherwise.
- C. Plate and Bar: ASTM A36, unless noted otherwise.
- D. Cold-Formed Hollow Structural Sections:
 1. Square and rectangular: ASTM A500, Grade B, unless noted otherwise.
 2. Round: ASTM A500, Grade C, unless noted otherwise.
- E. Steel Pipe: ASTM A53, Type E or S, Grade B.
- F. Welding Electrodes:
 1. Comply with AWS requirements.
 2. Unless indicated otherwise, all electrodes shall be E70XX, low hydrogen.
- G. Finish: All steel shall be hot-dip galvanized in accordance with Section 05 05 13, "Galvanizing."

2.02 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.
 1. Material:
 - a. Grade A325, unless noted otherwise.
 2. Finish:
 - a. For bolts at galvanized members or as otherwise indicated: Hot-dip zinc coating, ASTM F2329 or Mechanically deposited zinc coating, ASTM B695, Class 55.

- B. Anchor Rods (headed or unheaded): ASTM F1554, Grade 36, unless noted otherwise.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A563 heavy hex carbon steel.
 - 3. Plate Washers: ASTM A36 carbon steel.
 - 4. Washers: ASTM F436 hardened carbon steel.
 - 5. Finish: Hot-dip zinc coating, ASTM F2329 or Mechanically deposited zinc coating, ASTM B695, Class 55.
- C. Threaded Rods: ASTM A36.
 - 1. Nuts: ASTM A563 heavy hex carbon steel.
 - 2. Washers: ASTM F436 hardened carbon steel.
 - 3. Finish:
 - a. For rods at galvanized members or as otherwise indicated: Hot-dip zinc coating, ASTM F2329 or Mechanically deposited zinc coating, ASTM B695, Class 55.

2.03 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and ANSI/AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A6 and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations, if required.
- B. Drawings indicate the design, sections and weights of members. Substitutions shall not be permitted except upon written permission from the Engineer.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- D. Bolt Holes: Cut, drill or punch bolt holes perpendicular to metal surfaces.
 - 1. Unless noted otherwise, all holes are AISC standard.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- F. Galvanized Components:
 - 1. Lifting, filling, vent and drain holes shall be constructed at the Fabricator's shop prior to delivery to the galvanizer.

2. Fabricate structural steel in accordance with Class I, II, III guidelines as described in AGA's Recommended Details for Galvanized Structures.
3. Fabrication practices for products to be in accordance with the applicable portions of ASTM A143, A384, and A385. Avoid fabrication techniques that could cause steel distortion or embrittlement.
4. Provide holes and/or lifting lugs to allow for handling during galvanizing.

2.04 SHOP CONNECTIONS

- A. Shop connections shall be composed of bolted or welded connections. Combinations of bolted and welded connections on a common shearing face are not allowed.
- B. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened bearing type with threads included in the shear plane, unless noted otherwise.
- C. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

2.05 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated in the Drawings and Specifications according to ASTM A123.
- B. Refer to Division 05 Section "Galvanizing" for galvanized coatings and repairs.
 1. Fill vent holes and grind smooth after galvanizing.
 2. Galvanize lintels.

2.06 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Welded Connections:
 1. Full penetration welds and other welds as specified: In addition to 100 percent visual inspection, 10 percent of connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

- a. Liquid Penetrant Inspection: ASTM E165.
- b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
- c. Ultrasonic Inspection: ASTM E164.
- d. Radiographic Inspection: ASTM E94.

3.00 EXECUTION

3.01 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Dimensions scaled from the Drawings shall not be used for fabrication, and the Contractor shall determine actual dimensions of the structure.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings," ANSI/AISC 360.
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 1. Set base and bearing plates for structural members on wedges, shims, as required.
 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 3. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and moist cure for a minimum of 7 days. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened, unless noted otherwise.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings," ANSI/AISC 360-05, for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Unless indicated otherwise, beam flanges employing full penetration welds shall have 1-1/4-by-3/16-inch backup plate. Back gouge root pass and weld flush on backside where full penetration is specified.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- C. Welded Connections: Field welds will be 100 percent visually inspected according to AWS D1.1.
 - 1. Full penetration welds and other welds as specified: In addition to 100 percent visual inspection, 10 percent of connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

- a. Liquid Penetrant Inspection: ASTM E165.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
1. Corrective measures shall be taken when welding is unsatisfactory or indicates inferior workmanship. Chip and grind if the removal of part of the weld or a portion of the base metal is required. Where deposition of additional weld material is necessary, the sides of the area to be welded shall have no less than one to one (1:1) slope to allow room for depositing new material. Correct defective or unsound welds by the removal and replacement of the entire weld using the following procedures:
 - a. Excessive Convexity: Reduce to size by removal of excess weld metal by grinding.
 - b. Shrinkage Cracks, Cracks in Base Metal, Craters and Excessive Porosity: Remove defective portions of base and weld material down to sound metal, and deposit additional sound material.
 - c. Undercutting, Undersize, and Excessive Concavity: Clean and deposit additional weld metal.
 - d. Overlapping and Incomplete Fusion: Remove and replace the defective portion of the weld.
 - e. Slag Inclusion: Remove those parts of the welds containing slag. Fill with sound weld metal.
 - f. Removal of Adjacent Base Metal during Welding: Clean and form full size by depositing weld material.
 2. Remove cracked welds throughout their length.
 3. Where work performed subsequently to the making of the deficient weld has rendered the weld inaccessible, or has caused new conditions which make connection of the deficiency dangerous or ineffectual, restore the original conditions by removing welds or members, or both before making the necessary corrections. Another option is to compensate for the deficiency with additional work according to the revised design, approved by the Engineer.
 4. Cut apart and reweld improperly fitted and misaligned parts.
 5. Straighten members distorted by heat of welding using mechanical means or by carefully supervised application of a limited amount of localized heat. Heated areas shall not exceed 1200 degrees Fahrenheit as measured by Tempilsticks. Parts to be heated for straightening shall be free from external stress forces, except when mechanical means are used in conjunction with heat application.
 6. If faulty welding or its removal for rewelding damages the base metal so that, in the Engineer's judgment, it is not in accordance with the intent of the Contract

Documents, remove and replace the damaged material and compensate for the deficiency in a manner acceptable to the Engineer.

7. Maximum space between pieces or members for fillet welds shall be 1/16 inch. Only effective portion shall be considered in measuring fillet welds.

3.06 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items according to Division 05 Section "Galvanizing."

END OF SECTION

05 50 00 METAL FABRICATIONS

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Miscellaneous steel trim.
4. Metal bollards.
5. Loose bearing and leveling plates for applications where they are not specified in other Sections.
6. Type A Manhole Cover.
7. Fabricated hatch cover.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Sections:

1. Section 03 30 00 "Cast-In-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 04 20 00 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Section 05 51 00 "Metal Stairs."
4. Section 05 52 13 "Pipe and Tube Railings."
5. Section 05 53 00 "Metal Gratings."

1.03 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling,

opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 F (67 C), ambient; 180 F (100 C), material surfaces.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Grout.
3. Paint Products

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.06 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.08 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts,

and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

2.00 PRODUCTS

2.01 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Stainless-Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 316L, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A276, Type 316L, Type 304.
- D. Steel Tubing: ASTM A500, cold-formed steel tubing.
- E. Steel Pipe: ASTM A53/A53M, standard weight (Schedule 40) unless otherwise indicated.

2.03 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B209 (ASTM B209M), Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- D. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.04 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 2.
- C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Hot-dip galvanized or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.05 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Galvanizing Repair Solder: Zinc solder per ASTM A 780.
- C. Shop Primers: Provide primers that comply with Section 09 91 00 "Painting" or Section 09 96 00.01 "High-Performance Coatings."
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.06 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.07 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports unless indicated otherwise.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.08 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize miscellaneous steel trim unless indicated otherwise.
- D. Prime miscellaneous steel trim with zinc-rich primer where indicated.

2.09 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 80 steel pipe.
- B. Galvanize bollards.

2.10 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates unless indicated otherwise.

- C. Prime plates with zinc-rich primer where indicated.

2.11 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than eight inches unless otherwise indicated.
- C. Galvanize loose steel lintels.

2.12 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Section 09 91 00 "Painting" or primers specified in Section 09 96 00.01 "High-Performance Coatings."
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3. Items Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.15 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Dull Satin Finish: No. 6.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.16 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

3.00 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
 - E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
 - F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 1. Cast Aluminum: Heavy coat of bituminous paint.
 2. Extruded Aluminum: Two coats of clear lacquer.
- 3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS
- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- 3.03 INSTALLING METAL BOLLARDS
- A. Anchor bollards in place with concrete footings. Center and align bollards in holes three inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
 - B. Fill bollards solidly with concrete, mounding top surface to shed water.
- 3.04 INSTALLING BEARING AND LEVELING PLATES
- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
 - B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 1. Use nonshrink, nonmetallic grout unless otherwise indicated.
 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- 3.05 FIELD QUALITY CONTROL
- A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect.
 - B. Bolted Connections: Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
 - C. Welded Connections: Field welds will be 100 percent visually inspected according to AWS D1.1.

1. Full penetration welds and other welds as specified: In addition to 100 percent visual inspection, 10 percent of connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
 1. Corrective measures shall be taken when welding is unsatisfactory or indicates inferior workmanship. Chip and grind if the removal of part of the weld or a portion of the base metal is required. Where deposition of additional weld material is necessary, the sides of the area to be welded shall have no less than one to one (1:1) slope to allow room for depositing new material. Correct defective or unsound welds by the removal and replacement of the entire weld using the following procedures:
 - a. Excessive Convexity: Reduce to size by removal of excess weld metal by grinding.
 - b. Shrinkage Cracks, Cracks in Base Metal, Craters and Excessive Porosity: Remove defective portions of base and weld material down to sound metal, and deposit additional sound material.
 - c. Undercutting, Undersize, and Excessive Concavity: Clean and deposit additional weld metal.
 - d. Overlapping and Incomplete Fusion: Remove and replace the defective portion of the weld.
 - e. Slag Inclusion: Remove those parts of the welds containing slag. Fill with sound weld metal.
 - f. Removal of Adjacent Base Metal during Welding: Clean and form full size by depositing weld material.
 2. Remove cracked welds throughout their length.
 3. Where work performed subsequently to the making of the deficient weld has rendered the weld inaccessible, or has caused new conditions which make connection of the deficiency dangerous or ineffectual, restore the original conditions by removing welds or members, or both before making the necessary corrections. Another option is to compensate for the deficiency with additional work according to the revised design, approved by the Engineer.
 4. Cut apart and reweld improperly fitted and misaligned parts.
 5. Straighten members distorted by heat of welding using mechanical means or by carefully supervised application of a limited amount of localized heat. Heated areas shall not exceed 1200 degrees Fahrenheit as measured by Tempilsticks.

Parts to be heated for straightening shall be free from external stress forces, except when mechanical means are used in conjunction with heat application.

6. If faulty welding or its removal for rewelding damages the base metal so that, in the Engineer's judgment, it is not in accordance with the intent of the Contract Documents, remove and replace the damaged material and compensate for the deficiency in a manner acceptable to the Engineer.
7. Maximum space between pieces or members for fillet welds shall be 1/16 inch. Only effective portion shall be considered in measuring fillet welds.

3.06 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780 using zinc solder.

END OF SECTION

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05 51 00 METAL STAIRS

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:

- 1. Industrial-type stairs with steel grating treads.

- B. Related Sections:

- 1. Section 05 52 13 "Pipe and Tube Railings" for pipe and tube railings.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

- 1. Uniform Load: 100 lbf/sq. ft.
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch, whichever is less.

1.04 ACTION SUBMITTALS

- A. Product Data: For metal stairs and the following:

- 1. Steel grating treads.
 - 2. Grout.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. NAAMM Stair Standard: Comply with “Recommended Voluntary Minimum Standards for Fixed Metal Stairs” in NAAMM AMP 510, “Metal Stairs Manual,” for class of stair designated, unless more stringent requirements are indicated.
 - 1. Industrial-Type Stairs: Industrial class.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, “Structural Welding Code - Steel.”

1.07 COORDINATION

- A. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

2.00 PRODUCTS

2.01 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A36.
- B. Steel Tubing: ASTM A500 (cold formed).
- C. Steel Bars for Grating Treads: ASTM A36 or steel strip, ASTM A1011 or ASTM A1018.
- D. Wire Rod for Grating Crossbars: ASTM A510.

2.03 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be galvanized.

- C. Machine Screws: ASME B18.6.3.
- D. Lag Screws: ASME B18.2.1.
- E. Plain Washers: Round, ASME B18.22.1.
- F. Lock Washers: Helical, spring type, ASME B18.21.1.
- G. Post-Installed Anchors: chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.04 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.05 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.06 STEEL-FRAMED STAIRS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Alfab, Inc. - Stairco
 2. American Stair, Inc.
 3. Sharon Companies Ltd. (The).
- B. Stair Framing:
1. Fabricate stringers of steel channels.
 - a. Provide closures for exposed ends of stringers.
 2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
 3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
- C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
1. Fabricate treads and platforms from welded or pressure-locked steel grating with openings in gratings no more than 1/2 inch in least dimension.
 2. Surface: Serrated.
 3. Finish: Galvanized.
 4. Fabricate grating treads with cast abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
 5. Fabricate grating platforms with nosing matching that on grating treads. Provide toe plates at open-sided edges of grating platforms. Weld grating to platform framing.
 6. Fabricate risers using galvanized sheet metal.

2.07 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.
 - 1. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

3.00 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

3.02 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonmetallic, nonshrink grout unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.03 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

05 52 13 PIPE AND TUBE RAILINGS

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Aluminum pipe and tube railings.

1.03 COORDINATION

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project Site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
 - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of connecting and finishing members at intersections.
- D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

- B. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.
- C. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.06 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2, "Structural Welding Code - Aluminum."

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.08 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Aluminum Pipe and Tube Railings:
 - 1. ATR Technologies, Inc.
 - 2. Blum, Julius & Co., Inc.
 - 3. Braun, J. G., Company; the Wagner Companies
 - 4. CraneVeyor Corp.
 - 5. Hollaender Manufacturing Company
 - 6. Kee Industrial Products, Inc.
 - 7. Moultrie Manufacturing Corporation
 - 8. Sterling Dula Architectural Products, Inc. / Kane Sterling
 - 9. Superior Aluminum Products, Inc.
 - 10. Thompson Fabricating, LLC
 - 11. Tri Tech, Inc.
 - 12. Tubular Specialties Manufacturing, Inc.
 - 13. Tuttle Railing Systems
 - 14. Wagner, R & B, Inc.

2.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.

- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F.

2.03 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.04 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- B. Extruded Bars and Tubing: ASTM B221, Alloy 6063-T5/T52.
- C. Extruded Structural Pipe and Round Tubing: ASTM B429, Alloy 6063-T6.
 - 1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.
- D. Drawn Seamless Tubing: ASTM B210, Alloy 6063-T832.
- E. Plate and Sheet: ASTM B209, Alloy 6061-T6.
- F. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.
- G. Castings: ASTM B26, Alloy A356.0-T6.

2.05 FASTENERS

- A. General: Provide the following:
 - 1. Aluminum Railings: Type 316 stainless-steel fasteners.

2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
 1. Material: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.06 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- C. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project Site to create pourable anchoring, patching, and grouting compound.
 1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.07 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.
- H. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- J. Form Changes in Direction as Follows:
 - 1. By bending or by inserting prefabricated elbow fittings.
- K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- P. For railing posts set in concrete, provide sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- Q. For removable railing posts, fabricate slip-fit sockets from tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
 - 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

- R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.08 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41.

3.00 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.02 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.03 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with non-shrink, non-metallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Cover anchorage joint with flange of same metal as post, attached to post with set screws.
- C. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
- E. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.04 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends or connected to railing ends using nonwelded connections.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.
- C. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.

3.05 ADJUSTING AND CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

3.06 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

05 53 00 METAL GRATINGS

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal bar gratings.
 - 2. Metal frames and supports for gratings.
- B. Related Sections:
 - 1. Section 05 51 00 "Metal Stairs" for grating treads and landings of steel-framed stairs.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design gratings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Floors: Uniform load of 100 lbf/sq. ft. or concentrated load of 1000 lbf, whichever produces the greater stress.
 - 2. Limit deflection to L/240 or 1/4 inch, whichever is less.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Clips and anchorage devices for gratings.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.06 QUALITY ASSURANCE

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

1.08 COORDINATION

- A. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

2.00 PRODUCTS

2.01 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A36.
B. Steel Bars for Bar Gratings: ASTM A36 or steel strip, ASTM A1011 or ASTM A1018.
C. Wire Rod for Bar Grating Crossbars: ASTM A510.

2.02 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners.
B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
1. Material: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.03 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.
B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.04 FABRICATION

- A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Welding: Comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

2.05 METAL BAR GRATINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alabama Metal Industries Corporation; a Gibraltar Industries company.
 - 2. All American Grating.
 - 3. BarnettBates Corporation.
 - 4. Borden Metal Products (Canada) Limited.
 - 5. Fisher & Ludlow; Division of Harris Steel Limited.
 - 6. Grating Pacific, Inc.
 - 7. Grupo Metelmex, S.A. de C.V.
 - 8. IKG Industries; a division of Harsco Corporation.
 - 9. Marwas Steel Co.; Laurel Steel Products Division.
 - 10. Ohio Gratings, Inc.
 - 11. Seidelhuber Metal Products; Division of Brodhead Steel Products.
- B. Welded Steel Grating:
 - 1. Bearing Bar Spacing: 1-3/16 inches o.c.
 - 2. Bearing Bar Depth: 1-1/2 inches or as required to comply with structural performance requirements.
 - 3. Bearing Bar Thickness: 3/16 inch or as required to comply with structural performance requirements.
 - 4. Crossbar Spacing: 4 inches o.c.
 - 5. Traffic Surface: Serrated.
 - 6. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. of coated surface.

- C. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
 - 1. Provide no fewer than four saddle clips for each grating section composed of rectangular bearing bars 3/16 inch or less in thickness and spaced 15/16 inch or more o.c., with each clip designed and fabricated to fit over two bearing bars.
 - 2. Furnish threaded bolts with nuts and washers for securing grating to supports.
 - 3. Furnish self-drilling fasteners with washers for securing grating to supports.
- D. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
 - 1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.
- E. Do not notch bearing bars at supports to maintain elevation.

2.06 GRATING FRAMES AND SUPPORTS

- A. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
 - 1. Unless otherwise indicated, fabricate from same basic metal as gratings.
 - 2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
- B. Galvanize steel frames and supports.

2.07 STEEL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish gratings, frames, and supports after assembly.
- C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.

3.00 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
- D. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.

3.02 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.03 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

DIVISION 06

WOOD, PLASTICS, AND COMPOSITES

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06 10 00 ROUGH CARPENTRY**1.00 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Wood blocking, cants, and nailers.

1.03 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project Site.

1.05 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

2.00 PRODUCTS**2.01 WOOD PRODUCTS, GENERAL**

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the

ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

2.03 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
 3. Cants.
- B. Dimension Lumber Items: Construction or No. 2
- C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

4. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.04 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193] or ICC-ES AC308 as appropriate for the substrate.
 1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 (ASTM F738M and ASTM F836M, Grade A1 or A4).

3.00 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- B. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

3.02 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.03 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

DIVISION 07

THERMAL AND MOISTURE PROTECTION

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07 11 13.01 CONCRETE VAULT BITUMINOUS DAMPPROOFING

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Cold-applied, emulsified-asphalt dampproofing applied to exterior of meter vault.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Letter of Recommendation from manufacturer indicating the proposed system of products.

1.04 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

2.00 PRODUCTS

2.01 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course and auxiliary materials recommended in writing by manufacturer of primary materials.
- B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.02 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. BASF Construction Chemicals - Building Systems; Sonneborn Brand Products.
 - 2. Euclid Chemical Company (The); an RPM company.
 - 3. Meadows, W. R., Inc.
- B. Brush and Spray Coats: ASTM D1227, Type III, Class 1.

2.03 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

- B. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D1668, Type I.
- D. Patching Compound: Of type recommended in writing by dampproofing manufacturer.
- E. Protection Course: Of type recommended in writing by dampproofing manufacturer.

3.00 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.
- C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections as recommended by dampproofing manufacturer.

3.03 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
 - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Turn up vapor retarder from below footing and bed into asphalt on edge and top of footing while still tacky. A minimum of 12-inch lap between asphalt and vapor retarder.
 - 3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced,"

by embedding an 8-inch wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Concrete Foundations: Apply two coat system as recommended by dampproofing manufacturer.

3.05 INSTALLATION OF PROTECTION COURSE

- A. As recommended by manufacturer, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.

- 1. Install as recommended by dampproofing manufacturer.

3.06 CLEANING

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

07 27 26 FLUID-APPLIED MEMBRANE AIR BARRIERS

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes fluid-applied, vapor-permeable membrane air barriers.
- B. Related Requirements:
- C. Fluid-Applied Membrane Air Barriers for wall sheathings and wall sheathing joint-and-penetration treatments.

1.03 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.04 MOCKUPS

- A. Mockups: Install fluid applied membrane in mockups of assemblies specified in other Sections that are indicated to receive membrane specified in this Section. Use materials and installation methods specified in this Section. Include in masonry mockup.
- B. Manufacturer's representative shall visit the site during the installation process to assure a uniform, quality, watertight barrier is provided. The manufacturer's representative shall provide the Owner with a report including photographs for documentation of in place work from each site visit during the duration of the installation.
- C. Manufacturer and Contractor to inspect product upon final completion to assure work is free of defects, voids and/or gaps.
- D. Contractor shall verify and repair any defects in surfaces that are to receive the dampproofing material prior to installation. The Contractor is to inspect the wall after installation to determine if there are any defective gaps or open material bridging that would not allow the damp proofing to perform as recommended by the manufacturer. Fill all remaining voids with compatible sealer as recommended by manufacturer to create a watertight barrier on the surface of the wall substrate.
- E. Refer to Specification Section 04 20 00 Unit Masonry for additional mock up requirements.

- F. Envelope Preconstruction meeting shall be held with all of the subcontractors responsible for erecting the envelope related materials as well as product technical representatives.

1.05 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.06 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 2. Include details of interfaces with other materials that form part of air barrier.

1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.08 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 - 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- B. Mockups: Build mockups to set quality standards for materials and execution.
 - 1. Build integrated mockups of exterior wall assembly , 150 sq. ft. (14 sq. m), incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

- a. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - b. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.09 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.
- B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
 1. Qualitative Air-Leakage Testing: Mockups will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.
 2. Quantitative Air-Leakage Testing: Mockups will be tested for air leakage according to ASTM E783.
 3. Adhesion Testing: Mockups will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. (207 kPa) according to ASTM D4541.
 4. Notify Architect 7 days in advance of the dates and times when mockups will be tested.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
 1. Protect substrates from environmental conditions that affect air-barrier performance.
 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

2.00 PRODUCTS

2.01 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
- 2.02 VOC CONTENT: **[250]** G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24) AND COMPLYING WITH VOC CONTENT LIMITS OF AUTHORITIES HAVING JURISDICTION.PERFORMANCE REQUIREMENTS
- A. General: Air barrier shall be capable of performing as a continuous vapor-**permeable** air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa)], when tested according to ASTM E283 or ASTM E783.
- 2.03 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER
- A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymermembrane.
1. Products: Subject to compliance with requirements, provide one of the following:
- a. Elastomeric, Modified Bituminous Membrane
- 1). Meadows, W. R., Inc.; Air-Shield LMP.
- 2). Tremco Incorporated, an RPM company; ExoAir 220R.
- b. Synthetic Polymer Membrane
- 1). Carlisle Coatings & Waterproofing Inc.; Barritech VP.
- 2). Grace, W. R., & Co. - Conn.; Perm-A-Barrier VP.
- 3). Henry Company; Air-Bloc 31 or Air-Bloc 33.
- 4). Rubber Polymer Corporation, Inc.; Rub-R-Wall Airtight VP.
- 5). Tremco Incorporated, an RPM company; ExoAir 230.
2. Physical and Performance Properties:
- a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E2178.
- b. Vapor Permeance: Minimum 10 perms (580 ng/Pa x s x sq. m)] [5.5 perms (320 ng/Pa x s x sq. m); ASTM E96/E96M.
- c. Ultimate Elongation: Minimum 200 percent; ASTM D412, Die C.
- 2.04 ACCESSORY MATERIALS
- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

- B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.
- C. Counterflashing Strip: Modified bituminous, 40-mil (1.0-mm) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil (0.2-mm) thick, cross-laminated polyethylene film with release liner backing.
- D. Butyl Strip: Vapor retarding, 30 to 40 mils (0.76 to 1.0 mm) thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.
- E. Modified Bituminous Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil (0.1-mm) thick polyethylene film with release liner backing.
- F. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.
- G. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- H. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- I. Stainless-Steel Sheet: ASTM A240/A240M, Type 304, 0.0250 inch (0.64 mm) thick, and Series 300 stainless-steel fasteners.
- J. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb./cu. ft. (24 to 32 kg/cu. m) density; flame-spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- K. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil (0.43-mm) thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance value of 37 perms (2145 ng/Pa x s x sq. m).
- L. Elastomeric Flashing Sheet: ASTM D2000, minimum 50- to 65-mil (1.3- to 1.6-mm) thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.
- M. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 123 Silicone Seal.
 - b. Momentive Performance Materials Inc.; US11000 UltraSpan.
 - c. Pecora Corporation; Sil-Span.
 - d. Tremco Incorporated, an RPM company; Spectrem Simple Seal.
- N. Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 07 92 00 "Joint Sealants."
- O. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

3.00 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
 - 3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

- A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

- A. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.04 TRANSITION STRIP INSTALLATION

- A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier from concrete below grade structures to the roof of the building.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 2. Install butyl or modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall Openings: Prime concealed, perimeter frame surfaces of thru wall hvac unit, and doors. Apply modified bituminous transition strip flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.
1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
- G. Fill gaps in perimeter frame surfaces of thru wall hvac units, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- I. Seal top of through-wall flashings to air barrier with an additional 6-inch (150-mm) wide, modified bituminous strip.
- J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.05 FLUID AIR-BARRIER MEMBRANE INSTALLATION

- A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.

1. Apply primer to substrates at required rate and allow it to dry.
 2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
1. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil (1.0-mm) dry film thickness, applied in two equal coats.
- C. Apply strip and transition strip over cured air-barrier material overlapping 3 inches (75 mm) onto each surface according to air-barrier manufacturer's written instructions.
- D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.06 FIELD QUALITY CONTROL

- A. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Continuous structural support of air-barrier system has been provided.
 3. Site conditions for application temperature and dryness of substrates have been maintained.
 4. Maximum exposure time of materials to UV deterioration has not been exceeded.
 5. Surfaces have been primed, if applicable.
 6. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 7. Termination mastic has been applied on cut edges.
 8. Strips and transition strips have been firmly adhered to substrate.
 9. Compatible materials have been used.
 10. Transitions at changes in direction and structural support at gaps have been provided.
 11. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 12. All penetrations have been sealed.

- B. Tests: As determined by Owner's testing agency from among the following tests:
 - 1. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E783.
 - 2. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. (207 kPa) according to ASTM D4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.
- C. Air barriers will be considered defective if they do not pass tests and inspections.
 - 1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 - 2. Remove and replace deficient air-barrier components for retesting as specified above.
- D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.07 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 - 1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
 - 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION

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07 52 00 SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

1.00 GENERAL

1.01 SUMMARY

- A. This Section includes SBS-modified bituminous membrane roofing.
 - 1. NRCA modified bitumen roof assembly identification matrix:
 - a. MBS-2-I-M-M
 - 2. Roof Insulation

1.02 DEFINITIONS

- A. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F (14 deg C), measured at the mop cart or mechanical spreader immediately before application.
- B. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Water-proofing Manual" for definition of terms related to roofing work in this Section.

1.03 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: For each product included in roofing system.
- C. Maintenance data.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer, approved by manufacturer to install manufacturer's products.
- B. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.
- C. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or an-other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
- D. Preinstallation Conference: Conduct conference at Project site.

1.05 WARRANTY

- A. Special Warranty: Manufacturer's standard form, without monetary limitation and signed by manufacturer, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within 10 years from date of Substantial Completion. Failure includes roof leaks.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. SBS-Modified Bituminous Membrane Roofing:
 - a. CertainTeed Corporation.
 - b. GAF Materials Corporation.
 - c. Johns Manville International, Inc.
 - d. TAMKO Roofing Products, Inc.
 - e. Tremco, Inc.
 - f. U.S. Ply, Inc.

2.02 SBS-MODIFIED ASPHALT-SHEET MATERIALS

- A. Roofing Membrane Sheet: ASTM D 6164, Grade S, Type I or II, polyester-reinforced or ASTM D 6163, Grade S, Type I or II, glass-fiber-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
- B. Roofing Membrane Cap Sheet: ASTM D 6164, Grade G, Type I or II, polyester-reinforced or ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:
 - 1. Granule Color: White.

2.03 BASE FLASHING SHEET MATERIALS

- A. Backer Sheet: ASTM D 6164, Grade S, Type I or II, polyester-reinforced or ASTM D 6163, Grade S, Type I or II, glass-fiber-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
- B. Flashing Sheet: ASTM D 6164, Grade G, Type I or II, polyester-reinforced or ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:
 - 1. Granule Color: White.

2.04 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
- B. Asphalt Primer: ASTM D 41.
- C. Roofing Asphalt: ASTM D 312, Type III or IV as recommended by roofing system manufacturer for application.

- D. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

2.05 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.
- B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48), unless otherwise indicated.
- C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.06 INSULATION ACCESSORIES

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- B. Wood Nailer Strips and Cants: Comply with requirements in Division 6 Section "Miscellaneous Carpentry."
- C. Cover Board: ASTM C 728, Type 2 high density perlite-based insulation board, 3/4 inch (19 mm) thick, with top surface seal-coated. Minimum R-value: 1.8.

3.00 EXECUTION

3.01 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to concrete deck according to roofing system manufacturer's written instructions.

3.02 INSULATION INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- B. Nailer Strips: Mechanically fasten 4-inch nominal- (89-mm actual-) width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:
 - 1. 16 feet (4.88 m) apart for roof slopes greater than 1 inch per 12 inches (1:12) but less than 3 inches per 12 inches (3:12).

2. 48 inches (1220 mm) apart for roof slopes greater than 3 inches per 12 inches (3:12).
- C. Wood Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.
- D. Install tapered insulation under area of roofing to conform to slopes indicated.
- E. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 1-1/2 inches (38 mm) or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
- F. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- G. Adhered insulation: Install each layer of insulation and adhere to substrate as follows:
 1. Set each layer of insulation in a solid mopping in hot asphalt or in cold fluid-applied adhesive as recommended by the roofing manufacturer.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck.

3.03 ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
- B. Where roof slope exceeds 1/2 inch per 12 inches (1:24), install roofing membrane sheets parallel with slope.
 1. Backnail roofing membrane sheets to nailer strips according to roofing system manufacturer's written instructions.
- C. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
- D. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- E. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively.
- F. Install one lapped course of base sheet, extending sheet over and terminating beyond cants. Attach base sheet as follows:
 1. Spot- or strip-mop to substrate with hot roofing asphalt.
 2. Adhere to substrate in a solid mopping of hot roofing asphalt.
 3. Adhere to substrate in a uniform coating of cold-applied adhesive.
- G. Install modified bituminous roofing membrane sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.

Extend roofing membrane sheets over and terminate beyond cants, installing as follows:

1. Adhere to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F (218 deg C).
 2. Adhere to substrate in cold-applied adhesive.
 3. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
- H. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
1. Repair tears and voids in laps and lapped seams not completely sealed.
- I. Install roofing membrane sheets so side and end laps shed water.

3.04 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions.
- B. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing membrane and 4 inches (100 mm) onto field of roofing membrane.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
- D. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.

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07 62 00 SHEET METAL FLASHING AND TRIM

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:

1. Manufactured through-wall flashing with snaplock receiver.
2. Manufactured reglets.
3. Formed roof-drainage sheet metal fabrications.
4. Formed low-slope roof sheet metal fabrications.

- B. Related Requirements:

1. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.03 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.04 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.
 - 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 - 8. Include details of roof-penetration flashing.
 - 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 10. Include details of special conditions.
 - 11. Include details of connections to adjoining work.
 - 12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish.
 - 1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 - 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
 - 3. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.07 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof edge, eave, including gutter, fascia, fascia trim, approximately 10 feet (3.0 m) long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.09 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

2.00 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.02 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
 - 1.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A653/A653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A755/A755M.
 - 1. Surface: Smooth, flat.
 - 2. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3. Color: As indicated by manufacturer's designations.
 - 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.03 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 - 1. Carlisle Coating and Waterproofing
 - 2. Grace Construction Products
 - 3. Metal-fab manufacturing
 - 4. Owens Corning
 - 5. Thermal Stability: ASTM D1970; stable after testing at 240 deg F (116 deg C) or higher.

6. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 deg F (29 deg C) or lower.
- B. Slip Sheet: Rosin-sized building paper, 3 lb./100 sq. ft. (0.16 kg/sq. m) minimum.

2.04 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - b. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Zinc Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.
- C. Solder:
 1. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- E. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D1187.
- F. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.05 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 2. Obtain field measurements for accurate fit before shop fabrication.
 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- H. Do not use graphite pencils to mark metal surfaces.

2.06 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop)and Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates. Shop fabricate interior and exterior corners.
 1. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.
 2. Fabricate with scuppers spaced 10 feet (3 m) apart, to dimensions required with 4-inch- (100-mm-) wide flanges and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
 3. Fabricate from the Following Materials:
 - a. Galvanized Steel: 0.028 inch (0.71 mm) thick.
- B. Roof-Penetration Flashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

3.00 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.
- B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.03 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.
 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."
- G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.04 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.
- C.

3.05 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.06 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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07 92 00 JOINT SEALANTS

1.00 GENERAL

1.01 SUMMARY

- A. This Section includes sealants for the following:
 - 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces.
 - 2. Exterior joints in horizontal traffic surfaces.
 - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 4. Interior joints in horizontal traffic surfaces.
- B. See Division 32 Section "Concrete Paving Joint Sealants" for pavement sealant joints installed in concrete paving and between concrete and asphalt paving.
- C. See Division 8 Section "Glazing" for glazing sealants.

1.02 SUBMITTALS

- A. Product Data: For each joint sealant product indicated.
- B. Samples: For each joint sealant product indicated.
- C. Sealant compatibility and adhesion test reports.
- D. Preconstruction field-adhesion test reports.
- E. Product certificates.

1.03 QUALITY ASSURANCE

- A. Sealant Compatibility and Adhesion Testing: Use sealant manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates using test method indicated in Part 3 "Field Quality Control" Article.
- C. Mockups: Before installing joint sealants, apply elastomeric sealants to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.04 WARRANTY

- A. Special Installer's Warranty: Written warranty in which Installer agrees to repair or replace elastomeric joint sealants that do not meet requirements specified in this Section or fail in adhesion within specified warranty period two years from date of Substantial Completion.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.

2.02 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected.

2.03 ELASTOMERIC JOINT SEALANTS

- A. Low-Modulus Nonacid-Curing Silicone Sealant, Type 1:
1. Products:
 - a. Dow Corning; 790.
 - b. GE Silicones; Silpruf
 - c. Pecora Corporation; 890.
 - d. Sonneborn Building Products Div., ChemRex Inc.; Omniseal.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Additional Movement Capability: Capable of 100 percent movement in extension and 50 percent movement in compression when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719.
 5. Exposure: Use NT (nontraffic).
 6. Substrates: Uses M, G, A, and, as applicable to joint substrates indicated, O.
 7. Nonstaining to porous substrates when testing per ASTM C 1248 for substrates indicated.
- B. Medium-Modulus Neutral-Curing Silicone Sealant, Type 2:
1. Products:
 - a. Dow Corning; 791.
 - b. Tremco; Spectrem 2.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Exposure: Use NT (nontraffic).
 5. Substrates: Uses M, G, A, and, as applicable to joint substrates indicated, O.
 6. Nonstaining to porous substrates when testing per ASTM C 1248 for substrates indicated.
- C. Mildew-Resistant Silicone Sealant, Type 3:
1. Products:

- a. Dow Corning; 786 Mildew Resistant.
 - b. GE Silicones; Sanitary 1700.
 - c. Pecora Corporation; 898 Silicone Sanitary Sealant.
 - d. Tremco; Tremsil 600 White.
2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Exposure: Use NT (nontraffic).
 5. Substrates: Uses G, A, and, as applicable to joint substrates indicated, O.
- D. Multicomponent Nonsag Urethane Sealant, Type 4:
1. For joints not subject to traffic and requiring additional movement capability, provide the following:
 - a. Products:
 - 1) Pecora Corporation; Dynatrol II.
 - 2) Sika Corporation; Sikaflex - 2c NS.
 - 3) Tremco; DYmeric 511.
 - b. Type and Grade: M (multicomponent) and NS (nonsag).
 - c. Class: 25.
 - d. Additional Movement Capability: 50 percent movement in extension and 50 percent in compression when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719.
 - e. Exposure: Use NT (nontraffic).
 - f. Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 2. For joints not subject to traffic, Type 5:
 - a. Products:
 - 1) Bostik Inc.; Chem-Calk 500.
 - 2) Tremco; DYmeric.
 - b. Type and Grade: M (multicomponent) and NS (nonsag).
 - c. Class: 25.
 - d. Exposure: Use NT (nontraffic).
 - e. Substrates: Uses M, G, A, and, as applicable to joint substrates indicated, O.
- E. Single-Component Nonsag Urethane Sealant, Type 6:
1. For joints subject to traffic and not subject to traffic, provide the following:
 - a. Products:
 - 1) Sika Corporation; Sikaflex - 1a.
 - 2) Sonneborn Building Products Div., ChemRex Inc.; NP 1.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 25.
 2. Exposure: Use NT (nontraffic).
 3. Substrates: Uses M, G, A, and, as applicable to joint substrates indicated, O.
 4. For joints not subject to traffic, provide the following:
 - a. Products:
 - 1) Bostik Inc.; Chem-Chalk 900.
 - 2) Pecora Corporation; Dynatrol I.
 - 3) Tremco; DyMonic.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 25.
 - d. Exposure: Use NT (nontraffic).
 - e. Substrates: Uses M, A, and, as applicable to joint substrates indicated.

F. Single-Component Pourable Urethane Sealant, Type 7

1. Products:
 - a. Bostik Inc.; Chem-Calk 950.
 - b. Pecora Corporation; NR-201.
 - c. Sonneborn Building Products Div., ChemRex Inc.; SL 1.
2. Type and Grade: S (single component) and P (pourable).
3. Class: 25.
4. Exposure: Use T (traffic) and NT (nontraffic).
5. Substrates: Uses M, G, A, and, as applicable to joint substrates indicated, O.

2.04 LATEX JOINT SEALANTS

A. Latex Sealant: ASTM C 834.

1. Products:
 - a. Bostik Inc.; Chem-Calk 600.
 - b. Pecora Corporation; AC-20.
 - c. Sonneborn Building Products Div., ChemRex, Inc.; Sonolac.
 - d. Tremco; Tremflex 834.

2.05 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 1. Type: C O, or B.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

3.00 EXECUTION

3.01 INSTALLATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
1. Remove foreign material from joint substrates that could interfere with adhesion of joint sealant.
 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues could interfere with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- D. Sealant Installation: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- E. Acoustical Sealant Installation: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- F. Install sealant backings to support sealants during application and at position required to produce optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- G. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
- H. Place sealants so they directly contact and fully wet joint substrates.
1. Completely fill recesses provided for each joint configuration.
 2. Produce uniform, cross-sectional shapes and depths that allow optimum sealant movement capability.
- I. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealants from surfaces adjacent to joint.
 2. Use tooling agents that are approved by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Joint Configuration: Concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- J. Installation of Preformed Silicone-Sealant System:
1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 2. Complete installation of horizontal joints before installing vertical joints. Lap vertical joints over horizontal joints. At end of joints, cut silicone extrusion with a razor knife.
- K. Clean excess sealants or sealant smears adjacent to joints as installation progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.02 JOINT SEALANT SCHEDULE

- A. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
1. Control and Expansion Joints in Cast-in-Place Concrete: Type 1, 5, 6 sealant.
 2. Control and Expansion Joints in Unit Masonry: Type 1,5,6 sealant.
 3. Joints between Metal Panels: 1, 5 sealant.
 4. Joints between Different Materials Listed above: Type 1, 5, 6 sealant.
 5. Perimeter Joints between Materials Listed above and Frames of Doors and Windows: Type 1, 5, 6 sealant.
- B. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
1. Control and Expansion Joints on Exposed Interior Surfaces of Exterior Walls: Type 1, 5, 6 sealant..
 2. Perimeter Joints of Exterior Openings Where Indicated: Type 1, 5 sealant.
 3. Vertical Control Joints on Exposed Surfaces of Interior Unit Masonry and Concrete Walls and Partitions: Type 1, 5, 6 sealant.
 4. Perimeter Joints between Interior Wall Surfaces and Frames of Interior Doors, Windows, and Elevator Entrances: Type 1, 5, 6 sealant.
 5. Joints between Plumbing Fixtures and Adjoining Walls, Floors, and Counters: Type 4, 7 sealant.

END OF SECTION

DIVISION 08

OPENINGS

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08 11 13 HOLLOW METAL DOORS AND FRAMES

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:

- 1. Standard hollow metal doors and frames.

- B. Related Sections:

- 1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
 - 2. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
 - 3. Division 09 Sections "Architectural Painting" for field painting hollow metal doors and frames.

1.03 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.

- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, and finishes.

- B. Shop Drawings: Include the following:

- 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.08 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amweld Building Products, LLC.
 2. Benchmark; a division of Therma-Tru Corporation.
 3. Ceco Door Products; an Assa Abloy Group company.
 4. Curries Company; an Assa Abloy Group company.
 5. Deansteel Manufacturing Company, Inc.
 6. Kewanee Corporation (The).
 7. Mesker Door Inc.
 8. Pioneer Industries, Inc.
 9. Security Metal Products Corp.
 10. Steelcraft; an Ingersoll-Rand company.

2.02 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 (ZF120) metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Division 08 Section "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.03 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard polystyrene, polyurethane or polyisocyanurate, core.
 - a. Thermal-Rated (Insulated) Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu (1.057 K x sq. m/W) when tested according to ASTM C 1363.
 - 1). Locations: Exterior doors and interior doors.
 - 3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
 - 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
 - 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.04 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded unless otherwise indicated.
 - 3. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded unless otherwise indicated.
 - 3. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.05 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.06 ACCESSORIES

2.07 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 2. Astragals: Provide overlapping astragal on one leaf of pairs of doors. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1). Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2). Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3). Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4). Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 2. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - b. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

- c. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8
 - 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.08 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

3.00 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable glazing stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

- f. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 4. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

3.04 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.

- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION

08 71 00 DOOR HARDWARE

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:

1. Mechanical door hardware for the following:
 - a. Swinging doors.

B. Related Sections:

1. Section 08 11 13 "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.
2. Section 08 33 23 "Overhead Coiling Doors" for door hardware provided as part of overhead coiling door assemblies.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: For power, signal, and control wiring and including the following:
 - a. Details of interface of electrified door hardware and building safety and security systems.
 - b. Schematic diagram of systems that interface with electrified door hardware.
 - c. Point-to-point wiring.
 - d. Risers.
 - e. Elevation doors controlled by electrified door hardware.

2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

- C. Samples for Initial Selection: For plastic protective trim units in each finish, color, and texture required for each type of trim unit indicated.

D. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

- a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
- b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
- c. Content: Include the following information:
 - 1). Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2). Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3). Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4). Fastenings and other pertinent information.
 - 5). Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6). Mounting locations for door hardware.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 1. Warehousing Facilities: In Project's vicinity.
 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- B. Source Limitations: Obtain each type of door hardware from a single manufacturer.
- C. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
 1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 2. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

- D. Preinstallation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

Deliver keys and permanent cores to Owner by registered mail or overnight package service.

COORDINATION

1. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
2. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 2. Warranty Period: 3 years from date of Substantial Completion, unless otherwise indicated.
 - a. Exit Devices: 2 years from date of Substantial Completion.
 - b. Closers: 10 years from date of Substantial Completion.

1.08 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, provide 6 months' full maintenance by skilled employees of door hardware Installer. Include repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

2.00 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 “Door Hardware Schedule” Article to comply with requirements in this Section.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers’ products.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 “Door Hardware Schedule” Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturers’ Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers’ names may be abbreviated in Part 3 “Door Hardware Schedule” Article.

2.02 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch (3.0-mm) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bommer Industries, Inc.
 - b. Cal-Royal Products, Inc.
 - c. Hager Companies.
 - d. IVES Hardware; an Ingersoll-Rand company.
 - e. McKinney Products Company; an ASSA ABLOY Group company.
 - f. Select Products Limited.
 - g. Stanley Commercial Hardware; Div. of The Stanley Works.
 - h. Zero International.

2.03 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
- C. Lock Backset: 2-3/4 inches (70 mm), unless otherwise indicated.

1. Levers: Cast.
 2. Escutcheons (Roses): Cast.
 3. Dummy Trim: Match lever lock trim and escutcheons.
 4. Operating Device: Lever with escutcheons (roses).
- D. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
- E. Mortise Locks: BHMA A156.13; Security Grade 1; stamped steel case with stainless steel or brass parts; Series 1000.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Best Access Systems; Div. of Stanley Security Solutions, Inc.
 - b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - d. Schlage Commercial Lock Division; an Ingersoll-Rand company.
 - e. Yale Security Inc.; an ASSA ABLOY Group company.

2.04 SURFACE BOLTS

- A. Surface Bolts: BHMA A156.16.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Burns Manufacturing Incorporated.
 - b. Don-Jo Mfg., Inc.
 - c. Door Controls International, Inc.
 - d. IVES Hardware; an Ingersoll-Rand company.
 - e. Trimco.

2.05 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices: BHMA A156.3.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.

- b. Dor-O-Matic; an Ingersoll-Rand company.
- c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
- d. Von Duprin; an Ingersoll-Rand company.
- e. Yale Security Inc.; an ASSA ABLOY Group company.

2.06 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass, bronze or stainless steel. All internal components of material suitable for a corrosive environment.
 - 1. Manufacturer: Same manufacturer as for locking devices.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ASSA, Inc.; An ASSA ABLOY Group Company.
 - b. Best Access Systems; Div. of Stanley Security Solutions, Inc.
 - c. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - d. Falcon Lock; an Ingersoll-Rand company.
 - e. Medeco Security Locks, Inc.; an ASSA ABLOY Group company.
 - f. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - g. Schlage Commercial Lock Division; an Ingersoll-Rand company.
 - h. Yale Security Inc.; an ASSA ABLOY Group company.
- B. High-Security Lock Cylinders: BHMA A156.30; Grade 1; Type M, mechanical; permanent cores that are removable; face finished to match lockset.
- C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 5 construction master keys.

2.07 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference. Match Owner's existing keying system.
 - 1. Existing System:
 - a. Master key or grand master key locks to Owner's existing system.
 - 2. Keyed Alike: Key all cylinders to same change key.
- B. Keys: Brass.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: Information to be furnished by Owner.
 - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.

2.08 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; aluminum or stainless steel, unless otherwise indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burns Manufacturing Incorporated.
 - b. Don-Jo Mfg., Inc.
 - c. Forms + Surfaces.
 - d. Hager Companies.
 - e. Hiawatha, Inc.
 - f. IVES Hardware; an Ingersoll-Rand company.
 - g. Rockwood Manufacturing Company.
 - h. Trimco.

2.09 ACCESSORIES FOR PAIRS OF DOORS

- A. Astragals: BHMA A156.22.

2.10 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - b. Dor-O-Matic; an Ingersoll-Rand company.
 - c. LCN Closers; an Ingersoll-Rand company.
 - d. Norton Door Controls; an ASSA ABLOY Group company.
 - e. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
 - f. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - g. Yale Security Inc.; an ASSA ABLOY Group company.

2.11 MECHANICAL STOPS AND HOLDERS

- A. Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Architectural Builders Hardware Mfg., Inc.
- b. Baldwin Hardware Corporation.
- c. Burns Manufacturing Incorporated.
- d. Door Controls International, Inc.
- e. Hager Companies.
- f. IVES Hardware; an Ingersoll-Rand company.
- g. Rockwood Manufacturing Company.
- h. Stanley Commercial Hardware; Div. of The Stanley Works.
- i. Trimco.

2.12 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Builders Hardware Mfg., Inc.
 - b. Glynn-Johnson; an Ingersoll-Rand company.
 - c. Rockwood Manufacturing Company.
 - d. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

2.13 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - d. Reese Enterprises, Inc.
 - e. Zero International.

2.14 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products.

- c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
- d. Reese Enterprises, Inc.
- e. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
- f. Zero International.

2.15 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch (1.3-mm) thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Baldwin Hardware Corporation.
 - b. Burns Manufacturing Incorporated.
 - c. Don-Jo Mfg., Inc.
 - d. Hiawatha, Inc.
 - e. IPC Door and Wall Protection Systems, Inc.; Div. of InPro Corporation.
 - f. IVES Hardware; an Ingersoll-Rand company.
 - g. Pawling Corporation.
 - h. Rockwood Manufacturing Company.
 - i. Trimco.

2.16 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1). Hinges mortised to doors or frames.
 - 2). Strike plates to frames.
 - 3). Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1). Surface hinges to doors.

- 2). Closers to doors and frames.
 - 3). Surface-mounted exit devices.
2. Spacers or Sex Bolts: For through bolting of FRP doors.
 3. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.17 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

3.00 EXECUTION

3.01 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights unless otherwise indicated or required to comply with governing regulations.
 1. DHI's recommendations.
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.
 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 1. Replace construction cores with permanent cores as directed by Owner.

- D. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of asphaltic emulsion.
- E. Stops: Provide floor stops for doors unless other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- F. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- G. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- H. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
 2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 3. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
- B. Occupancy Adjustment: Approximately 6 months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.04 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

Door Hardware Set No.1				
Door Number:				
1 each	Hinge	McKinney	MCK-12-HD	628
1 each	Lockset	Kaba	Simplex LP 1000	626
1 each	Exit Device	Corbin-Russwin	ED8200	626
1 each	Floor Stop	Hager	268S	US26D
3 each	Silencer	Glynn Johnson	Z1 (64)	
1 each	Closer	LCN	4041	652

1 each	Threshold	Pemko	171A x 4"	627
1 each	Weatherstripping	Pemko	S88	
1 each	Automatic Door Bottom	NGP	220SA	628
2 each	Drip Cap top & bottom	NGP	16A	628
1 each	Kick Plate	Hager	194S	US32D
Door Hardware Set No. 2				
Door Number:				
1 each	Hinge	McKinney	MCK-12-HD	628
1 each	Passage Latch	Schlage	L9040	626
1 each	Floor Stop	Hager	268s	US26D
3 each	Silencer	Glynn Johnson	Z1 (64)	
1 each	Closer	LCN	4041	652
1 each	Kick Plate	Hager	194S	US32D

END OF SECTION

DIVISION 09

FINISHES

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09 91 00 PAINTING

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior and interior substrates.
 - 1. Concrete masonry units (CMUs).
- B. Related Requirements:
 - 1. Section 09 96 00.01 "High Performance Coatings" for concrete, steel and all surfaces except for interior CMU and Hollow Metal Doors and Frames.

1.03 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5\ percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.06 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.08 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Basis of design: Benjamin Moore & Co. is preferred by the owner, but subject to compliance with requirements, provide optional products by one of the following:
1. Behr Process Corporation.
 2. Benjamin Moore & Co.
 3. Dulux (formerly ICI Paints); a brand of AkzoNobel.
 4. Glidden Professional.
 5. PPG Architectural Finishes, Inc.
 6. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products\ listed in the Interior Painting Schedule for the paint category indicated.

2.02 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
- D. Colors: As indicated in finish schedule.

2.03 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.00 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (Clay and CMUs): 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.03 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.04 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 INTERIOR PAINTING SCHEDULE

- A. CMU Substrates:
1. Latex System MPI INT 4.2A:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, matching topcoat.

- c. Topcoat: Latex, interior (MPI Gloss Level 2), MPI #44.
- B. Steel Substrates:
 - 1. Latex System, Alkyd Primer MPI INT 5.1Q:
 - a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

3.07 EXTERIOR PAINTING SCHEDULE.

- A. Steel and Iron Substrates:
 - 1. Water-Based Light Industrial Coating System MPI EXT 5.1M:
 - a. Prime Coat: Primer, rust inhibitive, water based MPI #107.
 - b. Prime Coat: Shop primer specified in Section where substrate is specified.
 - c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - d. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3), MPI #16.
 - e. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
 - 2. Quick-Dry Enamel System MPI EXT 5.1A:
 - a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.
 - b. Intermediate Coat: Alkyd, quick dry, matching topcoat.
 - c. Topcoat: Alkyd, quick dry, semi-gloss (MPI Gloss Level 5), MPI #81.
 - d. Topcoat: Alkyd, quick dry, gloss (MPI Gloss Level 7), MPI #96..

END OF SECTION

09 96 00 HIGH PERFORMANCE COATINGS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment, and incidentals necessary to apply protective coatings to material and equipment, including the preparation of surfaces prior to application of coatings.

1.02 ABBREVIATIONS

- A. The following abbreviations are used herein:

Abbreviations	
ANSI	American National Standards Institute
ASTM	ASTM International
MDFT	Minimum Dry Film Thickness
MDFTPC	Minimum Dry Film Thickness per Coat
mil	Thousandths of an Inch
NACE	NACE International
NSF	NSF International
OSHA	Occupational Safety and Health Administration
PSDS	Paint System Data Sheet
SFPG	Square Feet per Gallon
SFPGPC	Square Feet per Gallon per Coat
SP	Surface Preparation
SSPC	The Society for Protective Coatings
TCLP	Toxicity Characteristic Leaching Procedure

1.03 SUBMITTALS

- A. Product Data:
 1. For each coating system used, furnish a Paint System Data Sheet (PSDS), technical data sheets, and available colors for each product used in the coating system. Indiscriminate submittal of manufacturer's literature is not acceptable. A sample PSDS form is appended at the end of this Section.
 2. Coatings applied by equipment manufacturers do not require product data submittal
 3. Submit the required information on a system-by-system basis.
 4. The Coating Contractor shall also provide copies of the coating system submittals to the Coating Applicator.

- B. Where ANSI/NSF Standard 60 and 61 approval is required, submit ANSI/NSF certification letter for each product in the system. Indicate product application limits on size of equipment or piping, dry film thickness; number of coats, specific product tested, certified colors, and approved additives.
- C. Provide TCLP test data for lead and other regulated heavy metals in non-recyclable, slag type abrasive blast media to be used on the Project. Acceptable abrasive test data shall indicate the abrasive manufacturer, location of manufacture, and media gradation and type. Surface preparation will not be permitted to begin until acceptable test data has been submitted.
- D. Colors charts of each coating system.
- E. Quality Control:
 - 1. Applicator's Experience: List of references substantiating compliance to the requirements.
 - 2. Factory Applied Coatings: Manufacturer's certification stating factory applied coating systems meets or exceeds the requirements.
 - 3. If the manufacturer of the finish coating differs from that of shop-applied primer, provide written confirmation from both manufacturers that the two coating materials are compatible.

1.04 QUALITY ASSURANCE

- A. The coating system manufacturer shall provide a representative to visit the Site at intervals during surface preparation and coating as may be required for product application quality assurance, and to determine compliance with manufacturer's instructions and the Specifications, and as may be necessary to resolve field problems attributable to, or associated with, the manufacturer's products furnished.
- B. Coating Applicator's Experience: Minimum of 5 years' practical experience in application of specified products. Submit a list of recent projects and names of references for those projects. The Engineer will waive the requirement for 5 years' experience when, at the discretion of the Engineer, the applicator's experience and capabilities meet the intent of the experience requirement.
- C. Continuity of Contractor: Coating Contractor's field supervisor shall be coordinated with the Engineer, CMAR, and the Owner. Notify the Engineer 72 hours in advance of any replacement of the supervisor. Replacement will be subject to approval by the Owner.
- D. Inspection:
 - 1. Inspect and provide substrate surfaces prepared in accordance with the Specifications and the printed instructions and recommendations of coating manufacturer whose product is to be applied.
 - 2. Perform Work only in the presence of Owner's Representative, unless Owner grants prior approval to perform such Work in Owner's absence. Approval to perform Work in the Owner's absence is limited to the current day unless specifically noted to extend beyond the completion of the work day.

3. Inspection by the Owner’s Representative, or the waiver of inspection of any particular portion of the Work, shall not be construed to relieve the Coating Contractor of responsibility to perform the Work in accordance with the Drawings and Specifications.

1.05 STANDARDS

- A. The applicable provisions of the latest version of the following standards shall apply as if written here in their entirety:

American National Standards Institute (ANSI)/NSF International (NSF)	
ANSI/NSF 60	Drinking Water Treatment Chemicals – Health Effects
ANSI/NSF 61	Drinking Water System Components – Health Effects

ASTM International (ASTM)	
ASTM D4541	Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

NACE International (NACE)	
NACE SP0188	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
NACE SP0274	High-Voltage Electrical Inspection of Pipeline Coatings

The Society for Protective Coatings (SSPC)	
SSPC-SP1	Solvent Cleaning
SSPC-SP2	Hand Tool Cleaning
SSPC-SP3	Power Tool Cleaning
SSPC-SP5	White Metal Blast Cleaning
SSPC-SP6	Commercial Blast Cleaning
SSPC-SP7	Brush-Off Blast Cleaning
SSPC-SP8	Pickling
SSPC-SP10	Near-White Blast Cleaning
SSPC-SP11	Power Tool Cleaning to Bare Metal
SSPC-SP13	Surface Preparation of Concrete

1.06 WARRANTY

- A. The Coating Contractor and coating manufacturer shall jointly and severally warrant to the Owner and guarantee the Work under this Section against defective workmanship and materials for a period of two years commencing on the date of final acceptance of the Work.
- B. A warranty inspection shall be conducted one month prior to expiration of the warranty period. Any defective Work discovered at this date shall be corrected by the Coating Contractor in accordance with the Specifications at no additional cost to the Owner. Other corrective measures may be required during the two-year warranty period.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. A manufacturer letter code, as follows, will be found following the generic descriptions of materials outlined in this Section. Location is that of the general offices. Contact these offices for information regarding the location of representative nearest the project site.
 - 1. Manufacturer Code A – Coatings manufacturers (able to supply most heavy-duty industrial coatings and architectural paints):
 - a. PPG Protective and Marine Coatings, Pittsburg, PA.
 - b. Carboline Global, St. Louis, MO.
 - c. Devoe Coatings, Louisville, KY.
 - d. The Chemours Company, Wilmington, DE.
 - e. International Coatings, Louisville, KY.
 - f. Sherwin Williams, Cleveland, OH.
 - g. Tnemec Coatings, Kansas City, MO.
 - h. Wasser Coatings, Auburn, WA.
 - 2. Manufacturer Code E – Fusion-bonded coating applicators:
 - a. 3M Co., St. Paul, MN.

2.02 MATERIALS

- A. Products shall meet federal, state, and local requirements limiting the emission of volatile organic compounds. Specific information may be secured through the local office of the Air Pollution Control Officer.
- B. Provide materials produced by same coating manufacturer including primer and finish coats.
- C. Thinners, cleaners, driers, and other additives shall be as recommended by that coating manufacturer. Where coatings are required to meet ANSI/NSF Standard 60 and 61, addition of thinners, driers, and other coating additives not approved under the ANSI/NSF certification letter will not be permitted without written approval from the Engineer.
- D. Approved coating shall be designated by the manufacturer code below and manufacturers listed in Paragraph 2.01.

Product	Definition
Polyamide Epoxy, High Solids	Polyamide or polyamine cured epoxy, capable of 4 to 8 MDFT per coat, 70% solids by volume minimum, suitable for immersion or buried service. MANUFACTURER CODE: A
Moisture Cured Zinc Primer	Single component, moisture cured urethane based, 12 lbs. metallic zinc content per gallon minimum, unlimited recoat period. MANUFACTURER CODE: A
Moisture Cure Urethane	Single component, moisture cured urethane intermediate and top coat, suitable for high humidity and condensation, unlimited recoat period. MANUFACTURER CODE: A
Inorganic Zinc Primer	Solvent or water based, 14 lbs. metallic zinc content per gallon minimum; follow manufacturer's recommendation for top coating. MANUFACTURER CODE: A
Polyurethane Enamel	Two-component, aliphatic or acrylic based polyurethane; high gloss finish, high build. MANUFACTURER CODE: A
Rust-Inhibitive Primer	Single-package steel primers with anti-corrosive pigment loading; may be alkyd, vinyl, epoxy ester, chlorinated rubber. MANUFACTURER CODE: A
Alkyd Enamel	Optimum quality, gloss finish, medium long oil. MANUFACTURER CODE: A
Wash Primer	Vinyl butyral acid MANUFACTURER CODE: A
Polyurethane	Self-priming, plural component, 100% solids, non-extended polyurethane, suitable for burial or immersion, and shall be one of the approved products as specified in Section 09 97 16 "Pipeline Coatings and Linings."
Fusion Bonded Coating	100% solids, thermosetting, fusion bonded, dry powder epoxy or polyurethane resin, suitable for this intended service. MANUFACTURER CODE: E

2.03 COLOR SELECTION

- A. Provide as selected by the Owner or Engineer. Color for all above grade or exposed piping in potable water system shall be TNEMEC Delft Blue. Color of all buried pipe shall be tan, or generally light in color. Any change from this must be approved by the Owner and Engineer.
- B. Provide coatings formulated with colorants free of lead, lead compounds, or other materials which might be affected by the presence of hydrogen sulfide or other gases likely to be present at the Site.
- C. Proprietary identification of colors is for identification only. Any authorized manufacturer may supply matches.

D. Equipment Colors:

1. Equipment shall be meant to include the machinery or vessel itself plus the structural supports and fasteners and attached electrical conduits.
2. Paint non-submerged portions of equipment in the same color as the process piping it serves, except as itemized below:

Non-Submerged Portions	Color
Dangerous parts of equipment and machinery	OSHA Orange
Fire protection equipment and Apparatus	OSHA Red
Radiation hazards	OSHA Purple
Physical hazards in normal operating area	OSHA Yellow

3. Fiberglass reinforced plastic (FRP) equipment with an integral colored gel coat does not require painting, provided the color is as specified.

2.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver coating to the Site in unopened containers that plainly show the designated name, manufacture date, color, and name of manufacturer.
- B. Store coatings in a suitably protected area that is heated or cooled as required to maintain temperatures within the range recommended by the coating manufacturer.
- C. Shipping:
 1. Where pre-coated items are to be shipped to the Site, protect coating from damage. Batten coated items to prevent abrasion.
 2. Use nonmetallic or padded slings and straps in handling.
 3. Items will be rejected for excessive damage.

2.05 INSPECTION TEST EQUIPMENT

- A. Provide a magnetic type or electronic dry film thickness gauge to test coating thickness, as manufactured by:
 1. Paul N. Gardner Co., Pompano Beach, FL, Mikrotest.
 2. DeFelsko Corp., Ogdensburg, NY, PosiTector.
 3. Or equal.
- B. For finish coatings less than 20 mils thick, provide a wet sponge type, low voltage, electrical holiday detector to test for holidays and discontinuities. Detector shall be as manufactured by:
 1. Tinker and Razor, San Bernardino, CA, Model M/1.
 2. Or equal.
- C. For elastomeric coatings and coating systems in excess of 20 mils thick, provide a pulse type, high voltage, electrical holiday detector, to test for holidays and discontinuities. Detector shall be as manufactured by:

1. Tinker and Razor, San Bernardino, CA, Model AP-W.
2. D. E. Stearns Company, Shreveport, LA, Model 14/20.
3. Elcometer, Rochester Hills, MI.
4. Or equal.

3.00 EXECUTION

3.01 GENERAL

- A. The intention of this Section is for all new, interior, exterior, and submerged metal surfaces be coated, unless specified otherwise. Concealed structural steel surfaces shall receive prime coat only unless specified otherwise.
- B. Surface preparation and coating application shall be in conformance with the Specifications and the coating manufacturer's written product data sheets and written recommendations of the manufacturer's technical representative. Where conflicts occur between the manufacturer's recommendations and the Specifications, the more stringent of the two shall apply unless approved by the Engineer.
- C. For coatings subject to immersion, obtain full cure for the completed system. Consult coatings manufacturer's written instructions for these requirements. Do not immerse coating for any purpose until the curing cycle is complete.

3.02 REGULATORY REQUIREMENTS

- A. Volatile organic compounds emissions and worker exposures shall meet federal, state, and local limits.
- B. Comply with applicable federal, state, and local air pollution and environmental regulations for surface preparation, blast cleaning, disposition of spent aggregate and debris, coating application and dust prevention to protect workers. Applicable acts, regulations, standards, and guidelines include but are not limited to:
 1. Clean Air Act.
 2. National Ambient Air Quality Standards.
 3. Resource Conservation and Recovery Act (RCRA).
- C. Meet applicable federal, state, and local air pollution control regulations for blast cleaning and disposition of spent aggregate and debris.
- D. Comply with applicable federal, state, and local regulations for confined space entry.
- E. Provide and operate equipment that meets explosion proof requirements.

3.03 ENVIRONMENTAL CONDITIONS

- A. Do not perform abrasive blast cleaning whenever the relative humidity exceeds 85 percent, and/or whenever surface temperature is less than 5 degrees F above the dew point of the ambient air.

- B. Surface preparation power tools and blast equipment shall contain dust collection equipment that will prevent discharge of dust particles into the atmosphere when surface preparation work is located within enclosures or confined areas with electrical equipment, motors, instrumentation, or other equipment that may be damaged by airborne dust and particles.
- C. Do not apply coating when:
 - 1. Surface temperatures exceeds the maximum or minimum temperature recommended by the coating manufacturer or the specifications.
 - 2. In a dust or smoke-laden atmosphere, damp or humid weather, or under conditions that could cause icing on the metal surface.
 - 3. When it is expected that surface temperatures will drop below 5 degrees F above the dew point within 8 hours of coating application.
 - 4. Whenever the relative humidity exceeds 85 percent, or the maximum recommended by the coating manufacturer.

3.04 DEHUMIDIFICATION

- A. Where weather conditions or Project requirements dictate, Coating Contractor shall provide and operate dehumidification equipment to maintain environmental conditions suitable for abrasive blasting and coating application as specified.
- B. Dehumidification equipment shall be sized to maintain dew point temperature 5 degrees F or more below surface temperature of metal surfaces to be cleaned and coated. Provide equipment systems capable for air flows as required to maintain positive pressure and ventilation within the environmentally controlled areas. Environmentally controlled work areas shall meet all of the following requirements:
 - 1. Two air exchanges per hour, minimum.
 - 2. Personnel exposures limits (PEL) at 50 percent of OSHA PEL limits for all chemicals used in the performance of the work.
 - 3. Lower explosive limits (LEL) to less than 50 percent of the most volatile solvent used in the performance of the work.
- C. Dehumidification equipment type, size, air flow, and power requirements shall be designed by a qualified company knowledgeable in the setup and operation requirements of the dehumidification equipment. Design shall be based on Project requirements and anticipated weather conditions. Design shall include evaluation of existing conditions, humidity, and temperature, proper air exchange requirements, ventilation requirements, ducting requirements for adequate air flow, and any other issues necessary to achieve the specified performance and environmental conditions throughout the duration of the project.
- D. Submit written recommendations for bulkhead locations, bulkhead venting, duct work for each bulkhead section, any secondary ventilation requirements for coating cure, dust collection equipment CFM requirements, and drying requirements for blast hose compressed air necessary to maintain environmental control as specified herein. At a minimum, provide bulkheads to separate surface preparation work zones, coating application zones, and coating cure zones.

- E. Dehumidification equipment shall operate 24 hours per day throughout surface preparation, coating application, and coating cure. Liquid, granular, or loose lithium chloride drying systems will not be acceptable.
- F. Coating Contractor shall either operate the equipment or provide training in the operation and maintenance of the dehumidification equipment. Coatings Contractor shall provide a technical dehumidification representative on site for a minimum of two 8 hour days to insure proper operation of the equipment, achievement of desired environmental control, and to ensure proper setup, operation, monitoring, and maintenance of the equipment.
- G. Monitor ambient temperature, humidity, dew point temperature, and pipe surface temperature both outdoors and within the work area at the start, midpoint, and end of each work shift at a minimum, but not greater than 5 hours between measurements.
- H. Document daily maintenance requirements of the equipment in writing. Post documentation near the equipment for review by the Engineer.
- I. Cleaned metal surfaces shall be prevented from flash rusting throughout the Project duration. Condensation or icing shall be prevented throughout surface preparation and coating application. Re-blasting of flash rusted metal surfaces or removal of damaged coatings, as a result of equipment malfunction, shutdown, or other events that result in the loss of environmental control, will be at the sole expense of the Coating Contractor.

3.05 ILLUMINATION AND VENTILATION

- A. Provide adequate illumination while Work is in progress. Whenever required by the inspector, the Coating Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the inspector.
- B. Provide adequate ventilation to control dust and hazardous conditions within confined areas. Ventilation flow rates shall be in accordance with OSHA regulations and as required to reduce air contamination to nonhazardous conditions.

3.06 SURFACES NOT REQUIRING COATING

- A. Unless otherwise stated in the Specifications or shown on the Drawings, the following areas or items will not require coating:
 - 1. Concrete and masonry surfaces.
 - 2. Nonferrous and corrosion-resistant ferrous alloys such as copper, bronze, Monel, aluminum, chromium plate, atmospherically exposed weathering steel, and stainless steel, except where:
 - a. Required for electrical insulation between dissimilar metals.
 - b. Aluminum and stainless steel are embedded in concrete or masonry, or aluminum is in contact with concrete or masonry.
 - c. Color coding of equipment and piping is required.
 - 3. Nonmetallic materials such as glass, wood, porcelain, and plastic (PVC, FRP, etc.) except as required for architectural coating or color coding.

4. Prefinished electrical and architectural items such as motor control centers, switchboards, switchgear, panelboards, transformers, disconnect switches, acoustical tile, cabinets, elevators, building louvers, wall panels. Color coding of equipment is required.
5. Non-submerged electrical conduits attached to uncoated concrete surfaces.
6. Cathodic protection anodes.
7. Items specified to be galvanized after fabrication, unless specifically required elsewhere or subject to immersion.

3.07 PREPARATION OF SURFACES

A. Inspection:

1. Inspect and provide substrate surfaces prepared in accordance with the Specifications and the printed instructions and recommendations of coating manufacturer whose product is to be applied.
2. Provide Engineer minimum three days' advanced notice to start of surface preparation or coating application work, unless otherwise specified.
3. Perform such Work only in the presence of Engineer, unless Engineer grants prior approval to perform such Work in Engineer's absence.

B. Metal Surface Preparation:

1. General:
 - a. Do not perform a surface preparation blast prior to submission of Samples.
 - b. Specified workmanship for metal surface preparation shall meet current Society for Protective Coatings (SSPC) specifications.
 - c. All surface preparation of new equipment and surfaces shall be assumed to be on a SSPC Grade A steel surface condition, unless specifically noted otherwise.
 - d. Wherever the words "solvent cleaning", "hand tool cleaning", "wire brushing", or "blast cleaning", or similar words of equal intent are used in the Specifications or in coating manufacturer's instructions, they shall be understood to refer to the applicable SSPC specifications listed above.
 - e. Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet or vacuum blast methods may be required. Coating manufacturers' recommendations for wet blast additives and first coat application shall apply.
 - f. Hand tool clean areas that cannot be power tool cleaned.
2. Welds and adjacent areas:
 - a. Prepared such that there is:
 - 1). No undercutting or reverse ridges on the weld bead.
 - 2). No weld spatter on or adjacent to the weld or any other area to be coated.
 - 3). No sharp peaks or ridges along the weld bead.

- b. Grind embedded pieces of electrode or wire flush with the adjacent surface of the weld bead.
3. Pre-blast Cleaning Requirements:
 - a. Remove oil, grease, welding fluxes, and other surface contaminants prior to blast cleaning. Use solvents that will not harm the surface. Solvents shall be in accordance with SSPC-SP1
 - b. Clean surfaces using steam, open flame, hot water, or cold water with appropriate detergent additives. Follow with clean water rinsing.
 - c. Clean small isolated areas as above or with suitable solvents and clean cloths.
 - d. Round or chamfer all sharp edges and grind smooth all burrs, jagged edges, and surface defects.
4. Blast Cleaning Requirements:
 - a. Equipment and speed of travel shall be designed to obtain specified degree of cleanliness.
 - b. Select type and size of abrasive to produce a surface profile that meets the coating manufacturer's recommendations for the particular coating to be applied or not less than 20 percent of the specified coating thickness, whichever is more stringent.
 - c. Do not reuse abrasive, unless abrasive is a recyclable abrasive.
5. Shop Blasting:
 - a. Provide Engineer at least seven days advance notice to start of shop blast cleaning to allow for inspection of the Work during surface preparation and shop application of coatings. Work shall be subject to the Engineer's approval before shipment to the Site.
 - b. Items such as structural steel, metal doors and frames, metal louvers, and similar items as inspected by the Engineer may be shop prepared and primed.
 - c. Centrifugal wheel blast cleaning is an acceptable alternate to shop blast cleaning.
6. Field Blasting:
 - a. Perform sandblasting for items and equipment specified and as required to restore damaged surfaces previously shop or field blasted and primed. Materials, equipment, procedures, shall meet requirements of SSPC.
 - b. Field blasting in areas with electrical or mechanical equipment, or within buildings shall be performed with dustless abrasive systems such as sponge or dry ice abrasive blasting.
7. Post-Blast Cleaning and Other Cleaning Requirements:
 - a. Clean surfaces of dust and residual particles by dry air blast cleaning or other method prior to coating. Oil or water vapor cleaning are not allowed. Vacuum clean enclosed areas and other areas where dust settling is a problem. Wipe with a tack cloth.

- b. Coat surfaces the same day they are sandblasted. Re-blast surfaces that have started to rust before they are coated.
- C. Concrete Surface Preparation:
1. Do not begin until 30 days after the concrete has been placed or 7 days if steam cured.
 2. Remove grease, oil, dirt, salts or other chemicals, loose materials or other foreign matter by solvent, detergent, or other suitable cleaning methods.
 3. Clean concrete using mechanical or chemical methods appropriate for the degree of cleaning specified for the coating system and in accordance with SSPC-SP13.
 4. Ensure surfaces are dry prior to coating unless otherwise required for proper adhesion.
 5. Fill or patch bug holes, air pockets, and other voids in the concrete in chemical exposure areas, secondary containment, and where specifically required.
 6. Concrete Surface Preparation Inspection:
 - a. Adhesion Testing:
 - 1). The Engineer will perform tensile testing of the surface preparation using for concrete surface adhesion testing. Pneumatic adhesion testing equipment will be Type 4 or Type 5 with 2-inch diameter dollies in accordance with ASTM D4541.
 - 2). Score concrete surface or applied coating for concrete adhesion testing.
 - 3). Substrate adhesive failure greater than 50 percent of the dolly surface area shall indicate inadequate surface preparation.
 - 4). Cohesive failures which result in loss of sound concrete will be acceptable provided the loss is greater than 50 percent of the dolly surface area.
 - 5). Low cohesive failures with a thin layer of concrete due to weak concrete or laitance over 50 percent of the dolly surface will be rejected.
 - b. Concrete soundness shall be determined using the scratching or hammer impact methods as defined in SSPC-SP13.
 - c. Moisture content shall be tested as specified in SSPC-SP13 and shall not exceed the moisture content recommended by the coating manufacturer.
- D. Preparation of Existing Coated or Shop-Primed Surfaces:
1. General:
 - a. Prior to additional coating application, shop primed or coated surfaces shall be inspected with the Engineer to determine the extent of damage to the coating and the ability of finish coats to adhere.
 - b. If a cured epoxy, polyurethane, or plural-component material is to be top coated, brush-off blast to a degree with a zero-gloss, frosted visual appearance as specified herein or as recommended by the existing coating manufacturer.
 - c. Surface preparation recommendations of coating manufacturer shall be subject to approval of the Engineer.

2. Prior to Recoat or Final Coat:
 - a. Detergent wash and freshwater rinse.
 - b. Perform touch-up repairs of existing coating.
 - c. Apply a seal coat to asphaltic varnish coated ductile iron pipe prior to the application of a cosmetic finish coat.
 3. Touch-up Repairs:
 - a. Clean loose, abraded, or damaged coatings to substrate by in accordance with SSPC-SP11.
 - b. Feather surrounding intact coating.
 - c. Apply one spot coat of the specified primer to bare areas. Overlap the prepared existing coating.
 - d. Apply one full finish coat of the specified primer or finish coat overall.
 4. Application of a Cosmetic Coat: The exact nature of shop-applied coatings is not known in all cases. Check compatibility by application to a small area prior to starting the coating. If lifting or other problems occur, request disposition from the Engineer.
- E. Brush-off Blast Cleaning:
1. Equipment, procedure, and degree of cleaning shall meet SSPC-SP7.
 2. Abrasive shall be either conventional abrasive blasting with sand, grit, or nut shells, or specialized abrasive blasting, such as sponge or dry ice blasting. Abrasives shall be 60 mesh grit, maximum.
 3. Select various surface preparation parameters such as size and hardness of the abrasive, nozzle size, air pressure, and nozzle distance from the surface such that the surface is cleaned without pitting, chipping, or exposure of metal substrate.
 4. Verify parameter selection by blast cleaning a trial area that will not be exposed to view.
 5. The Engineer shall approve trial blast cleaned area and shall use area as a representative Sample of surface preparation.
 6. Surface profile shall have the appearance of 100 grit sandpaper with no exposed metal substrate.
 7. Repair or replace coated surfaces damaged by blast cleaning. Damage is defined as visible metal substrate. If less than 5 percent of prepared surface has the metal substrate visible, the coating shall be repaired by application of a brush applied coat. If greater than 5 percent of the metal substrate is visible, the coating shall be fully removed to meet the specified surface cleanliness.
- F. Solvent Cleaning:
1. Remove foreign matter, such as oil, grease, soil, drawing and cutting compounds, and any other surface contaminants, by the use of solvents, emulsions, cleaning compounds, steam cleaning, or similar materials and methods which involve a solvent or cleaning action.
 2. Method shall meet the requirements of SSPC-SP 1.

3.08 PROTECTION OF SURFACES NOT TO BE COATED

- A. Remove, mask, or otherwise protect hardware, lighting fixtures, switchplates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be coated.
- B. Provide drop cloths to prevent coating materials from falling on or marring adjacent surfaces.
- C. Protect working parts of mechanical and electrical equipment from damage during surface preparation and the coating process.
- D. Mask openings in motors to prevent coating and other materials from entering the motors.

3.09 COAT MIXING

- A. Multiple-Component Coatings:
 - 1. Prepare coatings using all container contents for each component as packaged by the coating manufacturer.
 - 2. No partial batches will be permitted.
 - 3. Multiple-component coatings that have been mixed shall not be used beyond their pot life.
 - 4. Provide small quantity kits for touchup and for coating small areas.
 - 5. Mix only the components specified and furnished by the coating manufacturer.
 - 6. Do not intermix additional components for any reason, even within the same generic type of coating.
 - 7. Fast set or plural component products shall be applied using an appropriate multipart pump that properly mixes both components at the recommended ratio using equipment recommended by the coating manufacturer. Hot mixing of fast set or plural component products will not be permitted.
- B. Keep coating materials sealed when not in use. Provide a nitrogen blanket on fast set, plural, or moisture cured coatings on opened product containers when stored or not in use more than 8 hours.
- C. Provide alternating colors where more than one coat of a material is applied within a given system. Alternating colors will indicate that the required number of coats have been applied.

3.10 APPLICATION OF COATING

- A. General:
 - 1. Schedule an inspection with Engineer for cleaned surfaces and all coats prior to the application of the subsequent coat. Schedule inspection with Engineer to verify compliance to the Specifications for shop coated or factory finished items delivered to the Site.
 - 2. Apply coatings in accordance with the coating Manufacturer's recommendations. Allow sufficient time between coats to ensure thorough drying of applied coating.

3. Fusion Bonded Coatings Method Application: Electrostatic, fluidized bed, or flocking.
 4. Units to be coated shall be bolted together and to structures prior to assembly or installation.
 5. Shop Primed or Factory Finished Surfaces:
 - a. Power sand areas of chipped, peeled, or abraded coating. Feather the edges. Follow with a spot primer using specified primer.
 - b. For two-package or converted coatings, consult the coatings manufacturer's procedures for top coating of products.
 - c. Prior to application of finish coats, clean shop primed surfaces of dirt, oil, and grease. Apply a mist coat of specified primer, 1.0 mil dry film thickness.
 - d. After welding, prepare and prime holdback areas as required for the specified coating system. Apply primer in accordance with manufacturer's instructions.
 6. Manufacturer Applied Coating Systems:
 - a. Repair abraded areas on factory-finished items in accordance with the equipment manufacturer's instructions.
 - b. Carefully blend repaired areas into the original finish.
- B. Application Safety:
1. Perform coating in accordance with coating manufacturer's instructions, NACE, and federal, state, and local agencies having jurisdiction.
 2. Coatings Contractor will be solely and completely responsible for condition of the Site, including safety of all persons (including employees) and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours. Safety provisions will conform to U.S. Department of Labor, Occupational Safety and Health Act, any equivalent state law, and all other applicable federal, state, county, and local laws, ordinances, and codes.
 3. Comply with all safety-training requirements required for this Project.
- C. Film Thickness:
1. Coverage is listed as either the total minimum dry film thickness in mils (MDFT) or the spreading rate in square feet per gallon (SFPG). Per coat determinations are listed as MDFTPC or SFPGPC.
 2. Coating system film thickness per coat shall be applied at the specified thickness or the manufacturer's recommended minimum thickness, whichever is greater. Where the manufacturer has not specified a minimum coating thickness on the product data sheets, the minimum recommended coating application thickness shall apply.
 3. Maximum film build per coat shall not exceed the coating manufacturer's recommendations.
 4. Apply the minimum number of coats required regardless of the coating thickness. Additional coats may be required to obtain the minimum required coating thickness depending on method of application, differences in manufacturers' products, and atmospheric conditions.

- D. Surfaces that are subject to immersion, condensing environments, or where specifically specified shall be stripe coated on all angles, edges, corners, threads, welds, and similar type surfaces. Stripe coat shall be an extra coat of the intermediate or topcoat material. The stripe coat shall be a separate coat of coating from coats specified under the coating system. Stripe coats shall be alternated in color, similar to a full coat.
- E. Prime Coat for Porous Surfaces, such as Concrete and Masonry:
1. Coat may be thinned to provide maximum penetration and adhesion.
 2. Thinning of the Prime Coat is non-acceptable if the coating material is 100% Solids.
 3. The type and amount of thinning shall be determined by the coating manufacturer and is dependent on surface density and type of coating.
 4. Surfaces specified to receive water base coating shall be damp, but free of running water, just prior to application of the coating.
- F. Existing Coated or Shop-Primed Surfaces:
1. Cured epoxy, polyurethane, plural component materials or any other coating system that has exceeded its maximum recoat window shall be prepared as specified this section. Meet the requirements of Paragraph 3.07 D.
 2. If recoat window has been exceeded or has achieved full cure, epoxy, polyurethane, or plural-component coatings specified to be top coated shall be prepared in accordance with the coating manufacturer surface preparation recommendations. At a minimum, existing coated surface shall be sanded or abrasive sweep blasted to remove all gloss and to roughen the existing surface for adhesion of subsequent coats.
 3. Apply sealer or primer for coating compatibility where recommended by coating manufacturer.
- G. Damaged Coatings, Pinholes, and Holidays:
1. Feather edges and repair in accordance with the recommendations of the coating manufacturer.
 2. Repair fusion bonded coatings to be as recommended by the original applicator. Applicator shall provide liquid repair kits for this purpose as recommended by the coating manufacturer.
 3. Apply finish coats, including touchup and damage-repair coats, in a manner that will present a uniform texture and color-matched appearance.
- H. Unsatisfactory Application:
1. If the item has an improper finish color or insufficient film thickness, clean and topcoat surface with specified coating material to obtain the specified color and coverage. Obtain specific surface preparation information from the coating manufacturer.
 2. Evidence of runs, bridges, shiners, laps, or other imperfections shall be cause for rejection.
 3. Repair defects in coating system per written recommendations of coating manufacturer.
 4. Hand or power sand visible areas of chipped, peeled, or abraded coating, and feather the edges. Follow with primer and finish coat in accordance with the Specifications.

Depending on the extent of repair and its appearance, a finish sanding and topcoat may be required.

5. Leave all staging up until the Engineer has inspected the surface or coating. Replace staging removed prior to approval by Engineer.

3.11 COATING INSPECTION

A. General:

1. Perform all film thickness measurements and electrical inspection of the coated surfaces with properly calibrated instruments.
2. Recoat and repair as necessary for compliance with the Specifications and to repair damage caused by destructive testing methods utilized to inspect the coating application.
3. All coats will be subject to inspection by the Engineer and the coating manufacturer's representative.
4. Visually inspect concrete, nonferrous metal, plastic, and wood surfaces to ensure proper and complete coverage has been attained. Give particular attention to edges, angles, flanges, and other areas where insufficient film thicknesses are likely to be present and ensure proper millage in these areas.

B. Coating Thickness Testing:

1. Engineer shall conduct coating thickness testing as necessary. Testing conformance to the requirements of SSPC PA-2, "Measurement of Dry Coating Thickness with Magnetic Gages," is specifically excluded from this Section.
2. Measure coating thickness in mils with a magnetic dry film thickness gauge as specified.
3. Check each coat for the correct millage on a relatively flat surface of the pipe or appurtenance. Avoid testing the edges or connection points. Do not make measurement until 8 hours after application of the coating, minimum.
4. Tests for concrete coating thickness shall be with a Tooke Gauge, a destructive test. Coatings Contractor shall repair coating after thickness testing. A non-destructive ultrasonic dry film thickness gauge suitable for concrete surfaces may be used in lieu of a Tooke Gauge.

C. Coating Continuity (Holiday) Testing:

1. Test finish coatings less than 20 mils dry film thickness (except zinc primer, galvanizing, and elastomeric coatings) for holidays and discontinuities with a low voltage, wet sponge type, electrical holiday detector as specified.
2. Test finish elastomeric coatings, coatings in excess of 20 mils dry film thickness, concrete, and secondary containment coatings (except zinc primer) with a pulse type, high voltage, electrical holiday detector as specified.
3. Holiday detect coatings on pipe for buried application with high voltage spark tester in accordance with NACE SP0274. Testing shall be performed on a relatively flat surface of the pipe or appurtenance. Avoid testing the edges or connection points.

3.12 CLEANUP

- A. Place cloths and waste that might constitute a fire hazard in closed metal containers or destroy at the end of each day.
- B. Upon completion of the Work, remove staging, scaffolding from the Site. Remove containers from the Site or destroy in a legal manner.
- C. Completely remove coating spots, oil, or stains upon adjacent surfaces and floors and leave entire Site clean.
- D. Damages due to over spray on buildings, vehicles, trees, or other surfaces not specified to be coated shall be the responsibility of the Coatings Contractor.

3.13 MANUFACTURER SERVICES

- A. Furnish coating manufacturer's representative to:
 - 1. Visit the Site at intervals as may be required for product application quality assurance during surface preparation and coating.
 - 2. Determine compliance with manufacturer's instructions and the Drawings and Specifications.
 - 3. Resolve field problems as necessary that are attributable to, or associated with, manufacturer's products furnished.

3.14 PROTECTIVE COATING SYSTEMS AND APPLICATION SCHEDULE:

- A. Unless otherwise shown in the Drawings or specified, coat the Work in accordance with the following application schedule.
- B. In the event of discrepancies or omissions in the following, request clarification from the Engineer before starting the Work in question.

Application Schedule	
System No.	Title
1	Submerged Metal - Potable Water
2	Concrete Encased Metal
4	Exposed Metal - Highly Corrosive
5	Exposed Metal - Mildly Corrosive
8A	Buried Metal – Shop Coated
8B	Buried Metal – Field Coated
10	Galvanized Metal Conditioning
11	Galvanized Metal Repair
27	Aluminum and Dissimilar Metal Insulation
21	Nonskid Floor, Concrete
29	Fusion Bonded Coating

Application Schedule	
System No.	Title
30	Internal Lining of Steel Specials – Potable Water
31	Internal Lining Transition Sealant Between Mortar and Epoxy Lined Pipe

C. System No. 1 Submerged Metal - Potable Water:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Abrasive Blast, or Centrifugal Wheel Blast (SP5)	Polyamide Epoxy Coating	3 coats, 4 MDFTPC

2. Application:

- a. All new or existing metal surfaces below a plane 1 foot above the maximum liquid surface; metal surfaces above the maximum liquid surface which are a part of the immersed equipment; and concrete embedded surfaces of metallic items under submerged or buried conditions, such as wall pipes, pipes, wall or floor sleeves, access manholes, gate guides and thimbles, and structural steel, except reinforcing steel, unless otherwise specified.
- b. This system shall be applied to the following specific items:
 - 1). Flanged or mating metal surfaces of access manways, air valves, and other immersed metal surface on the interior of the pipeline.
 - 2). Buried miscellaneous metals as alternative to System No. 8A, subject to Engineer approval.
- c. Interior epoxy lining shall transition onto mortar lining by overlapping mortar lining for a minimum of 18 inches onto the epoxy coating. Location of overlap to be determined by the pipe fabricator, but shall not be less than 24-inches below finished grade unless otherwise noted.

D. System No. 2 Concrete Encased Metal:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Abrasive Blast, or Centrifugal Wheel Blast (SP10)	Polyamide Epoxy	2 or 3 coats, 16 MDFTPC

- 2. Application: Metal surfaces encased in concrete, such as wall pipes, pipes, pipe sleeves, access manholes, gate guides and thimbles, and structural steel, excluding reinforcing steel; and the following specific surfaces unless otherwise specified.

E. System No. 4 Exposed Metal - Highly Corrosive:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Abrasive Blast, or Centrifugal Wheel Blast (SP10)	Moisture Cured Zinc Rich Primer	1 coat, 3 MDFT
	Moisture Cured Urethane	1 coat, 5 MDFT
	Moisture Cured Urethane	1 coat, 5 MDFT

2. Application:

- a. All new exposed metal surfaces, located inside of structures, manholes, or vaults and/or subject to high humidity or condensation.
- b. All surfaces with shop applied fusion bonded epoxy or other two-component coating system shall be prepared as specified for existing or shop-applied coatings and top coated with the specified coating material. Final color shall be uniform in appearance.
- c. Moisture-cured urethane coatings, as specified, are available from Wasser Chemical and Sherwin Williams. Other coating manufacturers will only be considered if the product complies with the unlimited recoat window.

F. System No. 5 Exposed Metal - Mildly Corrosive:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Abrasive Blast, or Centrifugal Wheel Blast (SP10)	Inorganic Zinc Rich Primer	1 coat, 3 MDFT
	Polyurethane Enamel	2 coats, 6 MDFT

2. Application:

- a. All new exposed metal surfaces located outside of structures and exposed to weather.
- b. All transitions between buried or concrete encasement and exposed pipe shall be overlapped a minimum of 6 inches.

G. System No. 8A Buried Metal, Shop Coated:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Abrasive Blast, or Centrifugal Wheel Blast (SP5)	Polyurethane	1 coat, 35 MDFT

2. Application:

- a. All buried steel pipe shall be shop coated in accordance with Section 09 97 16 "Pipeline Coatings and Linings."

- b. All buried or concrete encased ferrous metal pipe, fittings, and appurtenances shall be shop coated with this system, unless specified otherwise.
- c. Epoxy coating in accordance with System No. 1 shall be allowable in lieu of System No. 8 only when approved by the Engineer. Manufacturer shall specifically request the use of System No. 1 in writing for Engineer review and approval.

H. System No. 8B Buried Metal, Field Coated:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Abrasive Blast (SP10) or Power Tool to Bare Metal (SP11)	Polyurethane	35 MDFT
	- or -	
	Wax Tape	35 MDFT
	- or -	
	Fast Cure Epoxy	1 coat, 20 MDFT

2. Application:

- a. Field coat all buried metallic items with this system, unless specified otherwise in Section 09 97 16 "Pipeline Coatings and Linings" or approved by Engineer.
- b. All buried non-ferrous valves, pipe, or tubing.
- c. All buried miscellaneous metals, valves, fittings, and associated bolts.

3. Special Requirements:

- a. Polyurethane coating manufacturers shall be as specified in Section 09 97 16 "Pipeline Coatings and Linings."
- b. Wax Tape manufacturer shall be Denso North America, Houston, TX; Trenton Corp., Ann Arbor, MI; or equal.
- c. Fast cure epoxy coatings shall be:
 - 1). Denso Protal 7125 (low temperature) or Protal 7300.
 - 2). Chase Corp. Tapecoat TC 7030.
 - 3). 3M ScotchKote 323.

I. System No. 10 Galvanized Metal Conditioning:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Solvent Clean (SP1) followed by Hand Tool (SP2) or Power Tool (SP3)	Wash Primer	1 Coat, 0.4 MDFT
	Finish Coats to Match Existing Coating	As Required to Match Surrounding Area

2. Application: All galvanized surfaces requiring painting.

J. System No. 11 Galvanized Metal Repair:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Solvent Clean (SP1) followed by Hand Tool (SP2) or Power Tool (SP3) or Brush-off Blast (SP7)	Organic Zinc Rich Primer	1 Coat, 3 MDFT

2. Application: All galvanized surfaces which are abraded, chipped, or otherwise damaged.

K. System No. 21 Nonskid Floor, Concrete:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Concrete (SP13)	Epoxy Nonskid Finish	1 coat, 160 SFPG (thinned)
		1 coat, 160 SFPG (unthinned)

2. Application: All non-submerged, concrete embedded, aluminum surfaces.

L. System No. 27 Aluminum and Dissimilar Metal Insulation:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Solvent Clean (SP1)	Wash Primer	1 Coat, 0.4 MDFT
	Bituminous Coating	1 Coat, 10 MDFT

2. Application: All non-submerged, concrete embedded, aluminum and dissimilar metal surfaces.

M. System No. 29 Fusion Bonded Coating:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Abrasive Blast or Centrifugal Wheel Blast (SP10) or Acid Pickling (SP8)	Fusion Bonded 100% solids Epoxy or Polyurethane	1 or 2 coats, 7 MDFT

2. Application:

- a. All surfaces specified to be shop coated and intended for burial, immersion, high humidity and condensation environments, pipe vault components, and where specified.
- b. All pipe, valves, fittings, and couplings.

N. System No. 30 Internal Lining of Steel Specials – Potable Water:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Abrasive Blast or Centrifugal Wheel Blast (SP10)	100% solids Epoxy per AWWA C210	1 or 2 coats, 30-40 MDFTPC

2. Application:

- a. All surfaces specified to be shop coated and intended as internal lining of steel interconnect piping at pressure control facilities where higher velocities are expected due to decreased pipe diameter, and where specifically specified.
- b. All steel specials and interconnect specials
- c. Transitions shall have epoxy applied up to the mortar lining and then sealed with epoxy paste, System No. 31.

O. System No. 31 Internal Lining Transition Sealant Between Mortar and Epoxy Lined Pipe:

1. Surface Preparation and Coating System:

Surface Prep.	Coating Material	Min. Coats, Cover
Mechanically abrade (sand) the existing epoxy lining and mortar surface	100% solids, solvent free Epoxy paste or grout	1-inch maximum Epoxy thickness

2. Application:

- a. Field apply and hand trowel at transitions where System No. 30 is used.
- b. Install transition material at mortar thickness and taper down to the epoxy thickness. Apply in a circumferential band, 6 to 8 inches wide, to form a gradual taper.
- c. De-gloss and mechanical abrade existing linings prior to application.
- d. Remove all laitance from mortar surface to be in contact with sealant prior to application.
- e. The leading edge of mortar to be in contact with the sealant shall be rounded off to a 1/8-inch radius.
- f. Surfaces shall be dust-free and dry prior to application.
- g. Mask 1 to 1.5 inches from the leading edge of the mortar lined pipe section.

3.15 PAINT SYSTEM DATA SHEET

- A. The Paint System Data Sheet (PSDS) follows the END OF SECTION below.

END OF SECTION

PAINT SYSTEM DATA SHEET

Attached products' Technical Data Sheet (if applicable) to this sheet for each coating system submittal.

Paint System Number (from spec.):		
Paint System Title (from spec.):		
Coatings Manufacturer:		
Representative:		
Surface Preparation:		
Paint Material (Generic)	Product Name/Number (Proprietary)	Min. Coats, Coverage

Additional Information Required (check applicable items):

- ANSI/NSF Certification letter for each coating material listed above requiring ANSI/NSF Standard 60 and 61 approval.
- Manufacturer's minimum and maximum recommended coating thickness per coat and for total coating system.
- Immersion coating cure requirements from minimum coating application temperature to 100 degrees in 15 degree temperature increments.

09 97 16 PIPELINE COATINGS AND LININGS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to apply external polyurethane coating and internal mortar lining on steel pipe; field coating to joints; and field repair to coating damage.
- B. Mortar coated steel pipe shall be provided where specifically shown on the Drawings.
- C. Externally coated BWCCP shall be provided where specifically shown on the Drawings.
- D. Exposed steel pipe in vaults and above grade will be coated in accordance with Section 09 96 00 "High-Performance Coatings," unless specified otherwise.

1.02 ABBREVIATIONS

The following abbreviations are used in this Section:

Abbreviations	
ANSI	American National Standards Institute
ASTM	ASTM International
AWS	American Welding Society
AWWA	American Water Works Association
BWCCP	Bar-Wrapped Concrete Cylinder Pipe
ISO	International Organization for Standardization
MDFT	Minimum Dry Film Thickness
mils	Thousandths of an Inch
NACE	NACE International
NSF	NSF International
OSHA	Occupational Safety and Health Act
SSPC	The Society for Protective Coatings

1.03 DEFINITIONS

- A. **Manufacturer's Technical Representative:** Employee of coating manufacturer who is factory trained and knowledgeable in all technical aspects of their products and systems. Sales representatives are not acceptable as a technical representative unless written authorization from the coating manufacture is provided which states the sales representative has full authority to act on the behalf of the coating manufacturer.

1.04 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01 33 00 "Submittal Procedures."

1. Shop Drawings:
 - a. Catalog data; material safety data sheets; manufacturer's recommendations and instructions on surface preparation, application, and curing; product performance reports; and other manufacturer's information for all proposed products.
2. Record Data:
 - a. Application procedures and repair procedures of coating manufacturer.
 - b. Application procedures of heat-shrink sleeve manufacturer.
 - c. Provide copies of the approved coating system submittals to the coating applicator.
3. Quality Control:
 - a. Applicator's experience with list of references substantiating compliance to the requirements specified.
 - b. Coating manufacturer's certification stating the applicator meets or exceeds coating application requirements and recommendations.
 - c. Coating application quality assurance manual.
 - d. If the manufacturer of field-applied coating differs from that of the shop applied primer, provide written confirmation from both manufacturers' that the two coating materials are compatible.
 - e. Certified Test Reports for all coating and lining.
 - f. At the start of coating and/or lining operations, the manufacturer shall certify that the coatings are being applied in accordance with the specifications.
 - g. Submit reports from monthly follow-up site visits from coating manufacturer stating that the shop-applied coatings are being applied in accordance with the specifications based upon monthly site visits.

1.05 QUALITY ASSURANCE

- A. Coating Applicator's Experience and Certification:
 1. Coating application company and coating application supervisor (Certified Applicator) shall have a minimum of five years' experience applying the specified coating system.
 2. Coating application personnel, who have direct coating application responsibility, shall have a minimum of two years' practical experience in application of the approved coating system.
 3. Coating Applicator shall be certified by the coating manufacturer as an approved applicator.
- B. Coating and/or lining manufacturer technical representative shall be present for a minimum of two weeks for technical assistance and instruction at the start of coating and/or lining operations within the shop. The technical representative shall observe surface preparation and coating application and conduct tests of the coating to ensure conformance with application instructions, recommended methods, and conditions.

- C. Coating and/or lining manufacturer's technical representative shall be onsite for two weeks, minimum, at the start of each construction season to inspect coating application and procedures in the field. During this visit, the technical representative shall observe surface preparation and coating application, and conduct tests of the coating to ensure conformance with application instructions, recommended methods, and conditions.
- D. Coating and/or lining manufacturer shall provide 8 hours per month of field or shop coating technical support and follow up with QC testing.
- E. Technical representative shall provide a written report to the Engineer for each visit. Report shall include copies of test data collected, description of observations, and all recommended corrective actions. Report shall be submitted within five working days after the visit. When deemed necessary by the Engineer, work will not be permitted to proceed until the recommended corrective actions have been implemented. After all corrective recommendations have been completed the manufacturer's representative shall return and certify that the application complies with the manufacturer's coating application recommendations.
- F. Additional visits by the manufacturer's representative shall be made at sufficient intervals during surface preparation and coating or lining as may be required for product application quality assurance, and to determine compliance with manufacturer's instructions, and as may be necessary to resolve problems attributable to, or associated with, manufacturer's products furnished for this project.

1.06 STANDARDS

- A. AWWA, NACE, and SSPC are the minimum industry standards and are referenced for the purpose of conformance, except where modified herein. The requirements of this Section have been written to a higher design standard with the intent of achieving a long-term coating performance. The applicable provisions of the latest version of the following standards shall apply as if written here in their entirety:

ASTM International (ASTM)	
ASTM C33	Specification for Concrete Aggregates
ASTM C150	Specification for Portland Cement
ASTM D1000	Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications
ASTM D4541	Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

American Water Works Association (AWWA)	
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe – 4-Inch and Larger – Shop Applied
AWWA C209	Cold-Applied Tape Coatings for Steel Water Pipe, Special Sections, Connections, and Fittings
AWWA C210	Liquid Epoxy Coatings and Linings for Steel Water Pipe and Fittings

American Water Works Association (AWWA)	
AWWA C216	Heat-Shrinkable Cross-Linked Polyolefin Coatings for Steel Water Pipe and Fittings
AWWA C217	Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines
AWWA C222	Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings
AWWA C602	Cement-Mortar Lining of Water Pipelines in Place – 4-Inch and Larger

International Organization for Standardization (ISO)	
ISO 8502-3	Preparation of Steel Substrates before Application of Paints and Related Products – Part 3: Assessment of Dust on Steel Surfaces Prepared for Painting (Pressure Sensitive Tape Method)

NACE International (NACE)	
NACE SP0188	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
NACE SP0274	High-Voltage Electrical Inspection of Pipeline Coatings
NACE RP0287	Field Measurement of Surface Profile of Abrasive Blast-Cleaning Steel Surfaces Using a Replica Tape

American National Standards Institute (ANSI)/NSF International (NSF)	
ANSI/NSF 61	Drinking Water System Components – Health Effects

Society for Protective Coatings (SSPC)	
SSPC-SP1	Solvent Cleaning
SSPC-SP2	Hand Tool Cleaning
SSPC-SP3	Power Tool Cleaning
SSPC-SP5	White Metal Blast Cleaning
SSPC-SP6	Commercial Blast Cleaning
SSPC-SP10	Near-White Metal Blast Cleaning
SSPC-SP11	Power Tool Cleaning to Bare Metal

1.07 WARRANTY

- A. The CMAR shall warrant to the Owner and guarantee the Work under this Section against defective workmanship and materials for a period of 2 years commencing on the date of final acceptance of the Work.

1.08 OBSERVATION OF WORK

- A. The Installation Contractor shall give the Owner Representative a minimum of 14 days' advance notice of the start of any work to allow scheduling for shop or field observation. Provide Owner Representative a minimum three days' notice for actual start of surface preparation and coating application work.
- B. Make provisions to allow Owner's Representative full access to facilities and appropriate documentation regarding coating application.
- C. Observation by the Owner's Representative or the waiver of observation of any particular portion of the Work shall not be construed to relieve the Installation Contractor of his responsibility to perform the Work in accordance with the Contract Documents.
- D. Materials shall be subject to testing for conformance with this Section as the Owner's representative may determine, prior to or during incorporation into the Work.

2.00 MATERIALS

2.01 GENERAL

- A. Exterior and interior pipe and fitting surfaces shall be prepared and coated in accordance with referenced standards, written directions of the coating or lining manufacturer, or the Specifications, whichever is more stringent.
- B. Coatings and linings will be stored, handled, and applied per manufacturer's written directions.
- C. Pipeline coating or lining shall be the product of a single manufacturer. Product substitutions during the Project will not be permitted.

2.02 CONTRACTOR FURNISHED TEST EQUIPMENT

- A. Contractor shall provide the following coating test equipment for field testing of pipe for holidays:
 - 1. Holiday Test Equipment:
 - a. Elcometer Model D236, 0 to 30 kV high voltage tester.
 - b. External pipe rolling spring probe, sized for the Project pipe diameter.
 - c. Right-angle wire brush probe, 20 inches or larger.
 - d. Telescopic probed extension handle, 2 to 4-foot length range.

2.03 SHOP-APPLIED EXTERIOR COATINGS

- A. General:
 - 1. Steel pipe shall be coated in accordance with AWWA C222, except as modified herein.
 - 2. Buried dielectrically coated pipe and fittings passing through a structure wall or floor shall be coated a minimum of 2 inches beyond the interior wall or floor surface.
 - 3. Pipe that is atmospherically exposed shall be shop primed as specified herein and Section 09 96 00 "High-Performance Coatings."

B. Plural Component Polyurethane:

1. Plural component, polyurethane coating system (referred to as a polyurethane system) shall be applied in accordance with AWWA C222 and as modified herein. The coating shall be light in color and as approved by the Engineer.
2. Shop Surface Preparation:
 - a. Steel pipe: SSPC-SP5, 3.0 mil profile minimum, or as required by the manufacturer, whichever is greater using standardized testing procedures.
3. Shop-Applied Coating Requirements:
 - a. Self-priming, plural component, 100 percent solids, non-extended polyurethane, suitable for burial or immersion. Extended polyurethane coating will not be acceptable.
 - b. One coat, 35 mils total dry film thickness minimum, or as required to meet the holiday and coating defect limits specified in this Section.
 - c. Polyurethane shall be manufactured within 30 days of shipping to application facilities.
 - d. Coating shall be one of the following products, subject to review and acceptance:
 - 1). Protec II, Futura Coatings, Montgomeryville, PA.
 - 2). Chemthane 2265, Chemline Inc., St. Louis, MO.
 - 3). Polyclad 777, Carboline Global, St. Louis, MO.
 - 4). Durashield 110 or Durashield 210, LifeLast, Pflugerville, TX.
 - 5). No approved equal.
 - e. Dielectric Coating Holdback Primer:
 - 1). Holdback primer for corrosion protection of holdbacks shall be compatible with the specified joint coating system and weld-after-backfill requirements.
 - 2). Approved holdback primers are:
 - a). Tnemec 1 Omnithane: Suitable for all joints, except joints subject to weld-after-backfill.
 - b). Tnemec 90E-92 Tnemec Zinc: Suitable for all joints, including weld-after-backfill joints.
 - c). Devoe Coatings Cathacoat 304V: Suitable for all joints, including weld-after-backfill joints.
 - d). Tape Primers: Not allowed.
 - f. Acceptance of submitted product is contingent upon:
 - 1). Submit written verification that no change in product formulation has occurred.
 - 2). Owner reserves the right to conduct laboratory comparison of the test product with the submitted product Part A and B formulation using infrared spectrometry analysis. Test shall be performed on product samples collected at

the fabrication shop by Owner designated personnel. Products found to have been modified from the product used for the coating performance test report will be rejected.

C. Exposed Steel Pipe:

1. All atmospherically exposed or vault piping shall be shop primed with the coating system as specified in Section 09 96 00 "High-Performance Coatings."
2. Manufacturer of shop-applied primer shall be coordinated with field application to provide a complete system by a single manufacturer. Engineer approval of a coating system with two or more coating manufacturers will require written approval from all coating manufacturers as to compatibility and acceptance under warranty.

D. Cement Mortar Coating or Overcoat:

1. Where indicated on the Drawings for tunnel carrier pipe or other applications, apply cement mortar coating system on steel pipe and fittings in accordance with AWWA C205, except as modified herein.
2. Cement mortar overcoat shall be applied over a dielectric coating system on steel pipe and fittings in accordance with AWWA C205, except as modified herein.
3. Holdback: Mortar overcoat shall be held back of dielectric coating a minimum of 18 inches for overlap of field applied heat shrink sleeve joint coating onto dielectric coating system.
4. Coating System:
 - a. Cement: Conform to ASTM C150, Type II.
 - b. Aggregate: Silica sand or other aggregate that is not subject to leaching. Conform to ASTM C33.
 - c. Cement mortar mixture: Consisting of one-part cement to not more than three parts aggregate.
 - d. Water for cement mortar: Clean and free from organic matter, strong alkalis, vegetable matter, and other impurities. Use no more than 4-1/2 gallons of water per sack of cement.
 - e. Cement mortar coating: Nominal 1-inch thick coating with permitted tolerance of plus or minus 1/4 inch.

2.04 SHOP-APPLIED INTERIOR LININGS

A. Cement Mortar Lining:

1. Shop-applied cement mortar linings shall conform to the requirements of AWWA C205. Clean and cement mortar line steel pipe and fittings in accordance with AWWA C205 with the following modifications:
 - a. Cement mortar linings shall be dense and smooth without bumps, blisters, ridges, or spalling, to the satisfaction of the Engineer.
 - b. All rough spots shall be smoothed out with a rubbing stone, or other method, to the satisfaction of the Engineer.

2. Shop-applied cement mortar lining shall be uniform in thickness over the full length of the pipe joint. Curing of the linings shall conform to the requirements of AWWA C205.
 3. Cement: Conform to ASTM C150, Type II.
 4. Aggregate: Washed silica sand or other aggregate that is not subject to water leaching. Conform to ASTM C33.
 5. Water for cement mortar: Clean and free from organic matter, strong alkalis, vegetable matter, and other impurities.
- B. Liquid Applied Epoxy Lining:
1. Provide liquid epoxy primer and lining in all cement mortar lined metallic pipe at insulating joints. Cement mortar lining shall be tapered at the transition for a minimum of two pipe diameters on each side of the insulated joint.
 2. Epoxy coatings shall be NSF approved coatings suitable for potable water contact in accordance with ANSI/NSF Standards 60 and 61.

2.05 SPECIALS, FITTINGS, AND CONNECTIONS

- A. Coating and lining application for special sections, connections, and fittings for steel or ductile iron pipe shall conform to coating system and application requirements as specified in this Section.
- B. Specials, fittings, and connections shall be defined as any pipe section with turnouts for blow-offs, interconnects, valves, or other appurtenances; tees; crosses; wyes; laterals; manholes; mitered angles or elbows; and pipes which require special fabrication that prevents mechanical production application of the specified coating system from end to end of pipe joint.
- C. In addition to the items listed as specials, the following items shall also be considered as specials:
1. Pipe joints with pass through holes.
- D. Hand-applied tape coatings will not be permitted on any specials, fittings, connections, or elbows.
- E. Specials, fittings, and connections shall be externally coated with polyurethane coating system applied over the entire fitting. Fabrication cutting and welding is not allowed on coated surfaces. Provide coating holdback as specified. No hybrid coating system, such as tape and polyurethane combination will be allowed.

2.06 FIELD-APPLIED EXTERIOR JOINT COATING

- A. Pipe joints shall be field coated after pipe assembly in accordance with AWWA C205, C216, or C217, as applicable, and as specified herein.
- B. Field-applied joint coating shall be compatible with the shop-applied coating system and provided by the same manufacturer or a manufacturer approved by the shop-applied coating manufacturer.
- C. All joints on pipe coated with polyurethane coating system shall be coated with a heat shrink coating material.

D. Field joint coating materials shall be as follows, or an approved equal:

1. Heat Shrink Sleeves:

a. Filler Material:

- 1). Provide filler material for all push-on, flange, and coupling type joints, and at all changes in outside diameter greater than 1/8 inch.
- 2). Filler material shall adhere to the pipe and heat shrink sleeve. Size and type shall be as recommended by the sleeve manufacturer for type of pipe and joint.
- 3). Filler mastic for weld-after-backfill joints shall exceed a 500 degree F melt point temperature.
- 4). Filler material shall be applied in a manner and of sufficient thickness that no tenting or voids remain under the heat shrink sleeve.
- 5). Filler material shall be Polyken 939 filler.

b. Joint Coating:

- 1). Heat shrink, cross-linked polyolefin wrap or sleeve with a mastic sealant, 85 mils minimum nominal thickness, suitable for pipeline operating temperature, as recommended by the manufacturer, and shall meet the requirements of AWWA C216.
- 2). Provide standard recovery sleeve for welded or bell and spigot steel pipe joints. High recovery sleeves shall be provided for flange joints and coupling style joints.
- 3). Width of heat shrink sleeves shall be sufficient to overlap existing coating by 3 inches minimum. Sleeve shall be a minimum of 17 inches wide, or as needed to meet the overlap requirements.
- 4). Installation Contractor shall consider sleeve shrinkage during installation and joint profile in determining sleeve width required. Overlapping of two or more heat shrink sleeves to achieve the necessary width on pipe joints will not be permitted without Engineer approval.
- 5). Sleeve shall meet requirements for weld-after-backfill per Section 33 11 13.13 "Steel Pipe and Fittings" when allowed and approved by Engineer.

c. Holdback Primer: per the specified coating system.

d. Heat Shrink Sleeve:

- 1). Outer Sleeve: Berry-CPG Covalence WaterWrap.

2. Wax Tape Coating:

- a. Apply coating in accordance with AWWA C217 and as modified herein.
- b. Wax tape coatings shall be field applied on all buried flexible joints; thrust restraint rods and brackets; buried coated bolts; couplings; and on connections, joints, fittings, irregular shapes, or complex configurations that are not suited for the use of heat shrink coating systems and are not cement over-coated.

- c. Do not use wax tape coating systems on vault piping, atmospherically exposed piping and appurtenances, or where subject to UV exposures.
 - d. Provide filler material to fill and smooth all irregular surfaces so that no tenting or voids remain under the applied wax tape.
 - e. Use flowable fill to protect wax coating from damage.
 - f. Coating System:
 - 1). Surface Preparation: SSPC-SP11.
 - 2). Primer: Petroleum or petrolatum wax.
 - 3). Filler Material: Filled Petroleum or petrolatum wax sealer/filler with closed cell plastic filler.
 - 4). Inner Tape: Petroleum or petrolatum wax impregnated fabric, 6-inch width maximum, 40 mils thick.
 - 5). Outer Wrap: PVC or tape suitable for application to inner tape.
 - g. Wax tape coating system shall be as manufactured by:
 - 1). Denso North America, Inc., Houston, TX.
 - 2). Trenton Corporation, Ann Arbor, MI.
 - 3). Or approved equal.
3. Cement Mortar Coating or Overcoat:
- a. Joints of cement mortar coated steel pipe shall be mortar coated as specified herein after application of the specified joint coating materials, where applicable.
 - b. Polyethylene foam lined fabric with steel strapping of sufficient strength to hold the fresh mortar, resist rodding of the mortar and allow excess water to escape.
 - 1). 100 percent closed-cell.
 - 2). Chemically inert, insoluble in water, resistant to acids, alkalis, and solvents.
 - c. Fabric Backing:
 - 1). Cut and sewn into strips wide enough to overlap shop coated areas by 4 inches on either side.
 - 2). Strips shall have slots for steel strapping on outer edges.

2.07 FIELD-APPLIED INTERIOR JOINT LINING

A. Mortar Lining:

- 1. Pipe joints shall be field coated after pipe assembly in accordance with AWWA C602.
- 2. Field-applied joint lining shall be compatible with the shop-applied lining system and provided by the same manufacturer or a manufacturer approved by the shop-applied lining manufacturer.

3. After the backfill has been completed to final grade, the interior joint recess shall be filled with grout. The grout shall be tightly packed into the joint recess and troweled flush with the interior surface. Excess shall be removed.
4. At no point shall there be an indentation or projection of the mortar exceeding 1/16 inch.
5. For pipe smaller than 24 inches in diameter, the bell shall be daubed with grout before the spigot is inserted into the bell. The joint shall be completed and excess mortar on the inside of the joint shall be swabbed out.

2.08 REPAIR OF COATINGS AND LININGS

A. General:

1. Repair materials shall be compatible with the shop-applied coating or lining system and shall be approved by the coating or lining manufacturer.
2. Repair materials shall be as required for the coating system and repair classification as defined in this Section.
3. All major repairs on pipe coated with polyurethane coating system shall be repaired using heat shrink sleeves as specified for field-applied joint coating in accordance with C216 and as specified.
4. Minor coating repairs for polyurethane coated or exposed pipe shall be as specified.

B. Exposed Pipe Coating System: Touch-up repair all damage to the primer and/or intermediate coats with the specified coating system prior to final coating of the pipeline in accordance with Section 09 96 00 "High-Performance Coatings."

C. Coating Repair Materials:

1. Heat Shrink Sleeves (major repair):
 - a. Filler Mastic: Provide mastic filler to fill tape void as required.
 - b. Full Wrap Coating: Cross-linked polyolefin wrap with a mastic sealant, 85 mils nominal thickness, suitable for pipeline operating temperature, sleeve material recovery as recommended by the manufacturer. Sleeve length shall provide a nominal of 3 inches overlap onto intact pipe coating.
 - c. Manufacturers: Berry-CPG Covalence WaterWrap.
2. Heat-Applied Patches (minor repair):
 - a. Patch: Heat applied adhesive, polyolefin backed, mastic coated tape, 12-inch maximum size. Patch shall provide a minimum 2-inch overlap onto intact pipe coating.
 - b. Manufacturer: Covalence PERP patch.

D. Polyurethane Coating:

1. Polyurethane coating system repair shall be in accordance with the coating manufacturer's recommended procedures.

2. Minor repairs shall be made with single-use kits or other mix ratio controlled packages of slow set polyurethane coating material similar to the existing coating.
3. Major repairs will be completed using the coating material specified for the coating or the lining. Coating shall be reapplied using plural component spray equipment by a manufacturer-certified coating applicator.
4. Pinhole holidays or adhesion test coating repairs shall be with minor repair coating material specified or melt stick repairs, such as Denso Protal 7125 fast cure epoxy.

3.00 EXECUTION

3.01 ENVIRONMENTAL LIMITATIONS

A. General:

1. Products shall comply with federal, state, and local requirements limiting the emission of volatile organic compounds and worker exposure.
2. Comply with applicable federal, state, and local, air pollution and environmental control regulations for surface preparation, blast cleaning, disposition of spent aggregate and debris, and coating application.
3. Do not perform abrasive blast cleaning whenever the relative humidity exceeds 85 percent and whenever surface temperature is less than 5 degrees F above the dew point of the ambient air.
4. Do not apply coatings:
 - a. When surface and ambient temperatures exceed the maximum or minimum temperatures recommended by the coating manufacturer or the Specifications.
 - b. In dust or smoke-laden atmosphere, in blowing dust or debris, in damp or humid weather, or under conditions that could cause icing on the metal surface.
 - c. For epoxy coatings or linings, when it is expected that surface temperatures would drop within 5 degrees F of dew point within 4 hours of coating application.
 - d. For polyurethane coatings, whenever relative humidity exceeds 85 percent.
5. Where weather conditions or Work requirements dictate, Installation Contractor shall provide and operate heaters and/or dehumidification equipment to allow pipe surfaces to be abrasive blasted and coated as specified and in accordance with the manufacturers coating application recommendations.
6. Work activities can be restricted by the Engineer until adequate temperature and humidity controls are in place and functioning within the environmental limits specified.
7. Shop Coating Applicator shall provide a monitoring system, approved by the coating manufacturer, that constantly records pipe and coating conditions during coating application. Recorded parameters shall include pipe temperature, surface preparation, holiday test voltage, and other applicable coating system parameters.

B. Temperature Control:

1. In cold weather, or if moisture collects on the pipe, preheat pipe to between 45 degrees F and 90 degrees F, or 5 degrees F above dew point, whichever is greater.

2. When temperatures are above or below the coating manufacturer's recommended application temperatures, the Installation Contractor shall provide temperature controls as necessary to permit Work to proceed within the manufacturer's temperature limitations.
 3. Provide tenting, insulating blankets, baffles, or bulkheads as required to zone and control heating or cooling effectiveness.
 4. Heating shall be with indirect fired heaters that do not increase humidity levels. Heaters shall be sized for the area to be heated.
- C. Dehumidification and Ventilation:
1. Dehumidification shall be performed in a manner that prevents condensation or icing during surface preparation, coating application, and coating cure.
 2. Re-blast flash-rusted metal surfaces or coatings damaged as a result of equipment malfunction, shutdown, or other events that result in the loss of environmental control at no additional cost to the Owner.
 3. Installation Contractor shall monitor ambient temperature, humidity, dew point temperature, and pipe surface temperature of the work area at the start, midpoint, and end of each work shift at minimum, with no greater than 5 hours between measurements.
 4. Daily environmental condition monitoring and maintenance of the equipment shall be documented in writing and posted near the dehumidification equipment for review by the Engineer.
 5. If the required environmental conditions cannot be maintained throughout the coating process, the Installation Contractor shall provide the following:
 - a. Desiccant dehumidification equipment to maintain environmental conditions 24 hours a day during abrasive blasting and coating application and cure. Liquid, granular, or loose lithium chloride drying systems will not be acceptable.
 - b. Dehumidification equipment sized to maintain dew point temperature 5 degrees F or more below surface temperature of metal surfaces to be cleaned and coated.
 - c. Ventilation within the environmentally controlled areas shall meet the following requirements:
 - 1). Two air exchanges per hour, minimum.
 - 2). Maintenance of personnel exposure limits (PEL) at 50 percent of OSHA PEL limits for all chemicals used in the performance of the Work.
 - 3). Maintenance of lower explosive limits (LEL) to less than 50 percent of the most volatile solvent used in the performance of the Work.
 - d. Dehumidification equipment shall provide ventilation at a minimum of 0.75 air exchanges per hour within all non-accessible work areas for worker protection or as required for maintaining PEL and LEL explosive limits as defined herein, whichever is more stringent.
 - e. Dehumidification equipment type, size, air flow, and power requirements shall be designed by a qualified company knowledgeable in dehumidification equipment,

and its operation, based on Project requirements and anticipated seasonal weather conditions. Design includes evaluation of existing conditions, humidity, temperature, proper air exchange, ventilation, ducting requirements for adequate air flow, and any other issues necessary to achieve the specified performance and environmental conditions throughout the duration of the Project.

- f. Installation Contractor to submit written recommendations from Dehumidification Contractor for enclosure work area size, bulkhead venting, duct work for each bulkhead section, any secondary ventilation requirements for coating cure, dust collection equipment CFM requirements, and drying requirements for blast hose compressed air necessary to maintain environmental control.
- g. At a minimum, work area shall be separated into surface preparation work zones, coating application zones, and coating cure zones.
- h. Dehumidification Contractor shall either operate the equipment or provide training to Installation Contractor on the proper operation and setup of dehumidification equipment. Dehumidification Contractor shall provide a technical representative on site for a minimum of two 8-hour days to insure proper operation of the equipment, achievement of desired environmental control, and to ensure Installation Contractor can properly setup, operate, monitor, and maintain the dehumidification equipment.

3.02 SURFACE PREPARATION

A. General:

- 1. Inspect and provide substrate surfaces prepared in accordance with the Specifications and the printed directions and recommendations of the coating system manufacturer.
- 2. Remove visible oil, grease, dirt, and contamination in accordance with SSPC-SP1.
- 3. Remove surface imperfections, such as metal slivers, burrs, weld splatter, gouges, or delamination in the metal, by filing or grinding prior to abrasive surface preparation.
- 4. Protect prepared surface from humidity, moisture, and rain. Remove all flash rust, imperfections, or contamination on cleaned pipe surface by re-blasting prior to coating application.
- 5. Priming and coating of pipe shall be completed the same day as surface preparation.

B. Weld Surface Preparation:

- 1. Spray applied coating systems do not require weld grinding.

C. Steel Surface Preparation:

- 1. Surface preparation of steel pipe shall be in accordance with SSPC standards and to the degree of cleanliness specified for the coating system or as specified herein, whichever is more stringent.
- 2. Grit and/or shot abrasive mixture and gradation shall be as required to achieve the degree of cleanliness and coating adhesion specified.
- 3. Pipe shall be cleaned of debris and spent abrasive in an air wash separator by abrasive blasting with recyclable steel grit and/or shot or other abrasive.

4. Polyurethane coating system shall have a sharp, angular surface profile of the minimum depth specified.
5. After abrasive blasting and before coating application, the metal surface shall be cleaned of residual dust to a minimum of Grade 2 per ISO Standard 8502-3.
6. Work shall be performed in a manner that does not permit the cleaned metal surface to rust back or flash rust.
7. Rust back or flash rust shall be fully removed. Steel surface cleanliness shall equal the surface cleanliness prior to rust back or flash rusting. Determination of the equivalent surface cleanliness shall be at the Engineer's discretion.

3.03 SHOP-APPLIED COATING SYSTEMS

A. Polyurethane Coating or Lining:

1. Applicator Qualifications:
 - a. Equipment will be certified by the coating manufacturer to meet the requirements for material mixing, temperature control, application rate, and ratio control for multi-part coatings.
 - b. Equipment not meeting the written requirements of the coating manufacturer shall be rejected for coating application until repairs or replacement of the equipment is made to the satisfaction of the Engineer.
 - c. Personnel responsible for the application of the coating system shall have certification of attendance at the coating manufacturer's training class within the last three years. The certified applicator shall be present during all coating application work and shall have responsibility for controlling all aspects of the coating application.
2. Pipe surface temperature shall be between 50 degrees F and 100 degrees F or 5 degrees F above dew point, whichever is greater.
3. Coating application shall be performed in an environmentally controlled shop area that meets or exceeds the written requirements of the coating manufacturer. Application in outdoor conditions will not be acceptable without adequate environmental shelter, environmental controls, and/or dehumidification.
4. Coating adhesion and holidays testing shall be as specified in this Section.
5. Coating manufacturer shall provide a coating application quality assurance manual prior to beginning coating application. Strict conformance to the requirements therein is required. Any deviation from those requirements are grounds for the Engineer to reject the applied coating.
6. Unacceptable Coating Application:
 - a. Coating applied under improper environmental conditions will be rejected.
 - b. Pipes that exceed the allowable quantity of coating defects shall be rejected regardless of size or cause.
 - c. Coating which fails adhesion or holiday testing shall be rejected.

- d. Pipe coating that is subject to off-ratio application, blistering, or is not applied in conformance with the coating manufacturer’s written instructions or recommendations shall be rejected.
- 7. Rejected coating shall be removed from the full length of the pipe to bare metal. Coating shall be reapplied in accordance with the quality assurance manual and the Specifications.
- 8. Perform coating and lining repairs as specified in this Section.

3.04 EXTERIOR COATING HOLDBACK

- A. Dielectric coating holdbacks shall be straight and through the full thickness of the coating.
- B. Dielectric coating holdbacks shall be completed in a manner that permits field coating of joints in accordance with the manufacturer’s recommendations and the Specifications.
- C. Dielectric coating holdbacks shall be as required for pipe joints as listed below. Pipe manufacturer may adjust holdback limits as required for special joint assemblies and with consideration for the joint coating provided and welding requirements:

Holdbacks	
Push-on joint, spigot	1 inch before centerline gasket
Push-on, bell	Flush with bell end
Welded, spigot	3 inches, minimum
Welded, bell	4 inches, minimum

- D. Dielectric Coating Holdback Corrosion Protection:
 - 1. Holding primer for corrosion protection of cutbacks or holdbacks shall be compatible with the specified joint coating system and weld-after-backfill requirements when applicable.
 - 2. Approved holdback primers are:
 - a. Tnemec Omnithane Modified Aromatic Polyurethane Primer: Suitable for all joints, except joints subject to weld-after-backfill.
 - b. Tnemec 90E-92 Ethyl Silicate Inorganic Zinc-Rich Primer: Suitable for all joints, including weld-after-backfill joints.
 - c. International Cathacoat 304V Ethyl Silicate Inorganic Zinc Primer: Suitable for all joints, including weld-after-backfill joints.
 - d. Tape Primers: Not allowed.
 - e. For BWCCP: as recommended by the coating manufacturer.
 - 3. Primer shall not result in running or melting of the coating or cause toxic fumes when heated during weld-after-backfill joints.
 - 4. Application and thickness of holdback primer shall be in accordance with the coating manufacturer’s recommendations, but shall not impair the clearances required for proper joint installation.

5. Primer application on spigot end of field welded pipe shall be held back 1 to 2 inches or as necessary to prevent toxic fumes during field welding.
6. Any corrosion within the holdback areas shall be prepared in accordance with SSPC-SP10 or SSPC-SP11 prior to joint coating application.

3.05 PIPE LINING APPLICATION

A. Shop-applied Cement Mortar Lining:

1. Centrifugally line straight sections of pipe. Lining of special pieces or fittings shall be by mechanical, pneumatic, or hand placement. Provide cement mortar lining of uniform thickness. Finish to a smooth dense surface.
2. Steel plate fittings and specials larger than 16 inches in diameter shall have lining reinforced with 2-inch by 4-inch, No. 13 gage, welded steel wire mesh.
3. Brace and support pipe during lining application to minimize pipe distortion or vibration. Bracing and supports shall not damage the pipe, coating, or lining.
4. Tightly close ends of pipe and fittings with plastic sheet caps. Plastic end caps shall be of sufficient thickness and strength to resist shipping, handling, and storage stresses.
5. Damage to the cement mortar lining, including spalling, cracking, or blistering, caused by improper curing, shipping, handling, or installation shall be repaired in accordance with AWWA specifications and to the satisfaction of the Engineer.
6. Other requirements of cement mortar lining materials and processes: As specified in AWWA C205.

B. Liquid Epoxy Lining:

1. Clean and coat the interior of cement mortar lined pipe at insulating joints or where specified with two coats of epoxy coating.
2. Epoxy coating applied at insulating joints shall be applied to both sides of the insulating joint for a minimum of two pipe diameters on each side of the insulating joint.
3. Mortar lining shall be allowed to cure for 15 days or steam cured for not less than 7 days prior to surface preparation for the mortar and epoxy coating application. Hand applied mortar lining shall be allowed to cure a minimum of 15 days or as required to meet the coating manufacturer's requirements for application on cement or concrete, whichever is greater.
4. Prepare mortar lining by abrasive blasting to remove all laitance and create a suitable anchor profile.
5. Epoxy coating shall be applied in two coats minimum, and with a total coating thickness of 16 mils dry film thickness. Epoxy shall be applied over the cement mortar lining where specified for the pipeline lining material. Coating applied over cement mortar lining shall be applied in a manner that will minimize gassing and pinholes in the completed lining.
6. Mortar lining shall be dry during epoxy lining application.

3.06 FIELD COATING JOINTS

A. General:

1. Prepare joints without a holdback primer by removing all oil and grease contamination from pipe and adjacent coating in accordance with SSPC-SP1.
2. Clean pipe surface and adjacent coating of all corrosion and other foreign contaminants in accordance with SSPC-SP11 or SSPC-SP10. Clean the full circumference of the pipe plus a minimum of 4 inches onto the existing coating. No profile is required with SSPC-SP11 preparation.
3. Prepare joints with a holdback primer by removing all oil and grease in accordance with SSPC-SP1. Follow with spot preparation of visible corrosion or rust in accordance with SSPC-SP11.
4. Remove all loose or damaged pipe coating at joint. Repair the coating or increase the length of the joint coating.
5. Joint bonds shall be installed before application of joint coating. Joint bonds shall be low profile and all gaps and crevices around the bonds shall be filled with mastic.
6. Electrically test the completed joint coating for holidays with high-voltage spark tester at Engineer's direction or if damage to the joint coating occurs.

B. Heat Shrink Sleeve Joint Coating:

1. Store, handle, and install field heat shrink sleeve coatings in accordance with AWWA C216 and the Specifications.
2. Apply coating to field joints using only personnel trained by heat shrinkable sleeve manufacturer.
3. Store sleeves in shipping box until use is required. Keep sleeves dry and sheltered from exposure to direct sunlight. Store sleeves off of the ground or concrete floors and maintain at a temperature between 60 degrees F and 100 degrees F, or as recommended by the manufacturer.
4. Metal surface shall be free of all dirt, dust, and surface corrosion prior to sleeve application. Surface preparation shall be in accordance with the joint coating manufacturer's recommendations.
5. Where corrosion in the holdback area is visible, surfaces shall be prepared in accordance with SSPC-SP10 or SSPC-SP11.
6. Complete joint bonding of pipe joints (where applicable) prior to the application of the joint coating. Joint bonds shall be low profile bonds. All gaps and crevices around the bonds shall be filled with mastic sealant.
7. Preheat pipe uniformly as recommended by the sleeve manufacturer. Monitor pipe temperature using a surface temperature gauge, infrared thermometer, or color changing crayons. Protect preheated pipe from rain, snow, frost, or moisture with tenting or shields. Do not permit the joint to cool.

8. Fill all cracks, crevices, gaps, and step-downs greater than 1/8 inch with filler mastic for the full circumference of the pipe, in accordance with the manufacturer's recommendations.
9. Apply heat shrink sleeve at a minimum temperature of 40 degrees F and while maintaining the pipe temperature above the specified preheat temperature. Apply sleeve in accordance with the manufacturer's instructions and center the sleeve over the joint to provide a minimum 2-inch overlap onto the existing pipe coating. Overlapping ends of the wrap should align evenly.
10. Apply heat to the sleeve using either propane torches, infrared heaters, or wraparound heaters. Hold the flame a minimum of 6 inches from the sleeve surface. Heat from the center of the sleeve to the outer edge until properly seated, then begin in the opposite direction. Periodically roll the coating on the pipe surface.
11. Monitor sleeve for color change or with appropriate temperature gage.
12. Completed joint sleeve shall be fully bonded to the pipe and existing coating surface without voids. Mastic beading shall be visible along the full circumference of the sleeve. There shall be no wrinkling or excessive burns on the sleeves. Sleeves that do not meet these requirements shall be removed and the joint recoated as directed by the Engineer.
13. Completely remove wrinkles, gaps, holes, or burns until acceptable coverage is achieved. Any finished heat shrink sleeves with wrinkles, gaps, holes, or burns will be removed and replaced at no additional cost to the Owner. Minor repairs may be made using heat-applied patch material specified for minor coating repairs.
14. Allow the sleeve to cool to the temperature recommended by the manufacturer before moving, handling, or backfilling. In hot climates, provide shading from direct sunlight. Water quenching will be allowed only when permitted by the sleeve manufacturer.
15. Heat shrink joint coatings which have become wrinkled or dis-bonded because of prolonged exposure to UV light or thermal cycling shall be removed and replaced.
16. Coating application is prohibited when there is water or slurry in bell holes.
17. Double coating of defective or damaged heat shrink coatings will not be permitted. Any double-coated heat shrink sleeves shall be immediately rejected and Installation Contractor shall remove the existing coating and recoat the joint.

3.07 REPAIR OF COATING AND LININGS

A. General:

1. Repair all areas where holidays are detected or coating is visually damaged, such as blisters, tears, rips, bubbles, wrinkles, cuts, or other defects.
2. Maximum defects allowable shall be as specified for the coating system.

B. Polyurethane Coating or Lining Repairs:

1. General:
 - a. Complete coating and lining repairs in accordance with the coating manufacturer's written instructions or the Specifications, whichever is stricter.

- b. Defect Size:
 - 1). Minor Repairs: Repairs that are less than 6 inches in the greatest dimension.
 - 2). Major Repairs: Repairs that exceed 6 inches in the greatest dimension.
 - c. Pipes exceeding the maximum number or size of coating defects shall be stripped of coating, re-blasted, and recoated.
2. Maximum Quantity of Defects Allowed:
- a. Minor coating or lining repairs on any joint of pipe shall not exceed 1.5 square feet per 100 square feet of surface area.
 - 1). Two or more minor repairs within a 6-inch diameter area will be considered a single repair.
 - 2). Repairs for adhesion testing will not be included in the total number of repairs.
 - b. Major repairs shall not exceed two per pipe joint and the combined area shall not be greater than 20 percent of the pipe.
 - c. Pipe arriving in the field with defects or repairs exceeding the maximum number or size of coating defects will be returned to the shop for recoating at no additional cost to the Owner.
3. Minor Repairs:
- a. Surface Preparation: Clean and feather the defect by power tool sanding with 80 grit or coarser sandpaper to roughen the existing coat and feather the edges of the defect for a minimum of 2 inches around the defect.
 - b. Shop Repair Materials:
 - 1). Slow setting parent material polyurethane coating material in syringes or other single-use packaging that controls mix ratio.
 - 2). Coating manufacturer's polyurethane coating repair products subject to Engineer approval.
 - c. Field Repair Materials:
 - 1). Melt stick coating repair (not acceptable for repairs greater than 1 inch diameter); 3M ScotchKote 226Por approved equal.
 - 2). Heat applied coating materials for heat shrink sleeves shall be Covalence PERP Patch, or approved equal.
 - 3). Coating manufacturer's polyurethane coating repair products subject to Engineer approval.
 - d. Apply a single coat of the specified patch coating material at the specified coating thickness.
 - e. Polyurethane or epoxy repair adhesion shall be 50 percent of the specified coating adhesion.
4. Major Repairs:
- a. Surface Preparation:

- a). The metal surface and surrounding coating shall be abrasively blasted in accordance with SSPC-SP10 or to equal in cleanliness and profile as the original surface preparation.
 - b). Existing coating shall be feathered and roughened to the equivalent of 40 grit sandpaper.
 - b. Shop Repair Materials: Same material as the pipeline coating or lining and shall be applied by using plural component spray equipment.
 - c. Field Repair Materials:
 - a). Same material as the pipeline coating or lining and shall be applied by using plural component spray equipment.
 - b). Heat shrink sleeves as specified for pipeline joints.
 - d. One coat of the specified original coating material shall be applied over the repaired surface at the specified thickness.
 - e. Repair adhesion shall be equal to the specified coating adhesion.
- C. Cement Mortar Coating or Overcoat:
1. Cement mortar coating that is cracked or dis-bonded shall be repaired in accordance with AWWA C205, except for mortar overcoat on dielectric coated steel.
 2. Dis-bonded mortar coating shall be removed and patched.
 3. Mortar coating with disbondment greater than 25 percent of the pipe surface shall be rejected and recoated.
 4. Cracks in mortar coating shall be repaired in accordance with AWWA C205.

3.08 INSPECTION AND TESTING

A. General:

1. Coating Applicator shall inspect and test the coating system in accordance with referenced standards and the Specifications, whichever is more stringent.
2. The frequency of the testing shall be determined by the coating applicator, but shall not be less than the requirements of this Section or AWWA C222.
3. Owner or Owner's representative will conduct random independent inspections and tests for the final acceptance or rejection of pipe coating or lining.
4. Installation Contractor to perform holiday testing in the field using equipment provided as specified in Paragraph 2.02. Tests will be completed in the presence of the Owner's representative on each joint of pipe and fitting once the pipe has been lifted to be lowered into the trench. Holidays shall be repaired as specified.

B. Surface Profile Testing

1. Surface profile of abrasive blasted surfaces to be tested with "Press-O-Film" tester tape or equivalent in accordance with NACE RP0287.
2. Tester tape shall be suitable for the intended profile height.

3. Profile shall be measured to a minimum tolerance of 0.1 mils, maximum.
4. Electronic surface profilometers shall be used, as deemed necessary, to verify tester tape measurements.

C. Adhesion Testing:

1. General:

- a. Adhesion testing shall be conducted at the shop prior to shipment. Pipe shipped without adhesion testing will be field-tested. Pipe rejected in the field will be returned to the shop for repair at the sole expense of the Installation Contractor.
- b. A minimum of two pipes shall be tested for adhesion from each lot of pipe coated up to 3,000 square feet of pipe. An additional adhesion test shall be conducted on every increment up to 2,000 square feet of pipe coated in excess of the first 3,000 square feet of pipe (i.e. if one workday of production is 7,000 square feet of pipe, four adhesion tests will be conducted on the pipe lot.). Adhesion testing shall be conducted on not less than 50 percent of each pipe produced within a lot.
- c. A pipe lot is defined as the quantity of pipe that is coated by a single crew within a work shift, but not to exceed 12 hours.
- d. The pipe coating applicator shall repair all coating damage from shop adhesion testing. Installation Contractor shall be responsible for coating repairs for all field adhesion testing.
- e. Adhesion tests shall be performed not less than 24 hours after coating application. Tests conducted prior to 24 hours will be acceptable only if the test meets or exceeds the adhesion criteria specified and the test was requested by the pipe fabricator.
- f. Pipe shall be randomly selected for adhesion testing. The Owner reserves the right to perform adhesion testing at any time or location.

2. Rejection of Coating:

- a. If any pipe within a lot fails to meet the test criteria specified for the coating type, that pipe shall be rejected along with all other pipes within the lot. Each pipe within the rejected pipe lot will then be individually tested and rejected on a pipe-by-pipe basis in conformance with the test procedures and criteria specific for the coating type.
- b. All rejected pipe shall have all coating removed from the full-length pipe and the pipe abrasive blasted and recoated.

3. Polyurethane Adhesion Testing:

- a. Polyurethane coatings or linings shall have an adhesion to steel of 1,750 pounds per square inch, minimum. One pull test will be required. If the test shows adhesive or cohesive failure values less than 1,750 psi, then two additional tests shall be taken within 4 inches of the failing pull test. If the average of the three tests is less than 1,750 psi, or any test is below 1,500 psi, then the adhesion test shall be deemed a failed test and the pipe will be rejected. If the average is above 1,750 psi and no single pull is below 1,500 psi, then the test will be deemed a passing test. If a test fails, then all pipe segments within the lot shall be tested using three adhesion pulls

per pipe segment within 4 inches of each other. If more than 25 percent of the segments within a lot fail, then the entire lot shall be rejected.

- b. Polyurethane coating adhesion to steel substrates shall be tested using pneumatic pull off equipment, such as DeFesko PosiTest, in accordance with ASTM D4541 and AWWA C222, except as modified in this section. All adhesion tests shall be performed at an applied load rate of 100 psi per second, plus or minus 10 psi. Automatic pull rate adhesion test equipment shall be used.
 - (a) Adhesion tests shall be based on the ASTM D4541 standard, 20 mm diameter dollies.
 - (b) The same person, test equipment, and test procedure shall conduct all three tests.
 - (c) All dollies shall be scored to metal substrate using manual methods and tools, normal to the pipe surface, and in a manner that does not stress or over heat the coating.
 - (d) Adhesion testing shall be performed at temperatures between 55 degrees F and 100 degrees F. Tests may be performed at temperatures up to 115 degrees F or as low as 45 degrees F if testing can demonstrate no statistically detectable affect in the test results and subject to Engineer approval.
 - c. Adhesion testing records shall include pipe identification, surface tested (interior or exterior), surface temperature, coating thickness, tensile force applied, mode of failure, and percentage of substrate failure relative of dolly surface. Records of all adhesion tests shall be maintained in an electronic spreadsheet that includes pipe identification, pipe coating date, adhesion test date, surface tested (interior or exterior), surface temperature at time of test, coating thickness, tensile force applied, applied load rate per second, mode of failure, and percentages of failure types present relative to dolly surface area
 - d. Dollies for adhesion testing shall be glued to the coating surface and allowed to cure for a minimum of 12 hours. Because of high cohesive strength, polyurethane coatings shall be scored around the dolly prior to conducting the adhesion test. Failure shall be by adhesive and cohesive failure only. Adhesive failure is defined as separation of the coating from the steel substrate. Cohesive failure is defined as failure within the coating, resulting in coating remaining both on the steel substrate and dolly. Partial substrate and glue failures will be retested if the substrate failure is less than 50 percent relative of the dolly surface area and the applied tension was less than the specified adhesion. Pipes that have partial substrate failures greater than 50 percent and less than the specified adhesion will be rejected as a substrate adhesion failure.
 - e. Glue failures in excess of the minimum required tensile adhesion would be accepted as meeting the specified adhesion requirements.
 - f. Adhesion tests will be conducted on polyurethane pipe coating and lining independently and will be accepted or rejected independently of the other.
4. Repair patches on the polyurethane coating shall be randomly selected for adhesion testing in a manner as described herein and at the discretion of the coating inspector

conducting the adhesion tests. Adhesion of repairs shall be as specified for the type of repair. A minimum of two adhesion tests per week shall be provided for repair patches.

D. Holiday Testing:

1. Conduct holiday tests on completed polyurethane coatings or linings after cure or 24-hours, whichever is less. Testing equipment shall be a high voltage spark test in accordance with NACE SP0274 and the Specifications. In addition, the pipe shall be holiday tested after delivery to the jobsite, approximately one day prior to installation in the trench.
2. Coating thickness used for holiday testing shall be the actual coating thickness.
3. Provide the holiday detector with an audible signal when contact is made between the pipeline and electrode at holidays (defects) in the coating. Provide a good ground and a low electrical resistance between the pipeline and the detector. Make only direct connections to uncoated areas or to the pipe ends at holdback areas.
4. Clean and dry pipe surface when testing. Always keep electrode in motion and in firm contact with the coated surface while test voltage is being applied. Move the electrode evenly over the surface at approximately 0.5 to 1 fps. Do not exceed 1 fps of travel time.
5. Holiday Testing of Heat-Shrink Sleeves:
 - a. Conduct holiday tests on heat-shrink sleeves using a portable holiday detector in accordance with NACE SP0274 and the manufacturer's instructions. Voltage shall be as recommended by the sleeve manufacturer, with the minimum voltage set to within 20 percent of the testing voltage determined by the following equation:
 - 1). Testing Voltage = $1250\sqrt{T}$, where T is the average coating thickness in mils (0.001 inch).
6. Mark location of detected holidays for repair. Retest after repair.

E. Dry Film Thickness Testing:

1. Coatings shall be tested for dry film thickness using a properly calibrated magnetic pull off or eddy current equipment.
2. Coating thickness measurements shall be conducted as necessary and without limitation. Testing conformance to the requirements of SSPC PA-2, Measuring Dry Film Coating Thickness with Magnetic Gages, is specifically excluded from this Section.

3.09 HANDLING, TRANSPORTATION, AND STORAGE

- A. Pipe shall be handled in such a manner as to protect the pipe and coating from damage.
- B. Coated pipe shall not be shipped or installed until coating has developed full adhesion and cure.
- C. During coating application, storage, loading, transportation, unloading, laying, and installation, every precaution shall be taken to protect and prevent damage to pipe, lining, and coating. Forklift equipment shall have all bearing surfaces padded with suitable padding material. Lift pipe with web slings a minimum of 12-inches wide and of a type that will not damage the coating. Metal chains, cable, tongs, forklifts, or other equipment likely to

- damage the coating will not be permitted. Dragging or skidding of pipe on grade or in the trench will not be permitted.
- D. Provide transportation vehicles with padded bolsters between each layer of pipe and heavy padding under load ties. Bolsters shall be curved to fit the outside of the pipe and 12 inches wide, minimum. All pipe contact locations shall be heavily padded with carpet and strips of the outer tape wrap material (adhesive side against the carpet) during shipment to the Site, from the storage yard, and to the point of installation.
 - E. Pipe shall not be stored on rocks, gravel, or other hard materials that might damage the coating. Provide padded 12-inch wide skids and chucks, sand bags, select loamy or sand berms to minimize coating damage. Pipe shall not be laid on asphalt without suitable padding at all contact points.
 - F. Pipe shall be inspected by the Installation Contractor at the Site for damage. Any damage to the pipe, lining, or coating shall be repaired as directed if, in the opinion of the Engineer, a satisfactory repair can be made; otherwise, the damaged section shall be replaced at the sole expense to the Installation Contractor.
 - G. No metal tools or heavy objects shall be permitted to come into contact with the finished coating unnecessarily. Workmen shall not be permitted to walk on the coating except when absolutely necessary and approved by the Engineer. When permitted, shoes with rubber or composition soles and heels, or other suitable footwear that will not damage coating, shall be used.
 - H. Long-term Exposure: Pipe shall either be provided with UV inhibitor for storage longer than one year or above grade exposure; or covered to prevent UV degradation of outer wrap. Amount of UV stabilizers required will depend on the Project location, laying schedule, anticipated length of exposure, and type of outer wrap. Manufacturer shall be consulted for recommended UV inhibitors requirements or pipe shall be stored under a protective cover. Protective covering can be colored plastic sheeting, canvas, or other UV blocking material. Clear plastic sheets are not acceptable. Areas of coating that display UV degradation shall be removed and repaired at no additional cost to the Owner.
 - I. End Caps: Ends of mortar lined pipe and fittings shall be tightly closed with a plastic wrap to aid in curing and to minimize drying out of and contamination of the lining. Plastic end cap shall consist of one 10 mil sheet of polyethylene, minimum, or other suitable material. End caps shall be substantial enough to resist shipment, handling, and storage loads, and shall firmly attached in place. The end cap shall remain intact and in place until pipe installation. Damaged or missing end caps shall be repaired or replaced.

END OF SECTION

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DIVISION 23

HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 00 00 HEATING, VENTILATING, AND AIR CONDITIONING

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Equipment installation requirements common to equipment sections
 - 2. Painting and finishing

1.03 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. PE: Polyethylene plastic.
 - 4. PVC: Polyvinyl chloride plastic.
- E. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.04 QUALITY ASSURANCE

- A. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing; connecting electrical services, circuit breakers, and conduit sizes are appropriately modified; and all is provided at no additional cost. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.06 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

2.00 PRODUCTS**2.01 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

3.00 EXECUTION**3.01 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.02 PAINTING

- A. Painting of mechanical systems, equipment, and components is specified in Division 09.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

END OF SECTION

23 05 13 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.03 DEFINITIONS

- A. Factory-Installed Motor: A motor installed by motorized-equipment manufacturer as a component of equipment.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.05 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices and features that comply with the following:
 - 1. Compatible with the following:
 - a. Magnetic controllers.
 - b. Multispeed controllers.
 - c. Reduced-voltage controllers.
 - 2. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.
 - 3. Matched to torque and horsepower requirements of the load.
 - 4. Matched to ratings and characteristics of supply circuit and required control sequence.
 - 5. Ambient and environmental conditions of installed location.

2.00 PRODUCTS

2.01 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.

- B. Comply with IEEE 841 for severe-duty motors.
- C. Motor requirements apply to factory-installed motors except as follows:
 - 1. Different ratings, performance, or characteristics for a motor are specified in another Section.
 - 2. Manufacturer for a factory-installed motor requires ratings, performance, or characteristics, other than those specified in this Section, to meet performance specified.

2.02 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 105 F (40 C) and at altitude of 3300 feet (1005 m) above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
- C. Enclosure: Unless indicated otherwise, provide the following enclosure type:
 - 1. Open Dripproof (ODP): Ventilation openings are arranged to prevent liquid drops from affecting performance when falling within a 15-degree angle from the vertical. Use: Indoors, in moderately clean environments.

2.03 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium efficient as defined in NEMA MG 1.
- C. Service factor: 1.15.
- D. Stator: Copper windings, unless otherwise indicated.
 - 1. Multispeed motors shall have separate winding for each speed.
- E. Rotor: Random wound squirrel cage.
- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F, unless otherwise indicated.
- I. Code Letter Designation:
 - 1. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

2.04 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

- B. Motors Used with Variable Frequency Controllers: Inverter – duty rated. Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
 - 2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.05 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 HP shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split-phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

3.00 EXECUTION (NOT USED)

END OF SECTION

23 05 53 IDENTIFICATION FOR HVAC EQUIPMENT

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
 - 1. Equipment nameplates.
 - 2. Equipment markers.
 - 3. Equipment signs.

1.03 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.04 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

2.00 PRODUCTS

2.01 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
 - 1. Data:
 - a. Manufacturer, product name, model number, and serial number.
 - b. Capacity, operating and power characteristics, and essential data.
 - c. Labels of tested compliances.
 - 2. Location: Accessible and visible.
 - 3. Fasteners: As required to mount on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
 - 1. Terminology: Match schedules as closely as possible.

2. Data:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
3. Size: 2-1/2 by 4 inches (64 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.
- C. Equipment Signs: ASTM D709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
 1. Data: Instructions for operation of equipment and for safety procedures.
 2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
 3. Thickness: 1/16 inch (1.6 mm) for units up to 20 sq. in. (130 sq. cm) or 8 inches (200 mm) in length, and 1/8 inch (3.2 mm) for larger units.
 4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

3.00 EXECUTION

3.01 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 23 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.02 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible.
- B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
 1. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering 2/3 to 3/4 the size of principal lettering.
 2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
 - a. Meters, gages, thermometers, and similar units.
 - b. Compressors, condensers, and similar motor-driven units.
 - c. Heat exchangers, coils, evaporators, and similar equipment.
 - d. Fans, blowers, primary balancing dampers, and mixing boxes.
 - e. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.
- C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.
 1. Identify mechanical equipment with equipment markers in the following color codes:
 - a. Green: For cooling equipment and components.
 - b. Yellow: For heating equipment and components.
 - c. Green and Yellow: For combination cooling and heating equipment and components.
 - d. Brown: For energy-reclamation equipment and components.
 2. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering 2/3 to 3/4 the size of principal lettering.
 3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

3.03 ADJUSTING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.04 CLEANING

- A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION

23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

1.00 GENERAL

1.01 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:
 - a. Constant-volume air systems.
2. HVAC equipment quantitative-performance settings.
3. Verifying that automatic control devices are functioning properly.
4. Reporting results of activities and procedures specified in this Section.

1.02 SUBMITTALS

- A. Strategies and Procedures Plan: Within 30 days from Contractor's Notice to Proceed, submit four copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.
- B. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.
- C. Warranties specified in this Section.

1.03 QUALITY ASSURANCE

- A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.
- B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," as applicable.

1.04 PROJECT CONDITIONS

- A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.05 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Perform TAB after leakage and pressure tests on air distribution systems have been satisfactorily completed.

1.06 WARRANTY

- A. National Project Performance Guarantee: If AABC, provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:
 - 1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
 - 2. Systems are balanced to optimum performance capabilities within design and installation limits.
- B. Special Guarantee: If NEBB, provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:
 - 1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
 - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

2.00 PRODUCTS (NOT APPLICABLE)

3.00 EXECUTION

3.01 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
 - 1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine Project Record Documents described in Division 01.

- D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
- F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
- G. Examine system and equipment test reports.
- H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- L. Examine equipment for installation and for properly operating safety interlocks and controls.
- M. Examine automatic temperature system components to verify the following:
 - 1. Dampers, valves, and other controlled devices are operated by the intended controller.
 - 2. Dampers and valves are in the position indicated by the controller.
 - 3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
 - 4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
 - 5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
 - 6. Sensors are located to sense only the intended conditions.
 - 7. Sequence of operation for control modes is according to the Contract Documents.

8. Controller set points are set at indicated values.
 9. Interlocked systems are operating.
 10. Changeover from heating to cooling mode occurs according to indicated values.
- N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.02 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
1. Permanent electrical power wiring is complete.
 2. Automatic temperature-control systems are operational.
 3. Equipment and duct access doors are securely closed.
 4. Balance, smoke, and fire dampers are open.
 5. Isolating and balancing valves are open and control valves are operational.
 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.03 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," as applicable, and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.04 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.

- C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling unit components.
- K. Check for proper sealing of air duct system.

3.05 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
 - 3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
 - 4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
 - 5. Obtain approval from Owners Representative for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes at no additional cost.

6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
 - C. Measure terminal outlets and inlets without making adjustments.
 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
 - D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.
 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.06 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 1. Manufacturer, model, and serial numbers.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Efficiency rating.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.

3.07 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

3.08 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Electric-Heating Coils: Measure the following data for each coil:
 - 1. Nameplate data.
 - 2. Airflow.
 - 3. Entering- and leaving-air temperature at full load.
 - 4. Voltage and amperage input of each phase at full load and at each incremental stage.
 - 5. Calculated kilowatt at full load.
 - 6. Fuse or circuit-breaker rating for overload protection.
- B. Refrigerant Coils: Measure the following data for each coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Wet-bulb temperature of entering and leaving air.
 - 3. Airflow.
 - 4. Air pressure drop.
 - 5. Refrigerant suction pressure and temperature.

3.09 PROCEDURES FOR TEMPERATURE MEASUREMENTS

- A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

3.10 TEMPERATURE-CONTROL VERIFICATION

- A. Verify that controllers are calibrated and commissioned.
- B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- C. Record controller settings and note variances between set points and actual measurements.
- D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).
- E. Check free travel and proper operation of control devices such as damper and valve operators.

- F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow measurements. Note the speed of response to input changes.
- G. Check the interaction of electrically operated switch transducers.
- H. Check the interaction of interlock and lockout systems.
- I. Check main control supply-air pressure and observe compressor and dryer operations.
- J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.
- K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.11 TOLERANCES

- A. Set HVAC system airflow flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Minus 5 to plus 10 percent.
 - 2. Air Outlets and Inlets: 0 to minus 10 percent.

3.12 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
 - 1. Include a list of instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to certified field report data, include the following:
 - 1. Fan curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.
- D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
 - 1. Title page.
 - 2. Name and address of TAB firm.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect/Engineer's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.

9. Signature of TAB firm who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer, type size, and fittings.
 14. Notes to explain why certain final data in the body of reports varies from indicated values.
 15. Test conditions for fans performance forms including the following:
 - a. Settings for outside-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- E. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outside, supply, return, and exhaust airflows.
 2. Duct, outlet, and inlet sizes.
 3. Pipe and valve sizes and locations.
 4. Terminal units.
 5. Balancing stations.
 6. Position of balancing devices.

3.13 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION

23 31 13 METAL DUCTS

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg (minus 500- to plus 2500-Pa). Metal ducts include the following:
 - 1. Rectangular ducts and fittings.

1.03 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.
- B. NUSIG: National Uniform Seismic Installation Guidelines.

1.04 SUBMITTALS

- A. Field Quality-Control Test Reports.

1.05 QUALITY ASSURANCE

- A. NFPA Compliance:
 - 1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
 - 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A653/A653M and having G60 (Z180) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.03 SEALANT MATERIALS

- A. Joint and Seam Sealants, General: The term “sealant” is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
- B. Joint and Seam Tape: 2 inches (50 mm) wide; glass-fiber-reinforced fabric.
- C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
- D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.
- E. Solvent-Based Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.

2.04 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
 - 2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
- B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
 - 1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
 - 2. Strap and Rod Sizes: Comply with SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible” for steel sheet width and thickness and for steel rod diameters.
 - 3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes complying with ASTM A36/A36M.
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.

2.05 RECTANGULAR DUCT FABRICATION

- A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
 1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
 2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
 1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Nexus Inc.
 - c. Ward Industries, Inc.
- C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
 1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Lockformer.
 2. Duct Size: Maximum 30 inches (750 mm) wide and up to 2-inch wg (500-Pa) pressure class.
 3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
- D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359 inch (0.9 mm) thick or less, with more than 10 sq. ft. (0.93 sq. m) of nonbraced panel area unless ducts are lined.

3.00 EXECUTION

3.01 DUCT APPLICATIONS

- A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
 1. Exhaust Ducts (Negative Pressure): 2-inch wg (500-Pa).

3.02 DUCT INSTALLATION

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
- B. Install ducts with fewest possible joints.
- C. Install fabricated fittings for changes in directions, size, and shape and for connections.
- D. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches (300 mm), with a minimum of three screws in each coupling.
- E. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- H. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
- I. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- J. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on four sides by at least 1-1/2 inches (38 mm).
- K. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Section 23 33 00 "Air Duct Accessories." Firestopping materials and installation methods are specified in Division 07 Section.
- L. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."
- M. Paint interiors of metal ducts, that do not have duct liner, for 24 inches (600 mm) upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.03 SEAM AND JOINT SEALING

- A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.
- B. Seal ducts before external insulation is applied.

3.04 HANGING AND SUPPORTING

- A. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

- B. Support vertical ducts at maximum intervals of 16 feet (5 m) and at each floor.
- C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- D. Install concrete inserts before placing concrete.
- E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

3.05 CONNECTIONS

- A. Make connections to equipment with flexible connectors according to Section 23 33 00 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.06 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
 - 1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give 7 days' advance notice for testing.
 - 3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (500-Pa) (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg (500- to 2500-Pa).
 - 4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

3.07 CLEANING NEW SYSTEMS

- A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.
- B. Use service openings, as required, for physical and mechanical entry and for inspection.
 - 1. Create other openings to comply with duct standards.
 - 2. Disconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling sections to gain access during the cleaning process.
- C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.

- D. Clean the following metal duct systems by removing surface contaminants and deposits:
1. Air outlets and inlets (registers, grilles, and diffusers).
 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 4. Coils and related components.
 5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
 6. Supply-air ducts, dampers, actuators, and turning vanes.
- E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
 5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
- F. Cleanliness Verification:
1. Visually inspect metal ducts for contaminants.
 2. Where contaminants are discovered, re-clean and reinspect ducts.

END OF SECTION

23 33 00 AIR DUCT ACCESSORIES**1.00 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
1. Backdraft dampers.
 2. Turning vanes.
 3. Flexible connectors.
 4. Duct accessory hardware.

1.03 QUALITY ASSURANCE

- A. NFPA Compliance: Comply with the following NFPA standards:
1. NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."
 2. NFPA 90B, "Standard for the Installation of Warm Air Heating and Air-Conditioning Systems."

1.04 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

2.00 PRODUCTS**2.01 SHEET METAL MATERIALS**

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A653/A653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.02 BACKDRAFT DAMPERS

- A. Description: Suitable for horizontal or vertical installations.

- B. Frame: 0.052-inch (1.3-mm) thick, galvanized, sheet steel, with welded corners and mounting flange.
- C. Frame: 0.090-inch (2.3-mm) thick extruded aluminum, with mounting flange.
- D. Blades: 0.050-inch (1.2-mm) thick extended aluminum sheet.
- E. Blade Seals: Vinyl.
- F. Blade Axles: Nonferrous (for aluminum dampers).
- G. Blade Axles: Galvanized steel (for steel dampers).
- H. Tie Bars and Brackets: Aluminum (for aluminum dampers).
- I. Tie Bars and Brackets: Galvanized steel (for steel dampers).
- J. Return Spring: Adjustable tension.

2.03 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch (38-mm) wide, curved blades set 3/4 inch (19 mm) o.c.; support with bars perpendicular to blades set 2 inches (50 mm) o.c.; and set into side strips suitable for mounting in ducts.
- C. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.04 FLEXIBLE CONNECTORS

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch (70-mm) wide, 0.028-inch (0.7-mm) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.
- C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch (70-mm) wide, 0.028-inch (0.7-mm) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.
- D. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 4-3/8-inch (111-mm) wide, 0.028-inch (0.7-mm) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.
- E. Conventional, Indoor System (minus 10 to plus 250 F) Flexible Connector Fabric: Glass fabric double coated with polychloroprene.
 - 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
 - 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.

- F. Conventional, Outdoor System (minus 10 to plus 250 F) Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.
 - 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
 - 2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp, and 440 lbf/inch (77 N/mm) in the filling.
- G. High-Temperature System (minus 25 to plus 500 F) Flexible Connectors: Glass fabric coated with silicone rubber and having a minimum weight of 16 oz./sq. yd. (542 g/sq. m) and tensile strength of 285 lbf/inch (50 N/mm) in the warp, and 185 lbf/inch (32 N/mm) in the filling.
- H. High-Corrosive-Environment System (minus 20 to plus 500 F) Flexible Connectors: Glass fabric coated with a chemical-resistant coating.
 - 1. Minimum Weight: 14 oz./sq. yd. (474 g/sq. m).
 - 2. Tensile Strength: 450 lbf/inch (79 N/mm) in the warp, and 340 lbf/inch (60 N/mm) in the filling.

2.05 ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.
- B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.
- C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.
- D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

3.00 EXECUTION

3.01 INSTALLATION

- A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

3.02 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Adjust duct accessories for proper settings.
2. Inspect turning vanes for proper and secure installation.

END OF SECTION

23 34 23 HVAC POWER VENTILATORS

1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Centrifugal roof ventilators.

1.03 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base air ratings on actual site elevations.
- B. Operating Limits: Classify according to AMCA 99.

1.04 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material gages and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
 - 2. Roof framing and support members relative to duct penetrations.

1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- D. UL Standard: Power ventilators shall comply with UL 705.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

1.07 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Sections.
- C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 08 Sections.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Centrifugal Roof Ventilators:
 - a. Broan Mfg. Co., Inc.
 - b. Carnes Company HVAC.
 - c. Cook, Loren Company.
 - d. Greenheck Fan Corp.

2.02 CENTRIFUGAL ROOF VENTILATORS

- A. Description Direct-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent.
 - 2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
 - 3. Bird Screens: Removable, 1/2-inch (13-mm) mesh, aluminum.

4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
- E. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch (40-mm) thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to suit roof opening and fan base.
 1. Configuration: Built-in cant and mounting flange.
 2. Overall Height: 18 inches (450 mm).
 3. Metal Liner: Galvanized steel.
 4. Hinged Subbase: Galvanized steel hinged arrangement permitting service and maintenance.
 5. Mounting Pedestal: Galvanized steel with removable access panel.
 6. Vented Curb: Unlined with louvered vents in vertical sides.

2.03 MOTORS

- A. Refer to Division 23 Section "Common Motor Requirements for HVAC Equipment" for general requirements for factory-installed motors.
- B. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.
- C. Enclosure Type: TENV.

2.04 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

3.00 EXECUTION

3.01 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Sections.
- C. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Sections.
- D. Install units with clearances for service and maintenance.
- E. Label units according to requirements specified in Section 23 05 53 "Identification for HVAC Equipment."

3.02 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 23 33 00 "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment.
- D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

- A. Equipment Startup Checks:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 - 5. Verify lubrication for bearings and other moving parts.
 - 6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 - 7. Disable automatic temperature-control operators.
- B. Starting Procedures:
 - 1. Energize motor and adjust fan to indicated rpm.
 - 2. Measure and record motor voltage and amperage.
- C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Shut unit down and reconnect automatic temperature-control operators.
- F. Refer to Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- G. Replace fan and motor pulleys as required to achieve design airflow.

- H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.04 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Lubricate bearings.

3.05 CLEANING

- A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.
- B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

END OF SECTION

23 81 13 WALL MOUNT AIR-CONDITIONERS

1.00 GENERAL

1.01 SUMMARY

- A. This Section includes wall mount air conditioners and their accessories and controls, in the following configurations:
 - 1. Vertical Wall Mount

1.02 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Show installation details for wall penetrations.
 - 1. Wiring Diagrams: Power, signal, and control wiring.

1.03 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of packaged terminal air conditioners and are based on the specific system indicated.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Seasonal Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

1.04 COORDINATION

- A. Coordinate layout and installation of packaged terminal air conditioners and wall construction with other construction that penetrates walls or is supported by them.

1.05 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged terminal air conditioners that fail in materials or workmanship within specified warranty period.
- B. Warranty Period for Sealed Refrigeration System: Manufacturer's standard, but not less one year from date of Substantial Completion, including components and labor.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bard Manufacturing Co.
 2. Carrier Corp.
 3. Marvair.
 4. Trane Company (The); North American Commercial Group.
 5. Specific Systems.

2.02 MANUFACTURED UNITS

- A. Description: Factory-assembled and tested, self-contained, wall mount air conditioner with electric refrigeration system and temperature controls; fully charged with refrigerant and filled with oil.
1. Power Supply: hard-wired chassis for 460/3 phase units.
- B. Cabinet: 0.052-inch (1.32-mm) thick, galvanized steel with removable front panel with concealed latches.
1. Mounting: Exterior wall.
 2. Finish: Baked enamel.
 3. Grilles: Extruded-aluminum supply and return grilles.
 4. Wall Sleeves: Galvanized steel with polyester finish.
- C. Refrigeration System: Direct-expansion indoor coil with capillary restrictor, hermetically sealed scroll compressor with internal spring isolation, external isolation, permanent-split-capacitor motor, and overload protection. Include the following:
1. Outdoor coil and fan.
- D. Indoor Fan: Forward curved, centrifugal, with permanent-split-capacitor motor and positive-pressure ventilation damper with electric operator.
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 2. Noise Rating: Quiet.
 3. Electrical devices and connections are specified in Division 26 Sections.
- E. Filters: MERV 8 filters.
- F. Condensate Drain: Drain pan and piping to direct condensate as shown on plans.
- G. Outdoor Fan: Forward curved, centrifugal type driven by indoor fan motor.
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2. Noise Rating: Quiet.
3. Electrical devices and connections are specified in Division 26 Sections.

2.03 CONTROLS

- A. Thermostat: Wall-mounted adjustable, programmable temperature controller. One stage cool fan switch.

2.04 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Factory test to comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."
- B. Unit Performance Ratings: Factory test to comply with ARI 310/380, "Packaged Terminal Air-Conditioners and Heat Pumps."

3.00 EXECUTION

3.01 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.
- B. Install wall sleeves in finished wall assembly; seal and weatherproof.
- C. Install wall sleeves to withstand, without damage to equipment and structure, seismic forces required by building code.

3.02 CONNECTIONS

- A. Electrical System Connections: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.
- B. Ground equipment according to Division 26.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 2. After installing packaged terminal air conditioners and after electrical circuitry has been energized, test for compliance with requirements.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove malfunctioning units, replace with new units, and retest as specified above.
- 3.04 STARTUP SERVICE
- A. Engage a factory-authorized service representative to perform startup service.
- B. After installation, verify the following:
1. Unit is level on base and is flashed in exterior wall.
 2. Unit casing has no visible damage.
 3. Compressor, air-cooled condenser coil, and fans have no visible damage.
 4. Labels are clearly visible.
 5. Controls are connected and operable.
 6. Shipping bolts, blocks, and tie-down straps are removed.
 7. Filters are installed and clean.
 8. Drain pan and drain line are installed correctly.
- C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections.
- D. Complete installation and startup checks according to manufacturer's written instructions, including the following:
1. Lubricate bearings on fan.
 2. Check fan-wheel rotation for correct direction without vibration and binding.
- E. After startup service and performance test, change filters.
- 3.05 ADJUSTING
- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- 3.06 DEMONSTRATION
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged terminal air conditioners.

END OF SECTION

DIVISION 26

ELECTRICAL

26 01 26 TESTING OF ELECTRICAL SYSTEMS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, material, equipment and incidentals of an independent testing agency. Testing shall be inclusive of all low voltage equipment including conductors for the project sites. Testing shall include all relay protective schemes and operation of the low voltage equipment.

1.02 QUALITY ASSURANCE

- A. Testing agency shall follow all tests and recommendations in NETA Acceptance Testing Specification for all equipment provided.
- B. Acceptable Testing Agencies:
1. National Field Services
 2. Real Power Technologies
 3. Shermco Industries
 4. Approved Equal.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures" and shall include:
1. ELECTRICAL QUALIFICATIONS & LIST OF TEST SUBMITTAL
 - a. 60 days prior to any testing taking place, Contractor shall submit to the Owner/Engineer the name of the testing agency; a list of all tests to be conducted shall also be submitted at this same time. No testing shall take place until this has been submitted and approved by the Engineer.
 2. ELECTRICAL TESTING PLAN
 - a. A minimum of two (2) weeks before testing is to take place, Contractor shall submit a detailed testing plan of the different configurations to be tested for the Owner's and Engineer's approval.
 3. ELECTRICAL TESTING REPORT
 - a. A written report shall be submitted by the testing agency performing installation checks, operation and testing of low voltage equipment. This report shall certify that
 - 1). The equipment has been properly installed,
 - 2). Is in accurate alignment, and
 - 3). Meets the acceptance testing specifications of NETA and the equipment manufacturer.

- 4). Provide a detailed list of all tests that were performed and the test results as part of the Electrical Testing Report.
- 5). Test Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- 6). Provide a detailed list of numeric megger results for low voltage cables. List should include circuit tag as shown on the contract documents, voltage, phase and cycle identification, phase-to-phase result for each combination of phases, phase-to-neutral result for each combination of phase and phase-to-ground result for each combination of phases. List should also include person's witnessing and performing tests.
- 7). Infrared test results shall include the following for each item tested:
 - a). A description of the equipment tested
 - b). The load (in amps) and operating conditions at which the equipment was running and other testing conditions that may affect the IR results
 - c). A thermal image alongside a standard photograph. With annotation on the standard photograph indicating where problems are detected.
 - d). A description of any problems detected
 - e). Information on the camera listing model number, processor type, date of last calibration, resolution, etc.
- b. Electrical Testing Report shall be submitted to the ENGINEER for approval at least four weeks before start-up and training and no later than four weeks after testing has been conducted. The Contractor shall not be allowed to wait for the final test to be performed to submit a single testing report. Individual test reports may be submitted to maintain the maximum of four weeks after test has been performed.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 1. American National Standards Institute (ANSI)
 2. American Standards for Testing and Materials (ASTM)
 3. Institute of Electrical and Electronic Engineers (IEEE)
 4. National Electrical Manufacturers Association (NEMA)
 5. International Electrical Testing Association (NETA)

1.05 RELATED SPECIFICATIONS

- A. All testing referenced in the following Specifications shall be submitted under this section:
 1. 26 05 19, "Low Voltage Electrical Conductors & Cables"
 2. 26 05 26, "Grounding & Bonding for Electrical Systems"
 3. 26 24 16.02, "Lighting and Branch Panelboards"

4. 26 28 16, "Enclosed Switches and Circuit Breakers"

2.00 PRODUCTS [NOT USED]**3.00 EXECUTION****3.01 GENERAL**

- A. Perform all testing identified in the latest edition of NETA Standard for Accepting Testing Specifications.
- B. All testing shall be witnessed by the Owner's Representative. Types of equipment required to be tested by these specifications shall include but not be limited to the following:
 - 1. The following tests shall be conducted by the Contractor:
 - a. Cables
 - 1). Low Voltage Cables.
 - a). Insulation - resistance test
 - b). Perform resistance measurements through all connections with a low resistance ohmmeter.
 - c). Perform Continuity test to ensure correct cable connection. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
 - d). Perform each visual and mechanical inspection and electrical tests stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - e). Perform all tests as specified in NETA Acceptance Testing Specifications.
 - f). Perform a thermographic survey of all connections under load conditions.
 - (1). Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No.3 AWG and larger. Remove box and equipment covers so terminations are accessible to portable scanner.
 - (a). Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each termination 11 months after date of Substantial Completion.
 - (b). Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - (c). Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
 - g). Remove and replace malfunctioning units and retest as specified above.

- b. Grounding.
- 1). Use Biddle Direct Reading Earth Resistance Tester or equivalent to measure resistance to ground of the system. Perform testing in accordance with the test instrument manufacturer's recommendation using the fall of potential method.
 - 2). All test equipment provided under this section shall be approved by the ENGINEER.
 - 3). Resistance to ground testing shall be performed during dry season. Submit test results in the form of a graph showing the number of points measured (12 minimum) and the numerical resistance to ground.
 - 4). Testing shall be performed before energizing the distribution system.
 - 5). A separate test shall be conducted for each building or system.
 - 6). Notify the ENGINEER immediately if the resistance to ground for any building or system is greater than five ohms. Provide additional ground rods and conductors as required to bring the resistance to five ohms.
 - 7). Submit reports of all tests to the Owner/Engineer.
- c. Transformers – Small Dry Type:
- 1). Perform inspections and tests per NETA ATS 7.2.1.1.
 - 2). Perform all tests as specified in Section 26 22 13 "Low Voltage Distribution Transformers".
 - 3). Perform the following additional tests:
 - a). Record phase-to-phase, phase-to-neutral, and neutral-to-ground voltages at no load after energizing, and at operating load after startup.
 - 4). Adjust tap connections as required to provide secondary voltage within 2-1/2 percent of nominal under normal load after approval of Owner's Representative.
 - 5). Record as-left tap connections
- d. Low Voltage Power Circuit Breakers:
- 1). Perform inspections and tests per NETA ATS 7.6.1.2.
 - a). Tests shall include primary current injection testing of all breakers at final settings.
 - b). Where short-time or instantaneous settings on large frame breakers are beyond the current capability of field testing, primary injection tests at reduced currents shall be permitted if combined with secondary injection calibration test of trip unit at final settings.
 - 2). Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
 - 3). Perform the following additional tests:
 - a). Shunt trip devices minimum tripping voltage.

- 4). Record as-left settings.
- e. Low Voltage Molded Case Circuit Breakers:
 - 1). Perform inspections and tests per NETA ATS 7.6.1.1.
 - 2). Components:
 - a). Test all components per applicable paragraphs of this Specification Section and NETA ATS.
 - b). Thermal magnetic breakers: Visual and mechanical inspection per NETA ATS only.
 - c). Solid state trip type: Visual and mechanical inspection and electrical tests per NETA ATS.
 - 3). Record as-left settings.
- f. Lighting and Branch Panelboards:
 - 1). Perform all tests as specified in Section 26 24 16.02 "Lighting and Branch Panelboards".
- g. Safety Switches/Disconnects:
 - 1). Perform all tests as specified in Section 26 28 16 "Enclosed Switches and Circuit Breakers".
 - 2). Perform inspections and tests per NETA ATS 7.5.1.1.
- h. System Functional Test
 - 1). Perform test upon completion and equipment acceptance tests.
 - 2). The test is to prove the correct interaction of all sensing, processing and action devices.
 - 3). Develop a test plan and parameters for the purpose of evaluating the performance of the system.
 - 4). Perform the following tests:
 - a). Verify the correct operation of all interlock safety devices for fail-safe functions in addition to design function.
 - b). Verify the correct operation of all sensing devices, alarm and indicating devices.
- C. All testing shall be in accordance with the manufacturer's recommendations for energization and start-up of the equipment.
- D. Testing shall include a complete functionality testing of electrical equipment under all the different operating parameters identified by the OWNER and ENGINEER.

END OF SECTION

26 05 00 COMMON WORK RESULTS FOR ELECTRICAL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary for complete and operational electrical systems, as specified herein.
- B. This Section, as well as Division 1, concerns all other Sections in Division 26, and shall be considered a part of each of those Sections as if written in their entirety.

1.02 QUALITY ASSURANCE

A. ELECTRICAL CONTRACTORS' QUALIFICATIONS

- 1. Use adequate numbers of skilled workmen, trained and experienced in their crafts, and who are familiar with the specifications and methods of performing the work in this Division. A licensed Journeyman shall be on site at all times when electrical work is being performed. Electrical work shall be performed under the direct supervision of a Master Electrician who holds a valid license in the State of Texas. The CONTRACTOR shall provide a monthly report to the OWNER/ENGINEER for review stating that the Master Electrician has been to the job site and thoroughly reviewed the work. **THE REPORT SHALL BE SIGNED BY THE MASTER ELECTRICIAN AND INCLUDE THE DATE AND TIME THE MASTER ELECTRICIAN WAS ON SITE. THE REPORT SHALL BE INCLUDED IN THE PAY APPLICATION. NO PAYMENT WILL BE GRANTED WITHOUT REPORT.**

B. WORKMANSHIP

- 1. Work shall be performed in accordance with quality, commercial practices. The appearance of finished work shall be of equal importance with its operation. Materials and equipment shall be installed based upon the actual dimensions and conditions at the project site. Locations for materials or equipment requiring an exact fit shall be field measured. Conduit, transformers, and motors shall be isolated to avoid unacceptable noise levels from objectionable vibrations from all systems.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures", and shall include:
 - 1. Component catalog number and manufacturing data sheet, indicating pertinent data and clearly marked identifying each component by the item number and nomenclature as specified.
 - 2. Submit copy of Master Electrician's license and each Journeyman's license that will be working on the project. Workers must be licensed to work in the City where the project is located.
 - 3. Component drawings showing dimensions, mounting, and external connection details.

4. Complete interconnection and point to point wiring diagrams in AutoCAD format for all field control and instrumentation wiring between instruments, electrical equipment, starters, etc. A hard copy shall be submitted to the ENGINEER for approval prior to the final AutoCAD files being submitted. Interconnection/wiring diagrams shall include cable numbers, wire tags, actual equipment terminal strip numbers at both ends of the cable, etc.
 5. Operation and maintenance manuals shall contain the approved shop drawings, submittals, spare part lists, schematics, final wiring diagrams with any changes made during start-up and maintenance procedures.
 6. Unless other additional information is required by the detailed equipment specifications, the following information shall be included for motors:
 - a. Motor identification number and nomenclature as specified
 - b. Make and motor type
 - c. Brake horsepower of the motor
 - d. Locked rotor current at full load
 - e. Motor efficiency at full load (3-phase motors only)
 - f. Starting torque
 - g. Method of insulating and impregnating motor coils (3-phase only)
 - h. Speed of the motor at full torque
 - i. Full load current
 - j. Service factor
 - k. Motor temperature rise measured by resistance over 40 degrees C ambient
- B. The CONTRACTOR shall provide a monthly report to the OWNER/ENGINEER for review stating that the Master Electrician has been to the job site and thoroughly reviewed the work. The report shall be signed by the Master Electrician and include the date and time the Master Electrician was on site.**
- C. The CONTRACTOR shall submit a copy of the Master Electrician's license and Journeyman's license who will be working on the project. This information shall be submitted as a formal submittal prior to beginning any work.
- D. The CONTRACTOR shall:
1. Prepare, and keep up-to-date, the Record Drawings and detailed construction drawings which shall be available at each monthly pay application.
 2. Record the exact locations of each of these differences, sizes and details of the Construction Work as executed, with cross-references to and other requirements on the Record Drawings.
 - a. Record Drawings shall include the location of all pull boxes, junction boxes, concrete pull boxes, manholes and hand holes that were provided under this contract and those existing boxes that were modified under this project (by either the addition or removal of cable/conduits).

- 1). The Contractor shall also include on the drawings a label next to each pull box, junction box, concrete pull box, manhole and handhole to reflect the nameplate label installed (existing or new) at each device.
 - 2). Refer to Section 26 05 53, "Identification for Electrical Systems" for labeling requirements for pull boxes, junction boxes, concrete pull boxes, manholes and hand holes.
 3. Keep the Record Drawings on the Work Site;
 4. Upon completion of the Work, or at such other time as may be determined by the ENGINEER, submit the Record Drawings and copies to the OWNER's Representative in accordance with the OWNER's Requirements.
 5. Underground Interference drawing showing all underground duct banks, ground rods, ground conductors, pipes, piers, vaults, manholes, pull boxes, etc. that clearly identifies the location and routing of these systems. All interferences shall be brought to the ENGINEER's attention. Provide as a minimum the duct bank dimensions, burial depth and coordinates of terminations and those of any changes of direction. The GPS coordinates of the duct bank shall be measured (width, depth, and burial depths) prior to back filling.
 6. Provide revised final shop drawings in AutoCAD format noting any changes made to equipment during start-up.
 7. Submit master electricians report with each pay application as specified in paragraph 1.02.A. of this specification.
- E. The CONTRACTOR shall provide a wall mounted copy of the complete one-line diagram in the electrical room. The wall mounted one-line shall be as follows:
1. The one-line shall reflect all changes made including but not limited to changes made during construction.
 2. The copy shall be framed in a picture frame with plexiglass. The copy of the sheet shall lay flat against the plexiglass without any wrinkles and other material necessary for the copy to lay flat shall be provided within the picture frame.
 3. Each page of the one-line shall be framed in a separate picture frame with plexiglass. The copy of the sheet shall lay flat against the glass without any wrinkles and other material necessary for the copy to lay flat shall be provided within the picture frame.

1.04 STANDARDS

- A. Electrical work shall be executed in accordance with local, State and national codes, ordinances and regulations which have jurisdiction or authority over the work. If the standards and codes conflict with each other, the most stringent shall apply. The applicable provisions of the following standard shall apply as if written here in their entirety:
1. National Electrical Manufacturer Association (NEMA)
 2. American Society for Testing and Materials (ASTM)
 3. National Fire Protection Association (NFPA)
 4. National Electrical Safety Code (NEC)

5. Institute of Electrical and Electronic Engineers (IEEE)
 6. National Electrical Code (NEC)
 7. Underwriters' Laboratories (UL)
 8. American National Standards Institute (ANSI)
 9. Uniform Building Code (UBC)
 10. Occupational Safety and Health Administration (OSHA)
 11. Local utility companies
 12. Local Electrical Ordinance
 13. Rural Electrification Association (REA)
 14. Insulated Power Cable Engineers Association (IPCEA)
 15. International Electrical Testing Association (NETA)
 16. National Electrical Contractors Association (NECA)
 17. Association Edison Illuminating Companies (AEIC)
- B. Electrical work shall be performed under the direct supervision of a Master Electrician who holds a valid license in the State of Texas.

1.05 DELIVERY AND STORAGE

- A. Follow the Manufacturer's directions for the delivery, storage and handling of equipment and materials. Tightly cover equipment and materials and protect it from dirt, water, chemical or mechanical injury and theft. Major electrical equipment shall be stored indoors in a climate controlled atmosphere and space heaters energized where applicable. Stored equipment shall be properly protected from rodents such as mice and rats.
- B. Equipment that will be stored indoors for an extended period of time and that do not have space heaters shall have a 100 watt incandescent light placed in it and energized to eliminate the build-up of condensation in the equipment. Coordinate with equipment manufacturer for additional storage requirements. Damaged equipment shall not be acceptable. Upon installation, protect the materials until the work is completed and accepted by the OWNER. Improperly stored equipment is subject to rejection by the Owner/Engineer and will not be allowed to be installed.

1.06 JOB CONDITIONS

- A. Permits, licenses, inspections and testing shall be secured and paid for as required by law by the CONTRACTOR for the completion of the work. Certificates of approval shall be secured, paid for, and delivered to the OWNER before receiving the final acceptance of the work.
- B. The location of materials, equipment, devices and appliances indicated are approximate and subject to revisions at the time the work is installed. Final location shall be as proposed by the CONTRACTOR and approved by the ENGINEER.

- C. Should project conditions require any rearrangement of work, or if equipment or accessories can be installed to a better advantage than the general arrangement of work on the plans, the CONTRACTOR shall before proceeding with the work prepare and submit plans of the proposed rearrangement for the ENGINEER's review and approval.
- D. Motor Horsepower ratings identified are anticipated ratings. If the actual equipment is a different size, the CONTRACTOR shall provide the appropriate wiring, conduit, over current protection, starters and accessories for a complete and working system at no cost to the OWNER.
- E. Enclosures for equipment in the air conditioned rooms shall be NEMA 1, 14 gauge steel and NEMA 4X, 304 Stainless Steel for all other locations unless noted otherwise. All enclosures shall have a quick release luggage type clasp or single handle operated, 3-point latching system.
- F. All enclosures for equipment unless specified otherwise shall be NEMA 4X, 304 stainless steel for exterior applications. All enclosures shall have a quick release luggage type clasp.
- G. No equipment is to be energized until the Power System Studies have been COMPLETED by the Engineer, the protective relays and breakers have been set per the Short Circuit and Relay Coordination Study and the arc flash labels have been installed on the equipment. No exceptions.

2.00 EXECUTION

2.01 INSTALLATION

- A. Maintain the waterproof integrity of conduit penetrations through the roof, exterior walls and floors. Roof penetrations shall not be located above any electrical equipment.
- B. Install stainless steel sleeves for each conduit passing through floors. Extend sleeves 1-1/2" above the floor slab and grout watertight. The sleeve sizes shall permit the subsequent insertion of a properly sized conduit or raceway.
- C. Submit location drawings and obtain ENGINEER approval prior to installing conduit penetrations through slabs, beams, ceiling and walls. The Contractor shall not core drill through existing beams. After the conduits are installed fill the annular space between the conduits with mastic. The complete installation shall be watertight and the fire rating of penetrations through walls, floors and ceilings shall be maintained.
- D. Install steel reinforced concrete foundations below floor mounted switchboards, panelboards, motor control centers, soft starters, adjustable frequency drives, transformers, and other floor mounted electrical equipment. Concrete foundations shall be not be less than 4" high or as indicated on plans. Neatly chamfer top edges. Concrete foundations shall be 6" wider and 6" longer than the base of the equipment being installed or as indicated on plans. Concrete shall be in accordance with Division 03, and shall be reinforced with a minimum of 6" x 6" #6 welded wire mesh or as indicated on plans.
- E. Route all conduits parallel to building lines, columns, or steel route conduits near to columns and roof beams. Conduits shall maintain a minimum of 3" away from adjacent work (duct work, insulations, etc.)

2.02 CUTTING AND PATCHING

- A. Provide adequate support during cutting operations to prevent any damage to the affected masonry. Where openings are cut through masonry walls, provide lintels or structural supports to protect the remaining masonry. The cutting of structural members shall not be permitted without the specific written approval of the ENGINEER.

2.03 PAINTING

- A. Maintain the original factory finish on material and equipment installed, unless specifically indicated on the plans or specifications. If the finish is marred in transit or during installation, re-finish to a neat, workmanlike appearance equal to the original factory finish. Leave equipment and raceway systems clean and free of grease, dirt, rust, and in a suitable condition for painting.

2.04 EXCAVATION, TRENCHING, BACKFILLING AND GRADING

- A. Prior to any excavation or trenching, notify the OWNER's representative, utility companies and OWNER's facilities department. Allow sufficient time for utilities to be located prior to excavation to avoid disruption of services. Provide a minimum of 72 hours written notice to the OWNER prior to trenching or excavation. Do not proceed with trenching or excavation until authorized by the OWNER. Utilities or services which are damaged, which are identified prior to excavation or trenching, or where confirmation by utility companies has not been obtained verifying that utilities are marked, shall be repaired to operable condition immediately, at no cost to the OWNER.
- B. Barricade open trenches and excavations for the entire duration of the project. Barricades for excavations shall have warning lights maintained during hours of darkness. Trenches shall be marked with warning tape, or access to trenches shall be prohibited with readily identifiable sawhorses, warning tape or other acceptable means. Barriers shall be illuminated or recognizable during hours of darkness. Barriers and tape shall be properly maintained at all times.
- C. Protect all adjacent work, structures and properties. Damage to adjacent work, structures or properties shall be repaired, or the cost of repair reimbursed in full.
- D. All construction areas shall be finally graded as indicated on the contract documents, or to the conditions of the site prior to construction. Grading shall bring the site back to the existing conditions as close as practical. Turfed areas shall be sodded, or hydro-mulched with matching turf. Landscaping shall be replaced with identical shrubbery, ground cover, or plants as existed. The CONTRACTOR shall be responsible for maintaining water on new turf and landscaping until established. If new turf and landscaping is impractical due to weather conditions, CONTRACTOR shall provide satisfactory arrangements to have turf and landscaping furnished and installed at the earliest opportunity thereafter. Provide a 90-day warranty on new turf and landscaping.
- E. Determine if irrigation systems exist prior to trenching and excavation. Obtain record or as-built drawings and locate control wiring and pressure main branches and devices. Determine by actual operation that systems are functional and repair or replace damaged systems to their original condition prior to beginning construction.

2.05 LOCKING OF ELECTRICAL FACILITIES

- A. Install locks immediately upon the installation of the electrical facility. Provide padlocks for exterior electrical facilities subject to unauthorized entry. Furnish the OWNER with two (2) keys per lock up to a quantity of 10 keys. Furnish locks to match the OWNER's locking system. Locks shall also be provided where required to obtain an electrical Certificate of Occupancy.

2.06 CLEAN AND ADJUST

- A. Remove shipping labels, dirt, paint, grease, and stains from equipment. Remove debris as it accumulates. Upon completion of work, clean electrical equipment and the entire electrical installation so that it is suitable for the OWNER's use.

END OF SECTION

26 05 19 LOW VOLTAGE ELECTRICAL CONDUCTORS & CABLES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install and test 600 volt wires and cables. Electrical work shall be in accordance with Section 26 05 00, "Common Work Results for Electrical".
- B. Work shall include building wire, cable, wiring connections and terminations, and modular wiring systems.

1.02 QUALITY ASSURANCE: TESTING

- A. Megger test circuits for continuity and ground. Verify phasing at connection points. Torque test conductor connections and terminations to the Manufacturer's recommended values. Megger tests shall be performed by a testing company with a minimum of 10 years' experience. All low voltage cables shall be verified by use of telephone communications.

1.03 SUBMITTAL PROCEDURES

- A. Submittal Procedures shall be in accordance with Section 01 33 00, "Submittal Procedures" and shall include:
 1. Shop Drawings: For each type of product.
 2. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
 3. Source quality-control reports.
 4. Field quality-control reports.

1.04 FIELD QUALITY-CONTROL REPORTSSTANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:

ICEA S-19-81/NEMA WC-3	Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
ICEA S-61-402/NEMA WC-5	Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NFPA 70	National Electrical Code
ANSI/TIA/EIA 606A	Standard for Telecommunications Infrastructure
UL 83	Thermoplastic Insulated Wires and Cables
UL 1063	Machine Tool Wires and Cables
ASTM B3	Soft or Annealed Copper Wires
ASTM B8	Concentric-Lay-Stranded Copper Conductors, Hard, MediumHard, Soft

1.05 DELIVERY AND STORAGE

- A. Deliver cable and wire to the project site in the original packages. Conductors with damaged insulation or exposed nylon jacketing shall not be permitted.
- B. Where cut lengths are specified, mark reel footage accordingly. Each reel shall contain one continuous length of cable.
- C. Check for reels not completely restrained, reels with interlocking flanges or broken flanges, damaged reel covering or any other indication of damage. Provide impact protection by wood lagging or suitable barrier across the traverse of the reel.
- D. Do not drop reels from any height.
- E. Unload reels using a sling and spreader bar. Roll reels in the direction of the arrows shown on the reel and on surfaces free of obstructions that could damage the wire and cable.
- F. Store cable on a solid, well drained location. Cover cable reels with plastic sheeting or tarpaulin. Do not lay reels flat.
- G. Provide moisture protection by using manufacturer's standard procedure or heat shrinkable self-healing end caps applied to both ends of cable. Do not remove end caps until cables are ready to be terminated.

2.00 PRODUCTS

2.01 GENERAL

- A. Wires and cables shall be soft-drawn, annealed copper with a conductivity of not less than that of 98% pure copper, UL83 and UL1063 listed, rated 600 volts and certified for continuous operation at maximum conductor temperature of 90 Celsius in dry locations and in wet locations
- B. Conductors #8 or larger shall be stranded and conductors #14 shall be stranded. Utilize single conductors.
- C. Except for control, signal and instrumentation circuits and as specifically indicated on the plans, the minimum conductor permitted is #12.

2.02 WIRE MARKING

- 1. Wire marking shall be in accordance with the National Electrical Code Article 310 and shall be printed on the wire insulation at 2 foot intervals. The printing method used shall be permanent and the color shall sharply contrast with the jacket color.
- 2. Wire marking shall include the U.L. label and necessary identification, including the Manufacturer, the number of conductors, size, conductor insulation type, sun-resistance, and other pertinent information.

2.03 CONDUCTORS AND CABLES

- A. **SINGLE CONDUCTOR CABLES:** Conductor with thermoplastic insulation rated at 600 volts and insulated with type XHHW-2 insulation. Wire shall be water tank tested and approved as machine tool wire, in accordance with National Machine Tool Builders Association. Wire in light fixture channels and other special locations shall be as specifically noted for temperature in NEC Article 300. Conductors #8 or larger and conductors #14 shall be stranded. Wire shall be manufactured by Southwire, Okonite, Encore, General Cable, or Houston Wire & Cable.
- B. **GROUND WIRE:** Ground wire shall be Class B stranded tin-plated conductor without insulation in all cases where a single ground wire is indicated to be installed in a conduit with no other conductors in the conduit, or where the ground wire is directly buried in earth or concrete. In all other cases, insulate ground wire with green insulator as specified for low voltage wire.
- C. **LOW-VOLTAGE CONTROL CABLE**
1. **Paired Cable: NFPA 70, Type CMG.**
 - a. Individually and overall shielded pair, twisted, No. 18 AWG, stranded ([7x28]) tinned-copper conductors with 0.021" extruded PVC; 0.004" nylon insulation twisted into pairs, stranded into a core and enclosed by a non-hygroscopic core tape, 100% coverage, helically wound, aluminum foil shield, and drain wire. Pairs shall be black/red or black/white numbered. Cables shall be 600 volts in accordance with NEC-725 and IEEE 383 and shall be suitable for wet location.
 - b. Shielded.
 - c. Extruded PVC jacket minimum 0.050.
 - d. Flame Resistance: Comply with UL 1685.
- D. **CONTROL-CIRCUIT CONDUCTORS**
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. General Cable; General Cable Corporation.
 - b. Southwire Company.
 - c. Alpha
 - d. Okonite
 - e. Belden
 - f. Houston Wire and Cable
 2. **General**
 - a. Wires and cables shall be soft-drawn, annealed copper with a conductivity of not less than that of 98% pure copper, UL83 and UL1063 listed, rated 600 volts and certified for continuous operation at maximum conductor temperature of 90 Celsius in dry locations and in wet locations
 - b. Control, signal and instrumentation circuits and as specifically indicated on the

plans the minimum conductor permitted is #14.

3. SINGLE CONDUCTOR CABLES: Conductor with thermoplastic insulation rated at 600 volts and insulated with type XHHW-2 insulation. Wire shall be water tank tested and approved as machine tool wire, in accordance with National Machine Tool Builders Association.
4. Class 1 Control Circuits: Stranded copper, Type XHHW-2, in raceway, complying with UL 83.
5. Class 2 Control Circuits: Stranded copper, Type XHHW-2, in raceway power-limited tray cable, in cable tray, complying with UL 83.
6. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type XHHW-2, in raceway power-limited tray cable, in cable tray, complying with UL 83.
7. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.

a. Control circuits

2.04 WIRE CONNECTIONS AND DEVICES

- A. CONNECTORS, COMPRESSION, COPPER, 600 VOLT: As manufactured by Burndy, Thomas & Betts, or Ideal Industries; of the appropriate hole sizes and spacing which are in accordance with NEMA standards; two (2) holes in the tongue for use on conductor sizes 250 kcmil or larger; not required for connections to the circuit breakers in the lighting and/or receptacle panels. All compression connectors shall be long-barrel type, no exceptions.
- B. 600 VOLT PLASTIC TAPE: Minnesota Mining & Manufacturing Company (3M), No. 35.
- C. WIRENUTS: Silicone-based pre-filled spring wire connecting devices with plastic covering; UL listed for damp and wet locations. Wirenut shall meet requirements of UL 486D for Sealed Wire Connector Systems and shall be manufactured by Ideal Industries, Inc model 63, or as manufactured by ITT or Panduit. Wirenut shall be spring insulated, properly sized and resistant to vibration may be used for No.12 through No.10 solid gauge conductor for lighting and branch circuits only.
- D. SPLIT BOLTS: Kearney, Burndy, or IlSCO; shall be usable for connecting conductors which are both copper, both aluminum or one copper and one aluminum. Split bolts shall have a spacer between the two conductors, which it connects.
- E. MECHANICAL SET SCREW CONNECTOR: Blackburn HPS, ADR-ALCUL, GP or GT, Burndy or IlSCO; consisting of an aluminum body which has openings on opposite ends for insertion of the conductors. Conductors inserted into these holes shall each be clamped by two set screws. Connectors shall be suitable for use with copper conductors.
- F. RUBBER TAPE: Scotch 2210.
- G. VINYL TAPE: Scotch 88.
- H. ARC PROOFING TAPE: 3M "Scotch 77 Fire and Electric Arc Proofing Tape". Fireproofing shall be done with a half-lapped layer of arc proofing tape, anchored at each end with a double wrap of 3M "Scotch 69 Glass Cloth Electrical Tape".
- I. INSULATING RESIN: Scotch 3576, 3577, or 3578.

- J. POWER DISTRIBUTION BLOCKS: Mersen, IlSCO or Allen-Bradley; rated for 600 VAC and termination of copper conductors. Individual poles shall be constructed of tin plated aluminum and mounted on an insulating base.

3.00 EXECUTION

3.01 PREPARATION

- A. Completely swab raceway system before installing conductors. Do not use cleaning agents and lubricants which have a deleterious effect on the conductors or their insulation.

3.02 INSTALLATION

A. GENERAL

1. Install raceway first as a complete system without conductors. Do not install pull wires and conductors until the raceway system is in place in accordance with the NEC and these specifications. Exception: Only flexible connections to motors shall be permitted to be installed after the installation of the remainder of the raceway system. The installation of these conductors shall be limited to exposure to damage for a maximum of one (1) week prior to installing flexible connection and making final terminations. Any conductors exposed to damage (i.e. not installed in raceway) longer than one (1) week shall be subject to rejection by the Owner and/or Engineer. If rejected, the cables shall be removed, discarded, replaced, reinstalled and retermination at the Contractor's expense.
2. Installed unapproved wire shall be removed and replaced at the Contractor's expense.
3. Grouping conductors together into one conduit shall not be allowed where the plans indicate the conductors to be placed in separate conduits. Each home run shown on the plans shall be in its own conduit.
4. Neatly train wiring inside boxes, equipment and panelboards. Pull conductors into a raceway at the same time and use U.L. listed, wire pulling lubricant for pulling No. 4 AWG and larger wire.
5. Except for hand-pulled conductors into raceways, all wire and cable installation shall be installed with tension-monitoring equipment. Where conductors are found to have been installed without tension-monitoring, the conductors and cables shall be immediately removed from the raceways, permanently identified as rejected material, and removed from the jobsite. New conductors and cables shall be reinstalled, tagged and raceways resealed, all at the Contractor's expense.
6. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii. Where pulling compound is used, use only UL listed compound compatible with the cable outer jacket and with the raceway involved.
7. Where single conductors and cables in manholes, hand holes, vaults, cable trays, and other indicated locations are not wrapped together by some other means such as arc and fireproofing tapes, bundle throughout their exposed length all conductors entering from each conduit with nylon, self-locking, releasable, cable ties placed at intervals not exceeding 4 inches on center.

8. Properly support cables in accordance with the NEC and manufacturer's recommendations in all raceways. Provide strain relief as required.
9. Arrange wiring in cabinets and panels neatly cut to proper length, remove surplus wire, and bundle and secure in an acceptable manner. Identify all circuits entering motor control centers or other control cabinets in accordance with the conductor identification system specified herein and in specification Section 26 05 53, "Identification For Electrical Systems."
10. Cap spare conductors and conductors not terminated, with the UL listed end caps.
11. Where conductors pass through holes or over edges in sheet metal, remove all burrs, chamfer all edges, and install bushings and protective strips of insulating material to protect the conductors.
12. For conductors that will be connected by others, provide at least 6 feet spare conductors in free standing panels and at least 2 feet spare in other assemblies. Provide additional spare conductor in any particular assembly where it is obvious that more conductor will be needed to reach the termination point.
13. Each circuit shall include a ground wire. Sharing grounds or neutrals is not allowed.

B. SPLICES

1. Power Conductors: Splice in junction boxes or at outlets only for lighting and receptacle branch circuits. Splices for all other circuits shall be disallowed. All splices are subject to the Engineer's approval. Obtain approval from Engineer before installing any splices.
 - a. For existing installations, splices of 120V circuits shall use twist-on wire nuts.
 - b. For splices of existing 480V circuits, the Contractor shall terminate the existing and new conductors using power distribution blocks mounted in a junction box.
2. Control and Instrumentation Conductors: No splicing of control and instrumentation conductors shall be permitted between terminal points except as specifically indicated on the plans.
3. No splicing of conductors shall be performed in any below ground structure.
4. Condulet type fittings shall not contain splices. Under no condition shall conductors of a different color be spliced together.
5. For No. 10 and smaller, connect conductors with a twist-on spring wirenut. If a splice or tap is below 3' above the final grade, fill the spring connectors with an electrical insulating resin so that the resin encapsulates conductor and spring materials. Conductor splices and taps inside the MCC, VFDs, panels, etc. shall be on the terminal strips or power distribution blocks.

6. For No. 8 and larger, connect conductors with a split bolt type of connector or a mechanical, set screw type connector. Wrap splices and taps with a single half-lapped layer or rubber tape followed by successive layers of vinyl tape until a vinyl tape layer thickness of twice the original conductor insulation thickness is achieved. If splice or tap is below 3' above the finished grade, the tape or splice shall have a final outer coating or insulating resin.

C. TERMINATIONS

1. Conductors terminated on a screw termination shall have a crimp on type spade connector applied on the wire end, Panduit PanTerm or approved equal.
2. Furnish and install power distribution blocks as required for tapping conductors at their load connection point with conductors of smaller size. Install power distribution blocks with the number of poles and sizes needed for connecting the phase, neutral, and ground conductors.
3. Tighten all screws and terminal bolts using torque type wrenches and/or drivers to tighten to the inch-pound requirements of the NEC and UL.
4. Use crimp connectors on all stranded conductors.
5. Soldered mechanical joints insulated with tape will not be acceptable.
6. SINGLE CONDUCTORS: Sufficient wire shall be left at outlets to make connections to equipment without straining. Light switches and receptacles shall be connected with pig-tails and crimp-on connectors.
7. PAIRED SHIELDED AND TRIAD SHIELDED CABLE: Ground paired shielded and triad shielded cables at the instrument panel or starter end only and insulate from ground elsewhere. The shield shall be continuous for the entire run. The paired shielded and triad shielded cable shall not be laced with or placed in the same conduit with power cables and digital control cables. Each termination of paired shielded or triad shielded cable shall be coated with silicone jelly after termination. The shield of pair shielded cable and triad shielded cable shall only be broken when the conductors are terminated on terminal strips. Each conductor and shield shall be landed on its own terminal. Sharing of shield shall not be allowed.

D. GROUNDING

1. Conduits and other raceway shall contain an equipment grounding conductor whether the raceway is metallic or not. Conduits, motors, cabinets, outlets, and other equipment shall be properly grounded in accordance with National Electrical Code requirements. Where ground wire is exposed to mechanical damage, install wire in rigid aluminum conduit. Make connections to equipment with solderless connections. All connections to ground rods shall be of the fused type utilizing an exothermic welding process.
2. Ground metallic material, including but not limited to metallic raceway, metallic boxes and metallic enclosures. Where metallic material is not connected by raceway to a solid ground, connect the metallic material to the largest equipment grounding conductor, which it houses. Clean the metal surface under the grounding lug to bright metal. Grounding connections to motors shall be to the grounding stud, which shall be threaded into the stationary frame; Use Burndy KC Servit, or approved equal. The

ground wire shall not be lugged to a mounting bolt.

3. Ground wire shall be uninsulated tin plated copper sized as shown on the plans in all cases where a single ground wire is indicated to be installed in a conduit with no other conductors in the conduit, or where the ground wire is directly buried in earth or concrete. In all other cases, insulate ground wire with green insulation as specified for low voltage wire. Provide and size bonding conductors in accordance with the National Electrical Code.
4. Provide a bare uninsulated ground wire to run the entire length of all cable trays. The contractor shall bond to each section and to every enclosure served by conductors routed through the cable tray system

E. TESTING

1. Testing: All testing required shall be per Specification Section 26 01 26, "Testing of Electrical Systems".
2. Perform tests and inspections and prepare test reports and submit to the Owner/Engineer prior to final inspection. Test reports shall be submitted as required by Specification Section 26 01 26, "Testing of Electrical Systems". All test reports shall be submitted in one binder under Specification Section 26 01 26, "Testing of Electrical Systems".
3. Tests and Inspections:
 - a. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
 - b. Perform each visual and mechanical inspection and electrical tests stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - c. Test Reports: Prepare a written report to record the following:
 - 1). Test procedures used
 - 2). Test results that comply with requirements.
 - 3). Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
 - d. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

26 05 26 GROUNDING & BONDING FOR ELECTRICAL SYSTEMS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install a complete grounding system in strict accordance with Article 250 of the National Electrical Code (NEC) as shown on the drawings or as specified herein. Electrical work shall be in accordance with Section 26 05 00 "Common Work Results for Electrical".

1.02 SUMMARY

- A. Submittal shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Product Data: For each type of product indicated.
 - 2. Test wells.
 - 3. Ground rods.
 - 4. Ground Conductors
 - 5. Connectors
 - 6. Grounding arrangements and connections for separately derived systems.
 - 7. Field quality-control reports in accordance with Section 26 01 26 "Testing of Electrical Systems".

1.03 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.
 - 2. ERICO International Corporation.

3. Harger Lightning & Grounding.
4. ILSCO.
5. O-Z/Gedney; a brand of Emerson Industrial Automation.
6. Thomas & Betts Corporation, A Member of the ABB Group.

2.02 CONDUCTORS

- A. Insulated Conductors: tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Tin-plated Bare Copper Conductors:
 1. Solid Conductors: ASTM B 3.
 2. Stranded Conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.
 4. Ground Cables: Ground wire shall be Class B stranded tin-plated copper conductor with 98% conductivity, without insulation in all cases where a single ground wire is indicated to be installed in a conduit with no other conductors in the conduit, or where the ground wire is directly buried in earth or concrete. In all other cases, insulate ground wire with green insulator as specified for low voltage wire.
 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.03 CONNECTORS

- A. Listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.04 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad; 3/4 inch by 10 feet.
- B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
 1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
 2. Backfill Material: Electrode manufacturer's recommended material.

2.05 MISCELLANEOUS

- A. CONDUIT GROUND FITTINGS: Fittings for bonding ground cable to the conduit shall be FCI Burndy Corp., type NE or Thomas & Betts No. 3951 series.
- B. GROUND ROD BOXES: Precast Box with cast iron lid. Lid shall read "ground rod". H-10 rated boxes shall be Brooks Precast Model "3-RT" or approved equal. Ground rod boxes located in driveway areas shall have an AASHTO HS-20 rating by ALT Fabrication Item #3114 or approved equal.
- C. EXOTHERMIC WELDING PROCESS: CADWELD MATERIALS – as manufactured by ERICO products or approved equal.

2.06 PROCESSES

- A. All grounding system connections to building steel and ground rods shall be exothermically welded including all cable connections, and cable steel terminations. The use of mechanical type connections is not acceptable.
- B. Any concealed connection (buried, encased in concrete or otherwise sealed) shall be done only with exothermic welds.
- C. All materials involved must be from the same sources to insure compatibility. Connections made from this process shall meet the requirements of IEEE Standards 80 and 837 and as listed in MIL 419 and other standards, National Electrical Code, etc.

2.07 GROUNDING SYSTEM

- A. Provide a complete grounding system that includes all connections and the testing of ground rods, ground cables, ground buses, conduits, fittings, anchor supports, thermite process materials and equipment and other materials required for a complete installation. Grounding system shall be installed and sized in accordance with the National Electrical Code.

3.00 EXECUTION

3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tin-plated copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 30 inches below grade.
 - 2. Duct-Bank Grounding Conductor: Place conductor on top of duct bank prior to back filling above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted/clamp type connectors.
 - 2. Underground Connections: Exothermically welded connectors.
 - 3. Connections to Ground Rods at Test Wells: Exothermically welded connectors.
 - 4. Connections to Structural Steel: Exothermically welded connectors.
 - 5. Connections to Equipment: NEMA ground pads and insulated jumpers.
 - 6. Connections to Ground Pad: Exothermic.
 - 7. The use of "pig tails" for connections to ground loops or equipment shall not be allowed.

3.02 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.03 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 and NFPA 70 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.04 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
 2. Lighting circuits.
 3. Receptacle circuits.
 4. Single-phase motor and appliance branch circuits.
 5. Three-phase motor and appliance branch circuits.
 6. Flexible raceway runs.
 7. Armored and metal-clad cable runs.
 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- F. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
- G. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- H. Metallic Fences: Comply with requirements of IEEE C2.
1. Grounding Conductor: Bare, tin-plated copper, not less than No. 8 AWG.
 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
 3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.05 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 6 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through bottom of Ground Rod Box. Ground Rod Box shall be at least 12 inches deep, with cover.
 - 1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated tin-plated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- I. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.
 1. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
- J. Ground electrical work in accordance with the National Electrical Code Article 250 and local codes.
- K. Install ground cables continuously between connections. Splices shall not be permitted, except where indicated on the plans. Where ground cables pass through floor slabs, buildings, etc., and when not in metallic enclosures, provide a sleeve of approved, non-metallic materials.
- L. Install a green-colored, equipment grounding conductor in raceways. Size conductors in accordance with NEC Article 250.
- M. Where ground wire is directly buried in earth or concrete, use standard bare tinned copper cable, in all other cases install a green-colored insulation, equipment grounding conductor in accordance with Section 26 05 19 "Low Voltage Electrical Power Conductors & Cables". Size conductors in accordance with NEC Article 250. Provide grounding conductors as required per the NEC.
- N. Metal conduits stubbed up into switchgear, motor control center or other electrical equipment shall be terminated with insulated grounding bushings and connected to the equipment ground bus. Size the grounding wire in accordance with applicable sections of the National Electrical Code.
- O. Provide exothermic weld connection for extension to existing stub-up ground conductors.
- P. Liquid tight flexible metal conduit in sizes 1-1/2" or larger shall have bonding jumpers. Bonding jumpers shall be external, run in parallel (not spiraled) and fastened with plastic tie wraps. Contractor shall provide bonding jumpers sized in accordance with the National Electrical Code.
- Q. All equipment enclosures, motor and transformer frames, conduit systems, cable armor, exposed structural steel and all other equipment and materials required by the NEC to be grounded, shall be grounded and bonded in accordance with the NEC. Provide grounding and bonding jumpers as required per the NEC.
- R. Ground transformer neutrals to the nearest available grounding electrode with a conductor sized in accordance with NEC Article 250.

- S. Where exothermic bonding is used, molds shall be of the appropriate size for the wire and rod used. All bonds shall remain exposed for inspection of the Owner's Representative.
- T. At each convenience outlet, install a grounding clip attached to the outlet box and leave a sufficient length of #12 wire with green-colored insulation to connect to the grounding terminal at the receptacle.
- U. Ground pad shall be installed in concrete foundations or pad for connections to equipment and grounding system. Flat plate all copper alloy Erico CADWELD B164-2Q or equal Ground pad shall be exothermic weld connection for connection to ground cable.
 - 1. The use of "pig tails" for connections to ground loops or equipment shall not be allowed.
- V. Provide a minimum of two ground connections to all medium voltage equipment including VFD's and transformer frames.

3.06 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections. Testing shall be in accordance with Section 26 01 26 "Testing of Electrical Systems" and the latest version of NETA Acceptance Testing Specification
- B. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect the grounding and bonding system conductors and connections for tightness and proper installation.
 - 3. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 4. Use Biddle Direct Reading Earth Resistance Tester or equivalent to measure resistance to ground of the system. Perform testing in accordance with the test instrument manufacturer's recommendation using the fall of potential method.
 - 5. All test equipment provided under this section shall be approved by the ENGINEER.
 - 6. Resistance to ground testing shall be performed during dry season. Submit test results in the form of a graph showing the number of points measured (12 minimum) and the numerical resistance to ground. The contractor shall test the grounding system at each ground rod shown on plans.
 - 7. Testing shall be performed before energizing the distribution system.
 - 8. A separate test shall be conducted for each building or system.
 - 9. Notify the ENGINEER immediately if the resistance to ground for any building or system is greater than five ohms. Provide additional ground rods and conductors as required to bring the resistance to five ohms
 - 10. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test

wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

- a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
11. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
 - D. Prepare test and inspection reports.
 - E. Report measured ground resistances that exceed the following values:
 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 5 ohms.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1.3 ohm(s).
 5. Manhole Grounds: 5 ohms
 - F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.03 SUBMITTALS

- A. Submit shop drawings and product data for each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Hangers.
 - b. Steel slotted support systems.
 - c. Nonmetallic support systems.
 - d. Trapeze hangers.
 - e. Clamps.
 - f. Turnbuckles.
 - g. Sockets.
 - h. Eye nuts.
 - i. Saddles.
 - j. Brackets.
 - 2. Include rated capacities and furnished specialties and accessories.

1.04 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.05 COORDINATION

Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

2.00 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame Rating: Class 1.
 2. Self-extinguishing according to ASTM D 635.

2.02 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit; a part of Atkore International.
 - b. B-line, an Eaton business.
 - c. ERICO International Corporation.
 - d. Flex-Strut Inc.
 - e. GS Metals Corp.
 - f. G-Strut.
 - g. Thomas & Betts Corporation, A Member of the ABB Group.
 - h. Unistrut; Part of Atkore International.
 2. Material: Stainless Steel, Type 304.
 3. Channel Width: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101
- C. Conduit and Cable Support Devices: 304 Stainless-steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of 304 stainless steel.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; 304stainless steel.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Mechanical-Expansion Anchors: Insert-wedge-type, 304 stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1). B-line, an Eaton business.
 - 2). Empire Tool and Manufacturing Co., Inc.
 - 3). Hilti, Inc.
 - 4). ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5). MKT Fastening, LLC.
2. Concrete Inserts: 304 stainless steel, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: 304 stainless steel, MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: 304 stainless steel, structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: 304 Stainless-steel springhead type.
6. Hanger Rods: 304 Threaded stainless steel.
7. Washers: 304 Stainless steel.

3.00 EXECUTION

3.01 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.
- B. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for Rigid Metal Conduits as required by NFPA 70. Minimum rod size shall be 3/8 inch in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted [or other] support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, Rigid Metal Conduit may be supported by openings through structure members, according to NFPA 70.

- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: 304 stainless steel beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 - 6. To Light Steel: 304 stainless steel sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.03 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 4000-psi, 28-day compressive-strength concrete.
- C. Anchor equipment to concrete base as follows:
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION

26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install a complete conduit system for each type of electrical system. Electrical work shall be in accordance with Div. 26 ELECTRICAL specifications.
- B. The CONTRACTOR shall be responsible for sizing all pull boxes and junction boxes per the National Electrical Code (NEC) Article 314 and all other relevant sections of the NEC. Electrical work shall be in accordance with Section 26 05 00, "Common Work Results for Electrical".

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Nonmetal wireways and auxiliary gutters.
 - 5. Surface raceways.
 - 6. Boxes, enclosures, and cabinets.
 - 7. Handholes and boxes for exterior underground cabling.

1.03 DEFINITIONS

- A. RAC: Rigid aluminum conduit.
- B. LFMC: Liquid tight flexible metal conduit.
- C. RNC: Rigid nonmetallic conduit.

1.04 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures" and shall include:
 - 1. Shop Drawings: Record data for surface raceways, wireways and fittings, Pull and Junction Boxes, hinged-cover enclosures, and cabinets.
 - 2. Pull and Junction Boxes Sizing Calculations: Detailed calculations shall be submitted to the ENGINEER with the pull and junction boxes' initial submittal. Submittals submitted without sizing calculations shall not be accepted.

2.00 PRODUCTS

2.01 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems; a part of Atkore International.
 2. Allied Tube & Conduit; a part of Atkore International.
 3. Anamet Electrical, Inc.
 4. Electri-Flex Company.
 5. FSR Inc.
 6. O-Z/Gedney; a brand of Emerson Industrial Automation.
 7. Picoma Industries, Inc.
 8. Republic Conduit.
 9. Robroy Industries.
 10. Southwire Company.
 11. Thomas & Betts Corporation, A Member of the ABB Group.
 12. Western Tube and Conduit Corporation.
 13. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. RAC: Comply with ANSI C80.5 and UL 6A.
- D. PVC-coated Rigid Aluminum conduit.
1. Comply with NEMA RN 1 and UL 6A
 2. Coating Thickness: minimum 0.040 inch PVC exterior coating and 0.020 inch urethane interior coating.
 3. ETL Verified PVC-001 and U.L. listed. Acceptable manufacturers shall be Rob Roy Plastibond Red, Ocal and Perma-Cote.
- E. LFMC: Single strip, helically wound, interlocking, hot dip galvanized, in accordance with U.L. 360. Liquid tight conduit shall have an extruded, polyvinyl jacket over the flexible metal .
- F. Fittings for Metal Conduit: Threaded type material to match the conduit. Comply with NEMA FB 1 and UL 514B.
1. Expansion Fittings: Aluminum match conduit type, rated for environmental conditions where installed, and including aluminum bonding jumper.
 2. Coating for Fittings for PVC-Coated Rigid Aluminum Conduit: minimum 0.040 inch PVC exterior coating and 0.020 inch urethane interior coating, with overlapping sleeves protecting threaded joints.
 3. Elbow and Bends: Conduit systems shall use PVC coated aluminum unless indicated otherwise.

- G. Joint Compound for RAC or PVC-Coated Rigid Aluminum Conduit: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems; a part of Atkore International.
 - 2. Anamet Electrical, Inc.
 - 3. Arnco Corporation.
 - 4. CANTEX INC.
 - 5. CertainTeed Corporation.
 - 6. Condux International, Inc.
 - 7. Electri-Flex Company.
 - 8. Kraloy.
 - 9. Lamson & Sessions.
 - 10. Niedax Inc.
 - 11. RACO; Hubbell.
 - 12. Thomas & Betts Corporation, A Member of the ABB Group.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material. Elbows and bends for all conduit systems shall be PVC-coated aluminum unless indicated otherwise.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. B-line, an Eaton business.
 - 2. Hoffman; a brand of Pentair Equipment Protection.
 - 3. MonoSystems, Inc.
 - 4. Square D.
- B. Enclosures: Sheet metal, complying with UL 870 and NEMA 250, Type 1 (metallic) for Air Conditioned spaces, Type 4X Stainless Steel for all other locations unless otherwise indicated, and sized according to NFPA 70.

- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireways shall have integral lugs, quick release cover with stainless steel latches, continuously welded seams, oil resistant gasket.
- E. Finish: ANSI 61 gray finish for NEMA 1.

2.04 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Adalet.
 - 2. Crouse-Hinds, an Eaton business.
 - 3. EGS/Appleton Electric.
 - 4. Erickson Electrical Equipment Company.
 - 5. FSR Inc.
 - 6. Hoffman; a brand of Pentair Equipment Protection.
 - 7. Hubbell Incorporated.
 - 8. Kraloy.
 - 9. Milbank Manufacturing Co.
 - 10. MonoSystems, Inc.
 - 11. Oldcastle Enclosure Solutions.
 - 12. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 13. RACO; Hubbell.
 - 14. Robroy Industries.
 - 15. Spring City Electrical Manufacturing Company.
 - 16. Stahlin Non-Metallic Enclosures.
 - 17. Thomas & Betts Corporation, A Member of the ABB Group.
 - 18. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514, galvanized steel, with ½" male fixture studs where required.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover, threaded hubs and integral mounting lugs. Use cast boxes for damp and outdoor installations.

- E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- I. Gangable boxes are allowed.
- J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 for Air Conditioned spaces, Type 4X 304 Stainless Steel for all other locations with hinged, gasketed doors and quarter-turned latches or a 3-point latch (single operator) system on enclosures larger than 36-inch wide or 32 inch tall unless otherwise indicated, and sized according to NFPA 70. Finish: ANSI 61 gray finish for NEMA 1.
- K. Cabinets:
 - 1. NEMA 250, Type 1 for Air Conditioned spaces, Type 4X 304 Stainless Steel for all other locations with, and sized according to NFPA 70. Finish: ANSI 61 gray finish for NEMA 1.
 - 2. Hinged, gasketed doors and quarter-turned latches or a 3-point latch (single operator) system on enclosures larger than 36-inch wide or 32 inch tall unless otherwise indicated.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

3.00 EXECUTION

3.01 RACEWAY APPLICATION

- A. Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed above grade conduit: RAC unless noted otherwise. PVC coated rigid aluminum conduit shall be used in corrosive environments or where in contact with concrete.
 - 2. Underground Conduit: RNC, Type EPC-40-PVC, red concrete encased. Conduit below grade shall not be smaller than 2".
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC shall only be used to equipment in non-hazardous locations not subject to physical damage or excessive temperatures, 6'-0" maximum length. The bending radius shall be in accordance with Chapter 9, Table 2 of the NEC and shall not deform or alter the flex jacket.
 - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 1 for Air Conditioned spaces, Type 4X Stainless Steel for all other locations.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Aluminum Conduit: Use threaded rigid aluminum conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Aluminum Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

3.02 INSTALLATION

A. RACEWAYS:

1. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
2. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
3. Complete raceway installation before starting conductor installation.
4. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
5. Arrange stub-ups so curved portions of bends are not visible above finished slab.
6. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
7. Support conduit within 12 inches of enclosures to which attached.
8. Raceways Embedded in Slabs:
 - a. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - b. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - c. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - d. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

9. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
10. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
11. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
12. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
13. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
14. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
15. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
16. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
17. Conduit stubbed-up under free standing enclosures located indoors/outdoors in an electrical room, etc., such as a motor control center, shall be PVC and have a PVC end bell terminator that is solvent welded onto each conduit end. End bell shall be installed flush with the finished floor. No PVC shall be exposed to daylight or be installed such that any portion is out of concrete housekeeping pad or duct bank.
18. Conduits terminating inside an air conditioned space from outside shall be sealed to prevent moisture/condensation from entering the enclosure.
19. At the transition from underground and or from concrete, protect PVC from mechanical damage by extending PVC coated rigid aluminum conduit a maximum of 12" and a minimum of 4" into the earth or concrete at the transition.
20. Aluminum conduit, straps, and struts shall not be in direct contact with concrete. Provide a neoprene washer between the two materials.
21. Aluminum conduit which penetrates into concrete shall be factory-coated with 0.40" of PVC, per Spec. MIL-P-15147.
22. Conduit extending into concrete shall not be closer than 3" from adjacent conduit and shall not be closer than 1" from any reinforcement bars.
23. PVC conduit shall not be installed above grade level, above concrete slab level, or for any exposed installations unless specified. All transitions from concealed to exposed shall be made with PVC coated aluminum. Conduit shall not be placed horizontally in a concrete floor slab or a beam without the ENGINEER's written approval.

24. Flexible metal conduit (sealtight) used for connecting light fixtures, i.e., fixture whips, shall be 1/2" as a minimum. Fixture whips shall contain only three conductors: one hot, one neutral, and one equipment grounding conductor. Other conduit types shall be 3/4" as a minimum. The inside surface of the conduit shall be reamed smooth after it has been cut.
25. Provide conduit sizes as shown on the plans. Where hash marks are used to indicate the number of conductors in a conduit without indicating the conduit size, provide a 3/4" conduit for up to nine #12 conductors, and a 1" conduit for ten to 20 #12 conductors.
26. Where conduits stub up through a floor slab from below finished floor level for multi-level structures, install a threaded fitting with PVC plug so that the top of the fitting is flush with the concrete or finished floor surface.
27. Conduit system shall be swabbed clean prior to installation of conductors.
28. Ground conduits in accordance with the National Electrical Code and Specification 26 05 26, "Grounding & Bonding For Electrical Systems".
29. Contractor shall properly tape PVC coated aluminum conduit where it transitions to PVC conduit in underground concrete encased duct banks so that no aluminum conduit is in contact with concrete encasement. Tape shall be manufactured by Scotch or approved equal. Coordinate with tape manufacturer for type of tape to use for the installation
30. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
31. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - b. Where an underground service raceway enters a building or structure.
 - c. Where otherwise required by NFPA 70.
32. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
33. Expansion-Joint Fittings:
 - a. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RAC conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 - b. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - 1). Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - 2). Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.

- 3). Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
- 4). Attics: 135 deg F temperature change.
- c. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
- d. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
- e. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

B. ROUTING AND SUPPORT

1. Use the conduit route where shown on the plans. Route conduits that do not have a specified route in the most direct path between the two points, i.e. home runs shown with an arrow symbol. Route conduits parallel to building lines. Concealed conduits on the plans shall be below grade, within walls, or above ceilings.
2. Route conduit through roof openings for piping and ductwork where possible. Otherwise, route conduit through the roof with pitch pocket. Conduit shall not penetrate ductwork. Exposed conduit shall not be installed on the roof without the ENGINEER's prior approval.
3. Install conduit at elevations which maintain headroom, and at locations which avoid interference with other work requiring grading of pipe, the structure, finished walls, etc. Avoid crossing other work. Conduits shall not be placed in close proximity to equipment, systems, and service lines. Maintain a minimum of 3" separation, except in crossing which shall be a minimum of 1". Conduits shall not be installed/concealed in water bearing walls.
4. Conduits in buildings shall be exposed on unfinished ceilings and basements, as shown on the plans. Rigidly support conduits to the building structures using hardware bolted or screwed to the structure. The mounting hardware shall not mount the conduit directly on concrete walls and ceilings, but shall space the conduit away from the surfaces using minerallac-type hardware, strut channel clamps, or one hole straps with clamp backs.
5. Provide expansion fittings at expansion, construction and seismic joints. Provide combination expansion/deflection fittings where conduits are concealed at these joints.
6. Group conduit in parallel runs where practical. Use a conduit rack constructed of channels with conduit straps or clamps. Provide space for an additional 25% conduit.
7. Parallel runs of conduit shall have bends and offsets made at the same point such that the angle of bend is the same in each conduit and the conduits remain parallel throughout the run. Conduits not installed in this manner shall be removed and

reinstalled at the Contractor's expense. Conductors that are installed shall be removed and replaced at the Contractor's expense.

8. Conduits installed in parallel shall be arranged such that crossings are eliminated.
9. Rigid aluminum conduit systems shall utilize Stainless Steel straps, clamps and strut channel. Coated rigid steel or aluminum conduit shall utilize PVC factory coated straps, clamps and thread rods, etc. as manufactured by Robroy.
10. Nuts, bolts, concrete anchor bolts and other metallic fasteners shall be stainless steel.
11. Install conduit other than PVC with threaded couplings and other threaded fittings. Threadless, or clamp type fittings shall not be used on metallic conduit. Rigid aluminum conduit shall have each set of threads coated with an oxidation inhibitor, IIsco, De-Ox, ITT Noalox, Blackburn Contax or approved equal.
12. Use suitable conduit caps to protect installed conduit against entry of dirt and moisture. The use of duct tape or any other tape shall be prohibited.
13. Use watertight hubs to fasten conduit to metal boxes, etc. in wet or damp locations per the National Electrical Code.
14. Install a pulling string in empty (spare) conduit, except sleeves and nipples, and leave for future pulling as applicable.
15. Expansion/deflation fittings made of neoprene in outdoor applications shall have aluminum lagging over the neoprene held in place with stainless steel tie-wraps.

C. TERMINATIONS

1. Use threaded hubs for termination of conduits. Locknut termination of conduits shall not be used on this project.
 - a. Conduit terminations shall not penetrate the top of NEMA 4X and NEMA 3R enclosures. Enclosures with top penetrations shall be removed and replaced with conduits re-routed for side or bottom penetration at contractor's expense. If conductors have been installed and are too short to accommodate the re-routed conduit, then they shall be removed and replaced at the Contractor's expense

D. UNDERGROUND RACEWAYS:

1. Underground conduit shall be steel reinforced red concrete encased. Conduit which is below the finished grade shall be PVC schedule 40, except where indicated on the plans or noted otherwise. Unless otherwise indicated, all other conduit shall be rigid aluminum.
2. Where underground conduits are routed under a concrete slab on grade and brought up under slab the duct bank reinforcing steel shall be tied into the slab.
3. Bury underground conduit a minimum of 18" deep to the top of the concrete encasement for 600V duct banks, and as shown on the plans, whichever is greater. Backfill buried conduit banks with material which is free from large rock, paving material, or large angular substance. Install underground conduit with the conduit duct bank dimensions shown on the plans. Adhere to conduit spacing by using spacers at intervals to ensure that proper spacings are maintained. The concrete shall be red in color. Apply dye in concrete truck, sprinkling dye on top of the duct bank after concrete

placement is prohibited. Place 3" CMU blocks under rebar cage to suspend rebar off of the bottom of the trench so that it does not contact the soil and is completely encased in the concrete envelope when concrete is placed.

4. Underground conduits terminating in a vault or below grade structure shall first turn up at least three feet above the structure top slab and terminate in a junction box. Only then shall a conduit penetrate the structure and go directly into the structure.
5. Grade underground and outdoor conduits to drain free of condensation and moisture. Provide for automatic draining at low points. Install horizontal runs of conduit to provide a natural drain for condensation without pockets or traps where moisture may collect.
6. Underground conduits shall drain to an underground structure with a floor drain, such as a manhole.
7. Install conduit drain assemblies in outside or underground conduits to provide for draining.
8. Underground conduit bends shall have a long sweep bend radius. Underground conduit bends shall have a minimum 2' bend radius or larger as required by the minimum bending radius of the cables, whichever is greater. All Underground conduit bends shall utilize PVC factory-coated rigid aluminum bends.
9. Contractor shall install duct bank spacers a minimum of every 5 feet.
 - a. Conduit shall slope uniformly at not less than 4" per 100', or more than 60" per 100' unless indicated otherwise on the plans or approved by the Engineer. Arrange duct banks to drain into manholes with no low pockets in the duct runs. The electrical contractor shall coordinate with the Contractor and the plans on the proposed grades for the site.
10. Minimum size for underground conduits shall be 2".

E. BOXES AND ENCLOSURES:

1. Unless otherwise noted, location of outlet boxes shall be as follows:

<u>Equipment or Outlets</u>	<u>Elevation *(A.F.F.)</u>
Toggle switches	4'0"
Receptacles	1'6"
<u>Equipment or Outlets</u>	<u>Elevation *(A.F.F.)</u>
Flow/Level Transmitters	5'5"
Circular Chart Recorder	5'5"
Motor starters	5'0"
Control stations	4'0"
Manual starters	5'0"
Thermostats in office areas	4'0"
Telephone outlets	1'6"
Circuit protective devices	6'6" to top of enclosure

* Above Finished Floor.

2. Locate boxes so that cover or plate will not span different building finishes.
 3. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
 4. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- F. Use separate pull boxes and junction boxes for electric power, control and communication systems.
- G. Install pull boxes and junction boxes where required by the National Electrical Code and wherever required to overcome mechanical difficulties.
- H. Install pull boxes in interior conduit at not more than 100' apart when conduit runs are not broken by junction or outlet boxes.
- I. Pull and junction boxes shall be accessible and not buried.
- J. Do not install boxes back to back in walls and provide a minimum of 6" separation, except in acoustic-rated walls, provide 24" separation.
- K. Support boxes independently of conduit except for cast boxes that is connected to two rigid metal conduits, both supported within 12" of box.
- L. Junction boxes shall have terminal strips/distribution blocks for splicing conductors where approved by the ENGINEER or as shown/specified on the plans. Terminal strips shall be manufactured by Allen-Bradley, Phoenix Contact or approved equal. No top entry in junction boxes with a terminal strip.
- M. Box shall be mounted using mounting lugs. Drilling through the box to mount is prohibited. Any box drilled to mount will be rejected and shall be removed and replaced at the Contractor's expense.
- N. Provide at least 1/4 inch air space between the back of the box and the wall.
1. Conduit penetrations in the top of any enclosure or junction box is strictly prohibited in all areas except dry NEMA 1 areas. Any enclosure top penetrated will be rejected and shall be removed and replaced at the Contractor's expense

3.03 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures" and shall include Record Data:
 - 1. Product Data to include cut sheets for each electrical identification product to be used on the project. Provide example of labeling for Owner/Engineer approval prior to beginning any work
 - 2. Post-Submittal Meeting for Appendix B Tagging Requirements:
 - a. The Contractor shall submit a detailed plan a minimum of three (3) weeks in advance of the post-submittal meeting. The plan shall include how the Contractor proposes to label all pull boxes, junction boxes, concrete pull boxes, manholes and hand holes provided under this contract. Refer to Appendix B, "NTMWD Tagging for Pull/Junction Boxes, Concrete Pull Boxes, Manholes and Handholes".
 - b. As a minimum the following shall be at the post-submittal meeting: Electrical Contractor, no exceptions. Contractor shall determine the number of people attending the meeting and cover each person's cost.

1.03 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.

- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, are not acceptable.

2.00 PRODUCTS

2.01 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. All markings to labels, schedules, tags or nameplates shall be machine printed only. Hand printing is prohibited. Circuits shall be tagged at terminations (both ends), in pull boxes, cabinets, and enclosures as follows:
 - 1. Tags relying on adhesives or tapes-on markers are not acceptable, unless noted otherwise.
 - 2. Hand written tags are not acceptable.
 - 3. Provide conductor tags for conductors No. 10 AWG and below with legible permanent sleeve of yellow or white PVC with machine printed black marking, Raychem TMS sleeves or approved equal.
 - 4. Provide tags for cables and for conductors No. 8 AWG and larger consisting of permanent nylon marker plates with legible designations hot stamped on the plate. Attach these marker plates to conductors and cables with stainless steel wire wraps. Tags shall be Raychem TMS-CM cable markers or approved equal.
 - 5. Tags shall be imprinted with panelboard and panelboard position number (e.g. LA3-23) for conductors fed from panelboards. Other conductors shall have tags imprinted with the MCC which feeds the conductors (e.g. MCC 1).
 - 6. Switchlegs shall have the designation described above on their tags, plus an "S" suffix. Travelers shall have the designation described above on their tags, plus a "T" suffix.
 - 7. Where more than one neutral is present with a group of conductors, a tag shall be applied to each neutral indicating which phase conductors are served by each neutral (e.g. HA-2, 4, 6).
 - 8. Tags shall follow the NTMWD tagging standards shown in the Drawings for control and instrumentation wire tags.

2.02 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.03 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE

2.04 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.05 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. Attach plates to equipment with stainless steel screws. Provide an O-ring for screws on NEMA 4X enclosures, O-rings shall maintain the integrity and NEMA 4X rating for enclosures.

B. NAMEPLATES:

1. For indoor applications with Air Conditioning: Plastic, black 1" letters on white background, on the front of each door on the switchgear; identifying the compartment contents for each compartment.
2. All other applications: Plastic, black 1" letters on white background, on the front of each door on the switchgear; identifying the compartment contents for each compartment.
3. Attach nameplates with a stainless steel screw and nut at each end of the nameplate. Adhesive backed nameplates shall not be installed.
4. Label that includes tag designation shown on Drawings for the transformer, switchgear, panelboards or other electrical equipment.

2.06 CONDUIT IDENTIFICATION PLATE

A. A conduit identification plate shall be installed on all power, control, instrumentation and communications conduits at the end of each run and at the conduit ends inside intermediate junction and pull boxes, manholes, handholes, etc. Conduit plates shall be installed be-

fore conductors are pulled into the conduits. Exact identification plate location shall be coordinated with the Owner/Engineer at the time on installation. The conduit identification tags shall identify the cable numbers as shown on the FNI plans and the “to” and “from” information. Coordinate with Owner for exact requirements for plate material and type. Provide an example to Owner/Engineer as a formal submittal for approval prior to the installation. Attach conduit identification plate with stainless steel tie wraps or stainless steel wire.

3.00 EXECUTION

3.01 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with stainless steel mechanical fasteners appropriate to the location and substrate.
- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.02 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase Identification. Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 - a. Color shall be field applied for sizes larger than No. 8 AWG
 - b. Colors for 120/240V Circuits:
 - 1). Phase A: Black
 - 2). Phase B: Red
 - 3). Neutral: White
 - 4). Equipment Grounding Conductor: Green

- c. Colors for 208/120-V or 240V/120V, 3-phase Circuits:
 - 1). Phase A: Black.
 - 2). Phase B: Red.
 - 3). Phase C: Blue.
 - 4). Neutral: White
 - 5). Equipment Grounding Conductor: Green
 - d. Colors for 480/277-V Circuits:
 - 1). Phase A: Brown.
 - 2). Phase B: Orange.
 - 3). Phase C: Yellow.
 - 4). Equipment Grounding Conductor: Green
 - e. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- B. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
- 1. Limit use of underground-line warning tape to direct-buried cables.
 - 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
 - 3. Identifying line shall be continuous along the entire underground route.
- C. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels
- 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- D. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- E. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems

include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

- a. Indoor Equipment: stainless steel screws and nuts, engraved and laminated nameplates. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
- b. Outdoor Equipment: Engraved, laminated acrylic or melamine label
- c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
- d. Fasten labels with appropriate mechanical fasteners and gaskets that do not change the NEMA or NRTL rating of the enclosure and void the U.L. listing of the enclosure.

2. Equipment to Be Labeled:

- a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be laminated acrylic or melamine label and placed in a clear plastic sleeve.
- b. Enclosures and electrical cabinets.
- c. Starters
- d. Switchgear.
- e. Switchboards.
- f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
- g. Motor-control centers.
- h. Enclosed switches.
- i. Enclosed circuit breakers.
- j. Enclosed controllers.
- k. Push-button stations.
- l. Contactors.
- m. Monitoring and control equipment.
- n. UPS equipment.
- o. Conduits
- p. Variable Frequency Drives
- q. Pull boxes, junction boxes, concrete pull boxes, manholes and hand holes.

END OF SECTION

26 05 73.01 ELECTRICAL POWER SYSTEM STUDIES

1.00 GENERAL

1.01 DESCRIPTION

General: This section specifies that the CONTRACTOR prepare a short circuit and protective device coordination study, load flow study, and an arc flash hazard analysis for the electrical power system as shown on the plans for the complete electrical system at the Custer Road Pump Station Meter Vault.

Short Circuit and Protective Device Coordination Study, Arc Flash Analysis, and Load Flow Study.

The studies shall provide an evaluation of the electrical power system and the model numbers and settings of the protective relays or devices and metering or motor monitoring devices for setting by the CONTRACTOR. The Studies shall include settings for all protective relays and circuit breakers, including breakers mounted in generator, power meters and electric system monitoring for both devices provided under this contract and for the existing devices. The Contractor shall obtain any needed data or information for the electrical equipment from Contract Documents, various suppliers, and from conducting his own field investigations.

A. Scope:

1. The CONTRACTOR is responsible for providing all pertinent information necessary for the successful completion of the Short Circuit and Protective Device Coordination Study, and Arc Flash Analysis. All cable and raceway data, data from all new Switchgear, motor control centers, transformers, generator, panelboards, and separately mounted fuses, starters or circuit breakers shall be obtained by the CONTRACTOR. Obtain all existing or new protective device information to include all present settings. The CONTRACTOR shall obtain any needed data or information from Contract Documents, various suppliers, the Electric Utility and from conducting his own field investigations. The data obtained shall be organized and submitted to the ENGINEER to show that all the necessary data gathering work has been done.
2. Calculations shall utilize actual X/R and three phase short circuit values obtained by the CONTRACTOR from the Electric Utility. The use of infinite bus fault current calculation is not acceptable.
3. The Contractor shall redo the Power System Studies if any changes are made during the field testing checkout and/or start-up and shall re-submit the updated study for engineer approval.
4. Provide a complete short circuit study. Include three phase and phase-to-ground calculations. Provide an equipment interrupting or withstand evaluation based on the actual equipment and model numbers provided on this project. Generic devices are not acceptable. Normal system operating method, alternate operation, and operations that could result in maximum fault conditions shall be thoroughly addressed in the study.
 - a. The study shall assume all motors operating at rated voltage with the exception that motors identified as "standby" shall not be included.
 - b. Electrical equipment bus impedance shall be assumed zero.

- c. Short circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at the electrical equipment busses.
 - d. The Study shall be performed using actual available short circuit currents available and system impedances as obtained from the Electric Utility and Generator manufacturer. An assumption of infinite bus for the purposes of the Study is not acceptable.
 - e. Study shall use actual motor X/R and subtransient reactance data obtained from equipment suppliers.
5. A protective device coordination study shall be performed to determine appropriate relay settings. The study shall include all electrical equipment provided under this contract and any up-stream equipment that has an impact on the coordination study. The study shall show transformer damage curves, generator damage curves, cable short circuit withstand curves and motor curves. Include all medium and low voltage switchgear, distribution switchboards, motor control centers, starters, and panelboards main circuit breakers. Complete the short circuit study down to the main breaker or main lugs on all panelboards. Panelboard branch circuit devices need not be considered. The phase over current and ground-fault protection shall be included as well as settings for all other adjustable protective devices. All motor monitoring relays and protective or monitoring devices that are a part of a supplier's equipment (such as soft starters, switchgear) shall be included. Include the last protective device in the Electric Utility's system feeding each facility being considered.
 6. Provide Time-Current Curves on 11X17 log-log paper. Do not put more than one branch of protective devices on any one coordination curve. Include a one-line diagram and the names of each protective device in the branch. Use the names designated in the Contract Documents. Include motor and transformer damage curves, and cable short circuit withstand curves. Coordination study time-current curves (11x17 log-log type) including the instrument transformer ratios, model numbers of the protective relays, and the relay settings associated with each breaker. Organize the curves as specified here in. Ground fault time current curves shall be on a separate sheet.
 7. An equipment evaluation study shall be performed to determine the adequacy of the fault bracing of all bus from the panelboard level up to the main Switchgear or protective device. Include circuit breakers, controllers, surge arresters, busway, switches, and fuses by tabulating and comparing the short circuit ratings of these devices with the available fault currents.
 8. Provide arc flash hazard analysis in accordance with the applicable NFPA, ANSI, and IEEE standards.
 9. The studies shall be performed, sealed and signed by a Registered Professional Engineer licensed in the State of Texas.
 10. Any problem areas or inadequacies in the equipment shall be promptly brought to the ENGINEER's attention.
 11. Use industry standard short circuit software, SKM CAPTOR and DAPPER or an equal approved by the ENGINEER.

12. The report shall include a comparison of short circuit duties of each bus to the interrupting capacity of the equipment that is protecting that bus.
13. The report shall include all data that was used as input to the report. This data shall include cable impedance, conduit type, source impedance, equipment ratings, motor X/R and subtransient reactance data, etc.
14. Provide and program all settings for all power meters, motor protection relays, feeder protection relays, etc.
15. The CONTRACTOR shall coordinate with the Utility for electrical data required for the studies.

1.02 REFERENCES

- A. This Section contains references to the following documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
IEEE 141 Plants	Recommended Practice for Electric Power Distribution for Industrial Plants
IEEE 242	Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
NFPA 70E	Handbook for Electrical Safety in the Workplace
IEEE 1584	IEEE Guide for Performing Arc-Flash Hazard Calculations
NEC	National Electrical Code

1.03 SCHEDULE

- A. The report shall be provided to the ENGINEER NO LATER THAN 60 days before the equipment is shipped to the Work site. SHIPMENT AND DELIVERY OF EQUIPMENT WILL NOT BE ACCEPTED AT THE JOBSITE UNTIL THE STUDY HAS BEEN COMPLETED, SUBMITTED AND APPROVED BY THE ENGINEER.

1.04 SUBMITTAL PROCEDURES

Submittals shall be in accordance with this section, the General Requirements, and shall include the following minimum information:

- A. Shop Drawings:
1. Short Circuit and Protective Device Coordination Study. Time current curves shall be on 11x17 log-log type paper. The 11x17 paper with the TCC shall also include a one-line diagram for the branch that the TCC on that sheet corresponds with. The CONTRACTOR can provide time current curves on 8 ½ x 11 log-log type paper as a supplement but not as a replacement.
 2. Provide a list of all recommended settings for all power meters, motor protection relays, feeder protection relays, etc.

3. Arc Flash Hazard Analysis
 - a. Provide a color copy of project specific Arc Flash labels for each panelboard, switchboard, switchgear, disconnect, Motor Control Center, VFDs, starters, transfer switches, including all existing electrical equipment – switchgear, starters, motor control center, panelboards, starters, etc.
 - b. Provide a copy of the one-line diagram color-coded to show the incident ranges at each bus. The one-line shall be on 11x17 paper.
 - 1). The one-line shall also include the information specified in section 2.03 below.
- B. After the report and one-line has been approved, provide a color copy in PDF format of the finalized 11x17 one-line diagram to the Contractor for the Contractor's use to frame in the electrical room as specified in section 26 05 00, "Common Work Results for Electrical". The one-line shall reflect all changes made including but not limited to changes made during construction
- C. The Contractor shall redo the Power System Studies if any changes are made during the field testing checkout and/or start-up. The Contractor shall re-submit the Power System Studies for Engineer Approval. The Studies shall include an updated copy of the color copy Arc Flash Labels.
- D. A CD with all SKM input files and a PDF of all output files is required for both the preliminary and final power system studies Submittal Procedures.
 1. Two Software copies of actual power systems computer program project data files burned in on a CD. The CONTRACTOR shall provide an electronic copy on a CD-ROM of all files used to develop the electrical system model in the power system analysis program and all files for the written study analysis and summary data tables. For instance if SKM software is used for the power system studies, then the SKM files shall be burned in on a CD-ROM and provided to the OWNER/ENGINEER. This shall include any library files used for circuit breakers, fuses, etc. for the power system analysis.

2.00 EXECUTION

2.01 GENERAL

- A. Provide a short-circuit and protective device coordination study load flow and motor starting study, and arc flash hazard analysis on the electrical power distribution system, as specified. The studies shall be performed in accordance with IEEE Standards 141 and 242, IEEE 1584, ANSI, and the NEC and shall utilize the ANSI method of short circuit analysis in accordance with ANSI C37.010. The studies shall be performed using actual equipment data for all equipment. The coordination studies shall use the data from the manufacturer of protective devices.

2.02 QUALIFICATIONS

- A. The studies shall be performed by an electrical manufacturer/consultant serving/electrical testing agency who is regularly engaged in power system studies. A Licensed Professional Engineer with proficiency in electrical power engineering shall conduct the studies and shall seal and sign the studies. The Professional Engineer shall be licensed to practice engineering in the State of Texas. A study submitted without a Professional Engineer's seal will not be reviewed and returned Not Approved, Revise & Resubmit. **EQUIPMENT MANUFACTURERS SHALL NOT BE ALLOWED TO PERFORM THE STUDIES, NO EXCEPTIONS.**

2.03 SHORT CIRCUIT STUDY

- A. The CONTRACTOR shall be responsible for obtaining and verifying all data needed to perform the study.
- B. As a minimum, each short circuit study shall include the following:
1. One-Line Diagram:
 - a. Location and function of each protective device in the system, such as relays, direct-acting trips, fuses, etc.
 - b. Type designation, current rating, range or adjustment, manufacturer's style and catalog number for all protective devices.
 - c. Power and voltage ratings, impedance, primary and secondary connections of all transformers. Use the ratings (ie. Impedance, X/R, etc.) of the actual transformers being provided where available.
 - d. Type, manufacturer, and ratio of all instrument transformers energizing each relay.
 - e. Nameplate ratings of all motors and generators with their subtransient reactances. Transient reactances of synchronous motors and generators and synchronous reactances of all generators. Obtain data on the actual equipment being provided. Generic or average data numbers are not acceptable.
 - f. Sources of short circuit currents such as utility ties, generators, synchronous motors, and induction motors. Provide short circuit studies using each source of power separately. The study shall determine if there is sufficient short circuit current to adequately cause interruption of a protective device using the weaker power source (typically local generation), and shall determine if the equipment can safely interrupt the fault if the greater power source is connected. Additional short circuit calculations shall include emergency as well as normal switching conditions as well as normal and emergency power sources described here in.
 - 1). Show short circuit calculations listing short circuit levels at each bus. Provide the same data in tabular form.
 - g. All significant circuit elements such as transformers, cables, breakers, fuses, reactors, etc shall be included.
 - h. The time-current setting of existing adjustable relays and direct-acting trips, if applicable.

- i. One-Line showing available fault current at each bus all the way down to the 120/240V and 208Y/120V panelboards.
2. Impedance Diagram:
 - a. Available MVA or impedance from the utility company.
 - b. Local generated capacity impedance.
 - c. Bus impedance.
 - d. Transformer and/or reactor impedances.
 - e. Cable impedances.
 - f. Equipment impedances.
 - g. System voltages.
 - h. Grounding scheme (resistance grounding, solidly grounding, or no grounding).
 - i. Motor contribution assuming the new and existing motors as shown on the plans all running at the same time.
 3. Calculations:
 - a. Determine the paths and situations where short circuit currents are the greatest. Assume bolted faults and calculate the 3-phase and line-to-ground short circuits of each case.
 - b. Calculate the maximum and minimum fault currents.
 - c. A discussion section evaluating the adequacy or inadequacy of the equipment method of calculation and formulas used such that all calculations can be verified manually by the ENGINEER, with recommendations as required for improvements to the system.
 - d. Any inadequacies shall be called to the attention of the ENGINEER and recommendation made for improvements.

2.04 PROTECTIVE DEVICE COORDINATION STUDY


- A. As a minimum, the coordination study for the power distribution system shall include the following on 5-cycle, log-log graph paper:
 1. The time-current coordination analysis shall be performed with aid of a digital computer.
 - a. Time-current curves for each device shall be positioned to provide for maximum selectivity to minimize system disturbances during fault clearing, but still maintain a low incident energy level. Where selectivity cannot be achieved, the ENGINEER shall be notified as to the cause.
 2. Time-current curves for each device shall be positioned to provide for maximum selectivity to minimize system disturbances during fault clearing. Where selectivity cannot be achieved, the ENGINEER shall be notified as to the cause.
 3. Time-current curves and points for cable and equipment damage.

4. Circuit interrupting device operating and interrupting times.
5. Indicate maximum fault values on the graph.
6. Sketch of bus and breaker arrangement.

2.05 ARC FLASH HAZARD ANALYSIS

- A. The study shall be performed in accordance with the NEC and all applicable OSHA, ANSI, and IEEE standards.
- B. The CONTRACTOR shall adjust all adjustable time-current devices such that the trip settings lower the arc flash exposure and minimizing the clearing time. However, the CONTRACTOR shall adjust the time-current devices to avoid nuisance tripping.
- C. The CONTRACTOR shall utilize fault current values from the short circuit analysis to determine the Incident energy, limited approach boundary, restricted approach boundary, prohibited approach boundary and appropriate PPE required.
- D. The CONTRACTOR shall provide project specific arc-flash labeling. The arc-flash labeling shall be placed on the outside of the cover of the switchgear, motor control centers, combination motor starters, panelboard, switchboard, distribution panel, and all electrical panels, etc. such that it can be read without opening the electrical equipment. Mount arc-flash labels a maximum of 6'-6" AFF, include the housekeeping pad in the mounting height. The CONTRACTOR shall provide arc-flash labeling on all existing panelboards, switchboards, distribution panel, etc. where breakers are added or work is performed in or on the electrical equipment.
- E. Arc Flash Labels shall be chemical resistant, UV resistant, water resistant, scratch resistant, and made of 3.0 mil vinyl tape as manufactured by DuraLabel, Brady or approved equal. The lettering shall be performed by thermal transfer print.
 1. Arc Flash labels and label lettering shall be sized large enough to be legible at a distance outside the hazard area.
 2. Arc Flash Labels shall be placed on the door(s) of the room if the hazard area reaches or extends beyond the electrical room door(s).
 3. The arc flash label shall include a DANGER header when the incident energy is above 40cal/cm², and a WARNING header for all other incident energy levels.
- F. To ensure a safe workplace, and that the labeling meets NEC, OSHA, IEEE, and NFPA requirements, use specialized arc flash software to calculate protection boundaries. These protection boundaries shall include the Flash Protection Boundary, Limited Approach Boundary, Restricted Approach Boundary and the Prohibited Approach Boundary.
- G. The arc-flash analysis shall be based on calculated fault from the Short Circuit Study at each respective bus. The arc-flash software program shall be used to calculate the available arcing fault at each bus in the system, the resultant flash protection boundary based on the applicable protective device operating times and the associated incident energy that workers may be exposed to at the specified working distances.
- H. The report shall include the following information: Arc-flash evaluation table, arc-flash and shock hazard label definitions, arc-flash evaluation information, arc-flash and shock hazard labels and definitions of terms used in the arc-flash hazard analysis.

I. Arc Flash labels shall be similar to the following example:

 WARNING	
Arc Flash and Shock Hazard	
Appropriate PPE Required	
13 inch	Flash Hazard Boundary
0.67	cal/cm ² Flash Hazard at 18 inches
3	PPE Category
480 VAC	Shock Hazard when cover is removed
0	Glove Class
42 inch	Limited Approach
12 inch	Restricted Approach
10.692 kA	Calculated Available Fault Current
Equip. ID:	Panel LP1
Protected By: 125A CB: TX1 (480V MCC1)	
Study Date: September 15, 2014	
Upstream Protective Device: Panel HP1 Circuit 1,3,5	

END OF SECTION

26 09 23 LIGHTING CONTROL DEVICES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install contactors. Electrical work shall be in accordance with Section 26 05 00, "Common Work Results for Electrical".

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures" and shall include:
 - 1. Project specific control schematic/diagram for Lighting Contactor Panel(s). Submittals without a project specific control schematic/diagram will be rejected and not approved. Diagram shall be done in CAD. Handwritten diagrams are not acceptable.
 - 2. Project Specific Front View Elevation of each Lighting Contactor Panel showing layout of selector switches, indicating lights, etc.
 - 3. Nameplate Schedule
 - 4. Product Data Sheets
 - 5. Bill of Material

1.03 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for in-tended use.
- B. STANDARDS: The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. ANSI/NEMA ICS 6
 - 2. NEMA ICS 2
- C. ACCEPTABLE MANUFACTURERS: Equipment shall comply with the specifications and shall be by the following manufacturers:
 - 1. Lighting contractors:
 - a. Allen-Bradley
 - b. Eaton
 - c. General Electric
 - d. Square D

2.00 PRODUCTS

2.01 ASTRONOMICAL CLOCK

- A. Furnish and install TORK digital time switch with 40 AMP contacts, models EWZ101
- B. Unit shall be capable of 20 set points.
- C. Unit shall be capable of a different schedule for each day of the week.
- D. Unit shall have astronomic option adjustable from 1° - 60° northern or southern latitudes.
- E. Unit shall have astronomic option with offset up to 4 hours and 59 minutes, before or after sunrise.
- F. Unit shall have automatic Daylight Savings Time and Leap Year compensation.
- G. Unit shall program in AM/PM format.
- H. Display shall be of LCD type.
- I. Unit shall have permanent schedule retention.
- J. Unit real time clock shall be retained by capacitor for 100 hours in a power failure.
- K. Unit shall be capable of manual override ON or OFF either in the next scheduled event or permanently.
- L. Unit shall have NEMA Type 3R indoor/outdoor enclosure as standard.
- M. Unit shall have Load Status indication.
- N. Unit shall have Power Failure indication.

2.02 LIGHTING CONTACTORS

- A. Description: Electrically operated and mechanically held, combination type with fusible switch, complying with NEMA ICS 2 and UL 508.
 - 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 - 2. Contactor shall be the number of poles required, rated 30 amps at 120VAC. See plans for more information. Lighting contactors shall be Square D Class 8903 Type L, or approved equal. 120V contactors shall have a 20A, 1 pole circuit breaker rated for 22,000 AIC. Where shown on the plans, the lights shall be fed from this circuit breaker through the contactor. Lighting contactors shall be mounted in a NEMA 1, 12 gauge steel enclosure suitable for indoor installation. See control schematics in plans for more details. Coil operating voltage shall be as indicated on plans.
 - 3. Indicating Lights, Switches, and Pushbuttons: Heavy duty and oil tight (30 mm); Square D Class 9001 or approved equal. Pilot lights shall be push to test (LED type) and shall be Square D SK or approved equal.
 - 4. Provide a print pocket pouch with the control schematic drawings on the inside of the Lighting Contactor door. The control schematic drawings shall be the final version of the drawings and shall include any field revisions made during start-up.

3.00 EXECUTION

3.01 ASTRONOMICAL CLOCK PROGRAMMING

- A. Coordinate desired hours of operation with NTMWD and program into clock.

3.02 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.
- B. Furnish and install a complete exterior lighting control system, as indicated on the plans. Provide materials and equipment to properly interface timing devices and photocells with relays and contactors so that a complete and satisfactory operating system is rendered.

3.03 IDENTIFICATION

- A. Identify components and power and control wiring according with Section 26 05 53, "Identification for Electrical Systems".
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.
 - 3. Externally visible, permanent nameplates shall be provided to identify each switch, indicating light, etc. Equipment and terminal blocks shall be suitably identified. This shall include items on the back side of doors and panel mounted items. Nameplates shall be white with black lettering and attached with stainless steel screws.
- B. Label contactors with a unique designation.

3.04 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.

3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

26 22 13 **LOW VOLTAGE DISTRIBUTION TRANSFORMERS**

1.00 **GENERAL**

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install transformers. Electrical work shall be in accordance with Section 26 05 00, COMMON WORK RESULTS FOR ELECTRICAL.

1.02 QUALITY ASSURANCE

- A. Transformers shall comply with the specifications and shall be produced by the following Manufacturers:
 - 1. Cutler-Hammer
 - 2. General Electric
 - 3. Square D
- B. All others shall submit qualifications to the Owner and the Engineer for review and approval prior to bid submittal no later than one week after bid advertisement date. Any submittals after this time period shall not be evaluated. Qualifications shall include equipment manufacturer who have had at least 10 years of successful experience in providing equipment for similar projects with a generator and pump station configurations. Qualifications shall include a list of similar projects within the last 5 years with the name of the project and contact information of the Owner.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures".
- B. Shop drawings submitted to the Owner/Engineer shall include the following:
 - 1. Bill of Material
 - 2. Equipment Data Sheets showing impedance weights, dimensions, etc. for each transformer.
 - 3. Product data on specified product documenting the following:
 - a. Dimensions
 - b. Weight
 - c. KVA
 - d. Voltage
 - e. % Impedance
 - f. Magnetizing current magnitude and duration
 - g. Taps
 - h. Insulation Class
 - i. Sound Level

- j. Wiring Diagram
- k. Installation Instructions

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:

ANSI/IEEE C57.96	Distribution and Power Transformers, Guide for Loading Dry-Type appendix to ANSI C57.12 standards
ANSI/IEEE C89.2	Dry Type Transformers for General Applications
IEEE C57.12.01	General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and / or Resin-Encapsulated Windings
IEEE C57.12.91	Test Code for Dry-Type Distribution and Power Transformers UL 506, Specialty Transformers
NEMA/ANSI ST20	Dry type transformers for General Applications
IEEE	Institute of Electrical and Electronic Engineers
NEMA TR1	Transformers, Regulators and Reactors
NEMA TP-1 2002	Guide for Determining Energy Efficiency for Distribution Transformers

2.00 PRODUCTS

A. DRY TYPE TRANSFORMERS

1. Provide dry type, 3-phase, delta wye connected transformers with KVA rating as required.
2. Transformers shall be suitable for indoor or outdoor installation as indicated on the plans, or as required by conditions. Transformers 75 KVA and less shall be suitable for floor, wall or trapeze mounting. Transformers larger than 75 KVA shall be suitable for floor or trapeze mounting.
3. Transformer shall be enclosed in a steel enclosure with covers secured with captive type hardware. Transformer shall be cooled by natural convection of air. The transformer enclosure shall be degreased, cleaned, phosphatized, primed and finished with a gray baked on enamel.
4. The average audible sound level shall not exceed 50 DB for transformers rated at 75 KVA and below, nor 60 DB for transformers rated above 75 KVA, when measured in accordance with NEMA Standard TR1.
5. The percent impedance for transformers shall not exceed 4.6 for up to 112 1/2 KVA 6 for 150 KVA to 750 KVA.
6. The transformers shall have the following characteristics:
 - a. Class H insulation
 - b. 150 degree Centigrade temperature rise rating at 40 degrees C ambient at full rated load.
 - c. Compartment for primary and secondary connections.

- d. Transformer coils shall be of continuous copper wound construction with terminations brazed or welded. Coils shall be impregnated with non hygroscopic, thermosetting varnish.
 - e. The maximum temperature of top of the enclosure shall not exceed 50 degrees C rise above a 40 degrees C ambient.
 - f. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible copper grounding conductor sized in accordance with applicable NEMA, IEEE, or ANSI standards.
 - g. Transformers shall have two (2) 2-1/2% full ampacity taps below and two (2) 2-1/2% taps above rated voltage in primary.
 - h. The basic impulse level shall be 10 KV for transformers less than 30 KVA, 30 KV for transformers 300 KVA and larger.
 - i. Transformer primary and secondary windings shall be copper. Aluminum windings shall not be permitted.
 - j. Transformers shall have efficiencies in accordance with NEMA TP-1. Provide written documentation as part of submittal process stating this and showing actual transformer efficiencies.
7. Three-phase transformer efficiency, total losses, shall not exceed losses @ 35% and 75°C per the NEMA Premium program tested per 10 C.F.R. Part 431 ("Test Procedures for Distribution Transformers"). Shall not exceed
- a. 15 kVA: 97.88% 112.30 W; 121.28 W
 - b. 30 kVA: 98.24% 185.52 W; 200.35 W
 - c. 45 kVA: 98.38% 256.42 W; 276.93 W
 - d. 75 kVA: 98.59% 362.89 W; 391.92 W
 - e. 112.5 kVA: 98.73% 500.31 W; 540.33 W
 - f. 150 kVA: 98.80% 576.14 W; 622.22 W
 - g. 225 kVA: 98.95% 764.14 W; 825.26 W
 - h. 300 kVA: 99.02% 1010.010 W; 1090.81 W.

3.00 EXECUTION

3.01 LOCATION

- A. Electrical Contractor to verify proper location for the unit.
- B. The transformer shall be installed in a location where the sides with ventilated openings are a minimum distance of six inches from noncombustible structures or equipment to ensure adequate air circulation

3.02 INSTALLATION

- A. Set the transformer plumb and level. Provide solderless lug bonding connection on the inside of the transformer enclosure in accordance with the NEC. Make primary and secondary connections with liquid tight flexible metal conduit to isolate transformer noise from the building structure or conduit system.
- B. When final connection has been made, check secondary voltage at dry transformers and make tap adjustments required to obtain correct voltage.
- C. Perform the following isolation procedures in addition to those provided by the transformer Manufacturer. Provide pad-type vibration isolators or waffle pads sized to load 50 pounds per square inch. Install one (1) at each corner of the transformer at floor mount or trapeze installations. Locate pads between hanger and wall for wall hung installations
- D. For critical installations, spring type isolation may be required by the Engineer consisting of steel, spring-type isolators, sized for 1/2" deflection based on the weight of the transformer. Install at each corner or in hanger rods so that vibration is not transmitted to the building structure.
- E. Secure transformer to concrete base according to manufacturer's written instructions.
- F. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

3.03 CONNECTIONS

- A. Ground equipment according to Section 26 05 26 GROUNDING & BONDING FOR ELECTRICAL SYSTEMS.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- C. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.04 FIELD QUALITY CONTROL

- A. Inspect installed dry type transformers for anchoring, alignment, grounding and physical damage.
- B. Check tightness of all accessible mechanical and electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer's instructions.

3.05 CLEANING

- A. Repaint scratched or marred exterior surfaces to match original finish.

3.06 TESTING

- A. Testing: All testing required shall be per Specification 26 01 26 Testing of Electrical Systems.

- B. Transformers furnished to this specification shall receive the following production tests:
1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.
 2. Applied Potential;
 3. Induced Potential;
 4. No Load Losses;
 5. Voltage Ratio;
 6. Polarity;
 7. Continuity
- C. Manufacturer shall perform the following additional tests on units identical to the design type being supplied to this specification. Manufacturer shall provide on request test data sheets to prove performance of these tests.
1. Sound Levels
 2. Temperature Rise Tests
 3. Full-Load Losses
 4. Regulation
 5. Impedance

3.07 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
- B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION

26 24 16.02 LIGHTING AND BRANCH PANELBOARDS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install lighting and branch panelboards. Electrical work shall be in accordance with Section 26 05 00, "Common Work Results for Electrical".

1.02 QUALITY ASSURANCE - ACCEPTABLE MANUFACTURERS

- A. Panelboards shall comply with the specifications and shall be by the following Manufacturers:
 - 1. Eaton
 - 2. General Electric
 - 3. Square D

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures" and shall include:
 - 1. Shop Drawings:
 - a. Bill of Material
 - b. Front Elevation with dimensions
 - c. Assembly ratings including short circuit ratings, continuous current and voltage
 - d. Cable terminal sizes
 - e. Cut sheet on circuit breakers and surge protective devices

1.04 STANDARDS

- A. Circuit breakers, molded case, and branch circuit shall be in accordance with the applicable provisions of the following standards as if written here in their entirety:
 - 1. Fed. Spec. W-C-375
 - 2. NEMA AB1 Molded Case Circuit Breakers and their application.
 - 3. NEMA PB1 Panelboards

1.05 DELIVERY AND STORAGE

- A. Equipment shall be handled and stored in accordance with the manufacturer's instructions. Equipment shall be protected from damage.

1.06 WARRANTY

- A. The manufacturer shall warrant the equipment to be free from defects.

1.07 QUALITY ASSURANCE

- A. Manufacturer shall be ISO 9001 2000 or later certified.
- B. Manufacturer shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

2.00 PRODUCTS

2.01 PANELBOARDS

- A. Panelboards shall consist of a box, front, interior and circuit protective devices and shall be manufactured in accordance with NEMA PB1 and bearing the applicable U.L. labels.
- B. Panelboards shall be four wire, three phase as scheduled or required. Panelboards shall be NEMA 1 for air conditioned spaces and 4X 304 Stainless Steel for all other locations and suitable for surface mounting. Panelboards shall contain sequence style busing and full capacity neutral, composed of an assembly of bolt-on, molded case, automatic breakers with thermal and an instantaneous, magnetic trip in each pole and a trip-free position separate from either the "On" and the "Off" positions. Two (2) and three (3) pole circuit breakers shall simultaneously open all poles. The use of metal clips tying single pole circuit breakers together to make a multi-pole breaker shall not be allowed. Circuit breakers, molded case and branch circuits shall be in accordance with Fed. Spec. W-C-375.
- C. The voltage rating, phase, number of wires and ampere rating shall be as indicated and scheduled on the plans.
- D. The panelboard box shall be fabricated of code gauge, steel in accordance with U.L. standards and have turned edges around the front for rigidity and frontal clamping. Provide standard knockouts on the panel enclosures.
- E. The panelboard front shall be fabricated of sheet steel and finished with a baked on gray enamel over a rust inhibitor. Each front shall have a door mounted on semi-concealed hinges with a cylinder lock, an index card and a card holder. Panelboard locks shall be master keyed, with two (2) keys furnished for each panelboard. Index cards shall be properly typewritten.
- F. The interior of the panelboard shall consist of a factory-assembled, rigid frame supporting the rectangular bus, the mains and the neutral bar.
- G. Busing shall be tin-plated copper and arranged for sequential phasing throughout. The bus bar shall be sized so that the temperature rise is limited in accordance with NEMA standards. The insulated neutral bar shall be located at the opposite end of the structure from the mains.
- H. Panelboards shall have either solderless lugs or a main circuit protective device as scheduled. Each enclosure shall have grounding lugs and uninsulated equipment grounding terminals.

2.02 CIRCUIT BREAKERS

- A. Panelboards shall be equipped with circuit breakers.

- B. Circuit breakers shall be molded case, bolt in type.
- C. Single pole circuit breakers serving fluorescent lighting loads shall have the SWD marking. Circuit breakers serving air conditioning branch loads shall be U.L. listed as type HACR.
- D. Each circuit breaker used in the panelboards shall have an interrupting capacity of not less than the RMS symmetrical rating indicated on the plans for that panelboard.
- E. Circuit breakers shall be manufactured by the panelboard manufacturer.
- F. The panelboard and circuit breaker interrupting capacities and rating shall be equal to or greater than the fault currents available to each panelboard and as shown on the panelboard schedules on plans. Series rating of breakers shall not be permitted.

2.03 SURGE PROTECTION DEVICES

- A. Surge Protection Device Description: IEEE C62.41-compliant, internally mounted, wired-in, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, third edition Type2, short-circuit current rating matching or exceeding the switchboard short-circuit rating, and with the following features and accessories:
 - 1. Fuses, rated at 200-kA interrupting capacity.
 - 2. Fabrication using bolted compression lugs for internal wiring.
 - 3. Integral disconnect switch/circuit breaker.
 - 4. Redundant suppression circuits.
 - 5. Redundant replaceable modules.
 - 6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 - 7. LED indicator lights for power and protection status.
 - 8. Audible alarm, with silencing switch, to indicate when protection has failed.
 - 9. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
 - 10. Four-digit, transient-event counter set to totalize transient surges.
- B. Peak Single-Impulse Surge Current Rating: 200kA per phase, 100kA per mode.
- C. Protection modes and UL 1449 3rd edition VPR for grounded wye circuits with 480Y/277V, 208Y/120V, three-phase, four-wire circuits shall be as follows:
 - 1. Line to Neutral, Line to Ground, Neutral to Ground: 1200 V for 480Y/277V and 800 V for 208Y/120V.
 - 2. Line to Line: 2000 V for 480Y/277V and 1200 V for 208Y/120V.
- D. Protection modes and UL 1449 3rd edition VPR for 240V, three-phase, three-wire circuits shall be as follows:
 - 1. Line to Line: 1200 V for 240V.

2. Line to Ground: 1200 V for 240V

3.00 EXECUTION

3.01 INSTALLATION

- A. Install the panelboard in accordance with applicable codes at each location indicated on the plans. Provide filler plates for unused spaces in the panelboard. All labeling shall be in accordance to Section 26 05 00, "Common Work Results for Electrical".
- B. Mount panelboard with 1/4" spacers off of walls.
- C. NAMEPLATES:
 1. For indoor applications with Air Conditioning: Plastic, black 1" letters on white background, on the front of each door on the switchgear; identifying the compartment contents for each compartment.
 2. All other applications: Plastic, black 1" letters on white background, on the front of each door on the switchgear; identifying the compartment contents for each compartment.
 3. Attach nameplates with a stainless steel screw and nut at each end of the nameplate. Adhesive backed nameplates shall not be installed.

END OF SECTION

26 27 26 WIRING DEVICES

1.00 GENERAL

1.01 WORK INCLUDED

Furnish labor, materials, equipment and incidentals necessary to install wiring devices. Electrical work shall be in accordance with Section 26 05 00, "Common Work Results for Electrical".

1.02 QUALITY ASSURANCE - ACCEPTABLE MANUFACTURERS

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.
- D. Products shall comply with the specifications and shall be by the following Manufacturers:
 - 1. Hubbell
 - 2. Leviton
 - 3. Pass & Seymour

1.03 SUBMITTALS

Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures" and shall include:

- A. Shop Drawings for Wiring Devices: Cut sheets of all devices indicating model being provided, NEMA configuration, rating, color, etc.

1.04 STANDARDS

The applicable provisions of the following standard shall apply as if written here in its entirety:

NEMA WD-1	General Color Requirements for Wiring Devices
NEMA WD-6	Wiring Devices – Dimensional Requirements
UL 943	Ground-Fault Circuit-Interruptioners
NFPA 70	National Electrical Code

2.00 PRODUCTS

2.01 MANUFACTURED PRODUCTS

- A. WALL SWITCHES: For general use, totally enclosed industrial type, specification grade, rated for 120/277 VAC and 20 amps. Approved wire connection to switches shall consist of inserting wire into back wiring hole and tightening terminal screw until wire is tightly gripped by clamping mechanism inside switch body. Side wiring shall not be allowed. Switches installed in hazardous areas shall be explosion proof type in accordance with the NEC.
- B. MOTOR RATED SWITCHES: HP rated switches approved for motor control or disconnect service when controlling or disconnecting motor loads in excess of 1/4 HP; 20 amp switches for loads exceeding 10 amps.
- C. WEATHERPROOF SWITCHES: Fitted with a single switch as specified, and weatherproof cover with spring door cover; gray in color for all areas.
- D. RECEPTACLES: For general use shall be U.L. approved, hospital grade heavy duty duplex grounding type 20 ampere 125 volt heavy duty phosphor bronze contacts. Terminal screws shall be large head, deep slotted #8-32 brass, backed out, color coded for polarity identification, and shall accept up to 10 AWG wire. Side wiring shall not be allowed.
 - 1. GROUND FAULT CIRCUIT INTERRUPTING, INDOOR: GFCI receptacle shall include visible indication of ground fault condition. Feed-through feature shall not be used. Install GFCI device at each location indicated. GFCI circuit breaker shall not be permitted.
 - 2. ISOLATED-GROUND RECEPTACLES: Isolated-ground receptacles shall be listed and labeled as isolated-ground type. Receptacle body shall be orange in color. Isolation-ground shall be integral to the receptacle construction and not dependent on removable parts.
 - 3. WEATHER RESISTANT RECEPTACLES: Weather resistant receptacles shall be listed as weather resistant type in accordance with the National Electrical Code.
 - 4. WEATHERPROOF RECEPTACLES:
 - a. Weatherproof receptacles shall be hospital grade, 20 ampere, 125 volt and shall be listed as weather resistant type in accordance with the National Electrical Code and shall include a weatherproof device cover.
 - 1). Weatherproof Duplex Receptacle: Provide GFCI duplex receptacle with weatherproof cover.
 - 2). Weatherproof Single Receptacle: Provide a cast box fitted with a single receptacle and threaded cap with a weatherproof cover.
 - b. Weatherproof device covers shall have a NEMA 3R rating while receptacle is in use Heavy Duty rating with die cast metal construction as manufactured by Taymac Corporation, Tempe, Arizona or Thomas & Betts
- E. SWITCH AND RECEPTACLE COVER PLATES: The cover plate color shall be stainless steel for all areas, unless otherwise indicated or required by the NEC. Screw heads shall have color to match plate, 304 stainless steel. Provide telephone cover plates which are the same as above, except with a single bushed pole for the telephone cable.

3.00 EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
- D. Existing Conductors:
 - 1. Cut back and pigtail, or replace all damaged conductors.
 - 2. Straighten conductors that remain and remove corrosion and foreign matter.
- E. Pigtailing all conductors is required. Outlet boxes shall be oversized to allow pigtailing. All wiring devices shall be wired using pigtails.
- F. Terminate stranded wire with crimp on connectors.
- G. Install receptacles and switches only in electrical boxes which are clean, free from excess building materials, dirt and debris.
- H. Install switches, wall-mounted duplex receptacles and telephone outlets at the heights specified in Section 26 05 33, "Raceways and Boxes for Electrical Systems", unless indicated otherwise on the plans.
- I. Switches installed at one (1) location shall be ganged together under one (1) cover plate.
- J. Sharing of neutrals is not allowed.
- K. Through on wiring at receptacles is not allowed.

3.02 FIELD QUALITY CONTROL

- A. Test wiring devices to insure electrical continuity of grounding. Energize the circuit to demonstrate compliance with the requirements.
- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 108 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION

26 28 16 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

1.00 GENERAL

1.01 WORK INCLUDED

Furnish labor, materials, equipment and incidentals necessary to install disconnects. Electrical work shall be in accordance with Section 26 05 00, "Common Work Results for Electrical".

1.02 QUALITY ASSURANCE - ACCEPTABLE MANUFACTURERS

Disconnects shall comply with the specifications and shall be by the following Manufacturers:

- A. Eaton
- B. General Electric
- C. Square D
- D. No Approved Equal

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures" and shall include:
 - 1. Shop Drawings:
 - a. Product Data Sheets for Disconnects and Circuit Breakers.
 - b. Complete rating
 - c. Short circuit withstand ability of bus and lowest rated device
 - d. Overall outline dimensions including the space available for conduit
 - e. Conduit entry and exit points clearly showing dimensions of entry and exit points. Provide a detailed bottom view showing how conduits penetrate the bottom of the enclosure. Coordinate with the Electrical Contractor on this prior to submitting information to the Engineer.
 - f. Overall weight of line-up and each shipping split
 - g. Complete bill of materials with cut sheets on all major equipment clearly identifying exact model numbers of each component.
 - h. Device description
 - 2. O&M Manual
 - a. Operation and maintenance manuals shall contain the shop drawing submittals, final drawings with any changes made during start-up and maintenance procedures.
 - b. Operation and maintenance manuals shall include warranty information as well as a warranty information page that shall include information on the warranty start and end date as well as contact information for service

1.04 STANDARDS

The applicable provisions shall apply as if written here in their entirety:

- A. ANSI/UL - 198E
- B. NEMA RS1
- C. Fed. Spec. FS-WS-865

2.00 PRODUCTS

2.01 MANUFACTURED PRODUCTS

A. DISCONNECT SWITCHES:

- 1. Class "R" or non-fusible; of the required ampere rating, or as indicated on the plans; heavy duty, either single throw or double throw (as indicated in the plans) quick-make, quick-break, 3-phase, 3-pole switches, unless otherwise indicated.
- 2. Enclosure: NEMA 4X, 304 for Stainless Steel for interior and exterior installations not exposed to a hazardous location, as indicated on Construction Drawings. Furnish enclosures with interlocking covers with maintenance defeat feature and external front-operated flange-mounted switch levers. Disconnects shall have provisions for the use of three (3) safety padlocks in the "Off" position. Furnish horsepower rated switches for motor circuits. The fuse interrupting rating shall be 65,000 rms amperes.

3.00 EXECUTION

3.01 INSTALLATION

Install disconnect switches as required by the National Electrical Code. Install fuses in fusible disconnect switches where indicated on drawings.

END OF SECTION

26 29 87 ELECTRICAL CONTROL PANELS

1.00 GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install functional control panels to manually or automatically operate control systems as specified in the detailed requirements of this Section, and logic and schematics as shown on the Electrical Drawings.
- B. Submittals for Electrical Control Panels, specified as Control Panels by the Electrical or Mechanical equipment manufacturer, shall be submitted under this Section of the Specifications.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures"
- B. Submittals shall also contain information on related equipment to be furnished under this Specification. Incomplete submittals not containing the required information on the related equipment will also be returned unreviewed.
- C. The original equipment manufacturer shall create all equipment shop drawings, including all wiring diagrams, in the manufacturer's Engineering department. All equipment shop drawings shall bear the original equipment manufacturer's logo, drawing file numbers, and shall be maintained on file in the original equipment manufacturer's archive file system. Photocopies of the Engineer's ladder schematics are unacceptable as shop drawings.
- D. Submit to the Owner/Engineer, shop drawings and product data, for the following:
 - 1. Product data sheets and catalog numbers for overcurrent protective devices, motor starters, control relays, control stations, meters, pilot lights, etc. The manufacturer's name shall be clearly visible on the each cut sheet submitted. List all options, trip adjustments and accessories furnished specifically for this project. Clearly mark each sheet to indicate which items apply and/or those items that do not apply.
 - 2. Provide control systems engineering to produce custom project specific unit elementary drawings showing interwiring and interlocking between components and to remotely mounted devices. Include and identify all connecting equipment and remote devices on the schematics. The notation "Remote Device" will not be acceptable. Show wire and terminal numbers. Indicate special identifications for electrical devices per the Drawings.
 - 3. Equipment outline drawings showing elevation, plan and interior views, front panel arrangement, dimensions, weight, shipping splits, conduit entrances and anchor bolt pattern. Indicate all options, special features, ratings and deviations from this Section.
 - 4. Project Specific Schematic diagram, including manufacturer's selections of component ratings, and CT and PT ratios.
 - 5. Project Specific Power and control schematics including external connections. Show wire and terminal numbers, and color-coding.
 - 6. Instruction and replacement parts books.
 - 7. As-built final drawings.

8. Documentation that the panel assembly facility is a UL-508 certified panel shop.
 9. Facsimile of the UL label that is to be applied to the completed panel.
 10. Furnish complete Bill of Materials indicating manufacturer's name and part numbers.
 11. Manufacturer's cut sheets for every component used in the panel assembly adequately marked to show the items being included. The manufacturer's name shall be clearly visible on the each cut sheet submitted.
 12. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
 13. Major component ratings including:
 - a. Voltage
 - b. Continuous current
 - c. Interrupting ratings
 14. Cable terminal sizes.
 15. Instruction and renewal parts books.
- E. Factory Tests. Submittals shall be made for factory tests specified herein.
- F. Field Test Reports. Submittals shall be made for field tests specified herein.
- G. Operation and Maintenance Manuals.
1. Operation and maintenance manuals shall include the following information:
 - a. Manufacturer's contact address and telephone number for parts and service.
 - b. Instruction books and/or leaflets
 - c. Recommended renewal parts list
 - d. Record Documents for the information required by the Submittals paragraph above.

1.03 REFERENCE CODES AND STANDARDS

- A. All products and components shown on the Drawings and listed in this specification shall be designed and manufactured according to latest revision of the following standards (unless otherwise noted):
1. NEMA Standard ICS 2 - 2000 Industrial Control and Systems
 2. NFPA 70- National Electrical Code (NEC)
 3. NFPA 70E- Standard For Electrical Safety in the Workplace
 4. NFPA 79- Electrical Standard for Industrial Machinery
 5. UL 508/508A -Industrial Control Enclosures

- B. All equipment specified in this Section of the Specifications shall bear the appropriate label of Underwriters Laboratories.

1.04 QUALITY ASSURANCE

- A. The manufacturer of this equipment shall have produced similar equipment for a minimum period of five (5) years. When requested by the Owner/Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- B. The control panels shall be assembled in a UL-508 certified facility. A submittal of documentation certifying that the panel fabrication facility is a UL-508 certified facility is required. A UL label shall be affixed to the inside of the external door by the panel fabrication assembly. Submit a facsimile of the UL label in the submittal information.
- C. All components and material shall be new and of the latest field proven design and in current production. Obsolete components or components scheduled for immediate discontinuation shall not be used.
- D. Control Panels submitted shall fit within the space shown on the Drawings. Equipment which does not fit within the space is not acceptable.
- E. For the equipment specified herein, the manufacturer shall be ISO 9001 2000 certified.
- F. Equipment components and devices shall be UL labeled wherever UL standards exist for such equipment. The completed control panel shall be UL Labeled in accordance with UL 508 and 508A and other applicable UL standards. The panel shall also be UL labeled for the environment in which it is to be placed. A UL label shall be affixed to the inside of the external door by the panel fabrication assembly. Submit a facsimile of the UL label in the submittal information.

1.05 JOBSITE DELIVERY, STORAGE AND HANDLING

- A. Prior to jobsite delivery, the Contractor shall have successfully completed all submittal requirements, and present to the Owner/Engineer upon delivery of the equipment, an approved copy of all such submittals. Delivery of incomplete constructed equipment, onsite factory work, or failed factory tests will not be permitted.
- B. Equipment shall be handled and stored in accordance with manufacturer's instructions. Two (2) copies of these instructions shall be included with the equipment at time of shipment, and shall be made available to the Contractor and Owner/Engineer.
- C. Shipping groups shall be designed to be shipped by truck, rail, or ship. Indoor groups shall be bolted to skids. Breakers and accessories shall be packaged and shipped separately.
- D. Equipment shall be installed in its permanent finished location shown on the Drawings within seven (7) calendar days of arriving onsite. If the equipment cannot be installed within seven (7) calendar days, the equipment shall not be delivered to the site, but stored offsite, at the Contractor's expense, until such time that the site is ready for permanent installation of the equipment.
- E. Where space heaters are provided in equipment, provide temporary electrical power and operate space heaters during storage, and after equipment is installed in permanent location, until equipment is placed in service.

1.06 WARRANTY

- A. The Manufacturer shall warrant the equipment to be free from defects in material and workmanship for two years from date of final payment of the equipment containing the items specified in this Section. Within such period of warranty the Manufacturer shall promptly furnish all material and labor necessary to return the equipment to new operating condition. Any warranty work requiring shipping or transporting of the equipment shall be performed by the Contractor at no expense to the Owner.

2.00 PRODUCTS

2.01 MATERIAL MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following material Manufacturers are acceptable:
 - 1. General Electric Co.
 - 2. Eaton | Cutler-Hammer
 - 3. Square D Co.
 - 4. Allen Bradley
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Materials listed above are not relieved from meeting these Specifications in their entirety.

2.02 RATINGS

- A. The service voltage shall be as specified and as shown on the Drawings. The overall short circuit withstand and interrupting rating of the equipment and devices shall be 65,000 amperes RMS symmetrical at 480Y/277 Volts and 22,000AIC for 208Y/120 Volts. This includes all circuit breakers and combination motor starters. Systems of motor controllers employing series connected ratings for main and feeder devices shall not be used. Motor starter units shall be tested and UL 508A labeled for the specified short circuit duty in combination with the motor branch circuit protective device.
- B. There shall be selective device coordination between the Main Breaker, Feeder Breakers and control circuit protective devices. When using a circuit breaker or fuses as a main protective device, the instantaneous trip levels of the main protective device shall be higher than the available fault current to the control panel. If fuses are utilized in the control panel design, the protective devices for 3 phase loads shall contain single phase protection of such equipment. If a fault occurs in the circuit of one load of a design with a backup load, the feeder protective device shall not remove both loads from the control system.
- C. Use ground fault sensing on grounded wye systems.
- D. The complete control panel assembly shall be UL certified or carry a UL listing for "Industrial Control Panels".
- E. The control panel shall meet all applicable requirements of the National Electrical Code.
- F. The control panel enclosure shall be NEMA rated as indicated in the Electrical Specifications.

- G. Motor controllers, including associated devices, shall be designed for continuous operation at rated current in a 40 degree C ambient temperature unless noted otherwise.
- H. For additional ratings and construction notes, refer to the Drawings.
- I. The Manufacturer shall produce and install on each panel, an Arc Flash Warning Label listing the various Flash Hazard Protection Boundaries, calculated from NFPA 70E, Annexes, as listed below:
 - 1. Flash Hazard Protection Boundary.
 - 2. Limited Approach Boundary.
 - 3. Restricted Boundary.
 - 4. Prohibited Boundary.
 - 5. Incident Energy Level.
 - 6. Required Personal Protective Equipment Class.
 - 7. Type of Fire Rated Clothing.

2.03 CONSTRUCTION

A. General

- 1. Refer to Drawings for: actual layout and location of equipment and components; current ratings of devices, bus bars, components; protective relays, voltage ratings of devices, components and assemblies; and other required details.
- 2. Control units shall be arranged as shown on the Drawings.
- 3. Nameplates
 - a. External
 - 1). Nameplates shall be engraved, laminated impact acrylic, matte finish, not less than 1/16-in thick by 3/4-in by 2-1/2-in, Rowmark 322402. Nameplates shall be 304 SS screw mounted to all enclosures except for NEMA 4 and 4X. Nameplates for NEMA 4 and 4X enclosures shall be attached with double faced adhesive strips, TESA TUFF TAPE 4970, .009 X W', or equal. Prior to installing the adhesive nameplates, the metal surface shall be thoroughly cleaned with 70% alcohol until all residue has been removed. Epoxy adhesive or foam tape is not acceptable. Nameplates shall be white with black letters.
 - 2). There shall be a master nameplate that indicates supply voltage equipment ratings, short circuit current rating, manufacturer's name, shop order number and general information. Cubicle nameplates shall be mounted on the front face, on the rear panel and inside the assembly, visible when the rear panel is removed.
 - 3). Provide permanent warning signs as follows:
 - a). "Danger- High Voltage- Keep Out" on all doors.
 - b). "Warning- Hazard of Electric Shock - Disconnect Power Before Opening or Working On This Unit" on main power disconnect or disconnects.

- b. Internal
 - 1). Provide the panel with a UL 508A label.
 - 2). Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification, corresponding to appropriate designations on manufacturer's wiring diagrams.
 - c. Special
 - 1). Identification nameplates shall be white with black letters, caution nameplates shall be yellow with black letters, and warning nameplates shall be red with white letters.
4. Control Devices and Indicators
- a. All operating control devices, indicators, and instruments shall be securely mounted on the panel door. All controls and indicators shall be 30mm, corrosion resistant, reinforced plastic, NEMA 4/4X/13. Auxiliary contacts shall be provided for remote run indication and indication of each status and alarm condition. Additional controls shall be provided as specified herein and as required by the detailed mechanical and electrical equipment requirements.
 - b. Indicator lamps shall be LED type. Unless otherwise shown on the Drawings, lens color shall be Red for ON or OPEN, Green for OFF or CLOSED, Amber for FAIL or ALARM, and White for POWER ON. For all control applications, indicator lamps shall incorporate a push-to-test feature.
 - c. Mode selector switches (HAND-OFF-AUTO, LOCAL-OFF-REMOTE, etc) shall be as shown on the Drawings. Units shall have the number of positions and contact arrangements, as required. Each switch shall have an extra dry contact for remote monitoring.
 - d. Pushbuttons shall be Red for START or OPEN, Green for STOP or CLOSE, mushroom Red for EMERGENCY STOP (Pull to Reset), and Black for RESET.
 - e. Furnish nameplates for each device. All nameplates shall be laminated plastic, black lettering on a white background, attached with stainless steel screws. Device mounted nameplates are not acceptable.
5. Control and Instrument Power Transformers
- a. Control power transformers shall be provided where shown on the Drawings. Transformer shall be sized for the entire load, including space heaters, plus 25% spare capacity, and shall be not less than 100VA.
 - b. Control power transformers shall be 120 volt grounded secondary. Primary side of the transformer shall be fused in both legs. One leg of the transformer secondary shall be solidly grounded while the other leg shall be fused.
6. A failure alarm with horn and beacon light shall be provided when required or specified. Silence and reset buttons shall be furnished. Alarm horn and beacon shall be by Federal Signal; Crouse-Hinds, or equal, NEMA 4X for all areas except for NEMA 7 areas, which shall be NEMA 7/4X cast aluminum.

7. Where specified or shown on the Drawings, a six-digit, non-resettable elapsed time meter shall be installed on the face of each motor starter.
- B. Enclosure Types
1. NEMA 4X 304 Stainless Steel enclosures for all areas, unless specifically stated otherwise, or shown on the Drawings.
 - a. Wall Mounted
 - 1). Enclosures shall be NEMA Type 4X of 304 stainless steel with mounting lugs or brackets made on the enclosure suitable for wall mounting. Enclosures shall not have holes or knockouts. Enclosures shall not be less than .080 in. thick, gauge metal. All enclosures shall have continuous hinged, foam-in-place gasketed doors with handle latch, 3-point above 20" x 20". Screw-clamp latches shall not be acceptable. All enclosures shall have bonding provisions on door. Enclosures shall be LHCXXXXXSS6 Series with Hoffman APWKXXXXNFSS Window Kit, where shown on the Drawings, as manufactured by Hoffman Engineering Co. or equal.
 - b. Free Standing
 - 1). Enclosures shall be NEMA Type 4X of 304 stainless steel, with lifting eyes, without knockouts or holes. Enclosures shall not be less than 12 gauge metal. All enclosures shall have continuous hinged, foam-in-place gasketed doors with handle latch, 3-point. All enclosures shall have bonding provisions on door. Enclosures shall be AXXXXXXFSS6 Series with Hoffman APWKxxXXNFSS Window Kit, where shown on the Drawings, as manufactured by Hoffman Engineering Co. or equal.
 2. NEMA Types 1 or 1A enclosures will not be permitted, unless specifically stated in the Specification for the equipment, or shown on the Drawings.
 3. All panels installed outdoors shall have a factory applied, suitable primer and final coat of weather-proof white paint.
 4. Each enclosure shall incorporate a removable back panel, and side panels, on which control components shall be mounted. Back panel shall be secured to the enclosure with collar studs for wall mounted enclosures, and 304 stainless steel hardware for free standing enclosures. The enclosure door shall be interlocked with the main circuit breaker by a door mounted operating mechanism. Back panel shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any components.
 5. All enclosures shall be pad-lockable.
 6. The enclosure outer door shall have a rear mounted pocket, containing laminated copies of the Control schematics.
 7. Overload tables shall be laminated and adhered to the inside of the door.
- C. Environmental Conditioning
1. Condensation Control
 - a. A self-contained enclosure condensation heater with thermostat and fan shall be mounted inside the control panel, if panel is mounted outdoors or in a non-air-conditioned space.

- 1). Enclosure heaters shall be energized from 120 volt, single-phase power supply and sized to prevent condensation within the enclosure.
 - 2). Locate enclosure heaters to avoid overheating electronic hardware or producing large temperature fluctuations on the hardware.
 - 3). Enclosure heaters shall have an internal fan for heat distribution and shall be controlled with adjustable thermostats. The thermostat shall have an adjustment range of 40 degrees Fahrenheit to 90 degrees Fahrenheit. Provide a circuit breaker or fused disconnect switch within the enclosure.
 - 4). Enclosure heaters shall be Hoffman type DAH or equal.
- b. Strip heaters may be provided if they are 240 volt rated, powered at 120 volts AC and do not have a surface temperature higher than 60°C. Strip heaters and thermostats shall be as manufactured by Chromalox or equal.
- 1). Strip heaters shall be Chromalox, Type OT, 1.5-in wide, 240 Volts, single phase, 150 watts, energized at 120 volts, with rust resisting iron sheath, Catalog No. OT-715, Product Code No. 129314, or equal. Provide sufficient wattage in heaters to prevent condensation should the interior temperature of the enclosure drop below the dew point.
 - 2). A control thermostat mounted inside the control Panel shall be Chromalox, Type WR, single stage, Catalog No. WR-80, Product Code No.263177, or equal.
 - 3). The strip heater terminals shall be guarded by a protective terminal cover.
 - 4). High temperature connecting lead wire shall be used between the thermostat and the heater terminals. Wire shall be No. 12 AWG stranded, nickel-plated copper with Teflon glass insulation and shall be the product of Chromalox, Catalog No. 6-CFI-12, Product Code No. 263783, or equal.
- c. Each panel shall have a stainless steel condensate drain, installed on a stainless steel conduit hub, HGTZ Series, T&B or equal, in the bottom of the enclosure. Drain shall be 0-Z GedneyDBB-50SS, or equal.
2. Corrosion Control
- a. Provide corrosion protection in each control panel with a corrosion-Inhibiting vapor capsule as manufactured by Northern instruments; Model Zerust VC, or Hoffman Engineering; Model A-HCI, or equal.
3. Enclosure Fans
- a. Fans shall be furnished for soft start starters and VFDs, as required by the manufacturer, to provide air circulation and cooling. Fans shall be controlled by a temperature switch. The fan shall operate only when the drive is "ON" and for a cool- down period after the drive has stopped Otherwise the fan shall not run when the drive is "OFF". Louvers, if provided, shall have externally removable filters. The filter shall be metallic and washable.
 - b. Fan motors shall be protected by an input circuit breaker. Metal squirrel cage ball bearing, three phase fan motors with 10-year design life shall be used in the drive design. Plastic muffin fans are not acceptable. Fan power shall be obtained from a tap on the main control power transformer.

- c. A "loss of cooling" fault shall be furnished. In the event of clogged filters or fan failure, the drive shall produce an alarm and then, in a predetermined time, be shut down safely without electronic component failure by the temperature switch.
- d. Redundant fans shall be provided in the drive design as backup in the event of fan failure.
- e. Enclosure fans shall not be allowed on any NEMA 4X Enclosures.

D. Internal Wiring

- 1. Power and control wiring shall be tinned stranded copper, minimum size No. 14 AWG, with 600 Volt, 90 degree C, flame retardant, Type MTW thermoplastic insulation. Line side power wiring shall be sized for the full rating or frame size of the connected device, and as shown on the Drawings.
- 2. Analog signal wires shall be 600 Volt Class, insulated stranded tinned copper, twisted shielded #16 AWG pair.
- 3. All interconnecting wires between panel mounted equipment and external equipment shall be terminated at numbered terminal blocks. Field wiring shall not be terminated directly on any panel-mounted device.
- 4. All wiring shall be tagged and coded with an Identification number as shown on the Drawings. Coding shall be typed on a heat shrinkable tube applied to each end showing origination and destination of each wire. The marking shall be permanent, non-smearing, solvent-resistant type similar to Raychem TMS-SCE, or equal.
- 5. All wiring shall be enclosed in PVC wire trough with slotted side openings and removable cover. Plan wire routing such that no low twisted shielded pair cable conducting analog 4-20 mA signals or low voltage analog signals are routed in the same wire trough as conductors carrying discrete signals or power.

E. Field Installed Internal Wiring

- 1. Field installed interior wiring shall be neatly grouped by circuit and bound by plastic tie wraps. Circuit groups shall be supported so that circuit terminations are not stressed. In addition, low signal wiring (millivolt and milliamp) shall be bundle separately from the rest of the control wiring.
- 2. All field wiring shall be tagged and coded with an identification number. Coding shall be typed on a heat shrinkable tube applied to each end of the wire. The marking shall be a permanent, non-smearing, solvent-resistant type similar to Raychem TMS-SCE, or equal
- 3. In general, all conduit entering or leaving equipment shall be stubbed up into the bottom of the enclosure directly below the area in which the conductors are to be terminated, or from the top if shown on the Drawings. Conduits shall not enter the side unless approved in writing by the Owner/Engineer.

F. Terminal Blocks

- 1. Terminal blocks shall be DIN-rail-mounted one-piece molded plastic blocks with tubular-clamp-screw type and end barriers. Terminal blocks shall be rated for 600 volts except for control and instrumentation circuits, or 4-20 mA analog signal conductors.

2. Provide 600 volt rated terminal blocks for any conductor carrying any voltage over 120 volts to ground.
 3. Provide 600 volt rated strap screw terminal blocks for any power conductors carrying over 20 amps, at any voltage. Terminals shall be double sided and supplied with removable covers to prevent accidental contact with live circuits.
 4. Power conductors carrying over 20 amps, at any voltage shall be terminated to strap-screw type terminal blocks with crimp type, pre-insulated, ring-tongue lugs. Lugs shall be of the appropriate size for the terminal block screws and for the number and size of the wires terminated. Do not terminate more than one conductor in any lug, and do not land more than two conductors under any strap-screw terminal point.
 5. Terminals shall have permanent, legible identification, clearly visible with the protective cover removed. Each terminal block shall have 20 percent spare terminals, but not less than two spare terminals.
 6. Use the manufacturer's provided bridge connectors to interconnect terminal blocks terminating common or ground conductors.
 7. Twisted shielded pair or triad cables shall have each individual conductor and shield drain wire landed on individual terminal blocks. Use the manufacturer's provided bridge connectors to interconnect terminal blocks terminating the shield drain wire conductors.
 8. Control circuits, 120 volts and below, and 4-20 mA analog signal conductors shall be terminated with manufacturer's recommended insulated connectors.
 9. Provide an AC ground bar bonded to the panel enclosure (if metal) with 20 percent spare terminals.
 10. Provided ground terminal blocks for each twisted-shielded pair drain wire.
- G. CONTROL RELAYS: Industrial type; contacts rated for 10 amps at 600 VAC; Allen-Bradley bulletin 700 type PK, Square D Class 8501 type X, or approved equal. Relays shall have the capability of having contact decks added in the field. Contacts shall be field convertible to normally open or normally closed. Coils and contacts shall each be replaceable without replacing any other part of the relay. Where control relays are indicated on the Plans, industrial control relays shall be furnished whether the relay coil is operated with 120 VAC or 24 VDC. General purpose "plug-in" type relays shall not be acceptable.
- H. INDICATING LIGHTS, SWITCHES, PUSHBUTTONS: Heavy duty and oil tight (30mm); Square d Class 9001 or approved equal. Pilot lights shall be push to test (LED type) and shall be Square d SK or approved equal.

2.04 MAIN CIRCUIT PROTECTIVE DEVICE

- A. Unless otherwise shown on the Drawings, the main circuit protective device shall be a molded case (MCCB), 3 Pole, 600 Volt, fixed type, manually operated with stored energy closing mechanism. Trip device shall be solid state with adjustable long time pickup, and delay; adjustable short time pickup and delay; short time i²t switch.

- B. Provide a flange mounted main power disconnect operating handle with mechanical interlock having a bypass that will allow the panel door to open only when the switch is in the OFF position. Where panels are shown or specified with inner and outer doors, disconnecting handles and controls shall be located on the inner door.
- C. The overall short circuit withstand and interrupting rating of the equipment and devices shall be 65,000 amperes RMS symmetrical at 480Y/277 Volts and 22,000AIC for 208Y/120 Volts.

2.05 REMOTE MONITORING AND CONTROL INTERFACE

- A. General: All control and interconnection points from the equipment to the plant control and monitoring system shall be brought to a separate connection box. No field connections shall be made directly to the equipment control devices. Functions to be brought out shall be as shown on the Drawings
- B. Discrete control or status functions shall be form C relays with contacts rated at 120 volts AC. Analog signals shall be isolated from each other.
- C. Equipment functions to be directly interfaced to the Plant Control and Monitoring System shall be designed for operation with an Ethernet Connection.
- D. The equipment manufacturer shall factory enter the proper IP Address for such connection. Upon request by the Contractor, the Owner/Engineer will provide the proper Internet Protocol Address (IP Address), to be configured by the equipment manufacturer.
- E. Refer to the Drawings for monitored parameters.
- F. Communication
 - 1. For remote monitoring, one of the following communication capabilities shall be provided:
 - a. One (1) integral 10/100BaseT Ethernet port supporting Modbus TCP, Ethernet IP and SNMP protocols.
 - b. One (1) media protocol converter, interfacing the provided equipment to a 10/100BaseT Ethernet port supporting Modbus TCP, Ethernet IP and SNMP.
 - 2. The protocol interface shall implement the following:
 - a. All data shall be available and/or mirrored within the Modbus 4x or "Holding Register" memory area.
 - b. Register 4x00001 shall exist and be readable to allow simple, predictable "comm tests".
 - 3. The media protocol converter shall meet the following criteria:
 - a. The converter shall support 10/100Base-T Ethernet. The serial port speed (baud rate) shall support 230kbps. The protocol shall support Modbus TCP, Ethernet IP, DF1, and Modbus RTU/ASCII. Protocol shall be Web Browser configurable.
 - b. Operating limits shall be 0-60 degrees C, with humidity range minimum of 5-90 percent. Shock capability on the serial port shall be ESD +15 kV air GAP meeting IEC 1000-4-2. Power requirements shall be 9-30VDC at 0.5A minimum.

- c. The converter shall have LED status for serial, signals, power, and Ethernet.
- d. The converter housing shall be UL 1604, Class 1 Div 2, DIN Rail mountable. The converter shall have DB-9M port connection, with screw terminals, to the input.
- e. Converter shall be Digi One IAP, or approved equal.

2.06 FACTORY TESTING

- A. The entire control panel shall be completely assembled, wired, and adjusted at the factory and shall be given the manufacturer's routine shop tests and any other additional operational test to insure the workability and reliable operation of the equipment.
- B. Factory test equipment and test methods shall conform with the latest applicable requirements of ANSI, IEEE, UL, and NEMA standards.
- C. The operational test shall include the proper connection of supply and control voltage and, as far as practical, a mockup of simulated control signals and control devices shall be fed into the boards to check for proper operation.
- D. Factory test equipment and test methods shall conform to the latest applicable requirements of ANSI, IEEE, UL, and NEMA standards, and shall be subject to the Owner/Engineer's approval.

2.07 ENCLOSURES FOR BREAKER REMOTE CONTROL PANEL

- A. Enclosure: The Breaker Remote Control Panel shall be housed in a NEMA 4X, 304 stainless steel enclosure. It shall have lifting eyes and a front door provided with a key locking handle.
- B. All switches, fuses, terminal blocks, etc., shall have permanent nameplates or labels for identification. All wiring shall be identified with wiring markers with alphanumeric characters. The identification of each wire shall be the same as that shown on the electrical schematic. Each wire shall be so identified at each end. Each end of every wire shall be provided with a heat shrinkable or equivalent sleeve-type wire marker-labeled in accordance with the electrical schematic. Use of adhesive and clip-on type markers is prohibited.
- C. Provide a print pocket pouch with the control schematic drawings on the inside of the Panel door. The control schematic drawings shall be the final version of the drawings and shall include any field revisions made during start-up.
- D. All relays and pushbuttons shall be NEMA rated, heavy duty type. IEC or dual IEC/NEMA rated equipment shall not be acceptable.
- E. Terminal strips shall be 600V, NEMA rated manufactured by Allen-Bradley, Phoenix Contact or approved equal. Distribution blocks shall be per Section 26 05 19, "Low Voltage Electrical Conductors & Cables".

- F. CONTROL RELAYS: Industrial type; contacts rated for 10 amps at 600 VAC; Allen-Bradley Bulletin 700 Type PK, Square D Class 8501 Type X, or approved equal. Relays shall have the capability of having contact decks added in the field. Contacts shall be field convertible to normally open or normally closed. Coils and contacts shall each be replaceable without replacing any other part of the relay. Where control relays are indicated on the Plans, industrial control relays shall be furnished whether the relay coil is operated with 120 VAC or 24 VDC. General purpose "plug-in" type relays shall not be acceptable.
- G. INDICATING LIGHTS, SWITCHES, PUSHBUTTONS: Heavy duty and oil tight (30 mm); Square D Class 9001 or approved equal. Pilot lights shall be push to test (LED type) and shall be Square D SK or approved equal.
- H. Acceptable cabinet manufacturers:
 - 1. Hoffman
 - 2. Hammond
 - 3. Rittal

3.00 EXECUTION

3.01 INSTALLER'S QUALIFICATIONS

- A. Installer shall be specialized in installing this type of equipment with minimum 5 years documented experience. Experience documentation shall be submitted for approval prior to beginning work on this project.

3.02 EXAMINATION

- A. Examine installation area to assure there is enough clearance to install the equipment.
- B. Housekeeping pads shall be included for the floor mounted motor controllers as detailed on the drawings, with the exception of motor controllers which are to be installed adjacent to an existing unit. Housekeeping pads for these (if used) should match the existing installation.
- C. Check concrete pads and baseplates for uniformity and level surface.
- D. Verify that the equipment is ready to install.
- E. Verify field measurements are as instructed by manufacturer.

3.03 INSTALLATION

- A. The Contractor shall install all equipment per the manufacturer's recommendations and Contract Drawings.
- B. Conduit hubs for use on raceway system pull and junction boxes shall be watertight, threaded aluminum, insulated throat, stainless steel grounding screw, as manufactured by T&B H150GRA Series, or equal.
- C. Conduits entering a control Panel or box containing electrical equipment shall not enter the enclosure through the top.
- D. Install required safety labels.

3.04 RACEWAY SEALING

- A. Where raceways enter junction boxes or control panels containing electrical or instrumentation equipment, all entrances shall be sealed with 3M 1000 NS Watertight Sealant, or approved equal
- B. This requirement shall be strictly adhered to for all raceways in the conduit system.

3.05 FIELD QUALITY CONTROL

- A. Inspect installed equipment for anchoring, alignment, grounding and physical damage.
- B. Check tightness of all accessible electrical connections. Minimum acceptable values are specified in manufacturer's instructions.

3.06 FIELD ADJUSTING

- A. Adjust all circuit breakers, switches, access doors, operating handles for free mechanical and electrical operation as described in manufacturer's instructions.

3.07 FIELD TESTING

- A. Perform all electrical field tests recommended by the manufacturer. Disconnect all connections to solid-state equipment prior to testing.
- B. Megger and record phase to phase and phase to ground insulation resistance. Megger, for 1 minute, at minimum voltage of 1000 VDC. Measured Insulation resistance shall be at least 100 megohms. In no case shall the manufacturer's maximum test voltages be exceeded.
- C. Test each key interlock system for proper functioning.
- D. Test all control logic before energizing the motor or equipment.

3.08 CLEANING

- A. Remove all rubbish and debris from inside and around the motor controllers. Remove dirt, dust, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint free rags. Do not use compressed air.

3.09 EQUIPMENT PROTECTION AND RESTORATION

- A. Touch-up and restore damaged surfaces to factory finish, as approved by the manufacturer. If the damaged surface cannot be returned to factory specification, the surface shall be replaced.

3.10 MANUFACTURER'S CERTIFICATION

- A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted, including all settings designated in the Power System Study, and tested in accordance with the manufacturer's recommendations.
- B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.11 TRAINING

- A. Provide manufacturer's services for training of plant personnel in operation and maintenance of the soft start starters furnished under this Section.
- B. The training for each type of equipment shall be for a period of not less than one (1) eight hour day.
- C. The cost of training program to be conducted with Owner's personnel shall be included in the Contract Price. The training and instruction, insofar as practicable, shall be directly related to the system being supplied.
- D. Provide detailed O&M manuals to supplement the training course. The manuals shall include specific details of equipment supplied and operations specific to the project.
- E. The training session shall be conducted by a manufacturer's qualified representative. Training program shall include instructions on the assembly, motor starters, protective devices, metering, and other major components.
- F. The Owner reserves the right to videotape the training sessions for the Owner's use.

END OF SECTION

26 41 13 LIGHTNING PROTECTION FOR STRUCTURES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, design, materials, equipment and incidentals necessary to install a complete lightning protection system for the meter vault structure in accordance with UL 96A, NFPA 780. Lightning protection system shall be tied to the grounding system.

1.02 QUALITY ASSURANCE

- A. The system furnished under this specification shall be the standard product of a manufacturer regularly engaged in the production of lightning protection systems and shall be the manufacturer's latest approved design. Listing of the manufacturer in the lightning protection section of the current edition of Underwriters' Laboratories, Inc., Electrical Construction Materials List will be accepted as compliance with this requirement.
- B. All materials shall be copper and bronze and of the size, weight and construction to suit the application where used in accordance with UL, NFPA, NEC code requirements for this type structure and as per manufacturer's recommendations. Class I sized components may be utilized on roof levels 75 feet and below in height. Class II sized components are required for roof levels over 75 feet in height.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures", and shall include:
 - 1. Shop Drawings
 - a. Specifications
 - b. Catalog Sheets for All Products Provided
 - c. Shop drawings showing type, size and location of all equipment, grounds, cable routings, details, etc.
 - 2. Continuity Test Report
 - 3. Copy of U.L. Master Label for the Facility

1.04 STANDARDS AND REFERENCES

- A. Refer to Section 26 05 00, "Common Work Results for Electrical", for all standards which apply to this section.

NFPA 780	Standard for the Installation of Lightning Protection Systems
UL 96A	Standard for Installation Requirements for Lightning Protection Systems
LPI 175	Lightning Protection Institute Standard of Practice

2.00 PRODUCTS

2.01 MATERIALS

- A. Materials used in connection with the installation of the lightning protection systems shall be approved for lightning protection systems by the Underwriters' Laboratories, Inc. No combination of materials shall be used that form an electrolytic couple of such a nature that corrosion is accelerated in the presence of moisture unless moisture is permanently excluded from the junction of such metals. When unusual conditions exist which would cause deterioration or corrosion of conductors, conductors with suitable protective coatings or oversize conductors shall be used. If a mechanical hazard is involved, the conductor size shall be increased to compensate therefore, or suitable protection shall be provided. The conductors may be protected by covering them with molding or tubing preferably made of wood or nonmagnetic material. If metal tubing is used, the conductor shall be electrically connected to it at its upper and lower ends.
- B. All equipment used shall be new and of a design and construction to suit the application in accordance with UL 96A requirements and shall be so marked.

2.02 MANUFACTURED PRODUCTS

- A. CONDUCTORS - Copper conductors manufactured of copper grade ordinarily required for commercial electrical work generally designated as being 98 percent conductive when annealed. Down conductors of copper cable for installations other than towers shall weigh not less than 187.5 pounds per thousand feet and the size of any wire of this cable shall not be less than No. 17 AWG (0.045 inch). Down conductors shall be tinned. The thickness of any copper ribbon or strip shall be not less than No. 16 AWG (0.051 inch).
- B. AIR TERMINALS - Air terminals shall be tapered to a blunt point. The rod shall be of solid copper, 1/2 inch in diameter. Air terminals and support shall be designed over 24 inches to handle a 75 pound per square foot wind load. All air terminals shall be supported by a suitable brace, with guide(s) not less than one-half the height of the air terminal. Air terminals shall be located in accordance with the requirements of NFPA 780 and UL 96A. Air terminals shall extend at least ten inches above the object or area they are intended to protect. Air terminals shall be placed around the perimeter of flat or gently sloping roofs at intervals not exceeding 20 feet.
- C. FASTENERS - Fasteners shall be of the same material as the conductor base material or bracket being fastened, or other equally corrosion resistant material. Galvanized or plated materials shall not be used.
- D. FITTINGS - Fittings/bonding devices, cable splicers, and miscellaneous connectors shall be suitable for use with the installed conductor and shall be copper, bronze or aluminum with bolt pressure connections to the cable. Cast or stamped crimp type fittings shall not be used.
- E. Aluminum material may be used where the installation of dissimilar metals creates problems. The Contractor shall field verify all materials involved in the total installation and shall install system in accordance with all applicable NFPA and U.L. codes and standards.

3.00 EXECUTION

3.01 INSTALLATION

- A. The Contract Drawings (shop drawings) shall indicate the extent and general arrangement of the lightning protection system. If any departures from the Contract Drawings (shop drawings) are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Engineer for approval. No such departures shall be made without the prior written approval of the Engineer. Lightning protection systems for all applications shall conform to National Fire Protection Association Code No. 780 and the NEC, whichever is more stringent.
- B. Installation shall be performed by a certified master installer. Installer shall provide an Underwriters' Laboratories Master Label for the facilities.
- C. Air terminals shall be provided on the highest projections and at intervals not exceeding 20 feet along the perimeter top surface. Air terminals shall extend at least 10 inches above the object or area that they are intended to protect. Air terminals shall be connected to the lightning protection system when specifically authorized by the Engineer.
- D. Roof and down conductors shall be stranded and shall meet the requirements given in NFPA 780. Roof and down conductors shall maintain a horizontal or downward course. No bend in a roof or down conductor shall form an included angle of less than 90 degrees, nor shall it have a bend radius of less than eight inches. Conductors shall be routed external to buildings and six feet or more from power or signal conductors. Down conductors shall be routed outside of any structure and shall not penetrate or invade that structure. All down conductors except one may be provided with a screw type connector as described in UL 96 where lightning protection system testing may be required. Down connectors shall be supported from and secured to the building exterior using one hole straps of copper or bronze at maximum intervals of three feet.
- E. Guards shall be provided for down conductors located in or next to driveways, walkways or other areas where they may be displaced or damaged. Guards shall extend at least six feet above and one foot below grade level. Guards shall be metal pipe. Metal guards shall be bonded to the down conductor at both ends. Bonding jumpers shall be of the same size as the down conductor. Crimp type fittings shall not be used.
- F. Metallic bodies, on or below roof level, that are subject to induced charges from lightning include exhaust fans, radio towers, HVAC units, ladders, railings, antennas, roof drains, plumbing, vents, metal coping, metal flashing, gutters, downspouts, small metal wall vents, door and window frames, metal balcony railings, and in general any isolated metallic body within six feet of an exposed lightning protection system element. When these metallic bodies have a metal thickness of 3/16 inch or greater, they shall be bonded to the nearest main lightning protection system conductor with UL approved fittings and conductors meeting the requirements of NFPA 780. These bonding fittings shall provide surfaces of not less than three square inches. Provisions shall be made to prevent corrosive effects introduced by galvanic action of dissimilar metals at bonding points. If the metal parts of these units are less than 3/16 inch thick, additional approved air terminals, conductors and fittings, providing a two way path to ground from the air terminals shall be installed.

- G. If metallic, the mast of roof mounted antennas and obstruction lightning shall be bonded to the nearest roof or down conductor using UL approved fittings and conductors. The bonding jumpers shall be of the same size and material as the roof or down conductor to which they are connected. Provide as a minimum a path to ground at each corner of the building.
- H. Aluminum material may be used where the installation of dissimilar metals creates problems. The Contractor shall field verify all materials involved in the total installation and shall install system in accordance with all applicable NFPA and U.L. codes and standards.
- I. The lightning protection system for the ground storage tank shall consist of installing air terminals at 20 foot intervals along the perimeter top surface of the tank and anywhere else on the top of the tank that is required by UL, NFPA and LPI. Air terminals shall extend at least 10 inches above the tank. Air terminals shall be connected together with a cable ring conductor. "Down" conductors shall extend from the cable ring conductor down the side of the tank to the earth connecting to the ground rods.

3.02 FIELD QUALITY CONTROL

- A. The lightning protection system will be inspected by the Engineer to determine conformance with the requirements of this specification. No part of the system shall be concealed until so authorized by the Engineer.
- B. The Contractor shall establish and maintain quality control for the "Lightning Protection System" installation to assure compliance with contract requirements, and shall maintain records of his quality control for all construction operations. A copy of these records and Contractor tests, as well as records of corrective action taken, shall be furnished to Owner's Representative, as directed by the Engineer.
- C. Contractor shall obtain an Underwriters' Laboratories Master Label for the facility.
 - 1. Upon completion, an application shall be made to the Underwriters Laboratories, Inc. for inspection and certification.
 - 2. Cost for UL inspection and associated costs to obtain the UL Master Label shall be paid for by the Contractor.
- D. Testing of Continuity of all Conductors - A copy of these records and tests, as well as the records of corrective action taken, shall be furnished to Owner's Representative, as directed by the Engineer.

END OF SECTION

26 50 00 LIGHTING

1.00 GENERAL

1.01 WORK INCLUDED

Furnish labor, materials, equipment and incidentals necessary to install light fixtures, complete with lamps, ballasts and other incidentals. Electrical work shall be in accordance with Section 26 05 00, "Common Work Results for Electrical".

1.02 QUALITY ASSURANCE

A. ACCEPTABLE MANUFACTURERS

Lamps shall comply with the specifications and shall be by the following Manufacturers:

1. Refer to the Lighting Fixture Schedule for a listing of approved manufacturer's.

1.03 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00, "Submittals Procedures" and shall include Shop Drawings:

1. Refer to the Lighting Fixture Schedule for the manufacturer and model number for each type of fixture. Submittals with alternate manufacturers than those listed in the lighting fixture schedule will not be reviewed and will be returned without review.
2. Bill of Material
3. Product data sheets for each fixture type:
 - a. Product data sheets shall be marked for each fixture type, arranged in the order of the fixture designation.
 - b. Product data for fixtures, lamps, ballasts, drivers and emergency lighting units.
 - c. Outline drawings indicating dimensions and principal features of the fixture.
 - d. Electrical ratings and photometric data provided by certified laboratory tests for the fixture and lamps.
 - e. Provide data on LED Fixture indicating it is rated for maintained 70% lumen output at 60,000 hours.

1.04 DELIVERY AND STORAGE

- A. Ship light fixtures inside protective cartons and keep packaged until installed. Deliver lamps to the job site in the original packing cases and sleeves.
- B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- C. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.05 JOB CONDITIONS

- A. Provide cold weather ballasts in fixtures which are subject to temperatures below 32 degrees F.
- B. Provide special mounting, enclosures and fire-safing, as required by the authorities having jurisdiction so that the integrity of the U.L. listed ceiling assemblies is maintained.
- C. Provide U.L. labels where fixtures are subject to moisture. Provide DL or WL label on fixtures required for the location.
- D. Contractor shall verify voltages with ballasts and power supplies prior to ordering fixtures.

1.06 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
 - 2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
 - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
 - 4. Warranty Period for Lamps: Replace lamps and fuses that fail within 12 months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second 12 months from date of Substantial Completion.
 - 5. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than 5 years from date of Substantial Completion.

2.00 PRODUCTS

2.01 MATERIALS

- A. LED DRIVERS AND LAMPS: Drivers and LED lamps shall be integral to the fixture. The fixture shall be rated for operating temperatures of -40°C to +60°C, UL wet location rated with frosted impact rated glass lens. Fixture shall be rated for maintained 70% lumen output at 60,000 hours.
- B. POLES AND SUPPORT COMPONENTS:
 - 1. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.

2. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 - a. Materials: Shall not cause galvanic action at contact points.
 - b. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
 - c. Anchor-Bolt Template: Plywood or steel.

3.00 EXECUTION

3.01 INSTALLATION

- A. Provide the lighting fixtures, as specified and scheduled on the plans. If a type designation is omitted, verify the fixture selection with the Engineer before installation.
- B. Check the architectural finishes and provide fixtures with proper trim, frames, support hangers and other hardware required to coordinate with the proper finishes, regardless of the specified or scheduled catalog number, prefixes and suffixes.
- C. Test and aim flood lights, when dark outside to provide a uniform and widespread, illuminated area. Direct units as indicated or instructed by the Engineer to prevent objectionable glare.
- D. Furnish and install a complete exterior lighting control system, as indicated on the plans. Provide materials and equipment to properly interface timing devices and photocells with relays and contactors so that a complete and satisfactory operating system is rendered.

3.02 CLEAN AND ADJUST

- A. Immediately before final inspection, clean all fixtures, inside and out, including plastics and glassware. Adjust all trim to properly fit adjacent surfaces. Replace broken or damaged parts. Lamp and test all fixtures for electrical, as well as, mechanical operation.

3.03 SPARE PARTS

- A. LED Driver: Furnish at least one of each type.
- B. Globes and Guards: Furnish at least one of each type.

END OF SECTION

DIVISION 31

EARTHWORK

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31 05 13 SOILS FOR EARTHWORK

1.00 GENERAL

1.01 WORK INCLUDED

- A. This Section describes the classes of Earth Fill. All the classes of Earth Fill contained in this specification may not be used on this project. The classes of Earth Fill used on this project are shown on the drawings or specified in other sections. This Section does not include specifications for placement and compaction of Earth Fill. Specifications for placement and compaction of Earth Fill are included in other sections and/or shown on the drawings.

1.02 STANDARDS

- A. Soil materials shall be classified into the appropriate class of Earth Fill shown below according to ASTM D2487 "Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)" or other appropriate methods as designated by the Engineer.

2.00 PRODUCTS

2.01 MATERIALS; CLASSIFICATIONS

- A. Class 1 Earth Fill: Limited to clays and sandy clays classified as CH material with a liquid limit greater than or equal to 50, a plasticity index greater than or equal to 25, and a minimum of 60 percent passing the No. 200 sieve, which are free of organic materials.
- B. Class 2 Earth Fill: Limited to clays and sandy clays classified as CH and CL materials with a coefficient of permeability less than or equal to 1.0×10^{-7} cm/sec, a liquid limit greater than or equal to 30, a plasticity index greater than or equal to 15, and more than 50 percent passing the No. 200 sieve, which are free of organic materials.
- C. Class 3 Earth Fill: Consist of any materials classified as CH, CL, SM, SP, SP-SM, SC, and GC, which have a minimum plasticity index of 4, which are free of organic materials.
- D. Class 4 Earth Fill: Consist of materials which are classified as SP, SM, SC, CL, or dual classifications thereof, which have a liquid limit less than or equal to 35 and a plasticity index between a minimum of 7 and a maximum of 15, maximum of 70 percent passing the No. 200 sieve, which are free of organic materials.
- E. Class 5 Earth Fill: Consist of materials classified as SP or SP-SM which have a plasticity index less than or equal to 4 and a maximum of 12 percent passing the No. 200 sieve, which are free of organic materials.
- F. Class 12 Earth Fill: Consist of soils suitable for topsoil which are relatively free of stones or other objectionable debris, which have sufficient humus content to readily support vegetative growth. The suitability of soils for topsoil shall be subject to the approval of the Engineer.

END OF SECTION

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31 05 16 **AGGREGATES FOR EARTHWORK**

1.00 **GENERAL**

1.01 WORK INCLUDED

- A. This Section describes the classes of Aggregate Fill. All the classes of Aggregate Fill contained in this specification may not be used on this project. The classes of Aggregate Fill used on this project are shown on the drawings or specified in other sections. This Section does not include installation. Installation of Aggregate Fill is included in other sections and/or on the drawings.

1.02 QUALITY ASSURANCE

- A. Classification Testing:
 - 1. Contractor Testing:
 - a. Arrange and pay for the services of an independent testing laboratory to sample and test proposed Aggregate Fill materials.
 - b. Submit the test results to the Engineer, and obtain approval prior to providing Aggregate Fill.
 - 2. Owner Testing: The Owner shall arrange and pay for additional testing on the Aggregate Fill after delivery to the project site as determined necessary by the Engineer.
- B. Contamination Certification:
 - 1. Obtain a written, notarized certification from the Supplier of each proposed Aggregate Fill source stating that to the best of the Supplier’s knowledge and belief there has never been contamination of the source with hazardous or toxic materials.
 - 2. Submit these certifications to the Engineer prior to proceeding to furnish Aggregate Fill to the site. The lack of such certification on a potential Aggregate Fill source shall be cause for rejection of that source.

1.03 STANDARDS

- A. Aggregate Fill shall be classified into the appropriate class listed below according to ASTM testing procedures as specified for the various classes.
 - 1. American Society for Testing and Materials (ASTM) Standards:

ASTM C33	Specification for Concrete Aggregates
ASTM C88	Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium sulfate
ASTM C125	Terminology Relating to Concrete and Concrete Aggregates
ASTM C131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C535	Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM D448	Classification for Sizes of Aggregate for Road and Bridge Construction

2.00 PRODUCTS

2.01 MATERIALS; CLASSIFICATIONS

- A. Class 1 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 57:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	95-100
1/2"	25-60
No. 4	0-10
No. 8	0-5

- B. Class 2 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 67:

Sieve Size Square Opening	Percent Passing
1"	100
3/4"	90-100
3/8"	20-55
No. 4	0-10
No. 8	0-5

- C. Class 3 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with

ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 7:

Sieve Size Square Opening	Percent Passing
3/4"	100
1/2"	90-100
3/8"	40-70
No. 4	0-15
No. 8	0-5

- D. Class 4 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 467:

Sieve Size Square Opening	Percent Passing
2"	100
1-1/2"	95-100
3/4"	35-70
3/8"	10-30
No. 4	0-5

- E. Class 5 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 357:

Sieve Size Square Opening	Percent Passing
2-1/2"	100
2"	95-100
1"	35-70
1/2"	10-30
No. 4	0-5

- F. Class 6 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 1:

Sieve Size Square Opening	Percent Passing
4"	100
3-1/2"	90-100
2-1/2"	25-60
1-1/2"	0-15
3/4"	0-5

- G. Class 7 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and shall have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 6:

Sieve Size Square Opening	Percent Passing
1"	100
3/4"	90-100
1/2"	20-55
3/8"	0-15
No. 4	0-5

- H. Class 8 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and shall have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 56:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	90-100

3/4"	40-85
1/2"	10-40
3/8"	0-15
No. 4	0-5

I. Class 9 Aggregate Fill:

1. Consist of washed and screened gravel and natural sands or sands manufactured by crushing stones complying with the requirements of ASTM C33, except that the gradation shall be as follows:

Sieve Size Square Opening	Percent Passing
1/2"	100
3/8"	95-100
No. 4	80-95
No. 8	65-85
No. 16	50-75
No. 30	25-60
No. 50	10-30
No. 100	0-10

2. Class 9 Aggregate Fill shall have not more than 45 percent passing any sieve and retained on the next consecutive sieve of those shown above, and its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.

J. Class 10 Aggregate Fill:

1. Consist of washed and screened natural sands or sands manufactured by crushing stones complying with the requirements and tests of ASTM C33. The gradation as included in ASTM C33 is as follows:

Sieve Size Square Opening	Percent Passing
3/8"	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	0-10

2. Class 10 Aggregate Fill shall have not more than 45 percent passing any sieve and retained on the next consecutive sieve of those shown above, and its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.

K. Class 11 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-3/4"	100
7/8"	65-90
3/8"	50-70
No. 4	35-55
No. 40	15-30
No. 100	0-12 (Wet Sieve Method)

L. Class 12 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	85-100
3/4"	60-95
3/8"	50-80
No. 4	40-65
No. 16	20-40
No. 100	0-12 (Wet Sieve Method)

M. Class 13 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with

ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and shall meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-3/4"	100
7/8"	65-90
3/8"	50-70
No. 4	35-55
No. 40	15-30
No. 100	0-3 (Wet Sieve Method)

- N. Class 14 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	85-100
3/4"	60-95
3/8"	50-80
No. 4	40-65
No. 16	20-40
No. 100	0-3 (Wet Sieve Method)

- O. Class 15 Aggregate Fill: Consist of durable particles of silica sand, washed clean, chemically inert, and packaged by the Supplier. The material shall meet applicable regulatory requirements for monitor well filter pack. The source of the material shall be approved by the Engineer and shall meet the following gradation requirements:

Sieve Size Square Opening	Percent Passing
No. 20	98-100
No. 40	0-2

END OF SECTION

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31 23 10 STRUCTURAL EXCAVATION AND BACKFILL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to complete structural excavation, filling, backfilling, and compacting; to provide protection to equipment and cuts; to include backfill material; the construction or installation of cofferdams, and other similar facilities which may be necessary to perform excavations and/or backfilling; to include the necessary pumping, bailing, or associated drainage; to remove and dispose of surplus materials, cofferdams, and debris; and to provide final grading, as required.
- B. The work does not include excavation, filling, and backfilling for utility lines, manholes, vaults, valve boxes, and related structures. Work shall be performed in accordance with Section 31 23 33.16 "Trenching and Backfill."

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Submit qualifications of independent testing laboratory for approval.
 - 2. Backfill material classifications. Provide certification by an approved independent testing laboratory.
 - 3. Compaction test results. Provide compaction test results within 24 hours.

1.03 STANDARDS

- A. The following publications, referred to hereafter by basic designation only, form a part of this specification as if written herein in their entirety:
 - 1. American Society for Testing and Materials (ASTM) Standards:

ASTM D698	Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
ASTM D1556	Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D4253	Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4254	Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

- B. Any other testing required by these specifications and not specifically referenced to a standard shall be performed under ASTM or other appropriate standards as designated by the Engineer.
- C. References herein or on the drawings to soil classifications shall be understood to be according to ASTM D2487, "Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)" unless indicated otherwise.

1.04 DELIVERY AND STORAGE

- A. Deposit material to be used for backfill in storage piles at points convenient for handling of the material during the backfilling operations.

1.05 JOB CONDITIONS

- A. Review subsurface investigations. A limited subsurface investigation has been performed by Freese and Nichols, Inc. A geotechnical technical memorandum from that investigation is available at the Engineer's office. However, the precise profile of soil and rock strata beneath this site is not known.
- B. Review the site and determine the conditions which may affect the structural excavation, prior to the commencement of the excavation.

2.00 PRODUCTS

2.01 MATERIALS

- A. Compacted Select Fill: Fill shall be Class 4 Earth Fill as specified in Section 31 05 13 "Soils for Earthwork."
- B. Crushed Limestone Base Material: Conforming to TxDOT Standard Specifications, Item 247, Grade 1 or 2, Type A.
- C. On-Site Clays: Maximum aggregate size of 2 inches, free of organics.
- D. Clay Cap: Clay cap shall be Class 2 Earth Fill as specified in Section 31 05 13 "Soils for Earthwork."
- E. Flowable Fill: As specified in Section 31 23 23.34 "Flowable Fill."
- F. Lean Concrete Backfill: As specified in Section 03 30 00 "Cast-In-Place Concrete."
- G. Structural Earth Backfill: Structural backfill shall be Class 4 Earth Fill as specified in Section 31 05 13 "Soils for Earthwork."
- H. Structural Aggregate Backfill: Structural aggregate backfill shall be Class 2 Aggregate Fill as specified in Section 31 05 16 "Aggregates for Earthwork."
- I. Topsoil: Topsoil shall be Class 12 Earth Fill as specified in Section 31 05 13 "Soils for Earthwork."

2.02 COMPACTION EQUIPMENT

- A. Compaction equipment shall conform to the following requirements and shall be utilized as specified herein.
 - 1. Pneumatic Rollers: Pneumatic rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be such size and ply as can be maintained at tire pressures between 80 and 100 pounds per square inch for a 25,000-pound wheel load during roller operations. The roller wheels shall be located abreast and be designed so that each wheel will carry approximately equal load in transversing uneven ground. The spacing of the wheels shall be such that the distance between the nearest edges of adjacent tires will not be greater than 50 percent of the tire width of a single tire at the operating pressure of a 25,000-pound wheel load. The roller shall be provided with a body suitable

for ballast loading such that the load per wheel may be varied, from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed 10 miles per hour. The character and efficiency of this equipment shall be subject to the approval of the Engineer.

2. **Vibratory Rollers:** Vibratory rollers shall have a total static weight of not less than 20,000 pounds, with at least 90 percent of the weight transmitted to the ground through a single smooth drum when the roller is standing in a level position. The diameter of the drum shall be between 5 and 5-1/2 feet and the width between 6 and 9 feet. The unsprung weight of the drum, shaft, and internal mechanism shall not be less than 12,000 pounds. The frequency of vibration during operation shall be between 1100 and 1500 i.e., and dynamic force shall not be less than 40,000 pounds at 1400 i.e. No backing of the vibratory roller will be allowed on the embankment unless the vibrating mechanism is capable of being reversed. Self-propelled and towed vibratory rollers shall be operated at speeds not exceeding 3 miles per hour and 1-1/2 miles per hour, respectively.
3. **Power Hand Tampers and Vibratory Plate Hand Compactors:** Compaction of material in areas where it is impracticable to use a roller or tractor shall be performed with approved power hand tampers, vibratory plate hand compactors, or other approved equipment. Approval shall be based upon performance in a test section.

3.00 EXECUTION

3.01 PREPARATION

- A. Clear and grub the area to be excavated prior to the start of excavation.

3.02 EXCAVATION

- A. When footing concrete is to rest upon rock, remove the rock to a depth sufficient to expose sound rock. Level off or cut the rock to approximate grades, and roughen the area. When footing concrete is to rest on an excavated surface other than rock, take care not to disturb the bottom of the excavation, and do not make final removal of the foundation material to grade until just before the concrete is placed. Foundation material shall be protected, after exposure, with a concrete seal slab.
- B. For footings where the soil encountered at established footing grade is an unstable material, use the following procedure unless other methods are specified: Remove unstable soil. Carry the excavation at least 1 foot beyond the horizontal limits of the structure on all sides. Replace the unstable soil with compacted select fill. Place in uniform layers at a suitable depth for compaction. Wet each layer if necessary and compact by rolling or tamping to provide a stable foundation for the structure.
- C. When unfeasible to construct a stable footing as outlined above, construct footing by the use of special materials, such as flexible base, cement stabilized base, cement stabilized backfill, or other material, as directed by the Engineer.
- D. Perform excavation to permit surfaces to be brought to final line and grade within plus or minus 0.1 foot. Restore over-break at the Contractor's expense. In general, perform excavation in open-cut from the surface of the ground and at the line and grade indicated.

- E. The sides of the excavation, from the bottom of the excavation to the top of the ground shall be supported in accordance with OSHA requirements. Maintain the supports throughout construction. Remove supports after the completion of the work.

3.03 COFFERDAMS

- A. The interior dimensions of the cofferdams shall provide sufficient clearance for the construction, inspection (inside and outside), and the removal of any forms and to permit pumping outside of the forms. In general, extend sheet pile cofferdams well below the bottom of the footings and brace well. Cofferdams shall be as watertight as practicable.
- B. When a concrete seal is required by the plans, base the design on the normal water elevations as indicated. If the foundation concrete can be placed in the dry under construction conditions, the seal will shall not be required. If an additional seal is necessary for the conditions existing at the time of construction, increase the seal thickness as necessary. If the conditions existing at the time of construction require a seal for placing the foundation concrete in the dry, and none is provided in the plans, place an adequate seal.
- C. When the Engineer judges it to be impractical to de-water a cofferdam before placing a concrete seal around piling driven therein, extend the excavation below the footing grade, deep enough to allow for swell of material during pile driving operations. After driving the piling, remove the foundation material that has risen to a level more than 1 foot above the footing grade. It is the intention of this provision to establish a construction tolerance to be applied when a foundation is being constructed under water. Where possible to de-water the cofferdam without placing a seal, remove the foundation material to exact footing grades after piling are driven. Backfilling in a foundation to compensate for excavation which has been extended below grade shall not be permitted. Fill areas which are below grade with concrete at the time the seals or footings are placed.
- D. Unless otherwise indicated, remove cofferdams after the completion of the substructure without disturbing or marring the structure.

3.04 DEWATERING OF SITE

- A. Pumping or bailing from the interior of any foundation enclosure shall be done in a manner which precludes the possibility of movement of water through or alongside any concrete being placed. No pumping or bailing shall be permitted during the placing of structural concrete, or for a period of at least 24 hours thereafter, unless from a suitable sump separated from the concrete work by a water-tight wall. Pumping or bailing during placement of seal concrete shall be only to the extent necessary to maintain a static head of water within a cofferdam. Do not start pumping or bailing to de-water a sealed cofferdam until the seal has aged at least 36 hours.

3.05 PLACEMENT OF MATERIAL

- A. General:
 - 1. Backfill excavated spaces and areas not occupied by the permanent structure, except that no backfill shall be placed against any structure until the concrete has

reached its 28-day compressive strength or 7 days whichever is longer. Do not place backfill adjacent to support walls until the top slab has been in place at least 4 days.

2. Take care to prevent wedging action when placing backfill around structures. If backfill is to be placed on two or more sides of the structure or facility, simultaneously place the backfill on all sides to avoid uneven loading on the structure.
 3. Do not permit rollers to operate within 5 feet of structures.
 4. Maximum placement lifts measured in the loose condition are as follows:
 - a. 8 inches when heavy compaction equipment is used.
 - b. 4 inches when hand-directed compaction equipment is used.
- B. Moisture Control:
1. General: The materials in each layer of the fill shall uniformly contain the amount of moisture within the limits specified below necessary to obtain the maximum dry density for the soil. Compact Class 1 and Class 2 Earth Fill with a moisture content of at or within 5 percentage points wet of optimum moisture content. Compact Class 3, Class 4, and Class 5 Earth Fill with a moisture content within 1 percentage points dry to 2 percentage points wet of optimum moisture content. Compact Crushed Limestone Base Material with a moisture content within 2 percentage points dry to 0 percentage points wet of optimum moisture content. Compact On-Site Clays with a moisture content within 0 percentage points dry to 3 percentage points wet of optimum moisture content. The moisture content ranges specified above for the various classes of earth fill represent maximum upper and lower limits of the particular range. Determination of the maximum dry density-optimum moisture shall be by one or more of the following ASTM procedures D1556 or D6938. Completely cohesionless materials which are to be compacted to a specified relative density shall be at a moisture content which will allow use of the specified compaction equipment and consistent achievement of the specified density.
 2. Moisture Control During Placement: After spreading the soil, adjust the moisture content of the soil if necessary by either aeration or the addition of water to bring the moisture content within the range specified. Uniformly distribute the moisture content throughout the layer of soil to be compacted. In order to accomplish this distribution, thoroughly mix the layer of soil by disking, harrowing, or by the use of a power-driven pulverizer. Should the surface of a previously compacted layer become dry due to exposure to the elements, appropriately wet surface of the compacted layer prior to placing the succeeding layer of soil, and properly disk or harrow the surface. Should a layer of soil be over wet, allow the layer to dry to a proper moisture content prior to compacting. Should the surface of a layer become smooth and hard, roughen the surface by scarifying, and wet the surface if necessary prior to placing the next layer of soil. Reprocess any layer which becomes damaged by weather conditions to meet the specification requirements. There shall be no additional payment made for such reprocessing.
- C. Compaction:
1. Compaction shall be by power hand equipment or rubber tired equipment, provided the rubber tired equipment does no damage. Compaction by power

hand equipment or rubber tired equipment shall be completed such that there will be a 24-inch overlap by roller compaction.

2. Compact the Class 1 and Class 2 Earth Fill zones by a minimum of eight passes with a tamping roller. Compact the Class 3, Class 4, and Class 5 Earth Fill zones by a minimum of eight passes with a tamping roller or by a minimum of four passes with a tamping roller, followed by a minimum of four passes with a pneumatic roller. A vibratory roller shall be required if the material is sandy and if requested by the Engineer. A pass shall consist of one trip over the area being compacted. The front and rear axle rollers on self-propelled models shall only be considered as one pass per trip. The initial and final area to be rolled shall each have eight passes. Stagger passes between the initial and final area in order to establish overlapping with at least eight passes at all locations. Approve the exact method based upon the test section. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section where there is sufficient area to permit these operations to proceed simultaneously.
3. Areas of the fill being compacted with power hand tampers or vibratory plate hand compactors shall receive a minimum of eight passes of the equipment with an overlap of 50 percent of the equipment base plate width.
4. The in-place density of Class 1 through Class 5 Earth Fill shall not be less than 95 percent and not more than 100 percent of the maximum dry density as determined by ASTM D698, Standard Proctor, except compact the top 12 inches of fill underneath roadways and parking areas to not less than 100 percent of maximum dry density as determined by ASTM D698, Standard Proctor. The in-place density of Crushed Limestone Base Material shall not be less than 100 percent of the maximum dry density as determined by Tex-113-E. The in-place density of On-Site Clays shall not be less than 95 percent and not more than 100 percent of the maximum dry density as determined by ASTM D698, Standard Proctor. In areas cut underneath roadways and parking areas scarify and re-compact the top 8 inches of the subgrade within the specified moisture content, to not less than 100 percent of maximum dry density as determined by ASTM D698, Standard Proctor.
5. Compact cohesionless materials, on which it is not practical to control the density by proctor methods, to a minimum of 95 percent of the maximum density as determined by ASTM D4253. At the discretion of the Engineer, an alternate method of determining the maximum density may be used which has been correlated with methods ASTM D4253 and ASTM D4254.
6. If necessary, to achieve the specified density, increase the number of passes of the compaction equipment, and/or modify the weight of the compaction equipment.
7. Regardless of the density achieved, the number of passes of the compaction equipment shall not be less than eight.

3.06 FIELD QUALITY CONTROL

- A. The Contractor is responsible for the costs involved in providing an approved testing laboratory to perform quality control testing of backfill operations. The testing laboratory shall make tests of in-place density in accordance with ASTM Standards.

The testing laboratory shall monitor backfill operation continuously or at intervals acceptable to the Owner and Engineer at structures. It shall be the responsibility of the Contractor to notify the testing laboratory before backfill operations begin.

1. Unless noted otherwise, in-place density tests shall be conducted at a rate of one test per 1000 square feet for every lift, with a minimum of three tests for every lift.

END OF SECTION

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31 23 23.34 FLOWABLE FILL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment, and incidentals necessary to mix and place flowable fill, consisting of Portland cement, fine aggregate, fly ash, and water in the proper proportions as specified hereinafter. Flowable fill (Controlled Low-Strength Material, CLSM) shall be used to bed and backfill around piping, utilities, and structures where indicated.

1.02 QUALITY ASSURANCE

- A. Design Criteria – Flowable Fill Proportions and Consistency: Flowable fill shall be proportioned to give the necessary workability, strength, and consistency, and shall conform to the following governing requirements:
1. Permeability: Maximum permeability limit of 1×10^{-6} cm/sec. This limit shall apply at all locations where flowable fill is used as a utility trench plug (dam) within trench backfill materials.
 1. Subsidence: Evaporation of bleed water shall not result in shrinkage of more than 10.4 mm per m (1/8 inch per ft.) of flowable fill depth. Measurement of a Final Bleeding shall be as measured in Section 10 of ASTM C940.
 2. Strength for Excavatable Flowable Fill: Unconfined compressive strength at 28-days when tested in accordance with ASTM D4832: 100 psi (+/- 50 psi).
 - a. The 1-year strength shall not exceed 150 psi.
 - b. Where indicated provide Excavatable Flowable Fill around utilities, unless noted otherwise.
 - c. Excavatable Flowable Fill shall be excavatable with hand tools and conventional machinery such as backhoes.
 3. Strength for Non-Excavatable Flowable Fill: Unconfined compressive strength at 28-days when tested in accordance with ASTM D4832: 150 psi minimum.
 - a. Where indicated provide Non-Excavatable Flowable Fill below structures and/or around structures, unless noted otherwise.
 4. Fluidity: Flowable fill shall be self-consolidating and non-segregating in accordance with ASTM C1611:
 - a. Slump Flow Test: Minimum 20-inch mean spread.
 - b. Visual Stability Index (VSI) Test: Less than or equal to 1.
- B. Factory Testing: The Contractor shall be responsible for the design of the material. A trial mix shall be designed by an independent testing laboratory, retained by the Contractor. The testing laboratory shall submit verification that the materials and proportions of the trial mix design meets the requirement of the Specifications. In lieu of trial mix design, Contractor may submit historical data for a mix design used successfully in previous similar work. The Contractor shall not make changes in

materials, either in gradation, source, or brand, or proportions of the mixture after having been approved, except by specific approval of the Engineer.

- C. Owner Testing: It is the responsibility of the Contractor to achieve and maintain the quality of material required by this Section. However, the Owner may secure the services of an independent testing laboratory to verify the quality of the flowable fill. The Owner shall have the right to require additional testing, strengthening, or replacement of flowable fill which has failed to meet the minimum requirements of this Section.

1.03 SUBMITTALS

- A. Submit mix design on each material required. Provide backup data as required below.
- B. Submit historical or trial mix data and test results as a basis for mix design approval. Required data shall include:
 - 1. Permeability test results if plugs are required on Project.
 - 2. Subsidence test results.
 - 3. Strength test results for Excavatable and Non-Excavatable Flowable Fill if used on Project.
 - 4. Fluidity test results.

1.04 STANDARDS AND REFERENCES

- A. Materials shall meet recommendation for mix design and placement, as published by National Ready Mixed Concrete Association.
- B. The applicable provisions of the following references and standards shall apply to this Section as if written herein in their entirety.
 - 1. American Society for Testing and Materials (ASTM) Standards:

ASTM C33	Specification for Concrete Aggregates
ASTM C40	Test Method for Organic Impurities in Fine Aggregates for Concrete
ASTM C150	Specification for Portland Cement
ASTM C618	Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as Mineral Admixture in Portland Cement Concrete
ASTM C 940	Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory
ASTM C 1611	Standard Test Method for Slump flow of Self Consolidating Concrete
ASTM D 4832	Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders

2.00 PRODUCTS

2.01 MATERIALS

- A. Cement: Type I Portland cement conforming to the specifications and tests for ASTM C150.
- B. Fine Aggregate: Fine aggregate consisting of natural, washed and screened sand having clean, hard, strong, durable, uncoated grains complying with the requirements for ASTM C33. The sand shall generally be of such size that all will pass a 3/8-inch sieve, at least 95 percent pass a 1/4-inch screen and at least 80 percent pass a No. 8 sieve. Aggregate shall not contain strong alkali, or organic material which gives a color darker than the standard color when tested in accordance with ASTM Specification Designation C40.
- C. Fly Ash/Pozzolans: Fly ash shall be an ASTM C618, Class "C" fly ash. The fly ash may be used in controlled low-strength material.
- D. Water: Water for flowable fill shall be clean and free from oil, acid, alkali, organic matter or other harmful impurities. Water which is suitable for drinking or for ordinary household use will be acceptable for concrete. Where available, water shall be obtained from mains of a waterworks system.
- E. Performance Additive: As required to meet specification requirements:
 - 1. Darafill by Grace Construction Products.
 - 2. Rheocell Rheofill by BASF The Chemical Company.
 - 3. Sika Lightcrete Powder by Sika Corporation.
 - 4. Approved equal.
- F. Chemical Admixtures for Concrete per ASTM C494, as required by performance requirements.

2.02 MIXES

- A. In the determination of the amount of water required for mix, consideration shall be given to the moisture content of the aggregate. The net amount of water in the mix will be the amount added at the mixer; plus the free water in the aggregate; and minus the absorption of the aggregate, based on a 30 minute absorption period. No water allowance shall be made for evaporation after batching.
- B. The methods of measurement of materials shall be such that the proportions of water to cement can be closely controlled during the progress of the Work and easily checked at any time by the Owner's representative. To avoid unnecessary or haphazard changes in consistency, the aggregate shall be obtained from sources which will insure a uniform quality and grading during any single day's operation and they shall be delivered to the Work and handled in such a manner that the variation in moisture content will not interfere with the steady production of flowable fill of reasonable degree of uniformity. Sources of supply shall be approved by the Owner's representative.
- C. All material shall be separately and accurately measured. Measurement may be made by weight or by volume, as determined by the Contractor; however; all

equipment for measurement of materials shall be subject to approval by the Owner's representative.

3.00 EXECUTION

3.01 INSTALLATION

- A. Contractor shall give the Owner's representative sufficient advance notice before starting to place material in any area, to permit inspection of the area, and preparation for pouring.
- B. Conduct the operation of depositing the material so as to form a compact, dense, impervious mass, and so as not to develop air pockets in confined spaces.
- C. Unless specified otherwise, flowable fill shall be uniformly placed to the depth shown on the Drawings. The fill shall be brought up uniformly to the top of excavation elevation. Placement of flowable fill shall then cease and the fill protected from traffic for a period of 72 hours.
 - 1. To prevent pipe flotation place material in lifts or provide alternate means.
 - 2. Around structures, material shall be placed in lifts. Lift depth shall not exceed one-tenth of total structure embedment into subgrade nor 5 feet, whichever is less.
 - 3. When multiple lifts are required, material shall be allowed to harden before placing next lift. Hardening time varies with each mix. Verify flowable fill has reached a penetration number of 1500, in accordance with ASTM C403, but not less than 5 hours.
- D. The material shall be placed against undisturbed trench walls, and shall not be placed on or against frozen ground.
- E. At time of placement the ambient temperature shall be 35 F and rising.

3.02 FIELD QUALITY CONTROL

- A. An approved testing laboratory shall perform the quality control testing of backfill operations. The testing laboratory shall sample material in accordance with ASTM D5971. The testing laboratory shall monitor backfill operation continuously or at intervals acceptable to the Owner and Engineer at structures. It shall be the responsibility of the Contractor to provide sufficient advance notification to the testing laboratory before backfill operations begin. The independent testing agency will be approved by the Owner and paid by the Contractor.
 - 1. Strength: A strength test is the average of two cylinders per ASTM D4832.
 - 2. Fluidity: A fluidity test is a Slump Flow Test and a VSI Test per ASTM C1611.
 - 3. For all tests required, at a minimum perform one test per day, but not less than one per 150 cubic yards.

END OF SECTION

31 23 33.13 TRENCH SAFETY

1.00 GENERAL

1.01 WORK INCLUDED

- A. This Section consists of the basic requirements that the Contractor must comply with in order to provide for the safety and health of workers in a trench and adjacent to structures and slopes. This Section is for the purpose of providing minimum performance specifications, and the Contractor shall develop, design, and implement the trench safety system. The Contractor shall bear the sole responsibility for the adequacy of the trench safety system and providing "a safe place to work" for the workman.
- B. Should the trench safety protection system require wider trenches than specified elsewhere, the Contractor shall be responsible for the costs associated with determining adequacy of pipe bedding and class, as well as purchase and installation of alternate materials.

1.02 STANDARDS

- A. The following standard shall be the minimum governing requirement of this Section and is hereby made a part of this Section as if written in its entirety.
 - 1. Occupational Safety and Health Standards - Excavations (29 CFR Part 1926), U.S. Department of Labor, latest edition.
- B. Comply with the applicable Federal, State, and local rules, regulations, and ordinances.

1.03 SUBMITTALS

- A. Submit a copy of the Trench Safety Plan, signed and sealed by a licensed professional engineer registered in the State of Texas, for record purposes. The Contractor shall select an engineer based on competence and qualifications in accordance with Sec. 2254.004, Texas Government Code, and not on the basis of competitive bids and will certify to that effect with the Trench Safety Plan Submittal.

END OF SECTION

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31 23 33.16 TRENCHING AND BACKFILL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to excavate and backfill as required for the construction of the facilities to the line, grade and extent indicated.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Certified Test Reports for embedment material, coarse gravel, and flexbase. Certified Test Reports shall be from an independent laboratory. Test reports shall include sieve analysis Atterburg limits, and results of an Abrasion test.
 - 2. Certified Test Reports for compaction tests.
 - 3. A 5-gallon bucket of proposed granular embedment material.

1.03 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. American Society for Testing and Materials (ASTM):

American Society for Testing and Materials (ASTM)	
ASTM C33	Specifications for Concrete Aggregates
ASTM C131	Test Method for Resistance to Degredation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C535	Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM D698	Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures, Using 5.5-lb. Rammer and 12-Inch Drop
ASTM D1556	Test Method for Density and Unit Weight of Soil In Place by the Sand Cone Method
ASTM D2487	Classification of Solid for Engineering Purposes
ASTM D2922	Test Method for Density of Soil and Soil-Aggregate In Place by Nuclear Methods
ASTM D4253	Test Method for Maximum Index Density of Soils and Unit Weight of Soils Using Vibratory Tests
ASTM D4914	Test Method for Density of Soil and Rock In Place by the Sand Replacement Method in a Test Pit
ASTM G57	Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method

2. American Water Works Association (AWWA):

American Water Works Association (AWWA)	
AWWA C151	Ductile Iron Pipe
AWWA C200	Steel Water Pipe 6" and Larger
AWWA C301	Prestressed Concrete Pressure Pipe - Steel Cylinder Type for Water and Other Liquids
AWWA C303	Reinforced Concrete Pressure Pipe - Steel Cylinder Type, Pretensioned, for Water and Other Liquids

3. Texas Department of Transportation (TxDOT):

- a. Texas Highway Department Standard Specifications for Road and Bridge Construction, latest edition.

1.04 JOB CONDITIONS

- A. Classification of Excavation: Excavation shall be "unclassified" and involves the removing of the necessary materials to provide the trench to the required width and depth. The Contractor, prior to submitting a proposal, must satisfy himself as to the actual sub surface conditions. No extra or separate payments shall be made for rock, dewatering, or any other condition.
- B. City, County, and Private Road Crossings: Where the Work is in the right-of-way of City, County and/or privately owned roads, the Owner will secure the necessary permits and easements for the Work. Work to be performed within the limits of the public right-of-way shall be in full accordance with the requirements of the easements and permits and as requested by the City, County, and/or private owner. Provide temporary access and detours for roads and driveways cut off during pipe laying operations.
- C. Protection of Existing Structures and Utilities
 - 1. Prior to the manufacture of pipe and start of construction, the Contractor shall communicate with the local representative of all utility companies including, but not limited to oil, gas, electric and telephone companies, water and sanitary sewer utilities, and any other public or private utility companies in the location of the proposed construction in order to obtain the assistance of the utility owner in locating utility lines and in the avoidance of conflicts with utility lines. The Contractor shall uncover and determine the elevation and location of conflicts well ahead of the manufacture of the pipe. The Engineer has shown the approximate location of existing utilities as determined from field surveys and Record Data from utility companies. The fact that some utilities are not shown or are shown incorrectly in no way relieves the Contractor of his responsibility to locate all existing utilities.
 - 2. The Contractor shall advise the Engineer of any existing utilities that are not shown on the Drawings, or are shown incorrectly, that affect the pipe layout. Contractor shall also propose a resolution to the utility conflict for the Engineer's review. The Engineer will determine whether the utility will be relocated or the proposed pipeline location revised. If the pipeline location is revised, an adjustment to the Contract price will be made by adjusting the quantities for the

various unit price pay items. If the proposed pipe grade is adjusted by 2 vertical feet or less, no Contract Price adjustment will be made. If the proposed pipe grade is adjusted by more than 2 vertical feet, a Contract Price adjustment will be agreed to as described in Article 6 of the General Conditions.

3. Utilities that affect the pipe layout will be interpreted by the Engineer as follows:
 - a. Utilities that conflict with the grade of the proposed pipe will be interpreted as affecting the pipe layout.
 - b. Utilities that conflict with the operations and maintenance of the proposed pipe will be interpreted as affecting the pipe layout.
4. Where excavation endangers adjacent structures and utilities, the Contractor shall, at his own expense, carefully support and protect such structures and/or utilities so that there shall be no damage. Costs of temporarily or permanently relocating the conflicting utilities shall be borne by the Contractor without extra compensation from the Owner.
5. If in the opinion of the Engineer, concrete backfill is necessary for the support of utility lines crossing trenches, the Engineer may direct 2000 psi concrete backfill to be used. Payment shall be made to the Contractor at the unit price bid for the installation of such quantity of the concrete backfill as directed by the Engineer.

1.05 MAINTENANCE AGREEMENT

- A. Following the certification of completion by the Engineer, maintain paved surfaces, unpaved trench surfaces, fences, curbs, sidewalks, and gutters, for a period of 12 months thereafter. Material and labor required for the maintenance shall be supplied by the Contractor, and the Work shall be done in a manner satisfactory to the Engineer.

2.00 PRODUCTS

2.01 MATERIALS

- A. Concrete Embedment, Cap, Blocking, and Encasement: Where concrete embedment, cap, blocking, or encasement is indicated or requested by the Engineer, it shall be 2000 psi compressive strength as specified in Section 03 30 00 "Cast-In-Place Concrete."
- B. Granular Embedment:
 1. Granular embedment material shall be sandy gravel or blended sand and crushed rock, free from large stones, clay, and organic material. Embedment material shall be a soil classification of GW, GP, SW, or SP as determined by ASTM D2487. The embedment material shall be such that when wet, the fine material shall not form mud or muck. The embedment material shall be composed of angular, tough durable particles, free from thin, flat and elongated pieces, of suitable quality to insure permanence in the trench and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or ASTM C535. The P.I. of the fines shall not exceed 3. Light weight aggregate is not acceptable for granular embedment. Material used for granular embedment shall have a resistivity of not less than 5000 ohms/cm as measured by ASTM G57.

2. This shall be cohesionless material meeting the following gradation requirements:

Sieve Size Sq. Openings	Amount Passing Percent by Weight
1/2"	100
3/8"	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5

C. Coarse Gravel:

1. Where coarse gravel is required for water drainage, restoration of trench foundation, or other uses, it shall be crushed stone or gravel and in compliance with ASTM C33 for Coarse Concrete Aggregate. Gradation shall be ASTM C33 No. 57, No. 67, or as follows:

Sieve Size Sq. Openings	Amount Passing Percent by Weight
1"	95-100
3/4"	55-85
1/2"	25-50
No. 4	0-5

- D. Select Material: Selected or processed excavated trench material free from rock fragments and clods larger than 2 inches greatest dimension. The select material shall be free of organic materials. Select materials shall be free of sharp or angular materials that could damage the pipe coating.
- E. Ordinary Material: Trench excavated material free from rock fragments and clods larger than 6 inches greatest dimension. The ordinary material shall be free of organic materials.
- F. Flexible Base Backfill: Complying with Item 247 of the Texas Highway Department Standard Specifications for Road and Bridge Construction, latest edition, Type A, Grade 1.
- G. Crushed Concrete Backfill: Complying with Item 247 of the Texas Highway Department Standard Specifications for Road and Bridge Construction, latest edition, Type D, Grade 1.
- H. Topsoil: Soil material relatively free of stones or other objectionable debris, which have sufficient humus content to readily support vegetative growth. The suitability of soil for topsoil shall be subject to approval by the Owner's representative.
- I. Flexible Base Pavement: Complying with Item 247 of the Texas Highway Department Standard Specifications for Road and Bridge Construction, latest edition, Type A, Grade 1 or 2, Flexible Base (Crushed Stone).

- J. Hot Mix Asphalt Concrete (HMAC): Complying with Item 340 of the Texas Highway Department Standard Specifications for Road and Bridge Construction, latest edition.

3.00 EXECUTION

3.01 TRENCH EXCAVATION

A. General:

1. Excavate trenches to the alignment, width, and depth as indicated or as required for the proper installation of the pipe. Brace the trench and/or dewater the trench if necessary so that the workmen may work safely and efficiently.
2. Comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. Comply with the requirements of Section 31 23 33.13 "Trench Safety."
3. Dewater excavations so that the Work is performed in the "dry". Bailing, pumping, and dewatering shall be at the Contractor's expense. Use coarse gravel (at no extra cost to the Owner) instead of embedment material under the pipe to provide for the free drainage and flow of water in the pipe trench, where it is necessary, in order to keep the water level below the pipe barrel and bell holes for joints. The water removed from trenches shall be conducted to natural drainage ways, drains, or storm sewers in such a manner as to prevent damage to adjacent property or to the public. Pumps of ample capacity and in duplicate must be provided to ensure that once an excavation is made dry, the water is kept down until that part of the Work under construction is completed.
4. It is intended that the line be laid to the depth of cover shown on the Drawings. The minimum depth of cover shall be maintained at all locations unless shown otherwise. The approximate ground profile and the top of pipe profile show the relationship intended by the Engineer. The precise and detailed pipe layout is to be prepared by the Contractor and submitted to the Engineer for review. The responsibility for the workability of the detailed layout remains the responsibility of the Contractor. High points shall be located at air valves and air valves shall be located in pipe sections having a horizontal grade.
5. Where unforeseen existing utilities or other conditions warrant a revision of the pipe grade or alignment, the Contractor shall submit a revised pipe layout to the Engineer for review. No intermediate high or low points will be allowed in the pipe grade without the approval of the Engineer.

B. Pipe Trench:

1. The "pipe zone" shall be defined as the zone from the bottom of the pipe trench to 12 inches above the top of the pipe.
2. The trench walls in the pipe zone shall be vertical. Trench widths shall be as shown on the Drawings.
3. Trench walls above the pipe zone may be laid back or benched where room permits as necessary to meet the requirements of OSHA.
4. For semi-rigid pipe, where the character of the trench walls is loose, unstable, saturated soft clays, quicksand or otherwise unable to provide adequate side

support to maintain the required pipe deflection, the Contractor shall modify the backfill to keep the pipe within the limits of the specified pipe deflection.

- a. Contractor shall widen the trench excavation as necessary.
- b. Pipe shall be laid and trench backfilled with coarse gravel to the top of the pipe. Coarse gravel shall be compacted to 95 percent maximum density as measured by ASTM D4253.
- c. Contractor shall protect exterior pipe coating, and shall repair any damage caused by backfilling.
- d. Concrete encasement, soil cement or some other method approved by the Engineer may be used in lieu of this procedure.
- e. No additional compensation will be made for additional trench excavation, coarse gravel, concrete encasement, flowable fill, etc., for stabilizing the trench walls.

C. Pipe Foundation:

1. Excavate the trench to an even grade so that the full length of the pipe barrel is supported and joints make up properly. Excavate the trench to the line and grade indicated and as directed by the Engineer. Grades shall be uniform between high points and low points to eliminate intermediate "highs and lows."
2. The trench shall be "rough cut" a minimum of 6 inches below the bottom of the pipe. The "rough cut" dimension shall be increased as necessary to provide a minimum clearance of 2 inches from the bottom of the trench to the bottom of the bells, flanges, valves, fittings, etc.
3. The entire foundation area in the bottom of all excavations shall be firm, stable material. Loose material shall be removed, leaving a clean, flat trench bottom, and material shall not be disturbed below required sub grade except as hereinafter described. If the subgrade is soft, spongy, disintegrated, or where the character of the foundation materials is such that a proper foundation cannot be obtained at the elevation specified, then when directed by the Engineer the Contractor shall deepen the excavation to a depth where a satisfactory foundation can be obtained. The sub grade shall then be brought back to the required grade with coarse gravel, thoroughly compacted to 95 percent maximum density as measured by ASTM D4253. Payment for additional coarse gravel shall be made at the unit price bid in the proposal.

D. Correcting Faulty Grade:

1. If the trench is excavated to a faulty grade (at a lower elevation than indicated), correct the faulty grade as specified below:
 - a. In uniform, stable dry soils, correct the faulty grade with granular embedment material thoroughly compacted to 95 percent maximum density measured in accordance with ASTM D4253.
 - b. In soft spongy disintegrated soils or where necessary to allow proper drainage, correct the faulty grade with coarse gravel compacted to 95 percent maximum density measured in accordance with ASTM D4253.

E. Pipe Clearance in Rock: Remove ledge rock, rock fragments, or unyielding shale or marl to provide a clearance of at least 6 inches below the parts of the pipe, valves or

- fittings. Provide adequate clearance for properly jointing pipe laid in rock trenches at bell holes. Refill the excavation to grade with granular embedment material.
- F. **Blasting Procedure:** Blasting shall not be allowed.
- G. **Bell Holes Required:**
1. Bell holes of ample dimension shall be dug in trenches at each joint of pipe to permit the jointing to be made properly, visually inspected, and so that the pipe will rest on the full length of the barrel.
 2. Pipe with field-applied exterior coatings shall have the joints excavated to sufficient depth to allow proper cleaning, application, testing and inspection of the field-applied coating system.
- H. **Care of Surface Material for Reuse:** Surface materials such as topsoil in its natural state, suitable for reuse in restoring the excavated surface, shall be kept separate from the general excavation material. The top 12 inches of the trench backfill shall be considered topsoil. Save the topsoil to be used as backfill of the top 12 inches of the trench after pipe laying.
- I. **Manner of Piling Excavated Material:** Place excavated material so that Work is not endangered or interferes with public traffic. Do not place excavated material over buried pipelines or existing utilities unless adequate provisions are made to protect those pipelines and/or utilities. Roads and driveways must be kept open in every case. Keep drainage channels clear of obstructions or make other satisfactory provisions for drainage.
- J. **Trenching by Machine or by Hand:** The use of trench digging machinery is approved except in places where operations of same will cause damage to existing structures above or below ground, in which case employ hand methods.
- K. **Open Trench:**
1. The Owner's representative shall have the right to limit the amount of trench that may be opened or partially opened at any time in advance of the completed line; and also the amount of trench left not backfilled.
 2. Not over 500 feet of trench in open country or pasture land shall be opened at any one time, and not more than 150 feet of trench in populated areas shall be left open unless otherwise permitted in writing by the Owner.
 3. Backfill and/or protect trenches as necessary to prevent injury to livestock, adjacent property, and the public.
 4. Trenches left open at night shall be fenced with adequate construction fencing. The Owner will require that no trenches be left open at night in streets or populated areas.
- L. **Structural Excavation:** Excavation shall extend a sufficient distance from walls and footings to allow for form installation and inspection, except where concrete for walls and footings is authorized or required to be deposited directly against excavated surfaces. Where excavation, through the fault of the Contractor, is made below the elevation specified or directed by the Engineer, restore the excavation to the proper elevation with stabilized backfill (lean concrete) or other approved material at the Contractor's expense.

3.02 BACKFILLING OF TRENCHES OUTSIDE ROADWAYS

- A. General: This Section is intended to cover the requirements for trench backfill where trench is in open fields, unimproved alleys, fields, and other similar open areas, except public and private roadways.
- B. Time of Backfilling: Backfill operations shall immediately follow pipe jointing, joint coating application, and curing.
- C. Braced and Sheeted Trenches: Remove sheeting and shoring as backfilling operations progress. Incorporate methods so that a good bond is obtained between the backfill material and the undisturbed trench walls.
- D. Protection of Pipe during Backfilling Operations: Take the necessary precautions to protect the pipe during backfilling operations. Take care to prevent damage to the pipe or to the pipe coating, and repair any damaged pipe before being "covered up". Backfill the trench to prevent the deformation or otherwise deflection of the cylindrical shape of the pipe by more than the allowable pipe deflection as specified elsewhere. Use methods such as stulling or ellipsing as necessary.
- E. Site and Preparation: In addition to clearing and grubbing of brush and trees along the right of way for this Project, alteration to the topography shall be done if indicated on the Drawings, at the locations and to the extent shown.
- F. Backfill Procedure in Pipe Zone for AWWA C303 Pipe:
1. Depth of Cover 4 to 15 Feet:
 - a. Place the first lift of granular embedment material (bedding layer) to a depth slightly above the bottom of pipe grade and do not compact. Lay pipe on this material to the indicated grade. Provide bell holes to permit the pipe to rest on the full length of the barrel and to permit joint make-up.
 - b. Place subsequent lifts of granular embedment uniformly on both sides of the pipe to a depth of 0.7 times the outside diameter of the pipe. Compact using vibration or mechanical tamping to a minimum of 95 percent maximum density in accordance with ASTM D4253 in lifts not exceeding 12 inches loose depth. Test embedment compaction per ASTM D1556 and ASTM D2922. The Contractor shall take precautions to ensure no voids occur under the haunches of the pipe and to prevent disturbance of the pipe alignment.
 - c. After placement and compaction of the granular embedment, deposit select backfill in the trench simultaneously and evenly on both sides of the pipe for the full width of the trench to the top of the pipe zone. Consolidate this material by mechanical compaction within two percent (2 percent) of optimum moisture content in lifts not exceeding 18 inches loose depth. Compaction of this material shall be at a minimum of 95 percent of Standard Proctor Density (ASTM D698).
 2. Depth of Cover Over 15 Feet:
 - a. Backfill the pipe trench with flowable fill to 12 inches above the top of the pipe in accordance with Section 31 23 23.33 "Flowable Fill." Pipe shall be blocked up on soil pads to allow a minimum of 6 inches of flowable fill below the pipe. The Contractor shall perform backfilling in a manner to prevent dislocating or floating the pipe.

J. Backfill Around Structures:

1. After completion of foundations, walls, etc., remove forms and clean excavation of debris or other objectionable matter prior to placing backfill.
2. In areas where structures such as slabs or pipes are to be constructed on backfill, backfill shall be lean concrete or granular backfill as indicated. Thoroughly compact the backfill. Granular backfill shall be compacted to a minimum of 95 percent maximum density in accordance with ASTM D4253.
3. Mechanically tamp earth backfill around and over structures, using select material, and placed in layers not to exceed 8 inches loose thickness (higher lifts may be allowed with the approval of the Engineer in accordance with the manufacturer's recommendations for large mechanical tampers).
4. Bring material to within 2 percent of optimum moisture content and compact each layer to a uniform density of not less than 95 percent Standard Proctor density as determined by ASTM D698. Laboratory control shall be used to secure compliance with this requirement.

K. Inspection and Test Pits:

1. Provide a recognized testing laboratory capable of performing a full range of testing procedures complying with the standards or testing procedures specified. The testing lab shall provide certified technicians that are trained and knowledgeable in, in-trench nuclear density testing, sand cone, concrete sampling and testing, ASTM D698 and D1557 proctors at a minimum. Obtain Owner's approval for the testing Laboratory before testing is performed.
2. Testing Frequency:
 - a. Soils Testing: Pothole every 1000 feet and grab Samples at pipe level for materials testing and proctors.
 - b. Take a minimum of three in-trench/ pipe zone nuclear density tests every 150 feet of installed pipe in populated areas and every 250 feet in unpopulated areas or pastureland. If less than 150 feet of pipe is installed in one day, the Contractor shall perform the minimum number of three tests per day.
 - c. Take a minimum of three nuclear density tests above the pipe zone for every 150 feet of installed pipe in populated areas and every 250 feet in unpopulated areas, pastureland or cultivated fields.
 - d. Take a minimum of three in-trench/pipe zone nuclear density test and a minimum of three above pipe zone nuclear density test at all open cut road crossings.
 - e. Field record drawings shall be updated with test locations in the profile.
 - f. Laboratory test results shall be submitted with monthly pay requests. Pipe installation without passing tests and/or record drawing updates will not be considered for payment.
3. Excavate test pits after the backfill has been placed and compacted in the pipe zone for the purpose of taking field density tests and inspecting the haunch areas under the pipe for voids.

4. Excavate the test pits to a depth and area of sufficient size to allow the inspector to visually inspect the haunch area of the pipe for voids or loose material next to the pipe and to make a field density test. Provide a safety trench shield to protect the inspector while in the pit.
5. After inspection, backfill and compact the test pit area in accordance with the applicable specification herein.
6. Dig one test pit for inspection of each day's work, if deemed necessary, as determined by the Owner's representative. Repair and replace areas that are found not to be in compliance with the Specification requirements, until satisfactory results are consistently and uniformly attained.
7. Special care should be taken by the Contractor to ensure the backfill material flows under the pipe haunches. The Contractor's method and procedures used to accomplish this will be observed to confirm that adequate results are being achieved. This may require the removal of pipe joints to observe the results and make density tests. Pipe laying shall not begin until satisfactory results are achieved by the Contractor's proposed method.

3.03 BACKFILL PROCEDURE FOR PUBLIC AND PRIVATE ROADS

- A. Compact granular backfill material within and above the pipe zone (when required per the Drawings) for City and County roads, paved or improved private roads, driveways, sidewalks, parking lots and any proposed roads as indicated to a minimum of 95 percent maximum density as measured by ASTM D4253. Test compacted material per ASTM D1556 and ASTM D2922.

3.04 MAINTENANCE OF SURFACES

- A. Rock and Organic Material Exclusion: Rock and organic material removed from the trench excavated material shall be removed from the right of way at the Contractor's expense.
- B. Deficiency of Backfill: Any deficiency in the quantity of material for backfilling the trenches, or for filling depressions caused by settlement, shall be supplied by the Contractor at his expense. Make-up material shall be approved by the Owner's representative.
- C. Restoration of Surfaces: Replace surface material and restore paving, curbing, sidewalks, gutters, shrubbery, fences, grass or turf, and other surfaces disturbed to a condition equal to that before the Work began. Provide seeding as requested by the Owner or his Representative.
- D. Seeding: Provide seeding in TxDOT rights-of-way and where requested in writing by the Owner. Seeding shall be in accordance with Section 31 25 13.13 "Seeding for Erosion Control."
- E. Sodding: Provide new grass sod where requested in writing by the Owner. Grass sod shall be healthy, vigorous sod, minimum size of 12 inches by 12 inches by 1 inch, obtained from state certified commercial groves and planted within 48 hours after harvesting. Grass sod shall be Bermuda unless otherwise requested by the Owner. Sod shall be neither excessively wet nor dry when harvested and shall be kept damp until planted. Plant squares continuously with no space between squares. Apply fertilizer uniformly at a rate of 300 pounds per acre and water until

final acceptance by the Owner. Provide grass sodding where indicated by the Drawings or directed by Owner. Sodding shall be in accordance with Section 31 25 13.13 "Seeding for Erosion Control."

3.05 CLEAN AND ADJUST

- A. Remove surplus pipeline materials, tools, rubbish, and temporary structures, and leave the construction site clean, to the satisfaction of the Engineer. Grade the surface, and re-establish drainage. Removal of rock and other excess excavated material and general leveling and grading of the right of way surface to a presentable appearance shall proceed so as to not be further than 2500 feet behind the backfilling operations. The Contractor shall be responsible for location of sites for disposal of excess material and the Owner shall make no additional payment for expenses incurred in such disposal.

END OF SECTION

31 25 13.13 SEEDING FOR EROSION CONTROL

1.00 GENERAL

1.01 WORK INCLUDED

- A. Provide labor, materials, equipment and incidentals necessary to seed the slopes and other areas as specified. This Section includes seedbed fertilization, watering, mulching, and emulsifying or tacking the mulch and maintenance until final acceptance by the Owner.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Texas Testing Seed Label.
 - 2. Record Data for fertilizer to be used.

1.03 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. Texas Highway Department Standard Specifications for Construction of Highways, Streets and Bridges.
 - 2. Texas Seed Law.
 - 3. Texas Fertilizer Law.

1.04 DELIVERY AND STORAGE

- A. Deliver seed with each variety separately bagged.

1.05 OPTIONS

- A. When seed and fertilizer are to be distributed as a water slurry, apply the mixture within 30 minutes of mixing.
- B. If dry mechanical methods are permitted; the fertilizer may be spread at the same time as the seed. After sowing straw mulch will be mechanically spread over the seeded area.

2.00 PRODUCTS

2.01 MATERIALS

- A. Seed:
 - 1. Seed shall be from the previous season's crop and must carry a Texas Testing Seed Label showing purity and germination, name, type of seed and that the seed meets all requirements of the Texas Seed Law.

2. Each variety of seed shall be furnished and delivered in separate bags or containers clearly marked with the date of analysis shown. The date of analysis shall be within 9 months of the date of delivery to the Site.
 3. Seed shall equal or exceed the quality, purity and germination requirements established by Item 164. The species shall be determined based upon appropriate seasons listed under Item 164 for TxDOT District 18 (Dallas).
- B. Fertilizer: Contractor shall make a uniform application of 10-20-10 (nitrogen-phosphorus-potassium) fertilizer at a rate of 400 lb. per acre to seeded areas.
- C. Mulch:
1. Consisting of straw, wood-fiber, mulch nettings, wood chips or other suitable material approved by the Engineer and free of Johnson grass and other noxious weed seeds.
 2. Straw mulch shall be oat, wheat or rice straw, prairie hay, Bermuda grass hay, or other hay harvested before seed production and approved by the Engineer. The straw mulch will be kept dry and shall not be rotted or molded. A minimum of 50 percent by weight of the herbage making up the hay shall be 10 inches in length or longer.
- D. Topsoil: Soil material relatively free of stones or other objectionable debris that have sufficient humus content to readily support vegetative growth. The suitability of material for use as topsoil shall be determined by the Engineer.
- E. Herbicide: Contractor shall be responsible for using herbicides in a manner consistent with label requirements and precautions. Only registered herbicides having a minimal residual effect shall be used. Contractor shall strictly adhere to all Federal, State, and local laws governing herbicide usage.

3.00 EXECUTION

3.01 PREPARATION

- A. After the areas disturbed by construction operations have been backfilled and completed to the original preconstruction lines or final grades as shown on the Drawings, perform seeding in accordance with the procedure described below.

3.02 TOPSOIL PLACEMENT

- A. Place topsoil as specified in Section 31 23 33.16 "Trenching and Backfill."

3.03 PLANTING SEASON AND APPLICATION RATES

- A. Perform planting during the periods identified for each type of seed in Item 164 of the TxDOT specifications. The seed shall be applied at the mixture and rate specified in Item 164 for District 18 (Dallas).

3.04 FALL PLANTING

- A. Seedbed Preparation: Use a one-way plow, tandem disk, bedder, or equipment that will accomplish similar results. Break or mix the surface of the soil with the tillage equipment. Additional tillage operations will be necessary if required so planting can

be on a clean, firm seedbed. Chiseling will be necessary on areas that have been severely compacted.

B. Seeding:

1. Seeding will be required in TXDOT rights-of-way and where requested in writing by the Owner.
2. Accomplish the seeding for fall planting within the time period specified in TxDOT Item 164. Planting rates when drilled or broadcast shall be in accordance with Item 164.

3.05 SPRING PLANTING

A. Seedbed Preparation: Use a one-way plow, tandem disk, bedder, or equipment that will accomplish similar results. Break or mix the surface of the soil with the tillage equipment. Additional tillage operations will be necessary if required so planting can be on a clean, firm seedbed. Chiseling will be necessary on areas that have been severely compacted.

B. Mulching:

1. Spread mulch material on the area to be planted if construction was completed too late for planting a temporary fall crop or if insufficient residues are produced by the fall planting. Mulch the planting areas to control soil erosion and seed loss by wind and water and to promote grass establishment. Apply Mulch hay at the rate of 2 tons per acre and spread uniformly so that about 25 percent of the ground surface is uniformly visible through the mulch.
2. Anchor the mulch hay by treading into the soil with a straight disk type mulch tiller. Perform disking across the slope along contours. Other types of mulch such as wood cellulose fiber or cotton bur mulch may be used at recommended rates, if approved by the Engineer. Apply mulch in a manner that will not hinder emergence of seedlings.

C. Seeding:

1. Plant Bermuda grass seed between March 1 and May 15. Sow the seed at the rate of 5 pounds of pure live seed (PLS) per acre, or more if required to obtain a complete stand of grass. The PLS content is determined by multiplying the seed package weight by the product of the percent purity and the percent germination, which are contained on the seed label.
2. Accomplish seeding by mechanical means using either broadcasting or drilling type equipment to provide uniform distribution of the seed in the planting areas. Cover Bermuda grass seed by 1/4 to 1/2 inch of soil. If seed is drilled, the distance between drill rows shall not exceed 12 inches. Hydro seeding may be used to apply seed, fertilizer, and wood-fiber mulch with the approval of the Engineer.

3.06 MAINTENANCE

A. Irrigation: Supply the seeded areas with adequate moisture (3- to 4-inch penetration) at 10 day intervals, if needed, for seed germination and plant growth until acceptance by the Owner. Water the seed in a manner that will prevent erosion of the soil. Contractor shall furnish all water to be used.

- B. Repair: Repair washouts and other bare soil areas in a seeded area either by re-seeding, sprigging, or spot sodding, and perform maintenance as needed to establish grass in the area.
- C. Weed Control:
 - 1. Control competitive weed growth during the establishment period by mowing and/or with herbicides. Chemical usage shall be in accordance with the current recommendations of the Texas Agricultural Experiment Station or local Soil Conservation Service Field Office Technical Guides. Strictly adhere to all Federal, State, and local laws governing herbicides.
 - 2. Weed control shall be the Contractor's responsibility whether topsoil is from on-site or off-site sources and also for seeded areas that are specified not to receive topsoil.

3.07 FIELD QUALITY CONTROL; OBSERVATION AND ACCEPTANCE

- A. Observation: Upon completion of the site preparation, mulching, fertilizing, seeding, and maintenance of seeded areas, the Engineer will observe the seeded areas periodically to determine the establishment success. The Engineer will consider soil coverage, purity of the grass stand, and maturity of the plants.
- B. Establishment of Stand and Acceptance:
 - 1. The Engineer will determine that a grassed area is established upon fulfillment of the following conditions:
 - a. The permanent grass stand uniformly covers the planting area, with no exposed soil areas more than 36 inches across in any dimension.
 - b. The permanent grass stand is free of over-topping weed species which would compete for sunlight, moisture, and nutrients. In addition, no area of pure weed species greater than 36 inches across in any dimension shall occur within a permanent grass stand.
 - c. The majority of the grass plants in a stand shall have a well-established root system to survive if irrigation is discontinued, and shall be no less than 1-1/2 inches in height.
 - 2. Establish the permanent grass stand before October 1 to preclude having to perform a temporary fall seeding. In the event a fall seeding must be performed, follow-up the temporary seeding with a permanent seeding as specified. Upon final acceptance of the Work under this Contract, the Owner will assume the responsibility of maintaining the grassed areas.

END OF SECTION

DIVISION 33

UTILITIES

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33 05 01.02 DUCTILE IRON PIPE & FITTINGS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install ductile iron pipe and fittings, including taps, connections, and appurtenances as required for a functional system as indicated herein. Unless otherwise noted, all above grade exposed pipe, fittings, and appurtenances shall be flanged joints. Trenching, backfilling, and pipe embedment shall be as shown on the Drawings and in accordance with Section 31 23 33.16 "Trenching and Backfill."

1.02 QUALITY ASSURANCE

- A. **Factory Testing:** The manufacturer shall perform all tests as required by AWWA C151. Welded outlets shall be hydrostatically tested at a pressure of 250 psi for a period of 1 hour. No leakage shall be allowed.
- B. **Experience Requirements:** Pipe shall be the product of a manufacturer who has a minimum of 10 years' successful experience manufacturing pipe of the particular type specified and the total pipeline shall be the product of one pipe manufacturer. The manufacturer shall have a minimum of 10 years' successful experience in the design and manufacturing of pipe joints of similar design, working pressure, pipe diameter and wall thickness as specified.
- C. **Pipe Classification:** Pipe manufacturer shall manufacture the pipe to meet the installation conditions, cover depth, and bedding and backfill requirements as shown on the Drawings or specified and furnish the correct class of pipe to meet these conditions. If additional requirements are required, pipe manufacturer shall coordinate their requirements with the Contractor.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
1. **Record Data:** Catalog data, including dimensions of new pipe and fittings and recommendations for handling and storage; details of lining and coating; thrust restraint provisions; hydrostatic pressure test plan and results; affidavit stating the pipe furnished complies with AWWA C151, AWWA C104, AWWA C110, AWWA C111, and these specifications; mill certificates, including chemical and physical test results for each heat of metal, if requested during pipe manufacturing operations; record drawings, including a schematic location-profile and a tabulated layout schedule, referenced to the pipeline stationing.
 2. **Shop Drawings:** Mechanical joint connections; connections to differing pipe materials.
 3. **Certified Test Data:** Certified Test Reports from the manufacturer's testing facility or an Owner approved testing laboratory; results of factory hydrostatic tests; pipe and fitting certification for conformance to ANSI/NSF 61.

1.04 REFERENCE SPECIFICATIONS

A. Section 31 23 33.16 “Trenching and Backfill.”

1.05 STANDARDS

A. Except as modified herein, the applicable provisions of the following standards shall apply as if written here in their entirety:

1. American Water Works Association (AWWA) Standards:

AWWA C104	Standard for Cement Mortar Lining for Ductile Iron Pipe and Fittings
AWWA C105	Standard for Polyethylene Encasement for Ductile Iron Piping
AWWA C110	Standard for Ductile Iron and Gray Iron Fittings
AWWA C111	Standard for Rubber Gasket Joints for Ductile Iron Pipe and Fittings
AWWA C150	Standard for Thickness Design of Ductile Iron Pipe
AWWA C151	Standard for Ductile Iron Pipe
AWWA C153	Standard for Ductile-Iron Compact Fittings for Water Service
AWWA C600	Standard for Installation of Ductile Iron Water Mains and Appurtenances
AWWA C606	Grooved and Shouldered Joints

2. Steel Structures Painting Council (SSPC) Standard: SSPC SP6, Commercial Blast Cleaning.

1.06 DELIVERY AND STORAGE

A. Handling and storage of pipe and fittings shall comply with AWWA C600 and the manufacturer’s recommendations.

1.07 GUARANTEES

A. The product shall be warranted and guaranteed per the General Conditions of the Specifications.

2.00 PRODUCTS

2.01 MATERIALS

A. Ductile Iron Pipe:

1. Ductile iron pipe shall be made of ductile iron in accordance with AWWA C151. All ductile iron pipe shall have a minimum working pressure as indicated on the Drawings. Pipe shall be rated for pressure in accordance with AWWA C151 for pressure class of pipe as indicated. Standard joint length shall be 18 to 20 feet. Flanged ductile iron pipe shall be in accordance with AWWA C115.

2. Pipe manufacturer shall manufacture the pipe to meet the installation conditions, cover depth, and bedding and backfill requirements as shown on the Drawings or specified and furnish the correct class of pipe to meet these conditions.
- B. Fittings: Fittings shall be ASTM A536 ductile iron or ASTM A48 cast iron in accordance with AWWA C110. Fittings shall be rated for a minimum working pressure of 250 psi, unless specified otherwise.
- C. Joints for Pipe and Fittings:
1. Joints shall be in accordance with AWWA C110, AWWA C111, and AWWA C151. Standard joints for ductile iron pipe and fittings shall be push-on. Where indicated, joints shall be mechanical joint, flanged, or grooved.
 2. Flanged joints shall have pressure ratings equal to or greater than adjacent pipe. Flange pattern shall match pattern of valve, fitting, or appurtenance to be attached. Flanges on ductile iron pipe shall be ductile iron.
- D. Provisions for Thrust:
1. Thrust at bends, tees, plugs, or other fittings shall be resisted by restrained joints. If thrust cannot be accommodated using restrained joints, thrust blocking or concrete anchors to restrain thrust may be used on a case-by-case basis when approved by the Engineer.
 2. Restrained joints shall be used for all joints. For the purpose of thrust restraint, design pressure shall be 1.5 times the design working pressure class indicated.
 3. The length of pipe with restrained joints to resist thrust forces shall be determined by the pipe manufacturer in accordance with Thrust Restraint Design for Ductile Iron Pipe, Ductile Iron Pipe Research Association using the following parameters:
 - a. Laying condition equal AWWA C600 Type 4 bedding.
 - b. If polyethylene encasement is used, restrained length shall be doubled to account for reduced soil to pipe friction resistance.
 4. Where indicated and where required for thrust restraint, joints shall be restrained. Restrained joints shall be mechanically interlocking joints. Restrained joints shall be U.S. Pipe "TR Flex", American Ductile Iron Pipe "Flex Ring", or Clow Corporation "Super-Lock". Restraining fittings using set screws, gripper type glands, and field-cuts of restrained joints shall be Mega-Lug, or approved equal. Field welding shall not be allowed. Restrained joints shall be capable of sustaining the design pressure as specified herein.
- E. Coating:
1. Coat the exterior of the pipe and fittings with a 1 mil bituminous coating in accordance with AWWA C110 and AWWA C151, unless specified otherwise.
 2. In addition to the factory applied asphaltic coating, all buried ductile iron pipe and fittings shall have a tube-type polyethylene encasement in accordance with AWWA C105. Polyethylene encasement shall be 8 mils thick. Both ends of the pipe shall be thoroughly sealed with adhesive tape or plastic tie straps at the joint overlap. Place circumferential wraps of tape a 2-foot intervals along the barrel of the pipe to minimize the space between the encasement and the pipe.

F. Lining:

1. Ductile iron pipe and fittings shall be lined with factory installed Protecto 401 Ceramic Epoxy Lining by Enduron or American Polybond Plus (fusion bonded epoxy and fusion bonded polyethylene) or an approved equal. Lining primers, applications, and thicknesses shall be in accordance with manufacturer's recommendations for sanitary sewer applications, but shall not be less than 40 mils. Air valve vent piping (dry side of valve) shall be not be lined.
2. Ductile iron pipe and fittings inside the pump station and outside the pump station for the cleaning system supply lines may have either the Ceramic Epoxy Lining or a cement mortar lining in accordance with AWWA C104 and bituminous seal coat. Thickness of lining shall be as specified in AWWA C104.

G. Flexible Joint Couplings:

1. Flexible joint couplings shall be Dresser Style 38, Rockwell Style 411, Victaulic Depend-O-Lok - E x E, Type II or approved equal, unless otherwise shown.
2. Provide restrained flexible joint couplings or restrained flexible joints on all pipes connecting to concrete structures and at other locations shown on the Drawings. Restrained flexible couplings shall be Victaulic Depend-O-Lok F x F Type II or approved equal. Restrained flexible joints shall be U.S. Pipe "TR Flex", American Ductile Iron Pipe "Flex Ring", Clow Corporation "Super-Lock", or approved equal.

3.00 EXECUTION

3.01 INSTALLATION

- A. General: Install ductile iron pipe, fittings, specials, valves, and hydrants in accordance with AWWA C600 and the Specifications. Trenching and backfilling shall be in accordance with Section 31 23 33.16 "Trenching and Backfill." Before lowering into the trench, inspect each joint of pipe. Pipe will then be accepted, rejected, or repaired.
- B. Pipe Laying: Lower pipe, fittings, and special castings into trench by crane or other suitable method. Do not roll in or "dump" into the trench. Handle pipe and fittings with belts, slings, or other equipment designed to prevent damage to the pipe and coating. Remove dirt and trash that may be in the barrel of the pipe, on the spigot or in the bell while the pipe is suspended. Keep the pipe clean during the laying operation and free of sticks, dirt, and trash, and at the close of each operating day seal the open end of the pipe with a gasketed night cap. Do not lay pipe in water.
- C. Joint Making:
 1. Jointing Mechanical Joint Pipe:
 - a. Joint this type of pipe in accordance with the manufacturer's recommendations, with uniform torque on bolts.
 - b. After carefully cleaning both spigot and bell and after slipping the follower ring and gasket over the spigot end, slip the spigot into the bell. Apply a lubricant to the spigot to assist in assembly.

- c. Carefully seat the gaskets by hand to be even in the bell at all points.
 - d. After drawing up the follower ring to uniform bearing against the gasket, insert the bolts and tighten by hand in pairs using bolts opposite each other.
 - e. Tighten the nuts to hold the required pressure. Extension wrenches or pipes over wrench handles shall not be permitted. Use 10-inch ratchet wrenches to tighten the nuts to a uniform torque.
 - f. The finished joint shall be watertight.
2. Making Flanged Joints: Erect flanged pipe in accordance with the controlling dimension as specified. Thoroughly clean each piece of flanged pipe to remove dirt, rust, grease, and other foreign matter. Thoroughly wire brush flanged faces to ensure even bearing for gaskets and mating flanges. Place full face gasket, use drift pins to align holes, and tighten flange bolts, each in turn, at a uniform torque around the joint. Finished joints shall be watertight.
3. Making Push-On Joints:
- a. The jointing of this type of joint shall be as recommended by the manufacturer. The procedure for jointing shall be generally as follows:
 - 1). Thoroughly clean and dry the spigot and bell before starting the assembly of the joint. Wipe the gasket clean with a cloth.
 - 2). Place the gasket into the gasket seat in the bell.
 - 3). Apply a thin film of lubricant to the surface of the gasket that will come in contact with the entering pipe spigot. If necessary, also apply lubricant to the spigot.
 - 4). Make the joint by exerting sufficient force on the entering pipe so that its plain end will move past the gasket to the seat of the bell.
 - 5). If restrained joints are used, orient pipe to permit ease of assembly. Place locking device after installation of spigot into bell.
- D. Painting: Paint piping which is submerged or exposed to the atmosphere in accordance with Section 09 96 00 "High-Performance Coatings."

3.02 FIELD QUALITY CONTROL

- A. Perform a hydrostatic test as specified in Section 01 40 00 "Quality Requirements."

END OF SECTION

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33 05 01.05 BAR-WRAPPED CONCRETE CYLINDER PIPE AND FITTINGS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install bar-wrapped concrete cylinder pipe and fittings, and specials, including connections and appurtenances as required for the proper installation and function of the system as indicated herein.

1.02 QUALITY ASSURANCE

- A. Experience Requirements: Finished pipe shall be the product of one manufacturer that has had not less than 5 years successful experience manufacturing pipe of the types and sizes indicated. Pipe manufacturing operations (pipe, fittings, lining, coating) shall be performed at one location.
- B. Factory Testing:
1. The Owner reserves the option to have an independent testing laboratory, at the Owner's expense, inspect pipe and fittings at the pipe manufacturer's plant. The Owner's testing laboratory and Engineer shall have free access to the manufacturer's plant. The pipe manufacturer shall notify the Owner, in writing, at least 2 weeks ahead of pipe fabrication as to start of fabrication and fabricating schedule so that the Owner can advise the manufacturer as to Owner's decision regarding tests to be performed by an independent testing laboratory. In event the Owner elects to retain an independent testing laboratory to make material tests and weld tests, it is the intent that the tests be limited to one spot testing of each category unless the tests do not show compliance with the standard. If these tests do not show compliance, the Owner reserves the right to have the laboratory make additional tests and observations.
 2. The Owner will require the manufacturer to furnish mill test certificates on reinforcing steel or wire, steel plate, and cement. The manufacturer shall perform the tests described in AWWA C303, for all pipe, fittings, and specials.
 3. Absorption Test: A water absorption test shall be performed on Samples of cured mortar coating taken from each working shift. The mortar coating Samples shall have been cured in the same manner as the pipe. A test value shall consist of the average of a minimum of three Samples taken from the same working shift. The test method shall be in accordance with ASTM C497, Method A. The average absorption value for any test shall not exceed 9 percent and no individual Sample shall have an absorption exceeding 11 percent.
 4. Strength of Coating: Tests shall be made of cured mortar coating for the purpose of qualifying the mortar coating machine and the mortar mix design. One-inch cubes shall be tested in accordance with ASTM C109. The equivalent cylinder compressive strength of the mortar (0.74 times the cube strength) shall be not less than 5500 psi in 28 days.
 5. Charpy V-Notch test: Each heat of steel for plate or coil 0.25" and thicker shall be tested to verify minimum impact values of 25 ft-lb at 30°F, except that test are not required for small heats used for fittings.

6. Elongation test: For the tensile test specified in ASTM A370, 2-inch test specimens shall show elongations not less than 22 percent for each heat of steel.
 7. Hydrostatic Pressure Testing and Welding Testing: Fittings shall be fabricated from hydrostatically tested pipe. Fittings shall be tested by hydrostatic test, air test, ultrasonic test, or magnetic particle test. Air test shall be made by applying air to the welds at 10 pounds per square inch pressure and checking for leaks around and through welds with a soap solution. In addition, five percent of welds for fittings shall be checked with x-ray or ultrasonic testing by an independent Certified Welding Inspector paid for by the pipe manufacturer.
- C. Manufacturer's Technician for Pipe Installation: During the construction period, the Pipe manufacturer shall furnish the services of a factory trained, qualified, job experienced technician assistant as necessary in pipe laying and pipe jointing. This technician shall assist and advise the construction Contractor in his pipe laying operations and shall instruct construction personnel in proper joint assembly and joint inspection procedures. The technician is not required to be on-site full time; however, the technician shall be on-site during the first 2 weeks of pipe laying and thereafter as requested by the Engineer, Owner, or Contractor.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
1. Prior to the creation of fabrication and laying Shop Drawings, the Contractor shall submit drawings to the Engineer showing the northing, easting, and top of pipe elevation at each joint location where the proposed pipe connects to existing pipes.
 2. Prior to the fabrication of the pipe, submit fabrication and laying drawings to the Engineer as Shop Drawings. Shop Drawings shall include a complete description of the pipe offered, including cuts, tabulated layout and pertinent design data. Shop Drawings shall reference stationing on the plan/profile sheets and shall incorporate changes necessary to avoid conflicts with existing utilities and structures and adjustments necessary to make tie-ins. Details for the design and fabrication of all fittings and specials and provisions for thrust shall be included.
 3. Prior to delivery of the pipe to the Site, the manufacturer shall furnish an affidavit certifying that all pipe, fittings, and specials, and other products and materials furnished, comply with this Section and AWWA C303. Copies of results of factory tests and mill certificates for steel and cement shall be provided, including chemical and physical test results for each heat of steel.
 4. Certified Test Reports for factory and field welder certification.
 5. Certified Test Reports for all field welds.
 6. The Contractor's proposed field welding procedure in accordance with AWWA C206 and AWS D1.1.
 7. Copies of results of factory hydrostatic tests.
 8. Prior to final completion, submit as-built, top-of-pipe survey as Record Data. Top-of-pipe survey shall include station and top-of-pipe elevation for each pipe joint. Survey information shall be provided on the Contractor's "As-Built" Drawings.

1.04 STANDARDS

A. Except as modified or supplemented herein, bar-wrapped concrete cylinder pipe shall conform to the applicable requirements of the following standard specifications, latest edition.

1. American National Standards Institute (ANSI) / NSF:
 - a. ANSI/NSF Standard 61.
2. American Society for Testing and Materials (ASTM):

American Society for Testing and Materials (ASTM)	
ASTM A33	Standard Specification for Concrete Aggregates
ASTM A570	Standard Specification for Steel, Sheet and Strip, Carbon, Hot Rolled, Structural Quality
ASTM C144	Specification for Aggregate for Masonry Mortar
ASTM C150	Specification for Portland Cement
ASTM D698	Test for Moisture-Density Relations for Soils
ASTM E709	Practice for Magnetic Particle Examination
ASTM E1444	Guide for Magnetic Particle Examination

3. American Water Works Associations (AWWA):

American Water Works Associations (AWWA)	
AWWA C217	Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings to Steel Water Pipelines
AWWA C303	Standard for Concrete Pressure Pipe - Bar-Wrapped, Steel Cylinder Type
AWWA M9	Manual: Concrete Pressure Pipe

4. American Welding Society (AWS):
 - a. AWS D1.1 – Structural Welding Code.

1.05 DELIVERY AND STORAGE

A. Packing:

1. The pipe shall be prepared for shipment to afford maximum protection from normal hazard of transportation and allow pipe to reach the Site in an undamaged condition. Pipe damaged in shipment shall not be delivered to the Site unless such damaged pipe is properly repaired.
2. Pipes shall be carefully supported during shipment and storage. Pipe, fittings, and specials shall be separated so that they do not bear against each other in transit. Ship pipe on padded bunks with tie-down straps. Store pipe on padded skids, sand or dirt berms, tires, or other suitable means to protect the pipe from damage. Each length of pipe 36 inches and larger shall be internally supported and braced with stulls to maintain a true circular shape. Internal supports shall consist of steel or timber stulls firmly wedged and secured so that the stulls remain in place during

handling. Pipe shall be rotated so that one stull is vertical. Stulls shall not be removed until pipe is set to final grade.

3. Deliver, handle, and store pipe in accordance with the manufacturer's recommendations to protect coating systems.
- B. Marking for Identification: Each joint of pipe and each fitting shall have plainly marked on one end, the class for which it is designed, the date of manufacturer, and the identification number as shown on the Shop Drawings. Beveled pipe shall be marked with the amount of bevel. The top centerlines shall be marked on all specials.
- C. Point of Delivery: It is desired that pipe be hauled direct from pipe plant to the Site and strung along pipeline route, thus avoiding rehandling of pipe and the possibility of damage thereto. Where fully loaded truck and trailer cannot operate along the pipeline route, pipe may be unloaded at access points along the route, and brought to the trench side by approved methods; however, the Contractor shall be responsible that pipe is undamaged at the time of laying.

2.00 PRODUCTS

2.01 MATERIALS

- A. Cement: Cement for use in concrete and mortar shall be Type I Portland Cement for interior pipe mortar and Type II for the pipe exterior conforming to ASTM C150.
- B. Aggregates: Aggregates for concrete lining and coating shall conform to ASTM C33.
- C. Sand: Sand used for inside and outside joints shall be of silica base, conforming to ASTM C144.
- D. Special Coating: Pipe to be laid in casing shall have two built up rings or mortar each approximately 2 feet long and slightly higher than the pipe bell to prevent pipe being supported by the bell. Rings to be at the quarter points of the pipe section.
 1. Where indicated on the Drawings the exterior of the pipe shall be polyurethane coated in accordance with Section 09 97 16 "Pipeline Coatings and Linings."
- E. Steel: Steel shall meet the requirements of AWWA C303. Steel shall be homogeneous and shall be suitable for field welding.
- F. Threaded Outlets: Where outlets or taps are threaded, furnish and install brass bushings and plugs for the outlet size indicated.

2.02 MIXES; CEMENT MORTAR

- A. Cement mortar used for pipe joints shall consist of 1 part portland cement to 2 parts clean, fine, sharp silica sand, mixed with water. Exterior joint mortar shall be mixed to the consistency of thick cream. Interior joint mortar shall be mixed with as little water as possible so that the mortar is very stiff, but workable. Cement shall be ASTM C150, Type I. Sand shall conform to ASTM C144. Cement mortar used for patching shall be mixed as per cement mortar for inside joints.
- B. Water for cement mortar shall be treated and suitable for drinking water. Bonding agent for interior joints and pipe patching shall be Probond Epoxy Bonding Agent ET-150, parts A and B, Sikadur 32 Hi-Mod or approved equal.

- C. Cement mortar lining shall be centrifugally cast to leave a smooth lining. All rough spots shall be ground down with a rubbing stone or other approved method.

2.03 MANUFACTURED PRODUCTS

A. Pipe:

- 1. General: Pipe, specials and fittings shall be designed, manufactured, and tested in accordance with the applicable requirements of AWWA C303 and AWWA M9, and the special requirements of this Section.
- 2. Pipe Design Criteria:
 - a. Sizes and pressure classes (working pressure) shall be as shown on the Drawings. For the purposes of pipe design, the working pressure shall be 1.0 times the pressure class. The working pressure plus transient pressure shall be equal to 1.5 times the pressure class specified. Fittings, specials and connections shall be same class as the associated pipe. Pipe and fittings shall be clearly marked with the pressure class and piece number to permit easy identification in the field. Pipe design shall be based on trench conditions and design pressure class specified. Pipe shall be designed according to the methods indicated in AWWA C303 and AWWA Manual M9 for trench construction, using the following parameters:

Pipe Design Criteria	
Unit Weight of Fill (w)	130 pcf
Live Load	AASHTO HS 20
	Coopers E 80 at railroad
Trench Depth	As indicated
Coefficient (Ku')	0.150
Trench Width (Bd)	As indicated
Bedding Conditions	As indicated
Deflection Lag Factor – D ₁	1.1
Soil Reaction Modulus (E')	1500 (typical trench section) or 3000 (where encased)
Coefficient (k)	0.090
Maximum steel stress at working pressure	18,000 psi
Maximum calculated deflection (Dy = Dx)	1.0 %

- b. Trench depths indicated shall be verified after existing utilities are located. Vertical alignment changes required because of existing utility or other conflicts shall be accommodated by an appropriate change in pipe design depth. In no case shall pipe be installed deeper than its design allows.
- c. The fittings and specials shall be designed in accordance with AWWA C208 and AWWA M11 except that crotch plates shall be used for outlet

reinforcement for all Pressure Diameter Valves (PDV), greater than 6,000 unless otherwise specified. Where indicated on the drawings, collars or wrappers shall be used in lieu of crotch plates to allow working space and supports. As an alternate to crotch plates, collars or wrappers may be used when designed in accordance with ASME Section VII Division 1.

3. Provisions for Thrust:
 - a. Thrusts at bends, tees, plugs, or other fittings shall be resisted by restrained joints. Thrust at bends adjacent to casing shall be restrained by welding joints through casing and a sufficient distance each side of casing. No thrust restraint contribution shall be allowed for pipe in casing, unless the annular space in the casing is filled with cellular grout.
 - b. Restrained joints shall be used for a sufficient distance from each side of the bend, tee, plug, or other fitting to resist thrust which will be developed at the design pressure of the pipe. For the purpose of thrust restraint, design pressure shall be 1.5 times pressure class (working pressure). Restrained joints shall consist of welded joints. In areas where restrained joints are used for thrust restraint, the pipe shall have adequate cylinder thickness to transmit the thrust forces. For welded joints, if the thickness of the steel cylinder adjacent to the welded joint is greater than or equal to 0.1875 inches, the joints to be welded shall be prepared by trimming the spigot in the shop.
 - c. Thrust restraint design shall be the complete responsibility of the pipe manufacturer. The length of pipe with welded joints, the pipe cylinder thickness necessary to resist thrust forces, and all other provisions necessary for thrust restraint shall be determined by the pipe manufacturer, in accordance with the following:
 - Use latest M9 standards
 - Use latest edition of the TRDP program
 - Soil Type is Class V
 1. Unit weight of soil reduced to 60 pcf
 2. Coefficient of friction reduced to 0.25
 - Joint Type is welded
 - Use the minimum soil cover over entire restrained area
4. Inside Diameter: The inside diameter, including the cement mortar lining, shall be a minimum of the nominal diameter of the pipe specified.
- B. Joint Wrappers: Similar and equal to those manufactured by Mar Mac Manufacturing Company.
- C. Joint Bonds, Insulated Connections and Flange Gaskets: Joint bonds, Insulating connections and flange gaskets shall meet the requirements of Section 26 42 00.01 "Corrosion Control" or Section 33 12 16.13 "Miscellaneous Valves and Appurtenances."
- D. Flexible Joint Couplings and Expansion Joints: See Section 33 12 16.13 "Miscellaneous Valves and Appurtenances."

- E. Pipe Ends: The standard pipe end shall include Carnegie steel joint ring as per AWWA Manual M9 and AWWA C303 with rubber gasket. Welded joints shall be provided as required for thrust restraint. Harnessed joints and flanged joints shall be provided where indicated on the Drawings. Harnessed joints may be used in lieu of welded joints adjacent to structures, if approved by the Engineer.
- F. Bend Fittings: All bend fittings shall be long radius (minimum of 2.5 times the pipe ID) to permit easy passage of pipeline pigs.
- G. Butt Strap Closure Joints: Where necessary to make closure to pipe previously laid, closure joints shall be installed using butt strap joints in accordance with AWWA C206 and applicable provisions of this Section.
- H. Flanges, Nuts and Bolts: Furnish all bolts, nuts, flange gaskets, and insulation kits. Flanges shall conform to AWWA C207 class equal to or greater than the pipe class, unless otherwise specified, and shall match class of valves or appurtenances which are attached. All nuts, bolts and washers exposed inside building or vault shall be carbon steel and coated in accordance with specifications for adjacent pipe. Bolts shall be ASTM A307 grade B with ASTM A563 grade A heavy hex nuts for class B and D flanges. Bolts for class E and F flanges shall be ASTM A193 grade B7 with ASTM A194 grade 2H heavy hex nuts. All buried nuts, bolts and washers shall be Type 316 Stainless Steel of equivalent strength. All bolts shall be long enough that a minimum of three threads are exposed beyond the nut. Use an anti-seize compound during installation.
- I. Outlets for Weld Leads: The Contractor may use outlets for access for weld leads. Spacing of outlets shall be as determined by the Contractor and pipe manufacturer. Outlet configuration shall be approved by the Engineer. Outlets for weld leads shall be flanged not threaded. Northing and Easting and top of flange shall be recorded on the as-builts.

3.00 EXECUTION

3.01 INSTALLATION

A. General:

1. Install pipe, fittings, specials, and appurtenances as specified and required for the proper functioning of the completed pipe line. Install pipe, fittings, and specials in accordance with the manufacturer's recommendations and AWWA M9. Pipe shall be laid to the line and grade indicated.
2. The requirements of Section 31 23 33.16 "Trenching and Backfill" govern for the excavation and backfilling of trenches for laying steel pipe, fittings, and specials. Maximum allowable pipe deflection is limited to 1 percent for bar-wrapped concrete cylinder pipe measured in any direction. Contractor shall repair pipe not meeting this requirement at no additional cost to the Owner.
3. Keep the pipe clean during the laying operation and free of sticks, dirt, animals, and trash, and at the close of each operating day, effectively seal the open end of the pipe against the entrance of water using a gasketed night cap. Do not lay pipe in water.
4. Install bonds at all pipe joints, other than welded joints or insulated joints.

B. Pipe Deflection:

1. Pipe Deflection Measurements:
 - a. The Contractor shall complete internal welding of joints, welding inspections and grout of the inside joints prior to measuring deflection. The welding inspections shall be done in accordance with Section 3.01 D. 4. c.
 - b. Deflection measurements shall be made by the Contractor in the presence of the Owner's representative.
 - 1). Method for taking measurements shall be agreed to by the Owner and Engineer in writing prior to installing the first joint of pipe.
 - 2). Measurements shall be recorded by the Contractor.
 - 3). The deflection measurements shall be made no sooner than 5 days and no later than 21 days after backfilling operations are complete.
 - c. Deflection shall be determined with vertical measurements taken at the locations indicated below. Locations where vertical measurements are taken shall be clearly marked on the interior of the pipe.
 - 1). For pipe joints 36 feet in length or less, vertical measurements shall be taken at two locations, 1/4-distance from each pipe end.
 - 2). For pipe joints longer than 36 feet, vertical measurements shall be taken at three locations including 1/4-distance from each pipe end and at the pipe midpoint.
 - d. Vertical measurements may be taken at the same time the internal inspection is being performed.
2. Pipe Deflection Calculations: Deflection shall be calculated and reported by the Contractor within a week from the time the vertical measurements were taken. Deflection at each location shall be calculated using the equations below:

Δ = deflection (%)

$$\Delta = \left| \frac{(\text{Pipe ID} - \text{Vertical Measurement}) * 100}{\text{Pipe ID}} \right|$$

3. Pipe Deflection Acceptance Criteria:
 - a. Allowable pipe deflection is limited to 1 percent.
 - b. In no case shall a single measurement at any measured location exceed 1.5 times the allowable deflection.
 - c. These measurements include the allowable tolerance for lining thickness.
4. Correction of Pipe Not Complying with Deflection Requirements:
 - a. If the calculated deflection at any location or any single measurement fails to meet specifications, the entire joint shall be reworked in accordance with the manufacturer's recommendations and as directed by the Engineer at no additional cost to the Owner. This may include uncovering the pipe, re-compaction of the pipe bedding, and repair of the coating. It is the Contractor's responsibility to continuously measure and calculate pipe deflection to verify it meets specification.

- b. All costs associated with measuring for pipe deflection and any repairs or rework associated with meeting these requirements shall be borne by the Contractor.
5. Pipe Deflection Reports:
- a. A monthly report shall be submitted as Record Data showing the following for each joint of pipe:
 - 1). Allowable deflection and 1.5 times allowable deflection for each pipe diameter installed.
 - 2). Deflection measurements and calculated deflection for each location measured per joint.
 - 3). It is the responsibility of the Contractor to verify that the nominal pipe diameter meets specifications at all measured locations. Contractor shall coordinate pipe replacement with the pipe manufacturer for any pipe not meeting the specified internal diameter.
- C. Pipe Handling:
1. Haul, pipe, fittings, valves and other accessories to the Site. At all times handle the pipe with care to avoid damage. Load and unload pipe using hoists or cranes as specified below. Under no circumstances shall they be dropped.
 2. At all times handle pipe with wide nonabrasive slings, wire ropes, belts or other equipment designed to prevent damage to the coating, and keep this equipment in such repair that its continued use is not injurious to the coating. The use of tongs, bare pinch-bars, chain slings, or pipe hooks without proper padding or any other handling equipment which the Engineer deems to be injurious to the coating shall not be permitted. Provide adequate spacing of pipe supports to prevent cracking or damage to the cement mortar lining.
 3. Carefully observe the pipe for cracking and check the inside lining and coating, and should cracking occur, take immediate steps to protect the pipe. Have the pipe manufacturer repair any joint of pipe that has shrinkage cracks with a width of 1/16 inch or greater in the inside lining by using an approved method. If, in the opinion of the Engineer, the pipe is not suitable for repair, reject, plainly mark, and remove the pipe from the Site.
 4. Have the pipe manufacturer repair any joint of pipe that has exterior coating cracks larger than 0.005 inch (a hairline) by using an approved method. If, in the opinion of the Engineer, the pipe is not suitable for repair, reject, plainly mark, and remove the pipe from the Site.
 5. Remove, replace or reject any disbonded lining or coating. Apply bonding agent to patch area. A patch larger than 100 square inches or 12 inches in greatest dimension shall not be accepted. Adequately cure patches.
 6. Provide the proper implements, tools, equipment and facilities for safe and convenient prosecution of the Work. Lower pipe, fittings, specials, valves, etc. into the trench by means of a crane or other machine. Do not roll or dump into the trench. The crane shall be of a sufficient size for handling the pipe, and shall lift and lower the pipe at a slow rate of speed. The crane shall be capable of stopping the lifting operation at any point without producing a shock or otherwise jerking or vibrating the pipe.

7. Keep the pipe clean during the laying operation and free of sticks, dirt, and trash. At the close of each operating day, effectively seal the open end of the pipe using a gasketed night cap.
- D. Pipe Jointing:
1. General:
 - a. Thoroughly clean the bell and spigot rings before laying each joint of pipe by brushing and wiping. If any damage to the protective coating on the metal has occurred, repair the damage before laying the pipe. Lubricate the gasket and the inside surface of the bell with an approved lubricant (flax soap) which will facilitate the telescoping of the joint. Tightly fit together sections of pipe and exercise care to secure true alignment and grade. When a joint of pipe is being laid, place the gasket on the spigot ring and enter the spigot end of the pipe into the bell of the adjoining pipe and push into position. The inside joint space between ends of the pipe sections shall have an opening within the tolerances as recommended by the pipe manufacturer. No "blocking up" of pipe or joints will be permitted, and if the pipe is not uniformly supported or the joint not made up properly, remove the joint and properly prepare the trench. After joining, check the position of the gasket with a feeler gauge. If the gasket is out of position, disassemble the joint and repeat the joint laying procedure.
 - b. For interior welded joints, complete backfill before welding. After welding, apply the interior joint coating.
 2. Exterior Joints: Make the exterior joint by placing a joint wrapper around the pipe and secure in place with two metal straps. The wrapper shall be 9 inches wide for pipe 36 inches and larger, and 7 inches wide for smaller pipe, hemmed on each side. The wrapper shall be fiberglass reinforced or burlap cloth, with lengths encircling the pipe, leaving enough opening between ends to allow the mortar to be poured inside the wrapper into the joint. Fill the joint with mortar from one side in one continuous operation until the grout has flowed entirely around the pipe. During the filling of the joint, pat or manipulate the sides of the wrapper to settle the mortar and expel any entrapped air. Leave wrappers in place undisturbed until the mortar has set-up.
 3. Interior Joints:
 - a. Upon completion of backfilling of the pipe trench, fill the inside joint recess with a stiff cement mortar. Prior to placing of mortar, clean out dirt or trash that has collected in the joint, and moisten the concrete surfaces of the joint space by spraying or brushing with a wet brush. Where the mortar joint opening is 1 inch or wider, such as where trimmed spigots are required, apply a bonding agent to mortar and steel surface prior to placing joint mortar. Ram or pack the stiff mortar into the joint space and take extreme care to insure that no voids remain in the joint space. After the joint has been filled, level the surfaces of the joint mortar with the interior surfaces of the pipe with a steel trowel so that the surface is smooth.
 - b. Interior joints of pipe 24 inches and smaller shall have the bell buttered with mortar, prior to inserting the spigot, such that when the spigot is pushed into position it will extrude surplus mortar from the joint. The surplus mortar shall be struck off flush with the inside of the pipe by pulling a filled burlap bag or an inflated ball through the pipe with a rope.

4. Welded Joints:

- a. Pipe 36 inches and smaller shall be welded from the outside using the following procedures:
 - 1). Telescope together the joints to be welded with a rubber gasket as specified above and align perfectly with the adjacent section of pipe. Accomplish welding by laying a filler rod between the steel bell of one section and the steel spigot of the other, and welding the bell to the outside of the spigot. Use no less than three complete passes to make the weld. When the joint weld is completed, pour the exterior joint with mortar as specified above. After all sections are in final position, fill the interior joint as specified above. Welded joints shall meet the requirements of AWWA Manual M9.
- b. Pipe 42 inches and larger shall be welded from the inside, using the following procedures:
 - 1). Joint spigots shall be trimmed where the stress in the gasket groove exceeds 12,000 psi due to axial thrust load. Trim the joint ring behind the gasket groove. After the adjacent pipe sections are aligned and tack welded, weld the bell to the spigot with a full fillet weld. Welded joints shall meet the requirements of AWWA Manual M9. When the joint weld is completed, grout the inside joint, pour the exterior joint with mortar as specified above.
- c. General weld requirements shall be as follows:
 - 1). Weld joints in accordance with the AWWA C206 for Field Welding of Steel Water Pipe. Unless otherwise specified, welds shall be full circle fillet welds.
 - 2). Adequate provisions for reducing temperature stresses shall be the responsibility of the Contractor.
 - 3). After the pipe have been joined and properly aligned and prior to the start of the welding procedure, the spigot and bell shall be made essentially concentric by jacking, shimming, or tacking to obtain clearance tolerance around the periphery of the joint. In no case shall the clearance tolerance be permitted to accumulate.
 - 4). Before welding, thoroughly clean pipe ends. Weld pipe by machine or by the manual shielded electric arc process. Welding shall be performed so as not to damage lining or coating. Cover the coating as necessary to protect from welding.
 - 5). Furnish labor, equipment, tools and supplies, including shielded type welding rod. Protect welding rod from any deterioration prior to its use. If any portion of a box or carton is damaged, reject the entire box or carton.
 - 6). In all hand welding, the metal shall be deposited in successive layers. For hand welds, not more than 1/8 inch of metal shall be deposited in each pass. Each pass except the final one, whether in butt or fillet welds, shall be thoroughly bobbed or peened to relieve shrinkage stresses and to remove dirt, slag, or flux before the succeeding bead is applied. Each pass shall be thoroughly fused into the plates at each side of the welding groove

- or fillet and shall not be permitted to pile up in the center of the weld. Undercutting along the side shall not be permitted.
- 7). Welds shall be free from pin holes, non-metallic inclusions, air pockets, undercutting and/or any other defects.
 - 8). If the ends of the pipe are laminated, split or damaged to the extent that satisfactory welding contact cannot be obtained, remove the pipe from the line.
 - 9). Furnish each welder employed with a steel stencil for marking the welds, so that the work of each welder may be identified. Have each welder stencil the pipe adjacent to the weld with the stencil assigned to him. In the event any welder leaves the job, his stencil shall be voided and not duplicated if another welder is employed.
 - 10). Use only competent, skilled and qualified workmen. Each welder employed by the Contractor shall be required to satisfactorily pass a welding test in accordance with AWWA C206 before being allowed to weld on the line. Field welding shall be provided by one of the following firms:
 - a). Hanson Pipe and Products, Inc.
 - b). Fuller's Service Company, Barry Fuller, (817) 946-5458.
 - c). Scott's Welding, Scott Fowler, (972) 978-7865.
 - d). Fletcher's Welding, Darrell Fletcher.
 - e). Ted Cantu, (817) 307-8750.
 - f). Eddie's Welding Service, Eddie Pierce, (817) 909-6089.
 - g). National Welding Corporation, Nash Williams, (801) 255-5959.
 - h). No others will be accepted.
 - 11). After each welder has qualified in the preliminary tests referred to above, inspections shall be made of joints in the line. Any welder making defective welds shall not be allowed to continue to weld.
 - 12). Visual tests and magnetic particle tests in accordance with AWWA C206, ASTM E709 and E1444, shall be performed by a Independent Certified Welding Inspector on all field welded joints. Weld inspector will be paid by the Contractor. Welds that prove to be defective will be replaced or repaired, whichever is deemed necessary by the Engineer, at Contractor's expense.
 - 13). If the Contractor disagrees with the Engineer's interpretation of welding tests, test sections may be cut from the joint for physical testing. The Contractor shall bear the expense of repairing the joint, regardless of the results of physical testing. The procedure for repairing the joint shall be approved by the Engineer before proceeding.
 - 14). Keep daily welding reports which identify the welder's name and the joint welded. Joints must be shown on the daily welding reports with the identification number assigned in the lay drawings (ex. ID#1 – ID#2). Provide three copies of all daily welding reports to owner representative every month.

- E. Protection of Buried Metal: Protect buried ferrous metal such as flanges, nuts, bolts, dresser couplings, etc. by applying two wraps of wax tape in accordance with AWWA C217, and encasing it with flowable fill.
- F. Patching:
 - 1. Excessive field-patching of lining or coating shall not be permitted. Patching of lining or coating will not be allowed where area to be repaired exceeds 100 square inches or has dimensions greater than 12 inches. In general, there shall not be more than one patch on either the lining or the coating of any one joint of pipe.
 - 2. Wherever necessary to patch the pipe, make patch with cement mortar as previously specified for interior joints. Apply a bonding agent to a clean, dry surface prior to cement mortar patch. Do not install patched pipe until the patch has been properly and adequately cured and approved for laying by the Engineer. Promptly remove rejected pipe from the site.
- G. Pipe Bedding and Backfill:
 - 1. Pipe bedding and backfill shall be as specified in Section 31 23 33.16 "Trenching and Backfill." Remove sheeting and shoring in a manner such that a good bond is achieved between the backfill material and the undisturbed trench walls.

3.02 FIELD QUALITY CONTROL

- A. Disinfect the piping system as specified in Section 33 10 13 "Disinfection Water Utility Distribution."
- B. Perform a hydrostatic test as specified in Section 01 45 16.16 "Hydrostatic Testing."

END OF SECTION

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33 10 13 DISINFECTING OF WATER UTILITY DISTRIBUTION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Disinfect the facilities for pumping, storing, or conveying potable water to comply with the standards for potable water of the regulatory agency of jurisdiction. Potable water is defined as any water that has been filtered, disinfected or otherwise treated to the meet regulatory standards (in the water treatment plant this includes the inside surfaces of the filters).
- B. Disinfect piping systems that are used to convey water, solutions, or chemicals to the potable water facilities.
- C. Test water from the disinfected system per regulatory standards to verify that water is acceptable. Repeat procedure if tests do not meet standards.
- D. For critical operations identified in Section 01 35 00 "Special Procedures" the contractor shall plan and perform the repairs/work in a manner to allow the Bac-T samples to be taken by noon. In accordance with Texas Commission on Environmental Quality (TCEQ) Chapter 290 regulations, disinfection must be performed when repairs are made to existing facilities and before new facilities are placed into service. When it is necessary to return the facility back to service as rapidly as possible, it is acceptable to increase the doses to 500 mg/l and the contact time reduced to 30 minutes. This project will require the critical operations to be disinfected by 500 mg/l for 30 minutes followed by flushing prior to the sample being taken. The Owner will take the sample and have it tested. Contractor may also take a sample to be tested. Cost for failed tests and all associated re-disinfection, flushing shall be borne by the Contractor. Prior to the 30 minute test time, all new valves shall be fully closed and opened.
- E. All piping, appurtenances, and construction standards shall meet the requirements of the City in which construction occurs as shown in the City Details.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. De-watering Plan
 - 2. De-chlorination Plan

2.00 PRODUCTS

2.01 MATERIALS

- A. Liquid Chlorine: Meeting the requirements of AWWA B301.
- B. Calcium Hypochlorite: Meeting the requirements of AWWA B300.

3.00 EXECUTION

3.01 NEW FACILITIES

- A. New facilities shall be thoroughly disinfected in accordance with AWWA Standard C651 - Water Mains, C652 - Storage Facilities, C653 – Water Treatment Plants, and then flushed and sampled before being placed in service. Samples shall be collected and tested in accordance with the TCEQ Rules and Regulations, Chapter 290.
- B. During construction keep basins, pipe, fittings, equipment, and appurtenances free from dirt and debris.
 - 1. Clean basins thoroughly before disinfection.
 - 2. Seal the open ends of pipe with water-tight plugs when pipe is not being laid.
 - 3. Pump water from trenches before removing the plug when water accumulates in the trench.
- C. Complete hydrostatic test of the line prior to disinfection.
- D. Wash the surfaces to be disinfected.
 - 1. Flush pipelines. The minimum quantity of water used for flushing must exceed the capacity of the line to insure that clean water has traversed the entire length of pipe.
 - 2. Power wash the surfaces of basins and reservoirs using high pressure wash systems.
- E. Disinfect facilities per the following procedures of AWWA:
 - 1. Water Mains: C651 - latest revision.
 - 2. Water Storage Facilities: C652 - latest revision.
 - 3. Water Treatment Plants: C653 - latest revision.
- F. Fill the system with potable water. Test the water to see that it meets the requirements of the regulatory agency of jurisdiction for potable water. Monitor the system for 2 days. If water test fails to meet the prescribed standards, repeat the disinfection process until water meets quality standards for disinfection.

3.02 REPAIRS OR CONNECTIONS TO EXISTING LINES

- A. Clean and sterilize the interior surfaces of new piping, fittings, equipment, and appurtenances to be installed in an existing potable water system or connected to an existing system.
- B. Clean and sterilize the existing pipe or facilities for a minimum distance of 3 pipe diameters back from the ends of the pipe. Plug the ends of the line when work is not being performed on the pipe.
- C. Perform sterilization by swabbing each item with a concentrated chlorine solution.
 - 1. Each piece is to be disinfected prior to being assembled for installation in the existing pipe.
 - 2. Disinfect each piece just prior to assembly to help prevent re contamination.
 - 3. Plug the ends of the assembly until a new item is to be added to the assembly.
 - 4. Store disinfected materials on blocks to prevent contact with the ground.

3.03 DISPOSAL OF FLUSHING AND DISINFECTION WATER

- A. Chlorinated water used in flushing and disinfecting pipelines, storage tanks, or vessels prior to connection to the distribution system shall be disposed of by the Contractor in an acceptable manner. Chlorinated water must be “de-chlorinated” prior to disposal to eliminate adverse impacts to the surrounding environment. Water released to the environment shall meet all AWWA, EPA, and TCEQ regulatory requirements.
1. The Contractor is responsible for complying with all of the applicable requirements of the TPDES General Permit TXG670000, issued by the TCEQ, regarding the discharge of hydrostatic test water.
 2. Residual chlorine concentrations may be reduced using sulfur dioxide, sodium bisulfite, sodium sulfite, sodium thiosulfate, or ascorbic acid.
 3. The discharge must be to a splash pad or paved area, and may not be located within 300 feet of the intake for a domestic drinking water supply or 500 feet of any public or private water well.
 4. An effluent water sample must be taken during the first hour of discharge at a location immediately near the point of discharge, and collected prior to commingling with storm water, wastewater, or other flows.
 5. For discharges that extend beyond an hour in duration, a second sample must be taken of the last 10% of the effluent.
 6. Sampling protocol, sample containers, holding times, preservation methods, and analytical methods must follow the requirements set forth in the general permit.
 7. The effluent grab sample(s) must be analyzed for total residual chlorine by an accredited and certified laboratory.
 8. Any noncompliance that endangers human health or safety, or the environment must be reported to the TCEQ in accordance with the general permit.
 9. Any effluent violation which deviates from the permitted effluent limitation by more than 40% must be reported to the TCEQ in accordance with the general permit.
 10. The Contractor must record all hydrostatic test water sample results on an approved DMR (EPA Form 3320-1). These monitoring records shall be retained for a period of three years from the date of the record and be readily available for review by the TCEQ upon request. See attached form
- B. With the written permission of the Owner of the system, chlorinated water may be disposed of in a sanitary sewer system if one is available. In the case of larger pipelines and the larger volumes of water involved, the Contractor will not be permitted to use the sanitary sewer system for disposal even if one is available.

END OF SECTION

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Form Approved
OMB No. 2040-0004

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different) _____ NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

NAME _____ PERMIT NUMBER _____ DISCHARGE NUMBER _____
ADDRESS _____

FACILITY LOCATION _____ FROM _____ TO _____
MONITORING PERIOD
YEAR MO DAY YEAR MO DAY

NOTE: Read instructions before

PARAMETER	QUANTITY OR LOADING			QUALITY OR CONCENTRATION			NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
	AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM			
SAMPLE PERMIT REQUIREMENT									
SAMPLE PERMIT REQUIREMENT									
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SAMPLE PERMIT REQUIREMENT									

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER _____ TELEPHONE _____ DATE _____
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information on which this document is based. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.
 TYPED OR PRINTED _____ SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT _____ AREA _____ NUMBER _____ YEAR _____ MO _____ DAY _____

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

_____ This is a 4-part form _____ PAGE _____ OF _____

Paperwork Reduction Act Notice

Public reporting burden for this collection of information is estimated to vary from a range of 10 hours as an average per response for some minor facilities, to 110 hours as an average per response for some major facilities, with a weighted average for major and minor facilities of 18 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including strategies for reducing this burden, to Chief, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

General Instructions

1. If form has been partially completed by preprinting, disregard instructions directed at entry of that information already preprinted.
2. Enter "Permittee Name/Mailing Address (and facility name/location, if different)," "Permit Number," and "Discharge Number" where indicated. (A separate form is required for each discharge.)
3. Enter dates beginning and ending "Monitoring Period" covered by form where indicated.
4. Enter each "Parameter" as specified in monitoring requirements of permit.
5. Enter "Sample Measurement" data for each parameter under "Quantity" and "Quality" in units specified in permit. "Average" is normally arithmetic average (geometric average for bacterial parameters) of all sample measurements for each parameter obtained during "Monitoring Period"; "Maximum" and "Minimum" are normally extreme high and low measurements obtained during "Monitoring Period." (Note to municipals with secondary treatment requirement: Enter 30-day average of sample measurements under "Average," and enter maximum 7-day average of sample measurements obtained during monitoring period under "Maximum.")
6. Enter "Permit Requirement" for each parameter under "Quantity" and "Quality" as specified in permit.
7. Under "No Ex" enter number of sample measurements during monitoring period that exceed maximum (and/or minimum or 7-day average as appropriate) permit requirement for each parameter. If none, enter "0."
8. Enter "Frequency of Analysis" both as "Sample Measurement" (actual frequency of sampling and analysis used during monitoring period) and as "Permit Requirement" specified in permit. (e.g., Enter "Cont," for continuous monitoring, "1/7" for one day per week, "1/30" for one day per month, "1/90" for one day per quarter, etc.)
9. Enter "Sample Type" both as "Sample Measurement" (actual sample type used during monitoring period) and as "Permit Requirement," (e.g., Enter "Grab" for individual sample, "24HC" for 24-hour composite, "N/A" for continuous monitoring, etc.)
10. Where violations of permit requirements are reported, attach a brief explanation to describe cause and corrective actions taken, and reference each violation by date.
11. If "no discharge" occurs during monitoring period, enter "No Discharge" across form in place of data entry.
12. Enter "Name/Title of Principal Executive Officer" with "Signature of Principal Officer of Authorized Agent," "Telephone Number," and "Date" at bottom of form.
13. Mail signed Report to Office(s) by date(s) specified in permit. Retain copy for your records.
14. More detailed instructions for use of this *Discharge Monitoring Report (DMR)* form may be obtained from Office(s) specified in permit.

Legal Notice

This report is required by law (33 U.S.C. 1318; 40 C.F.R. 125.27). Failure to report or failure to report truthfully can result in civil penalties not to exceed \$10,000 per day of violation; or in criminal penalties not to exceed \$25,000 per day of violation, or by imprisonment for not more than one year, or by both.

EPA Form 3320-1 (Rev. 3/99)

33 11 13.13 STEEL PIPE AND FITTINGS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install steel pipe, fittings, and specials as specified, including connections and appurtenances, as required for the proper installation and function of the pipe as indicated herein.

1.02 QUALITY ASSURANCE

A. Experience Requirements:

1. Pipe shall be the product of one manufacturer who has had not less than 5 years' successful experience manufacturing pipe of the particular type and size indicated. Pipe manufacturing operations (pipe, fittings, lining, and coating) shall be performed at one location unless otherwise approved by the Engineer. The intent is that the lining and coating for the pipe or the fitting be done at the same location as the pipe or fitting. The pipe and fitting may be manufactured at different locations. The Engineer will waive the requirement for 5 years' experience in manufacturing of the pipe, when at the sole discretion of the Engineer, the manufacturer's experience and capabilities meet the intent of the experience requirement.
2. The manufacturer shall be certified under SPFA or ISO 9001 quality certification program for steel pipe and accessory manufacturing.

B. Owner Testing and Inspection:

1. Pipe may be subject to inspection by an independent testing laboratory, which laboratory shall be selected and retained by the Owner. Representatives of the laboratory or the Engineer shall have access to the Work whenever it is in preparation or progress, and the pipe manufacturer shall provide proper facilities for access and for inspection. The pipe manufacturer shall notify the Owner in writing, a minimum of 2 weeks prior to the pipe fabrication so that the Owner may advise the manufacturer as to the Owner's decision regarding tests to be performed by an independent testing laboratory. Material, fabricated parts, and pipe, which are discovered to be defective, or which do not conform to the requirements of this Section shall be subject to rejection at any time prior to Owner's final acceptance of the product. Pipe manufacturer shall be responsible for repairs to the coating system required as a result of Owner testing (polyurethane-coated pipe only) at no additional cost to the Owner.
2. The inspection and testing by the independent testing laboratory anticipates that production of pipe shall be done over a normal period of time and without "slow downs" or other abnormal delays. In the event that an abnormal production time is required, and the Owner is required to pay excessive costs for inspection, then the Contractor shall be required to reimburse the Owner for such laboratory costs over and above those which would have been incurred under a normal schedule of production as determined by the Engineer.

- C. Factory Testing: The manufacturer shall perform all tests as required by the applicable AWWA standards and as listed herein.

- D. Cement Mortar Lining: Shop-applied cement mortar linings shall be tested in accordance with AWWA C205.
- E. Pipe Coatings: Pipe coatings shall be as specified in Section 09 97 16 "Pipeline Coatings and Linings."
- F. Hydrostatic Pressure Testing:
1. Each joint of pipe shall be hydrostatically tested prior to application of lining or coating. The internal test pressure shall be that which results in a fiber stress equal to 75 percent of the minimum yield strength of the steel used. Each joint of pipe tested shall be completely watertight under maximum test pressure. As a part of testing equipment, the pipe manufacturer shall maintain a recording pressure gauge, reference number of pipe tested, etc. The pipe shall be numbered in order that this information can be recorded.
 2. Fittings shall be fabricated from hydrostatically tested pipe. Fittings shall be tested by hydrostatic test, air test or magnetic particle test. Air test shall be made by applying air to the welds at 10 pounds per square inch pressure and checking for leaks around and through welds with a soap solution. In addition, 5 percent of welds shall be checked with x-ray or ultrasonic testing.
- G. Charpy V-Notch Test: Each heat of steel shall be tested to verify minimum impact values of 25 ft-lb at 30 F.
- H. Elongation: For the tensile test specified in ASTM A370, 2-inch test specimens shall show elongations not less than 22 percent for each heat of steel. When 8-inch test specimens are used in lieu of 2-inch test specimens, the specimens shall show elongations not less than 18 percent for each heat of steel.
- I. Mill Certification: The Owner will require the manufacturer to furnish mill test certificates on reinforcing steel or wire, steel plate, and cement. The manufacturer shall perform the tests described in AWWA C200, for all pipe, fittings, and specials.
- J. Manufacturer's Technician for Pipe Installation:
1. During the construction period, the pipe manufacturer shall furnish the services of a factory trained, qualified, job experienced technician to advise and instruct as necessary in pipe laying and pipe jointing. The technician shall assist and advise the Contractor in his pipe laying operations and shall instruct construction personnel in proper joint assembly and joint inspection procedures. The technician is not required to be on-site full time; however, the technician shall be on-site during the first 2 weeks of pipe laying and thereafter as requested by the Engineer, Owner, or Contractor.
 2. The pipe manufacturer shall provide services of the polyurethane coating manufacturer's representative and a representative from the heat shrink joint manufacturer for a period of not less than 1 week at beginning of actual pipe laying operations to advise Contractor and Owner regarding installation, including but not limited to, handling and storage, cleaning and inspecting, coating repairs, field applied coating, heat shrink installation procedures and general construction methods and how they may affect the pipe coating.
 3. The manufacturer's representative shall be required to return if, in the opinion of the Engineer, the polyurethane coating or the Contractor's construction methods

do not comply with the Specifications. Cost for the manufacturer's representatives to return to the Site shall be at no additional cost to the Owner.

1.03 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:

B. SHOP DRAWINGS

1. Prior to the fabrication of the pipe, submit fabrication and laying drawings to the Engineer. Shop Drawings shall include:

- a. Schematic location, which shall include a profile and a tabulated layout schedule, both of which shall be appropriately referenced to the stationing of the proposed pipeline as shown on the plan and profile sheets.
- b. Shop Drawings shall be based on the Contract Documents and shall incorporate changes necessary to avoid conflicts with existing utilities and structures. The specific number of each pipe and fitting, location of each pipe, direction of each fitting in the completed line shall be depicted.
- c. Full details of reinforcement and dimensions for pipe and fittings.
- d. Location of all outlets as required by the Contractor to install welds.
- e. Location and details for the fabrication of all fittings and specials. The line layout shall include the pipe station and invert elevation at all changes in grade or horizontal alignment.
- f. Provisions for thrust restraint
- g. Where welded joints are required, welding requirements, welding procedures, provisions for thermal stress control, and provisions for control of coating damage shall be depicted.

2. The Contractor's Proposed Field Welding Procedure Specification (WPS) in accordance with AWWA C206 and AWS D1.1.

C. CERTIFICATION OF COMPLIANCE WITH CONTRACT DOCUMENTS

1. Prior to shipment of the pipe, the Contractor/Pipe Manufacturer shall submit an affidavit certifying that the pipe, fittings, specials, and other products and materials furnished, comply with this Section, Drawings, and the applicable requirements of the AWWA standards.

D. CERTIFIED TEST REPORTS

Submit the following Certified Test Reports prior to shipment of the pipe:

1. Copies of results of factory hydrostatic tests and test of fittings shall be provided to the Engineer.
2. Mill certificates, including chemical and physical test results for each heat of steel, Charpy v-notch tests, and elongation tests.
3. A Certified Test Report from the coating Manufacturer indicating that the coatings were applied in accordance with Manufacturer's requirements and in accordance with this Section on all pipe, fittings and joints made in the factory.
4. Welder Qualifications Records (WQR) in accordance with AWWA C206 and AWS D1.1 for both factory and field welders.

5. Certified test reports for cement mortar tests.
6. Gasket certification in accordance to AWWA C200 shall be provided where bell and spigot gasket joint pipe is specified.
7. Copies of all manufacturer's factory quality control tests.

E. RECORD DATA

1. Prior to fabrication, submit the following:
 - a. Manufacturer's Welding Procedure Specifications per AWS D1.1 or Section IX of the ANSI/ASME Boiler and Pressure Vessel Code, under ANSI/AWS B2.1.
 - b. Submit inspection procedures to be used by Manufacturer and for quality control and assurance for materials and welding. Submit standard repair procedures that describe in detail shop and field work to be performed.
 - c. Certification showing calibration within last 12 months for equipment such as scales, measuring devices, and calibration tools used in manufacture of pipe. Each device used in manufacture of pipe is required to have tag recording date of last calibration. Devices are subject to inspection by Owner.
2. Provide copies of "Release for Manufacture" layout sheets prior to pipe delivery.
3. Daily welding reports for field welding showing welder and joint welded shall be submitted monthly.
4. After construction, the Pipe Manufacturer shall provide AutoCad drawings of the pipe plan and profile layout sheets showing each joint of pipe and all appurtenances to the same coordinate system as used on the Drawings.
5. After construction, the installation Contractor shall provide ASCI electronic record data showing top-of-pipe survey every 50 feet along the pipeline and at horizontal and vertical deflections.

1.04 STANDARDS

- A. Except as modified or supplemented herein, the steel pipe, coatings, fittings, and specials shall conform to the applicable requirements of the following standard specifications, latest edition:
 1. American National Standards Institute (ANSI)/NSF:
 - a. ANSI/NSF Standard 61.
 2. American Society of Mechanical Engineers (ASME):
 - a. ASME Shop Welding Certification.
 3. American Society for Testing and Materials (ASTM):

American Society for Testing and Materials (ASTM)	
ASTM C33	Specifications for Concrete Aggregates
ASTM C35	Specifications for Inorganic Aggregates for Use in Gypsum Plaster
ASTM C150	Specifications for Portland Cement

American Society for Testing and Materials (ASTM)	
ASTM D16	Paint, Varnish, Lacquer, and Related Products
ASTM D522	Mandrel Bend Test of Attached Organic Coatings
ASTM E165	Practice for Liquid Penetrant Inspection Method
ASTM E709	Practice for Magnetic Particle Examination
ASTM E1444	Guide for Magnetic Particle Examination

4. American Water Works Associations (AWWA):

American Water Works Associations (AWWA)	
AWWA C200	Steel Water Pipe 6 Inches and Larger
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe 4 Inches and Larger - Shop-Applied
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 Inches thru 144 Inches
AWWA C208	Dimensions for Steel Water Pipe Fittings
AWWA C210	Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
AWWA C216	Heat Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C217	Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings to Steel Water Pipelines
AWWA C222	Polyurethane Coatings for the Interior and Exterior of Steel Water Pipelines and Fittings
AWWA C602	Cement-Mortar Lining of Water Pipelines - 4 Inches and Larger - In-Place
AWWA M11	Manual: Steel Pipe - A Guide for Design and Installation

5. American Welding Society (AWS):

- a. AWS D1.1 – Structural Welding Code.

6. Steel Structures Painting Council (SSPC):

Steel Structures Painting Council (SSPC)	
SSPC-SP-1	Steel Structures Painting Council - Solvent Cleaning
SSPC-SP-10	Steel Structures Painting Council - Near-White Blast Cleaning
SSPC-PA2	Steel Structures Painting Council - Measurement of Dry Paint Thickness with Magnetic Gages
SSPC-PA/Guide 3	Steel Structures Painting Council - A Guide to Safety in Paint Application

Steel Structures Painting Council (SSPC)	
SSPC-PS/ Guide 17	Steel Structures Painting Council - A Guide for Selecting Urethane Painting Systems

1.05 DELIVERY AND STORAGE

A. Packing:

1. The pipe shall be prepared for shipment to afford maximum protection from normal hazard of transportation and allow pipe to reach the Site in an undamaged condition. Pipe segments damaged in shipment that requires more than two repairs per segment will not be accepted at the Site. No more than 10 percent of all segments shall have damage repairs, or all damaged pipe segments will be rejected. Normal factory repair of lining and coating for fabrication of fittings and specials is acceptable.
2. Pipe sections shall be handled in accordance with Paragraph 3.01.C – Pipe Handling. In all instances deliver, handle, and store pipe in accordance with the Manufacturer's recommendations to protect coating systems. Upon delivery of the pipe, notify the Engineer, so that inspection can be made
3. For mortar lined pipe, after the completed pipe and fittings have been removed from the final cure at the manufacturing plant, the pipe lining shall be protected from drying by means of plastic end covers banded to the pipe ends. Covers shall be maintained over the pipe ends at all times until ready to be placed in the trench. Moisture shall be maintained inside the pipe by periodic addition of water as necessary.
4. Pipes shall be carefully supported during shipment and storage. Pipe, fittings, and specials shall be separated so that they do not bear against each other, and the whole load shall be securely fastened to prevent movement in transit. Ship pipe on padded bunks with tie-down straps approximately over stulling. Store pipe on padded skids, sand or dirt berms, tires, or other suitable means to protect the pipe from damage. Each end of each length of pipe, fitting, or special and the middle of each pipe joint shall be internally supported and braced with stulls to maintain a true circular shape. Additional stulls shall be included, as determined by the Pipe Manufacturer, if required to protect the pipe from damage. The Pipe Manufacturer's stulling shall meet or exceed the standards listed in ASCE MOP No. 79. Internal stulls shall consist of timber or steel firmly wedged and secured so that stulls remain in place during storage, shipment, and installation. Pipe and liner shall be protected from damage from stulls using shaped wood pads or similar devices, unless it can be demonstrated that the wood pads are not required to prevent damage to the pipe lining. Stulls shall not be welded directly to the pipe except at the end of the pipe where the mortar is held back. Pipe shall be rotated so that one stull remains vertical during storage, shipment and installation. Stulls shall not be removed until pipe is laid, set to grade and backfilled.
5. Deliver, handle, and store pipe in accordance with the manufacturer's recommendations to protect coating systems.

- B. Marking for Identification: Marking for Identification: Each joint of pipe and each fitting shall have plainly marked on one end, the class for which it is designed, the

date of manufacturer, and the identification number as shown on the Shop Drawings. The top centerlines shall be marked on all fittings and specials.

- C. Each joint of pipe and each fitting shall also be marked at each end on the interior lining near but not inside the bell or spigot with the section designation and pipe identification number as shown on the approved Shop Drawings. Markings should be visible from inside the pipe after installation during and after field welding, joint grouting, and inspection.

Point of Delivery: It is desired that pipe be hauled direct from pipe plant to the Site and strung along pipeline route, thus avoiding rehandling of pipe and the possibility of damage thereto. Where fully loaded truck and trailer cannot operate along the pipeline route, pipe may be unloaded at access points along the route, and brought to the trench side by approved methods; however, the Contractor shall be responsible that pipe is undamaged at the time of installation.

2.00 PRODUCTS

2.01 MATERIALS

- A. Cement Mortar Linings: Cement mortar linings shall be shop-applied (plant-spun) for pipe sizes 108 inches and smaller. Shop applied cement mortar linings shall conform to the requirements of AWWA C205 with the following modifications: Sand used for cement mortar shall be silica sand and shall not leach in water. Curing of the linings shall conform to the requirements of AWWA C205. Cement mortar linings shall be dense and smooth without bumps, blisters, ridges or spalling, to the satisfaction of the Engineer. All rough spots shall be smoothed out with a rubbing stone, or other method, to the satisfaction of the Engineer.
- B. Flanges, Nuts, Bolts and Gaskets: Furnish all bolts, nuts, flange gaskets, and insulation kits. All nuts, bolts and washers exposed inside building or vaults shall be carbon steel and coated in accordance with the specifications for adjacent pipe. Bolts shall be ASTM A307 grade B with ASTM A563 grade A heavy hex nuts for class B and D flanges. Bolts for class E and F flanges shall be ASTM A193 grade B7 with ASTM A194 grade 2H heavy hex nuts. All buried nuts, bolts and washers shall be Type 316 Stainless Steel of suitable strength to meet the service requirements. Manufacturer or supplier shall determine type of nuts and bolts needed to meet the service requirements. All bolts shall be long enough that a minimum of three threads are exposed beyond the nut. Use an anti-seize compound during installation. Non-insulated flange gaskets for working pressures up to 175 psi shall be rubber gaskets per AWWA C207. Non-insulated gaskets for working pressures above 175 psi shall be compressed fiber gaskets per AWWA C207. Insulating gaskets shall be full-face Type E with O-ring seal. The complete assembly shall have an ANSI rating of 150 pounds, minimum, or equal to or higher than that of the joint and pipeline. The gasket material shall be resistant to intended chemical exposure, operating temperatures, and pressures in the pipeline. Insulating sleeves shall be full-length Mylar or fiberglass reinforced epoxy (NEMA G-10 grade). Insulating washers shall be fiberglass reinforced epoxy (NEMA G-10 grade). Acceptable manufactures are GPT Industries (Houston, TX), Advanced Products and Systems (Scott, LA), or Central Plastics Co. (Shawnee, OK).
- C. Steel: Steel shall meet the requirements of AWWA C200 and shall be of continuous casting. Steel shall be homogeneous and shall be suitable for field welding, fully

- killed and fine austenitic grain size. Steel shall have a minimum yield strength of 42,000 psi.
- D. Bend Fittings: All bend fittings shall have a minimum radius of 2.5 times the pipe diameter to permit easy passage of pipeline pigs.
- E. Threaded Outlets: No threaded outlets will be allowed.
- F. Outlets for Weld Leads: The Contractor may use factory manufactured outlets for access for weld leads. Outlets shall be welded after use. Outlet configuration shall be shown in the Shop Drawings. Spacing of outlets shall be no closer than 500 feet. Outlets for appurtenances shall be used in the calculation of outlet spacing. Outlet configuration shall be approved by the Engineer.
- G. Joint Bonds:
- a. Coated Steel Pipe:
- i. Joint bonds shall be solid copper strap, 1-1/4-inch wide by 1/16-inch thick, equivalent to 1/0 AWG wire, with two punched holes for thermite welding to the pipe. Strap bond shall be 12-inches long, maximum.
 - ii. Provide three joint bonds per pipe joint.
 - iii. Connection of joint bond to pipe shall be with the thermite weld method using the cartridge and recommended by the bond manufacturer.
 - iv. Bonds shall be as manufactured by Erico Products, Continental Industries, or approved equal.
- b. Flexible Coupling, Flanged Coupling Adapter, and Other Non-standard Joints for Steel Pipe:
- i. Solid copper strap, 1-1/4-inch wide by 1/16-inch thick, equivalent to 1/0 AWG wire, with five punched holes for thermite welding to the coupling and pipe. Strap bond shall be fabricated for the length of the coupling with sufficient additional length for 1 inch of joint movement. Provide three bonds per joint for pipe less than 54-inches in diameter and four bonds per joint for pipe 54-inches or greater in diameter.
 - ii. Connection of joint bond to pipe shall be with the thermite weld method using the cartridge and recommended by the bond manufacturer. Strap bond shall be as manufactured by Erico Products, Continental Industries, or approved equal.
- c. Insulated Flexible Coupling Joints for Steel Pipe:
- i. Solid copper strap, 1-1/4-inch wide by 1/16-inch thick, equivalent to 1/0 AWG wire, with four punched holes for thermite welding to the coupling and pipe. Strap bond shall be fabricated for the length of the coupling with sufficient additional length for 1 inch of joint movement.
 - ii. Connection of joint bond to pipe shall be with the thermite weld method using the cartridge and recommended by the bond manufacturer.
 - iii. Strap bond shall be as manufactured by Erico Products, Continental Industries, or approved equal.
- I. Flexible Joint Couplings: Where couplings are indicated, furnish and install a gasketed, sleeve-type coupling as described below:

1. The pipe couplings shall be of a gasketed, sleeve-type with diameter to properly fit the pipe. Each coupling shall consist of one steel middle ring, two steel followers, two rubber-compounded wedge section gaskets and sufficient trackhead steel bolts to properly compress the gaskets. Field joints shall be made with this type of coupling. The middle ring and followers of the coupling shall be true circular sections free from irregularities, flat spots, or surface defects. They shall be formed from mill sections with the follower-ring section of such design as to provide confinement of the gasket. After welding, they shall be tested by cold expanding a minimum of 1% beyond the yield point.
 2. The coupling bolts shall be of the elliptic-neck, track-head design with rolled threads and be Type 316 stainless steel. The manufacturer shall supply information as to the recommended torque to which the bolts shall be tightened. All bolt holes in the followers shall be oval for greater strength.
 3. The gaskets of the coupling shall be composed of a crude or synthetic rubber base compounded with other products to produce a material that will not deteriorate from age, from heat, or exposure to air under normal storage conditions. It shall also possess the quality of resilience and ability to resist cold flow of the material so that the joint will remain sealed and tight indefinitely when subjected to shock, vibration, pulsation and temperature or other adjustments of the pipeline.
 4. The couplings shall be assembled on the job in a manner to ensure permanently tight joints under all reasonable conditions of expansion, contraction, shifting and settlement, unavoidable variations in trench gradient, etc. The coupling shall be Dresser, Style 38, as manufactured by Dresser Manufacturing Division, Bradford, Pennsylvania, Depend-O-Lok as manufactured by Victaulic, Easton, Pennsylvania or an approved equal.
- J. Epoxy Lining: Where indicated on the Drawings, at all insulating joints, and at all above grade piping provide epoxy lining in accordance with Section 09 97 16 PIPELINE COATINGS AND LININGS.
- K. Epoxy Coating: Where indicated on the Drawings, and for exposed piping, pipe shall have an epoxy coating per Section 09 96 00 HIGH PERFORMANCE COATINGS or Section 09 97 16 PIPELINE COATINGS AND LININGS.
- L. Polyurethane Coating: Polyurethane coating shall be in accordance with Section 09 96 00 HIGH PERFORMANCE COATINGS or Section 09 97 16 PIPELINE COATINGS AND LININGS.

2.02 MIXES

- A. Mortar for Interior and Exterior Joints: Mortar shall be 1 part cement to 2 parts sand. Cement shall be ASTM C150, Type I. Sand shall be of sharp silica base and shall not leach in water. Sand shall be plaster sand meeting ASTM C33 or C35. Exterior joint mortar shall be mixed to the consistency of thick cream. Interior joint mortar shall be mixed with as little water as possible so that the mortar is very stiff, but workable. Water for cement mortar shall be treated and suitable for drinking water.
- B. Mortar for Pipe Patching for Shop-Applied Cement Mortar Lining: Mortar for patching shall be as per interior joints.

- C. Bonding Agent: Bonding agent for cement mortar lining patching shall be Probond Epoxy Bonding Agent ET-150, parts A and B; Sikadur 32 Hi-Mod, or approved equal.

2.03 MANUFACTURED PRODUCTS

A. Pipe:

1. Pipe Design Criteria:

- a. Steel pipe shall be designed, manufactured, and tested in conformance with AWWA C200, AWWA M11, and with the criteria specified herein. Sizes and pressure classes (working pressure) shall be as shown on the Drawings. For the purpose of pipe design, the transient pressure plus working pressure shall be 1.5 times the working pressure class specified. Fittings, specials, and connections shall be designed for the same pressures as the adjacent pipe. Pipe design shall be based on trench conditions and the design pressure in accordance with AWWA M11; using the following parameters:

Pipe Design Criteria	
Unit Weight of Fill (w)	130 pcf
Live Load	AASHTO HS 20 (at all locations except railroads)
	Coopers E 80 at railroad
Trench Depth	As indicated
Deflection Lag Factor (DI)	1.1
Coefficient (K)	0.10
Maximum Calculated Deflection (Dy = Dx)	2 % (Polyurethane Coated Steel Pipe)
	1 % (Mortar Coated Steel Pipe)
Soil Reaction Modulus (E')	1500 (typical trench section) or 3000 (where encased)

- b. The fittings and specials shall be designed in accordance with AWWA C208 and AWWA M11 except that crotch plates shall be used for outlet reinforcement for all Pressure Diameter Values, PDV, greater than 6000 unless otherwise specified. Where indicated on the Drawings, collars or wrappers shall be used in lieu of crotch plates to allow working space and supports. Wrappers and collars shall meet ASME standards. As an alternate to crotch plates, collars or wrappers may be used when designed in accordance with ASME Section VIII, Division 1.
- c. Where the pipe requires additional external support to achieve the specified maximum deflection, the Contractor and the Supplier will be required to furnish alternate methods for pipe embedment. No additional compensation will be made to the Contractor by the Owner where this method is required.

- d. Trench depths indicated shall be verified after existing utilities are located. Vertical alignment changes required because of existing utility or other conflicts shall be accommodated by an appropriate change in pipe design depth. In no case shall pipe be installed deeper than its design allows.
- e. Pipe shall be designed for full vacuum conditions without buckling, damage to lining, or damage to pipe joints.
2. Provisions for Thrust:
- a. Thrust at bends, tees, or other fittings shall be resisted by restrained joints. Thrust at bends adjacent to casing shall be restrained by welding joints through the casing and a sufficient distance each side of the casing. No thrust restraint contribution shall be allowed for pipe in casing unless the annular space in the casing is filled with grout.
- b. Restrained joints shall be used a sufficient distance from each side of the bend, tee, plug, or other fitting to resist thrust which develops at the design pressure of the pipe. For the purposes of thrust restraint, design pressure shall be 1.5 times the working pressure class. Restrained joints shall consist of welded joints unless other joint types are specifically shown on the Drawings.
- c. Thrust restraint design shall be the complete responsibility of the pipe manufacturer. The length of pipe with restrained joints to resist thrust forces shall be determined by the pipe manufacturer in accordance with AWWA M11 and the following:
- 1). The Weight of Earth shall be calculated as the weight of the projected soil prism above the pipe.
 - 2). Soil Density = 110 pcf (maximum value to be used).
 - 3). Coefficient of Friction = 0.20 (maximum value to be used for polyurethane coated steel pipe).
 - 4). The above applies to unsaturated soil conditions. In locations where ground water is encountered, the soil density shall be reduced to its buoyant weight for all backfill below the water table, and the coefficient of friction shall be reduced to 0.15 for polyurethane coated steel pipe.
 - 5). For horizontal bends, the length of pipe to be restrained shall be calculated as follows:
 - a). For Δ less than 60 degrees:

$$L = \frac{P A \sin^2(\Delta/2)}{f(2W_e + W_p + W_w)}$$
 - b). For Δ greater than 60 degrees:

$$L = \frac{P A (1 - \cos\Delta)}{f(2W_e + W_p + W_w)}$$

L = Length of pipe to be restrained

- $P = 1.5$ times working pressure
- $A =$ Cross-sectional area of pipe steel cylinder I.D.
- $\Delta =$ Deflection angle
- $W_e =$ Weight of earth prism above the pipe
- $W_p =$ Weight of pipe
- $W_w =$ Weight of water
- $f =$ Coefficient of friction

- 6). For vertical bends, the length of pipe to be restrained shall be calculated in accordance with AWWA M11.
3. Inside Diameter: The inside diameter, including the cement mortar lining, shall be a minimum of the nominal diameter of the pipe specified, unless otherwise indicated on the Drawings.
4. Wall Thickness:
 - a. The minimum pipe wall steel thickness shall be 0.183 inch or pipe ID/230, whichever is greater for pipe and fittings, with no minus tolerance. Where indicated on the Drawings, pipe and fittings shall have thicker steel pipe wall. The minimum steel wall thickness shall also be such that the fiber stress shall not exceed 50 percent of the minimum yield strength of the steel, nor the following, at the specified working pressure.

Pipe Type	Maximum Stress at Working Pressure
Epoxy Coated Steel	23,000 psi
Polyurethane Coated Steel	18,000 psi
Mortar Coated Steel	23,000 psi

- b. Pipe which is placed in casing or tunnel shall have a minimum pipe wall steel thickness of 0.35 inch or pipe ID/144, whichever is greater.
- c. Fittings and pipe that are above grade or exposed (not in a trench, casing, or tunnel) shall have the following minimum thicknesses:

Diameter	Thickness
Diameter $\leq 36"$	0.250"
$36" < \text{Diameter} \leq 60"$	0.375"
$60" < \text{Diameter} \leq 84"$	0.500"
$84" < \text{Diameter} \leq 96"$	0.625"
$96" < \text{Diameter} \leq 120"$	0.750"

- d. Pipe, fittings, and specials shall be designed such that the maximum stresses in the pipe due to thrust loading will not exceed 18,000 psi nor 50 percent of

the steel yield strength at the thrust design pressure (1.5 times working pressure).

- 1). Fittings shall meet the requirements of AWWA C208.
5. Seams: Except for mill-type pipe, the piping shall be made from steel plates rolled into cylinders or sections thereof with the longitudinal and girth seams butt welded or shall be spirally formed and butt welded. There shall be not more than two longitudinal seams. Girth seams shall be butt welded and shall not be spaced closer than 6 feet except in specials and fittings.
 6. Joint Length: Maximum joint length shall not exceed 50 feet. Maximum joint length of steel pipe installed in casing shall not exceed 25 feet.
- B. Joint Bonds, Insulated Connections, and Flange Gaskets: See Section 2.01.H and 2.01.I of this specification
 - C. Bend Fittings: All bend fittings shall be long radius (minimum of 2.5 times the pipe ID) to permit passage of pipeline pigs.
 - D. Pipe Ends: Pipe ends shall be lap welded slip joint; butt strap joint; flanged joint, or flexible coupled joint.
 1. Rubber Gasket Joints: Rubber gasket joints shall be a rolled spigot or Carnegie joint with rubber gasket for pressure classes up to 250 psi. Joints shall conform to AWWA C200 standard. The joint shall consist of a flared bell end formed and sized by forcing the pipe over a plug die or by expanding on segmental dies. The spigot end shall be an integral rolled groove or a Carnegie shaped steel joint ring in accordance with AWWA C200 and as shown in AWWA Manual M11, current edition. Carnegie spigot ring shall be welded to the pipe cylinder. The welded area of bell and spigot pipe ends shall be checked after welding by the magnetic particle method. The difference in diameter between the I.D. of bell and the O.D. of spigot shoulder at point of full engagement with an allowable deflection shall be no more than .00 to .04 inch as measured on the circumference with a diameter tape. The gasket shall have sufficient volume to approximately fill the area of the groove and shall conform to AWWA C200. The joint shall be suitable for the specified pressure and a maximum deflected joint pull. Joints shall be of clearances such that water tightness shall be provided under all operating and test conditions with a pipe diameter deflection of 3 percent. At the pipe manufacturer's option, all steel pipe joints may be lap-welded slip joints in lieu of rubber gasket joints.
 2. Lap Welded Slip Joint:
 - a. Lap welded slip joint shall be provided in all locations for pipe larger than 48 inches, for pressure class greater than 250 psi and where joints are welded for thrust restraint. Ends of pipe, fittings, and specials for field welded joints shall be prepared with one end expanded in order to receive a plain end making a bell and plain end type of joint. Bells formed by rolling shall be approved by the Engineer. Clearance between the surfaces of lap joints shall not exceed the requirements of AWWA C206.
 - b. In addition to the provisions for a minimum lap of 1-1/2 inches as specified in AWWA C200, the depth of bell shall be such as to provide for a minimum distance of 1 inch between the weld and the nearest tangent of the bell radius when welds are to be located on the inside of the pipe.

- c. The depth of bell shall be such as to provide for a minimum lap of 2 inches or 3 times the thickness of the belled pipe, whichever is greater. Provide a deeper bell every 400 feet to accommodate thermal movement for which the minimum lap shall be 4 inches.
 - d. Lap welded slip joints shall be welded from the inside for pipe diameters 42 inches and larger. All other sizes may be welded from either the inside or outside.
3. For Fittings with Flanges: Flanged joints shall be provided at connections to valves and where indicated. Ends to be fitted with slip on flanges shall have the longitudinal or spiral welds ground flush to accommodate the type of flanges provided. Pipe flanges and welding of flanges to steel pipe shall conform to the requirements of AWWA C207 and AWWA C206. Pipe flanges shall be of rated pressure equal to or greater than the adjacent pipe class. Flanges shall match the fittings or appurtenances which are to be attached. Flanges shall be spot faced or back faced parallel to the front face.
 4. Flexible Couplings: Flexible couplings shall be provided where shown on the Drawings and as specified in Section 33 12 16.13 "Miscellaneous Valves." Ends to be joined by flexible couplings shall be of the plain end type, prepared as stipulated in AWWA C200. Pipe ends shall be truly circular to within 0.25 inch or the coupling manufacturer's tolerance, whichever is smaller. In addition, the welds on ends to be joined by couplings shall be ground flush to permit sliding the coupling in at least one direction to clear the pipe joint. Harness bolts and lugs shall comply with AWWA M11.
 5. Butt Strap Closure Joints: Where necessary to make closure to pipe previously installed, closure joints shall be installed using butt strap joints in accordance with AWWA C206 and applicable provisions of this Section. Where butt strap closure joints cannot be hydrostatically tested in the field with the main pipeline, the butt strap shall have an inside and outside weld and shall be air tested. Air test shall be operated at 5 psi for a minimum of 5 minutes from a threaded fitting between the welds.

3.00 EXECUTION

3.01 INSTALLATION

A. General:

1. Install steel pipe, fittings, specials, and appurtenances as specified and required for the proper functioning of the completed pipe line. Install pipe, fittings, and specials in accordance with the manufacturer's recommendations and AWWA M11 and AWWA C604. Pipe shall be laid to the lines and grade indicated. Just before each joint of polyurethane coated steel pipe is lowered into the ditch it is to be inspected and tested for holidays. All damaged areas and holidays are to be repaired before the pipe is lowered into the trench.
2. The requirements of Section 31 23 33.16 – TRENCHING AND BACKFILL govern for the excavation and backfilling of trenches for laying steel pipe, fittings, and specials. Conformance with pipe deflection requirements shall be as set forth below.

- a. Average allowable pipe deflection is limited to 2% for polyurethane coated steel pipe and 1% for mortar and shotcrete coated steel pipe. In no case shall a single measurement in any direction exceed 1.5 times the average allowable deflection. These measurements include the allowable tolerance for lining thickness. Percent deflection shall be calculated as:
- $$\text{Percent Deflection} = \frac{\text{actual (plan) ID} - \text{installed (measured) ID}}{\text{actual (plan) ID}} \times 100$$
- b. Deflection measurements shall be made by the Contractor in the presence of the Owner. Method for taking measurements shall be agreed to by the Owner and Engineer in writing prior to installing the first joint of pipe.
- c. The contractor shall measure deflection approximately 30 days after backfill to final grade. At the beginning of the project, the first mile of pipe shall be checked seven days after backfill and again 30 days after backfill. Payment for pipe installation will not be made until pipe deflection is measured, unless otherwise approved by the Owner. No Pipe may be measured for compliance prior to 15 days.
- d. The Owner may, at his discretion, perform additional verification measurements on any area prior to substantial completion.
- e. Average deflection shall be determined by averaging the pipe's measured horizontal and vertical deflection as indicated below. Locations where measurements are taken shall be clearly marked on the interior of the pipe.
- f. For pipe joints 36 feet in length or less, measurements shall be taken at two locations, $\frac{1}{4}$ -distance from each pipe end. Approximately 10 feet from each end.
- g. For pipe joints longer than 36 feet, measurements shall be taken at three locations including $\frac{1}{4}$ -distance from each pipe end and at the pipe midpoint.
- h. If the average calculated deflections for any segment of pipe or any single measurement fails to meet specifications, the entire segment of pipe shall be reworked in accordance with the Manufacturer's recommendations and as directed by the Engineer at no additional cost to the Owner. This may include uncovering the pipe and re-compaction of the pipe embedment, and repair of coating. A pipe segment shall be defined as a length of manufactured pipe between manufactured or field constructed joints.
- i. Installed pipe joints will also be examined for flat spots and internal lining stress cracks by the Owner. Lining damage shall be repaired in accordance with the Manufacturer's recommendations and as directed by the Engineer at no additional cost to the Owner. Repair of flat spots may include uncovering the pipe and re-compaction of the pipe embedment, and repair of the coating.
- j. Where pipe has been reworked to comply with the deflection requirements, Contractor shall re-measure for deflection no earlier than seven days after the repaired pipe is backfilled. Owner will re-inspect for flat spots at this time.
- k. No pipe installation shall be accepted until the entire installation is in compliance with the above deflection requirements.
3. All costs associated with measuring for pipe deflection and any repairs or rework associated with meeting these requirements shall be borne by the Contractor.

4. Keep the pipe clean during the laying operation and free of sticks, dirt, animals, and trash, and at the close of each operating day, effectively seal the open end of the pipe against the entrance of water using a gasketed night cap. Do not lay pipe in water. The Contractor may install a vent at the top of the night cap to prevent flotation of the pipe in the event of heavy rain during the night.
 5. Install bonds at all pipe joints, other than welded joints or insulated joints.
 6. Pipe Deflection Reports:
 - a. A monthly report shall be submitted as Record Data showing the following for each joint of pipe:
 - 1). Allowable deflection and 1.5 times allowable deflection for each pipe diameter installed.
 - 2). Deflection measurements and calculated deflection for each location measured per joint.
 - 3). It is the responsibility of the Contractor to verify that the nominal pipe diameter meets specifications at all measured locations. Contractor shall coordinate pipe replacement with the pipe manufacturer for any pipe not meeting the specified internal diameter.
- B. Line, Grade and Cover over Top of Pipe
1. It is intended that the pipe be laid to the depth specified or shown on Drawings. Cover shall be defined as the distance from the top of the pipe barrel to the natural ground surface. The Contractor shall be required to lay the pipe, to conform to the profiles shown on the approved Shop Drawings within six inches vertically and one foot horizontally.
- C. The grades shall be constructed so as to provide a uniform grade between low points and high points, and intermediate high and low points shall be eliminated. No additional compensation shall be made for extra trench depth required to meet these conditions
- D. Pipe Handling: Pipe shall be handled at all times with a minimum of two non-abrasive slings, belts or other equipment designed to prevent damage to the coating or lining. The equipment shall be kept in such repair that its continued use is not injurious to the coating. The spacing of pipe supports required to handle the pipe shall be adequate to prevent cracking or damage to the lining or coating.
- E. Line Up and Bends:
1. Line up pipe for joining so as to prevent damage thereto. Thoroughly clean the bell and spigot ends of each joint of pipe of foreign matter, rust and scale before placing spigot into bell. Welded joints shall have an overlap of 2-inch minimum to 4- inch maximum.
 2. All under-stabbed joints shall be butt strapped or re-stabbed. All over-stabbed joints shall not be acceptable. A joint shall be considered over-stabbed if the stabbed section is greater than 3-1/2 inches or the inside mortar gap is less than 1/4-inch. All over-stabbed joints shall be re-stabbed, butt strapped, or welded.
 3. Where abrupt changes in grade and direction occur, the Contractor shall employ special shop fabricated fittings for the purpose. Field cutting the ends of the steel

pipe to accomplish angular changes in grade or direction of the line shall not be permitted.

4. Where pipe horizontal alignment is on a curve, contractor may pull joints to make a curved alignment. Pulled joints that are welded shall meet the overlap requirements mentioned above. Pulled rubber gasket joint deflection shall not exceed 75% of the Manufacturers' recommended allowable.
 5. After joining rubber gasket joints, check the position of the gasket with a feeler gauge. If the gasket is out of position, disassemble the joint and repeat the joint laying operation. Upon completion of pipe jointing, the interior of the pipeline shall be left broom clean.
- F. Pipe Laying - Rubber Gasket Joints: Join rubber gasket joints in accordance with the Manufacturer's recommendations. Clean bell and spigot of foreign material. Lubricate gaskets and bell and relieve gasket tension around the perimeter of the pipe. Engage spigot as far as possible in bell, allowing for a minimum gap of 1/2-inch for inside joint grouting after any joint deflection. Joint deflection or pull shall not exceed 75 percent of the manufacturer's recommended maximum pull. Check gasket with feeler gauge all around the pipe.
- G. Pipe Laying – Welded Joints:
1. Weld joints in accordance with the AWWA C206 and AWS D1.1. Contractor shall provide adequate ventilation for welders and for Owner's representative to observe welds. Unless otherwise specified, welds shall be full circle fillet welds. Welding shall be completed before application of field applied joint coating. The Contractor may, at his option, weld pipe joints after the exterior joint coating and backfilling is complete. Contractor shall demonstrate that this procedure will not damage the exterior joint coating.
 2. A welding procedure qualification shall be approved by the Engineer before welding of joints begins. The procedure shall be in accordance with AWWA C206 and AWS D1.1.
 3. Provide a deeper bell every 400 feet to accommodate thermal movement.
 4. If the Contractor chooses to use weld after backfill, special techniques shall be used to limit damage to the exterior heat shrink sleeves. Contractor shall follow all Weld after Backfill Joint Requirements as dictated in Section 09 97 16 "Pipeline Coatings and Linings." After welding, the pipe shall be excavated to verify no unacceptable damage to the exterior heat shrink sleeve and coating protection. Each welder shall be required to demonstrate that no unacceptable damage will occur to the heat shrink sleeve. Test shall be conducted on pipe with the minimum wall thickness for each type of sleeve used on the project. Should the inspection of the exterior coating reveal damage in the opinion of the Engineer, the test will be considered a failure and the coating will be removed and replaced at no additional cost to the Owner. The test for the failed welder may be repeated on another joint at the Contractor's option with the approval of the Engineer.
 5. Adequate provisions for reducing temperature stresses shall be the responsibility of the Contractor.
 6. After the pipe has been joined and properly aligned and prior to the start of the welding procedure, the spigot and bell shall be made essentially concentric by

shimming or tacking to be within the maximum clearance tolerance around the periphery of the joint per AWWA C206. Tighter tolerance may be required to prevent damage to heat shrink sleeves for weld after backfill. In no case shall the clearance tolerance be permitted to accumulate.

7. Before welding, thoroughly clean pipe ends to bare metal. All welding shall be hand welded to minimize damage to heat shrink sleeves, unless it can be demonstrated that wire fed welding will not cause unacceptable damage to the heat shrink sleeve. Welding shall be performed so as not to damage lining or coating. Cover the polyurethane coating as necessary to protect from welding.
8. Furnish labor, equipment, tools and supplies, including shielded type welding rod to construct the work as required in the Contract Documents. Protect welding rod from any deterioration prior to its use. If any portion of a box or carton is damaged, reject the entire box or carton.
9. In all welding, the metal shall be deposited in successive passes. Not more than 1/8 inch of metal shall be deposited in each pass. Each pass except the final one, whether in butt or fillet welds, shall be thoroughly bobbed or peened to relieve shrinkage stresses and to remove dirt, slag, or flux before the succeeding bead is applied. Each pass shall be thoroughly fused into the plates at each side of the welding groove or fillet and shall not be permitted to pile up in the center of the weld. Undercutting along the side shall not be permitted.
10. Welds shall be free from pin holes, non-metallic inclusions, air pockets, undercutting and/or any other defects.
11. If the ends of the pipe are laminated, split or damaged to the extent that satisfactory welding contact cannot be obtained, the pipe will be replaced at no additional cost to the Owner and the defective joint removed from the Site.
12. Furnish each welder employed with a steel stencil for marking the welds, so that the work of each welder may be identified. Have each welder stencil the pipe adjacent to the weld with the stencil assigned to him. In the event any welder leaves the job, his stencil shall be voided and not duplicated if another welder is employed.
13. Keep daily welding reports which identify the welder's name and the joint welded. Joints must be shown on the daily welding reports with the identification number assigned in the lay drawings (ex. ID#1 – ID#2). Provide three copies of all daily welding reports to Owner's representative each month.
14. Use only competent, skilled and qualified workmen. Each welder employed by the Contractor shall be AWWA C206 and AWS D1.1 certified according to the Welding Procedure Qualification approved for the project. All welders shall have been certified within the last six months or shall provide a welding continuity log to be allowed to weld on the line. Field welding shall be provided by one of the following firms:
 - a. Forterra Pressure Pipe, Nels Thomsen, (972) 262-3600
 - b. Fuller's Service Company, Barry Fuller, (817) 477-3841.
 - c. Scott's Welding, Scott Fowler, (972) 978-7865.
 - d. Fletcher's Welding, Darrell Fletcher.

- e. Eddie's Welding Service, Eddie Pierce, (817) 909-6089.
 - f. National Welding Corporation, Nash Williams, (801) 255-5959.
 - g. Others may be accepted pending approval by Owner or Engineer.
15. After each welder has qualified in the preliminary tests referred to above, inspections shall be made of joints in the line. Any welder making defective welds shall not be allowed to continue to weld.
16. Visual tests and magnetic particle tests in accordance with AWWA C206, ASTM E709, and E144 shall be performed by the Owner's independent testing laboratory on all welded joints. Welds that prove to be defective will be replaced or repaired, whichever is deemed necessary by the Engineer, at Installation Contractor's expense. The Installation Contractor shall provide adequate ventilation and a safe environment for welding inspector. Inspections will be made on a weekly or bi-weekly basis as determined by the Owner. The Installation Contractor shall cooperate with the welding inspector to allow efficient inspections.
17. If the Contractor disagrees with the Engineer's interpretation of welding tests, test sections may be cut from the joint for physical testing. The Contractor shall bear the expense of repairing the joint, regardless of the results of physical testing. The procedure for repairing the joint shall be approved by the Engineer before proceeding.
- H. Inside Joint Grouting for Pipe with Plant-Applied Mortar Lining: Upon completion of backfilling of the pipe trench and inspection of interior welds, fill the inside joint recess with a stiff cement mortar. Prior to placing of mortar, clean out dirt or trash which has collected in the joint, and moisten the concrete surfaces of the joint space by spraying or brushing with a wet brush. Where the mortar joint opening is 1 inch or wider, such as where trimmed spigots are required, apply a bonding agent to mortar and steel surface prior to placing joint mortar. Ram or pack the stiff mortar into the joint space and take extreme care to ensure that no voids remain in the joint space. After the joint has been filled, level the surfaces of the joint mortar with the interior surfaces of the pipe with a steel trowel so that the surface is smooth.

3.02 PROTECTIVE COATINGS SYSTEM FOR WELDED JOINTS

- A. Perform field coating of joints in accordance with Section 09 97 16 - PIPELINE COATING AND LINING. For weld after backfill, heat tolerant heat-shrink joint wrapping and special welding techniques will be used. At the start of the project, at least 3 joints of pipe shall be uncovered at no additional cost to the Owner, CMAR or Contract Team to verify the exterior joint wrap is not damaged. Should a change of materials be required, or a new welder employed, additional test joints may be directed by the Engineer.
- B. The Installation Contractor is responsible for ensuring his operations do not damage the factory or field applied coating system.
- C. Protection of Buried Metal:
 - 1. Buried ferrous metal such as flanges, bolts, nuts and couplings which cannot be protected with factory or field-applied polyurethane coatings or heat shrink sleeves shall be coated as specified in accordance with Section 09 97 16 "Pipeline Coatings and Linings" and encased in flowable fill.

D. Repair of Mortar Lining:

1. Repair lining cracks larger than 1/8" (in width) with approved methods. Pipes with loose and disbonded linings will be rejected. Excessive repair of lining shall not be permitted. Apply bonding agent to patch area. Patching of lining shall be allowed where area to be repaired does not exceed four square feet and has no dimension greater than 24 inches. In general, there shall be not more than one (1) patch in the lining of any joint of pipe. Patching for the manufacture of fittings and specials is acceptable, and not limited to the maximum square footage described above.
 2. Wherever necessary to patch the pipe, make the patch with the mortar indicated. Do not install patched pipe until the patch has been properly and adequately cured and unless approved for laying by the Manufacturer's technician and by the Engineer.
 3. Plant applied mortar lined pipe joints requiring patches that exceed the size in subparagraph 3.01.E above shall be rejected and replaced at no additional cost to the Owner, CMAR or Contract Team. The opinion of the Engineer shall be the sole factor in determining the acceptability of the required repair.
- E. Quality Control of Field Applied Polyurethane Coating: See Section 09 97 16 "Pipeline Coatings and Linings."
- F. Pipe Through Vaults - Where piping is to be inside a vault, such as meters or valves, the vault floor shall be cast, then the piping installed, then the vault walls constructed.

3.03 FIELD QUALITY CONTROL

- A. Disinfect the piping system as specified in Section 33 10 13 "Disinfection Water Utility Distribution."
- B. Perform a hydrostatic test as specified in Section 01 45 16.16 "Hydrostatic Testing."

END OF SECTION

33 12 16.13 MISCELLANEOUS VALVES AND APPURTENANCES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install the equipment specified herein.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Shop Drawings, including a list of spare parts and tools.

2.00 PRODUCTS

2.01 MANUFACTURED PRODUCTS

- A. Corporation Stops: Corporation stops shall be bronze with tapered plug and flat key operator. Unless otherwise indicated, stops shall be equal to Mueller H-10046 with iron pipe thread on inlet and outlet, of the size indicated.
- B. Wax Tape: Wax tape shall be as specified in AWWA C217. Wax tape shall be Trenton No. 1 wax tape as manufactured by the Trenton Corporation or approved equal. Clean and dry the surface of all foreign matter and scrub with a wire brush. Apply a thin film of Trenton Wax Tape Primer, then apply two wraps of wax tape. Press on primer and tape to conform to the fitting surface. Backfill around fitting with flowable fill per Section 31 23 23.34 "Flowable Fill" or 2000 psi concrete per Section 03 30 00 "Cast-In-Place Concrete."
- C. Flange Gasket Material: Gaskets for piping, fittings, valves, etc. shall be EPDM to produce a material that is resistant to continued exposure to chloramines and suitable for normal operating pressure of the pipeline.
- D. Flexible Coupling:
 - 1. Where couplings are indicated, furnish and install a gasketed, sleeve-type coupling in accordance with AWWA C219.
 - a. The pipe couplings shall be of a gasketed, sleeve-type with diameter to properly fit the pipe. Each coupling shall consist of one steel middle ring, two steel followers, two rubber-compounded wedge section gaskets and sufficient trackhead steel bolts to properly compress the gaskets. Field joints shall be made with this type of coupling. The middle ring and followers of the coupling shall be true circular sections free from irregularities, flat spots, or surface defects. They shall be formed from mill sections with the follower-ring section of such design as to provide confinement of the gasket. After welding, they shall be tested by cold expanding a minimum of 1 percent beyond the yield point.
 - b. The coupling bolts shall be of the elliptic-neck, track-head design with rolled threads and be Type 304 stainless steel. The manufacturer shall supply

information as to the recommended torque to which the bolts shall be tightened. All bolt holes in the followers shall be oval for greater strength.

- c. The gaskets of the coupling shall be EPDM and shall not deteriorate from age, from heat, or exposure to air under normal storage conditions. It shall also possess the quality of resilience and ability to resist cold flow of the material so that the joint will remain sealed and tight indefinitely when subjected to shock, vibration, pulsation and temperature or other adjustments of the pipeline.
- d. The couplings shall be assembled on the job in a manner to ensure permanently tight joints under all reasonable conditions of expansion, contraction, shifting and settlement, unavoidable variations in trench gradient, etc. The coupling shall be Dresser, Style 38, as manufactured by Dresser Manufacturing Division, Bradford, Pennsylvania, or an approved equal.

E. Insulating Couplings:

1. Couplings shall meet the basic requirements of Paragraph 2.01.C. Where insulated couplings are indicated on the Drawings, the interior of the pipe shall be epoxy coated (30 mils) two diameters each side of dresser. Install insulating boot on the coupling and install insulating kits on thrust bolts. Adjust the stud hole diameters accordingly.
2. Insulating coupling shall be Smith-Blair Model 416 straight coupling with insulating boots, wiring, and other appurtenances required for the connection. Fasteners for coupling shall be Type 304 stainless steel.

F. Insulating Flanges:

1. Complete assembly shall have an ANSI rating of 150 pounds, minimum, or equal to or higher than that of the joint and pipeline.
2. Gasket materials shall be resistant to intended chemical exposure, operating temperatures, and pressures in the pipeline.
3. Gaskets: Full-face Type E with O ring seal.
4. Insulating Sleeves: Full-length Mylar or fiberglass reinforced epoxy (NEMA G 10 grade).
5. Insulating Washers: Fiberglass reinforced epoxy (NEMA G 10 grade).
6. Steel Washers: Plated, hot-rolled steel, 1/8-inch thick.
7. Manufacturers:
 - a. Pacific Seal, Inc., Burbank, CA.
 - b. Central Plastics Co., Shawnee, OK.

G. Insulating Unions: O ring sealed with molded and bonded insulating bushing to union body, as manufactured by Central Plastics Company, Shawnee, OK; or equal.

1. Products:
 - a. Housing:
 - 1). The housing shall be one or two-piece with a double arch cross-section that closes around pipe ends that are smooth for joint flexibility or

expansion and contraction requirements or pipe ends with steel restraint rings affixed for pipe end restraint requirements.

- 2). The housing shall be sized so that the inside diameter fits the outside diameter of the pipe. The coupling housing thickness shall be sufficient to handle the service loads
 - 3). As the coupling closes, it confines the elastomeric gaskets beneath the arches of the sleeve to create the radial seal. The axial seal is effected by the sealing pad at the closure plates as the bolts pull the coupling snug around the pipe ends.
 - 4). D-O-L ExE couplings are flexible, unrestrained pipe joints. FxE couplings are flexible, expansion joints. FxF couplings are flexible, restrained joints. Flexibility, contraction and expansion and joint restraint are as specified in the manufacturer's latest literature.
 - 5). Bolts or studs and nuts shall secure the closure plates.
 - 6). Stainless steel bolts and studs shall conform to the requirements of ASTM F593 Alloy Group 2 and ASTM A193 Class 2 Grade B8M respectively.
 - 7). Stainless steel nuts shall comply with the requirements of ASTM F594 Alloy Group 2.
 - 8). Housing and closure plates shall be manufactured from stainless steel conforming to ASTM A240 type 316L.
 - 9). Sealing plates shall be manufactured from ASTM A240 type 316L stainless steel.
- b. Gaskets:
- 1). The sealing members are comprised of two O-Ring gaskets and an elastomer-sealing pad bonded to the sealing plate. Internal pressure is not required to effect the seal.
 - 2). Gaskets and the sealing pad bonded to the sealing plate supplied shall be of the proper rubber compound for the service intended. Gasket material properties shall meet or exceed the appropriate requirements of ASTM D2000.
 - 3). Gaskets for water service shall be EPDM for service within the temperature range of -20 to 190 F.
- c. Restraint Rings:
- 1). D-O-L FxE shall allow for thermal expansion and contraction at the pipe joint. One (or two) restraint ring(s) affixed to one end of pipe keeps the D-O-L coupling in the proper location. D-O-L FxF provides a restrained pipe joint. D-O-L FxF Type 2 Modified provides a restrained pipe joint and allows for slight expansion/contraction or angular rotation of the joint. One restraint ring welded to each of the pipe ends fits beneath the coupling and is protected by the coupling. Follow manufacturer's recommendation for size and amount of welding required to attach the restraint rings to the plain end pipe.

- 2). The restraint rings shall be furnished with the couplings and shall be of the same material as the coupling housings.
- d. Spare Parts: Provide all special tools and appliances as may be needed to adjust, maintain, and retain the products provided under this Section.
- e. Protective Coatings :
 - 1). Prior to installation, carbon steel couplings shall be coated on the I.D. and O.D. with liquid epoxy paint per the requirements of AWWA C210 and Section 09 96 00 "High-Performance Coatings."
 - 2). Couplings installed underground shall receive additional protection against corrosion by the application of either Heat Shrink Sleeves or two layers of wax tape as specified in Section 09 97 16 "Pipeline Coatings and Linings."
 - 3). Bolts, Studs and nuts utilized on buried couplings are to be stainless steel.
- H. Tapping Sleeves:
 1. Contractor shall field verify outer diameters of all pipes where tapping sleeves are to be installed.
 2. Tapping Sleeves shall be in accordance with AWWA C223, Fabricated Steel and Stainless-Steel Tapping Sleeves. Flanges shall have an ANSI rating of 150 pounds.
 3. Coating: Tapping Sleeves shall be coated per Specification 09 96 00, System 8B, Buried Metal, Field Coated.
 4. Hardware: 304 Stainless Steel.
 5. Working Pressure: 150 psi.
- I. Tapping Valves:
 1. Tapping Valves shall have an oversized port to facilitate the use of full size tapping shell cutters, a raised male face on the end flange and shall conform to AWWA standards. Gate valves shall be in accordance with Specification 33 12 16.23.
- J. Stainless Steel Ball Valves:
 1. Full port stainless steel valves shall be manufactured of 316 stainless steel. The valve shall have an adjustable stem packing, reinforced PTFE seats, PTFE stem packing, thrust washer and body seal. Pressure rating shall be no less than **300 psi**. Valve shall conform to MSS-SP-110. Valve shall be a Watts Regulator Company Series S-FBV-1 or approved equal.
- K. Adjustable Pipe Supports
 1. Galvanized pipe supports for floor mounted piping, where indicated, shall be Anvil Figure 264 or approved equal, comprising a cast iron saddle, threaded nipple, and reducer assembly with extra strength steel pipe and floor flange. Where required, saddle shall be fabricated steel to fit valve or piping appurtenance. Entire unit shall be hot dipped galvanized after fabrication.

Where indicated to provide a U-bolt, the support shall be Anvil Figure 265 or approved equal.

2. Pipe supports shown on the Drawings as flange cradles shall support the full width and be radiused to fit snugly under the assembled flanges. Centering tabs shall be provided to maintain position. Flange cradle supports shall be Standon Model S96 or approved equal.

3.00 EXECUTION

3.01 INSTALLATION

- A. Install valves and appurtenances in accordance with the manufacturer's instructions.

END OF SECTION

33 12 16.16 AIR RELEASE AND AIR AND VACUUM VALVES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install air release and air and vacuum valves of the sizes and types indicated. Furnish the necessary isolating valves and piping.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Shop Drawings.
 - 2. Certificate of Adequacy of Design.
 - 3. Operation and Maintenance Manuals.

1.03 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. American National Standards Institute (ANSI)/NSF:
 - a. ANSI/NSF Standard 61.
 - 2. American Water Works Associations (AWWA):
 - a. AWWA C512 – Air Release, Air/Vacuum and Combination Air Valves for Water Works Service.

2.00 PRODUCTS

2.01 MANUFACTURED PRODUCTS

- 1. Each air valve shall have a stainless steel body, bronze, or stainless steel trim, polyethylene flat internal floats, and an anti-surge float to control premature closing, slam, and hammer. Float shall be baffled to prevent air from blowing valve closed until air is exhausted. Elastomers shall be EPDM.
- 2. Valve body, float, etc., shall be designed for the working pressure and shall seat at the minimum pressure shown in the valve schedule, Paragraph 3.03. The minimum operating pressure shown is under steady state conditions, and does not include minimum surge pressure.
- 3. Air valves shall be manufactured by Vent-Tech or Vent-O-Mat.
- 4. Top of valve assembly shall have piping extended to 4 feet above the ground as indicated on the Drawings. Valve inlet shall be N.P.T. for 2-inch and smaller valves. Valve inlet shall be ANSI flange for 3-inch and larger valves. Valve and flange rating shall equal or exceed the maximum working pressure.

5. Interior and exterior of the air valve shall be painted per the systems listed below. The interior shall be painted according to System No. 1 or System No. 29 as listed below and per Section 09 96 00 “High Performance Coatings.”
6. The exterior shall be coated per System No. 4 as listed below, and per Section 09 96 00 “High Performance Coatings.”

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast, or Centrifugal Wheel Blast (SP 10)	Moisture Cured Zinc Rich Primer	1 coat, 3 MDFT
	Moisture Cured Urethane	1 coat, 5 MDFT
	Moisture Cured Urethane	1 coat, 5 MDFT

- B. Air Release Valves (AR): Air release valves shall be designed to automatically release accumulated air pockets within the pipeline while in operation and under pressure.
- C. Air and Vacuum Valves (AV): Air and vacuum valves shall be designed to allow large volumes of air to escape through the valve orifice when filling a pipeline and to close watertight once the air has been expelled. Air and vacuum valves shall also permit large volumes of air to enter through the valve orifice when the pipeline is being drained to break the vacuum.
- D. Combination Air Valves (CAV):
 1. Combination air valves shall be heavy-duty air and vacuum valves with 2-inch air release valve.
 2. Combination air valves for raw water use shall be fitted with a vent hood. Combination air valves for treated water use shall include piping to vent air out of the manhole and above ground.
 3. Combination air valves shall be designed to release accumulations of air at high points within a pipeline by exhausting large volumes of air as the pipeline is being filled and by releasing accumulated pockets of air while the pipeline is in operation and under pressure. Combination air valves shall also be designed to permit large volumes of air to enter the pipeline during pipeline drainage.
 4. Combination air valves 3 inches and smaller shall be Vent-Tech Model WTR25TCS or Vent-o-Mat Model RBX 1931 or RBX 2521.
 5. Combination air valves 4 inches and larger shall be Vent-Tech Model WTR25SCS or Vent-o-Mat Model RBX 1931.

3.00 EXECUTION

3.01 INSTALLATION

- A. Carefully handle and install valves vertically in such a manner as to prevent damage to any part of the valves. Installation shall be in accordance with the manufacturer's instructions. Provide nuts, bolts, and gaskets where applicable.
- B. TAGGING: Valves shall be permanently tagged with a brass tag indicating the model number, working pressure rating, and valve identifier to be provided by NTMWD.

3.02 SCHEDULES

- A. The required valves and certain pertinent data are given below. This list is given to facilitate description of the various valves and as an aid to plan take-off. The Contractor is responsible for verifying size, type, and number of valves required.

Site Location	Station Location	No. Required	Size	Pipe Size	Type	Maximum Pressure (psi)	Minimum Pressure (psi)
42" Pipeline	2+35.00	1	4"	42"	CAV	150	10
ID Tag number to be provided by NTMWD.							

END OF SECTION

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33 12 16.23 GATE VALVES 24" DIAMETER AND UNDER

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install pipeline gate valves and appurtenances, including valve boxes, operators, bolts, nuts, and gaskets.
- B. All piping, appurtenances, and construction standards shall meet the requirements of the Owner/City in which construction occurs as shown in the Contract Drawings.

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers:
 - 1. M&H.
 - 2. Mueller.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Document Management" and shall include:
 - 1. Shop Drawings:
 - a. Shop Drawings shall include a list of similar installations that have been in service a minimum of 3 years, catalog data, materials of construction, weights, dimensions, and assembly drawings. Assembly drawings shall show seat orientation and operator and extension stem orientation.
 - b. For valves with limit switches:
 - 1). Provide a project specific wiring diagram for limit switches.
 - 2). Provide data sheet of limit switches clearly indicate model and options being provided.
 - 2. Certificate of Adequacy of Design: Test reports shall show compliance with AWWA, ANSI and ASTM standards including hydrostatic tests, operational tests and all other tests required by the applicable standards.
 - 3. Operations and Maintenance Manuals
 - a. Manuals shall be prepared by the equipment manufacturer and shall also incorporate appropriate final certified Shop Drawings and final wiring diagrams. Manuals may be the manufacturer's standard instructions, but shall be supplemented as necessary to cover any special feature not included in standard material. O&M manuals shall include storage instructions, valve installation and adjustment procedures and troubleshooting procedures.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
1. American National Standards Institute (ANSI)/NSF:
 - a. ANSI B16.1 – Cast Iron Pipe Flanges and Fittings.
 - b. ANSI/NSF Standard 61.
 2. American Society for Testing and Materials (ASTM):
 - a. ASTM A126 – Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - b. ASTM A536 – Standard Specification for Ductile Iron Castings.
 3. American Water Works Associations (AWWA):
 - a. AWWA C111 – Standard for Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
 - b. AWWA C500 – Standard for Metal-Seated Gate Valves for Water Supply Service.
 - c. AWWA C509 – Standard for Resilient-Seated Gate Valves for Water Supply Service.

2.00 PRODUCTS

2.01 MANUFACTURED PRODUCTS

A. General:

1. Gate valves smaller than 2 inches shall be bronze, non-rising stem with wedge disc and screwed ends for 300 psi W.O.G. working pressure. Valves shall have a handwheel operator.
2. Gate valves 2 through 36 inches in size shall be resilient seated with non-rising stem in accordance with AWWA C509 and shall be rated for pressure class of adjacent pipe.
3. Gate valves larger than 36 inches shall be double disc, parallel seat internal wedging type with non-rising stem in accordance with AWWA C500 and shall be rated for pressure class of adjacent pipe.

B. Gate Valves:

1. Gate: Gate for double disc valves shall be cast iron with bronze mounted wedges and seats. Gate for resilient seated valves shall be cast iron with rubber-seat compound bonded to the valve gate.
2. Operators: Operators shall turn counterclockwise to open the valve. Valves for buried service shall have a 2-inch square nut operator and shall be installed with a 1-inch carbon steel solid one-piece extension stems as required to extend operating nut to within 4 inches of the finished grade. Extension stem shall encapsulate and be pinned to the 2-inch operating nut. Operators shall be enclosed bevel geared grease packed.
3. Stem and Seal: The non-rising stem shall be bronze with inside screw. Shaft seal shall employ O-rings or V-type packing.

- C. Flanged Ends: Valves shall have flanges in compliance with ANSI B16.1, and flange pressure rating shall be suitable for the pressure class of the adjacent mainline pipe to which it is installed. Bidder shall coordinate flange drilling required with appurtenances prior to manufacture.
- D. Valve Boxes and Covers: Valves for buried service shall be supplied with cast iron valve boxes. Valve boxes shall be of the three-piece extension type. The three pieces shall consist of the top section, center section, and base plus the cover. For valve stacks and manholes with concrete covers, the cover shall be East Jordan Iron Works product Number NCR08-868A with NTMWD cast or stamped in the cover. For manholes with metal covers the valve cap shall be East Jordan Iron Works product Number NCR08-868B with NTMWD cast or stamped in the cover.

3.00 EXECUTION

3.01 INSTALLATION

- A. Installation shall be in accordance with the manufacturer's instructions. Carefully handle and lower valves into position to prevent damage to any part of the valves. Place the valve in the proper position with stem truly vertical and securely hold until connections have been made. Furnish bolts, nuts, and gaskets.

3.02 FIELD QUALITY CONTROL

- A. Upon completion of installation of the gate valves, an acceptance test to verify the satisfactory operation of each unit shall be conducted. Tests shall be conducted in a manner approved by and in the presence of the Owner or Engineer. The valve shall be checked for general operation and leakage. The valve must perform in a manner acceptable to the Owner or Engineer before the Owner will make final acceptance.

END OF SECTION

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33 12 16.26 BUTTERFLY VALVES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install butterfly valves and appurtenances, including valve boxes, operators, bolts, nuts and gaskets.

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers:

- 1. Acceptable Valves Manufacturers:

- a. DeZurik.
 - b. M&H.
 - c. K-Flo.
 - d. Rodney Hunt.
 - e. Golden Anderson.
 - f. Val-Matic.
 - g. Pratt.

- 2. Acceptable Motor Operator Manufacturers:

- a. AUMA-Aumatic.
 - b. Rotork IQ.

- 3. Acceptable Manual Operator Manufacturers:

- a. AUMA.
 - b. Limitorque HBC-Series.

- B. Experience Requirements: The manufacturer shall have had successful experience in manufacturing tight-closing, rubber-seated butterfly valves for this type service in the sizes indicated. The manufacturer shall have at least 10 years' experience in the manufacture of valves.

- C. Manufacturer's Representative for Startup and Testing: The valve manufacturer shall furnish the services of a competent service technician for the duration of time necessary to assist in the installation and adjustment of the equipment and making field acceptance tests. The Technician shall instruct the Owner's personnel in the proper care, maintenance, adjustment, and operation of the equipment and shall issue a written certification that the equipment has been properly installed. The Technician shall also be on-Site during field pipe pressure testing and startup of motor operated valves and shall adjust the limit switches as required. The Technician shall be factory trained and have a minimum of 5 years' experience in the installation and adjustment of valves.

- D. Factory Testing:

- 1. Valve shall be completely assembled at the factory. Valve shall be adjusted for correct seating, and tested in accordance with AWWA C504. Factory operational tests and adjustment shall be performed on each valve, with the valve in the same orientation (valve shaft horizontal or vertical) as the field installation. Correct

seating of each valve disc shall be certified with five fully open-close cycles. The valve will be opened 10 percent, closed, and tested in the position the valve will be installed. This test is to be repeated five times, and one opening test must be with the maximum pressure differential in order to test the actuator. The maximum differential pressure shall be equal to the pressure class of the valve unless noted otherwise.

2. Limit switches, seat adjustments, stops and functions shall be set and checked at the factory. Provide Certified Test Reports.
3. The manufacturer shall make thorough visual inspection and perform ultra-sound tests on all castings before assembly.
4. The manufacturer shall conduct ultrasound testing of each valve disc and valve body and certify there are no defects within the ductile iron material in accordance with the following test procedures.
 - a. The testing will be performed using a hand-held ultrasonic velocity/thickness gage that uses pulse-echo techniques to measure material thickness and velocity. The gage will be used as a velocimeter by coupling the transducer to a ductile iron Sample of known thickness and performing a velocity calibration. The ductile iron Sample will conform to ASTM A536 Gr. 65/45/12.
 - b. A minimum of sixteen readings per body and disc will be taken for valve sizes 42 through 96 inches. A minimum of eight readings shall be taken for valves sizes 24 through 36 inches. Valves less than 24 inches do not require testing. The points of measurement should be equally spaced and represent the entire body and disc casting and not limited to one specific area.
 - c. Velocity will be read off the gage display, recorded and included as a Certified Test Report. Components with measured velocities of less than .21 in/ μ S (5300 m/S) will be rejected. The gage will also be used as an ultrasonic thickness gage to confirm the minimum body shell thickness meets the requirements listed in Table 1 of the latest revision of ANSI/AWWA C504 and the requirements of Section 4.3.1.5. Although AWWA C504 establishes minimum requirements for rubber seated butterfly valves through 72 inches, all requirements for AWWA C504 will also apply to larger valves.
5. Provide Certified Test Reports for factory testing.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 1. Shop Drawings:
 - a. Shop Drawings showing standard cut sheets, seat orientation, operator and extension stem orientation, and materials of construction. The Shop Drawings for the valves with extension stems shall indicate the provisions for supporting the valve, gearing, and extension stem.
 - b. Weight of valves and operators
 - c. Description of valve body seats and disc seats with appropriate ASTM, AWWA, or ANSI material specification.
 - d. Valve flange pressure rating, flange bolt diameter, and flange bolt orientation.
 - e. A description of the components that will be shipped separately, thus requiring field assembly.

- f. Project specific motor operator control schematic / wiring diagrams.
 - g. Motor operator motor data sheet showing voltage horsepower, full load amps, locked rotor amps, etc.
 - h. Valve torque calculations.
 - i. Motor operator torque.
 - j. Provide torque calculations through the full range of operations for all motor operated valves.
2. Operation and Maintenance Manuals: Manuals shall be prepared by the equipment manufacturer and shall also incorporate appropriate final certified Shop Drawings and final wiring diagrams. Manuals may be the manufacturer’s standard instructions, but shall be supplemented as necessary to cover any special feature not included in standard material. O&M manuals shall include storage instructions, valve installation and adjustment procedures and troubleshooting procedures.
 3. Certified Test Reports indicating compliance with factory hydrostatic tests, operational tests, seat test, and ultra-sound tests.
 4. Equipment Installation Report for all valves.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 1. American National Standards Institute (ANSI)/NSF:
 - a. ANSI B16.1 – Cast Iron Pipe Flanges and Fittings.
 - b. ANSI/NSF Standard 60/61.
 2. American Society for Testing and Materials (ASTM):

American Society for Testing and Materials (ASTM)	
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A276	Standard Specifications for Stainless Steel Bars
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM B148	Standard Specifications for Aluminum Bronze Coatings

3. American Water Works Associations (AWWA):

American Water Works Associations (AWWA)	
AWWA C504	Standard for Rubber-seated Butterfly Valves
AWWA C542	Standard Specification for Electric Motor Actuators for Valves and Slide Gates
AWWA C550	Standard for Protective Interior Coatings for Valves and Hydrants

4. National Electric Manufacturers Association (NEMA).

1.05 GUARANTEES

- A. Vendor shall warrant the equipment furnished under this Section for a period of 3 years against defects in materials and workmanship and operational failure.
- B. In the event of failure of any part or parts of the equipment during the 3 years of service, provided that the equipment has been operated and maintained in accordance with good practice, the vendor shall furnish, deliver, and install the defective part or parts at his own expense.
- C. The first 3 years of service shall be interpreted as the 36-month period following the installation, adjusting, and acceptance testing, and the start of actual operation of the equipment, or 42 months following delivery of the equipment, whichever comes first.

2.00 PRODUCTS

2.01 VALVE CONSTRUCTION

- A. General: Butterfly valves supplied under this Contract shall be of the tight-closing, rubber seated type with rubber seats that are securely attached to the valve disc or body. Valves which are used for modulating service or pump control service shall have the rubber seat attached to the disc. Valves shall be bubble tight at rated pressures with flow in either direction and shall be satisfactory for applications involving valve operation after long periods of inactivity. Butterfly valves shall conform to the applicable requirements of AWWA C504, AWWA C542, and AWWA C550. All valves for potable water service shall comply with NSF61 standards.
- B. Motor Control Operation:
 - 1. For normal start, engage the RUN (OPEN) contactor at the valve or remotely.
 - 2. For normal stop, engage the STOP (CLOSE) contactor at the valve or remotely.
 - 3. Valve operator motor shall move the valve from full closed to full open or from full open to full closed in approximately 180 seconds.
 - 4. Provide two limit switches on the valve for remote indication of valve limits. LSC13 shall close when valve lifts from its seat and LS015 shall open when valve is fully open. Switches will turn-off remote lights and indicate valve is in the fully closed or open position.
- C. Butterfly Valves:
 - 1. Valve Bodies: Valve bodies shall be constructed of ductile iron in accordance with ASTM A536, Grade 65/45/12. Valve class shall be suitable for the pressure class of the adjacent pipe or as shown in the valve list herein. Valve shall have flanged ends with ANSI B16.1 drilling. Two trunnions for shaft bearings shall be integral with each valve body. Pressure class of valve shall be permanently marked on the valve.
 - 2. Valve Discs: Valve discs shall be ductile iron conforming to ASTM A536, Grade 65/45/12. There shall be no external ribs transverse to the flow path.
 - 3. Valve Shafts: Valve shafts shall be turned, ground and polished, constructed of stainless steel conforming to ASTM A276. Valve shafts may consist of a one piece unit extending completely through the valve disc, or may be of the "stub shaft" type, which comprises two separate shafts inserted into the valve disc hubs. If of the "stub shaft" construction, each stub shaft shall be inserted into the valve disc hubs for a distance of at least 1-1/2 shaft diameters. The shaft shall be tightly connected to the disc using tapered or wedged keying devices.

4. Valve Seats: Valves shall have Neoprene, Buna-N or other synthetic rubber resilient seats to provide tight shut off at the pressure specified. The mating seat surface shall be ASTM A276, 18 8 stainless steel or a 95 percent pure nickel overlay. All valves shall have mechanically retained, replaceable, adjustable seats. Seats retained using epoxy or similar system are not acceptable. Valves 30 inches and larger shall have in-line replaceable seats.
 5. Valve Bearings: Valve shall be fitted with sleeve type bearings. Bearings shall be of corrosion-resistant and "self-lubricated" materials that will not deteriorate natural or synthetic rubber.
 6. Valve Shaft Seals: Where shafts project through the valve bodies for operator connection, a split-V or O-ring type shaft seal shall be provided.
 7. Valve Operators, General: The valve operator shall be designed and manufactured in accordance with the applicable requirements of AWWA C504 and AWWA C542, and shall be arranged for horizontal valve shaft installation.
 8. Valve Position Indicator: Above ground or valves in vaults shall have an indicator which will indicate the valve position. The indicator shall be permanently match-marked at the factor to indicate full open and full closed position. Valve position indicator is not required for buried valves.
- D. Manual Operators:
1. Manual operators shall have all gearing totally enclosed and shall be pre-lubricated or grease packed. Operators shall be of the enclosed worm gear type with a non-rising stem. Worm gear shall be grease lubricated. The direction of the manual rotation shall be clockwise to close.
 2. Operators for exposed valves shall be provided with a valve position indicator.
 3. Operators shall have a 2-inch square operating nut. Provide bevel gear for vertical operation of the operating nut. Provide a handwheel where indicated.
 4. Provide a cast iron valve box to enclose the operating stem. Valve box shall be three-piece extension type, Mueller No. 10380 or Clow F2450. For valves installed with the shaft vertical, provide a bevel gear for vertical operation of the operating nut.
- E. Valve Extension Stems and Stem Guides: Worm gear actuator shall be designed for submerged service with operating nut pinned to shaft with a solid round pin. Extension stem shall be 1-inch carbon steel solid shaft. Valves in vaults shall include two (minimum) adjustable Trumbull 367 stem guides, one at each end of extension stem. Supports shall be provided at 10 foot maximum spacing.
- F. Motor Control Operation:
1. For normal start, engage the RUN (OPEN) contactor at the valve or remotely.
 2. For normal stop, engage the STOP (CLOSE) contactor at the valve or remotely.
 3. Valve operator motor shall move the valve from full closed to full open or from full open to full closed in approximately 300 seconds.
 4. Provide two (2) limit switches on the valve for remote indication of valve limits. Limit switch LS4 shall close when valve lifts from its seat and LS3 shall open when valve is fully open. Switches will turn-off remote lights and indicate valve is in the fully closed or open position.
 5. Limit switches shall be set per the Limit Switch Positions Table shown in the electrical drawings.

G. Electric Motor Operator:

1. General:

- a. The motor operators shall be AUMA Aumatic or Rotok IQ. Actuator sizes shall be developed and verified by the valve manufacturer as appropriate selections.
- b. Both valve and motor operator manufacturer shall submit torque calculations for engineer approval. The motor operator shall have a seating torque 50 percent greater than the maximum torque required to operate the valve. The torque requirements listed above are the minimum requirements.
- c. The electric motor valve operators shall be of the reversible motor type. The rated torque capability of each operator shall be sufficient to seat, unseat and rigidly hold in any position the valve disc under the operating conditions specified herein.
- d. Operators shall be self-contained units comprising housing, motor, reversing contactor, limit switches, torque switches, relays, control transformer, gear train, and auxiliary handwheel. Operators shall comply with the applicable requirements of AWWA C542. Operators shall be IP 68 fully submersible.
- e. Operator for the valve shall move the valve from fully open to closed position or the reverse, in the time specified in schedule below. Operator shall allow full gear travel for opening and closing. Repeat cycle timers will not be allowed.
- f. Provide remote handheld programmer for Operator.

2. Construction:

- a. Operators shall be equipped with an auxiliary handwheel to provide for manual actuation of the valve in the event of power failure. The handwheel shall not turn during normal operation of the valve.
- b. Each operator shall have an integral three-phase, full-voltage, reversing contactor with electrical and mechanical interlocks and three overload sensing relays. The contactor shall operate on 120 VAC and shall have a control transformer to transform 480 VAC to 120 VAC. The control transformer shall be sized with sufficient capacity to operate the contactor, relays, and the motor switch compartment heaters.
- c. Limit switches shall be furnished for valve control, for remote and local OPEN-CLOSE indications. Limit switches shall be dry contacts and shall be independently adjustable at the open and closed limits. Auxiliary limit switches shall have isolated Form A or B contacts rated 10 amps at 120 VAC. See Drawings for limit switch requirements.
- d. The operator enclosure shall be NEMA 4. Space heaters with thermostat shall be provided in the enclosure of wattage suitable for keeping the compartment dry at all times. There shall be installed also a suitable breather and drain. A schematic wiring diagram shall be attached and protected from the environment for maintenance use. Controls shall be shop wired to terminal strip, complete and ready for field installation. Wires to terminal strip shall be identified with heat shrinkable wire tags.
- e. Motor shall be designed for 30 minute duty and rated for 460 volts, 60 hertz, 3-phase service. Motor shall have an extra 50 percent service factor of torque. Motors shall have thermal switch wired to 120 VAC control circuit on operator. Control voltage shall be 120 volts AC. Bearings shall be permanently lubricated ball bearings.

- f. Operator shall have a selector switch, LOCAL-OFF-REMOTE and CLOSE-STOP-OPEN pushbuttons mounted on the operator with watertight boots. Operators shall have local position indicator.

3.00 EXECUTION

3.01 INSTALLATION

A. Pipeline:

1. Install valves in piping with valve shaft horizontal and with the disc seat adjustment facing the thrust harness, unless otherwise indicated.

B. General:

1. Valve operators shall be stored in an environmentally protected area until installed. Space heaters shall be energized during storage as materials on hand, and upon installation of the valve.
2. Installation shall be in accordance with the manufacturer's instructions. Carefully handle and lower valves into position to prevent damage to any part of the valves. Place the valve in the proper position with the stem aligned as specified and securely hold until connections have been made. Furnish stainless steel bolts, nuts, and gaskets.
3. For buried valves, adjust valve boxes to the proper length to conform to the surrounding ground surface and construct a 30-by-30-inch concrete pad around the valve box at the ground surface.
4. Atmospherically exposed valves shall be painted per System No. 4, in Section 09 96 00 "High-Performance Coatings."

3.02 FIELD QUALITY CONTROL

- A. Upon completion of installation of the equipment, an acceptance test to verify the satisfactory operation of each valve shall be conducted. The test shall be conducted in a manner approved by and in the presence of the Engineer. The unit must perform in a manner acceptable to the Engineer before final acceptance will be made by the Owner. Valves shall be painted per item 3.14 D (System No. 4 Exposed Metal - Highly Corrosive) in Section 09 96 00 "High-Performance Coatings."

3.03 CLEAN AND ADJUST

- A. Adjustments shall be in accordance with the valve manufacturer's instructions.

3.04 SCHEDULES; VALVES

Location	Number Required	Size and Ends	AWWA Class	Type Operator	Valve Orientation	Valve Seat Location	Tag Numbers
Exterior	2	42" Flg	150B	Manual	Horizontal	Upstream	WA3560-VLV-0100-1 WA3560-VLV-0100-2
Inside Meter Vault	1	24" Flg	150B	Motor	Horizontal	Upstream	WA3560-FV-0100-1

3.05 SCHEDULES; MOTOR OPERATORS

Location	Qty	BFV Size	Closing Time (sec)	Max. Differential Pressure (psi)	Min. Seating Torque (ft-lb)	AUMA* actuator	AUMA* Worm gearbox & primary reduction gearing	4-20mA Output
Exterior	2	42"	120	150	TBD	TBD	TBD	NO
Inside Meter Vault	1	24"	120	150	TBD	TBD	TBD	NO

***AUMA-Aumatic or Rotork IQ actuator, worm gearbox and primary reduction gearing shall be equivalent.**

END OF SECTION

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DIVISION 40

PROCESS INTEGRATION

40 90 00 INSTRUMENTATION AND CONTROL FOR PROCESS SYSTEMS

1.00 GENERAL

1.01 SCOPE

A. General Requirements for Instrumentation and Control.

1. There are two scopes of work in the Instrumentation Work in this project as described below:
 - a. The Instrumentation System Integrator Contractor shall provide all hardware, software, and configuration and integration associated with the PLC based Instrumentation and Process Control system. Provide a complete and operational system in accordance with these Contract Documents:
 - 1). Provide instrumentation, hardware, conductors and raceway required for a complete and operable system that is above that specified in the Contract Documents. Provide all labor and materials specified in the Contract Documents.
 - b. Provide all required labor, materials and PLC programming and system configuration and integration to interconnect the I/O as required per the project to the PLC at the Custer Road Pump Station flow meter vault.
 - 1). Provide all required software and programming in each of the PLCs and computer system for a complete and operational system in accordance with these Contract Documents.
 - 2). Coordinate and fully cooperate with the OWNER to provide all required hardware, PLC hardware and PLC programming necessary to interface with the existing system.
 - 3). Provide personnel to check out, test and commission the system.
 - 4). Provide factory trained personnel to train the OWNER's staff as specified.
 - 5). Provide software programming to create new screens and modify existing screens on the existing computer system.
 - 6). Provide the required drivers, if required, to receive and transmit data over the licensed and unlicensed frequency radio system to fully communicate with the PLC systems.
 - 7). Coordinate with the OWNER for standard control programming templates.

1.02 QUALITY ASSURANCE

- A. GENERAL: Should there be a conflict between various standards, codes, specifications, and contract drawings, bring the matter immediately to the attention of the OWNER's Representative.

B. REFERENCE STANDARDS:

1. American Society of Testing Materials:

A269	Seamless and Welded Austenitic Stainless Steel Tubing for General Service
B 68	Seamless Copper Tube
D 1047	Polyvinyl Chloride Jacket for Wire and Cable
A 36	Specification for Structural Steel
	Zinc Coating (Hot-Dip) on Iron and Steel Hardware

2. Research Council on Riveted and Bolted Structural Joints (RCRBSJ).

3. American Institute of Steel Construction (AISC).

4. Steel Structures Painting Council (SSPC): Painting Specifications for weather exposure.

5. American Welding Society (AWS): Welding Code D 1.1-75.

6. Federal Specifications: Primer, Paint Zinc, Chromate, Alkyd Type, Fed. Spec. TT-P-645a.

7. National Electrical Manufacturers Association (NEMA).

8. National Fire Protection Association (NFPA): National Electrical Code (NEC), 1990 edition.

9. International Society of Automation (ISA):

RP 3.1-1960	Flow Meter Installations, Seal and Condensate Chambers
S5.1-1973	Instrumentation Symbols and Identification
RP7.1-1956	Pneumatic Control Circuit Pressure Test
S7.3-1975	Quality Standard for Instrument Air
RP18.1-1965	Specifications and Guides for the Use of General Purpose Annunciators
S5.4-1976	Instrument Loop Diagrams
S8.1-1968	Instrument Enclosures for Industrial Environments
RP12.1-1960	Electrical Instruments in Hazardous Atmospheres
RP20.1, 20.2	Specification Forms for Instruments
S39.1-1972	Control Valve Sizing Equations
S39.2-1972	Control Valve Capacity Test Procedures
S51.1	Process Instrumentation Terminology

10. American Petroleum Institute (API):

API RP 550 Manual on Installation of Refinery Instruments and Control Systems

API RP 520 Recommended Practice for the Design and Installation of Pressure-Relieving Systems in Refineries

11. Scientific Apparatus Makers Association (SAMA):

PM 20.1-1973 Process Measurement and Control Terminology

RC5-10-1963 Resistance Thermometers

12. Underwriters' Laboratory (UL): Subject 13, Subject 1227.

13. Factory Mutual (FM).

14. American National Standard Institute (ANSI):

15. Supplement to C37.90-1971, Relays and Relay Systems Associated with Electric Power Apparatus (IEEE Std. 313-1971), C37.90a-1974.

16. National Bureau of Standards (NBS).

17. Institute of Electrical and Electronics Engineers (IEEE): Tray Fire Tests, IEEE 383.

1.03 GUARANTEE

- A. GUARANTEE PERIOD: The CONTRACTOR shall provide guarantees as defined hereunder for a period of one year after final acceptance by the OWNER.
- B. GUARANTEE REQUIREMENTS FOR ANALOG DEVICES: Each device shall perform its intended function within the specified operating accuracy and repeatability without more than 12 adjustments for any consecutive period of 12 months. The availability of each device shall be not less than 98.0 percent for any consecutive period of six months. Downtime of analog devices affecting more than 8 loops shall be considered a system failure.

1.04 CONTRACTOR'S QUALIFICATIONS

- A. The System Integrator's personnel shall have a minimum of ten years of prior experience in furnishing, installation, testing, programming, debugging, start-up, and training for systems at least as large and similar to the one in this Contract. The system installer shall have employees who are qualified technicians for the duration of the contract. The Contractor shall submit for evaluation within one week of Notice to Proceed, his instrumentation systems installer's company resumes complete with company history, project lists, locations, Owner, costs, type of system installed, and references with phone numbers. Installers not meeting these qualifications shall not be accepted. As a part of this contract, the instrumentation system installers shall assume complete system responsibility, including coordination and interfacing with all subsystems and equipment suppliers and manufacturers. The Contractor shall actively be involved in control system integration industry for the last five years. The Contractor shall not act as a broker for the project; he shall provide and be responsible for all hardware, interfacing software, training, testing, and extended warranties.

- A. The following Instrumentation System Integrator Contractors are pre-qualified with NTMWD:
 - 1. Prime Controls, Inc.
 - 2. Richardson Logic Control, LLC.
- B. The following Instrumentation System Integrator Contractors are pre-qualified with The City of Prosper:
 - 1. DHS Automation, Inc.

1.05 DEFINITIONS

- A. The terms used in this specification conform to definitions in ISA S51.1, SAMA PMC 20.1-1973 and RC 5-10-1963, except as modified below.
 - 1. Device: An electronic or mechanical apparatus designed to perform a specific measurement or control function.
 - 2. Equipment: The machinery used in a process, e.g., pumps, fans, etc.
 - 3. Interchangeability error: The algebraic difference between the indication and true value of the measured variable as a result of exchanging a device with a replacement.
 - 4. Loop: Any combination of interconnected transmitters, receivers, switches, alarms, indicators, controllers, computers, or final control elements.
 - 5. Operating accuracy: Conformity of indicated value to accepted standard value or true value throughout specified operating conditions with a confidence level of 95 percent includes, but is not limited to, hysteresis, linearity, and operating influence of temperature, pressure, supply voltage, and transmitter power supply. Operating accuracy for loop is defined as root-mean-square (RMS) of individual device operation accuracies.
 - 6. Process: A progressively continuing operation that consists of a series of controlled actions systemically directed toward a particular result, e.g., a process to mix, filter, heat, and/or cool air to a particular condition.
 - 7. Response: The results of the act, or process of measuring the time difference between the time of a change in an input signal or a measured variable, and the time when the output, display, and final control element in the loop has changed to at least 60 percent of the change which should result from the input change.
 - 8. Subsystem: A discrete subdivision of a system and an assemblage of parts, devices, or software modules designed to perform one or more of the specific tasks required for the system to accomplish its functions.
 - 9. System: An assemblage of sometimes diverse parts, devices, or software modules serving a common set of measurement or control functions.
 - 10. Time resolution: The result of the act or process of rendering distinguishable events occurring at nearly the same time. Expressed as a measurement of time in seconds.
 - 11. Unit: Any combination of equipment items interconnected in a predetermined manner, performing one or more controlled actions toward a particular result. A discrete subdivision of a process.

12. Concealed - Accessible: Out of general sight, but can be easily reached by removing panels or access doors.
13. Concealed - Inaccessible: Out of general sight and cannot be easily reached except by removing a permanent part of the building or using special tools.
14. Exposed: Open to general view without removing panels, access doors, or a permanent part of the building.
15. Field termination point: Termination of a run of raceway from an instrument panel to the vicinity of a field instrument. Field termination point is usually within five horizontal feet from the field instrument.
16. Analog device: Any sensor, transmitter, indicator, recorder, controller, computing relay, or control valve which transmits or receives an analog signal. Excludes the analog portion of a digital system or I/O subsystems.

1.06 SUBMITTALS

A. SHOP DRAWINGS AND PRODUCT DATA:

1. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures".
2. Detail: Give sufficient detail to permit system configuration, installation, and wiring without reference to design drawings. Refer to Division 1 - General Requirements.
3. As a minimum, shop drawings shall include a bill of materials with original manufacturer's name and catalog number (re-labeled component information is not acceptable), original manufacturer's catalog cut sheets each sheet marked to show applicable items being submitted for approval, front views, assembly drawings, nameplate schedules, electrical schematics, and electrical connections diagrams.
4. Electrical and interconnection diagrams shall show all terminations of equipment, complete with conduit, cable, and equipment designations, and shall include terminal identification information.
5. Include size of all conduits, pipe, cables, and conductors.
6. Physical arrangement drawings shall include operating and servicing clearance requirements, cooling requirements, electrical power requirements, and cabling information.
7. Drawings indicating internal and external panel layouts shall be drawn to scale.
8. Logic drawer drawings shall show used space and expansion space.
9. Show appropriate tag numbers on all product data.
10. Software specifications for all software provided in addition to existing standard software.
 - a. Include fully annotated source listings, input-output requirements, memory requirements, timing and sequencing requirements, flow chart showing functions performed, operating sequences and decision points, required system configuration, list of known or anticipated limitations of software modules, list of malfunction procedures to be followed for recovering from operator error or other malfunction, and description of how each module interfaces with calling and called programs.

- b. Provide proposed screen layouts showing modifications to existing screens, and new screens: Show all displays, inputs, outputs, recorders, alarms and indications along with the associated signal tag number. OWNER shall review and approve screen layouts.

B. TECHNICAL MANUALS:

1. Supply six (6) sets of technical manuals with software specifications to OWNER's Representative no later than the equipment shipment date. Each set shall be bound in a standard size, three-ring, loose-leaf, vinyl plastic, hard-cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches.
2. Each set of technical manuals shall include a general and detailed description, a theory of operation description, detailed schematic drawings, specifications, and installation, connection, calibration, operating, troubleshooting, preventive maintenance, and overhaul instructions in complete detail with a clear and specific description of the steps the operators must take to perform each of the tasks and modes of operating specified. These manuals shall provide the OWNER with comprehensive information on all systems and components to enable operation, service, maintenance and repair. Exploded or other detailed views of all instruments, assemblies, and accessory components shall be included together with complete parts lists and ordering instructions. These manuals are in addition to all applicable requirements of Division 01 - General Requirements.

C. CD ROMS AND OPERATION AND MAINTENANCE MANUALS

1. Provide four (4) CD ROMS each with a copy of the HMI and PLC programming to the OWNER's Representative no later than substantial completion. Include a soft copy of all final approved shop drawings, technical manuals and product data on each CD ROM.

2.00 PRODUCTS

2.01 INFORMATION ON DRAWINGS

A. The following information is indicated on the drawings:

1. Loop diagram on flow sheet for each control loop. Diagrams are schematic in nature and intended only as a guide to work to be performed.
2. Approximate location of primary elements, instrument panels, and final control elements.
3. Location of electrical distribution panel boards for instrument electrical power.
4. Location of equipment having alarms and equipment status contacts.
5. Location of equipment being controlled by system.

B. The following information is not shown on drawings, but shall be the responsibility of the CONTRACTOR to determine, furnish, and coordinate with other divisions based upon systems specified. Show this information on project record drawings.

1. Instrument loop drawings per ISA S5.4 minimum, desired and optional items.
2. Location of electrical distribution panel boards supplying power to any device supplied under this Contract.

3. Detailed enclosure and instrument panel layouts, PLC enclosure layouts, fabrication details, and wiring diagrams.
4. Detailed system configuration.
5. Raceway and cable routing for instrumentation wiring.

2.02 OPERATING CONDITIONS

- A. **AMBIENT CONDITIONS:** Provide equipment suitable for ambient conditions specified. Provide system elements to operate properly in the presence of radio frequency fields produced by portable RF transmitters with output of five watts operated at 24 inches from instruments in the presence of plant telephone lines, power lines, and electrical equipment, and in the presence of digital data transmission systems.
- B. **FIELD LOCATIONS:** Field equipment may be subjected to ambient temperatures from -5 to 50°C with direct radiation and relative humidity from 45 to 95 percent with condensation.
- C. **POWER SUPPLY:** Power supply will be 117 volts a-c, single-phase, 60-hertz commercial power. Voltage variations will be at least plus or minus 8 percent. Certain loops shall have integral power supply as specified in the Contract Documents. Power supplies shall be provided in the panels as specified in the Contract Documents or required for a complete system, plus one spare.

2.03 MATERIALS AND EQUIPMENT

- A. Provide equipment of solid-state construction utilizing second source semiconductors, unless otherwise specified. Derate components to assure dependability and long-term stability. Provide printed or etched circuit boards of glass epoxy, hand or wave soldered, of sufficient thickness to prevent warping. Coat printed circuit boards in field-mounted equipment with two mils of solderable conformal coating complying with MIL-I-46058B. Alignment and adjustments shall be noncritical, stable with temperature changes or aging, and accomplished with premium grade potentiometers. Do not insert components of specially selected values into standard electronic assemblies to meet performance requirements. Use parts indicated in instruction manuals, replaceable with standard commercial components of the same description without degrading performance of completed assembly.
- B. Use test equipment and instruments to simulate inputs and read outputs suitable for purpose intended and rated to an accuracy of at least five times greater than the required accuracy of device being calibrated. Such test equipment shall have accuracies traceable to the National Bureau of Standards as applicable.

2.04 SPECIAL PROJECT REQUIREMENTS

- A. As a part of this Contract, the instrumentation systems CONTRACTOR shall coordinate with the OWNER and with all the sub-systems suppliers and manufacturers, during bidding, construction, testing, installation and start-up phases of the project. The coordination is to assure that the instruments and sub-systems are in compliance with the Contract Documents and that the necessary tie-ins and interface signals with the existing system are provided as specified or required.

- B. The instrumentation system CONTRACTOR shall provide the OWNER's staff with all required training and operating procedures, at no extra cost to the OWNER, in addition to the SCADA training specified in Section 40 90 02, "Supervisory Control and Data Acquisition (SCADA) System". The training schedule shall be coordinated with the OWNER's Representative. Training shall include operating, testing, calibration and programming of the system, and simple troubleshooting of the system. The training shall include manuals which are specifically written for the system provided as described in Division 1 - General Requirements of these Specifications.
- C. The calibration, testing, and start-up of all the instruments whether existing or provided new, shall be done by the manufacturer's field technician/ENGINEER in the presence of the OWNER. The CONTRACTOR shall provide a list of all manufacturers whose technicians will perform this work. The CONTRACTOR shall also provide a certified calibration report stating that each instrument shown or specified in the Contract Documents has been installed, tested and calibrated per manufacturer's recommendations and per these Contract Documents.
- D. Follow-up Services: After the acceptance of the system, the CONTRACTOR shall make four (4) trips to the project site for calibration and adjustment of all the instruments and devices, including the SCADA system. The first trip shall be three months after acceptance of the complete system, and thereafter every three months for a total of four trips. These trips are in addition to all warranty items, and shall be at no extra cost to the OWNER. The CONTRACTOR shall provide the services of a trained technician for each trip with appropriate calibration and testing instruments. All defects shall be immediately remedied. The trips shall be coordinated with the OWNER.
- E. All control software developed and required for this contract shall be delivered to the OWNER stored on electronic media in a format suitable for installing on the existing equipment and new equipment installed under this contract. This includes all source code, compiled code, link libraries, run-time libraries or other modules necessary to recreate an operational system in the event of a catastrophic failure or cessation of business by any of the Contractors. In addition, copies of all data bases and necessary associated files as configured after the final test shall be supplied on the same medium.
- F. Identify equipment (control panels, control stations, instruments, etc.) with the name of the equipment it serves. Control panels, instruments, meters, junction or terminal boxes, etc. shall have nameplate designations as shown on the drawings. Nameplates shall be engraved, laminated impact acrylic, black lettering on white background, matte finish, not less than 1/16-in thick by 3/4-in by 2-1/2-in, Rowmark 322402. Nameplates shall be 316 SS screw mounted to all enclosures except for NEMA 4 and 4X. Nameplates for NEMA 4 and 4X enclosures shall be attached with double faced adhesive strips, TESA TUFF TAPE 4970, /009 X 1/2", no equal. Prior to installing the nameplates, the metal surface shall be thoroughly cleaned with a 70% alcohol solution until the metal surface residue has been removed. Epoxy adhesive of foam tape is not acceptable.

END OF SECTION

40 90 01 INSTRUMENTATION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install all equipment for complete instrumentation and controls. CONTRACTOR's work shall include but not be limited to the following:
 - 1. Installation of equipment furnished under this contract.
 - 2. Interconnections between equipment furnished under this contract.
 - 3. Interconnection between equipment furnished under this contract and the existing instrumentation and control equipment or that furnished and installed under other contracts.
- B. The CONTRACTOR's attention is directed to the fact that instrumentation is an integrated system and as such shall be furnished by one vendor or system integrator who shall provide all the equipment and appurtenances, regardless of manufacture, and be responsible to the CONTRACTOR for satisfactory operation of the entire system.
- C. Supervision, labor, tools, and materials necessary for installation of the instrumentation equipment and material furnished herein and their interconnection shall be provided by the CONTRACTOR. Installation work shall conform to applicable city, state, and national building and electrical codes.
- D. Coordinate the work of the system manufacturer's service personnel during construction, testing, calibration and acceptance of the instruments.
- E. Provide equipment as shown in the specifications and on the drawings.

1.02 QUALITY ASSURANCE

- A. GENERAL: Equipment shall be the Manufacturer's latest and proven design. Specifications and drawings call attention to certain features, but do not purport to cover all details entering into the design of the instrumentation system. The completed system shall be compatible with the functions required and the equipment furnished by the CONTRACTOR.
- B. OPERATING VOLTAGE: Electrical components of the system shall operate on 120 volt, single-phase, 60 Hertz, except as otherwise noted in the specifications.
- C. POWER SUPPLIES: The drawings and specifications indicate the energy sources that will be provided. Any other devices or power supplies necessary to obtain proper operation of the instrument system from these energy sources shall be furnished with the instrumentation.
- D. PROTECTION
 - 1. The instrumentation system supplier shall be responsible for input-output isolation of all incoming and outgoing signals.
 - 2. Each 4-20 mA DC process measurement current loop installed on this contract shall be protected by insertion of a 1/4 amp fuse, Buss Type MKB. Fuses shall be installed in standard fuse blocks.

3. The necessary fuses or switches required by the Instrumentation Manufacturer for his equipment shall be provided with the equipment. The instruments requiring an internal power supply shall have an internal ON-OFF switch.

E. INPUT/OUTPUT

1. In general and unless specifically stated otherwise, inputs and outputs involving instrumentation systems shown shall be 4-20 mA DC process measurement signals. Current loop isolators, current repeaters, or other signal isolators shall be furnished and installed as required to meet instrument specifications and to make instrumentation system fully operational.
2. Pair shielded cable, as specified in Section 26 05 19 "Low Voltage Electrical Conductors & Cables" shall be used for all 4-20 mA DC loops.

F. HARDWARE CHECKOUT

1. CONTRACTOR shall be responsible for checkout and calibration of all field instrumentation up to and including the PLC cabinets. CONTRACTOR shall provide a checkout of all I/O points under the supervision of the ENGINEER. Checkout shall be scheduled two weeks in advance of the date with the ENGINEER. CONTRACTOR shall provide a schedule of checkout and procedures to be used to the ENGINEER two weeks in advance of the test date for the ENGINEER's approval.
2. I/O points and sequence of operations shall be judged Pass/Fail by the ENGINEER. If a point fails, the CONTRACTOR shall move on to the next point and resubmit a new test schedule to the ENGINEER. The CONTRACTOR shall run a rehearsal of the test procedure to be witnessed by the ENGINEER prior to the test date as field modifications of equipment during the testing for a failed point shall not be allowed. Testing shall simulate actual field conditions and reflect the sequence of operations expected when in use.

G. EQUIPMENT WARRANTY

1. All equipment shall be warrantied for a period of one (1) year after final acceptance.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures" and shall include:
- B. Shop Drawings
 1. Shop drawings shall be submitted to the ENGINEER for approval before fabrication or shipment to the job. Equipment shall not be fabricated or shipped to the job before receipt of approved shop drawings from the ENGINEER. Submittals for approval shall include (1) component manufacturing data sheet indicating pertinent data and identifying each component by item number and nomenclature, (2) component drawing showing dimensions, mounting, and external connection details, (3) a system piping schematic and wiring schematic each on a single drawing with full description of operation, (4) complete schematic diagram of each piece of electrical and electronic equipment including electrical valves and tolerances for each component. Component identification on the schematic shall be as described above.

2. Following approval, the manufacturer shall be responsible for preparation of the required sets of these drawings for distribution as indicated in Division 0 and Division 1 specifications.
 3. Shop drawings submitted for all equipment furnished under this section of the specifications, shall be submitted at the same time in the same package. Partial submittals will not be reviewed.
- C. Sales bulletins and other general publications are not acceptable as submittals for approval.
- D. Equipment installation Report. CONTRACTOR shall provide an Equipment Installation Report for each instrument (flow meter, level transmitter, etc.) to the ENGINEER/OWNER for approval. The equipment installation report shall include documentation stating that the instrument was installed and properly calibrated per the manufacturer's recommendations by an Authorized representative of the instrument manufacturer. All parameters required for programming of the instrument shall be provided in a hard copy format as part of the equipment installation report. Documentation stating that the person performing the calibration and start-up is an authorized representative shall be provided as well.
- E. Operation and Maintenance Manuals
1. Operating instructions shall incorporate a functional description of the entire system including the system schematics which reflect "as-built" modifications. Wiring diagrams shall be furnished as a part of the Operation and Maintenance Manuals which clearly show terminal numbers and wire numbers as they actually are in the instrumentation system. Instrument panel wiring shall be such that each wire installed has its own number designation at each end and such that no number is repeated. Instrument panel wire tagging instructions as specified in Section 26 05 19 "Low Voltage Electrical Conductors & Cables" shall be followed.
 2. Special maintenance requirements particular to the system shall be clearly defined along with special calibration and test procedures.
- F. CONTRACTOR shall provide point to point interconnection diagrams for all control/instrumentation connections between the PLC cabinet and field devices including instruments, motor starters, and switchgear. Point-to-point diagrams shall be provided for all control/instrumentation wiring between field devices and panels, i.e. Adjustable Frequency Drives (AFDs) motor starters, switchgear, etc. CONTRACTOR shall provide AutoCad files of interconnection diagrams to the OWNER. Interconnection diagrams shall include cable no., terminal block no., instrument no., panel no., etc. Hard copies of the Interconnection drawings shall be submitted to the ENGINEER for approval as an official submittal prior to the final AutoCAD files being submitted.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
1. ASTM A-126 Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
 2. ASTM B-61 Specification for Steam and Valve Bronze Castings

1.05 JOB CONDITIONS

- A. SPECIAL TOOLS: Furnish a kit which contains special size wrenches and other types of tools, not normally available, which are necessary for assembling, disassembling, aligning, and calibrating each piece of equipment. In addition, any piece of equipment (meter, test set, etc.) required by the Manufacturer to align, adjust, or otherwise calibrate any item under this section of the specification shall be furnished, including software.

2.00 PRODUCTS

2.01 ENCLOSURES/PANELS

- A. Enclosures and panels as indicated on the plans and in this specification shall be furnished, installed, and wired. Enclosures for equipment in the electrical building and vault shall be NEMA 4X 304 stainless steel unless otherwise noted. All enclosures shall have a quick release luggage type stainless steel clasp.

2.02 TUBING

- A. Instrument tubing shall be 316 stainless steel conforming to ASTM A269 for seamless tubing for use with compression type fittings. Hydraulic connections to instruments shall be made with compression type fittings.
- B. Tubing shall be 3/8" trade size (OD= .375", ID= .315", wall thickness =.030"), shall be rated for 810 psi working pressure at 150°F and shall be manufactured by Halstead or approved equal. Tube fittings shall be compression type as manufactured by Parker or approved equal.

2.03 ELECTROMAGNETIC FLOW METER

- A. Flow element shall be of the electromagnetic type utilizing the pulsed DC type Coil excitation principle with high preamp input impedance. Unit shall have zero stability feature thereby eliminating the need to stop flow to check zero alignment. Electromagnetic flow meter shall be flange mounted with remotely mounted transmitter. The flow meter body shall have an internal diameter not less than the line size indicated and be constructed of 316 stainless steel with AWWA Class D flanged ends of epoxy coated carbon steel. The flow tube shall be rated IP68 for indefinite submersion. The flow meter shall be provided with an NSF 61 drinking water approved hard rubber liner and shall include two 316 SS measuring electrodes. Two additional electrodes for grounding and empty pipe detection shall be of the same material. Electrodes shall be either flush or bullet nose type. Suitable covers shall be provided for flow elements ends to protect the tube liner during shipment. Install grounding rings on the flow tube.
- B. The flow meter shall generate a HART 4-20mA and pulse output linearly proportional to flow for full-scale velocity settings from 1 to 33 feet per second. Accuracy of the flow meter shall be $\pm 0.2\%$ of rate $\pm 0.01\%$ of full scale (33 ft/sec).
- C. The meter shall incorporate a high impedance amplifier of 10^{12} ohms or greater, eliminating the need for electrode cleaning systems. The meter shall utilize bipolar pulsed DC coil excitation with auto-integrated zeroing each half-cycle. Manual zero adjustment shall not be required. Power consumption shall be no more than 15 VA, independent of meter size. Meter shall operate via external 120VAC source.

- D. The magnetic flow meter shall be microprocessor based with remote mounted electronics. The electronics enclosure is to have a NEMA 4X rating. Flow transmitter shall be enclosed and indicating & suitable for mounting with the flow element. Output span and zero shall be manually adjustable. The meter is required to be capable of in-line meter verification in order to verify proper operation in the field.
- E. The meter's analog and pulse outputs shall be independently selected by push buttons. The analog output shall be an isolated 4-20 mA DC into 700 ohms load. The pulse output shall be an open collector output with a maximum frequency of 1000 Hz with configurable pulse width (0.05 to 2 sec). An open collector status output shall indicate either system or process error, or flow direction. An auxiliary input shall be available for positive zero return. A low flow cutoff will be standard, which can be turned on or off by push buttons.
- F. A 4-line, 16-digit LCD backlit display shall indicate flow rate and/or total flow. The totalizer value shall be protected by EEPROM during power outages. The display shall also be capable of indicating error messages such as empty pipe condition, error condition, and low flow cutoff. The flow meter shall have the capability of being programmed remotely using HART protocol.
- G. Electromagnetic flowmeter shall be Siemens MAGFLO flanged meter or Endress & Hauser Model 50W. The meter shall include external verification.
- H. Electromagnetic flowmeter shall be provided with 10 year manufacturer's warranty.
- I. Calibrations, programming and startup of flow meter in the field shall be performed by the instrument manufacturer's factory technicians only. Flow meter will not be accepted without factory technician starting up, programming, and calibrating flow meter. No exceptions.
- J. Contractor shall field verify size of piping for installation of flow meter. Provide letter as a formal submittal to the Engineer that the line size required has been field verified and the gallons per minute for the application has been coordinated with the motor manufacturers.

Tag	Service	Range	Line Size
WA3560-FE-0100-1	Flow Meter	TBD	24"

2.04 PRESSURE TRANSMITTER

- A. Pressure indicating transmitter shall be of the two wire capacitance sensing solid state electronic type having a 4-20 mA DC output signal proportional to the calibrated pressure range. The transmitter shall have 316 stainless steel wetted parts and Ceramic diaphragm. The transmitter shall have 1/4 NPT on flange process connection. The transmitters shall have an externally adjustable span and zero, an integral junction box and an accuracy of +/- 0.25% of span, +/- 0.25% stability of upper range limit. Pressure transmitter shall be provided with pressure indication.

- B. Range limits of transmitter shall be 0-50 to 0-300 psig. Each transmitter shall include an integrally or externally mounted transient protector to protect the instrument against lightning produced voltage spikes and other transient surges. Transient protector shall be Rosemount Model 470. Each transmitter shall be furnished with a 3-valve manifold with NORMAL, ZERO, BLOCK, CALIBRATE and BLOWDOWN functions and shall be D/A PTM6 or approved equal. Transmitter shall have local indication of pressure. Transmitter shall be Siemens, or Endress & Hauser, no approved equal.

Tag	Service	Range
WA3560-PIT-0100-1	Vault	0-150 psig

2.05 LEVEL FLOATS

- A. The level sensing device shall be a 5-1/2" diameter, 316 stainless steel float switch. The switch shall be mercury free.
- B. The switch shall be SPDT, rated 1 Amps at 150 VAC/VDC non-inductive with a mechanical life of 10 million operations.
- C. The float cable shall be rated "continuous service" for high flexibility.
- D. The float switch(es) shall be cable/pipe mounted as shown on the plan drawings or as described in the specifications. All mounting hardware shall be 316 SS. All float fittings shall be flared and incorporate strain relief jacketing.
- E. The float switch shall be a CONTEGRA Model FS 90 and shall have a 3 year warranty. Float switch shall be installed in accordance with the manufacturer's recommendations.

Tag	Service	Set at
WA3560-LSH-0105-1	Vault High Level	6" AFF

2.06 INTRUSION ALARM

- A. Hermetically sealed brushed anodized aluminum housing, Rhodium plated switch contacts, industrial wide gap magnetic contacts, UL listed, surface mount, 3' stainless steel armored cable, Sentrol 2500 series or approved equal. Provide with one normally open and one normally closed set of contacts.

Tag	Service
WA3560-ZS-0112-1	Electrical Building

2.07 PROCESS INDICATORS

- A. Process indicator shall take a 4-20 mA DC process variable signal input and display the current value of the process variable in engineering units on a 4-1/2 digit display. Display digits shall be bright red .56" seven segment light emitting diodes (LED's). Accuracy of unit shall be ±0.1%

and each unit shall have a loop power supply for powering its own loop. Unit shall be powered by 120 VAC. Process indicator shall be SITRANS RD200.

Tag	Service
WA3560-FIT-0100-1	Flow Meter
WA3560-PIT-0100-1	Pressure
WA3560-LIT-0107-1	3.0/5.0 GST Level

2.08 CURRENT LOOP ISOLATORS

- A. Current isolators shall accept an input of 4-20 mA DC and produce a linearly proportional 4-20 mA DC output signal. Accuracy shall be $\pm 0.1\%$ of scale. Isolators shall be 2-wire, input loop powered. Output load capability shall be a minimum of 1500 ohms.
- B. Current isolators shall be Moore Industries #ECT/4-20mA/4-20mA/24DC(din) or approved equal.

3.00 EXECUTION

3.01 INSTALLATION

- A. Wire each device requiring power so that when wires are removed from any one device, power is not be disrupted to any other device. Ground the case of each device either by mounting directly on a steel frame or by a third wire. For non-loop powered instruments (such as a LIT, FIT, etc.) provide a snap switch at the device if the device is remote mounted (ie: not near the 120V panel it is fed from). The Contractor shall provide, outlet box, conductors, conduits and switch as required for a complete and operational system.

3.02 FIELD QUALITY CONTROL

- A. The supervisory service of a factory-trained service engineer who is specifically trained on the type of equipment herein specified shall be provided during construction to assist the CONTRACTOR in the location of sleeves; methods of installing conduit and special cable; mounting, piping, and wiring one of each type of device, and the methods of protecting all of the equipment prior to placing it into service. Upon completion of the installation, the services of the above service engineer shall be provided for calibration and startup of the equipment and for instructing the operating personnel. The Manufacturer shall provide sufficient service to place the system in satisfactory operation.
- B. Check out and calibrate the system upon completion of the installation.
- C. Prior to the OWNER turning on any form of energy to the system, the CONTRACTOR shall provide the ENGINEER with a certified statement of approval of the installation including his supplier's authorization for turning on energy to the system.

END OF SECTION

40 90 02 SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM**1.00 GENERAL****1.01 SCOPE**

- A. Contractor shall be responsible to acquire the latest OWNER's SCADA Standards document, as applicable. All hardware and software standards shall be followed.
- B. This section specifies furnishing, installing, testing, and start-up operations of a complete control sub-system as indicated in the Plans and as specified herein. The system shall be totally integrated with the existing SCADA system. The system shall be configured to operate as a Distributed Control System having an open system architecture.
- C. Reference the following specifications for SCADA work:
 - 1. 40 90 00, "Instrumentation and Control For Process Systems"
 - 2. 40 90 01, "Instrumentation"
 - 3. 40 95 43, "Communications Interface Equipment"
- D. A representative from The North Texas Municipal Water District shall be present during the total period the SCADA System Integrator is making programming changes at the OWNER's Main Control Room. The SCADA System Integrator Contractor shall contact the North Texas Municipal Water District representative two (2) weeks in advance for approval, prior to scheduling any programming modifications at the OWNER's Main Control Room.
 - 1. The Instrumentation System Integrator Contractor shall provide all hardware, software, and configuration and integration associated with the PLC based Instrumentation and Process Control system and the sites. Provide a complete and operational system in accordance with these Contract Documents. In each PLC Cabinet: provide a minimum of 20% or a minimum of 4 AI, 4 AO, 8 DI, 8 DO (whichever is greater) spare I/O of all active I/O points provided under this contract, plus the 20% or a minimum of 4 AI, 4 AO, 8 DI, 8 DO (whichever is greater) spare I/O shall be wired to terminal blocks.
 - 2. Provide all required software and programming in the PLCs, servers, and computer system for a complete and operational system in accordance with these Contract Documents.
 - 3. Provide personnel to check out, test and commission the system.
 - 4. Provide personnel to train the OWNER's staff as specified.
 - 5. Provide software programming to create new screens and modify existing screens on the existing computer system and Graphic User Interface Screen as specified.
- E. The Site specific scope of work detailed below is not all inclusive. It provides a summary of work to be performed.
 - 1. Provide new RTU and NEMA 4X 316 stainless steel enclosure "WA3560-PLC-001-1" with Modicon M340 and RTU components in the new electrical room.
 - 2. Digital Displays
 - a. Vault Flow Meter (WA3560-FIT-0100-1)
 - b. Vault Pressure Transmitter (WA3560-PIT-0100-1)

3. Door Mounted Indication Lights
 - a. Valve Open Status (WA3560-FV-0100-1, WA3560-FCV-0101-1)
 - b. Valve Closed Status (WA3560-FV-0100-1, WA3560-FCV-0101-1)
 4. Provide new NEMA 4X 316 stainless steel Network Enclosure for 900MHz licensed radio, Ethernet Switch, and Firewall.
 5. Provide new NEMA 4X 316 stainless steel UPS enclosure for Bypass Switch and UPS.
 6. Provide new antenna cable and SPD.
 7. Program the Modicon M340 to monitor and control the site for the valves, instrumentation, and controls per OWNER's standards and contract drawings.
- F. Software Requirements - The SCADA System Contractor shall work with the OWNER's representative to provide as a minimum the following software programming modifications:
1. Modify existing SCADA system and screens at the OWNER's main control room.
 2. Program the remote PLC at the site.
 3. All PLC programming shall be done in ladder logic only using Modicon's Unity Pro Software, no exceptions.
- G. Contractor shall coordinate with the OWNER to modify the OWNER's existing SCADA systems and screens to receive additional flow signals at the site.
- H. Onsite Requirements - The Instrumentation System Integrator Contractor shall have technical staff on site as required to provide a complete and operating system and shall include as a minimum:
1. Preliminary Site Visit – two (2) days
 2. Programming System Upgrades (two weeks) – An OWNER's representative shall be present during the total period the SCADA System Integrator is making programming changes at the OWNER's Main Control Room. The SCADA System Integrator Contractor shall contact the OWNER's representative two (2) weeks in advance for approval, prior to scheduling any programming modifications at the OWNER's Main Control Room.
 3. Startup Site Visit
- I. Reference Standards:
1. American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE):
 - a. C37.90.1, IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems.
 - b. C37.90.2, Trial Use Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers.
 - c. Electronic Industries Association (EIA):
 - d. RS-232-C, Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange.

- e. RS-422-A, Electrical Characteristics of Balanced Voltage Digital Interface Circuits.
2. National Electrical Manufacturers Association (NEMA):
 - a. ICS 1, General Standards for Industrial Control and Systems.
 - b. ICS 1.1, Safety Guidelines for the Application, Installation and Maintenance of Solid State Control.
 - c. ICS 4, Terminal Blocks for Industrial Use.
 - d. ICS 6, Enclosures for Industrial Controls and Systems.
 - e. Publication No. 250, Enclosures for Electrical Equipment (1000 V maximum).
3. National Electrical Code.
4. NEC409/UL 508A
5. ISA Standards
6. IEC 2 KV Isolation test
7. IEEE472/ANSI C37-90A Surge withstand capability test.
8. IEEE 802.3
- J. Path Study for Radio Communications
 1. Prior to purchasing any equipment associated with the SCADA systems, the Contractor shall do a path study to determine the exact antenna height required for a clear line of sight and good reliable communication path year around between the different sites.
 - a. A radio propagation study shall be included. The study shall include physically transmitting a calibrated radio signal between sites. The transmitting antenna shall exhibit the same overall gain as the proposed system locating the antenna in its proposed location and height.
 - b. The results of the study shall be submitted to the OWNER/Engineer as an official submittal for approval prior to purchasing any equipment.
 - c. Any interferences shall be noted in path study.

1.02 SUBMITTAL

- A. Submittals shall conform to the requirements set forth in section 01 33 00, "Submittal Procedures" and Section 40 90 00, "Instrumentation & Control for Process Systems".
- B. Loop diagrams shall be prepared according to ISA Standard ISA-S5 and using loop numbers provided.
- C. Shop Drawings:
 1. Radio Path Study Results.
 2. Loop diagrams shall be prepared according to ISA Standard ISA-S5 and using loop numbers.

3. Schematic ladder diagrams shall include all terminal blocks, hardware devices, software interlocks, software data links, and control. Drawings shall utilize line numbers in the ladder diagrams.
 4. Project specific Interconnection diagrams of all devices. Interconnection diagrams shall include terminal blocks and wire tags.
 5. PLC Cabinet layout, plans, elevations, sections, details, bill of materials, etc. The layout drawings shall be to scale and include dimensions.
 6. Project specific panel layout, elevations, schematics, details, bill of materials, etc. for the miscellaneous panels (e.g.-Pump Lockout Relay Panel, PLC panels, etc.).
 7. A schedule defining all I/O, database reference, and point of origin or destination, and PLC system internal address tag names.
 8. Software manuals shall be provided to configure the central system and technical review information. Provide sample program documentation from previous projects.
 9. Complete spare parts list with catalog and part numbers and quantities.
 10. Updated PLC cabinet drawings in AutoCAD format showing all modifications made to existing cabinets as per the contract documents.
 11. I/O list of all hardware and software I/O. Clearly identify all data to be read over Data Highways – RS485, Ethernet, etc. at GUIs and HMI. I/O list shall use tags in accordance with the OWNER's tagging standards.
 12. UPS battery sizing calculations.
- D. Operation and Maintenance Manuals
1. Operating instructions shall incorporate a functional description of the entire system including the system schematics which reflect "as-built" modifications. Wiring diagrams shall be furnished as a part of the Operation and Maintenance Manuals which clearly show terminal numbers and wire numbers as they actually are in the instrumentation system. Instrument panel wiring shall be such that each wire installed has its own number designation at each end and such that no number is repeated. Instrument panel wire tagging instructions as specified in Section 26 05 19, "Low Voltage Electrical Conductors & Cables" shall be followed.
 2. Special maintenance requirements particular to the system shall be clearly defined along with special calibration and test procedures.
 3. A schedule defining all I/O, database reference, and point of origin or destination, and PLC system internal address.
 4. Submit written description of functions, loops, and logic.
 5. Submit all SAMA Logic and Wiring Diagrams and ISA Logic Diagrams for all equipment requiring programming at the PLCs, with all set points and ranges indicated.
 6. One software copy of actual program files burned on a CD/DVD.
 7. Provide hardcopy of PLC programming logic in O&M Manuals.
 8. One PDF copy of the "as-built" wiring diagrams and associated drawings burned on a CD.

- a. Maximum file size is 5MB. If manual is greater than maximum allowable file size, provide individual files for each major section of manual.
- b. All files shall be compatible with the latest software version available.
- c. Filename shall identify the plant site, plant area, equipment manufacturer, and date equipment placed in service. i.e. WWTP-PC1-Manufacturer-200503.pdf.
- d. Each electronic file shall contain a table of contents at the beginning of the file which includes hypertext links or bookmarks to navigate the file contents per section/chapter. The chapter labels shall identify the information included in that chapter i.e.: PLC Cabinet Layout.
- e. Scanned images of written documents are not acceptable. Document must allow character selection. Text within a file shall be transferable to other documents.
- f. Submit a preliminary version of the electronic format of the manual for review. Upon approval of the preliminary submittal, the Contractor shall provide the number of copies required per Division 01 of the electronic manual to the OWNER.

E. Factory Acceptance Test Reports

F. Equipment Installation Report

1.03 QUALITY ASSURANCE

- A. Suppliers Qualifications: The complete system shall be configured, programmed, and installed by one qualified system supplier who is regularly engaged and qualified in designing and building control systems. The system suppliers shall assume complete systems responsibility, including coordination and interfacing with all subsystems and equipment suppliers and manufacturers. The installation supervisor shall have had experience in overseeing installation and start-up of at least three similar installations. The bidder shall submit, upon ENGINEER's request, complete company history, resumes of full-time project manager for this project, other key full-time system analysts, programmers, technicians, and submit project list with costs, OWNER, contact person, phone number, etc. Refer to Section 40 90 00, "Instrumentation and Control for Process Systems" for Instrumentation System Integrator Contractors who are pre-qualified with the OWNER and for additional information.
- B. Tests: The complete system shall be assembled and tested at the job site. The OWNER'S representative and the ENGINEER'S presence will be required at the time of final testing at the system supplier's facilities.
- C. All equipment shall be new and UL listed and labeled.
- D. Assembly, Storage, & Handling: Once assembled and factory tested, the system shall be stored in air-conditioned and heated rooms. Ship the unit to job site only after the electrical room has been built and its HVAC system is in operation.
 1. The OWNER may approve partial payment for SCADA equipment ready to be onsite but is stored off site. Partial payment may be disallowed by the OWNER.
 - a. For partial payment, the OWNER shall receive as a minimum a sales receipt, lien release, proof of insurance and the OWNER's name shall be stenciled on the equipment being paid for. The OWNER has the right to inspect equipment completion at the factory prior to approving partial payment.

1.04 SYSTEM DESCRIPTION

- A. Furnish and install a programmable controller-based supervisory control and data acquisition system configured as a distributed processing network as defined by the Contract Documents. Control functions shall include digital logic control, PID control, and setpoint control.

1.05 WARRANTY

- A. The Equipment supplier and the CONTRACTOR shall warrant to the OWNER that the equipment delivered with reference to this specification complies with this specification.
- B. The equipment supplier and the CONTRACTOR shall warrant the equipment as to defects in material and workmanship for a period of one year from the date of final acceptance of the project. Vendor shall include a copy of his special equipment warranty with the shop drawings. The warranty specified by this specification shall be exclusive, and in lieu of all other warranties whether written, implied, orally presented, or statutory.
- C. Warranty for equipment shall be through the equipment manufacturer and shall include the option to purchase additional service agreements/extended warranties after the initial warranty for up to five years.

2.00 PRODUCTS

2.01 PROGRAMMABLE LOGIC CONTROLLER SYSTEM

- A. The following components are preferred hardware and software components. All PLC programming shall be done in ladder logic using Modicon's UNITY Pro programming software. If the programming provided does not use ladder logic the Contractor shall re-program the PLC at no additional cost to the OWNER. Contractor shall use these where the installation allows. Otherwise hardware and software shall be compatible with the following list and from the same manufacturer:
 - 1. PLC: Modicon M340.
- B. Where an existing PLC is to be modified or expanded as part of this Contract, as shown on the Drawings, the modified PLC shall meet all of the requirements of Paragraph 2.01 of this Section.

- C. The control system shall be configured using microprocessor-based programmable controllers for local process control functions. The control system shall be equipped with power supplies and individual uninterruptible power supply (UPS) to perform logic control functions based on the program stored in memory and the status of inputs and outputs. Memory will be required such that there is a minimum of 100 percent spare memory capacity and 100 percent spare data capacity installed. The spare capacity shall be documented by submitting to the ENGINEER, during factory acceptance testing, a statement indicating the amounts of memory of all types being utilized and the total amount available. The statement shall include an estimate of the total program and data memory necessary, including spare capacity, based on the I/O hardware for the system, and previous programming experience. Control functions such as register loading, register reading, and diagnostics may be downloaded from the central computer system programming. Automatic shutdown feature shall be selectable such that the desired field condition will be the default condition in the event of power loss or system failure. Power supplies shall be provided for the process controller as required with built-in protection against short-circuits, overcurrent, and overvoltage. At least one communication port shall be provided for each programmable controller.

The programmable controller shall be capable of complete control, including PID control, digital logic control, batch, and setpoint control.

The entire PLC system shall immediately shut down and annunciate the occurrence of any of the following abnormal circumstances:

1. Memory parity error.
 2. Loss of signal communication between CPU and I/O's.
 3. Halt or interruption of memory scan.
- D. The PLC system shall accomplish the control requirements of the loop diagrams, and Contract Documents.
- E. The design application and installation of the PLC system shall conform to NEMA ICS 1.1.
- F. PLC programming shall be documented annotated in detail, and factory tested where allowed.
- G. Human-machine interface (HMI) at the main control room shall utilize existing system viewable displays and keyboard(s). Interface functionality shall include:
1. Indication of process variables
 2. Configuration of control loop parameters
 3. Adjustment of controller output
 4. Display of real time and historical process trends
 5. Push button station controls
 6. System and process status indicators
 7. Graphic representation of plant operations with interactive status and measurement symbols
 8. Annunciation

- H. The PLC system shall operate in ambient conditions of 32 to 140 degrees F temperature, in an ambient temperature of 45°C outside the enclosure, and 0 to 95 percent relative humidity without the need for purging or air conditioning.
- I. Environmental Controls:
1. Furnish circulation fans in solid state control system enclosures.
 2. Over-temperature switches shall be utilized to provide special cooling if required to maintain operating temperatures within the manufacturer's specified range.
 3. Air conditioning applications shall include means of preventing moisture condensation.
- J. Input/Output Connection Requirements:
1. Outputs shall be fused:
 - a. External fusing shall be provided if output module does not possess internal fusing.
 - b. Fuses provided external to output model shall:
 - 1). Be in accordance with module manufacturer's specifications.
 - 2). Be installed at terminal block.
 2. Install bleeding resistors across input from field devices which leak current sufficiently to flicker input status light.
 3. Make connections to I/O subsystem by terminating all field wiring on terminal blocks within the I/O enclosure.
 4. Prewire I/O modules to terminal blocks.
 5. Provide terminal blocks with continuous marking strip.
 6. Size terminals to accommodate all active data base points and spares. Provide a minimum of 20% spare I/O of all active I/O points provided under this contract, plus the 20% spare I/O shall be wired to terminal blocks.
 7. Provide terminals for individual termination of each signal shield. Stripping back twisted shielded pair and twisting together all the shields is not acceptable.
 8. Field wiring shall not be disturbed when removing or replacing an I/O module.
- K. Where the PLC is utilized to control multiple trains of equipment, the PLC components (I/O modules, power supplies, etc.) shall be assigned so that the failure of one component does not affect equipment on all trains. I/O modules shall be segregated on a train basis unless required otherwise for safety reasons.
- L. All PLC control system components shall be capable of meeting or exceeding electromagnetic interference tests per ANSI/IEEE C37.90.2.
- M. Incorporate the following minimum safety measures:
1. External Watchdog Function to Monitor:
 - a. Internal processor clock failure
 - b. Processor memory failure
 - c. Loss of communication between processor and I/O modules

- d. Processor ceases to execute logic program
2. Safety Function Wiring:
 - a. Emergency shutdown switches shall not be wired into the controller.
3. An emergency power disconnect shall be placed in the power circuit feeding the power supply as a means of removing power from the entire PLC system.
 - a. Capacitor shall be placed across the disconnect to protect against current outrush through trails.
4. Safe Wiring:
 - a. Equipment failure mode shall be selected so that the loss of power or control signal to the equipment will result in the equipment either shutting down or operating safely unless specifically stated otherwise.
 - b. Activation of alarms and stopping of equipment shall result from the de-energization of control circuits, rather than the energization of control circuits unless specifically stated otherwise.
 - c. Low voltage control signal wires:
 - 1). Place in conduit segregated for that purpose only
 - 2). Twisted shielded wire pair
Not located in the same conduit or bundled with power wiring
5. Initial Safety Conditions:
 - a. Utilize program module to dictate output states in a known and safe manner prior to running of control program.
 - b. Utilize program each time PLC is re-initiated and the control program activated.
6. PLC Fault Relay:
 - a. Placed in series with any other emergency stop conditions
 - b. Opening of PLC Fault Contact:
 - 1). Upon unsafe or undesirable system operation, including:
 - 2). Loss of memory
 - 3). Processor fault
 - 4). Power supply fault
 - 5). Isolation failure
 - 6). Communications failure
 - 7). Scan time overrun
 - 8). Module failure
7. Monitoring of Internal Faults and Display:
 - a. Internal PLC system status and faults shall be monitored and displayed. Monitored items shall include:

- 1). Memory ok/loss of memory
 - 2). Processor ok/processor fault
 - 3). Battery ok/battery low
 - 4). Power supply ok/power supply fault
 - 5). Isolation failure
 - 6). High CPU temperature
 - 7). Scan time overrun
 - 8). Module failure
8. Effects of Failure:
- a. PLC system shall incorporate safe responses to the following failure effects:
 - 1). Power losses, interruptions, excursions, dips, and transients.
 - 2). Loss or corruption of memory
 - 3). Information transfer corruption or loss
 - 4). "Fail on" or "Fail off" of inputs or outputs
 - 5). Unreadable signals
 - 6). Addressing errors
 - 7). Processor faults
9. Design PLC system with high noise immunity to prevent occurrence of false logic signals resulting from switching transients, relay and circuit breaker noise or conducted and radiated radio frequency interference.
10. Incorporate noise suppression and inductive load suppression design into input, output, and logic modules
11. Operator Intervention:
- a. Logic system failure shall not preclude proper operator intervention
 - b. Safety shutdown of equipment or a system shall require manual operator intervention before the equipment or system operation may be reestablished.

2.02 COMPONENTS

- A. PLC System Central Processor Unit (CPU):
1. Completely solid state CPU designed to provide:
 - a. Digital relay logic
 - b. Analog loop control
 - c. Other required control functions:
 - 1). Counting
 - 2). Floating point math computations

3). Timing

2. To provide communications with other control systems and man-machine interfaces as specified.
 3. To use electrical ladder diagram style programming only.
 4. Memory:
 - a. Capacitor-based energy for RAM
 5. 100 percent minimum spare useable memory capacity after all required programming is in place and operating.
 6. Capable of executing all control functions required by the Contract Drawings including digital and analog loops.
 7. Built-in three-mode (proportional-integral-derivative) control capabilities.
 - a. As directly selectable algorithms requiring no user knowledge of programming languages.
 8. On line reconfigurable.
 9. Lighted status indicators for "RUN" and "FAILURE."
 10. Capable of manual or automatic control mode transfer from the HMI system or from within the control strategy. Transfer shall be bumpless and balanceless.
 11. The CPU shall contain a minimum of 1 serial configuration port and 1 Ethernet port.
 12. The CPU shall be able to do time synchronization for the system.
- B. Input/Output (I/O) Modules
1. Provide plug-in modular-type I/O racks in each PLC enclosures if required, with cables to connect to all other required PLC system components.
 2. Provide I/O system with:
 - a. I/O solid state boards with status lights indicating I/O status and board failure.
 - b. Electric isolation between logic and field device.
 - c. Individually fused outputs with blown fuses indication.
 - d. Interchangeable modules for similar I/O type to allow substitution of operating modules for failed units by the operator.
 - e. Incorporate noise suppression design.
 - f. Capable of meeting or exceeding surge-withstand capability tests, per ANSI/IEEE C37.90.1.
 - g. Capable of meeting or exceeding electrical noise tests, NEMA ICS1-109.60-109.66.
 3. Discrete I/O Modules:
 - a. Interface to ON/OFF devices
 - b. I/O status indicator module front
 - c. Voltage rating to match circuit voltage

- d. Output module current rating:
 - 1). Match maximum circuit current draw
 - 2). Minimum 1.5 A/point for 120 V AC applications
 - e. Isolated modules for applications where one module interfaces with devices utilizing different sources of power.
 - f. Individually fused inputs and outputs with blown fuse indication.
4. Analog I/O Modules:
- a. Input modules to accept signals indicated on Drawings or in the Specifications
 - b. Minimum 16 bit resolution
 - c. I/O chassis supplied power for powering connected field devices
 - d. Isolated (differential) inputs and outputs
 - e. User configurable for desired fault response state
 - f. Provide output signals as indicated on Drawings and in the Specifications
 - g. Individual D/A converter for each output module
 - h. Individual A/D converter for each input module
- C. Communication Card (COMM)
1. Ethernet Control Network Module
- a. Product compatibility: BMXP34XXXXXX
 - b. Communication port protocol: Ethernet/IP and Modbus TCP
 - c. Ethernet ports: 10BASE-T/100BASE-TX, connection type: RJ45
 - d. Communication Services:
 - 1). Port mirroring
 - 2). RSTP support
 - 3). Embedded 4-port switch
 - 4). Ethernet/IP I/O Scanner and Messaging
 - 5). Modbus TCP I/O Scanner and Messaging
 - 6). SNMP Network administrator
 - 7). Rack Viewer
 - 8). FDR Server
 - 9). Data Editor (via PC terminal)
 - 10). Bandwidth Management

2.03 SURGE SUPPRESSOR

- A. Surge suppressor for AC power circuits shall be UL listed or recognized. Suppressor shall be designed to withstand a maximum 10 kA test current of a 8/20 μ S waveform according to ANSI/IEEE C62.41 Category C Area. Suppressor shall consist of a multistage hybrid circuit with staging inductors or resistors to properly coordinate the components. Surge protection modules shall have a visual indication of circuit integrity. Devices shall include a SPDT contact rated for at least 120 VAC, 1 Amp, for remote failure indication. AC power surge suppressor shall be Phoenix Contact Mains-Plugtrab Series or approved equal.
- B. Surge suppressors for analog, discrete and data signals shall be UL listed or recognized. Suppressors shall be designed to withstand a maximum 10 kA test current of a 8/20 μ S waveform according to ANSI/IEEE C62.41 Category C Area. Suppressors shall consist of a multistage hybrid circuit with staging inductors or resistors to properly coordinate the components. Analog, discrete and data signal surge suppressors shall be Phoenix Contact Plugtrab Series or approved equal.
- C. Surge suppressors for field protection of analog signals shall consist of a multistage hybrid circuit utilizing only diodes and/or gas discharge tubes but no metal oxide varistors (MOV). Suppressors shall be designed to withstand a maximum 10 kA test current of a 8/20 μ S waveform according to ANSI/IEEE C62.41 Category C Area. Surge protection shall not have a cutoff frequency less than 400 kHz (for a 600 Ohm system) to allow HART protocol and other superimposed smart digital signals to function. 2-wire analog field surge suppressor shall be Phoenix Contact Pipetrab Series or approved equal. 4-wire analog field surge suppressor shall be Phoenix Contact Boxtrab or approved equal.

2.04 POWER SUPPLY

- A. The power supply shall be fully enclosed and provide screw terminations by means of a cable clamping terminal block activated by a screw. Connections shall be gas-tight, and the terminal block shall be fabricated of non-ferrous, non-corrosive materials. All wiring points shall be touch safe with no live voltages that can make contact with a misplaced finger. Power supply shall have integral metal mounting feet to attach to 35-mm DIN-rail.
- B. The power supply shall conform to UL 508C standards allow use at the full rated current. The power supply shall have a visual indicator for applied power. Operating temperature range shall be -25°C to 70°C. Power supply shall have means of limiting DC current in case of short circuit and shall automatically reset when fault is corrected. Power supply shall be able to be run in parallel mode without external circuitry to provide redundancy. Residual ripple shall not exceed 150 mV peak to peak.
- C. Provide regulated power units:
 - 1. Designed to operate with PLC system and shall provide power to:
 - a. All components of PLC system
 - b. Two-wire or four-wire field instruments
 - c. Other devices as indicated on Drawings or Specifications
 - d. Power supplies shall be summable type
 - 2. Capable of supplying PLC system when all of the specified spare capacity is utilized.

3. Each power supply shall be sized such that it will carry no more than 75 percent of capacity under normal loads. Calculated full load shall not exceed the 100% power rating of the power supply. Temporary power supply overload conditions of the power supply shall be approved by the Engineer prior to manufacturing of the panel.
- D. Electrical service to PLC system is 105 to 125 V, 60 HZ, +1 percent, 1 phase power.
- E. Separate AC circuit breakers shall be provided for each power supply.
- F. If the PLC system is field expandable beyond the specified spare capacity, and if such expansion requires power supply modification, note such requirements in the submittals and allow room in the PLC system enclosure.
- G. Provide integral battery backup to maintain 60 seconds upon loss of all AC power. This is required to ensure transient power surges and dips do not affect the operation of the PLC system.
- H. Capable of meeting or exceeding electrical noise tests, NEMA ICS1-109.60-109.66.
- I. Capable of meeting or exceeding surge-withstand capability tests per ANSI/IEEE C37.90.1.
- J. Power Distribution:
 1. Immune to transients and surges resultant from noisy environment.
 2. Shall provide constant voltage level DC distribution to all devices.
- K. Power supply shall be Phoenix Contact. No open frame power supplies.

2.05 PLC CABINET

- A. Furnish and install the PLC cabinets at the location indicated. Cabinet shall be a NEMA 4X, 316 Stainless Steel, wall-mounted enclosure where installed in electrical building. The enclosure shall have a hinged front door with key interlocking handle. The enclosure shall include an 11 gauge mounting panel inside.
 1. The enclosure shall be 36"H x 24"W x 16" D minimum. The contractor is responsible for sizing the panel to the specified equipment plus 50% spare space. The PLC shall be housed in the PLC cabinet. The UPS shall be located in a separate enclosure.
- B. Each PLC Cabinet shall include a pull out/up laptop. The laptop tray when pulled out/up shall be at a height of 3'-0" and shall be a minimum of 18"W x 18" D when pulled out/up. The laptop tray shall be painted white.
- C. All discrete inputs/outputs shall have interposing relays. Interposing relays contained in this cabinet shall be have a spare, unused pole after of system, shall have 24VDC coils, shall each have a pilot light indicating energized coil, and shall each be mounted in a plug in socket with relay retainer clip and screw terminals. Relays shall be Square D KU13M1P14 or approved equal.
- D. Panel wiring shall be as follows:
 1. Single conductor wire shall be stranded, tinned 16 AWG and MTW insulation, as manufactured by American Insulated Wire or approved equal. Color-coding shall be purple for ungrounded conductors and white for grounded conductors.

2. Pair shielded cable for 4-20 mA DC loops shall be as specified in 26 05 19, "Low Voltage Electrical Conductors & Cables".
3. Each conductor terminated under a screw head shall have a crimp on spade terminal applied to its end prior to its termination.
4. Each conductor has its own number and no number is used more than once.
5. The number of each wire is placed at both ends of the wire next to its end according to wire tagging instructions as specified in 26 05 19, "Low Voltage Electrical Conductors & Cables".
6. The wire numbers, as actually installed, match the numbers on the shop drawings, O&M manuals, wiring diagrams, OWNER's wire tag name standards, and interconnection diagrams for this instrument panel. Contractor shall get the latest standards document from the district prior to bidding.
7. Wiring shall be run enclosed in plastic wireway wherever possible. Wireways shall be installed as required to enclose panel wiring. Where the use of plastic wireway is not practical, conductors shall be bundled and run open. Conductors run open shall be bundled and bound at regular intervals not to exceed 6" with nylon ties, or approved equal. Wires within a bundle are to be run parallel to one another and not twisted. Bundles shall have a uniform appearance, circular cross section, and shall be securely fastened to the panel framework. Conductors carrying different voltages that are from the same source may occupy the same wireway provided all are insulated for the maximum voltage of any conductor in the wireway. Wiring carrying voltages that originate at different source shall not run in the same wireway.

Wire ducts shall be insulated for the maximum voltage of any conductor in the wire duct. Wiring carrying voltages that originate at different source shall not run in the same wire duct. Wire ducts shall be color coded as follows:
 - a. 24VDC shall be routed in a Wire duct with a Light Grey Color cover.
 - b. 48VDC shall be routed in a Wire duct with a Blue Color cover.
 - c. 120VAC shall be routed in a Wire duct with a White Color cover.
 - d. 480VAC shall be routed in a Wire duct with a Black Color cover.
8. Terminal blocks shall be installed for wire terminations and shall be capable of mounting on a 35mm DIN-rail. Terminal blocks shall have a method of labeling for easy identification. Typewritten labels shall denote terminal block numbers and shall match numbers shown on shop drawings, O&M manuals and wiring diagrams. 25 percent additional terminals shall be provided for OWNER's use. Terminal blocks shall be available with screw clamp technology and be made of a non-corrosive material. The metal body shall contain a serrated pressure plate that will provide a gas-tight connection with the conductor. All terminal block wiring points shall be "touch safe" with no live voltages that can make contact with a misplaced finger. Terminal blocks shall be rated 600V and shall be Phoenix Contact UT Series, Allen Bradley 1492-H1 Series or approved equal.
9. A separate 120VAC Terminal Block and circuit breaker shall be provided for PLC cabinet.

- E. Enclosure shall be provided with an enclosed switched fluorescent light and separate 120 volt grounded duplex receptacle. Switch for light shall be mounted on inside of cabinet, easily accessible.
- F. Acceptable cabinet manufacturers:
 - 1. Hoffman
 - 2. Hammond
 - 3. Rittal
- G. A print pocket shall be provided in the panel and shall contain an 11" x 17" control schematic and an 11" x 17" wiring diagram or diagrams. The wiring diagram shall contain all wire numbers, device names and terminal numbers. Drawings shall be laminated in clear plastic for preservation of the drawings.
- H. All equipment shall be mounted in such a manner that all maintenance may be accomplished with easy access through the cabinet doors.

2.06 UNINTERRUPTIBLE POWER SUPPLY:

- A. For each remote station, a separate UPS enclosure shall be provided to power the network and PLC panels.
- B. The systems supplier shall size the UPS to supply power for a period of one hour (to PLCs) and 15 minutes (for work stations) for the connected load plus 20% spare capacity.
- C. Provide a make before break external bypass switch in the PLC cabinet for each UPS. Switch shall be Liebert Micropod bypass switch.
- D. UPS shall include output alarm contact for remote health monitoring.
- E. The UPS shall be Eaton 9PX Series.
- F. UPS topology: on-line, double-conversion technology
- G. 120V operation UPS
- H. Operate between 0-50°C ambient temperature.
- I. Enclosures:
 - 1. NEMA 4X 316 Stainless Steel, 24"H x 20"W x 16" D minimum
 - 2. Stainless steel continuous hinge
 - 3. Foam in-place gasket
 - 4. 3-point latch
- J. Manufacturers:
 - 1. Hoffman
 - 2. Pentair
 - 3. Rittal WM Series
 - 4. EMF Company
 - 5. NEMA Enclosures Company

6. Hammond Company
- K. Environmental Controls:
1. Furnish circulation fans in solid state control system enclosures.
 2. Over-temperature switches shall be utilized to provide special cooling if required to maintain operating temperatures within the manufacturer's specified range.
 3. Air conditioning applications shall include means of preventing moisture condensation.
- 2.07 NETWORK ENCLOSURE:
- A. For each remote station, provide a separate network enclosure for 900MHz licensed radio, Ethernet Switch, and Firewall. Refer to Section 40 95 43, "Communications Interface Equipment" for network system component details.
- B. Operate between 0-50°C ambient temperature.
- C. Enclosures:
1. NEMA 4X 316 Stainless Steel, 24"H x 20"W x 16" D minimum
 2. Stainless steel continuous hinge
 3. Foam in-place gasket
 4. 3-point latch
- D. Acceptable cabinet manufacturers:
1. Hoffman
 2. Hammond
 3. Rittal
- E. Environmental Controls:
1. Furnish circulation fans in solid state control system enclosures.
 2. Over-temperature switches shall be utilized to provide special cooling if required to maintain operating temperatures within the manufacturer's specified range.
 3. Air conditioning applications shall include means of preventing moisture condensation.

3.00 EXECUTION

3.01 INSTALLATION

- A. All work shall be in accordance with manufacturer's recommended practices. Care shall be exercised to avoid damage to equipment during installation. Damaged equipment shall be replaced by CONTRACTOR at no expense to the OWNER.
- B. System equipment shall be installed where indicated in the Contract Documents. Power and signal connections between components shall provide the specified functions. Install according to equipment manufacturer's instruction.

- C. The system Supplier Contractor shall utilize their own printers, monitors, and computers for programming, testing, and start-up. The use of the OWNER's computers, monitors, or printers shall not be acceptable until the entire system has been installed, debugged, programmed, and operated to ENGINEER's satisfaction.

3.02 PROGRAMMING

A. Programming Languages

1. Each PLC shall support IEC Standard 61131-3 for all the following programming languages:
 - a. Ladder (LD)
 - b. Function Block Diagram (FBD)
 - c. Structured Text (ST)
2. PLC shall support user defined functions for customization and user defined tag structures.
3. PLC shall have application-specific instructions for process, drive, batch, motion and safety applications built into the controller.

- B. The loop diagrams shown in the Contract Documents are functional only and do not attempt to specify detail program coding that may be required. The CONTRACTOR shall utilize this functional information to develop complete application programming for the PLC equipment provided under this CONTRACT. Programs shall be designed to provide fail-safe operation of equipment in case of PC logic or power supply failure. Fail-safe shall be defined as "stopped" for all drives and "closed" for valves, unless otherwise specified. Interrupting logic between the PLC and central computer system shall be required as per system sequence of operation. Additional graphics shall be developed in the field in coordination with the OWNER and the ENGINEER. The graphics shall be sufficiently detailed to include all equipment, pipes, valves, solenoids, meters, switches, etc. Graphics shall include equipment tag numbers and display the current flow rates, levels, quantities, status, elapsed time of equipment, etc. All such work shall be done at no extra cost to the OWNER. Before programming the graphics, the CONTRACTOR shall furnish a set of drawings for ENGINEER'S AND OWNER'S review.

- C. Programming shall include programming of the Data Concentrator PLC at the Wylie Water Treatment Plant. Coordinate with the OWNER for requirements.
- D. Program shall include detailed notes identifying the purpose of a main and sub-programs that identifies the purpose of the control logic, where variables are read from, and any other pertinent programming information that may help explain the conditions.
- E. Utilize a power turn-on time delay circuit when powering up or down DC power supplies to ensure power supply output voltage has reached the proper value prior to application of power to solid state logic and output circuits.

3.03 DOCUMENTATION

- A. Following delivery to the site, the equipment manufacturer, in the presence of the ENGINEER, shall demonstrate operation of the complete system.

- B. The CONTRACTOR shall provide documentation for all application software. Documentation system shall be diagrams in ladder-rung format, and shall show all input devices to the left of the left "power rail" and all outputs to the right of the right "power rail." The diagrams shall show all device codes and functional description used in the project manual, and shall also show PLC address codes, element codes, and I/O assembly codes, modules numbers, and terminal numbers.

3.04 TESTS

- A. All elements of the SCADA system, both hardware and software, shall be tested to demonstrate that the total system satisfies all of the requirements of the Specifications.
- B. The CONTRACTOR shall furnish and install the field instruments, PLC, remote input/output (RI/O), and interface equipment in a schedule to meet the construction sequencing.
- C. As a minimum, the testing shall include the following:
 - 1. Software Acceptance Tests (SAT)
 - 2. Factory Acceptance Tests (FAT)
 - 3. Operational Readiness Tests (ORT)
 - 4. Functional Demonstration Tests (FDT)
 - 5. 30-Day Acceptance Test
- D. Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and, upon the system's or subsystem's producing the correct result (effect), the specific test requirement will have been satisfied.
- E. All tests shall be conducted in accordance with Engineer-approved procedures and documented. Each specific test to be performed shall be described and a space provided after it for signoff by the appropriate party after its satisfactory completion.
- F. Copies of signoff test procedures, forms, and checklists will constitute the required test documentation.
- G. Provide all special testing materials and equipment. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation. Define these simulations techniques in the test procedure.
- H. Coordinate all testing with other Contractors, the OWNER, and the ENGINEER.
- I. The OWNER and/or ENGINEER will actively participate in many of the tests. The OWNER and/or ENGINEER reserves the right to test or retest any and all specified functions whether or not explicitly stated in the approved test procedures. The OWNER and/or ENGINEER reserves the right to observe and/or inspect the work during any phase.
- J. The ENGINEER's decision shall be final regarding the acceptability and completeness of all testing.

3.05 SOFTWARE ACCEPTANCE TEST (SAT)

- A. Prior to the start of the witnessed Software Acceptance Test (SAT), the entire system shall be installed on site, inspected and tested to ensure that it is fully operational and ready for the SAT demonstration testing.
- B. All panels and assemblies of the subsystem shall be completely installed except I/O signals to field elements or devices shall not be connected. The system shall be inspected and tested to verify that they are in conformance with related submittals and the Contract Documents.
- C. The PLC and subsystem primary elements, shall be interconnected and tested to ensure that the system is fully operational. The system shall be operated without signals leaving or entering from the field elements or devices for at least one week to verify that it is capable of continuous operation. Outputs to and inputs from the excluded primary elements shall be simulated.
- D. The system shall be tested, installed on site to demonstrate that it is operational and in conformance with the Contract Documents.
- E. Notify the ENGINEER and OWNER in writing a minimum of 30 days in advance of the proposed starting date for the Software Acceptance Test. At the time of notification, submit any revisions to the detailed test procedure previously approved by the ENGINEER in the Project System Plan.
- F. The purpose of the test shall be to witness and verify the functionality, performance, and stability of the hardware and software. The system must operate continually for 24 hours without failure before the test shall be judged successful. Successful completion of this test shall be the basis for approval of the system.
- G. The Software Acceptance tests shall be performed on all the equipment installed including the HMI system, PLC panels and subsystems. The SAT shall be a two-part text procedure; Part I shall include the PLC sub-system to verify all I/O addresses and proper step sequence for all features. Part II shall add the HMI to verify all screen displays, addressing and report generation.
- H. Where hardware items are of standard manufacture and in current production, the manufacturer shall certify that applicable tests have been performed and met, in accordance with IEEE and ISA Standards, and be prepared to supply copies of data to ENGINEER upon request. Such statements shall accompany the equipment submittals called for in SUBMITTALS of this Section. Any assemblage of devices together with operating programs shall be tested together as provided herein.
- I. The various tests performed during Software Acceptance Test shall be designed to demonstrate that the hardware and software fulfill all the requirements of the Contract Documents. The test conditions shall resemble, as closely as possible, actual conditions. Any additional hardware or software that may be required to successfully verify system operation shall be supplied at no cost to the OWNER.
- J. Some of tests to be performed shall include, but not be limited to, the following:
 - 1. Building and loading the system database.
 - 2. Conduct online modifications to the database.
 - 3. Demonstrate operability of the interfaces (hardware and software).

4. Demonstrate operability of the data communication network.
 5. Demonstrate all system software functions specified.
 6. Verify the displays and interactive capabilities of an operator's console.
 7. Simulate selected normal and abnormal operating conditions to verify the performance of the monitoring and control functions.
 8. Simulate every I/O point by opening or shorting digital inputs, inject appropriate signals into every analog input point, and measure the output signal from each analog output point.
- K. All deficiencies identified during these tests shall be corrected and retested prior to completing the Software Acceptance Test.
- L. The following documentation shall be made available to the ENGINEER at the test site both before and during the Software Acceptance Test.
1. All drawings and specifications, addenda, and change orders.
 2. Master copy of the test procedure.
 3. List of the equipment to be tested including make, model, and serial number.
 4. Design-related hardware submittals applicable to the equipment being tested.
 5. Preliminary software documentation submittal.
- M. The daily schedule during these tests shall be as follows:
1. Testing and meetings: Nominally 8 hours per day; 24 hours per day if required to meet schedule.
 2. Morning meetings to review the day's test schedule.
 3. Evening meetings to review the day's test results and to review or revise the next day's test schedule.
- N. All test data and procedures followed during testing shall be logged, and certified copies of the logs shall be provided to the ENGINEER and OWNER.
- O. The ENGINEER will observe each test once on a pass-fail basis. The ENGINEER alone has the authority to determine if a test passes or fails. Only four (4) fifteen-minute windows per day will be allowed during the test procedure to make corrections to software and successfully pass a re-test. Otherwise, that test will be declared a failure. If a test fails, it will be put on a retest schedule. If other tests to follow rely on a particular test passing, then the following tests will also be placed on a retest schedule even though they were not tested before. Retesting shall not interrupt the test schedule. The CONTRACTOR may schedule retest days during the testing period, but not more than two per week. All retesting shall only occur on a day designated in the schedule or at the end of testing.
- P. All time and expense incurred by the ENGINEER and/or OWNER'S staff for all retests shall be borne by the CONTRACTOR and paid to the OWNER. Time and expense incurred shall be on a time and material basis tracked by the ENGINEER and OWNER for their own staff and presented to the CONTRACTOR on a periodic basis.

- Q. The CONTRACTOR shall expedite the correction of any deficiency discovered during testing. The CONTRACTOR shall have personnel from each trade to standby during the test period to immediately correct, or adjust any item of software or hardware or equipment causing a test to fail.

3.06 FACTORY ACCEPTANCE TEST (FAT)

- A. The SCADA Contractor shall provide a factory acceptance test for all controls.
- B. Loop/Component Inspections and Tests: The system shall be checked for proper installation, calibrated, and adjusted on a loop-by-loop and component-by-component basis to ensure that it is in conformance with related submittals and these specifications. Actual real-time signals generated from the field devices shall be used. Simulation of field signals shall not be permitted. This test is intended to actually operate the entire process and to find and correct all real-time operational deficiencies.
1. The Loop/Component Inspections and Tests shall be implemented using forms and checklists.
 - a. Each loop shall have a Loop Status Report to organize and track its inspection, adjustment, and calibration. These reports shall include the following:
 - 1). Project name
 - 2). Loop number
 - 3). Tag number for each component
 - 4). Check offs/sign offs for each component
 - a). Tag/identification
 - b). Installation
 - c). Termination - wiring
 - d). Termination - tubing
 - e). Calibration/adjustment
 - 5). Check offs/ sign offs for the loop
 - a). Panel interface terminations
 - b). I/O interface terminations
 - c). I/O signal operation
 - d). Inputs/outputs operational: received/sent, processed, adjusted
 - e). Total loop operational
 - 6). Space for comments
 - 7). Space for signoff by Contractor
 - b. Each active analog subsystem element and each I/O module shall have a Component Calibration Sheet. These sheets shall include the following:
 - 1). Project name

- 2). Loop number
 - 3). Component tag number or I/O module number
 - 4). Component code number analog system
 - 5). Manufacturer (for analog system element)
 - 6). Model number/serial number (for analog system)
 - 7). Summary of functional requirements, for example:
 - a). For indicators and recorders: Scale and chart ranges
 - b). For transmitters/converters: Input and output ranges
 - c). For computing elements: Function
 - d). For controllers: Action (direct/reverse) control modes (PID)
 - e). For switching elements: Unit range, differential (fixed/adjustable), reset (auto/manual)
 - f). For I/O modules: Input or output
 - 8). Calibrations; for example:
 - a). For analog devices: Required and actual inputs and outputs at 0, 10, 50, and 100 percent of span, rising and falling
 - b). For discrete devices: Required and actual trip points and reset points
 - c). For controllers: Mode settings (PID)
 - d). For I/O modules: Required and actual inputs or outputs of 0, 10, 50, and 100 percent of span, rising and falling
 - 9). Space for comments
 - 10). Space for signoff by the Contractor
2. Maintain the Loop Status Reports and Component Calibration Sheets at the jobsite and make them available to the Engineer and OWNER upon request.
 3. The OWNER/Engineer will witness the FAT testing. After the testing plan is approved, Contractor shall provide a minimum of two weeks' notice to the OWNER/ENGINEER of when the FAT testing will be conducted.
 4. Documentation supporting a successful unwitnessed FAT shall be submitted and approved prior to scheduling the witnessed FAT.
 5. FAT procedures shall be submitted and approved prior to scheduling the witness FAT.

3.07 OPERATIONAL READINESS TEST (ORT)

- A. General: Prior to start-up, the installed system shall be certified (inspected, tested, and documented) that it is ready for operation. Download all databases on job computers from this test onwards. The OWNER and ENGINEER shall be notified when ORT starts. Copies of ORT forms that have been signed off by the CONTRACTOR shall be copied and sent to the OWNER and ENGINEER on a daily basis for record purposes only. No signature by the ENGINEER or OWNER is required for ORT forms.
- B. Loop/Component Inspections and Tests: The system shall be checked for proper installation, calibrated, and adjusted on a loop-by-loop and component-by-component basis to ensure that it is in conformance with related submittals and these specifications. Actual real-time signals generated from the field devices shall be used. Simulation of field signals shall not be permitted. This test is intended to actually operate the entire process and to find and correct all real-time operational deficiencies.
1. The Loop/Component Inspections and Tests shall be implemented using Engineer-approved forms and checklists.
 - a. Each loop shall have a Loop Status Report to organize and track its inspection, adjustment, and calibration. These reports shall include the following:
 - 1). Project name
 - 2). Loop number
 - 3). Tag number for each component
 - 4). Checkoffs/signoffs for each component
 - a). Tag/identification
 - b). Installation
 - c). Termination - wiring
 - d). Termination - tubing
 - e). Calibration/adjustment
 - 5). Checkoffs/signoffs for the loop
 - a). Panel interface terminations
 - b). I/O interface terminations
 - c). I/O signal operation
 - d). Inputs/outputs operational: received/sent, processed, adjusted
 - e). Total loop operational
 - f). Space for comments
 - g). Space for signoff by CONTRACTOR
 - b. Each active analog subsystem element and each I/O module shall have a Component Calibration Sheet. These sheets shall include the following:
 - 1). Project name

- 2). Loop number
 - 3). Component tag number or I/O module number
 - 4). Component code number analog system
 - 5). Manufacturer (for analog system element)
 - 6). Model number/serial number (for analog system)
 - 7). Summary of functional requirements, for example:
 - a). For indicators and recorders: Scale and chart ranges
 - b). For transmitters/converters: Input and output ranges
 - c). For computing elements: Function
 - d). For controllers: Action (direct/reverse) control modes (PID)
 - e). For switching elements: Unit range, differential (fixed/adjustable), reset (auto/manual)
 - f). For I/O modules: Input or output
 - 8). Calibrations; for example:
 - a). For analog devices: Required and actual inputs and outputs at 0, 10, 50, and 100 percent of span, rising and falling
 - b). For discrete devices: Required and actual trip points and reset points
 - c). For controllers: Mode settings (PID)
 - d). For I/O modules: Required and actual inputs or outputs of 0, 10, 50, and 100 percent of span, rising and falling
 - e). Space for comments
 - f). Space for signoff by the CONTRACTOR
2. Maintain the Loop Status Reports and Component Calibration Sheets at the jobsite and make them available to the ENGINEER and OWNER upon request.
 3. These inspections and tests do not require witnessing. However, the ENGINEER will review the Loop Status Reports and Component Calibration Sheets and spot-check their entries periodically and upon completion of the Operational Readiness Test. Any deficiencies found shall be corrected.

3.08 FUNCTIONAL DEMONSTRATION TEST (FDT)

- A. Once ORT has been completed and operational readiness has been confirmed, a witnessed Functional Demonstration Test shall be performed on the complete system to demonstrate that it is operating and in compliance with the Contract Documents. Each specified function shall be demonstrated on a paragraph-by-paragraph, loop-by-loop, and component-by-component basis. This test shall be scheduled and conducted only after all motors, pumps, switchgear, starters and all other ancillary equipment is completed and operational.

- B. FDT shall be a minimum of 1, eight-hour day. FDT shall begin with a meeting to review what is to be tested. A detailed list shall be developed by the Contractor and distributed at the FDT meeting. At the conclusion of each day and at the final day of the FDT, a meeting shall be held to review what was tested and the result of the tests.
- C. Loop-specific and non-loop-specific tests shall be the same as specified under SOFTWARE and OPERATIONAL READINESS TESTS except that the entire installed PICS shall be tested and all functions demonstrated.
- D. Simulation of field signals, or simulation of the response of the process, or the response of individual components, or the functions being monitored or controlled, shall not be permitted. Simulation may be permitted with the express permission of the ENGINEER. The decision to simulate is the ENGINEER's alone. The CONTRACTOR shall include in the Contract Price the time necessary to wait for all process responses.
- E. Updated versions of the documentation called for under SOFTWARE and OPERATIONAL READINESS TESTS shall be made available to the ENGINEER at the jobsite both before and during the test. In addition, one copy of the approved Instrumentation O&M Manual shall be made available to the ENGINEER at the jobsite both before and during testing. The approved schedule shall be followed strictly on an item-by-item basis. Combining of test items shall be at the discretion of the ENGINEER alone. The CONTRACTOR shall include in the Control Price adequate time necessary to complete each test item one at a time.
- F. The daily schedule called for under SOFTWARE and OPERATIONAL READINESS TESTS shall also be followed during the Functional Demonstration Test.
- G. The ENGINEER will observe each test once on a pass-fail basis. The ENGINEER alone has the authority to determine if a test passes or fails. Only one (1) fifteen-minute window per day will be allowed during the test procedure to make corrections to software or to field equipment and successfully pass a re-test; otherwise, that test will be declared a failure. If a test fails, it will be put on a retest schedule. If other tests to follow rely on a particular test which has failed, then the following tests will also be placed on a retest schedule even though they were not tested. Retesting shall not interrupt the test schedule. The CONTRACTOR may schedule retest days during the testing period, but not more than two per week. All retesting shall only occur on a day designated in the schedule or at the end of testing.
- H. All time and expense incurred by the ENGINEER and/or OWNER'S staff for all retests shall be borne by the CONTRACTOR and paid to the OWNER. Time and expense incurred shall be on a time and material basis tracked by the ENGINEER and OWNER for their own staff and presented to the CONTRACTOR on a periodic basis.
- I. The CONTRACTOR shall expedite the repair or correction of any deficiency discovered during testing. The CONTRACTOR shall have personnel representing each trade to standby during the test period to immediately correct, repair, or adjust any item of hardware, software or field equipment causing a test to fail.
- J. The system shall operate continuously for 100 hours without failure before this test will be considered successful.

3.09 30-DAY ACCEPTANCE TEST

- A. All database errors must be corrected prior to the start of the 30-Day Acceptance Test. The 30-Day Acceptance Test will not be considered successful until all databases are correct.

- B. Any malfunction during the test shall be analyzed and corrections made by the CONTRACTOR. The ENGINEER and OWNER will determine whether any such malfunctions are sufficiently serious to warrant a repeat of the test. The cost of a retest shall be borne by the CONTRACTOR as specified.
- C. After completion of the Functional Demonstration Test and Plant Start-up, the CONTRACTOR shall be responsible for operation of the entire System for a period of 30 consecutive days, under conditions of full plant process operation, without single non-field repairable malfunction.
- D. During this test, CONTRACTOR personnel shall be present as required. The CONTRACTOR shall provide personnel for this test who have an intimate knowledge of the hardware and software of the system and also are familiar with the overall plant process. The Supplier shall be on-site a minimum of 8 hours a day and be on call for the rest of the day, during the first two weeks of the 30-Day Acceptance Test. During the rest of the test period the supplier shall be available and on the job site within 48 hours of any failure.
- E. While this test is proceeding, the OWNER shall have full use of the system. Only plant operating personnel shall be allowed to operate equipment associated with live plant processes.
- F. Any malfunction, during this 30 consecutive day test period, which cannot be corrected within 24 hours of occurrence by the CONTRACTOR's personnel, or more than two similar failures of any duration, will be considered as a non-field-repairable malfunction.
- G. Upon completion of repairs, by the Supplier, the test shall be repeated as specified herein.
- H. In the event of rejection of any part or function, the Supplier shall perform repairs within 5 days or replacement within 30 days.
- I. Upon successful completion of the 30-Day Acceptance Test, approval of all as-built drawing and O&M Manuals, completion of all related OWNER training, and delivery of all spare, expendable, and test equipment, the systems shall be considered substantially complete and the warranty period shall commence.

3.10 TRAINING

- A. Provide an integrated training program for the OWNER's personnel, at the jobsite. The Contractor shall submit a detailed training schedule and syllabus for approval. Tailor the training program to meet the specific needs of the OWNER's personnel. Include training sessions, classroom and field, for managers, engineers, operators, and maintenance personnel.
- B. Training shall be carried out by technically competent and experienced instructors proficient in Modicon programming at the local Schneider Electric training facility in the Dallas-Ft. Worth area. Training shall be for six people. An "instructor week" shall consist of 40 hours of actual instruction time. An "instructor day" shall consist of 8 hours of actual instruction time. Provide instruction on any or all three working shifts as needed to accommodate the OWNER's personnel schedule. The actual training schedule shall be coordinated with the OWNER. Training shall be a minimum of one day but not longer than two days.

- C. The Contractor shall hire a professional firm regularly engaged in video tape and/or film productions to video tape of all of the factory and on-site training sessions. The video tape and all rights there to shall become the property of the OWNER. The OWNER may re-use or distribute the video tape at their discretion.

3.11 OPERATIONS AND MAINTENANCE TRAINING

- A. O&M training for each subsystem shall be in accordance with the requirements specified under the related Instrumentation specification sections.
- B. All training shall be given using only equipment identical to the equipment provided on this Contract or currently owned by the OWNER.
- C. Unless otherwise specified, hardware maintenance training shall be suitable for instrument technicians who have at least a 2-year associate engineering or technical degree, or equivalent education and experience in electronics, instrumentation, or digital systems.

3.12 ON-SITE SUPERVISION

- A. The Supplier shall provide, on-site, an experienced resident engineering manager to supervise and coordinate all of the on-site activities. This resident engineering manager shall be on-site as required during the total period to affect all the activities relating to the PICS.

3.13 START-UP AND TESTING TEAM

- A. The Supplier shall provide, on-site, a team of experienced engineering, technician, trades personnel, and software/configuring personnel during the total construction period to:
 - 1. Thoroughly check the installation, termination, and adjustment of all the subsystems and their components.
 - 2. Perform and complete all on-site tests.
 - 3. Provide start-up assistance.

END OF SECTION

40 90 02.02 Input/Output List

Line Item No.	Facility Name	Loop	Point Type	Point Tag	Signal Description	Function	I/O Char.	Isolated/ Loop	To SCADA Cabinet
1	Meter Vault	0100	AI	WA3560- FIT-0100-1	- FI Flow	Indication	4-20mA	Isolated	WA3560- CP-001-1
2	Meter Vault	0100	AI	WA3560- PIT-0100-1	- PI Pressure	Indication	4-20mA	Isolated	WA3560- CP-001-1
3	Meter Vault	0100	AI	WA3560- PIT-0100-1	- PIR Pressure Trend	Indication	4-20mA	Isolated	WA3560- CP-001-1
4	Meter Vault	0100	DI	WA3560- FV-0100-1	- IR Butterfly Valve Remote Enable	Status			WA3560- CP-001-1
5	Meter Vault	0100	DI	WA3560- FV-0100-1	- ZH Buttery Valve Opened	Status			WA3560- CP-001-1
6	Meter Vault	0100	DI	WA3560- FV-0100-1	- ZL Butterfly Valve Closed	Status			WA3560- CP-001-1
7	Meter Vault	0100	DO	WA3560- FV-0100-1	- ZD Butterfly Valve Open	Control			WA3560- CP-001-1
8	Meter Vault	0100	DO	WA3560- FV-0100-1	- ZB Butterfly Valve Close	Control			WA3560- CP-001-1
9	Meter Vault	0101	AI	WA3560- FCV-0101-1	- ZI Valve Position Indicate	Indication	4-20mA	Isolated	WA3560- CP-001-1
10	Meter Vault	0101	AO	WA3560- FCV-0101-1	- ZC Valve Position Setpoint	Control	4-20mA	Isolated	WA3560- CP-001-1
11	Meter Vault	0101	DI	WA3560- FCV-0101-1	- IR Sleeve Valve Remote Enable	Status			WA3560- CP-001-1
12	Meter Vault	0101	DI	WA3560- FCV-0101-1	- ZH Sleeve Valve Opened	Status			WA3560- CP-001-1
13	Meter Vault	0101	DI	WA3560- FCV-0101-1	- ZL Sleeve Valve Closed	Status			WA3560- CP-001-1
14	Meter Vault	0101	DO	WA3560- FCV-0101-1	- ZD Sleeve Valve Open	Control			WA3560- CP-001-1
15	Meter Vault	0101	DO	WA3560- FCV-0101-1	- ZB Sleeve Valve Close	Control			WA3560- CP-001-1
16	Meter Vault	0105	DI	WA3560- LSH-0105-1	- LH High Level Alarm	Status			WA3560- CP-001-1
17	Meter Vault	0107	AI	WA3560- LIT-0107-1	- LI Ground Storage Tank Level	Indication	4-20mA	Isolated	WA3560- CP-001-1
18	Meter Vault	0112	DI	WA3560- ZS-0112-1	- XA Meter Vault Intrusion	Alarm			WA3560- CP-001-1
19	Meter Vault	0112	DI	WA3560- CP-0001-1A	- JA UPS Fault	Alarm			WA3560- CP-001-1
20	Meter Vault	0112	DI	WA3560- CP-0001-1A	- XA UPS Enclosure Intrusion	Alarm			WA3560- CP-001-1
21	Meter Vault	0112	DI	WA3560- CP-0001-1B	- JF RTU Enclosure AC Fail	Alarm			WA3560- CP-001-1
22	Meter Vault	0112	DI	WA3560- CP-0001-1B	- JA RTU Enclosure DC Fail	Alarm			WA3560- CP-001-1
23	Meter Vault	0112	DI	WA3560- CP-0001-1B	- XA RTU Enclosure Intrusion	Alarm			WA3560- CP-001-1
24	Meter Vault	0112	DI	WA3560- CP-0001-1C	- JF Network Enclosure DC Fail	Alarm			WA3560- CP-001-1
25	Meter Vault	0112	DI	WA3560- CP-0001-1C	- XA Network Enclosure Intrusion	Alarm			WA3560- CP-001-1
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40 95 43 COMMUNICATIONS INTERFACE EQUIPMENT

1.00 GENERAL

1.01 SCOPE OF WORK

- A. This Section of the Specifications describes the requirements for Communications Interface Equipment and Systems to be furnished under Division 40.
- B. All equipment described herein shall be submitted and furnished as an integral part of equipment specified elsewhere in these Specifications.
- C. Each pole shall be designed to support the antennas specified within this Section.
- D. The Contractor shall furnish all material, labor, transportation, design services and engineering to completely design, fabricate and erect the poles/tower, including all appurtenances, foundations and grounding systems.
- E. The Contractor shall be responsible to field verify the location of each pole base and the mounting height of each pole prior to installation. Pole locations shall be selected by the contractor based on close proximity to the control panel housing the radio and provide obstruction free line of sight towards the poles respective headend radio site. Each pole shall be located such that obvious obstructions are avoided along the bearings specified. Each pole location shall be subject to the approval of OWNER. This approval shall be obtained after the site layout has been completed and prior to installation of the pole foundations.
- F. The Contractor shall develop installation and/or foundation designs for poles/tower based on an inspection of existing soil conditions at each remote site. The Contractor shall engage the services of a geotechnical firm to conduct a geotechnical investigation and submit a geotechnical report documenting the conditions. This report shall be signed by a Professional Engineer licensed in the State of Texas.
- G. Installation designs and foundation designs shall be submitted as part of the installation submittal. The ultimate authority and responsibility for the foundation design and installation rests with the Contractor.
- H. Reference the following specifications for electrical wiring work:
 - 1. 26 05 19, "Low Voltage Electrical Conductors & Cables"
 - 2. 26 05 26, "Ground & Bonding for Electrical Systems"

1.02 SUBMITTALS

Submittals shall be in accordance with Section 01 33 00, "Submittal Procedures" and shall include:

- A. Shop Drawings:
 - 1. Submittals for equipment specified herein shall be made as a part of equipment furnished under other Sections. Individual submittals for equipment specified herein will not be accepted and will be returned un-reviewed.

2. Component catalog number and manufacturing data sheet, indicating pertinent data and clearly marked identifying each component by the item number and nomenclature as specified.
 3. Component drawings showing dimensions, mounting, and external connection details.
 4. Submit catalog data for all items supplied from this specification Section as applicable. Submittal shall include catalog data, functions, ratings, inputs, outputs, displays, etc., sufficient to confirm that the equipment provides every specified requirement. Any options or exceptions shall be clearly indicated.
- B. Submit the following shop drawings for the tower:
1. Erection drawings indicating the dimensions and arrangement of the pole components
 2. Specification sheets or details for all pole components
 3. Design calculations
 4. All pole design and installation submittals, including the foundation, shall be signed and sealed by a Professional Engineer licensed in the State of Texas.
 5. Complete installation drawings are required on a per site basis. The drawing shall show all of the necessary components, their part number corresponding to the number stamped on the component itself and the connecting hardware sizes. To aid in installation, it is necessary to note the weight of each section of the pole. The installation drawing shall show the location of antennas to be mounted. The placement of antennas shall not be left to the judgement of installation crews.
 6. Complete foundation drawings are required to show the anchor bolt placement, size and placement of the reinforcing bars, and pier sizes. It is also necessary to show the size, grade and bending detail of each piece of reinforcing steel.
 7. Before submitting drawings or other data to OWNER, it shall be the sole responsibility of the Contractor to comprehensively and thoroughly check for accuracy and full compliance with plans and specifications.
 8. Two complete sets of pole assembly drawings (prints) shall be provided and shipped with the pole parts. Complete packing slips shall be provided for each pole. Two prints each of the installation drawings shall be placed in a moisture-proof bag with the material and hardware packing slips and secured to the pole material or crating.
- C. Operation and Maintenance Manuals.
1. Operation and Maintenance manuals shall include the following information:
 - a. Instruction books and/or leaflets
 - b. Recommended renewal parts list
 - a. Submit Manuals with instructions for installation, adjustment, operation and maintenance of the equipment in accordance with the specific conditions.
 - b. Operation and maintenance manuals shall be prepared by the supplier and shall contain the final certified approved shop drawings, submittals, list of manufacturer recommended spare parts, schematics, and maintenance procedures, and field test data. O&M manuals shall include all field changes made during startup and testing.

- c. Manuals may be manufacturer's standard instructions, but shall be supplemented as necessary to cover any special feature not included in standard material.
- d. Operation and maintenance manuals shall include warranty information as well as a warranty information page that shall include information on the warranty start and end date as well as Manufacturer's contact address and telephone number for parts and service.

1.03 REFERENCE CODES AND STANDARDS

A. Instrumentation equipment, materials and installation shall comply with the National Electrical Code (NEC) and with the latest edition of the following codes and standards:

1. Structural Standard for Steel Antenna Towers and Antenna Supporting Structures ANSI/TIA/EIA- 222-G
2. American Institute of Steel Construction (AISC)
3. American Concrete Institute (ACI)
4. American Welding Society (AWS)
5. Federal Communications Commission (FCC)
6. Federal Aviation Administration (FAA)
7. American Society for Testing and Materials (ASTM)
8. Concrete Reinforcing Steel Institute (CRSI)
9. Occupational Safety and Health Administration (OSHA)
10. Telecommunications Industry Association (TIA)
11. National Electrical Safety Code (NESC)
12. Occupational Safety and Health Administration (OSHA)
13. NEMA ICS 1-101 Diagrams, Designations and Symbols
14. ANSI/ISA-5.06.01-2007 - Functional Requirements Documentation for Control Software Applications.
15. ISA-TR20.00.01-2001 - Specification Forms for Process Measurement and Control Instruments Part 1: General Considerations Updated with 27 New Specification Forms in 2004-2005.
16. ISA-5.4-1991 Instrument Loop Diagrams.
17. ISA-5.5-1985 Graphic Symbols for Process Displays.
18. ISA-5.1-1984 (R1992) Instrumentation Symbols and Identification.
19. ISA-5.3-1983 Graphic Symbols for Distributed Control/Shared Display Instrumentation Logic, and Computer Systems.
20. ISA-5.2-1976 (R1992) Binary Logic Diagrams For Process Operations.
21. NEMA ICS 6 Enclosures for Industrial Controls and Systems
22. National Fire Protection Association (NFPA)

23. National Electrical Manufacturers Association (NEMA)
 24. American National Standards Institute (ANSI)
 25. Insulated Cable Engineers Association (ICEA)
 26. Instrument Society of America (ISA)
 27. Underwriters Laboratories (UL)
 28. UL 508, the Standard of Safety for Industrial Control Equipment
 29. UL 508A, the Standard of Safety for Industrial Control Panels
 30. UL 50, the Standard of Safety for Enclosures for Electrical Equipment.
 31. NFPA 79, Electrical Standard for Industrial Machinery
 32. Factory Mutual (FM)
 33. NFPA 70 National Electrical Code (NEC)
 34. NFPA 70E Standard For Electrical Safety in the Workplace
 35. ANSI C37.90.2 Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference From Transceivers.
 36. NEMA ICS 4 Terminal Blocks for Industrial Use.
 37. NEMA LS1 Low Voltage Surge Protection Devices.
 38. UL 1283 Standard for Safety-Electromagnetic Interference Filters.
 39. UL 1449 Third Edition Surge Protective Devices
 40. Local Electrical Code
 41. All equipment and installations shall conform to applicable Federal, State, and local codes.
- B. All equipment shall comply with the requirements of the National Electric Code and Underwriters Laboratories (UL) where applicable.
- C. Each specified device shall also conform to the standards and codes listed in the individual device paragraphs.

1.04 DELIVERY, SHIPMENT, PROTECTION, AND STORAGE

- A. Equipment provided under this section shall be shipped, protected, and stored as specified in the Instrumentation and Control System section. Identification of packaging shall be as described in the Instrumentation and Control System section.
- B. Follow the Manufacturer's directions for the delivery, storage and handling of equipment and materials. Tightly cover equipment and materials and protect it from dirt, water, chemical or mechanical injury and theft. Major communications/networking hardware equipment shall be stored indoors in a climate controlled atmosphere where applicable. Coordinate with equipment manufacturer for additional storage requirements. Damaged equipment shall not be acceptable. Upon installation, protect the materials until the work is completed and accepted by the OWNER. Improperly stored equipment is subject to rejection by the OWNER/Engineer and will not be allowed to be installed.

1.05 CONNECTION TO OWNER NETWORKS

- A. Network hardware and software provided shall be compatible with the OWNER's existing network systems whenever a system interconnection is provided. System Supplier shall verify existing systems to ensure compatibility.
- B. All connections to the OWNER's existing network shall be fully coordinated between the OWNER and the System Supplier. Prior to connecting to the existing network, the System Supplier shall provide a written request to the OWNER for an OWNER's representative to be available when existing systems are disconnected and at the time of any new connections.

1.06 COORDINATION WITH OWNER

- A. The System Supplier shall coordinate all demolitions, installations, and rework on the existing networks with the OWNER and the Engineer. No work shall be performed without the written consent of the OWNER. The System Supplier shall submit a written request to perform work on the existing network, including date, time, scope of work, length of time, and any OWNER's support that may be required.

1.07 QUALITY ASSURANCE

- A. The manufacturer of this equipment shall have produced similar equipment for a minimum period of five years. When requested by the OWNER/Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- B. Equipment submitted shall fit within the space or location shown on the Drawings. Equipment which does not fit within the space or location is not acceptable.
- C. For the equipment specified herein, the manufacturer shall be ISO 9001 2000 certified.

1.08 WARRANTY

- A. The Manufacturer shall warrant the equipment to be free from defects in material and workmanship for two years from date of acceptance of the equipment containing the items specified in this Section. Within such period of warranty the Manufacturer shall promptly furnish all material and labor necessary to return the equipment to new operating condition. Any warranty work requiring shipping or transporting of the equipment shall be performed by the Contractor at no expense to the OWNER.

2.00 PRODUCTS

2.01 INDUSTRIAL ETHERNET SWITCH LAYER 3 MODULAR (TYPE A)

- A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
 - 1. Cisco IE 4000 Series
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

C. Environmental

1. Operating temperature: -40 Deg F to 167 Deg F
2. Operating humidity: 10 – 95% Non-condensing
3. Storage Temperature: -13 to 185 Deg F
4. Electrical Classification: Intrinsically safe for UL 1602 Class I Division 2 A-D locations

D. Physical

1. Enclosure: NEMA TS-2.
2. Power Supply: 120VAC from UPS source
3. Microprocessor based managed type.
4. Din rail mountable capability.
5. 19 inch rack mountable where shown in plans.

E. Functional Performance

1. Per Port status LED indication.
2. Port based Ethernet MAC security individually port configurable.
3. Wire Speed switching, 16 Gigabit Switching Fabric.
4. HSRP Protocol Support.
5. Cisco Express Forwarding Hardware Routing Architecture.
6. SNMPv1, SNMPv2c, and SNMPv3 Support
7. 802.1d Spanning Tree Protocol Support.
8. HTTPS accessible.
9. Common Industrial Protocol (CIP) Management Objects Support.
10. Smart Templates for Ethernet/IP
11. PROFINET v2 certification.
12. Alarm Contacts for external fault notification.
13. 10/100 BaseT ports with RJ-45 connectors for Category 6 cabling.
14. Switch Configuration on removable/ configurable via Flash Memory module.
15. LC type Fiber Optic Connectors for 100BaseFX, 1000BaseSX for Multimode Fiber and 1000BaseLX for Single mode Fiber as shown on the drawings
16. Fully managed switch capability.

F. Options and Accessories Required:

1. Provide maximum installation space for additional future modules for each switch location.
2. Provide twenty percent spare port capacity for each port type.

2.02 INDUSTRIAL ETHERNET FIREWALL ROUTER BRICK TYPE / CELLULAR RADIO

- A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
 - 1. Phoenix Contact Model: FL MGuard RS2000 VZW VPN
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.
- C. Environmental
 - 1. Operating temperature: -4 Deg F to 140 Deg F
 - 2. Operating humidity: 5 – 95% Non-condensing
 - 3. Storage Temperature: -40 to 158 Deg F
- D. Physical
 - 1. Power Supply: redundant 24VDC
 - 2. Microprocessor based managed type.
 - 3. DIN rail mounting.
 - 4. Port count and type shall be as shown in drawings as a minimum
- E. Functional Performance
 - 1. Per Port status LED indication.
 - 2. Wire Speed switching.
 - 3. 24 V DC voltage supply alarm contact
 - 4. Management via IT standard SNMP (Simple Network Management Protocol)
 - 5. Redundancy via Spanning Tree (IEEE 802.1D) or Rapid Spanning Tree (802.1w) Support.
 - 6. Web Browser setup accessible.
 - 7. 10/100BaseT ports with RJ-45 connectors for Category 6 cabling.
 - 8. VPN Tunnel Support up to 10 IPsec tunnels
 - 9. Firewall rules with configurable stateful inspection
 - 10. MAC filtering
 - 11. IP address filtering
 - 12. Protection against IP spoofing, DoS and Syn Flood Protection

2.03 REMOTE SITE UNLICENSED RADIO

- A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
 - 1. General Electric Model: MDS TransNet
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

C. Environmental

1. Operating temperature: -40 Deg F to 158 Deg F
2. Operating humidity: 10 – 95% Non-condensing

D. Physical

1. Power Supply: 6 to 30 VDC input
2. DIN Rail mountable.
3. Class 1 Division 2 groups A, B, C and D rated
4. Interface connections: TIA-232-E Serial interface implemented in a DB-9 connection, Ethernet 10/100 BaseT implemented in a RJ45 and Antenna connection utilizing a TNC Female connector

E. Functional Performance

1. RF data rate 300 to 115,200 bps
2. Licensed Frequency bands: 902-928MHz
3. Receiver type: double conversion super heterodyne, Sensitivity > -100dBm.
4. Transmitter with programmable carrier power from 0.1 to 1 Watt, Continuous duty cycle.
5. Operating mode: Half-duplex
6. Modulation: Binary CPFSK
7. Model: Serial
8. Case: Aluminum
9. Sub-band in accordance with OWNER's 900MHz FCC licenses

F. Options and Accessories Required:

1. Provide minimum 2-year warranty.

2.04 ETHERNET AND RADIO SYSTEM COMMUNICATION CABLES

A. Subject to compliance with the contract documents, the following manufacturers are acceptable:

1. Belden

B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

C. Cables for Ethernet: Category 5e Above Grade Cable: Sunlight and Oil Resistant U/UTP 003 Cable, non-plenum.

1. Conductors: 4 bonded pair 24 AWG Tin-plated Copper
2. Insulation: Polyolefin
3. Jacket: PVC with 600 volt rated color of jacket to match as follows:

- a. Green – Phone / Data
 - b. Red – FIRE Alarm
 - c. Blue – SCADA
4. Transmission Standards: ANSI/TIA568C
 5. Nominal Velocity of Propagation: 69%
 6. Flame Test Method: CMR Regulatory Compliance
 7. Model: Belden 7957A
- D. Cables for Ethernet: Category 6 Above Grade Cable: Sunlight and Oil Resistant U/UTP 003 Cable, non-plenum.
1. Conductors: 4 bonded pair 23 AWG Tin-plated Copper
 2. Insulation: Polyolefin
 3. Overall Cabling Separator Material of Foamed Polyolefin Tape
 4. Jacket: PVC with 300 volt rated Color of jacket to match as follows:
 - a. Green – Phone / Data
 - b. Red – FIRE Alarm
 - c. Blue – SCADA
 5. Transmission Standards: Category 6 - TIA 568.C.2
 6. Nominal Velocity of Propagation: 72 %
 7. Flame Test Method: UL1666 Vertical Riser
 8. Model: Belden 7953A
- E. Cables for Ethernet: Category 5e Below Grade Outdoor and Under Grade locations cable: Sunlight and Oil Resistant Category 5e U/UTP 003 Cable, non-plenum.
1. Conductors: 4 pair 24AWG Tin-plated Copper
 2. Insulation: Polyolefin
 3. Shield: 100 percent aluminum foil polyester tape with drain wire
 4. Jacket: LLPE (Linear Low Density Polyethylene) with 300 volt rated and manufacturer's identification
 5. Misc.: NEMA WC-63.1, listed for outdoor and wet locations use
 6. Model: Belden 7937A
- F. Cables for serial: 485 Communication Cable
1. Conductors: 1 pair 24AWG Tinned Copper
 2. Insulation: Polyethylene
 3. Shield: 100 percent aluminum foil polyester tape with tinned copper drain wire
 4. Jacket: PVC with 300 volt rated and manufacturer's identification

5. Misc.: UL2919 listed for indoor and dry locations use
 6. Model: Belden 9841
- G. Cables for serial: 232 Communication Cable
1. Conductors: 4 pair 28AWG Tinned Copper
 2. Insulation: Polypropylene
 3. Shield: 100 percent aluminum foil polyester tape with tinned copper drain wire
 4. Jacket: PVC with 300 volt rated and manufacturer's identification
 5. Model: Belden 9806

2.05 900MHZ YAGI DIRECTIONAL ANTENNA

- A. Subject to compliance with the contract documents, the following manufacturers are acceptable:
1. Samco Model: SAM-970
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.
- C. Physical
1. Number of Elements as required balancing gain and output power.
 2. Impedance 50 ohms
 3. Max Power 10 watts
 4. Gain 10 dBi
 5. Radiation Directional
 6. Polarization Vertical
 7. Connector N-Female
 8. Material Aluminum
 9. Mount Mounts on pipe with 0.5 inch to 1.5 inch diameter
- D. Accessories and Options:
1. Antenna mounting kit
 2. Weather proofing kit
 3. Antenna mast bonding kit
 4. Air Terminal
 5. Air Terminal bonding kit

2.06 ETHERNET SURGE PROTECTOR

- A. Subject to compliance with the contract documents, the following manufacturers are acceptable:

1. Phoenix Contact
 2. PolyPhaser
 3. Cooper Bussman
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.
- C. Environmental
1. Operating temperature: -40 degrees F to 176 degrees F
 2. Operating humidity: 95% non-condensing for indoor applications
 3. Storage Temperature: -40 to 176 degrees F
- D. Physical
1. DIN Rail Mountable indoors and pole mountable outdoors applications
 2. I/O connectors: RJ-45
 3. Power over Ethernet POE+ to IEEE802.3 at up to 57VDC
- E. Functional Performance
1. Protection: handles 100 or more lightning strikes at surge levels of 8/20uSec at 6kV/3kA
 2. Standard: Compliant to IEC61000-4-5.

2.07 RADIO SYSTEM SURGE PROTECTOR

- A. Subject to compliance with the contract documents, the following manufacturers are acceptable:
1. Phoenix Contact
 2. PolyPhaser
 3. Cooper Bussman
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.
- C. Environmental
1. Operating temperature: -40 degrees F to 176 degrees F
 2. Operating humidity: 95% non-condensing for indoor applications
 3. Storage Temperature: -40 to 176 degrees F
- D. Physical
1. Barrel configuration for control panel applications
 2. TNC type connectors/ N type connectors
- E. Functional Performance

1. Protection: handles lightning strikes up to surge levels of 8/20uSec at 6kV/3kA
2. Standard: Compliant to IEC61000-4-5.

2.08 ETHERNET COMMUNICATION PATCH PANELS

- A. Subject to compliance with the contract documents, the following manufacturers are acceptable:
1. Panduit
 2. Belden
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.
- C. Ethernet: Patch Panels shall be used within all rack type panels, office spaces and where otherwise shown on the drawings. All components of the patch panels shall be of the same manufacturer.
1. 19" Rack type
 - a. Modular type mountable on standard 19" equipment panels
 - b. Shall include number of spaces as shown or directed by the ENGINEER
 - c. Pre-printed numbers above each port for identification
 2. Single Gang wall plate type
 - a. Modular type mountable on standard single gang wall mounted enclosure
 - b. Shall include number of spaces as shown or directed by the ENGINEER
 - c. Pre-printed numbers above each port for identification
 - d. Provide blank covers for all unused spaces.

2.09 RADIO ANTENNA CABLES

- A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
1. Times Microwave Systems LMR-600 runs under 75 feet
 2. Commscope AVA7-50 HELIAX runs 75 feet and greater
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.
- C. General
1. Provide sufficient lengths of cables for installation for connection to all Radio Equipment with no splices.
- D. Cable Construction
1. Inner Conductor Solid BCCAI

2. Dielectric Foam PE
 3. Outer Conductor Aluminum Tape
 4. Overall Braid Tinned Copper
 5. Jacket Black PE.
- E. Function/Performance:
1. Max Operating Frequency GHz 2.5
 2. Minimum Operating Frequency 800 MHz
 3. Velocity of Propagation % 87
 4. Dielectric Constant NA 1.32
 5. Time Delay nS/ft (nS/m) 1.17 (3.83)
 6. Impedance ohms 50
 7. Capacitance pF/ft (pF/m) 15.6 (51.1)
 8. Inductance uH/ft (uH/m) 0.088 (0.29)
 9. Shielding Effectiveness dB >90
 10. DC Resistance
 - a. Inner Conductor ohms/1000ft (/km) 1.39 (4.56)
 - b. Outer Conductor ohms/1000ft (/km) 1.2 (3.9)
 11. Peak Power kW 40
- F. Required Options/Accessories
1. Provide Surge Arrestors at the antenna connection and the entrance to the equipment per the NEC.
 2. Provide antenna cable jumpers as required.
 - a. Times Microwave Systems LMR-240 Flexible Low Loss Communication Cable

2.10 ANTENNA MONOPOLES

- A. Provide monopoles with height as shown on the drawings. Each monopole shall be elevated to the height required according to a radio path study. The exact height of all antennas shall be determined by the contractor. The monopoles provided shall meet the following minimum requirements:
1. Eighteen-sided and tapered in design with top diameter of 16" and a base diameter of 16".
 2. Sustain basic wind speed of 90 mph with 0" of radial ice, and 30 mph with ¾" of radial ice, in accordance with ANSI/TIA-222-G.
 3. Foundation and anchor bolt designs shall be based on ANSI/TIA-222-G.
 4. Provide cable type safety climbing device.
 5. Standard access port size shall be 6" x 12".

6. Provide two access ports located at 3' elevation with azimuths of 0 degrees and 180 degrees. An additional access port shall be located at 7' elevation with an azimuth of 270 degrees.
 7. Monopole materials shall be hot dip galvanized as outlined in ASTM A-123.
 8. Manufacturer: Sabre Industries.
- B. All concrete shall have a minimum 28-day compressive strength of 4500 PSI, in accordance with ACI 318-05. Rebar shall have minimum of 3" concrete cover and shall conform to ASTM specification A615, Grade 60. All exposed concrete corners shall be chamfered at ¼".
- C. Accessories and Options:
1. Anchor bolts and templates
 2. Step Bolts
 3. Tri-collar Mount
 4. Access ports with J hooks
 5. Safety Climb
 6. Air Terminal copper clad
 7. Air Terminal grounding kit
 8. Pole grounding kit for antenna in accordance with manufacturers' recommendation and per TIA-222-G.
- D. Provide antenna, transmission line, jumpers, grounding kits, hangers, and miscellaneous hardware to make the antenna system operational for proper wireless communication.
- E. The final profile, foundation, geotechnical study, and erection design is to be performed by the Contractor, certified as a professional engineer licensed in the State of Texas. The work shall be compliant with TIA-222-G, Structural Standard of Antenna Supporting Structures and Antennas. All pole submittals shall be submitted, signed and sealed, by a Texas registered Professional Engineer.

2.11 ACCESSORIES

- A. Provide necessary brackets for antenna mounting.

2.12 GROUNDING

- A. Provide the pole base and guy anchor grounding kits for a complete tower grounding system.
- B. Provide all necessary ground lugs and clamps.

3.00 EXECUTION

3.01 INSTALLATION

- A. All equipment specified herein shall be factory installed in an overall assembly, field adjusted, tested and cleaned as an integral part of equipment specified elsewhere in these Specifications.

B. Monopole:

1. This work shall be performed exclusively by experienced and qualified personnel in pole and tower installations.
2. Preparation for delivery
 - a. **Packaging:** All materials shall be packaged to provide protection from damage during shipment
 - b. **Marking:** All equipment shall be appropriately marked regarding function, handling and storage
3. Shipping:
 - a. All equipment shall be shipped in a manner that assures timely delivery and protection of materials. Any equipment damaged during shipping or delivery shall be rejected and repaired or replaced by the Contractor, at OWNER's discretion and at no additional cost to OWNER.
 - b. No materials, goods or equipment shall be received or stored at the work site nor installed or incorporated into the work without a successfully reviewed shop drawing submittal.
4. Delivery:
 - a. Upon delivery to the site, the equipment in this section shall be carefully unloaded and properly stored until installation. The equipment shall be handled and stored in strict accordance to the manufacturer's recommendations.
5. Inspections:
 - a. A failure by the Contractor to schedule and participate in the mandatory inspections described in this section will require the Contractor to return the construction to its pre-inspection state.
 - b. Comply with all inspection for excavation and backfill. All drilled holes are to be inspected by the Engineer or their representative prior to installing the pole or backfilling. The Contractor will provide one (1) week notice to the Engineer/OWNER for scheduling of the inspection. All holes will be inspected during the scheduled inspection period. The Contractor will install concrete pad at the bottom of the hole during this inspection period.
 - c. The setting of all poles is to be inspected by the Engineer or their representative after the concrete backfill has been placed and prior to backfilling the remaining part of the hole with stone dust. The Contractor will provide one (1) week notice to the Engineer for scheduling of the inspection. All holes will be inspected during the scheduled inspection period.
 - d. The completed installation of underground conduit, antenna system grounding and transmission cable is to be inspected by the Engineer or their representative prior to backfilling the trench. The Contractor will provide one (1) week notice to the Engineer for scheduling of the inspection. All holes will be inspected during the scheduled inspection period.

- e. The Contractor is to provide a bucket truck, capable of reaching the top of the pole, for inspection of two (2) remote site antennas. The sites inspected will be selected by the Engineer. The Engineer will provide one (1) week notice to the Contractor for scheduling of the inspection.

6. Pole Erection:

- a. The Contractor shall furnish all necessary personnel, supervision, tools, equipment, and transportation required to complete the installation and erection of all items specified herein.
- b. Contractor is to locate pole taking into consideration: location of existing underground devices, lot plan, overhead electrical distribution cables, access to top of pole with a boom truck, and line-of-sight with headend radio site.
- c. After materials have been unloaded, the Contractor shall inventory all parts per the bill of material and report immediately to OWNER that: a) materials received agree with bill of materials, or b) there are shortages and damaged materials, listing all such items.
- d. All necessary local construction permits shall be obtained by the Contractor before construction begins. All costs for the permits will be borne by the Contractor.
- e. The Contractor shall maintain a check of pole plumbness during all phases of the erection work. Plumbness shall be measured by means of a transit placed so that the sight elevation angles are less than 45 degrees. At least two sights shall be made for each check, oriented at right angles to each other and taken within the shortest practical time interval. At all times the pole shall be plumb within the tolerance specified in drawings. After completion of pole erection, with all joints tight, and all appurtenances installed, the Contractor shall make a final check for plumbness in the manner prescribed above.
- f. Field modifications including welding or burning of holes in members shall not be allowed.
- g. The Contractor shall provide a dedicated, full-time supervisor. The supervisor shall be assigned and available through all phases of construction. Responsibilities include, but are not limited to: verification of pole and anchor locations; finished grade and construction of foundations; delivery and erection of pole; off-load location and installation of antennas; and joint inspection of construction.

C. Installation at Remote Sites

1. General

- a. This section describes the installation requirements for remote site radios. The Contractor shall install all radios, antennas, coaxial cable and associated equipment. The Contractor shall also provide any miscellaneous parts not specified, but which are required for the installation of the equipment specified in this Section.

2. Antenna

- a. The antenna shall be installed as shown in the antenna mounting details drawings/
- b. Each antenna shall be oriented and aimed as determined in the Filed Radio Link Verification Test.

- c. The Contractor shall adjust each antenna as required to optimize the antenna link signal quality.
3. Wireless Radio
- a. The Contractor shall install the wireless radio in the RTU enclosure as specified in this specification.
 - b. The output power of the wireless radio shall be adjusted to achieve the maximum Effective Isotropic Radiated Power (EIRP) as specified in the FCC Rules, Part 15.247.
4. Coaxial Cable Installation
- a. The Contractor shall perform the following minimum requirements regarding the installation of the coaxial cable between the radio and the antenna. Refer to antenna installation details.
 - b. The Contractor shall:
 - 1). Furnish, install and connect coaxial cable, with appropriate connectors, between the radio and the antenna.
 - 2). Install coaxial cable in conduit as shown in the drawings. Conduit shall be installed with sweeping bends so as to not exceed the minimum bending radius of the coaxial cable.
 - 3). Seal all outside coaxial cable connections against the entrance of water with a waterproofing kit.
 - 4). Use a single cable type for the entire feed line run, except for the last five feet at each end, where the Contractor may use a jumper for connection to the radio and/or the antenna. Jumper connections shall not be allowed inside conduit.
 - 5). Coaxial cable hangers shall be provided to secure coaxial cable throughout the entire run. The hangers shall be installed at a maximum of three foot intervals.
 - 6). Install a feed line ground kit on the coaxial cable.
5. Waterproofing
- a. A waterproof seal shall be provided at the point of entrance of the coaxial cable into the outside conduit. All building and/or RTU enclosure penetrations for conduit and cable shall be protected by a waterproof seal.
6. Lighting Protection
- a. The Contractor shall install a lightning arrestor in the control panel and at the entrance to the building, as shown in the Contract Drawings. Lightning arrestors shall be designed to allow greater than 220 microjoules of throughput energy during impulse event. The arrestor shall be direct current blocked, have 50 Ohms impedance and VSWR of 1.1 or less over a frequency range of 125MHz to 1GHz.
7. Grounding
- a. The Contractor shall install $\frac{3}{4}$ "x10' copper-clad ground rods directly below or near the antenna mount pole with 20 feet minimum spacing between each ground rod. A 4/0 AWG (min.), insulated copper ground wire shall be used for grounding the antenna and the air terminal. The ground wires shall be bonded to the mast. The antenna

ground wire shall be connected to the ground rod using an exothermic weld. The air terminal ground wire shall be bonded to the antenna cable using a grounding kit and shall be connected to the ground rod using exothermic weld.

- b. All grounding shall conform to the requirements set forth in Section 26 05 26, "Grounding & Bonding for Electrical Systems".

3.02 CONFIGURATION

- A. The System Supplier shall fully configure all network devices. All device selections shall be fully coordinated with the OWNER to ensure compatibility with existing systems and standards. Provide all hardware and software as required for a tempered network.
- B. Ethernet Switches: The System Supplier shall fully configure all Ethernet switches. The following shall be configured:
 1. Unused ports shall be disabled for security purposes.
 2. Spanning Tree or other appropriate redundancy scheme shall be configured for all redundant links. Trunking or other bandwidth sharing redundancy schemes shall be utilized where available to minimize switching times, and increase available bandwidth.
 3. Management password Security
 4. Quality of Service, with any traffic to/from PLCs getting priority over all other traffic.
- C. Routers: The System Supplier shall fully configure all network routers. The routers shall be configured for all network and telephone interfaces.
- D. Firewalls: The System Supplier shall fully configure all network firewalls. The firewall shall be configured for all network connections provided under this contract, and shall be configured to exclude devices not part of the control system network unless otherwise specified. The firewall shall be configured to deny all traffic, except for traffic specifically allowed in the rule set.
- E. Management Software: Management software shall be fully configured for all network devices provided.
- F. Network Configuration Report
 1. The System Supplier shall provide a configuration report to the OWNER detailing all connections, addresses, and port assignments.

3.03 TESTING

- A. Network Testing: After each network has been installed, a technical representative of System Supplier shall test the network and shall provide a written report for each test.
- B. Test Equipment: Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by System Supplier for the duration of the testing work and this test equipment will remain the property of System Supplier
- C. Ethernet Network Minimum Test Requirements: The following minimum tests are to be performed by the System Supplier:
 1. Verify Link Integrity Status LED is lit on both sides of each link

2. Verify proper operation and failover of each redundant component and redundant link.
 3. Verify alarming of each link failure.
 4. Verify bandwidth usage
- D. Ethernet Network Test Reports:
1. Upon completion and testing of the installed Ethernet network, the System Supplier shall submit test reports to the Engineer in printed form. Test reports are to show all test results performed by the System Supplier for each port and piece of equipment. Date of calibration of the test equipment is also to be provided.
- 3.04 SYSTEMS CHECK
- A. A technical representative of System Supplier shall participate in the checkout of network systems. Systems check requirements shall be as specified in the instrumentation and Control System section.
- 3.05 NETWORK TROUBLESHOOTING
- A. It is the System Supplier's responsibility to provide trouble-free and reliable networks. The System Supplier shall employ any means necessary to ensure operational networks. The System Supplier shall obtain any needed test equipment, including but not limited to time-domain reflectometer, protocol analyzers and network sniffers, to troubleshoot any problems. The System Supplier shall utilize the services of a trained and certified Network Engineer that is regularly involved in troubleshooting network problems, in the event that operational or reliability problems exist. Acceptable certifications include Cisco CCNP, Cisco CCIE, or Network Professional Association Certified Network Professional (CNP).
- 3.06 SPARE PARTS
- A. Spare parts shall be provided as specified below.
1. Switches – (1) One of each type provided
 2. Firewall / Routers – (1) One of each type
- 3.07 TRAINING
- A. The Contractor shall provide a training session for the OWNER's representatives at the jobsite or other office location chosen by the OWNER. Each eight hour training session shall be broken up into two segments each of 4-hours with a 15 minute break every two hours. Lunch break will be one hour. Training sessions shall be scheduled and coordinated with the OWNER.
- B. Training shall be for five members of the OWNER's staff.
- C. Supplier shall submit a training outline for OWNER's/Engineer's review and comment a minimum of 4 weeks before training is to take place.

- D. Instruct the operating and maintenance personnel in principle of operating of all major devices and the care and maintenance of components included the software and troubleshooting for a period of not less than one (1) eight (8) hour day. Coordinate with OWNER for exact requirements. Provide three-ring binders to participants complete with copies of drawings and other course material covered.
1. Network training shall be conducted in one session at OWNER's facilities using the hardware and software installed for this project.
 2. Course shall provide an overall description of the network and how it operates.
 3. A one hour course (for each make/model of switch, router and firewall) on configuration shall be provided. This instruction shall be aimed at network administrator's level of understanding, and shall be provided by the individual that configured the devices. The course shall review the configuration settings. Course training material shall be vendor provided equipment manuals.
 4. A one hour course on the use of the management software shall be provided. This instruction shall be aimed at a network administrator's level of understanding, and shall be provided by the individual that configured the software. Course training material shall be vendor software manuals.
 5. Training shall be provided on the use of any Network Test Equipment provided. Course training material shall be vendor provided equipment manuals.
- E. All costs (travel expenses, testing equipment, etc.) required for the training shall be the responsibility of the equipment manufacturer/contractor.

END OF SECTION

DIVISION 44

POLLUTION & WASTE CONTROL EQUIPMENT

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44 42 60 SUBMERSIBLE SUMP PUMP**1.00 GENERAL****1.01 WORK INCLUDED**

- A. Furnish labor, materials, equipment and incidentals necessary to install 35 gpm submersible sump pumps. Provide a sump pump capable of fitting in the size sump shown. Any structural modifications required at the structure shall be made at no additional cost to the Owner. The pump and motor shall have a standard manufacturer's nameplate securely affixed in a conspicuous place showing the serial number, model number, manufacturer, ratings, and other pertinent nameplate data.

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers:

Aurora

Hydromatic

Sulzer

Goulds

Approved Equal.

- B. Manufacturer's Representative for Startup and Testing:

The services of the manufacturer's technical representative shall be provided for pre-startup installation checks, startup assistance, training of Owner's operating personnel, troubleshooting and other services as required to demonstrate that the sump pump operates properly as specified.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "SUBMITTALS" and shall include:

- 1. Shop Drawings.

- a. Shop Drawings shall include pump and motor data, pump curves, project specific control schematics with terminal strip information showing customer's connections, miscellaneous electrical equipment cut sheets, layout, elevation and Bill of Material.

- 2. Operation and Maintenance Manuals:

- a. Manuals shall be prepared by the equipment Manufacturer per Section 01 78 23 "Operation and Maintenance Data" and shall incorporate storage and installation instructions and operation and maintenance procedures, appropriate final certified shop drawings, performance curves, and test data. Manuals may be Manufacturer's standard instructions, but shall be supplemented as necessary to cover any special feature not included in standard material. Submit preliminary manuals for review prior to delivery of the equipment.
 - b. Manufacturer's written instructions for testing, adjusting, and reprogramming pump controllers.

- c. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
 - d. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.
3. If requested, the Equipment Manufacturer shall submit a list of 10 similar installations which have been in satisfactory operation for at least three (3) years.

2.00 PRODUCTS

2.01 SUMP PUMP MOTOR AND CABLE

- A. Each pump shall be equipped with a heavy-duty integral mercury float switch.
- B. The motor shall be totally-encased, sealed, non-ventilating and shall have automatic thermal overload protection. The motor shall be 120 Volt, 1-phase, 3450 RPM and suitable for plugging into a receptacle and shall be suitable for continuous duty.
- C. The electrical cable entrance to the motor shall be provided with positive strain relief to prevent leakage or pullout of the cable in the event that a force is accidentally placed on the cable during the raising or lowering of the pump. Manufacturer's supplied cable shall be one continuous cable from pump to pump control panel. No splicing allowed. Provide stainless steel cable strain relief on each cable at top of sump pump pit.

2.02 SAFETY GRATE

- A. The safety grate shall be designed to withstand a minimum live load of 300 pounds per square foot using 17,300 psi as the design stress for the aluminum. Deflection shall not exceed 1/150th of the span. Each safety grate shall be designed to combine covering of the opening, fall through protection per OSHA standard 1910.23 and controlled confine space entry per OSHA standard 1910.146.
- B. Safety grate shall be as manufactured for Halliday, USB Fab, Flygt Corporation or approved equal.
- C. The safety grate shall be made of 6061-T6 aluminum and designed per the "Specifications for Aluminum Structures", by the Aluminum Association, Inc., 5th Edition, Dec. 1986 for "Bridge Type Structures." This specification requires the manufacturer to use 38,000 psi as the ultimate strength and 35,000 psi as the minimum yield strength, for grade 6061-T6 aluminum and then a safety factor of 2.2 be applied, leaving a 17,300 psi design stress.
- D. Grate openings shall allow for visual inspection, limited maintenance and float adjustments while the safety grate fall through protection is left in place.
- E. Welding shall be in accordance with ANSI/AWS D1.2-90 Structural Welding Code for Aluminum.
- F. All mounting hardware, bolts, nuts, etc. shall be 316 stainless steel.

3.00 EXECUTION

3.01 INSTALLATION

- A. Install submersible sump pumps pump, controls, and motor in accordance with manufacturer’s recommendations.

3.02 FIELD QUALITY CONTROL

- A. Upon completion of the installation of the equipment, an acceptance test to verify the satisfactory operation of the pump shall be conducted. The test shall be conducted in a manner approved by and in the presence of the Engineer. Units shall be checked for excessive noise, vibration, general operation, etc. The units must perform in a manner acceptable to the Engineer before final acceptance will be made by the Owner.

3.03 WARRANTY

- A. The manufacturer shall warranty the unit against defects in materials and workmanship for a period of 12 months from the date of installation.

3.04 PAINTING

- A. Pumps, motors, baseplates, discharge elbows, and guiderails shall be painted in accordance with Section 09 96 00 “High-Performance Coatings” of these Specifications.

3.05 SCHEDULES

Location	Pump Capacity (gpm)	Max Horsepower	Max Full Load Amps	Voltage	No. of Pumps	Max TDH	Min TDH
Meter Vault	35	0.5 HP	9.8	120V, 1PH	6	25 ft	20 ft

END OF SECTION

APPENDIX A

BUY AMERICA REQUIREMENTS



U.S. Department
of Transportation
**Federal Highway
Administration**

Texas Division Office

October 3, 2019

300 E. 8th Street, Room 826
Austin, Texas 78701
Phone: 512-536-5900
Fax: 512-536-5990
texas.fhwa@dot.gov

In Reply Refer To:
HAD-TX

Mr. Kyle Madsen
Director, TxDOT Right of Way Division
Texas Department of Transportation
125 East 11th Street
Austin, Texas 78701-2483

Subject: TxDOT Implementation of Buy America Laws for Utility Accommodations

Dear Mr. Madsen,

The Federal Highway Administration received your letter, dated October 3, 2019, transmitting TxDOT's Buy America Guidelines for Utility Accommodations. We have reviewed the proposed guidelines and found them to be acceptable for use on Federal-aid Projects.

Thank you for your cooperation in this important matter. If you should have any questions, please contact me at (512) 536-5957.

Sincerely,

Lisell Guerra
Area Engineer/ Utility Program Liaison

cc: Ms. Anna, Pulido, P.E., Utility Portfolio Section Director



125 EAST 11TH STREET, AUSTIN, TEXAS 78701-2483 | 512.463.8588 | WWW.TXDOT.GOV

October 3, 2019

Al Alonzi
Division Administrator
Federal Highway Administration
J.J. Pickle Federal Building
300 E. 8th Street, Room 826
Austin, TX 78701

**Subject: TxDOT Implementation of Buy America Laws
for Utility Accommodations**

The Texas Department of Transportation (TxDOT) is pleased to offer our proposed Buy America guidelines (attached) to the Federal Highway Administration (FHWA) Texas Division. TxDOT will use these guidelines to clarify and implement Buy America requirements for utility relocations within the state of Texas.

These guidelines are relevant for all federally eligible transportation projects where FHWA is determined to be the lead federal agency; however, they do not take precedence over projects where the Federal Transit Administration (FTA) or the Federal Railroad Administration (FRA) is determined to be the lead federal agency. These procedures are intended to document the cooperative effort of the FHWA Texas Division and TxDOT.

I am hopeful that you will find the attached document satisfactory and acceptable for use on federal-aid projects.

Should you have questions or require additional information, please contact Anna Pulido, P, E., Utility Portfolio Section Director, at 512-416-2852.

Sincerely,

DocuSigned by:

KYLE MADSEN, J.D.

Director, TxDOT Right of Way Division

Buy America: Utility Accommodations

Definitions:

TxDOT intends to use the following definitions to provide clarity and to assist utility-service providers as they develop internal processes to ensure compliance with Buy America.

TxDOT and the utility will identify the proposed utility structures and their components that will be monitored in the Utility Agreement Estimate.

Anchor & High-Strength Bolts – Anchor & high-strength bolts will be identified and consistently applied. The utility owner and TxDOT will identify anchor & high-strength bolts in the estimate, specifications or plans in the Utility Agreement as necessary for the safe and functional design of the utility relocation. If a bolt is not called out as an anchor or high strength bolt the supplied bolt is not subject to Buy America.

Assembly Materials (miscellaneous steel) – The collection of miscellaneous materials used to fasten, hold, attach, secure and/or assemble materials including but not limited to nuts, bolts, U-bolts, screws, washers, clips, fittings, sleeves, lifting hooks, mounting brackets, pole steps, clamps, brackets, mountings, straps, fasteners, hooks, pins, braces, disks, clevises, couplers, swivels, snaps, crimps, trunnions, dead-ends, compression swages, and other miscellaneous materials used to assemble.

Attachment Materials – Items or material that is not an integral part or permanently attached to a pole, pipe, or valve. Attachment materials include but, are not limited to cross arm bracing, insulators, avian equipment, miscellaneous hardware (as defined below), fittings, racks, ladders, encasements, guy wire, strand, conductors, and tubing 0.75-inch or less in diameter.

Betterments – Any upgrading of the facility being relocated that is not attributable to the highway construction and is made solely for the benefit of and at the election of the utility (23 CFR 645.105). Betterments as part of a reimbursable Utility Agreement must be Buy America compliant.

Conductor – A material (specifically wires and cables) that allows the flow of energy including electricity, heat, data, audio/video transmission, etc.

Conductor Support Cables – Iron or steel cables that support conductor lines between towers or poles.

Fittings – Individual parts used to join, adjust or adapt a system of pipes including but not limited to elbows, tees, wyes, crosses, nipples, reducers,

end caps, couplers, o-lets, transitions, connectors (steady state, seismic and flexible), unions, mechanical flanges (not permanently affixed to the pipe), bushings, ferrules, gaskets, O-rings, plugs or taps.

Girders – A load bearing beam or strut commonly taking the cross-sectional shape of a circle, square, rectangle, or an I, C, L, or Z, and assembled for the purpose of creating lattice towers, stand-alone platforms or transmission towers.

Housing Encasements – Include cabinets, housings, boxes, vaults, covers, shelves, and other items use to protect or house equipment or miscellaneous electronics.

Lattice Towers – A structure that is compiled of girders and is typically used in series to support conductor cables.

Maintenance – An action or application of materials necessary to keep a system functioning safely and at optimal capacity; general up-keep.

Miscellaneous Electronics – Manufactured products or assemblies consisting of many components such as electronic equipment, routers, switches, radios, processors, power supplies, batteries, antennas, splice cases, pre-connected hubs and terminals, and cross-boxes.

Miscellaneous Hardware – An assembly of small parts that are compiled to form a finished product that is often used independently or as an attachment material, including but not limited to, locks, switches, cutouts, regulators, gauges, meters, barometers, strainers, filters, pilots, arrestors, insulators, ball bearings, dampeners, needle valves, braces, pipe supports, actuators, motors and pumps.

Permanent Installation – Is the final location and final installation of the materials as defined on the plans or in the specifications. No further adjustments or relocations are necessary to accommodate the final transportation project improvements.

Stand-alone Platforms – A structure that is compiled of girders and is used to permanently hold or support large equipment.

Temporary Utility Relocation – A temporary utility relocation is generally subject to the schedule necessary to accomplish the scope of the project as defined by the NEPA document. A temporary utility relocation is one that is needed to allow the project to proceed, but is not required to remain in its relocation upon completion of the project. For example, if the scope of the project requires the sequential completion of six separate construction contracts, theoretically a temporary utility relocation could remain in place

prior to commencement of the first construction contract and extend beyond completion of the sixth construction contract prior to its final placement. A temporary utility relocation can also be established if the contract specification or plans require that the steel or iron material used on the project either must be removed at the end of the project or may be removed at the contractor's convenience.

Guidelines

On federal-aid projects, utility facility owners will use domestically manufactured products that are composed predominately of steel and/or iron to incorporate into the permanent installation of the utility facility – in compliance with the Buy America provisions of 23 CFR 635.410 as amended. Examples of such products may include poles, cross arms, and structural support members; towers and girders used to comprise transmission towers and stand-alone structures; conductor support cables; high-strength bolts used as anchor bolts and anchor rods; iron or steel baseplates; encasement pipes, pipes and valves; rebar and other reinforcing iron/steel for all cast-in-place and precast installations; conduit and ducting; fire hydrants; manhole covers, rims, and drop-inlet grates.

Prior to the installation of products subject to Buy America compliance, the utility facility owner will submit an executed TxDOT Form 1818 with attached Mill Test Reports, issued and signed by the initial fabricator, supplier of materials, or utility owner. Mill Test Reports should state that the materials were manufactured domestically. In certain instances, the utility facility owner may demonstrate Buy America compliance by providing a written certification signed by the vendor or manufacturer on company letterhead or other acceptable documentation signed by an authorized representative declaring that all supplied materials subject to the Buy America provisions are fully compliant. The written certification will include the specific project information pertaining to the Standard Utility Agreement and state that all products that are composed predominately of steel and/or iron were manufactured domestically and in compliance with the Buy America provisions of 23 CFR 635.410 as amended.

Certain utility agreements, executed before Dec. 31, 2013, that do not have federal funding for utility materials or relocation are not subject to Buy America (even if other contracts associated with the project were reimbursed with federal funds). The date of the original utility agreement will be used as the date to determine Buy America compliance if the utility agreement is amended after December 31, 2013 unless the amendment includes major changes in the scope of work.

Betterments as part of a reimbursable Utility Agreement must be Buy America compliant.

Buy America does not apply to assembly materials, attachment materials, housing encasements, or miscellaneous electronics, as defined below.

Buy America does not apply to any associated materials (including spare materials) required for maintenance.

Buy America does not apply to existing utility materials that are relocated from one location to another within the project limits.

Buy America does not apply to any materials necessary to repair equipment that was discovered or damaged during construction **and** requires immediate action to restore to safe conditions or to minimize adverse public impact. However, these materials shall be considered temporary and must be replaced with Buy America compliant material prior to completion of the project.

Buy America does not apply to associated materials necessary for a temporary utility relocation.

Non-domestic iron and steel materials may be used provided the cost of such materials does not exceed one-tenth of one percent (0.1 %) of the individual utility agreement amount or \$2,500.00, whichever is greater, per 23 CFR 635.410 (b)(4). The De Minimus equation is calculated by the following formula: Combined Cost of Only those Materials that are subject to Buy America and are Non-Compliant (limited to the individual utility agreement) divided by the Total Utility Relocation Cost (cited in the individual utility agreement).

Buy America does not apply if the utility relocation effort is not eligible for federal reimbursement when State law prohibits TxDOT from reimbursing utilities. For example, if the utility owner is required to pay for 100% of the entire relocation effort, then the materials associated with that relocation are not subject to Buy America. However, all such work must remain separate from and cannot be accomplished under a utility agreement or contract that includes work eligible for Federal-aid.

Per 23 CFR 635.410, the work to be performed under the utility agreement may include foreign iron and steel products if the cost of Buy America compliant materials will cause the cost of the work to increase by at least 25%. To determine applicability of this provision, one of the following two procedures shall be used, per Texas Department of Transportation policy:

1) If the utility company will use a contractor or developer or concessioner to perform the work included in the utility agreement, the following procedures apply: Demonstration of meeting the 25% excess cost requirement must be accomplished by receiving two separate bids each from at least two qualified contractors for the work. Requests for bids from the qualified contractors must conform to 23 CFR 635.410 (b)(3). One bid from each contractor will include a cost of performing the work described in the utility agreement using Buy America compliant material and the other bid will include a cost for the same work assuming foreign materials. If the bid with the Buy America compliant materials is at least 25% greater than

the bid that includes foreign material, then the contract can be awarded to the lowest bid based on materials that are not compliant with Buy America.

2) If the utility company will perform work in the utility agreement with its own forces, the following procedures apply: Demonstration of meeting the 25% excess cost requirement must be accomplished by receiving two separate bids from vendors or manufacturers listing the cost of Buy America compliant materials on one bid document and listing the cost of non-compliant materials on a separate bid document. The utility company will take the cost of the Buy America compliant materials and use it to create the total estimated cost of the work included in the utility agreement. The utility company will do the same with the cost of the noncompliant materials. If the cost of the work included in the utility agreement with Buy America compliant materials is at least 25% greater than the cost using the materials that are not compliant with Buy America, then the non-compliant materials may be used.

TxDOT will periodically review, or audit, the Form 1818 and Bills of Materials (BOMs) for utility projects and determine if the above categories are adequately documented resulting in certification of compliance with Buy America as intended by federal law.

These periodic reviews may result in the addition of categories that are not currently listed above.

APPENDIX B

GEOTECHNICAL REPORT

TO: Prabin KC, P.E.; Clayton Barnard, P.E.
FROM: Micah Hargrave, P.E.; Cory Rauss, E.I.T.
SUBJECT: Geotechnical Investigation and Analysis
PROJECT: Custer Road PS Meter Station Relocation [PRP18708]
DATE: February 11, 2020
QC: Tony Bosecker, P.E.



Micah L. Hargrave
 FREESE AND NICHOLS, INC.

TEXAS REGISTERED ENGINEERING FIRM F-2144

PROJECT DESCRIPTION

This memorandum summarizes the results of the geotechnical investigation performed for the Custer Road PS Meter Station Relocation for the Town of Prosper. This work was provided under Freese and Nichols, Inc. (FNI) project number PRP18708 authorized by the contract with the Town.

Existing infrastructure along Custer Road is to be removed to avoid conflicts with proposed utilities associated with the widening of Custer Road. This project includes construction of a new meter vault and installation of a 42-inch diameter water line to replace an existing section of 36-inch diameter line located within the future Custer Road right-of-way. A summary of the geotechnical-related items of the project are summarized below in Table 1. The general project area is shown on the vicinity and boring location maps included with this memorandum.

Table 1 – Project Summary

Project Location:	<ul style="list-style-type: none"> Prosper, Texas (refer to Figures 1 and 2)
Proposed Improvements:	<ul style="list-style-type: none"> Original Scope: <ul style="list-style-type: none"> New meter vault and installation of 42-inch diameter steel pipeline Revised Scope: <ul style="list-style-type: none"> Addition of a new retaining wall at revised site location
Investigation Activities:	<ul style="list-style-type: none"> Field Exploration <ul style="list-style-type: none"> Two (2) geotechnical borings (B-01 and B-02) drilled to depths ranging from about 25 to 35 feet below grade Refer to Attachment 1 for boring locations and Attachment 2 for logs of borings for detailed subsurface information Laboratory Soils Testing

This geotechnical investigation was conducted to aid in the design of the project for the purpose of providing the following:

- Anticipated subsurface conditions at the site.
- Foundation design recommendations for the meter vault.
- Foundation design recommendations for the retaining wall (added scope based on revised site location).

This memorandum has been prepared based on our current knowledge and understanding of the proposed project. Significant changes in the design of the proposed improvements described in this document may require modification of the recommendations contained in this geotechnical memorandum. This memorandum presents the results of the geotechnical investigation and analysis in a direct and abbreviated manner and was developed

specifically for the project team. The geotechnical information and data provided are not intended to provide data for other disciplines or associated designs.

SUBSURFACE EXPLORATION AND LABORATORY TESTING

The subsurface exploration consisted of drilling two (2) geotechnical borings at select locations at the originally proposed site. Both borings (B-01 and B-02) were drilled by Texplor of Dallas, Inc. using a truck-mounted CME 55 drilling rig. Boring B-01 was drilled to a termination depth of 35 feet below grade and boring B-02 to a depth of 25 feet. Samples were collected within the borings using seamless, steel tube samplers. The Texas Cone Penetration (TCP) test was used to evaluate the hardness of limestone in-situ within the borings during drilling.

The boring schedule is summarized in Table 2.

Table 2 – Boring Schedule

Site	Boring	Date Drilled	Depth, ft*	Latitude	Longitude
Prosper, TX	B-01	5/17/2019	35	33.223709	-96.734838
Prosper, TX	B-02	5/17/2019	25	33.223105	-96.733085

*Depth below existing ground

Prior to finalizing this memorandum for the original scope, the location of the proposed meter vault was relocated southwest from its initial location, approximately 250 feet south of the existing pump station on site. Due to the relocation, the preliminary geotechnical borings referenced in Table 2 above are no longer in close proximity to the proposed meter vault. Due to the relocation, boring logs produced from a previous project for the North Texas Municipal Water District (NTMWD), under project number NTD18446, were utilized in a comparative analysis to determine the effect on the subsurface stratigraphy and earthwork conditions. Figure 1 below presents the relocation of the meter vault and approximate location of retaining wall along with the change in location of borings utilized for design.

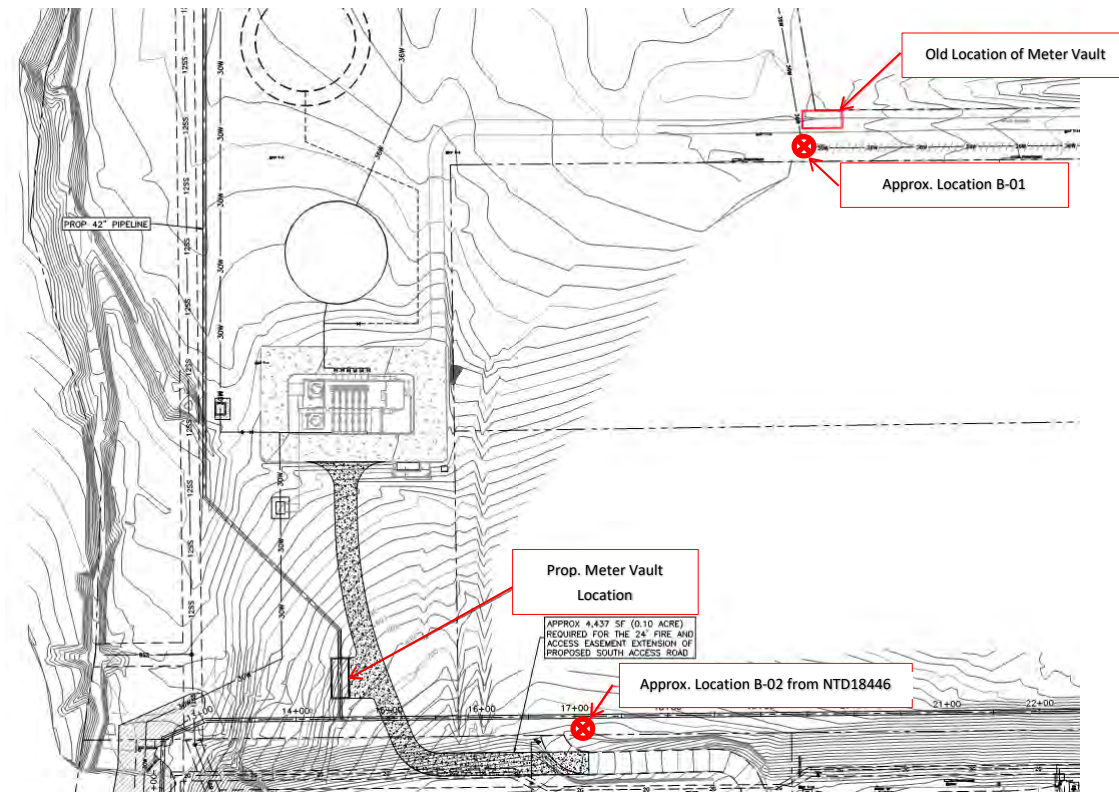


Figure 1 – Meter Vault Relocation, Retaining Wall Location

All borings utilized in this geotechnical analysis are presented on the boring location map (Attachment 1) included with this memorandum. The actual boring locations were not surveyed; however, the estimated geodetic coordinates were obtained using a handheld GPS device and are listed on boring logs for reference. The coordinates should only be considered accurate to the degree implied by the method used to collect the data. Ground surface elevations at the boring locations were not determined, and therefore, references within this text are based on depths and not elevations.

A limited number of laboratory tests were performed on selected samples obtained from the borings to allow for material classification in accordance with the Unified Soil Classification System (USCS) and to evaluate pertinent engineering properties of the subsurface materials. Test results are reported on the boring logs and individual summary sheets included with this memorandum. The testing included:

- Atterberg limits
- Percent passing a no. 200 sieve (P200)
- Unconfined compressive strength, soil
- Unit dry weight
- Moisture content

Boring logs were developed from the field logs and laboratory test results and represent a generalized interpretation of the stratigraphy encountered within each boring based on field descriptions, in situ test results, and laboratory test results. Stratigraphy lines shown on the logs correspond to the approximate boundary between strata. In situ, this transition can be and is often gradual. The boring logs are included with this memorandum along with a key to the symbols and terms used on the logs.

GENERALIZED SUBSURFACE CONDITIONS

Geology and Stratigraphy

The project site is mapped within surface outcroppings of the Austin Chalk geologic formation. Borings also encountered Alluvial deposits. Characteristics of these geologic formations are summarized below in Table 3.

Table 3 – Generalized Geologic Conditions

Geologic Formation	Generalized Description ⁽¹⁾
Alluvium	Alluvial deposits can consist of a variety of materials, including gravel, sand, silt, and clay. Alluvial deposits are associated with rivers and streams and are present along existing and historic channels.
Austin Chalk	The Austin Chalk typically consists of clays overlying chalky limestone. The depth of the limestone varies but is generally encountered at relatively shallow depths. Upper portions of the limestone are typically weathered, fractured, and very light brown to light yellow-brown in color. Zones of severely weathered limestone that are clay-like are sometimes present above the weathered material. The underlying primary limestone is generally harder than the weathered portions and is typically light to medium gray in color.

(1) Descriptions based on the USGS geologic database

The materials encountered in the initial borings described in Table 2 for this investigation are generally consistent with those typically expected within Alluvial deposits and the Austin Chalk formation. Expansive clays with liquid limits (LL) ranging from 50 to 66 and plasticity indices (PI) ranging from 26 to 46 were encountered overlying the limestone. Weathered limestone was encountered at approximately 15 feet below existing grade within both borings. Gray, unweathered limestone was encountered about 18 feet within boring B-01 and at about 20 feet within boring B-02.

The materials encountered in the previous geotechnical investigation borings exhibited similar results to those described above. With respect to boring B-02 (NTD18446), the stratigraphy consists of fat clay underlain by weathered and unweathered limestone at depths of 3 feet and 8 feet, respectively. Lab tests performed on one of the fat clay samples indicated a liquid limit of 56 and a PI of 27. The elevation of boring B-02 (NTD18446) was located about 7-8 feet below the elevation of the proposed meter vault. Reference should be made to the

following sections of this text and to the boring logs for additional details and descriptions related to the subsurface materials encountered within the borings.

Groundwater

Observations of groundwater seepage were made during drilling. Seepage was observed during drilling in B-01 at a depth of about 30 feet below grade. The water level was at 25 feet upon completion of drilling. Seepage was observed during drilling in B-02 at a depth of 12.5 feet below grade. The water level rose to about 3 feet below the ground surface upon completion of drilling within boring B-02. Seepage was not observed during drilling for the previous geotechnical boring, B-02 (NTD18446).

The occurrence of groundwater can vary due to many factors, such as seasonal changes, site topography, surface runoff, the layering and permeability of subsurface strata, utilities, and other factors not evident at the time of this investigation. These observations of groundwater and seepage have been made during the course of this investigation. A detailed groundwater study has not been performed, and long-term observations would be necessary to accurately evaluate groundwater levels and fluctuations.

ANALYSIS AND RECOMMENDATIONS

Expansive Soil Movement

The project site includes expansive clays that will exhibit shrink and swell behavior as fluctuations in moisture occur. The magnitude of the shrink/swell behavior is dependent upon the thickness of the expansive soil and the depth of the active moisture zone. Moisture fluctuations occur due to seasonal cycles but are also influenced by drainage conditions and site grades, landscaping, irrigation practices, vegetation, and groundwater. The total magnitude of shrink/swell movement is difficult to predict due to the large number of variables affecting this behavior.

An estimate of the potential soil movement (PSM) was made using a variety of sources, including the Potential Vertical Rise (PVR) Method 124-E published by TxDOT, laboratory index testing, engineering judgment, and experience. Based on this information, the estimated potential soil movement for at-grade components for the meter vault is summarized below in Table 4.

Table 4 – Potential Soil Movement (PSM) Estimate

Estimated PSM (Existing Grade):	Approx. 3 inches with Active Zone of 10 feet
Condition:	Dry Condition

The active zone at the meter vault is anticipated to extend to a depth of approximately 10 feet based on the depth of limestone encountered in B-02 (NTD18446), and the estimated PSM was calculated for the dry condition (complete moisture cycle). Clays within this dry range represent the condition where the shrinkage potential is least, and swell potential is greatest. Recognize that these values are not an exact determination of movement and are only an indication of the potential movements due to expansive soil for seasonal moisture fluctuations. Actual movements may be significantly larger than estimated due to inadequate site grading, poor drainage, ponding surface water, and/or leaks in utility lines. The estimated PSM provided above in Table 4 assumes that onsite expansive clays are used for backfill around the vault.

Meter Vault

Boring B-01 was initially drilled within the vicinity of the proposed meter vault, however, this has been relocated southwest of its original location, approximately 250 feet south of the existing pump station as presented previously in Figure 1. The vault has approximate plan dimensions of 26 feet by 42.5 feet. Most of the structure is below grade, however, a building above the eastern portion of the vault is planned. It is understood that the bottom of the vault will be approximately 16.5 feet below proposed grade. This places the bottom of the meter vault within unweathered limestone, based on the boring B-02 (NTD18446) log.

Since B-02 (NTD18446) was not drilled within the footprint of the meter vault, located approximately 250 feet southeast of the meter vault, some variation in the depth of limestone may be observed during construction. If

variation does exist, it is recommended that the subgrade below the vault be over excavated to expose sound, gray limestone, removing all clay and weathered limestone, and backfilled with compacted crushed limestone (flexible base). The bottom slab of the vault should bear directly on the compacted crushed stone. The crushed stone should comply with TxDOT Item 247, Grade 1-2, Type A or D. The in-place density should be no less than 98% of standard proctor density (ASTM D698) with a moisture content from -2 to +1 percent of optimum moisture. Compaction of the crushed stone too “wet” of optimum moisture could result in pumping of the material and make compaction difficult.

The vault can be designed as a mat foundation with a net allowable bearing capacity of 4,000 psf (safety factor of at least 3) when bearing within the unweathered limestone or upon the compacted crushed stone as specified. During excavation, exposure of the limestone should be minimized. This can be accomplished by placing the crushed stone (or a portion of the stone) within 8 hours of reaching the final excavation depth. If this is not possible, a mud slab should be used to cover the exposed surface. The mud slab should be at least 3 inches thick and have a 28-day compressive strength of at least 150 psi.

The below-grade portions of the vault walls will experience lateral earth pressures from equivalent fluid pressures developed by the backfill soil, water, and surrounding subgrade. The structure will be rigid, or restrained at the top, and will develop an at-rest earth pressure condition. Undrained equivalent fluid pressures for onsite clays and imported, non-expansive select fill (if desired) are provided below in Table 5. The fluid pressures do not include load factors and should be applied using a triangular distribution. Permanent, transient, or other ground surcharge loads should be applied using a uniform distribution and factored using the appropriate earth pressure coefficient.

Table 5 – Equivalent Fluid Pressures

Material	Earth Pressure Condition	Undrained Equivalent Fluid Pressure, psf/ft
Onsite Clays $\phi = 18^\circ, \gamma = 125 \text{ pcf}$	At-rest, $k_0 = 0.69$	108
Non-expansive Select Fill $\phi' = 30^\circ, \gamma = 130 \text{ pcf}$	At-rest, $k_0 = 0.50$	96

Note: Refer to the *Earthwork* section for material and compaction requirements

Depending upon the excavation plan, some near-vertical cut slopes extending beyond the edge of the walls of the valve vault may be required. Flowable fill (minimum 28-day compressive strength of 150 psi) is recommended in areas where limited space will make compaction difficult.

If select fill is used for backfill, it is recommended that the on-site clays be placed around the perimeter of the building above the select fill, creating a “clay cap” to reduce surface water infiltration. The clay cap should have a thickness of approximately 2 feet and be graded such that water drains away from the structure.

42-inch Pipeline

Approximately 1,100 linear feet of new 42-inch diameter steel water line will be installed along with the meter vault structure. Borings B-01 and B-02 were initially located within the vicinity of the proposed pipeline in the original alignment, however, as the pipeline has moved southwest of the initial location, no current borings are available along the revised alignment. A generalized subsurface stratigraphy can be developed utilizing a previous geotechnical investigation report for the existing pump station and 3 MG ground storage tank (Project: PRP05200). The proposed 42” pipeline runs along the western side of the existing pump station and ground storage tank. Soil descriptions for the borings drilled for PRP05200 are summarized below. Figure 2 presents the relative location of the previously drilled borings.

- PS-1 through PS-5
 - Expansive clays noted at depths of 3 to 11 feet below ground surface, overlying 1 to 7.5 feet of weathered limestone with unweathered limestone below.

- T-1 through T-4
 - Expansive clays noted at depths of 7 to 15 feet below ground surface, overlying 0 to 6 feet of weathered limestone with shale present below the weathered limestone.
- T2-1
 - Expansive clays noted at depths of 12 feet below ground surface, overlying 4 feet of weathered limestone with shale present below the weathered limestone.

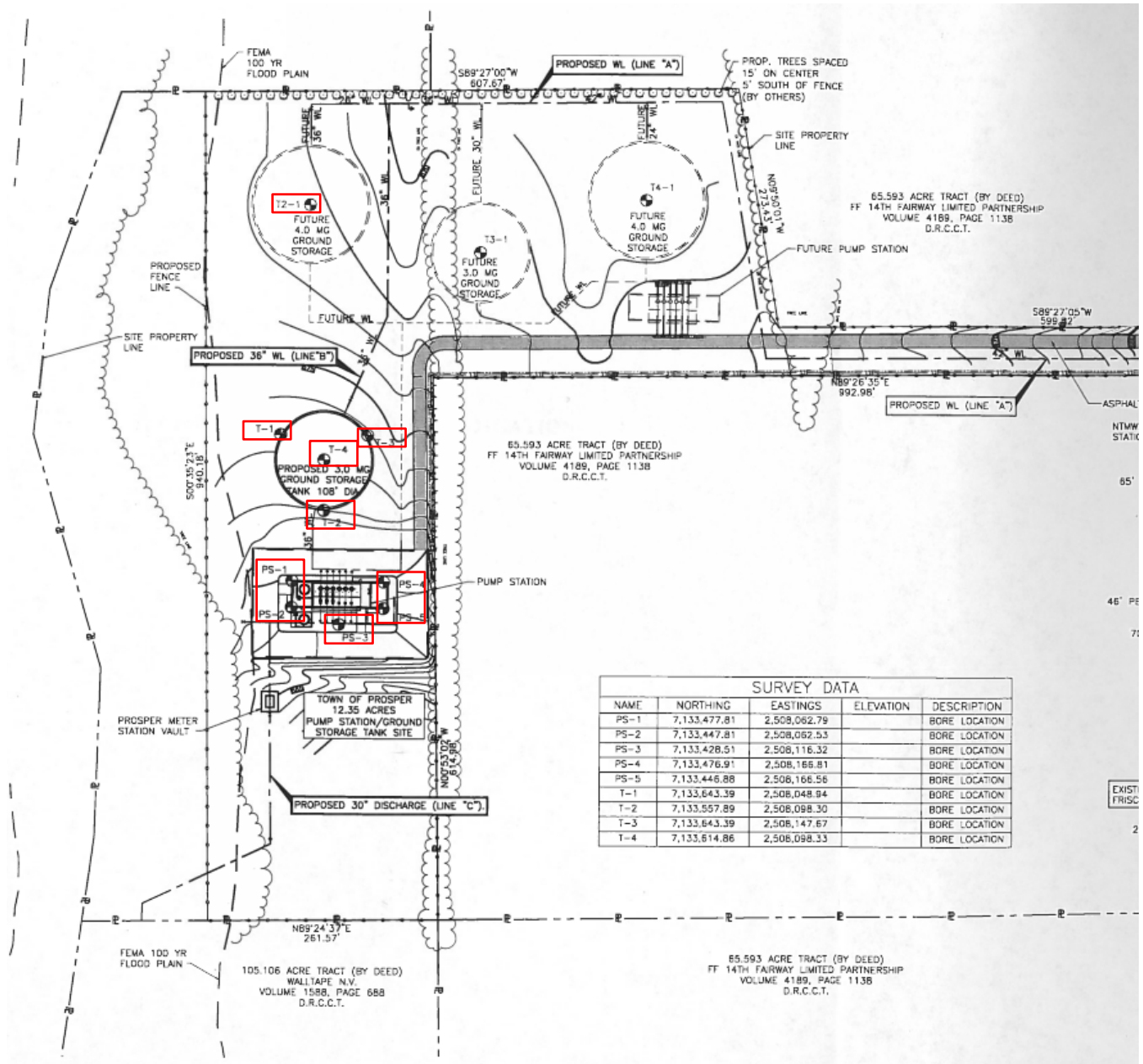


Figure 2 – Previous Boring Location Plan for Existing Pump Station and 3 MG GST (PRP05200)

Granular material is recommended for the pipe embedment. The embedment material should be compacted to at least 95% of the maximum density per ASTM D4253. Extra care and special attention should be taken when placing and compacting material around the haunches of the pipe to ensure adequate compaction. The native

clays can be used above the pipe zone as general backfill. Placement and compaction requirements for the clays are discussed in the *Earthwork* section of this text.

Retaining Wall

The location of the retaining wall is southeast of the proposed meter vault. Based on the proposed structural elevations and estimated existing ground surface elevations, the bottom of the footing of the retaining wall will be approximately 2 feet below existing grade, subject to varying depths along the alignment. Utilizing boring B-02 (NTD18446), the bottom of the footing will be approximately 5 to 6 feet above the top of the unweathered limestone and is expected to bear within expansive fat clay.

Due to the presence of expansive clays and the potential for excessive movement, it is recommended that the clays beneath the footing be excavated a minimum of 4 feet or until sound limestone is exposed, removing all clay, and backfilled with compacted crushed limestone (flexible base). The bottom of the footing should bear directly on the compacted crushed stone. The foundation of the retaining wall can then be sized with a net allowable bearing capacity of 3,000 psf (safety factor of at least 3) when bearing upon the compacted crushed stone as specified. Compliance of the compacted crushed stone base should be in accordance with TxDOT, Item 247. This replacement of existing expansive clay will also reduce the PSM to approximately one inch or less. For frictional resistance, a coefficient of friction of 0.45 may be used for the crushed limestone.

The below-grade portion of the retaining wall will experience lateral earth pressures from equivalent fluid pressures developed by the backfill. Undrained equivalent fluid pressures for on-site clays, non-expansive select fill, and passive pressures developed at the shear key for the underlying foundation material are provided below in Table 6. The fluid pressures for on-site clay and non-expansive select fill are representative of values obtained for an inclined slope of 4H:1V above the retaining wall. The fluid pressures do not include load factors and should be applied using a triangular distribution.

Table 6 – Equivalent Fluid Pressures – Retaining Wall

Material	Earth Pressure Condition	Undrained Equivalent Fluid Pressure, psf/ft
Onsite Clays $\phi = 18^\circ, \gamma = 125 \text{ pcf}$	Active, $k_a = 0.65$	103
Non-expansive Select Fill $\phi' = 30^\circ, \gamma = 130 \text{ pcf}$	Active, $k_a = 0.36$	87
Foundation Material (Crushed Stone) $\phi = 26^\circ, \gamma = 130 \text{ pcf}$	Passive, $k_p = 2.56$	236

Note: Refer to the *Earthwork* section for material and compaction requirements

Earthwork

Table 7 provides material, moisture, and density requirements for onsite clay soils and select fill to be used as backfill or general fill. Fill should be placed in loose, horizontal lifts not exceeding about 8 to 9 inches. The lift thickness should be reduced as necessary to achieve the specified compaction.

Table 7 – Material and Compaction Requirements

Material Use	Material Requirements	Test Method	Density Requirement ⁽¹⁾	Moisture Requirement ⁽¹⁾
General Fill/Backfill Onsite Clays	Max. Aggregate Size = 2 in. No Organics	Standard Proctor (ASTM D698)	95%+	Optimum to +4%
Structural Fill Non-expansive Select Fill	-#200 Sieve: $\leq 70\%$ LL $\leq 35, 7 \leq \text{PI} \leq 15$ No Organics	Standard Proctor (ASTM D698)	95%+	-2% to +2%

(1) Based upon maximum dry density and optimum moisture content

The following items should be included in the final design plans/drawings and/or appropriate sections of engineering specifications.

- The project limits should be stripped of vegetation, roots, organic material, existing construction materials, and other undesirable debris. Obstructions that could hinder preparation of the site should also be removed, with special attention given to tree stumps and associated root systems. After stripping, the area should be suitable for the support of construction equipment.
- Unsuitable areas (such as those with wet, soft, yielding, and/or pumping subgrade) should be corrected before construction proceeds.
- Exposed foundation areas should be observed by qualified personnel to confirm the bearing surface and material complies with the intended design.
- Fill materials should be consistent with regard to type and moisture content. Clods should be processed and mixed, and water should be evenly applied, such that each lift has a uniform moisture and density. Compaction of each lift should be continuous over its entire area.
- Heavy compaction equipment shall not be permitted within three feet of structures, and only hand-directed compaction equipment shall be used within this area. The maximum lift thickness with hand-directed compaction equipment shall be 4 inches measured in the loose condition.
- Fill placed along slopes should be benched into the slope and placed in horizontal lifts to ensure proper bonding between lifts.
- Each lift should be tested to confirm it has the specified moisture and compaction. One moisture/density verification test should be performed for every 500-square-foot of compacted area and every 150 to 250 feet along utility lines. For smaller areas, a minimum of three verification tests should be provided for every lift.
- Lifts failing to meet moisture and density requirements should be reworked to meet the specifications. Subsequent lifts should not be placed until the exposed lift has the specified moisture and density.
- The specified moisture content must be maintained until compaction of the overlying lift or construction of overlying flatwork.
- The contractor must provide some means of controlling the moisture content, such as water hoses, water trucks, etc. (maintaining subgrade moisture is always critical, but will require the most effort during warm, windy and/or sunny conditions).

Density and moisture verification testing are recommended to provide some indication that adequate earthwork is being provided. However, the quality of the fill is the sole responsibility of the contractor, and satisfactory verification testing is not a guarantee of the quality of the contractor's earthwork operations.

Surface Drainage

Proper drainage is critical to the performance and condition of the proposed structures and surrounding flatwork. Positive surface drainage must be provided that directs surface water away from structures. If water is allowed to collect next to or below the structures or flatwork, then undesirable soil movements can occur, and these movements can exceed values used in design. It is recommended that a slope of at least 1½ percent be provided to direct water away from the proposed structures. These slopes should be maintained throughout construction and the life of the structures.

IBC Seismic Site Class

Seismic designs in Texas are typically based upon the criteria established in the International Building Code (IBC). The seismic design is based on the Site Class, as defined in Sections 1613.3.2, in accordance with Chapter 20 of ASCE 7. Based on the results of the site-specific borings, the recommended site class is presented below in Table 8.

Table 8 – IBC Seismic Site Class

Site Class⁽¹⁾:	B – Structures bearing directly within limestone (valve vault) C – All others
----------------------------------	--

(1) As defined in Table 20.3-1 – Site Classification within Chapter 20 of ASCE 7

The site classification is based on the upper 100 feet of the site profile. The maximum depth of the borings drilled for this investigation was 35 feet below existing grade; therefore, the site classes noted above in Table 8 were selected based on the stiff to hard overburden clays (CH) underlain by limestone assumed to extend below 35 feet to a depth of at least 100 feet.

LIMITATIONS

This memorandum was prepared specifically for use by the City of Prosper and Freese and Nichols, Inc. for this particular project and shall not be used for other projects or purposes. This work was performed in a manner consistent with the level of care and skill ordinarily exercised by other members of the engineering profession practicing in the same locality, under similar conditions, and at the date the services were provided. Freese and Nichols, Inc. makes no other representation, guarantee or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

The information and opinions contained in this memorandum are based on field observations, subsurface explorations, laboratory tests, and present knowledge of the proposed project. It is possible that soil, rock, or groundwater conditions could vary between or beyond the points explored. Paragraphs, statements, test results, boring logs, figures, etc., should not be taken out of context, nor utilized without a knowledge and awareness of their intent within the purpose of this memorandum.

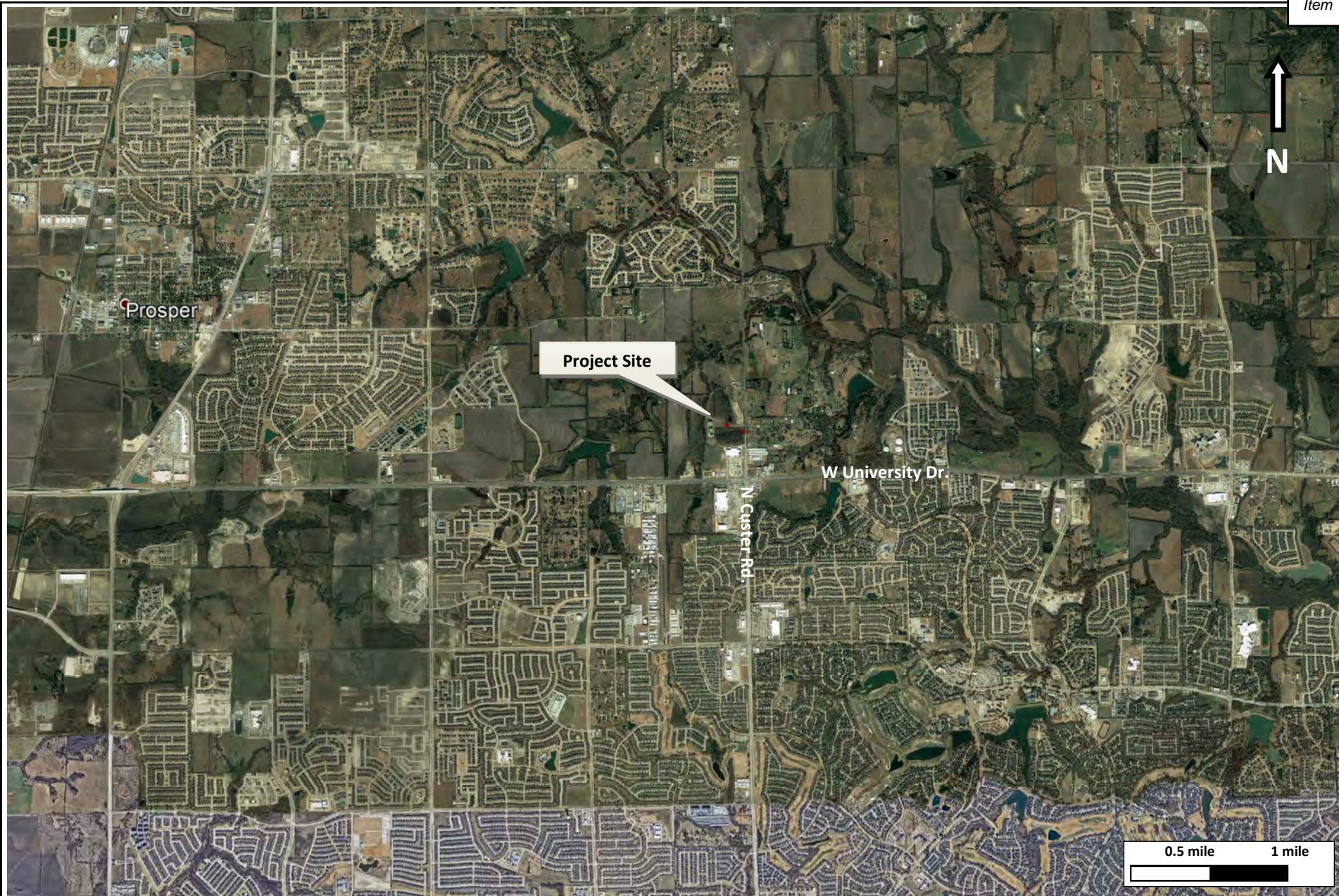
This memorandum may be used by the City of Prosper and the design team for the purposes stated, within a reasonable time from its issuance. Should it be decided to provide the information in this memorandum to others outside the design team and the City, attachments 1, 2, and 3 are technical data and can be provided as part of the contract documents. The remaining portions of the Geotechnical Memorandum are interpretations of the data and may be provided for informational purposes only but are not considered part of the contract documents.

-END OF MEMORANDUM-

ATTACHMENTS

1. Vicinity and Boring Log Location Map (2 pages)
2. Boring Logs and Boring Log Legend and Nomenclature (22 pages)
3. Laboratory Test Results (5 pages)

ATTACHMENT 1
Vicinity Map and Boring Location Map



FNI PROJECT:	PRP18708
DATE:	June 6, 2019
PREPARED:	CR

FREESSE NICHOLS
 2111 N. HASKELL AVE., STE 3300
 DALLAS, TX 75204

CITY OF PROSPER
CUSTER ROAD PS METER STATION RELOCATION
VICINITY MAP

FIGURE
1
 Page 879



FNI PROJECT:	PRP18708
DATE:	June 6, 2019
PREPARED:	CR

**FREESSE
NICHOLS**
CONSULTANTS

2111 N. HASKELL AVE., STE 3300
DALLAS, TX 75204

CITY OF PROSPER
CUSTER ROAD PS METER STATION RELOCATION
BORING LOCATION MAP

FIGURE
2

ATTACHMENT 2

Boring Logs and Boring Log Legend and Nomenclature



LOG OF BORING NO. B-01

Project Description: Custer Road Meter Station Relocation
Project Location: Prosper, Texas
Date Drilling Started: 5/17/2019
Logged By: R. Randle
Rig Type: CME 55
Latitude: 33.223709

Drilling Co.: Texplor of Dallas, Inc.
Hammer Type: Automatic
Longitude: -96.734838

Project No.: PRP18708
Phase No.: ***
Date Drilling Completed: 5/17/2019
Drill Method: DRY w/ HSA
Elevation:

DEPTH, ft	SAMPLE					SYMBOL	MATERIAL DESCRIPTION	WATER CONTENT, %	UNIT DRY WEIGHT, pcf	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNC. COMPRESSIVE STRENGTH, tsf	STRAIN AT FAILURE, %	ELEVATION, ft	
	TYPE	BLOW COUNTS	HAND PENETROMETER (P) / TORVANE (T), tsf	RECOVERY, %	RQD, %												
5	U-1		4.5 (P)	42		FAT CLAY (CH), brown, with gravel (Fill)											
	U-2		2.75 (P)	46			FAT CLAY (CH), brown, stiff, moist (Alluvium) ^{2/}	27	97	98	66	20	46	1.6	4.9		
	U-3		3.0 (P)	50													
	U-4		2.25 (P)	42													
	U-5		2.5 (P)	54			-tan, with some gravel from 9 to 13 feet	28	95	98	64	21	43	1.2	3.9		
	U-6		4.5 (P)	42			-tan and light gray, hard, no gravel below 13.5 feet	22	104								
15	TCP	50/4" 50/2.25"				Limestone, weathered, tan, soft (Austin Chalk) ^{15/}											
	A-7						Limestone, gray, hard (Austin Chalk) ^{18/}										
20	TCP	50/0.50" 50/0.25"															
	A-8																
25	TCP	50/0.50" 50/0.25"															
30	TCP	50/0.25" 50/0"															

GROUND WATER OBSERVATIONS

MEASUREMENT	∇ At Time Of Drilling	∇ At End of Drilling	∇ After Drilling
DATE			
DEPTH (ft.bgs.)	30		25
NOTES			

Remarks:
 Boring backfilled with auger cuttings upon completion.



LOG OF BORING NO. B-01

Project Description: Custer Road Meter Station Relocation

Project Location: Prosper, Texas

Date Drilling Started: 5/17/2019

Logged By: R. Randle

Rig Type: CME 55

Latitude: 33.223709

Drilling Co.: Texplor of Dallas, Inc.

Hammer Type: Automatic

Longitude: -96.734838

Project No.: PRP18708

Phase No.: ***

Date Drilling Completed: 5/17/2019

Drill Method: DRY w/ HSA

Elevation:

DEPTH, ft	SAMPLE					SYMBOL	MATERIAL DESCRIPTION	WATER CONTENT, %	UNIT DRY WEIGHT, pcf	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNC. COMPRESSIVE STRENGTH, tsf	STRAIN AT FAILURE, %	ELEVATION, ft
	TYPE	BLOW COUNTS	HAND PENE-TROMETER (P) / TORVANE (T), tsf	RECOVERY, %	RQD, %											
35	TCP	50/0.50" 50/0.25"					LIMESTONE, gray, hard (Austin Chalk) (continued)									
							Total boring depth 35.0 ft.									

GROUND WATER OBSERVATIONS

MEASUREMENT	At Time Of Drilling	At End of Drilling	After Drilling
DATE			
DEPTH (ft.bgs.)	30		25
NOTES			

Remarks:

Boring backfilled with auger cuttings upon completion.



LOG OF BORING NO. B-02

Attachment 3

Item 11.

Project Description: Custer Road Meter Station Relocation

Project Location: Prosper, Texas

Date Drilling Started: 5/17/2019

Logged By: R. Randle

Rig Type: CME 55

Latitude: 33.223105

Drilling Co.: Texplor of Dallas, Inc.

Hammer Type: Automatic

Longitude: -96.733085

Project No.: PRP18708

Phase No.: ***

Date Drilling Completed: 5/17/2019

Drill Method: DRY w/ CFA

Elevation:

DEPTH, ft	SAMPLE					SYMBOL	MATERIAL DESCRIPTION	WATER CONTENT, %	UNIT DRY WEIGHT, pcf	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNC. COMPRESSIVE STRENGTH, tsf	STRAIN AT FAILURE, %	ELEVATION, ft	
	TYPE	BLOW COUNTS	HAND PENE-TROMETER (P) / TORVANE (T), tsf	RECOVERY, %	RQD, %												
0	U-1		3.0 (P)	46			FAT CLAY with sand (CH), light brown, very stiff, moist (Alluvium)	22	104	79	50	24	26	2.4	7.1		
1	U-2		3.25 (P)	46			FAT CLAY (CH), tan, stiff, moist (Alluvium) ^{4/}										
5	U-3		2.25 (P)	50													
6	U-4		2.5 (P)	42													
8	U-5		2.0 (P)	38					25	100	92	54	21	33	1.7	15.5	
14	U-6		4.5 (P)	67													
15	TCP	50/4" / 50/3"					LIMESTONE, weathered, tan, soft (Austin Chalk) ^{14.5/}										
20	TCP	50/0.25" / 50/0"					LIMESTONE, gray, hard (Austin Chalk) ^{20/}										
25	TCP	50/0.25" / 50/0"					Total boring depth 25.0 ft.										

GROUND WATER OBSERVATIONS

Remarks:

Boring backfilled with auger cuttings upon completion.

MEASUREMENT	At Time Of Drilling	At End of Drilling	After Drilling
DATE			
DEPTH (ft.bgs.)	12.5		3
NOTES			



LOG OF BORING NO. B-02

NTD18446

Project Description: Pipeline and Meter Station Relocation

Project Location: Prosper, TX

Date Drilling Started: 2/26/2019

Logged By: D. Rohmer

Rig Type: CME 75

Latitude: 33.221948

Drilling Co.: Texplor of Dallas, Inc.

Hammer Type: Automatic

Longitude: -96.735758

Project No.: NTD18446

Phase No.: ****

Date Drilling Completed: 2/26/2019

Drill Method: CFA

Elevation:

DEPTH, ft	SAMPLE					SYMBOL	MATERIAL DESCRIPTION	WATER CONTENT, %	UNIT DRY WEIGHT, pcf	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNC. COMPRESSIVE STRENGTH, tsf	STRAIN AT FAILURE, %	ELEVATION, ft	
	TYPE	BLOW COUNTS	HAND PENE-TROMETER (P) / TORVANE (T), tsf	RECOVERY, %	RQD, %												
5	U-1		4.5+ (P)	50		[Diagonal Hatching]	FAT CLAY (CH) with sand, brown, hard, moist, calcareous (Fill) 1/	24	103	78	56	29	27	4.5	9.7		
	U-2						FAT CLAY (CH) with gravel [Decomposed Limestone], very light brown, hard, moist, calcareous (Austin Chalk)										
	TCP	50/2" 50/1.5"				[Brick Pattern]	LIMESTONE, highly weathered to weathered, light yellow-brown, hard (Austin Chalk) 3/										
10	A-3	50/0.50" 50/0.50"				[Brick Pattern]	LIMESTONE, unweathered, dark gray, hard (Austin Chalk) 8/										
15	TCP	50/0.50" 50/0.50"				[Brick Pattern]											
20	TCP	50/0.50" 50/0.50"				[Brick Pattern]											
25	TCP	50/0.50" 50/0.50"				[Brick Pattern]											
Total boring depth 25.0 ft.																	

GROUND WATER OBSERVATIONS

MEASUREMENT	At Time Of Drilling	At End of Drilling	After Drilling
DATE			
DEPTH (ft.bgs.)			
NOTES	None	None	None

Remarks:
Boring backfilled with auger cuttings upon completion of drilling and sampling.



FREESE • NICHOLS

LOG OF BORING NO. PS-1

Attachment 3

Item 11.

Project Description: Pump Station and Ground Storage Tank
 Project Location: Prosper, Texas
 Logged By: GM Enterprises
 Drilled By: GM Enterprises

Rig: CME-55

Sheet 1 of 2
 Project No.: PRP05200
 Task No.:
 Date: 11/07/05
 Method: 6" CFA

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 681.0 Total Depth: 35.2 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION	
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD										MATERIAL DESCRIPTION
0	U1		4.5+	[Diagonal Hatching]	CLAY (CL), light brown, hard, dry with weathered limestone fragments		12		75	44	29	680	
	U2		4.5+										
	U3		4.5+										
					678.0		13	100	91	45	25		
					LIMESTONE, light brown, marly, weathered	3.0							
5	TCP		50/1.5" 50/1"	[Brick Pattern]	LIMESTONE, gray, marly, unweathered	675.0						675	
													6.0
10	TCP		50/1" 50/7.5"	[Brick Pattern]	SHALE, gray, unweathered	663.5						670	
													17.5
15	TCP		50/1" 50/7.5"	[Horizontal Lines]								665	
20	TCP		50/2.3" 50/1"	[Horizontal Lines]								660	
25	TCP		50/2" 50/1"	[Horizontal Lines]								655	
30	TCP		50/2" 50/1.3"	[Horizontal Lines]								650	
35													

Water Level Surface Dry at ATD
 Dry at 0 hrs AD
 at

Remarks:



LOG OF BORING NO. PS-1

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: GM Enterprises

Drilled By: GM Enterprises

Rig: CME-55

Sheet 2 of 2

Project No.: PRP05200

Task No.:

Date: 11/07/05

Method: 6" CFA

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 681.0 Total Depth: 35.2 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD									
35	TCP		50/2" 50/.75"		Total boring depth 35.2 ft.	645.8 35.2						645
40												640
45												635
50												630
55												625
60												620
65												615
70												

FREESE AND NICHOLS, INC.

The stratification lines represent approximate strata boundaries. In situ, the transition may be gradual.



LOG OF BORING NO. PS-2

Attachment 3

Item 11.

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: Tony Bosecker, P.E.

Drilled By: GM Enterprises

Rig: CME-55

Sheet 1 of 2

Project No.: PRP05200

Task No.:

Date: 11/04/05

Method: 6" CFA

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 681.5 Total Depth: 40.5 feet	MATERIAL DESCRIPTION	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD										
0	U1	50	4.5+	[Diagonal Hatching]	SILTY CLAY (CL/CH), light brown to yellowish brown, hard, dry, slightly fissile and increase in plasticity from 2.5'	678.0	9.1	16	112	89	63	18	680
	U2	71	4.5+										
	U3	79	4.5+										
	A4												
5	TCP		50/4" 50/2"	[Horizontal Hatching]	LIMESTONE, light brown to yellowish brown, weathered, soft, marly	3.5							675
	A5												
10	TCP		50/1.8" 50/1"	[Brick Pattern]	LIMESTONE, gray, unweathered, soft, marly	7.0							670
	A6												
15	TCP		50/0.75" 50/1"										
	A7												
20	TCP		50/3.5" 50/1.5"	[Vertical Hatching]	SHALE, dark gray, unweathered - softer from 20'	18.0							660
	A8												
25	TCP		50/3.8" 50/2.5"										
	A9												
30	TCP		50/2.5" 50/1.5"	[Horizontal Hatching]	- a few thin, gray limestone seams from 28' to 29'								650
	A10												

Water Level Surface Dry at ATD
Dry at 0 hrs AD
at

Remarks:



LOG OF BORING NO. PS-2

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: Tony Bosecker, P.E.

Drilled By: GM Enterprises

Rig: CME-55

Sheet 2 of 2

Project No.: PRP05200

Task No.:

Date: 11/04/05

Method: 6" CFA

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 681.5 Total Depth: 40.5 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD									
35	TCP		50/3.3" 50/1.5"									645
40	A11 TCP		50/4.5" 50/1.8"		Total boring depth 40.5 ft.	641.0 40.5						640
45												635
50												630
55												625
60												620
65												615
70												

FREESE AND NICHOLS, INC.

The stratification lines represent approximate strata boundaries. In situ, the transition may be gradual.



LOG OF BORING NO. PS-3

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank
 Project Location: Prosper, Texas
 Logged By: GM Enterprises
 Drilled By: GM Enterprises

Sheet 1 of 1
 Project No.: PRP05200
 Task No.:
 Date: 11/07/05
 Method: 6" CFA

Rig: CME-55

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 683.5 Total Depth: 25.2 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD									
0	U1		4.5+		CLAY (CH/CL), light brown, hard, dry with limestone fragments		14	86	88	59	28	680
	U2		4.5+									
	U3		4.5+									
	U4											
5	U5											
					LIMESTONE, light brown, marly, highly weathered	677.5						
					LIMESTONE, gray, marly, unweathered	6.0						
					LIMESTONE, gray, marly, unweathered	676.5						
					LIMESTONE, gray, marly, unweathered	7.0						
10	TCP		50/1" 50/1.8"		SHALE, gray, unweathered	666.5						675
15	TCP		50/1" 50/0.75"									
					SHALE, gray, unweathered	17.0						
20	TCP		50/2" 50/1"		SHALE, gray, unweathered	666.5						670
25	TCP		50/2" 50/0.75"		SHALE, gray, unweathered	658.3						665
					Total boring depth 25.2 ft.	25.2						

Water Level Surface Dry at ATD
 Dry at 0 hrs AD
 at

Remarks:



LOG OF BORING NO. PS-4

Attachment 3

Item 11.

FREESSE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: Tony Bosecker, P.E. and GM Enterprises

Drilled By: GM Enterprises

Rig: CME-55

Sheet 1 of 1

Project No.: PRP05200

Task No.:

Date: 11/04/05 and 11/07/05

Method: 6" CFA

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 680.5 Total Depth: 30.2 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION	
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD										
0	U1	54	4.5+		CLAY (CH), reddish brown to brown, hard, dry with scattered calcareous nodules - with calcareous veins and nodules from 3'		13		86	53	31	680	
	U2	50											
	U3	58	4.5+										
	U4	75	4.5+					18		95	50	26	
5	U5	63	4.5+										675
	U6	100	4.5+					8.5	16	116	94	49	23
10	U7	83	4.5+										670
					LIMESTONE, light brown, highly weathered, soft, marly	669.5 11.0							
					LIMESTONE, gray, marly, unweathered	667.5 13.0							
15	TCP		50/1" 50/0.5"									665	
					SHALE, gray, unweathered	662.5 18.0							
20	TCP		50/2" 50/1"									660	
25	TCP		50/1.5" 50/1.3"									655	
30	TCP		50/1.8" 50/0.75"		Total boring depth 30.2 ft.	650.3 30.2						650	
35													

Water Level Surface Dry at ATD
Dry at 0 hrs AD
at

Remarks:



LOG OF BORING NO. PS-5

FREESSE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: Tony Bosecker, P.E.

Drilled By: GM Enterprises

Rig: CME-55

Sheet 1 of 2

Project No.: PRP05200

Task No.:

Date: 11/08/05

Method: 8" HSA/NX Core

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 681.8 Total Depth: 44.1 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD									
0	U1	88	4.5+	[Diagonal Hatching]	SILTY CLAY (CH), brown, hard, dry - with light yellowish white, weathered, soft limestone layers from 1' - transition from clay to weathered limestone from 2'-3', parts easily	678.8	10	107	75	52	25	680
	U2	50	4.5+									
	U3	54										
5	TCP		50/5.5" 50/3"	[Horizontal Hatching]	LIMESTONE, light yellowish white, weathered, soft, marly	3.0						675
	A4											
10	TCP		50/.75" 50/2"	[Vertical Hatching]	LIMESTONE, gray, unweathered, marly, soft	10.5						670
	A5		50/1.5" 50/2.5"									
15				[Horizontal Hatching]	SHALE, gray, unweathered, soft - with thin limestone seams (0.25" or less) @ 16.8', 18.1', 19.1', 19.15', 19.33', 20.3', 21.33', 23.5'	14.0	15	120				665
	C6	99	97.5									
20												
25				[Horizontal Hatching]	- with hard, gray sandy limestone seam (0.75" thick) @ 26.2' - with thin limestone seams (0.25" thick or less) @ 26.3', 26.35', 27.0', 27.1', 27.5', 28.1', 28.3', 32.9', 33.3' - 10" thick, light gray limestone seam with a few fossil fragments from 28.5'-29.33' - fossil fragments scattered throughout core run	142.8	10	136				655
	C7	94	93.3									
30												
35				[Horizontal Hatching]								

Water Level Surface Dry at ATD
Dry at 0 hrs AD
at

Remarks:



LOG OF BORING NO. PS-5

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: Tony Bosecker, P.E.

Drilled By: GM Enterprises

Rig: CME-55

Sheet 2 of 2

Project No.: PRP05200

Task No.:

Date: 11/08/05

Method: 8" HSA/NX Core

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 681.8 Total Depth: 44.1 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD									
35					from 34'-44'							645
40	C8	92	86.7		- 0.25" thick partings filled with polished, amber colored ???substance??? @ 37.25' and 43.5' - with thin limestone seams (0.25" thick or less) @ 39.1', 41.1', 41.2', 41.3', 41.4' and 41.7' - with some fine-grained sand partings from 40' to 41.0'	35.9	14	122				640.8 640
					LIMESTONE, gray, unweathered, marly with sand partings and shale seams (1' 2" thick)	28.4	12	130				637.9 637.7 637.7 44.1
45	TCP		50/1.3" 50/0"		SHALE, gray, unweathered							635
					Total boring depth 44.1 ft.							630
50												625
55												620
60												615
65												
70												



LOG OF BORING NO. T-1

Attachment 3

Item 11.

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: GM Enterprises

Drilled By: GM Enterprises

Sheet 1 of 2

Project No.: PRP05200

Task No.:

Date: 11/07/05

Method: 6" CFA

Rig: Mobile B-47

DEPTH, feet	SAMPLE		SYMBOL	Location: Prosper, Texas Surface El.: 677.0 Total Depth: 35.1 feet	MATERIAL DESCRIPTION	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)										
0	U1		4.5+	CLAY (CL), light brown, hard, dry			14		89	44	24	675
	U2		4.5+									
	U3		4.5+									
	U4		4.5+									
5	U5		4.5+									
				670.0	LIMESTONE, light brown, weathered, marly	7.0						670
10	A6 TCP		50/1.5" 50/1"	SHALE, gray, unweathered								665
15	A7 TCP		50/1.5" 50/1"									
20	A8 TCP		50/1.3" 50/0.7"									
				665								
25	A9 TCP		50/1" 50/0.75"									650
30	A10 TCP		50/0.75" 50/0.5"									
												645
35	A11											

Water Level Surface Dry at ATD
Dry at 0 hrs AD
at

Remarks:



LOG OF BORING NO. T-1

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: GM Enterprises

Drilled By: GM Enterprises

Sheet 2 of 2

Project No.: PRP05200

Task No.:

Date: 11/07/05

Method: 6" CFA

Rig: Mobile B-47

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 677.0 Total Depth: 35.1 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD									
35	TCP		50/0.5" 50/0.5"		Total boring depth 35.1 ft.	641.9 35.1						640
40												635
45												630
50												625
55												620
60												615
65												610
70												



LOG OF BORING NO. T-2

FREESE - NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: GM Enterprises

Drilled By: GM Enterprises

Sheet 1 of 1

Project No.: PRP05200

Task No.:

Date: 11/07/05

Method: 6" CFA

Rig: CME-55

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 678.5 Total Depth: 25.2 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD									
0	U1		4.5+		CLAY (CL), light brown, hard, dry with scattered limestone fragments		8		91	49	23	675
	U2		4.5+									
	U3		4.5+									
	U4		4.5+									
5	U5		4.5+									
					672.5							
					LIMESTONE, light brown, weathered with clay seams, marly	6.0						670
10	A6		50/2.5"		SHALE, gray, unweathered							665
	TCP		50/1.5"									
15	A7		50/1.5"									
	TCP		50/1"									660
20	A8		50/2"									655
	TCP		50/1"									
25	A9		50/1.8"		Total boring depth 25.2 ft.	25.2						650
	TCP		50/1"									
30												645
35												

Water Level Surface Dry at ATD
Dry at 0 hrs AD
at

Remarks:



LOG OF BORING NO. T-3

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: GM Enterprises

Drilled By: GM Enterprises

Sheet 1 of 2

Project No.: PRP05200

Task No.:

Date: 11/07/05

Method: 6" CFA

Rig: CME-55

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 675.3 Total Depth: 35.2 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD									
0	U1		4.5+	[Hatched Pattern]	CLAY (CH/CL), dark brown to light brown, hard, dry with scattered calcareous nodules	6.7	15	111	90	47	19	675
	U2		4.5+									
	U3		4.5+									
	U4		4.5+									
	U5		4.5+									
5												
	U6		4.5+									
	U7		4.0	- with gray clayey shale seams	660.3	15.0					665	
10												
	U8		4.5	[Horizontal Line Pattern]	SHALE, gray, unweathered							660
15												
	A9		50/2.8"	[Vertical Line Pattern]								655
20	TCP		50/1.5"									
	A10		50/2.3"									
25	TCP		50/1.2"									650
	A11		50/1.5"									
30	TCP		50/1"									645
35	A12											

Water Level Surface Dry at ATD
Dry at 0 hrs AD
at

Remarks:



LOG OF BORING NO. T-3

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: GM Enterprises

Drilled By: GM Enterprises

Sheet 2 of 2

Project No.: PRP05200

Task No.:

Date: 11/07/05

Method: 6" CFA

Rig: CME-55

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 675.3 Total Depth: 35.2 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD									
35	TCP		50/1.2" 50/1"		Total boring depth 35.2 ft.	640.1 35.2						640
40												635
45												630
50												625
55												620
60												615
65												610
70												



FREESE • NICHOLS

LOG OF BORING NO. T-4

Attachment 3

Item 11.

Project Description: Pump Station and Ground Storage Tank
 Project Location: Prosper, Texas
 Logged By: Tony Bosecker, P.E.
 Drilled By: GM Enterprises

Rig: CME-55

Sheet 1 of 2
 Project No.: PRP05200
 Task No.:
 Date: 11/08/05
 Method: 8" HSA/NX Core

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 676.7 Total Depth: 35.1 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION	
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD										
0	U1	88	4.5+	[Diagonal Hatching]	CLAY (CL/CH), dark brown to brown, hard, dry with scattered calcareous nodules (increasing with depth)	3.8	15	99	83	47	23	675	
	U2	54											
	U3	58	4.5+										
	U4	75	4.5+										
5	U5	46											
	U6	100	4.5+	- with weathered clayey shale-shaly clay, light yellowish white	7.5	16	110	89	52	22	670		
					667.7								
10	U7	83		[Diagonal Hatching]	CLAYEY SHALE-SHALY CLAY (CH), light yellowish white and light brown, weathered	9.0	7.3	16	110	94	51	22	
					665.7								
				[Horizontal Hatching]	SHALE, gray, unweathered, soft with a few scattered fossils	11.0						665	
15	TCP		50/2.8" 50/1.7"	[Horizontal Hatching]		20.9	16	120				660	
20	C8	100	91	[Horizontal Hatching]									
				[Brick Pattern]	LIMESTONE, light gray, unweathered, marly, soft	22.0						655	
				[Horizontal Hatching]	SHALE, gray, unweathered, soft	23.5	47.4	13	127				
25				[Horizontal Hatching]								650	
30	C9	100	100	[Horizontal Hatching]		34.5	13	128				645	
35													

Water Level Surface at
at
at

Remarks:



LOG OF BORING NO. T-4

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank
 Project Location: Prosper, Texas
 Logged By: Tony Bosecker, P.E.
 Drilled By: GM Enterprises

Sheet 2 of 2
 Project No.: PRP05200
 Task No.:
 Date: 11/08/05
 Method: 8" HSA/NX Core

Rig: CME-55

DEPTH, feet	SAMPLE		SYMBOL	Location: Prosper, Texas Surface El.: 676.7 Total Depth: 35.1 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%) RESISTANCE pp (TSF) RQD									
35	TCP	50/0.5" 50/25"		Total boring depth 35.1 ft.	641.6 35.1						640
40											635
45											630
50											625
55											620
60											615
65											610
70											



LOG OF BORING NO. T2-1

FREESE • NICHOLS

Project Description: Pump Station and Ground Storage Tank

Project Location: Prosper, Texas

Logged By: Tony Bosecker, P.E.

Drilled By: GM Enterprises

Rig: CME-55

Sheet 1 of 1

Project No.: PRP05200

Task No.:

Date: 11/09/05

Method: 6" CFA

DEPTH, feet	SAMPLE			SYMBOL	Location: Prosper, Texas Surface El.: 672.1 Total Depth: 20.2 feet	UNC. COMPRESSIVE STRENGTH (tsf)	WATER CONTENT, %	UNIT DRY WEIGHT, lb/ft ³	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	ELEVATION
	TYPE	RECOVERY (%)	RESISTANCE pp (TSF) RQD									
0					CLAY (CL/CH), dark brown, dry							670
5					CLAY (CL/CH), light brown, moist	666.1						665
10						660.1						660
15					LIMESTONE, light brown, highly weathered, soft	12.0						660
20					SHALE, gray, unweathered, soft	16.0						655
20	TCP	50/2"	50/1"		Total boring depth 20.2 ft.	651.9						650
20.2						20.2						650
25												645
30												640
35												640

Water Level Surface Dry at ATD
Dry at 0 hrs AD
at

Remarks:

BORING LOG LEGEND AND NOMENCLATURE

Abbreviations

U – Undisturbed Sample (tube)	SPT – Standard Penetration Test	NT – Not Testable
A – Auger Sample	TCP – Texas Cone Penetration	NP – Non Plastic
CS – Continuous Sample	CFA – Continuous Flight Auger	ATD – At Time of Drilling
C – Rock Core	HSA – Hollow Stem Auger	AD – After Drilling

General Terms

Term	Description
Blow Counts	Results from either the Standard Penetration Test (SPT) or the Texas Cone Penetration Test (TCP) test.
Recovery	Length of sample or core recovered divided by the total length pushed, driven, or cored (expressed as a %)
Rock Quality Designation (RQD)	Cumulative length of unfractured pieces of core material more than 4 inches in length divided by the total length of material cored (expressed as a percentage)

Consistency of Cohesive Soil

Description	Comp. Strength, tsf	SPT Blows	TCP Blows	Criteria
Very Soft	< 0.25	0 – 2	0 – 8	Sample sags under its own weight and is easily deformed
Soft	≥ 0.25 – < 0.5	> 2 – 4	> 8 – 20	Easily pinched between fingers and remolded with light finger pressure
Medium Stiff	≥ 0.5 – < 1.0	> 4 – 8	N/A for TxDOT	Imprinted easily with fingers and remolded with firm finger pressure
Stiff	≥ 1.0 – < 2.0	> 8 – 15	> 20 – 40	Imprinted with strong finger pressure or indented easily with fingernail
Very Stiff	≥ 2.0 – < 4.0	> 15 – 30	> 40 to 80	Light imprint from finger or light indent with fingernail
Hard	≥ 4.0	> 30	> 80	Difficult to indent with fingernail

Apparent Density of Cohesionless Soil

Description	SPT Blow Count	Texas Cone Blow Count
Very Loose	0 – 4	0 – 8
Loose	> 4 – 10	> 8 – 20
Medium Dense	> 10 – 30	> 20 to 80
Dense	> 30 – 50	80 to ≥ 5"
Very Dense	> 50	0" to < 5"

Soil Structure

Description	Criteria
Stratified	Alternating layers of varying material/color with layers ≥ 1/4-inch thick
Laminated	Alternating layers of varying material/color with layers < 1/4-inch thick
Fissured	Breaks along definite planes with little resistance
Slickensided	Fracture planes appear polished or glossy; shows movement direction
Blocky	Cohesive soil that can be broken into small, angular lumps
Lensed	Inclusion of small pockets of soil that is different from dominant type
Homogeneous	Same color and appearance throughout

Moisture Condition

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water

Textural Adjectives

Textural Item	Description
Pit	Pinhole sized openings
Vug	Small openings up to 4 inches in size
Cavity	Opening larger than 4 inches
Honeycomb	Numerous and grouped pits and vugs
Vesicle	Small openings in volcanic rocks

BORING LOG LEGEND AND NOMENCLATURE

Rock Hardness Descriptors

Grade	Approx. Comp. Strength, tsf	Approx. TCP Range	Field Test
Very So	< 10 - 100	>6"	Can be peeled with pocket knife, crumbles under firm blows of geological hammer
So	100 - 500	4" - 6"	Can be peeled with pocket knife with difficulty, indented by firm blows of geological hammer
Hard	500 - 1000	1" - 5"	Cannot be peeled with pocket knife, can be fractured by single firm blow of hammer
Very Hard	1000 - 2000	0" - 2"	Specimen requires more than one blow of geological hammer to fracture it
Extremely Hard	> 2000	0"	Specimen requires many blows of geological hammer to fracture it











Degree of Rock Weathering

Description	Criteria
Unweathered	No evidence of chemical or mechanical alteration
Slightly Weathered	Slight discoloration of surface or discontinuities; < 10% volume altered
Weathered	Discoloring evident; 10 to 50% of volume altered
Highly Weathered	Entire mass discolored; alteration through majority of rock
Decomposed	Rock reduced to soil consistency with some rock-like texture







Rock Bedding Structure

Description	Criteria
Laminated	< 3/8 inch
Very Thinly Bedded	3/8—1 inch
Thinly Bedded	1 inch—4 inches
Moderately Bedded	4 inches—1 foot
Thickly Bedded	1 foot—3 feet
Very Thickly Bedded	3—10 feet
Massive	> 10 feet

Soil Column Graphic Symbols*

Graphic	Represented Soil Types	Graphic	Represented Soil Types
	Fat Clay, Fat Clay with sand, Sandy Fat Clay		Well-Graded Sand or Poorly-Graded Sand; little to no fines
	Lean Clay, Lean Clay with sand, Sandy Lean Clay, Silty Clay		Clayey Gravel, Gravel-Sand-Clay Mixtures
	Inorganic Silt and Organic Silt		Silty Gravel, Gravel-Sand-Silt Mixtures
	Clayey Sand, Clay-Sand Mixtures		Well-Graded Gravel or Poorly-Graded Gravel; little to no fines
	Silty Sands, Sand-Silt Mixtures		Fill with Significant Debris or Deleterious Material

Rock Column Graphic Symbols*

Graphic	Represented Rock Types	Graphic	Represented Rock Types
	Limestone, Shaly/Marly Limestone, Limestone with Shale		Marl, Marl with Limestone, Marl with Shale
	Shale, Shale with Limestone		Sandstone, Shaly Sandstone, Sandstone with Shale
	Mudstone		Generic Bedrock Symbol

* Combined graphics may be used for dual classifications. Not all graphics represented. Refer to lithology description for soil classification or rock type.

ATTACHMENT 3
Laboratory Test Results

SUMMARY OF LABORATORY RESULTS

Attachment 3

Item 11.

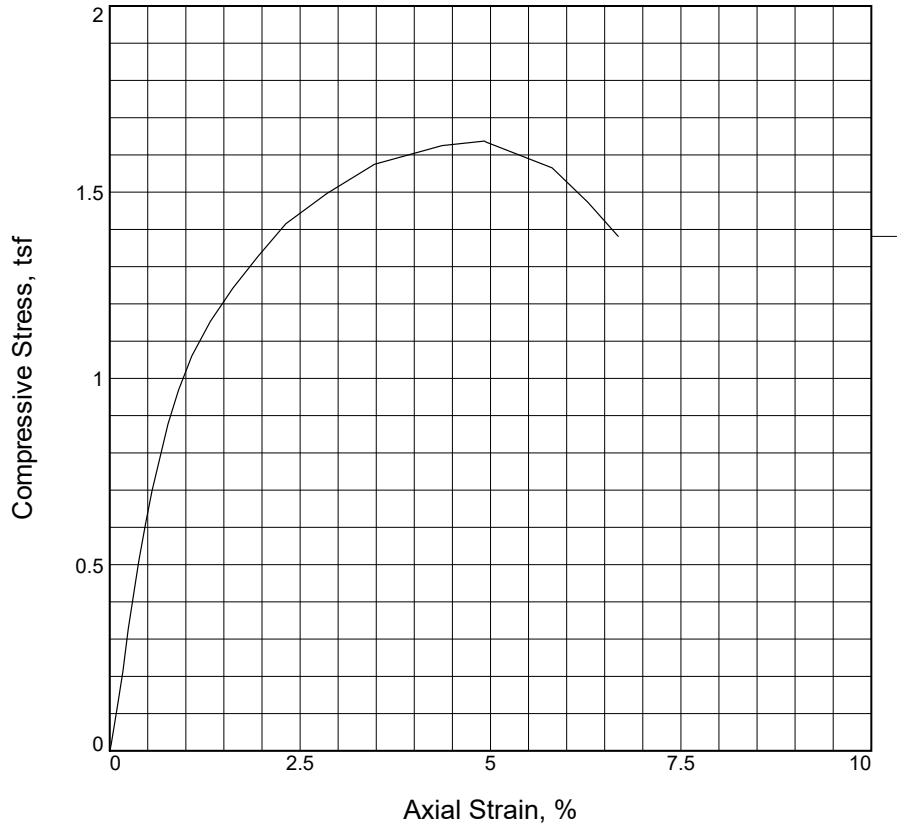
PAGE 1 OF 1

PROJECT NAME Custer Road Meter Station Relocation
 PROJECT NUMBER PRP18708
 PROJECT PHASE ***
PROJECT LOCATION Prosper, Texas
 TESTING PERFORMED BY: Gorrondonga and Associates

Borehole	Depth, ft	Water Content, %	Unit Dry Weight lb/ft ³	% Passing No. 200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index	Unconfined Compressive Strength, tsf	Strain at Failure, %
B-01	2.0	26.9	97.3	98	66	20	46	1.6	4.9
B-01	8.0	28.5	94.8	98	64	21	43	1.2	3.9
B-01	13.0	21.9	104.0						
B-02	0.0	22.3	104.0	79	50	24	26	2.4	7.1
B-02	8.0	24.9	100.1	92	54	21	33	1.7	15.5

LAB SUMMARY - FNI ROCK LOG.GDT - 8/8/19 11:58 - T:\GEO\3_FIELD EXPLORATION\04_LOGS & GINT\PRP18708_GINT.GPJ

UNCONFINED COMPRESSION TEST



Sample No.	1		
Unconfined strength, tsf	1.637		
Undrained shear strength, tsf	0.819		
Failure strain, %	4.9		
Strain rate, %/min.	1.00		
Water content, %	26.9		
Wet density, pcf	122.5		
Dry density, pcf	96.6		
Saturation, %	N/A		
Void ratio	N/A		
Specimen diameter, in.	2.76		
Specimen height, in.	5.75		
Height/diameter ratio	2.08		

Description:

LL = 67

PL = 20

PI = 47

GS=

Type: Shelby Tube

Project No.: PRP18708

Date Sampled: 05/17/2019

Remarks:
Bulge Failure

Client: Freese & Nichols, Inc.

Project: Custer Road Meter Vault Relocation

Location: B-01

Sample Number: U-2 **Depth:** (2.0-4.0) ft.

UNCONFINED COMPRESSION TEST

Gorrondona & Associates, Inc.

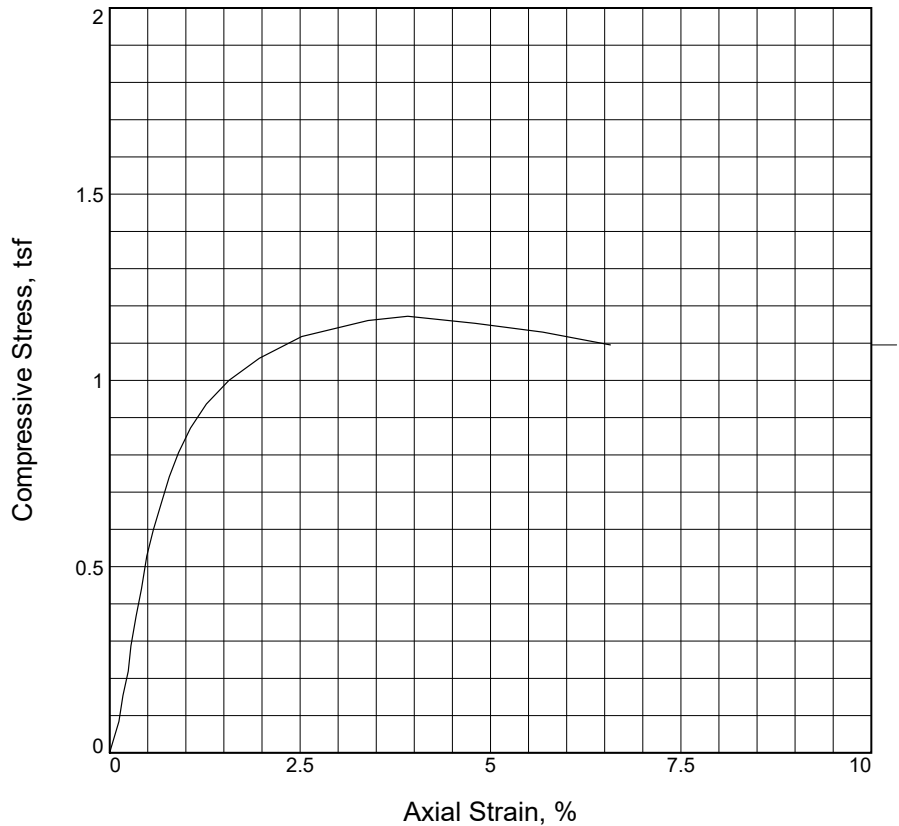
Houston, Texas

Figure _____

 Tested By: KC

 Checked By: SS

UNCONFINED COMPRESSION TEST



Sample No.	1		
Unconfined strength, tsf	1.172		
Undrained shear strength, tsf	0.586		
Failure strain, %	3.9		
Strain rate, %/min.	1.00		
Water content, %	28.5		
Wet density, pcf	121.8		
Dry density, pcf	94.8		
Saturation, %	N/A		
Void ratio	N/A		
Specimen diameter, in.	2.74		
Specimen height, in.	5.75		
Height/diameter ratio	2.10		

Description:

LL = 65

PL = 21

PI = 44

GS=

Type: Shelby Tube

Project No.: PRP18708

Date Sampled: 05/17/2019

Remarks:

Bulge Failure

Client: Freese & Nichols, Inc.

Project: Custer Road Meter Vault Relocation

Location: B-01

Sample Number: U-5 Depth: (8.0-10.0) ft.

UNCONFINED COMPRESSION TEST

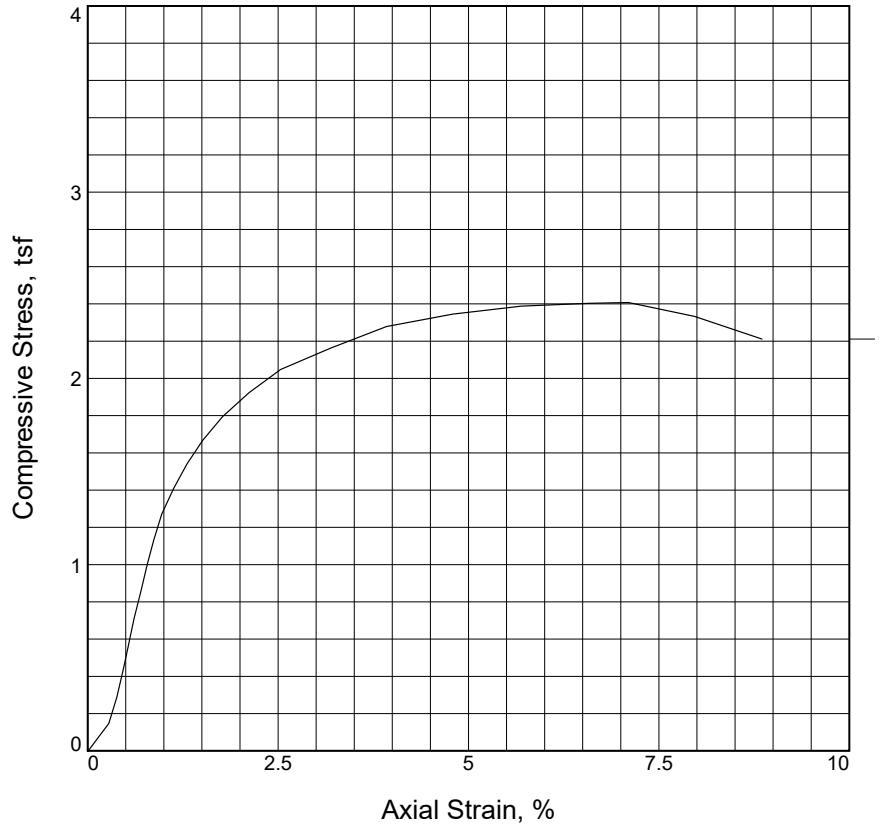
Gorrodona & Associates, Inc.

Houston, Texas

Figure _____

Tested By: KCChecked By: SS

UNCONFINED COMPRESSION TEST



Sample No.	1		
Unconfined strength, tsf	2.408		
Undrained shear strength, tsf	1.204		
Failure strain, %	7.1		
Strain rate, %/min.	1.00		
Water content, %	22.3		
Wet density, pcf	125.4		
Dry density, pcf	102.5		
Saturation, %	N/A		
Void ratio	N/A		
Specimen diameter, in.	2.74		
Specimen height, in.	5.76		
Height/diameter ratio	2.10		

Description:

LL = 50

PL = 24

PI = 26

GS=

Type: Shelby Tube

Project No.: PRP18708

Date Sampled: 05/17/2019

Remarks:
Bulge Failure

Client: Freese & Nichols, Inc.

Project: Custer Road Meter Vault Relocation

Location: B-02

Sample Number: U-1 Depth: (0-2.0) ft.

UNCONFINED COMPRESSION TEST

Gorrodona & Associates, Inc.

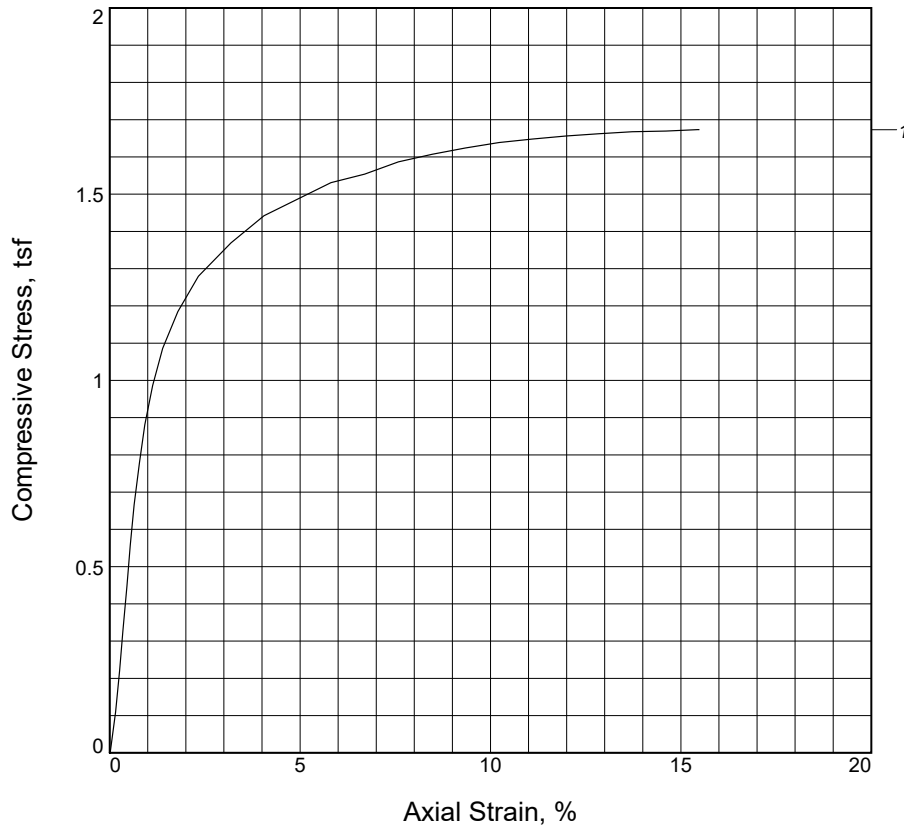
Houston, Texas

Figure _____

Tested By: KC

Checked By: SS

UNCONFINED COMPRESSION TEST



Sample No.	1		
Unconfined strength, tsf	1.673		
Undrained shear strength, tsf	0.837		
Failure strain, %	15.5		
Strain rate, %/min.	1.00		
Water content, %	24.9		
Wet density, pcf	126.8		
Dry density, pcf	101.5		
Saturation, %	N/A		
Void ratio	N/A		
Specimen diameter, in.	2.74		
Specimen height, in.	5.75		
Height/diameter ratio	2.10		

Description:

LL = 54

PL = 21

PI = 33

GS=

Type: Shelby Tube

Project No.: PRP18708

Date Sampled: 05/17/2019

Remarks:

Bulge Failure

Client: Freese & Nichols, Inc.

Project: Custer Road Meter Vault Relocation

Location: B-02

Sample Number: U-5 Depth: (8.0-10.0) ft.

UNCONFINED COMPRESSION TEST

Gorrodona & Associates, Inc.

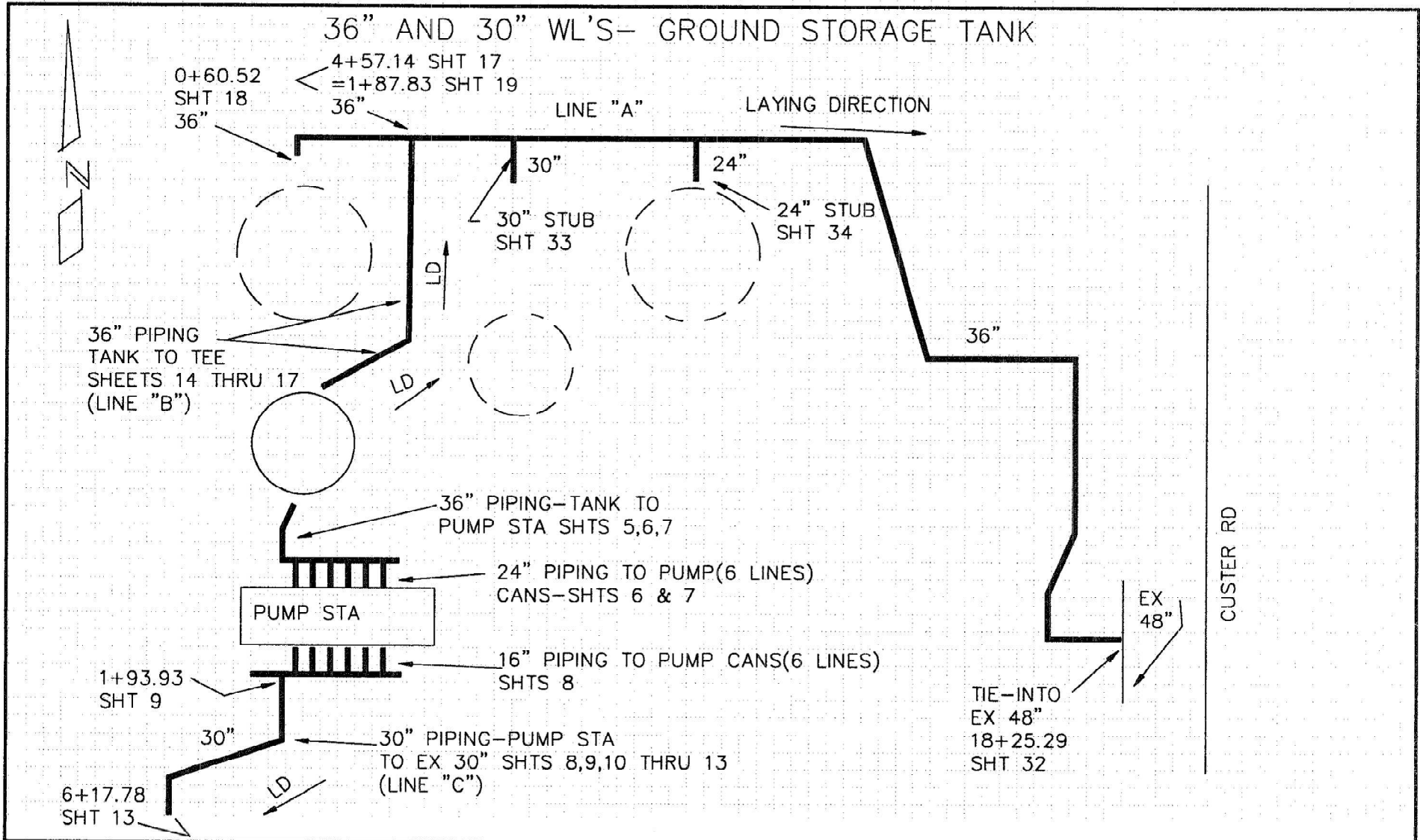
Houston, Texas

Figure _____

Tested By: KCChecked By: SS

APPENDIX C

LAY DRAWINGS



REV.	BY	DATE	REVISION	DRAWN BY: CE	ORIENTATION PROSPER, TEXAS	GIFFORD-HILL-AMERICAN, INC.		
				CHECKED:		DWG. NO. 06-041B	SHT.	Page 911
				DATE:				

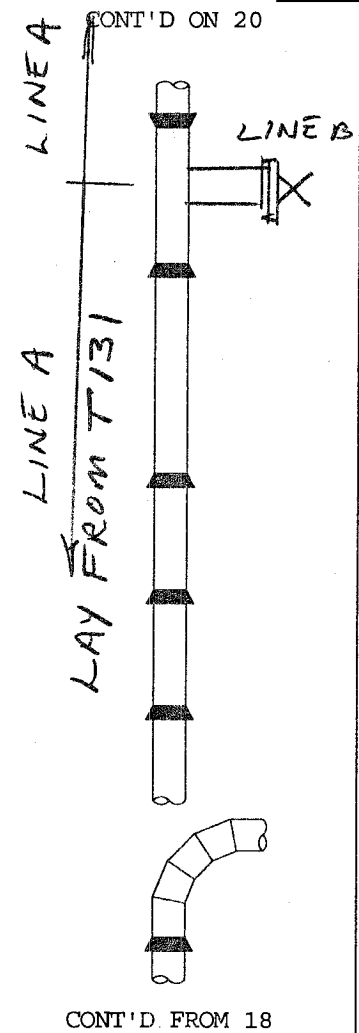
May 23, 2006

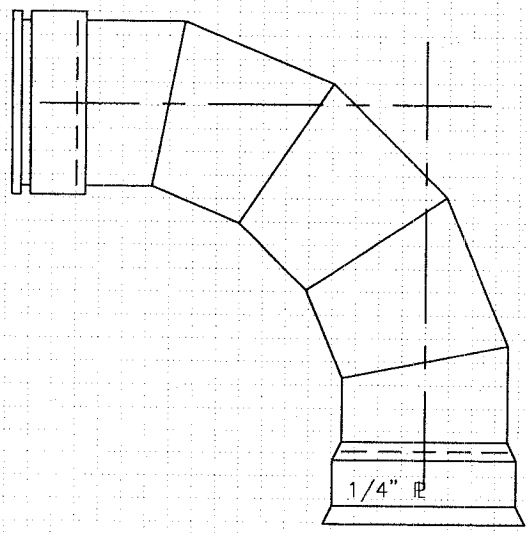
CONT'D ON 19

PIECE NO.	QTY	DESCRIPTION	DET SHT	SPL HPL	TOP STATION (Ft)	DEFLECTION DATA	SLOPE TANGENT	TOP ELEV (Ft)	PLAN READ UP
A 135	1	CLASS 150 36" ADAPTOR FLG/BS W/ 2" TO		031	1.07 1.07			0+96.00 667.00	
---	---	36" BF VALVE (BY OTHERS)			1.00 1.00			0+94.93 667.00	
A 134	1	CLASS 150 36" ADAPTOR FLG/BB W/ 2" TO		034	1.41 1.41			0+93.93 667.00	
133	1	CLASS 150 B303 SPC HBB/BS			32.00 32.00			0+92.52 667.00	
DP 132	1	CLASS 150 36" DH HBS/ PLUG W/ 2" TO		037	0.01 0.01	0.00° 0.0000		0+60.52 667.00	
		LINE A						0+60.51 667.00	
					NOTE: WELD ALL JOINTS PER 3A.				
					NOTE: READ UP				
					DRAWN: CAE CHK BY: DATE: 5-18-06				
					HANSON Pipe & Products, Inc.				
NO.	BY	DATE	REVISION		PROSPER, TEXAS		PROJECT: 06-041B	SHEET: 18	

REVIEW COPY
NOT FOR FABRICATION
May 23, 2006

PIECE NO.	QTY	DESCRIPTION	DET SHT	SPL HPL	TOP STATION (Ft)	DEFLECTION DATA	SLOPE TANGENT	TOP ELEV (Ft)	PLAN READ UP	
		CLASS 150 SEE T131 SHEET 17		7.00 7.00		1+91.31 PULL VPI= 1+91.31 0.39°Dn (0.92°Dn)	-0.00° 0.0001	665.00 (665.00)		
BX 139	1	CLASS 150 36" B303 BS/BB SHORT BEVL SPIG 1.00		D ₁ D ₇ 16.29 16.29		T = 1 + 87.83 A = 4 + 57.14 B 1+84.33 B&P VPI= 1+84.31 1.36°Up (1.36°Up)	-1.36° 0.0237	665.00 (665.00)		
138	1	CLASS 150 36" B303 STD BB/BS		32.00 31.99		1+68.02		665.39		
137	1	CLASS 150 36" B303 STD BB/BS		32.00 31.99		1+36.03		666.15		
B 136	1	CLASS 150 36" B303 4-CUT BEND 90.00° BB/BS		D ₄ 4.04 4.04 4.00 4.00		1+04.04 CPI= 1+00.00 90.00°Rt 1.36°Dn 90.00°Cb	-1.36° 0.0237 0.00° 0.0000	666.90 667.00		
		LINE A (CONT'D)								
NOTE: WELD ALL JOINTS PER 3A.										
NOTE: READ UP										
DRAWN: CAE CHK BY:					HANSON Pipe & Products, Inc.					
NO.	BY	DATE	REVISION	DATE: 5-18-06	PROSPER, TEXAS	PROJECT: 06-041B	SHEET: 19			





PC. NO. B136	ID= 36"	OD CYL= 37 7/8"	ANGLE= 90.00°	FULL CUTS= 4	TYPE 3
RADIUS= 45.00"	TANGENT= 45.00"	PLATE= 5/16"	CUT ANGLE= 11.250°	OVERALL CAN LENGTH= 73 1/16"	
LEG1	LEG2	DISTANCE AROUND CIR.		DISTANCE FROM END TO EA. CUT	
LL= 4.04'	LL= 4.00'	CUT1	CUT2	CUT3	CUT4
X= 2.98"	Y= -1.50"	1) 0"	15 11/16"	26 1/16"	51 1/2"
BEVEL=	BEVEL=	2) 14 7/8"	14 5/8"	27 3/16"	50 3/8"
JOINT TYPE: P-303 SPIG	JOINT TYPE: P-303 BELL	3) 29 3/4"	11 15/16"	29 13/16"	47 3/4"
LENGTH= 3 3/4"	LENGTH= 4 1/2"	4) 44 5/8"	9 1/4"	32 1/2"	45 1/16"
BACKUP RING:	BACKUP RING:	5) 59 1/2"	8 3/16"	33 5/8"	43 15/16"
RING ID=	RING ID=				61 7/8"
RING OD=	RING OD=				63"
CHECK LENGTH= 51 3/4"	CHECK LENGTH= 48"				65 5/8"
					68 5/16"
					69 3/8"



2020-62-B Addendum 1
Wilson Contractor Services
Supplier Response

Event Information

Number: 2020-62-B Addendum 1
Title: Custer Road Pump Station Meter Vault Relocation
Type: Request for Bids
Issue Date: 5/20/2020
Deadline: 6/5/2020 02:00 PM (CT)
Notes: **Engineer's Estimate for this project: \$2,694,200 (including allowances)**

The Town of Prosper is accepting competitive sealed bids for **BID NO. 2020-62-B CUSTER ROAD PUMP STATION METER VAULT RELOCATION**. Bids will be accepted online through IonWave.net, the Town's e-procurement system, or in hard copy in the Purchasing Office located in the 3rd Floor Finance Suite of Town Hall, 250 W. First St., Prosper, Texas 75078 until **2:00 P.M. on Friday, June 5, 2020**. Any bids received after this time will not be accepted and will be returned unopened. **The bid opening will be held online on Friday, June 5, 2020 @ 2:30 P.M.** To participate in the bid opening, please use the following:

Join Zoom Meeting: <https://us02web.zoom.us/j/87609450087>
Meeting ID: 876 0945 0087
Dial-in any of these numbers: +1 929 436 2866, +1 312 626 6799, +1 669 900 6833, +1 253 215 8782,
+1 301 715 8592 or +1 346 248 7799

The Project consists of furnishing all labor, equipment and materials (except as otherwise specified), and performing all work necessary for the construction of constructing a new meter vault with associated electrical, mechanical and piping, relocating the existing 16-inch sleeve valve, removal of the existing meter vault and piping along Custer Road and approximately 1,100 linear foot of 42-inch Bar-wrapped Concrete Cylinder pipe.

Each bid submitted shall be accompanied by a cashier's check in the amount of 5% of the maximum amount bid, payable without recourse to the Town of Prosper, or a Bid Bond in the same amount from a reliable surety company as a guarantee that, if awarded the contract, the successful Contractor will execute a Construction Agreement with the Town, including all required bonds and other documents.

The successful Contractor shall furnish a Performance Bond in the amount of 115% of the contract amount, and a Payment Bond in the amount of 100% of the contract amount, as well as evidence of all required insurance coverage within ten (10) calendar days of notice of award. The successful Contractor shall also furnish a Maintenance Bond in the amount of 100% of the contract amount covering defects of material and workmanship for two calendar years following the Town's approval and acceptance of the construction. An approved surety company, licensed in the State of Texas, shall issue all bonds in accordance with Texas law.

Copies of Plans, Specifications, and Contract Documents may be examined at Town of Prosper Engineering Department, 250 W. First Street, Prosper, Texas, 75078, Phone: (972) 569-1198 without charge. These documents may be acquired from that office for the non-refundable purchase price of \$50.00 per set, payable to the Town of Prosper. Copies of Plans, Specifications, and Contract Documents may also be downloaded free of charge from Current Bidding Opportunities, at the following link:
<http://www.prospertx.gov/business/bid-opportunities/>.

Questions and requests for clarifications in regards to this bid should be submitted in writing through IonWave.net, the Town's e-procurement system, or emailed directly to January Cook, CPPO, CPPB, Purchasing Manager, at january_cook@prospertx.gov. The deadline for receipt of questions and requests for clarifications is **12:00 P.M. on Friday, May 29, 2020**. After that day and time, no further questions or requests for clarifications will be accepted or answered by the Engineer or Town.

If you are downloading plans, please complete and submit the Planholder Registration Form to be placed on the official Planholder List.

Attachment 3

Item 11.

Contact Information

Contact: January Cook Purchasing Manager

Address: Purchasing Office

Town Hall

3rd Floor

250 W. First St.

P.O. Box 307

Prosper, TX 75078

Phone: (972) 569-1018

Email: january_cook@prospertx.gov

Wilson Contractor Services Information

Contact: Tony Martinez
Address: 3985 Mingo Rd
Denton, TX 76208
Phone: (940) 243-1174
Email: Tony@WilsonContractorServices.Com

By submitting your response, you certify that you are authorized to represent and bind your company.

Tony Martinez

Signature
Submitted at 6/5/2020 1:44:45 PM

tony@wilsoncontractorservices.com

Email

Requested Attachments

Bid Bond	WCS Custer Rd Mtr Vault Rel Bid Bond .pdf
Completed Projects and References Worksheet	WCS Current and Completed Projects.pdf
Resumes for Key Personnel	Key Personnel Qualification.pdf
Copy of Actual Project Schedule Used During Construction	WCS Custer Rd Mtr Vault Rel Schedule .pdf
Conflict of Interest Form	Conflict of Interest Questionnaire WCS .pdf
Only if applicable	
Out of State Contractor Compliance Form	No response
Only if applicable	

Bid Attributes

- Bid Proposal Condition No. 1**

The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with Owner in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.
- Bid Proposal Condition No. 2**

Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those terms and conditions dealing with the disposition of Bid guaranty. This Bid will remain subject to acceptance for 90 calendar days after the day of opening Bids. Bidder will sign and submit the Agreement with the Bonds and other documents required by the Contract Documents within ten (10) calendar days after the date of Owner's Notice of Award.
- Bid Proposal Condition No. 3**

The right is reserved, as the interest of the Owner may require, to reject any and all Bids and to waive any informality in the Bids received.

4 Bid Proposal Condition No. 4 Attachment 3 Item 11.
Bidder has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance or furnishing of the Work.
 I Agree

5 Bid Proposal Condition No. 5
Bidder has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests and studies that pertain to the subsurface or physical conditions at the site or which otherwise may affect the cost, progress, performance or furnishing of the Work as Bidder considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, and no additional examinations, investigations, explorations, tests, reports or similar information or data are or will be required by Bidder for such purposes.
 I Agree

6 Bid Proposal Condition No. 6
Bidder has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports or similar information or data in respect of said Underground Facilities are or will be required by the Bidder in order to perform and furnish the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents.
 I Agree

7 Bid Proposal Condition No. 7
Bidder has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
 I Agree

8 Bid Proposal Condition No. 8
Bidder has given Engineer written notice of all conflicts, errors or discrepancies that it has discovered, if any, in the Contract Documents and the written resolution thereof by Engineer is acceptable to Bidder.
 I Agree

9 Bid Proposal Condition No. 9
This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm or corporation to refrain from submitting a Bid; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.
 I Agree

10 Bid Proposal Condition No. 10 (PROJECT SPECIFIC)
Bidder will substantially complete the Work for the price(s) shown in the schedule of bid items and within **150 calendar days based on date of Notice to Proceed.**
 I Agree

1
1 **Bid Proposal Condition No. 11 (PROJECT SPECIFIC)**
Bidder hereby agrees to commence work within ten (10) days after the date written notice to proceed shall have been given to him, and to substantially complete the work on which he has bid within **150 calendar days** as part of this Proposal. Within 30 additional calendar days after Substantial Completion, all outstanding issues shall be addressed and ready for final payment. All such time restrictions are subject to such extensions of time as are provided by the General Provisions and Special Conditions.

1
2 **Bid Proposal Condition No. 12**
Bidder agrees that the implementation of the Owner's right to delete any portion of the improvements shall not be considered as waiving or invalidating any conditions or provisions of the contract or bonds. Bidder shall perform the Work as altered and no allowances shall be made for anticipated profits.

1
3 **Bid Proposal Condition No. 13**
Since the Work on this Project is being performed for a governmental body and function, the Owner will issue to the Contractor a certificate of exemption for payment for the State Sales TAX on materials incorporated into this Project if requested.

1
4 **Bid Proposal Condition No. 14**
In the event of the award of a contract, vendor will furnish a Performance Bond for 115% of the contract amount, and a Payment Bond for 100% of the contract amount, to secure proper compliance with the terms and provisions of the contract with sureties offered by **surety company named in the space provided**, to insure and guarantee the work until final completion and acceptance, and to guarantee payment of all lawful claims for labor performed and materials furnished in the fulfillment of the contract. **In addition, the undersigned will furnish a Maintenance Bond for 100% of the contract amount covering defects of material and workmanship for two calendar years following the Owner's approval and acceptance of the construction.**

1
5 **Bid Proposal Condition No. 15**
The work, proposed to be done, shall be accepted when fully completed in accordance with the plans and specifications, to the satisfaction of the Engineer and the Owner.

1
6 **Bid Proposal Condition No. 16**
The vendor submitting this Bid certifies that the bid prices contained in this Bid have been carefully checked and are submitted as correct and final.

1
7 **Base Bid**
Cost of Materials

1
8 **Base Bid**
Cost of Labor, Profit, etc.

19 Addendum No. 1
Bidder has examined copies of all the Contract Documents and of the following Addenda (if issued)

20 Addendum No. 2
Bidder has examined copies of all the Contract Documents and of the following Addenda (if issued)

21 Addendum No. 3
Bidder has examined copies of all the Contract Documents and of the following Addenda (if issued)

22 Addendum No. 4
Bidder has examined copies of all the Contract Documents and of the following Addenda (if issued)

23 Addendum No. 5
Bidder has examined copies of all the Contract Documents and of the following Addenda (if issued)

24 Subcontractor 1 - Name
Each Bidder shall include a list of proposed subcontractors, the type of work to be completed by each such subcontractor and the approximate percentage of contract labor to be completed by each subcontractor. If complete listing of subcontracts totals more than five, please attach such additional pages as may be required. Owner reserves the right to accept or reject any subcontracts and/or amount subcontracted that it deems to be objectionable.

25 Subcontractor 1 - Type of Work

26 Subcontractor 1 - % of Work

27 Subcontractor 2 - Name

28 Subcontractor 2 - Type of Work

29 Subcontractor 2 - % of Work

30 Subcontractor 3 - Name

31 Subcontractor 3 - Type of Work

3 2	Subcontractor 3 - % of Work <input style="width: 100%;" type="text" value="No response"/>
--------	---

3 3	Subcontractor 4 - Name <input style="width: 100%;" type="text" value="No response"/>
--------	--

3 4	Subcontractor 4 - Type of Work <input style="width: 100%;" type="text" value="No response"/>
--------	--

3 5	Subcontractor 4 - % of Work <input style="width: 100%;" type="text" value="No response"/>
--------	---

3 6	Subcontractor 5 - Name <input style="width: 100%;" type="text" value="No response"/>
--------	--

3 7	Subcontractor 5 - Type of Work <input style="width: 100%;" type="text" value="No response"/>
--------	--

3 8	Subcontractor 5 - % of Work <input style="width: 100%;" type="text" value="No response"/>
--------	---

3 9	Supplier 1 - Name Each Bidder shall include a list of proposed suppliers of major materials and equipment to be furnished and installed in connection with this Bid. If complete listing of suppliers totals more than five, please attach such additional pages as may be required. <input style="width: 100%;" type="text" value="No response"/>
--------	---

4 0	Supplier 1 - Type of Material/Equipment <input style="width: 100%;" type="text" value="No response"/>
--------	---

4 1	Supplier 2 - Name <input style="width: 100%;" type="text" value="No response"/>
--------	---

4 2	Supplier 2 - Type of Material/Equipment <input style="width: 100%;" type="text" value="No response"/>
--------	---

4 3	Supplier 3 - Name <input style="width: 100%;" type="text" value="No response"/>
--------	---

4 4	Supplier 3 - Type of Material/Equipment <input style="width: 100%;" type="text" value="No response"/>
--------	---

4 5	Supplier 4 - Name <input style="width: 100%;" type="text" value="No response"/>
--------	---

4 6	Supplier 4 - Type of Material/Equipment <input style="width: 100%;" type="text" value="No response"/>
--------	---

4 7	Supplier 5 - Name	Attachment 3	Item 11.
	No response		

4 8	Supplier 5 - Type of Material/Equipment
	No response

4 9	Project Timeline: Substantial Completion
	Provide total number of calendar days from project start date to reach substantial completion of construction <input style="width: 100px;" type="text" value="150"/>

5 0	Project Timeline: Final Completion
	Provide total number of calendar days from project start date to reach final completion of all construction <input style="width: 100px;" type="text" value="180"/>

Bid Lines

1	Package Header		
	Base Bid (A)		
	Quantity: <u> 1 </u>	Total:	\$3,401,513.33
	Package Items		
	1.1 Mobilization (Not to exceed 3% of Total Project Cost)		
	Quantity: <u> 1 </u> UOM: <u> LS </u>	Unit Price: <input style="width: 100px;" type="text" value="\$96,050.40"/>	Total: <input style="width: 100px;" type="text" value="\$96,050.40"/>
	1.2 Meter Vault Facility		
	Quantity: <u> 1 </u> UOM: <u> LS </u>	Unit Price: <input style="width: 100px;" type="text" value="\$1,324,313.04"/>	Total: <input style="width: 100px;" type="text" value="\$1,324,313.04"/>
	1.3 Removal of Existing 36-in Pipeline		
	Quantity: <u> 490 </u> UOM: <u> LF </u>	Unit Price: <input style="width: 100px;" type="text" value="\$27.55"/>	Total: <input style="width: 100px;" type="text" value="\$13,499.50"/>
	1.4 Removal of Existing Meter Vault		
	Quantity: <u> 1 </u> UOM: <u> LS </u>	Unit Price: <input style="width: 100px;" type="text" value="\$9,850.00"/>	Total: <input style="width: 100px;" type="text" value="\$9,850.00"/>
	1.5 Removal of Existing Concrete Roadway		
	Quantity: <u> 2360 </u> UOM: <u> SF </u>	Unit Price: <input style="width: 100px;" type="text" value="\$2.89"/>	Total: <input style="width: 100px;" type="text" value="\$6,820.40"/>
	1.6 Removal of Existing Retaining Wall		
	Quantity: <u> 50 </u> UOM: <u> LF </u>	Unit Price: <input style="width: 100px;" type="text" value="\$176.00"/>	Total: <input style="width: 100px;" type="text" value="\$8,800.00"/>
	1.7 42-in Butterfly Valve and Manhole		
	Quantity: <u> 2 </u> UOM: <u> EA </u>	Unit Price: <input style="width: 100px;" type="text" value="\$100,689.91"/>	Total: <input style="width: 100px;" type="text" value="\$201,379.82"/>
	1.8 12-in Blowoff Valve and Manhole		
	Quantity: <u> 1 </u> UOM: <u> EA </u>	Unit Price: <input style="width: 100px;" type="text" value="\$43,826.93"/>	Total: <input style="width: 100px;" type="text" value="\$43,826.93"/>
	1.9 4-in Combination Air Valve and Manhole		
	Quantity: <u> 1 </u> UOM: <u> EA </u>	Unit Price: <input style="width: 100px;" type="text" value="\$39,480.00"/>	Total: <input style="width: 100px;" type="text" value="\$39,480.00"/>
	1.10 Connect to NTMWD 48-in Pipeline		
	Quantity: <u> 1 </u> UOM: <u> LS </u>	Unit Price: <input style="width: 100px;" type="text" value="\$21,200.00"/>	Total: <input style="width: 100px;" type="text" value="\$21,200.00"/>

1.11 Connect to Ex. 36-in Pipeline

Quantity: 1 UOM: LS Unit Price: Total:

Attachment 3

1.12 Hydrostatic Testing of Pipeline

Quantity: 1 UOM: LS Unit Price: Total:

1.13 Seeding

Quantity: 1 UOM: AC Unit Price: Total:

1.14 Storm Water Pollution Prevention Plan

Quantity: 1 UOM: LS Unit Price: Total:

1.15 Concrete Pavement and Base

Quantity: 1635 UOM: SY Unit Price: Total:

1.16 42-in AWWA C303 Bar Wrapped Concrete Cylinder Pipe By Open Cut

Quantity: 909 UOM: LF Unit Price: Total:

1.17 42-in AWWA C303 Bar Wrapped Concrete Cylinder Pipe By Other Than Open Cut

Quantity: 181 UOM: LF Unit Price: Total:

1.18 60-in Steel Casing By Other Than Open Cut

Quantity: 181 UOM: LF Unit Price: Total:

1.19 Trench Safety

Quantity: 909 UOM: LF Unit Price: Total:

1.20 Removal of Existing Chainlink Fence

Quantity: 645 UOM: LF Unit Price: Total:

1.21 Installation of 8-ft Chainlink Fence

Quantity: 602 UOM: LF Unit Price: Total:

1.22 Installation of Chainlink Gate

Quantity: 1 UOM: EA Unit Price: Total:

1.23 Retaining Wall Extension

Quantity: 275 UOM: CY Unit Price: Total:

2 Package Header

Time Bid (B)

Quantity: 1 Total:

Package Items

2.1 Value of Time Bid: Total number of Calendar Days to achieve **FINAL COMPLETION** multiplied by the corresponding Value of a Calendar Day (reference Section SC.04 of the Contract Documents and Specifications for table). Enter as a lump sum total.

Quantity: 1 UOM: LS Unit Price: Total:

Response Total: \$3,581,513.33

BID BOND

STATE OF TEXAS)
)
COUNTY OF COLLIN)

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, Wilson Contractor Services, LLC, whose address is 3985 Mingo Rd., Denton, TX 76028, hereinafter called Principal, and U.S. Specialty Insurance Company, a corporation organized and existing under the laws of the State of Texas, and fully licensed to transact business in the State of Texas, as Surety, are held and firmly bound unto the Town of Prosper, a home-rule municipal corporation organized and existing under the laws of the State of Texas, hereinafter referred to as "Owner," in the penal sum of \$ 5% GAB***** as the proper measure of liquidated damages arising out of or connected with the submission of a Bid Proposal for the construction of a public work project, in lawful money of the United States, to be paid in Collin County, Texas, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors jointly and severally, firmly by these presents. The condition of the above obligation is such that whereas the Principal has submitted to Owner a certain Bid Proposal, attached hereto and hereby made a part hereof, to enter into a contract in writing, for the construction of:

**BID NO. 2020-62-B
CUSTER ROAD PUMP STATION METER VAULT RELOCATION**

NOW, THEREFORE, if the Principal's Proposal shall be rejected or, in the alternative, if the Principal's Proposal shall be accepted and the Principal shall execute and deliver a contract in the form of the Contract attached hereto (properly completed in accordance with said Proposal) and shall furnish performance, payment and maintenance bonds required by the Contract Documents for the Project and provide proof of all required Insurance coverages for the Project and shall in all other respects perform the agreement created by the acceptance of said Proposal, then this obligation shall be void, otherwise the same shall remain in force and affect; it being expressly understood and agreed that the liability of the Surety for any breach of condition hereunder shall be in the face amount of this bond and forfeited as a proper measure of liquidated damages.

PROVIDED FURTHER, that if any legal action were filed on this Bond, exclusive Venue shall lie in Collin County, Texas.

AND PROVIDED FURTHER, the Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by an extension of the time within which the Owner may accept such Proposal; and said Surety does hereby waive notice of any such extension.

The undersigned and designated agent is hereby designated by the Surety herein as the Resident Agent in Collin County or Dallas County to whom any requisite notices may be delivered and on whom service of process may be had in matters arising out of such suretyship, as provided by Article 7 19-1 of the Insurance Code, Vernon's Annotated Civil Statutes of the State of Texas.

IN WITNESS WHEREOF, this instrument is executed and shall be deemed an original, this, the 5th day of June, 2020.

ATTEST:

By: 
 Signature
Marnie Menter
 Typed/Printed Name
 Title
 3985 Mingo Rd.
 Address
 Denton, TX 76028
 City State Zip
 (940) 243-1174 (940) 898-1175
 Phone Fax

ATTEST:

By: 
 Signature
 Jennifer Clark
 Printed Name
 Witness
 Title
 1200 S. Main Street, Suite 1600
 Address
 Grapevine, TX 76051
 City State Zip
 817-865-1516 817-424-1404
 Phone Fax

PRINCIPAL:

Wilson Contractor Services, LLC
 Company Name
 By: 
 Signature
A.A. MARTINEZ
 Typed/Printed Name
 Title
 3985 Mingo Rd.,
 Address
 Denton, TX 76028
 City State Zip
 (940) 243-1174 (940) 898-1175
 Phone Fax
 President

SURETY: U.S. Specialty Insurance Company

By: 
 Signature
 Elena Sells
 Printed Name
 Attorney-In-Fact
 Title
 13403 Northwest Freeway
 Address
 Houston, TX 77040
 City State Zip
 (713) 462-1000 (214) 872-3655
 Phone Fax

The Resident Agent of the Surety in Collin County or Dallas County, Texas, for delivery of notice and service of the process is:

NAME: Jennifer Clark
 STREET ADDRESS: 11700 Luna Rd #1101,
 CITY, STATE, ZIP: Farmers Branch, TX 75234

NOTE: If Resident Agent is not a corporation, give a person's name.

U.S. Specialty Insurance Company

TEXAS COMPLAINT NOTICE

IMPORTANT NOTICE

1. To obtain information or make a complaint:
2. You may contact your agent.
3. You may call the company's toll free telephone number for information or to make a complaint at:

1-800-486-6695

4. You may also write to the company at:

801 S. Figueroa Street, Suite 700
Los Angeles, CA 90017

5. You may contact the Texas Department of Insurance to obtain information on companies, coverages, rights, or complaints at:

1-800-252-3439

6. You may write to the Texas Department of Insurance at:

Consumer Protection (111-1A)
P.O. Box 149091
Austin, TX 78714-9091
Fax No. (512) 490-1007
Web: <http://www.tdi.texas.gov>
E-mail: ConsumerProtection@tdi.texas.gov

7. **PREMIUM OR CLAIM DISPUTES:**

Should you have a dispute concerning your premium or about a claim you should contact the agent or the company first. If the dispute is not resolved, you may contact the Texas Department of Insurance.

8. **ATTACH THIS NOTICE TO YOUR POLICY**

This notice is for information only and does not become a part or condition of the attached document.

AVISO IMPORTANTE

- Para obtener informacion o para someter una queja:
- Puede comunicarse con su agente.
- Usted puede llamar al numero de telefono gratis de la compania's para informacion o para someter una queja al:

1-800-486-6695

- Usted tambien puede escribir a la compa ia:

801 S. Figueroa Street, Suite 700
Los Angeles, CA 90017

- Puede comunicarse con el Departamento de Seguros de Texas para obtener informacion acerca de companias, coberturas, derechos, o quejas al:

1-800-252-3439

- Puede escribir al Departamento de Seguros de Texas al:

Consumer Protection (111-1A)
P.O. Box 149091
Austin, TX 78714-9091
Fax No. (512) 490-1007
Web: <http://www.tdi.state.tx.us>
E-mail: ConsumerProtection@tdi.texas.gov

- DISPUTAS SOBRE PRIMAS O RECLAMOS:**

Si tiene una disputa concerniente a su prima o a un reclamo, debe comunicarse con el agente o la compania primero. Si no se resuelve la disputa, puede entonces comunicarse con el departamento (TDI).

- UNA ESTE AVISO A SU POLIZA**

Esta aviso es solo para proposito de informacion y no se convierte en parte o condicion del documento adjunto.



POWER OF ATTORNEY
AMERICAN CONTRACTORS INDEMNITY COMPANY TEXAS BONDING COMPANY
UNITED STATES SURETY COMPANY U.S. SPECIALTY INSURANCE COMPANY

KNOW ALL MEN BY THESE PRESENTS: That American Contractors Indemnity Company, a California corporation, Texas Bonding Company, an assumed name of American Contractors Indemnity Company, United States Surety Company, a Maryland corporation and U.S. Specialty Insurance Company, a Texas corporation (collectively, the "Companies"), do by these presents make, constitute and appoint:

Steven W. Lewis, Kathy Sells, Lanny Land, Elena Sells or Jennifer Clark of Grapevine, Texas

its true and lawful Attorney(s)-in-fact, each in their separate capacity if more than one is named above, with full power and authority hereby conferred in its name, place and stead, to execute, acknowledge and deliver any and all bonds, recognizances, undertakings or other instruments or contracts of suretyship to include riders, amendments, and consents of surety, providing the bond penalty does not exceed *****Fifteen Million***** Dollars (***\$15,000,000.00***) . This Power of Attorney shall expire without further action on April 23rd, 2022. This Power of Attorney is granted under and by authority of the following resolutions adopted by the Boards of Directors of the Companies:

Be it Resolved, that the President, any Vice-President, any Assistant Vice-President, any Secretary or any Assistant Secretary shall be and is hereby vested with full power and authority to appoint any one or more suitable persons as Attorney(s)-in-Fact to represent and act for and on behalf of the Company subject to the following provisions:

Attorney-in-Fact may be given full power and authority for and in the name of and on behalf of the Company, to execute, acknowledge and deliver, any and all bonds, recognizances, contracts, agreements or indemnity and other conditional or obligatory undertakings, including any and all consents for the release of retained percentages and/or final estimates on engineering and construction contracts, and any and all notices and documents canceling or terminating the Company's liability thereunder, and any such instruments so executed by any such Attorney-in-Fact shall be binding upon the Company as if signed by the President and sealed and effected by the Corporate Secretary.

Be it Resolved, that the signature of any authorized officer and seal of the Company heretofore or hereafter affixed to any power of attorney or any certificate relating thereto by facsimile, and any power of attorney or certificate bearing facsimile signature or facsimile seal shall be valid and binding upon the Company with respect to any bond or undertaking to which it is attached.

IN WITNESS WHEREOF, The Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 1st day of June, 2018.

AMERICAN CONTRACTORS INDEMNITY COMPANY TEXAS BONDING COMPANY
UNITED STATES SURETY COMPANY U.S. SPECIALTY INSURANCE COMPANY

State of California
County of Los Angeles



By: [Signature]
Daniel P. Aguilar, Vice President

A Notary Public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document

On this 1st day of June, 2018, before me, Sonia O. Carrejo, a notary public, personally appeared Daniel P. Aguilar, Vice President of American Contractors Indemnity Company, Texas Bonding Company, United States Surety Company and U.S. Specialty Insurance Company who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature [Signature] (seal)



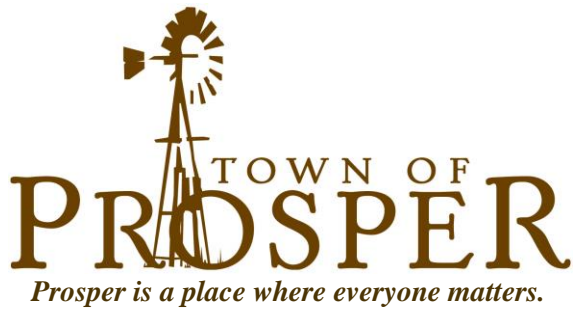
I, Kio Lo, Assistant Secretary of American Contractors Indemnity Company, Texas Bonding Company, United States Surety Company and U.S. Specialty Insurance Company, do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney, executed by said Companies, which is still in full force and effect; furthermore, the resolutions of the Boards of Directors, set out in the Power of Attorney are in full force and effect.

In Witness Whereof, I have hereunto set my hand and affixed the seals of said Companies at Los Angeles, California this 5th day of June, 2020.

Corporate Seals
Bond No. NA
Agency No. 18799



[Signature]
Kio Lo, Assistant Secretary



ENGINEERING SERVICES

To: Mayor and Town Council

From: Hulon T. Webb, Jr., Director of Engineering Services

Through: Harlan Jefferson, Town Manager
Rebecca Zook, Executive Director of Development and Infrastructure Services

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Consider and act upon authorizing the Town Manager to execute a Standard Utility Agreement (SUA) U-Number U16097 between the Texas Department of Transportation and the Town of Prosper, Texas, for the reimbursement of costs incurred in adjustment, removal and relocation of the Town's water facilities along Custer Road (FM 2478), up to the amount of eligibility for State participation.

Description of Agenda Item:

The Texas Department of Transportation (TxDOT) is preparing to widen Custer Road (FM 2478) through the Town of Prosper. The Town's existing 36-inch water line and meter vault are located within a separate utility easement parallel to the existing Custer Road Right-of-Way (ROW) north of US 380. Also within the utility easement, the Town's 36-inch water line connects to the North Texas Municipal Water District's (NTMWD) 48-inch water line with a 24-inch tap. The proposed ROW of FM 2478 will extend past both the Town of Prosper's and NTMWD's existing easements.

The construction plans for the relocation of the water line and meter vault includes upsizing the existing 36-inch water line to a 42-inch water line to accommodate the future ultimate capacity needs for the Town of Prosper. The cost associated with the upsizing of the water line will not be reimbursed by TxDOT, and the SUA estimates the Town of Prosper's costs for the upsizing to be approximately \$282,750. The new meter vault is designed in accordance with NTMWD's Meter Vault Standards.

The attached SUA will reimburse the Town of Prosper for the relocation costs associated with the section of 36-inch water line and meter vault to avoid conflicts with the widening of Custer Road. The attached SUA includes estimated costs associated with construction, professional services, easement acquisition, and Town of Prosper direct costs. These estimated costs will be adjusted at the completion of the project for final payment.

Budget Impact:

The Standard Utility Agreement (SUA) is comprised of several items including Estimated Construction Costs of \$3,551,352, Professional Service cost of \$359,225, Fire Lane, Utility, Access Easement costs of \$53,244, and Town of Prosper Engineering, Administration, and Inspection costs of \$45,174. The SUA is a reimbursement contract that will reimburse the Town for costs incurred except for upsizing of the current 36-inch water line to a new 42-inch water line to accommodate the future ultimate capacity needs for the Town of Prosper, estimated at \$282,750. Funding has been budgeted in Account No. 760-6610-10-00-1902-WA.

Legal Obligations and Review:

Terrence Welch of Brown & Hofmeister, L.L.P., has reviewed the Texas Department of Transportation Standard Utility Agreement as to form and legality.

Attached Documents:

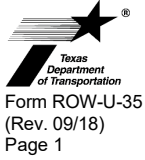
1. TxDOT Standard Utility Agreement U-Number U16097
2. Relocation Exhibit
3. Cost Breakdown

Town Staff Recommendation:

Town staff recommends that the Town Council authorize the Town Manager to execute a Standard Utility Agreement (SUA) U-Number U16097 between the Texas Department of Transportation and the Town of Prosper, Texas, for the reimbursement of costs incurred in adjustment, removal and relocation of the Town's water facilities along Custer Road (FM 2478), up to the amount of eligibility for State participation.

Proposed Motion:

I move to authorize the Town Manager to execute a Standard Utility Agreement (SUA) U-Number U16097 between the Texas Department of Transportation and the Town of Prosper, Texas, for the reimbursement of costs incurred in adjustment, removal and relocation of the Town's water facilities along Custer Road (FM 2478), up to the amount of eligibility for State participation.



STANDARD UTILITY AGREEMENT

U-Number: **U16097**

District: Dallas
Federal Project No.: STP 1702(848)
ROW CSJ: 2351-01-022
Highway Project Letting Date: 09/2020

County: Collin
Highway: FM 2478
From: US 380
To: N. of FM 1461

This Agreement by and between the State of Texas, acting by and through the Texas Transportation Commission, ("**State**"), and Town of Prosper, ("**Utility**"), acting by and through its duly authorized representative, shall be effective on the date of approval and execution by and on behalf of the **State**.

WHEREAS, the **State** has deemed it necessary to make certain highway improvements as designated by the **State** and approved by the Federal Highway Administration within the limits of the highway as indicated above;

WHEREAS, the proposed highway improvements will necessitate the adjustment, removal, and/or relocation of certain facilities of the **Utility** as indicated in the following statement of work: This project will relocate the section of Prosper's 36-inch Pipeline and Meter Vault outside the proposed Right-Of-Way on to the Custer Road Pump Station site to avoid conflicts with proposed utilities associated with the new roadway. The new meter vault and electrical building will be designed in accordance with NTMWD's Meter Vault Standard. The town has elected to increase the size of the pipeline from 36-inch to 42-inch in anticipation of future capacity needs.; and more specifically as shown in the **Utility's** plans, specifications and estimated costs, which are attached hereto as Attachment "A".

WHEREAS, the **State** will participate in the costs of the adjustment, removal, and relocation of certain facilities to the extent as may be eligible for State and/or Federal participation.

WHEREAS, the **State**, upon receipt of evidence it deems sufficient, acknowledges the **Utility's** interest in certain lands and facilities that entitle it to reimbursement for the adjustment, removal, and relocation of certain of its facilities located upon the lands as indicated in the statement of work above.

NOW, THEREFORE, BE IT AGREED:

The **State** will pay to the **Utility** the costs incurred in adjustment, removal, and relocation of the **Utility's** facilities up to the amount said costs may be eligible for **State** participation.

All conduct under this agreement, including but not limited to the adjustment, removal, and relocation of the facility, the development and reimbursement of costs, any environmental requirements, and retention of records will be in accordance with all applicable federal and state laws, rules and regulations, including, without limitation, the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act, 42 U.S.C. §§ 4601, et seq., the National Environmental Policy Act, 42 U.S.C. §§ 4231, et seq., the Buy America provisions of 23 U.S.C. § 313 and 23 CFR 635.410, as amended, Texas Transportation Code § 223.045, the Utility Relocations, Adjustments, and Reimbursements provisions of 23 CFR 645, Subpart A, and the Utility Accommodation provisions of 23 CFR 645, Subpart B.

The **Utility** shall supply, upon request by the **State**, proof of compliance with the aforementioned laws, rules, regulations, and guidelines prior to the commencement of the adjustment, removal, and relocation of the facility.

The **Utility** shall comply with the Buy America provisions of 23 U.S.C. § 313, 23 CFR 635.410, as amended, and the Steel and Iron Preference provisions of Texas Transportation Code § 223.045 and, when products that are

Initial _____ Date _____
TxDOT

Initial _____ Date _____
Utility

composed predominately of steel and/or iron are incorporated into the permanent installation of the utility facility, use domestically manufactured products. TxDOT Form 1818 (Material Statement), along with all required attachments, must be submitted, prior to the commencement of the adjustment, removal, and relocation of the facility, as evidence of compliance with the aforementioned provisions. Failure to submit the required documentation or to comply with the Buy America, and Steel and Iron Preference requirements shall result in: (1) the **Utility** becoming ineligible to receive any contract or subcontract made with funds authorized under the Intermodal Surface Transportation Efficiency Act of 1991; (2) the **State** withholding reimbursement for the costs incurred by the **Utility** in the adjustment, removal, and relocation of the **Utility's** facilities; and (3) removal and replacement of the non-compliant products.

The **Utility** agrees to develop relocation or adjustment costs by accumulating actual direct and related indirect costs in accordance with a work order accounting procedure prescribed by the **State**, or may, with the **State's** approval, accumulate actual direct and related indirect costs in accordance with an established accounting procedure developed by the **Utility**. Bills for work hereunder are to be submitted to the **State** not later than one (1) year after completion of the work. Failure to submit the request for final payment, in addition to all supporting documentation, within one (1) year after completion of the work may result in forfeiture of payment for said work.

When requested, the **State** will make intermediate payments at not less than monthly intervals to the **Utility** when properly billed. Such payments will not exceed 90 percent (90%) of the eligible cost as shown in each such billing. Intermediate payments shall not be construed as final payment for any items included in the intermediate payment.

The **State** will, upon satisfactory completion of the adjustment, removal, and/or relocation and upon receipt of final billing prepared in an approved form and manner and accounting for any intermediate payments, make payment in the amount of 90 percent (90%) of the eligible costs as shown in the final billing prior to audit and after such audit shall make an additional final payment totaling the reimbursement amount found eligible for **State** reimbursement.

Alternatively, the **State** agrees to pay the **Utility** an agreed lump sum of \$N/A as supported by the attached estimated costs. The **State** will, upon satisfactory completion of the adjustments, removals, and relocations and upon receipt of a final billing, make payment to the **Utility** in the agreed amount.

Upon execution of this agreement by both parties hereto, the **State** will, by written notice, authorize the **Utility** to perform such work diligently and to conclude said adjustment, removal, and relocation by the stated completion date which is attached hereto in Attachment "C". The completion date shall be extended for delays caused by events outside the **Utility's** control, including an event of Force Majeure, which shall include a strike, war or act of war (whether an actual declaration of war is made or not), insurrection, riot, act of public enemy, accident, fire, flood or other act of God, sabotage, or other events, interference by the **State** or any other party with the **Utility's** ability to proceed with the work, or any other event in which the **Utility** has exercised all due care in the prevention thereof so that the causes of other events are beyond the control and without the fault or negligence of the **Utility**.

This agreement in its entirety consists of the following elements:

1. Standard Utility Agreement – ROW-U-35;
2. Plans, Specifications, and Estimated Costs (Attachment "A");
3. Accounting Method (Attachment "B");
4. Schedule of Work (Attachment "C");
5. Statement Covering Contract Work – ROW-U-48 (Attachment "D");
6. Utility Joint Use Acknowledgment – ROW-U-JUAA and/or Utility Installation Request – Form 1082 (Attachment "E");
7. Eligibility Ratio (Attachment "F");
8. Betterment Calculation and Estimate (Attachment "G"); and
9. Proof of Property Interest – ROW-U-1A, ROW-U-1B, or ROW-U-1C (Attachment "H").

All attachments are included herein as if fully set forth. In the event it is determined that a substantial change from the statement of work contained in this agreement is required, reimbursement therefore shall be limited to costs covered by a modification or amendment of this agreement or a written change or extra work order approved by the **State** and the **Utility**.

Initial Date
TxDOT

Initial Date
Utility

This agreement is subject to cancellation by the **State** at any time up to the date that work under this agreement has been authorized, and such cancellation will not create any liability on the part of the **State**. However, the **State** will review and reimburse the **Utility** for eligible costs incurred by the **Utility** in preparation of this Agreement.

The State Auditor may conduct an audit or investigation of any entity receiving funds from the **State** directly under this contract or indirectly through a subcontract under this contract. Acceptance of funds directly under this contract or indirectly through a subcontract under this contract acts as acceptance of the authority of the State Auditor, under the direction of the Legislative Audit Committee, to conduct an audit or investigation in connection with those funds. An entity that is the subject of an audit or investigation must provide the state auditor with access to any information the state auditor considers relevant to the investigation or audit.

The **Utility** by execution of this agreement does not waive any of the rights that the **Utility** may have within the limits of the law.

It is expressly understood that the **Utility** conducts the adjustment, removal, and relocation at its own risk, and that the **State** makes no warranties or representations regarding the existence or location of utilities currently within its right of way.

The signatories to this agreement warrant that each has the authority to enter into this agreement on behalf of the party represented.

UTILITY

Utility: Town of Prosper
Name of Utility

By: _____
Authorized Signature

Print or Type Name

Title: _____

Date: _____

EXECUTION RECOMMENDED:

Director of TP&D (or designee), Dallas District

<p>THE STATE OF TEXAS</p> <p>Executed and approved for the Texas Transportation Commission for the purpose and effect of activating and/or carrying out the orders, established policies or work programs heretofore approved and authorized by the Texas Transportation Commission.</p> <p>By: _____ <i>District Engineer (or designee)</i></p> <p>Date: _____</p>
--

Initial Date
TxDOT

Initial Date
Utility

Attachment "A"

Plans, Specifications, and Estimated Costs

All material items that must meet Buy America or Steel and Iron Preference Provision requirements must be indicated with an asterisk (*).

Initial _____ Date _____
TxDOT

Initial _____ Date _____
Utility

TOWN OF PROSPER, TEXAS



CUSTER ROAD PUMP STATION METER VAULT RELOCATION

BID NO. 2020-62-B
RCSJ 2351-01-022
CSJ 2351-01-017
MAY 2020
U 16097

MAYOR
 RAY SMITH

CITY COUNCIL
 MARCUS E. RAY, PLACE 1

CRAIG ANDRES, PLACE 2

CURRY VOGELSANG, JR, PLACE 3
 MAYOR PRO-TEM

MEIGS MILLER, PLACE 4

JEFF HODGES, PLACE 5

JASON DIXON, PLACE 6
 DEPUTY MAYOR PRO-TEM

TOWN MANAGER
 HARLAN JEFFERSON

DIRECTOR OF ENGINEERING SERVICES
 HULON T. WEBB, JR., P.E.

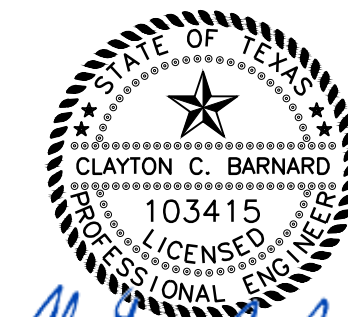
PUBLIC WORKS DIRECTOR
 FRANK E. JAROMIN, P.E.



5805 MAIN STREET, SUITE B
 FRISCO, TX 75034
 PHONE - (972)624-9201
 FAX - (972)624-9202
 WEB - WWW.FREESE.COM

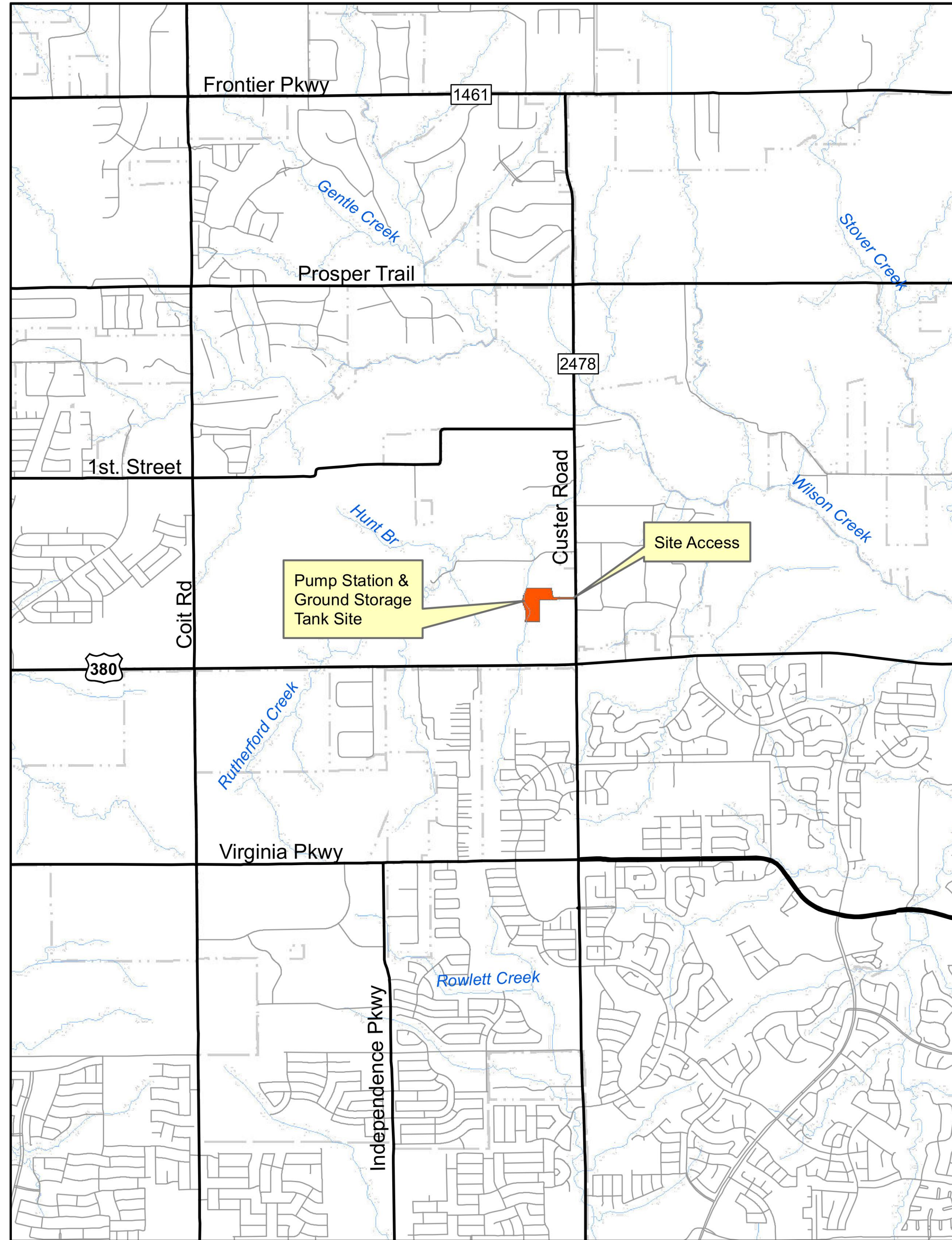
PRP18708

Freese and Nichols, Inc.
 Texas Registered Engineering Firm F-2144



Clayton C. Barnard

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VICINITY MAP

1"=2000'

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3	G-2	GENERAL NOTES AND LEGEND
4	G-3	GENERAL NOTES
5	G-4	TCEQ GENERAL NOTES
6	G-5	HORIZONTAL CONTROL PLAN
7	G-6	SITE DEMOLITION PLAN
8	G-7	SITE DEMOLITION PLAN II
9	G-8	EXISTING NTMWD METER VAULT DEMOILION
10	G-9	SITE PLAN
CIVIL		
11	C-1	STA 1+00 TO STA 6+00
12	C-2	STA 6+00 TO STA 11+00
13	C-3	STA 11+00 TO END
14	C-4	SECTIONAL PLAN
15	C-5	PROPOSED METER VAULT SECTION
16	C-6	PROPOSED METER VAULT SECTION
17	C-7	PAVING AND DIMENSIONAL CONTROL PLAN
18	C-8	GRADING AND EROSION
19	C-9	PAVING DETAILS
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21	DT-2	BAR-WRAPPED PIPE DETAILS
22	DT-3	PIPELINE APPURTENANCES
23	DT-4	PIPELINE APPURTENANCES II
24	DT-5	PIPELINE APPURTENANCES III
25	DT-6	PIPELINE APPURTENANCES IV
26	DT-7	BUTTERFLY VALVE DETAILS
27	DT-8	MISCELLANEOUS DETAILS I
28	DT-9	MISCELLANEOUS DETAILS II
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54	E-5	FLOW METER VAULT PLAN
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56	E-7	ONE-LINE DIAGRAM
57	E-8	CONTROL SCHEMATICS
58	E-9	SCHEDULES
59	E-10	DETAILS I
60	E-11	DETAILS II
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62	E-13	DETAILS IV
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63	PI-1	LEGEND
64	PI-2	NETWORK DIAGRAM
65	PI-3	LOOPS I

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

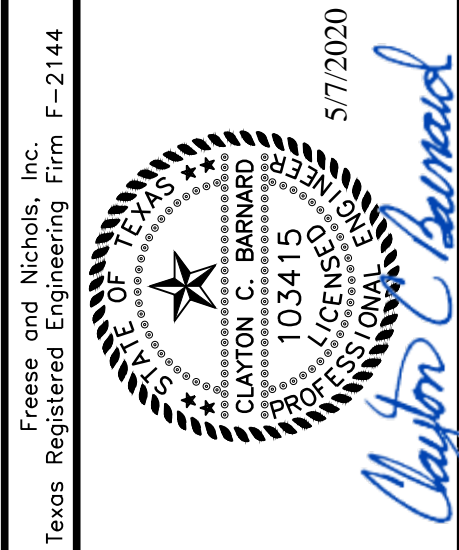


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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
GENERAL
SHEET INDEX AND VICINITY MAP

NO.	ISSUE	BY	DATE	PRJ NO.	DATE	DESIGNED	DRAWN	CHECKED	FILE NAME
				PRP18708	MAY 2020	MDS	NIRM	CCB	GN-ALL-INDX.dwg
VERIFY SCALE: Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.									

SHEET **G-1**
SEQ. **2**



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
GENERAL
GENERAL NOTES AND LEGEND

NO.	ISSUE	DATE	BY	REVISED	CHECKED	FILE NAME
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PRP18708	DESIGNED	MAY 2020				
	DRAWN					
	REVISION					
	CCB					

VERIFY SCALE: Bar is one inch on original drawing; if not one inch on this sheet, adjust scale.

SHEET: **G-2**

SEQ. 3

LEGEND OF SYMBOLS

	AIR VALVE - PLAN VIEW
	AIR VALVE - PROFILE VIEW
	BLOWOFF VALVE
	BUTTERFLY VALVE
	LIMITS OF TEMPORARY EASEMENT
	LIMITS OF PERMANENT EASEMENT
	PROPERTY LINE AND / OR R.O.W.
	BENCH MARK
	EXISTING WATER VALVE
	WATER METER OR GAS METER
	FIRE HYDRANT (EXISTING)
	FIRE HYDRANT (PROPOSED)
	EXISTING SPRINKLER VALVE
	IRON ROD (FOUND)
	UNDERGROUND FIBER OPTIC LINE
	UNDERGROUND GAS LINE
	UNDERGROUND TELEPHONE LINE
	UNDERGROUND ELECTRIC LINE
	OVERHEAD ELECTRIC
	STD. LIGHT POLE
	POWER POLE
	GUY WIRE AND ANCHOR
	TELEPHONE PEDESTAL
	SIGN
	TREE
	FENCE
	ASPHALT PAVING
	BRUSH OR TREES
	SLOPE
	RAILROAD
	SURVEY CONTROL POINT
	PAVEMENT REPLACEMENT (CONCRETE, ASPHALT, GRAVEL)
	FUTURE PAVEMENT
	EXISTING FLOODPLAIN

GENERAL PROJECT NOTES (NO SEPARATE PAY ITEMS):

- ALL TRENCH BACKFILL IN UNPAVED AREAS OVER FIVE (5) FEET FROM ROAD OR DRIVEWAY SHALL BE PLACED TO EXISTING GRADE PLUS SIX INCHES TO ALLOW FOR SETTLEMENT. ALL BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY PER SPECIFICATIONS.
- THE CONTRACTOR SHALL REMOVE FROM THE PROJECT AREA ALL SURPLUS MATERIAL. THIS SHALL BE INCIDENTAL AND NOT A SEPARATE PAY ITEM. SURPLUS MATERIALS FROM EXCAVATION INCLUDING DIRT, TRASH, ETC. SHALL BE PROPERLY DISPOSED OF AT A SITE ACCEPTABLE TO THE TOWN'S ENGINEER IF WITHIN THE TOWN LIMITS. IF THE LOCATION IS NOT WITHIN THE TOWN LIMITS, THE CONTRACTOR SHALL PROVIDE A LETTER STATING AS SUCH. NO EXCESS EXCAVATED MATERIAL SHALL BE DEPOSITED IN LOW AREAS OR ALONG NATURAL DRAINAGE WAY WITHOUT WRITTEN PERMISSION FROM THE AFFECTED PROPERTY OWNER AND THE TOWN'S ENGINEER. IF THE CONTRACTOR PLACES EXCESS MATERIAL IN THE AREAS WITHOUT PERMISSION, THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL DAMAGE RESULTING FROM SUCH FILL AND HE SHALL REMOVE MATERIAL AT HIS OWN COST.
- CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARATION, IMPLEMENTATION AND MAINTENANCE OF A STORM WATER POLLUTION PREVENTION PLAN FOR THIS PROJECT. THE INSPECTION AND MAINTENANCE OF THE EROSION PREVENTION MEASURES SHALL BE THE CONTRACTOR'S RESPONSIBILITY THROUGHOUT ALL PHASES OF CONSTRUCTION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COMPLY WITH THE EPA'S NPDES REGULATIONS 40-CFR-122, 123, 124 CONCERNING EROSION AND SEDIMENT CONTROL. THE CONTRACTOR WILL BE RESPONSIBLE FOR SUBMITTING A NOTICE OF INTENT "NOI" TO TCEQ 72 HOURS PRIOR TO BEGINNING CONSTRUCTION AND NOTICE OF TERMINATION "NOT" TO TCEQ UPON COMPLETION OF THE PROJECT.
- ALL TRENCH EXCAVATION SHALL BE IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATOR'S STANDARDS. CONTRACTOR IS RESPONSIBLE FOR ALL TRENCH SAFETY. THE CONTRACTOR SHALL CONSTRUCT THE PROPOSED WORK UTILIZING A TRENCH SAFETY PLAN. A TRENCH SAFETY PLAN SHALL BE SUBMITTED AT THE PRE-CONSTRUCTION MEETING.
- CONTRACTOR SHALL MAINTAIN SUITABLE CONSTRUCTION ACCESS TO THE ENGINEER, LAND OWNER AND THE TOWN OF PROSPER AT ALL TIMES DURING CONSTRUCTION.
- ALL BURIED VALVES, FIRE HYDRANT BASES, FITTINGS, METALLIC PIPING, AND METALLIC EQUIPMENT SHALL BE WRAPPED OR COATED IN ACCORDANCE WITH THE SPECIFICATIONS.
- THE CONTRACTOR SHALL REMOVE ALL FENCES, LOCATED WITHIN EASEMENTS, INTERFERING WITH CONSTRUCTION OPERATION AND PROVIDE TEMPORARY FENCING DURING CONSTRUCTION. REMOVED FENCES SHALL BE REPLACED WITH A NEW FENCE OF EQUAL OR BETTER MATERIAL OR UNDAMAGED ORIGINAL FENCING. ALL AFFECTED PROPERTY OWNERS SHALL BE NOTIFIED PRIOR TO CONSTRUCTION. REMOVAL AND REPLACEMENT OF EXISTING AND TEMPORARY FENCES SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT COST AND REFLECTED IN THE UNIT BID PRICES FOR VARIOUS ITEMS LISTED IN THE PROPOSAL.
- CONTRACTOR SHALL PROVIDE CLOSURE PIECES FOR WATERLINE AS REQUIRED TO CONSTRUCT THE PROJECT, INCLUDING THOSE REQUIRED FOR SPECIAL CONSTRUCTION PROCEDURES TO COORDINATE CHANGES TO THE SEQUENCE OF CONSTRUCTION. ALL CLOSURE PIECES SHALL BE CONSIDERED A SUBSIDIARY COST TO THE PROJECT AND WILL BE PROVIDED AND/OR REMOVED AT NO ADDITIONAL COST TO THE OWNER.
- THE CONTRACTOR SHALL DISTRIBUTE LETTERS TO ALL AFFECTED PROPERTY OWNERS PRIOR TO BEGINNING WORK ON EACH PROPERTY. THIS LETTER SHALL INCLUDE NAMES AND TELEPHONE NUMBERS OF CONTRACTOR CONTACTS, A DESCRIPTION OF WORK TO BE DONE, AND THE TIME FRAME FOR DOING THE WORK. COPIES OF THE LETTER SHALL BE FORWARDED TO THE TOWN INSPECTOR. THE CONTRACTOR SHALL NOTIFY RESIDENTS 48 HOURS IN ADVANCE OF PERFORMING ANY WORK ON PRIVATE PROPERTY. DISTRIBUTION OF LETTERS SHALL BE CONSIDERED SUBSIDIARY TO THE COST OF PROJECT AND NO ADDITIONAL COMPENSATION WILL BE ALLOWED.
- CONTRACTOR SHALL REMOVE TOPSOIL AND STOCKPILE FOR USE DURING TRENCH RESTORATION. THE TOP 12-INCHES OF TRENCH BACKFILL MATERIAL SHALL HAVE A GRADATION SIMILAR TO EXISTING GROUND ADJACENT TO TRENCH. MAXIMUM ROCK SIZE WITHIN THE TOP 12-INCH LAYER SHALL NOT EXCEED 1-INCH.
- CONTRACTOR IS RESPONSIBLE FOR MAINTAINING WATER CONNECTIONS TO ALL HOMES AND BUSINESSES IN WORKING ORDER AT ALL TIMES, EXCEPT FOR BRIEF INTERRUPTIONS FOR SERVICES TO BE REINSTALLED. IN NO CASE SHALL SERVICES BE ALLOWED TO REMAIN OUT OF SERVICE OVERNIGHT.
- ALL DRIVEWAYS, WHICH ARE OPEN CUT, SHALL HAVE ACCESS PROVIDED AT ALL TIMES. THE TEMPORARY SURFACE WILL BE CONSIDERED A NON-PAY ITEM. ALL OPEN CUT DRIVEWAYS & ROADS SHALL HAVE PERMANENT SURFACE REPLACED WITHIN 1 WEEK OF OPEN CUTTING. DRIVEWAY REPLACEMENT SHALL BE SIMILAR MATERIAL AND THICKNESS TO EXISTING.
- CONTRACTOR SHALL INSTALL TEMPORARY BACKFILL AS REQUIRED FOR OPEN TRENCH IN ESTABLISHED ROADWAYS. NO OPEN TRENCH WILL BE ALLOWED IN EXISTING PAVEMENT EXCEPT DURING DAYLIGHT HOURS DURING CONSTRUCTION OPERATIONS. TEMPORARY BACKFILL SHALL BE INSTALLED TO THE FINISHED GRADE OF THE EXISTING PAVEMENT AND SHALL BE MAINTAINED BY THE CONTRACTOR TO ENSURE A SMOOTH DRIVING SURFACE, FREE OF RUTTING AND POTHOLE. REPAIR DAMAGED PAVEMENT IN ACCORDANCE WITH SPECIFICATIONS.
- CONTROL POINTS SHOWN ON PLANS ARE INTENDED FOR CONTRACTOR'S USE ONLY. ANY ADDITIONAL SURVEYING NEEDED TO LAYOUT ANY PROJECTS SHALL BE SUBSIDIARY TO THE BID PRICES
- CONSTRUCTION SURVEYING IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR INCLUDING BUT NOT LIMITED TO LIMITS OF PERMANENT EASEMENT, TEMPORARY EASEMENT, CENTERLINE, ETC. THE CONTRACTOR SHALL VERIFY ALL CONTROL MONUMENTATION PRIOR TO BEGINNING CONSTRUCTION.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN NEAT, ACCURATE AND CURRENT PLANS OF RECORD ON THE JOB SITE AT ALL TIMES.
- THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ADEQUATE SITE DRAINAGE THROUGHOUT THE DURATION OF THIS PROJECT.
- THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS BEFORE CONSTRUCTION BEGINS.
- THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO ENSURE THAT ELECTRIC POWER, TELEPHONE POLES, AND OTHER UTILITIES ARE NOT DISTURBED DURING CONSTRUCTION. ALL COSTS INCURRED FOR MOVING OR SUPPORTING ELECTRIC POWER AND TELEPHONE POLES SHALL BE INCLUDED IN THE PRICE BID FOR THE CONSTRUCTION OF THE PROJECT.
- CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING ALL EXISTING UTILITIES IN SERVICE DURING CONSTRUCTION.
- THE CONTRACTOR SHALL PROTECT AND SUPPORT EXISTING UTILITIES IN ACCORDANCE WITH STANDARDS, PROCEDURES, POLICIES AND REQUIREMENTS OF THE OWNERS OF THE UTILITIES. PROTECTION AND SUPPORT OF EXISTING UTILITIES SHALL INCLUDE PROTECTION AND SUPPORT OF UTILITIES LINES, VAULTS, BOXES, VALVES, POLES, PIPES, CONDUITS, AND ANY OTHER ITEMS ASSOCIATED WITH THE UTILITIES' FACILITIES AT NO ADDITIONAL COST TO THE OWNER.
- PRIOR TO EXCAVATION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING PIPING AND UTILITIES IN THE CONSTRUCTION AREA(S). CONTRACTOR SHALL TEMPORARILY RELOCATE AND SUPPORT EXISTING UTILITIES AS REQUIRED FOR CONSTRUCTION OF NEW ITEMS AND REINSTALL THEM AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER.
- ALL STREETS WITHIN THE SCOPE OF THE CONTRACT SHALL BE KEPT ACCESSIBLE TO FIRE TRUCKS, AMBULANCES, OTHER EMERGENCY VEHICLES, RESIDENTS AND BUSINESSES.
- THE CONTRACTOR SHALL USE EXISTING RIGHT-OF-WAYS OR EASEMENTS FOR ACCESS TO THE JOB SITE.
- WHERE GRASS IS DISTURBED BY AN ACTIVITY OF THIS PROJECT, CONTRACTOR SHALL REPLACE GRASS BY HYDROMULCH SEEDING INCLUDING BOTH PERMANENT BERMUDA GRASS SEED AND WINTER WHEAT SEED SUCH THAT THE GRASS THAT WAS PRESENT IN PRE-CONSTRUCTION CONDITIONS IS REPLACED AND/OR RESTORED TO ITS CONDITION IN AS GOOD OR BETTER CONDITION THAN PRIOR TO CONSTRUCTION. SOD OF EQUAL TYPE TO EXISTING GRASS, SHALL BE PLACED IN DISTURBED AREAS IN RESIDENTIAL YARDS AND IN DISTURBED R.O.W. AREAS IMMEDIATELY ADJACENT TO RESIDENTIAL YARDS.
- THE CONTRACTOR SHALL MAKE CONNECTIONS TO EXISTING PIPE, AS REQUIRED AND SHALL PROVIDE ALL FITTINGS, ADAPTERS, LABOR, EQUIPMENT AND APPURTENANCES REQUIRED TO MAKE CONNECTIONS. CLEAN, DISINFECT, FLUSH AND TEST THE PIPING SYSTEM. WHEN EXISTING WATERLINES REQUIRE A CONNECTION OR TIE-IN, THE GRADE OF THE NEW WATERLINE SHALL BE ADJUSTED ACCORDINGLY, NOT EXCEEDING PIPE MFG'S SPECIFIED MAXIMUM DEFLECTION PER JOINT OR MAXIMUM VERTICAL OR HORIZONTAL RADIUS FOR MULTIPLE DEFLECTIONS. THE CONTRACTOR SHALL NOT EXCEED 75% OF THE PIPE MFG.'S SPECIFIED MAXIMUM DEFLECTION PER JOINT. ALL MAIN LINE CONNECTIONS SHALL BE SUBSIDIARY TO THE PIPELINE CONSTRUCTION UNLESS SPECIFIED BY A PAY ITEM OF THE TECHNICAL SPECIFICATIONS FOR THIS PROJECT.
- NO TREES OUTSIDE OF THE RIGHT-OF-WAY OR PERMANENT EASEMENT SHALL BE REMOVED, TRIMMED OR DAMAGED WITHOUT THE TOWN'S WRITTEN PERMISSION. ALL TREES TO BE REMOVED OR TRIMMED SHALL BE REVIEWED WITH THE TOWN, INCLUDING THOSE WITHIN THE RIGHT-OF-WAY OR PERMANENT EASEMENT.
- CONTRACTOR SHALL MAINTAIN ALL OPERATIONS WITHIN THE TOWN ROW OR EASEMENTS.
- CONTRACTOR SHALL BE REQUIRED TO INSTALL TEMPORARY TEST PLUGS, FITTINGS, AND SPECIALS FOR HYDROSTATIC TESTING AS NECESSARY AT NO ADDITIONAL COST TO THE OWNER.
- CONTRACTOR, AT HIS DISCRETION AND WITH PROPER APPROVAL, MAY TUNNEL OR BORE UNDER EXISTING UTILITIES OR ROADWAYS OTHER THAN THOSE SPECIFICALLY SHOWN ON THE DRAWINGS AT NO ADDITIONAL COST TO THE OWNER.
- WHEN NEW WATERLINE CONSTRUCTION CROSSES UNDER EXISTING PIPELINES, CONTRACTOR SHALL BACKFILL EXISTING PIPELINE WITH GRANULAR EMBEDMENT FROM TOP OF PIPE ZONE OF NEW WATERLINE TO ONE FOOT ABOVE EXISTING PIPELINE, UNLESS FLOWABLE FILL ENCASEMENT IS SHOWN IN THE PLANS.
- CONTRACTOR SHALL PROTECT AND OR REPLACE ALL UNDERGROUND IRRIGATION SYSTEMS (KNOWN AND UNKNOWN). ALL DAMAGE SHALL BE REPAIRED BY IRRIGATOR LICENSED IN THE STATE OF TEXAS AT NO ADDITIONAL COST TO THE OWNER. CONTRACTOR IS TO ASSUME ALL COMPONENTS OF IRRIGATION SYSTEM ARE IN WORKING ORDER UNLESS MUTUALLY AGREED UPON WITH LANDOWNER PRIOR TO CONSTRUCTION. WHILE IRRIGATION SYSTEMS ARE OFF-LINE, CONTRACTOR IS RESPONSIBLE FOR WATERING GRASS, TREES AND LANDSCAPING IN AFFECTED AREAS.
- IN ACCORDANCE WITH TEXAS STATE LAW, AT LEAST 2 DAYS PRIOR TO BEGINNING EXCAVATION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING A TEXAS REGISTERED NOTIFICATION CENTER (I.E. TEXAS ONE CALL, DIG TESS, ETC.), IN ORDER TO HAVE EXISTING UTILITIES LOCATED.
- CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING PLAN TO TRANSFER SERVICE TO THE PROPOSED WATERLINE AND SHALL COORDINATE THE PLAN AT LEAST 72 HOURS IN ADVANCE OF COMMENCING WORK.
- CONTRACTOR SHALL PROVIDE 2" THREADED TAPPING SADDLES ON WATERLINES AT 1000' INTERVALS AND AT ALL HIGH POINTS IN THE LINE TO BE USED IN FILLING AND TESTING WATERLINES.
- NO FIRES WILL BE ALLOWED. BRUSH AND CONSTRUCTION DEBRIS SHALL BE REMOVED FROM THE SITE. DIRT AND ROCK SHALL BE SEPARATED FROM BRUSH.
- BLASTING WILL NOT BE ALLOWED.
- CONTRACTOR SHALL STAKE ALL ROW, PERMANENT AND TEMPORARY EASEMENTS EVERY 50-FT PRIOR TO BEGINNING CONSTRUCTION AND MUST MAINTAIN THIS STAKING THROUGHOUT THE DURATION OF THE PROJECT.
- THIS PROJECT IS WITHIN THE AUSTIN CHALK FORMATION AND ROCK MAY BE ENCOUNTERED DURING EXCAVATION. THE COST FOR ROCK EXCAVATION SHALL BE SUBSIDIARY TO THE BID ITEM FOR PIPE INSTALLATION.
- CONTRACTOR SHALL PROVIDE TEMPORARY FENCING FOR LIVESTOCK ANYWHERE FENCING IS REMOVED FOR CONSTRUCTION ACTIVITIES. ANY PERMANENT FENCING DAMAGED BY CONSTRUCTION ACTIVITIES SHALL BE REPLACED IN THE SAME LOCATION WITH NEW FENCING IN AS GOOD OR BETTER CONDITION AS EXISTED PRIOR TO CONSTRUCTION.

EXISTING UTILITY OWNERS

TOWN OF PROSPER FRANK JAROMIN (972) 347-9969	ATMOS ENERGY DAVID COKER (972) 733-5122	NORTH TEXAS MUNICIPAL WATER DISTRICT TRAVIS MARKHAM (972) 442-5405	SUDDENLINK GARY ESTEP (469) 400-6338
COSERV ELECTRIC JODY PADRON (904) 321-7800 x7581	TXDOT TODD NEELY (972) 547-2321	COSERV GAS LUIS CONTRERAS (940) 390-5500	
CITY OF IRVING DANNY MASELLA (972) 734-1095	DIG TESS (800) 344-8377	ENERGY TRANSFER TOMMY RIGSBY (807) 559-3829	
AT&T CASEY WISEMAN (972) 569-3070	GRANDE COMMUNICATIONS CHRIS LANGSTON (940) 270-7016	ZAYO LOUISE JUDY (817) 665-4702	

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TOWN OF PROSPER - CONSTRUCTION / GENERAL NOTES - GN.1 DESCRIPTION

1. IT IS NOT THE INTENT OF THESE CONSTRUCTION NOTES TO COVER ALL DETAILS AND/OR SPECIFICATION REQUIREMENTS OF THE TOWN OF PROSPER. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE TOWN'S STANDARD SPECIFICATIONS, GENERAL DESIGN STANDARDS, ORDINANCES, RULES, POLICIES, REQUIREMENTS AND REGULATIONS, AS WELL AS ANY OTHER APPLICABLE STATE AND/OR FEDERAL RULES, REGULATIONS AND/OR REQUIREMENTS, AS THEY EXIST OR MAY BE AMENDED. ENGINEERING DRAWINGS SHALL GOVERN FOR CONSTRUCTION OF ALL CIVIL IMPROVEMENTS. THE EXISTENCE AND LOCATIONS OF ALL UNDERGROUND UTILITIES SHOWN (MAIN LINES, NO LATERAL OR SERVICES SHOWN) ON THE DRAWINGS WERE OBTAINED FROM AVAILABLE RECORDS AND ARE APPROXIMATE. NEITHER THE OWNER NOR THE ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES NOT SHOWN OR NOT IN THE LOCATION SHOWN. THE CONTRACTOR SHALL DETERMINE THE DEPTH AND LOCATION OF EXISTING UNDERGROUND UTILITIES PRIOR TO TRENCHING AND SHALL BE REQUIRED TO TAKE ANY PRECAUTIONARY MEASURES TO PROTECT ALL LINES SHOWN AND / OR ANY OTHER UNDERGROUND UTILITIES NOT OF RECORD OR NOT SHOWN ON THE PLANS. CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING ALL FRANCHISE AND TOWN UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL MAINTAIN SERVICE OF UTILITIES AT ALL TIMES EXCEPT AS APPROVED BY THE TOWN. CONTRACTOR SHALL IMMEDIATELY REPAIR ANY DAMAGE TO EXISTING UTILITIES.

2. ANY CONTRACTOR / SUBCONTRACTOR PERFORMING WORK ON THIS PROJECT SHALL FAMILIARIZE HIMSELF WITH THE SITE AND SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING DIRECTLY OR INDIRECTLY FROM HIS OPERATIONS. SAID EXISTING IMPROVEMENTS SHALL INCLUDE BUT NOT BE LIMITED TO BERMS, DITCHES, FENCES, AND PLANTS. ANY REMOVAL OR DAMAGE TO EXISTING IMPROVEMENTS SHALL BE REPLACED OR REPAIRED BY THE CONTRACTOR AT HIS EXPENSE AND SHALL BE APPROVED BY THE TOWN OF PROSPER.

3. ALL CONSTRUCTION, TESTING, AND MATERIALS SHALL MEET OR EXCEED ALL REQUIREMENTS OF THE TOWN OF PROSPER. ALL SUBMITTALS MUST BE ORIGINALS WITH SIGNATURES WHERE APPLICABLE; FACSIMILES OR EMAILS SHALL BE FOLLOWED UP WITH ORIGINALS.

4. ALL TESTING SHALL BE DONE BY AN APPROVED LABORATORY AT THE EXPENSE OF THE CONTRACTOR. THE TOWN WILL ONLY ACCEPT SIGNED ORIGINAL COPIES OF ALL TESTING REPORTS FOR REVIEW.

5. THE DEVELOPER OR HIS/HER DESIGNEE SHALL BE RESPONSIBLE FOR FURNISHING AND INSTALLING ALL TEMPORARY AND PERMANENT TRAFFIC CONTROL IN ACCORDANCE WITH THE MINIMUM REQUIREMENTS OF THE LATEST REVISION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL HANDBOOK. ALL REFERENCE FOR USING TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT) STANDARDS AND CONSTRUCTION DETAILS SHALL BE THE LATEST REVISIONS AND/OR AMENDMENTS THEREOF. THE TOWN OF PROSPER USES RAISED PAVEMENT MARKINGS (BUTTONS) FOR STRIPING AND THERMOPLASTIC MARKINGS IN LIEU OF PAINT. THE MINIMUM SIGN SIZE SHALL BE THE STANDARD SIZE IN THE MANUAL. DETAILS ARE AVAILABLE UPON REQUEST FOR THE TYPE OF BUTTON PATTERNS AND POSTS AND CONNECTIONS REQUIRED FOR THE SIGNS.

6. THE CONTRACTOR SHALL MAKE EVERY EFFORT NOT TO IMPEDE TRAFFIC ON EXISTING STREETS, ALLEYS, OR FIRE LANES OPEN TO THE PUBLIC. IN THE EVENT THE CONSTRUCTION WORK REQUIRES THE CLOSURE OF AN EXISTING STREET, ALLEY, OR FIRELANE, THE CONTRACTOR SHALL REQUEST THE ROAD CLOSURE THROUGH THE TOWN. IF THE CLOSURE ELIMINATES THE SECOND POINT OF ACCESS TO EXISTING BUILDINGS WITH A CERTIFICATE OF OCCUPANCY, THEN THE ACCESS MAY NOT BE CLOSED FOR MORE THAN FORTY-EIGHT (48) HOURS AND WILL REQUIRE FIRE CHIEF/FIRE MARSHAL APPROVAL IN EITHER CASE. UNLESS OTHERWISE SPECIFIED BY THE TOWN, ALL OTHER STREETS OR ALLEYS MAY NOT BE CLOSED FOR MORE THAN SEVENTY-TWO (72) HOURS.

GN.2 WATER SYSTEM - GENERAL NOTES

1. ALL TAPPING SLEEVES AND VALVES SHALL BE FULL BODY DUCTILE IRON. WITH PRIOR APPROVAL BY THE TOWN ENGINEER, STAINLESS STEEL SMITH BLAIR 623 MAY BE ALLOWED FOR CONNECTION TO EXISTING LINES TWENTY-INCH (20") OR LARGER.

2. GATE VALVES SHALL BE MUELLER MODEL SERIES 2360, M&H MODEL SERIES 4067/7571 OR AMERICAN FLOW CONTROL MODEL SERIES 2500. - 150 PSI TEST.

3. FITTINGS SHALL BE OF THE MECHANICAL JOINT TYPE, FLANGED WHERE APPLICABLE, AND BE MANUFACTURED BY US PIPE, AMERICAN, OR OTHER AS APPROVED BY THE TOWN - CLASS 250. ALL FITTINGS SHALL BE RESTRAINED BY THE USE OF MEGA-LUGS OR APPROVED OTHER AND CONCRETE THRUST BLOCKING. ALL CONCRETE SHALL BE DESIGNED WITH APPROPRIATE SULFATE RESISTANT CEMENT OR EQUIVALENT BASED ON LOCAL SOIL CONDITIONS.

4. FIRE HYDRANTS SHALL BE KENNEDY OR AMERICAN FLOW CONTROL (WATEROUS) TRAFFIC MODEL WB 67-250, THREE-WAY STANDARD THREAD WITH VALVE IN LEAD OR APPROVED OTHER. ALL MAIN STEAMER NOZZLES SHALL HAVE A NOMINAL INSIDE DIAMETER OF FOUR INCHES (4-1/2") WITH A STORZ CAPPED.

5. WATER LINES IN THE AREA OF STORM DRAIN INLETS SHALL BE CONSTRUCTED BEHIND THE INLET BY PULLING THE PIPE USING LONGITUDINAL BENDING IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS. FITTINGS MAY BE USED IF BENDING IS IMPRACTICAL; CONSULT WITH THE PROJECT TOWN CONSTRUCTION INSPECTOR.

6. WATER LINES CROSSING UNDER STORM DRAINS AND SANITARY SEWER LINES SHALL HAVE A MINIMUM OF EIGHTEEN INCHES (18") CLEARANCE BELOW STORM DRAINS AND TWENTY-FOUR INCHES (24") CLEARANCE BELOW SANITARY SEWER LINES OR OTHERWISE AS GOVERNED BY TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) CHAPTER 290 REQUIREMENTS. PARALLEL WATER LINES SHALL BE AT LEAST NINE FEET (9') CLEAR HORIZONTALLY TO SANITARY SEWER LINES AND MANHOLES. WHERE MINIMUM CLEARANCE CANNOT BE ACHIEVED, WATER LINES SHALL BE ENCASED SIX INCHES (6") AROUND IN CONCRETE TO TEN FEET (10') EITHER SIDE OF THE UTILITY CROSSING. WHERE WATER LINES CROSS CREEKS OR DITCHES THE WATER LINE SHALL BE PROTECTED BY CONCRETE ENCASEMENT AT LEAST TEN FEET (10') PAST THE EMBANKMENT SLOPE ON EACH SIDE.

7. WATER MAINS: ALL WATER MAINS SHALL HAVE A MINIMUM OF FORTY-EIGHT INCHES (48") COVER OVER THE TOP OF THE PIPE. ALL NEW WATER MAINS SHALL BE PVC PIPE IN ACCORDANCE WITH THE FOLLOWING: C900 DR 18 FOR FOUR-INCH (4") TO EIGHT-INCH (8"), C900 DR 18 FOR TWELVE-INCH (12"), AND C905 DR 18 FOR OVER TWELVE-INCH (12"), ALL "BLUE" IN COLOR AS PER TOWN SPECIFICATIONS; THE PIPE SHALL BE LAID ON A MINIMUM OF CLASS "F1" EMBEDMENT (SEE STANDARD CONSTRUCTION DETAIL NO. W10). WATER MAINS UP TO TWELVE INCHES (12") SHALL BE INSTALLED TWO FEET (2') BACK OF CURB; MAINS LARGER THAN TWELVE INCHES (12") SHALL BE INSTALLED AT LEAST THREE FEET (3') FROM THE BACK OF CURB DEPENDING UPON CONDITIONS. DETECTABLE METALLIC TAPE ("BLUE-CAUTION BURIED WATER BELOW" OR APPROVED OTHER) SHALL BE INSTALLED AFTER INITIAL BACKFILL ON APPROXIMATE CENTERLINE OF PIPE AND PRIOR TO FINAL BACKFILL ABOVE ALL PVC MAINS.

8. THE CONTRACTOR SHALL INSTALL FIRE HYDRANTS AT THE LOCATIONS SHOWN. A M.J. AND FLANGED TEE WITH A FLANGED END TO M.J. GATE VALVE IS REQUIRED SO THAT THE GATE VALVE IS ANCHORED TO THE MAIN.

9. FIRE HYDRANTS SHALL BE PAINTED AS FOLLOWS:
A. T.NEMEC SERIES 2H-HI BUILD T.NEMEC-GLOSS, CANDY APPLE RED/SAFETY FOR SIX-INCH (6") MAINS.
B. T.NEMEC SERIES 2H HI-BUILD T.NEMEC-GLOSS, TRUE BLUE SAFETY FOR EIGHT-INCH (8") MAINS.
C. T.NEMEC SERIES 2H HI-BUILD T.NEMEC-GLOSS, SAFETY YELLOW FOR TWELVE-INCH (12") OR LARGER WATER MAINS.

ALL HYDRANTS SHALL BE PAINTED WITH TWO COATS OF T.NEMEC SERIES 530 1201 OMNITHANE ALUMINUM / MATTE, SILVER PAINT. WHEN A COLOR CODE OTHER THAN ALUMINUM IS REQUIRED, THE TOP BONNET, INCLUDING THE LIP AND ALL NOZZLE CAPS, SHALL BE PAINTED THE APPROPRIATE COLOR.

10. ALL BOLTS AND NUTS USED WITH MECHANICAL JOINT FITTING SHALL BE "COR-TEN" STEEL OR APPROVED OTHER.

11. THE INSTALLATION OF A BLUE STEMSONITE (OR OTHER) MODEL 88-SSA FIRE HYDRANT MARKER WILL BE INSTALLED OPPOSITE FIRE HYDRANTS JUST OFF CENTER TO THE SIDE OF THE STREET ADJACENT TO THE HYDRANT.

12. POLYETHYLENE ENCASEMENT - THE CONTRACTOR SHALL FURNISH AND INSTALL POLYETHYLENE WRAP AROUND DUCTILE IRON PIPE, RELATED FITTINGS, AND VALVES. THIS WRAP SHALL BE AN 8 MIL. THICKNESS POLYTUBE. SEAMS AND OVERLAPS SHALL BE WRAPPED AND HELD IN PLACE BY TWO-INCH (2") WIDE PLASTIC BACKED ADHESIVE TAPE, POLYKEN 900 OR SCOTCHRAP NO. 50, OR AN APPROVED OTHER, WITH APPROXIMATE TWO-FOOT (2') LAPS ON THE POLYTUBE. THE WRAP ON THE BARREL OF THE PIPE SHALL BE LOOSE ENOUGH TO ALLOW THE FILM TO SHIFT WITH THE SOIL. THE WRAP SHALL BE INSTALLED WITHOUT BREAKS, TEARS, OR HOLES IN THE FILM. THE COST OF THE POLYETHYLENE TUBE WRAP AND COMPLETE INSTALLATION SHALL BE INCLUDED IN THE UNIT PRICE BID FOR THE FURNISHING AND THE INSTALLATION OF DUCTILE IRON PIPE, RELATED FITTINGS, AND VALVES.

13. VALVE BOXES SHALL BE FURNISHED AT THE REQUIRED LENGTH IN ORDER TO BE SET TO FINAL GRADE ON EACH GATE VALVE. AFTER THE FINAL CLEAN UP AND ALIGNMENT HAS BEEN COMPLETED, THE CONTRACTOR SHALL POUR A REINFORCED CONCRETE BLOCK 24" X 24" X 6" AROUND ALL VALVE BOXES SO THE FINISHED GRADE IS LEVEL WITH THE FINISHED PARKWAY. ALL VALVE STACK COMPONENTS SHALL BE CAST IRON. VALVE BOXES OVER FOUR FEET (4') DEEP WILL REQUIRE EXTENSIONS. ALL VALVES SHALL BE MARKED WITH A SAW ON THE CURB OR PAVEMENT WITH "V". THE "V" SHALL POINT TO THE LOCATION OF THE VALVE AS FOLLOWS: IF THE VALVE IS IN THE PAVING, THE "V" SHALL BE MARKED UPRIGHT; IF THE VALVE IS OUTSIDE THE PAVING, THE "V" SHALL BE MARKED UPSIDE DOWN.

14. THE CONTRACTOR SHALL COORDINATE OPERATION OF ALL EXISTING VALVES WITH THE TOWN. CONTACT THE ASSIGNED TOWN CONSTRUCTION INSPECTOR. ALL WATER LINES SHALL BE PRESSURE TESTED TO 200 PSI FOR A THREE (3) HOUR CONTINUOUS PERIOD. LEAKAGE RATE SHALL NOT EXCEED TWENTY-FIVE (25) GALLONS PER INCH OF NOMINAL DIAMETER PER MILE OF PIPE OVER A TWENTY-FOUR (24) HOUR PERIOD. CONTRACTOR SHALL FLUSH AND STERILIZE LINES AND PROVE LINES TO BE FREE OF FECAL COLIFORM ORGANISMS BY OBTAINING SAMPLES FOR LABORATORY TESTS FOR CONTAMINATION. THE LINE SHALL BE FLUSHED OUT, COMPLETELY REPLACING ITS ENTIRE VOLUME WITH WATER FROM THE OWNER'S MAINS. ONCE THE LINE HAS BEEN FILLED, ALL FLUSHING IS REQUIRED TO BE METERED, AND PAID FOR BY THE CONTRACTOR AT THE CURRENT RESIDENTIAL RATE. METERS WILL BE INSTALLED BY THE CONTRACTOR ON BLOW OFFS AS SHOWN ON THE TESTING PROGRAM. NO FLUSHING WILL BEGIN UNTIL THE TESTING PROGRAM HAS BEEN APPROVED BY THE TOWN. THE CONTRACTOR SHALL RE-FLUSH AND RE-STERILIZE UNTIL ALL SAMPLES PROVE FREE FROM CONTAMINATION.

15. ALL RESIDENTIAL WATER SERVICES SHALL BE AS FOLLOWS:
A. WATER SERVICES SHALL BE NORMALLY LOCATED TWO FEET OFF THE LOT LINE. PLASTIC METER BOXES SHALL BE DFW 16 AMR WITH A DFW 1600 AMR SOLID LID OR EQUAL FOR 1" METERS AND SHALL BE INSTALLED TWO FEET (2') BACK OF CURB LINE.
B. MINIMUM ONE-INCH (1") METER AND ONE-INCH (1") A.S.T.M. D2737 WORKING PRESSURE OF 200 PSI AT 23 C, SDR 9, POLY SERVICES ARE REQUIRED TO SERVE ALL RESIDENTIAL LOTS, AND SERVICE SHALL BE PROVIDED TO EACH OF THE FAMILY UNITS. SAND EMBEDMENT SHALL BE USED AROUND THE PIPE AND CORPORATION STOP. SERVICE SADDLES SHALL BE BRASS BODY WITH DOUBLE BRONZE OR STAINLESS STEEL FLATTENED STRAPS (NO BANDED) - FORD, CAMBRIDGE, A.Y. MCDONALD, OR TOWN APPROVED OTHER.
C. THE CONTRACTOR SHALL TIE A ONE-INCH (1") WIDE PIECE OF BLUE PLASTIC FLAGGING TO THE WATER SERVICE METER SET AND SHALL LEAVE A MINIMUM OF THIRTY-SIX INCHES (36") OF FLAGGING EXPOSED AFTER FINAL COMPLETION OF PAVING, BACKFILL, AND FINAL GRADE.
D. THE UTILITY CONTRACTOR SHALL INSTALL THE WATER SERVICES TO A POINT TWO (2) FEET BACK OF THE CURB LINE TO A DEPTH OF 12 INCHES BELOW FINAL GRADE WITH 3" CLEAR OF SOIL UNDER THE CURB STOP. THE SERVICE LINE SHALL BE CONTINUOUS WITH NO FITTINGS UNDER PAVING. THE METER BOX SHALL BE FURNISHED AND INSTALLED BY THE UTILITY CONTRACTOR AFTER THE PAVING CONTRACTOR HAS COMPLETED THE FINAL GRADING IN BACK OF THE CURB. EACH SERVICE LOCATION WILL BE MARKED ON THE CURB WITH A SINGLE VERTICAL SAW MARK BY THE UTILITY CONTRACTOR AND TIED TO PROPERTY CORNERS ON THE "AS-RECORDED" PLANS.

16. FOR NON-RESIDENTIAL WATER SERVICES, THE METER BOX OR VAULT SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR AFTER THE PAVING CONTRACTOR HAS COMPLETED THE FINAL GRADING IN BACK OF THE CURB. METER BOXES/VAULTS SHALL BE LOCATED OUTSIDE OF PAVING AND FLATWORK. EACH SERVICE LOCATION WILL BE MARKED ON THE CURB OR PAVEMENT WITH A SINGLE VERTICAL SAW MARK BY THE UTILITY CONTRACTOR AND TIED TO PROPERTY CORNERS ON THE "AS-RECORDED" PLANS.

17. DENSITY TESTING/COMPACTION REQUIREMENTS FOR PROJECTS IN THE AUSTIN GROUP FORMATION: FREQUENCY OF TRENCH COMPACTION TESTS SHALL NOT BE LESS THAN ONE (1) FOR ANY PIPE SECTION AND EVERY THREE HUNDRED LINEAR FEET (300') OF MAIN PIPE PER TWO FEET (2') OF LIFT UNTIL FINAL GRADE, STARTING AT TWO FEET (2') ABOVE THE TOP OF PIPE. WATER SERVICES ARE TO BE TESTED AT A RATE OF ONE (1) FOR EVERY SIX (6) SERVICES WHICH CROSS THE PROPOSED RIGHT OF WAY OR EVERY THREE HUNDRED LINEAR FEET (300') OF WATER SERVICE INSTALLED. EVERY OTHER FIRE HYDRANT LEAD THAT CROSS THE EXISTING OR PROPOSED STREET, ALLEY, OR FIRE LANE SUBGRADE SHALL ALSO RECEIVE AT LEAST ONE SET OF DENSITY TESTS. ALL DITCHES SHALL BE MECHANICALLY TAMPED AND COMPACTED TO NINETY-FIVE PERCENT (95%) STANDARD PROCTOR (ASTM D 698) DENSITY AT ZERO PERCENT (0%) TO FOUR PERCENT (4%) ABOVE OPTIMUM MOISTURE. WATER JETTING IS NOT PERMITTED.

17. CONTINUED - DENSITY TESTING/COMPACTION REQUIREMENTS FOR PROJECTS IN THE EAGLE FORD FORMATION: TRENCH BACKFILL SHALL CONSIST OF CLAY SOILS AND SHALL BE PLACED IN THIN, LOOSE LIFTS, MOISTURE CONDITIONED TO A MINIMUM OF 3 PERCENTAGE POINTS ABOVE OPTIMUM MOISTURE CONTENT, AND COMPACTED TO A MINIMUM OF 95 PERCENT OF STANDARD PROCTOR (ASTM D 698) MAXIMUM DRY DENSITY. SAND INITIAL BACKFILL SHALL BE PLACED IN THIN, LOOSE LIFTS AND MOISTURE CONDITIONED TO WITHIN 2 PERCENTAGE POINTS OF OPTIMUM MOISTURE CONTENT AND COMPACTED TO A MINIMUM OF 95 PERCENT OF STANDARD PROCTOR (ASTM D 698). FREQUENCY OF DENSITY TESTING REQUIREMENTS SHALL BE AS OUTLINED ABOVE.

18. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING "AS-RECORDED" PLANS TO THE ENGINEER OF RECORD SHOWING THE LOCATION OF WATER SERVICES AND VALVES BY DISTANCES TO LOT LINES. THIS INFORMATION SHALL BE PLACED AND MARKED "AS-RECORDED" BY THE ENGINEER OF RECORD. COPIES OF THESE "AS-RECORDED" PLANS SHALL BE FURNISHED TO THE TOWN AS REQUIRED.

19. THE CONTRACTOR SHALL FURNISH A MAINTENANCE BOND IN THE AMOUNT OF 100% (ONE-HUNDRED PERCENT) OF THE TOTAL CONTRACT PRICE TO THE TOWN (AS OBLIGEE) TO RUN TWO (2) YEARS FROM THE DATE OF FINAL ACCEPTANCE OF THE PROJECT BY THE TOWN.

20. STERILIZATION OF WATER MAINS: DURING THE CONSTRUCTION OPERATIONS WORKMEN SHALL BE REQUIRED TO USE UTMOST CARE TO SEE THAT PARTS OF THE STRUCTURES, INSIDE OF PIPES, FITTINGS, JOINTING MATERIALS, VALVES, ETC., THE SURFACE OF WHICH COME IN CONTACT WITH OWNER'S WATER ARE MAINTAINED IN A SANITARY CONDITION. EVERY EFFORT MUST BE MADE TO KEEP THE INSIDE OF THE PIPE, FITTINGS, AND VALVES FREE OF ALL FOREIGN MATTER, STICKS, DIRT, ROCKS, ETC. AS EACH JOINT OF PIPE IS BEING LAID IT MUST BE EFFECTIVELY SWABBED SO THAT ALL FOREIGN MATTER IS REMOVED. ALL FITTINGS AND EXPOSED OPEN ENDS OF PIPE MUST BE BLOCKED OR CAPPED UNTIL THE LINE IS COMPLETED. PRIOR TO ANY STERILIZATION, PRESSURE TESTING OR FLUSHING A TESTING PROGRAM WILL BE SUBMITTED TO THE TOWN SHOWING TOTAL FOOTAGE OF PIPE TO BE TESTED, LOCATIONS OF BLOW OFFS AND DESIGNATING SAMPLE LOCATIONS TO BE USED. TEST LOCATIONS WILL BE CLEARLY MARKED AND NUMBERED USING HALF SIZED DRAWINGS OF THE PROPOSED IMPROVEMENTS.

- A. THE LINE SHALL BE FLUSHED OUT, COMPLETELY REPLACING ITS ENTIRE VOLUME WITH WATER FROM THE OWNER'S MAINS. ONCE THE LINE HAS BEEN FILLED, ALL FLUSHING IS REQUIRED TO BE METERED, AND PAID FOR BY THE CONTRACTOR AT THE CURRENT RESIDENTIAL RATE. METERS WILL BE INSTALLED BY THE TOWN ON BLOW OFFS AS SHOWN ON THE TESTING PROGRAM. METERS ARE AVAILABLE AT PUBLIC WORKS FOR TESTING.
- B. CHLORINATED WATER USED IN FLUSHING AND DISINFECTING PIPELINES, STORAGE TANKS, OR VESSELS PRIOR TO CONNECTION TO THE DISTRIBUTION SYSTEM SHALL BE DISPOSED OF BY THE CONTRACTOR IN AN ACCEPTABLE MANNER. CHLORINATED WATER MUST BE "DE-CHLORINATED" PRIOR TO DISPOSAL TO ELIMINATE ADVERSE IMPACTS TO THE SURROUNDING ENVIRONMENT. WATER RELEASED TO THE ENVIRONMENT SHALL MEET ALL AWWA, EPA, AND TCEQ REGULATORY REQUIREMENTS.
- C. THE CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH ALL OF THE APPLICABLE REQUIREMENTS OF THE TPDES GENERAL PERMIT TXG670000, ISSUED BY THE TCEQ, REGARDING THE DISCHARGE OF HYDROSTATIC TEST WATER.
- D. RESIDUAL CHLORINE CONCENTRATIONS MAY BE REDUCED USING SULFUR DIOXIDE, SODIUM BISULFITE, SODIUM SULFITE, SODIUM THIOSULFATE, OR ASCORBIC ACID.
- E. THE DISCHARGE MUST BE TO A SPLASH PAD OR PAVED AREA, AND MAY NOT BE LOCATED WITHIN 300 FEET OF THE INTAKE FOR A DOMESTIC DRINKING WATER SUPPLY OR 500 FEET OF ANY PUBLIC OR PRIVATE WATER WELL.
- F. AN EFFLUENT WATER SAMPLE MUST BE TAKEN DURING THE FIRST HOUR OF DISCHARGE AT A LOCATION IMMEDIATELY NEAR THE POINT OF DISCHARGE, AND COLLECTED PRIOR TO COMMINGLING WITH STORM WATER, WASTEWATER, OR OTHER FLOWS.
- G. FOR DISCHARGES THAT EXTEND BEYOND AN HOUR IN DURATION, A SECOND SAMPLE MUST BE TAKEN OF THE LAST 10% OF THE EFFLUENT.
- H. SAMPLING PROTOCOL, SAMPLE CONTAINERS, HOLDING TIMES, PRESERVATION METHODS, AND ANALYTICAL METHODS MUST FOLLOW THE REQUIREMENTS SET FORTH IN THE GENERAL PERMIT.
- I. THE EFFLUENT GRAB SAMPLE(S) MUST BE ANALYZED FOR TOTAL RESIDUAL CHLORINE BY AN ACCREDITED AND CERTIFIED LABORATORY.
- J. ANY NONCOMPLIANCE THAT ENDANGERS HUMAN HEALTH OR SAFETY, OR THE ENVIRONMENT MUST BE REPORTED TO THE TCEQ IN ACCORDANCE WITH THE GENERAL PERMIT.
- K. ANY EFFLUENT VIOLATION WHICH DEVIATES FROM THE PERMITTED EFFLUENT LIMITATION BY MORE THAN 40% MUST BE REPORTED TO THE TCEQ IN ACCORDANCE WITH THE GENERAL PERMIT.
- L. THE CONTRACTOR MUST RECORD ALL HYDROSTATIC TEST WATER SAMPLE RESULTS ON AN APPROVED DMR (EPA FORM 3320-1). THESE MONITORING RECORDS SHALL BE RETAINED FOR A PERIOD OF THREE YEARS FROM THE DATE OF THE RECORD AND BE READILY AVAILABLE FOR REVIEW BY THE TCEQ UPON REQUEST.
- M. CHLORINE WILL BE INJECTED INTO THE SECTION OF LINE BEING STERILIZED SO THAT ITS ENTIRE CAPACITY WILL BE FILLED WITH WATER CONTAINING CHLORINE IN THE AMOUNT OF FIFTY (50) P.P.M. OR IN SUCH OTHER QUANTITY AS DETERMINED BY THE ENGINEER. THE STERILIZING AGENT SHALL BE INTRODUCED AT ONE END OF THE SECTION AND THE WATER RELEASED FROM THE OPPOSITE END UNTIL THE STERILIZING AGENT IS PRESENT AT THE DISCHARGE END IN SUCH QUANTITY AS TO INDICATE A RESIDUAL-CHLORINE OF FIFTY (50) P.P.M. OR AS OTHERWISE DETERMINED BY THE ENGINEER. ALL VALVES SHALL THEN BE CLOSED AND THE STERILIZING SOLUTION PERMITTED TO REMAIN IN THE PIPE LINE SECTION FOR NOT LESS THAN TWENTY-FOUR (24) HOURS.
- N. AT THE END OF THE STERILIZING PERIOD THE STERILIZING SOLUTION SHALL BE DISCHARGED FROM THE PIPE AND REPLACED WITH WATER DIRECT FROM A MAIN OF THE OWNER.
- O. A SAMPLE OF WATER FROM THE STERILIZED MAIN SHALL BE TAKEN FROM A SUITABLE TAP UNDER THE SUPERVISION OF THE ENGINEER OR HIS INSPECTOR AND SUBMITTED TO A TCEQ APPROVED TESTING LABORATORY. IF THE TEST SHOWS A SATISFACTORY QUALITY OF WATER, THE LINE SO STERILIZED SHALL THEN BE PLACED IN SERVICE BY THE CONTRACTOR WHO SHALL NOTIFY THE WATER SUPERINTENDENT AND ASSIST THE WATER SUPERINTENDENT IN LOCATION AND OPERATION OF ALL VALVES INSTALLED BY THE CONTRACTOR. IF THE SAMPLE SHOWS UNSATISFACTORY QUALITY OF WATER, THE PROCESS OF STERILIZATION SHALL BE REPEATED UNTIL SATISFACTORY WATER IS OBTAINED. THE LINES SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA C651, LATEST REVISION THEREOF.
- P. STERILIZATION OF THE LINE OR ANY SECTION THEREOF SHALL NOT BE COMMENCED UNTIL THE ENGINEER'S APPROVAL OF THE METHOD, APPARATUS, STERILIZING AGENT, AND THE SECTION OF THE LINE HAS BEEN OBTAINED.
- Q. TEST SAMPLES WILL BE DONE TO MEET THE TCEQ REQUIREMENTS AND TEST STATIONS WILL BE THE CONTRACTOR'S RESPONSIBILITY. WHEN ADDITIONAL TAPS ARE REQUIRED TO MEET SAMPLING FREQUENCY THE CONTRACTOR SHALL SUBMIT HIS PROCEDURE FOR THE TOWN'S APPROVAL. SAMPLES WILL BE TAKEN AT 1,000 LF AND WITH THE TOWN'S INSPECTOR PRESENT. SAMPLES WILL BE WRAPPED BY THE TOWN'S INSPECTOR WITH TAMPER PROOF TAPE PRIOR TO LEAVING THE CONSTRUCTION SITE.

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Item 12
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144
Professional Seal: CLAYTON C. BARNARD, PROFESSIONAL ENGINEER, LICENSE NO. 103415, EXPIRES 05/31/2020
Signature: Clayton C. Barnard

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TOWN OF PROSPER, TEXAS
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
GENERAL

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Page 938

**TCEQ WATER DISTRIBUTION SYSTEM
GENERAL CONSTRUCTION NOTES**

1. THIS WATER DISTRIBUTION SYSTEM MUST BE CONSTRUCTED IN ACCORDANCE WITH THE CURRENT TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) RULES AND REGULATIONS FOR PUBLIC WATER SYSTEMS 30 TEXAS ADMINISTRATIVE CODE (TAC) CHAPTER 290 SUBCHAPTER D. WHEN CONFLICTS ARE NOTED WITH LOCAL STANDARDS, THE MORE STRINGENT REQUIREMENT SHALL BE APPLIED. AT A MINIMUM, CONSTRUCTION FOR PUBLIC WATER SYSTEMS MUST ALWAYS MEET TCEQ'S "RULES AND REGULATIONS FOR PUBLIC WATER SYSTEMS."
2. ALL NEWLY INSTALLED PIPES AND RELATED PRODUCTS MUST CONFORM TO AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)/NSF INTERNATIONAL STANDARD 61 AND MUST BE CERTIFIED BY AN ORGANIZATION ACCREDITED BY ANSI [§290.44(A)(1)].
3. PLASTIC PIPE FOR USE IN PUBLIC WATER SYSTEMS MUST BEAR THE NSF INTERNATIONAL SEAL OF APPROVAL (NSF-PW) AND HAVE AN ASTM DESIGN PRESSURE RATING OF AT LEAST 150 PSI OR A STANDARD DIMENSION RATIO OF 26 OR LESS [§290.44(A)(2)].
4. NO PIPE WHICH HAS BEEN USED FOR ANY PURPOSE OTHER THAN THE CONVEYANCE OF DRINKING WATER SHALL BE ACCEPTED OR RELOCATED FOR USE IN ANY PUBLIC DRINKING WATER SUPPLY [§290.44(A)(3)].
5. ALL WATER LINE CROSSINGS OF WASTEWATER MAINS SHALL BE PERPENDICULAR [§290.44(E)(4)(B)].
6. WATER TRANSMISSION AND DISTRIBUTION LINES SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. HOWEVER, THE TOP OF THE WATER LINE MUST BE LOCATED BELOW THE FROST LINE AND IN NO CASE SHALL THE TOP OF THE WATER LINE BE LESS THAN 24 INCHES BELOW GROUND SURFACE [§290.44(A)(4)].
7. THE MAXIMUM ALLOWABLE LEAD CONTENT OF PIPES, PIPE FITTINGS, PLUMBING FITTINGS, AND FIXTURES IS 0.25 PERCENT [§290.44(B)].
8. THE CONTRACTOR SHALL INSTALL APPROPRIATE AIR RELEASE DEVICES WITH VENT OPENINGS TO THE ATMOSPHERE COVERED WITH 16-MESH OR FINER, CORROSION RESISTANT SCREENING MATERIAL OR AN ACCEPTABLE EQUIVALENT [§290.44(D)(1)].
9. THE CONTRACTOR SHALL NOT PLACE THE PIPE IN WATER OR WHERE IT CAN BE FLOODED WITH WATER OR SEWAGE DURING ITS STORAGE OR INSTALLATION [§290.44(F)(1)].
10. WHEN WATERLINES ARE LAID UNDER ANY FLOWING OR INTERMITTENT STREAM OR SEMI-PERMANENT BODY OF WATER THE WATERLINE SHALL BE INSTALLED IN A SEPARATE WATERTIGHT PIPE ENCASEMENT. VALVES MUST BE PROVIDED ON EACH SIDE OF THE CROSSING WITH FACILITIES TO ALLOW THE UNDERWATER PORTION OF THE SYSTEM TO BE ISOLATED AND TESTED [§290.44(F)(2)].
11. PURSUANT TO 30 TAC §290.44(A)(5), THE HYDROSTATIC LEAKAGE RATE SHALL NOT EXCEED THE AMOUNT ALLOWED OR RECOMMENDED BY THE MOST CURRENT AWWA FORMULAS FOR PVC PIPE, CAST IRON AND DUCTILE IRON PIPE. INCLUDE THE FORMULAS IN THE NOTES ON THE PLANS.
 - THE HYDROSTATIC LEAKAGE RATE FOR POLYVINYL CHLORIDE (PVC) PIPE AND APPURTENANCES SHALL NOT EXCEED THE AMOUNT ALLOWED OR RECOMMENDED BY FORMULAS IN AMERICA WATER WORKS ASSOCIATION (AWWA) C-605 AS REQUIRED IN 30 TAC §290.44(A)(5). PLEASE ENSURE THAT THE FORMULA FOR THIS CALCULATION IS CORRECT AND MOST CURRENT FORMULA IS IN USE;

$$Q = \frac{LD\sqrt{P}}{148,000}$$

WHERE:

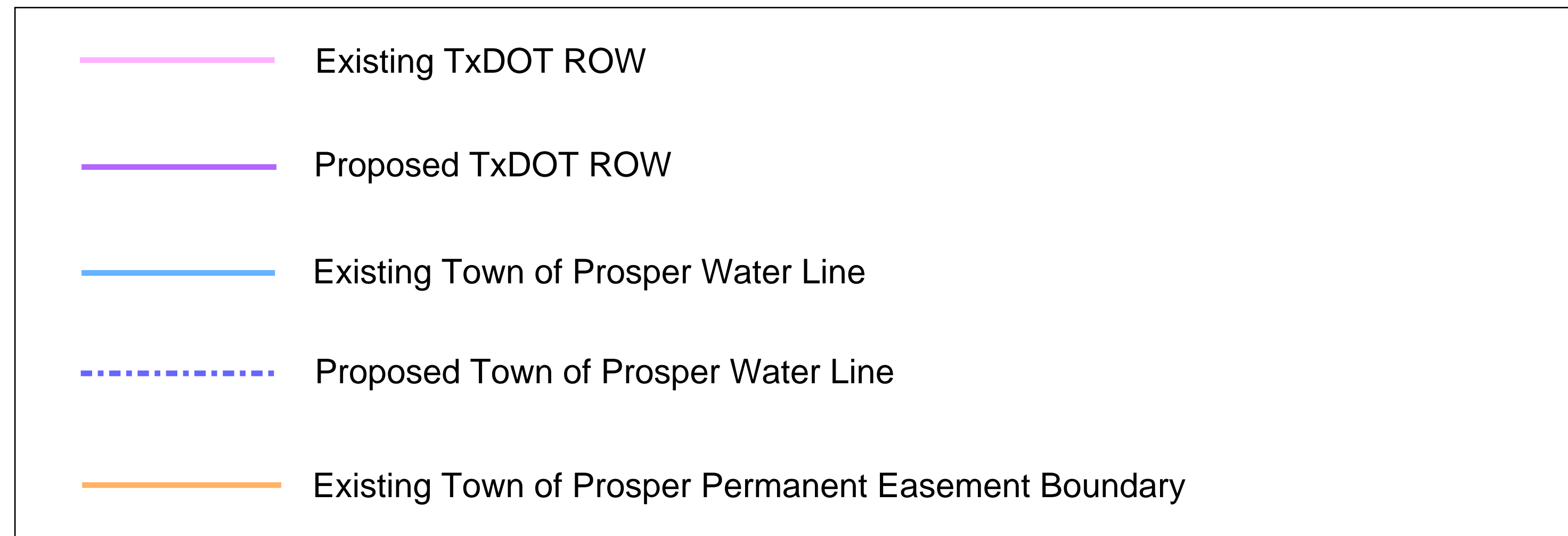
- Q = THE QUANTITY OF MAKEUP WATER IN GALLONS PER HOUR,
- L = THE LENGTH OF THE PIPE SECTION BEING TESTED, IN FEET,
- D = THE NOMINAL DIAMETER OF THE PIPE IN INCHES, AND
- P = THE AVERAGE TEST PRESSURE DURING THE HYDROSTATIC TEST IN POUNDS PER SQUARE INCH (PSI).
- THE HYDROSTATIC LEAKAGE RATE FOR DUCTILE IRON (DI) PIPE AND APPURTENANCES SHALL NOT EXCEED THE AMOUNT ALLOWED OR RECOMMENDED BY FORMULAS IN AMERICA WATER WORKS ASSOCIATION (AWWA) C-600 AS REQUIRED IN 30 TAC §290.44(A)(5). PLEASE ENSURE THAT THE FORMULA FOR THIS CALCULATION IS CORRECT AND MOST CURRENT FORMULA IS IN USE;

$$L = \frac{SD\sqrt{P}}{148,000}$$

WHERE:

- L = THE QUANTITY OF MAKEUP WATER IN GALLONS PER HOUR,
- S = THE LENGTH OF THE PIPE SECTION BEING TESTED, IN FEET,
- D = THE NOMINAL DIAMETER OF THE PIPE IN INCHES, AND
- P = THE AVERAGE TEST PRESSURE DURING THE HYDROSTATIC TEST IN POUNDS PER SQUARE INCH (PSI).

12. THE CONTRACTOR SHALL MAINTAIN A MINIMUM SEPARATION DISTANCE IN ALL DIRECTIONS OF NINE FEET BETWEEN THE PROPOSED WATERLINE AND WASTEWATER COLLECTION FACILITIES INCLUDING MANHOLES. IF THIS DISTANCE CANNOT BE MAINTAINED, THE CONTRACTOR MUST IMMEDIATELY NOTIFY THE PROJECT ENGINEER FOR FURTHER DIRECTION. SEPARATION DISTANCES, INSTALLATION METHODS, AND MATERIALS UTILIZED MUST MEET §290.44(E)(1)-(4).
13. THE SEPARATION DISTANCE FROM A POTABLE WATERLINE TO A WASTEWATER MAIN OR LATERAL MANHOLE OR CLEANOUT SHALL BE A MINIMUM OF NINE FEET. WHERE THE NINE-FOOT SEPARATION DISTANCE CANNOT BE ACHIEVED, THE POTABLE WATERLINE SHALL BE ENCASED IN A JOINT OF AT LEAST 150 PSI PRESSURE CLASS PIPE AT LEAST 18 FEET LONG AND TWO NOMINAL SIZES LARGER THAN THE NEW CONVEYANCE. THE SPACE AROUND THE CARRIER PIPE SHALL BE SUPPORTED AT FIVE-FOOT INTERVALS WITH SPACERS OR BE FILLED TO THE SPRINGLINE WITH WASHED SAND. THE ENCASEMENT PIPE SHALL BE CENTERED ON THE CROSSING AND BOTH ENDS SEALED WITH CEMENT GROUT OR MANUFACTURED SEALANT [§290.44(E)(5)].
14. FIRE HYDRANTS SHALL NOT BE INSTALLED WITHIN NINE FEET VERTICALLY OR HORIZONTALLY OF ANY WASTEWATER LINE, WASTEWATER LATERAL, OR WASTEWATER SERVICE LINE REGARDLESS OF CONSTRUCTION [§290.44(E)(6)].
15. SUCTION MAINS TO PUMPING EQUIPMENT SHALL NOT CROSS WASTEWATER MAINS, WASTEWATER LATERALS, OR WASTEWATER SERVICE LINES. RAW WATER SUPPLY LINES SHALL NOT BE INSTALLED WITHIN FIVE FEET OF ANY TILE OR CONCRETE WASTEWATER MAIN, WASTEWATER LATERAL, OR WASTEWATER SERVICE LINE [§290.44(E)(7)].
16. WATERLINES SHALL NOT BE INSTALLED CLOSER THAN TEN FEET TO SEPTIC TANK DRAINFIELDS [§290.44(E)(8)].
17. THE CONTRACTOR SHALL DISINFECT THE NEW WATERLINES IN ACCORDANCE WITH AWWA STANDARD C-651-14 OR MOST RECENT, THEN FLUSH AND SAMPLE THE LINES BEFORE BEING PLACED INTO SERVICE. SAMPLES SHALL BE COLLECTED FOR MICROBIOLOGICAL ANALYSIS TO CHECK THE EFFECTIVENESS OF THE DISINFECTION PROCEDURE WHICH SHALL BE REPEATED IF CONTAMINATION PERSISTS. A MINIMUM OF ONE SAMPLE FOR EACH 1,000 FEET OF COMPLETED WATERLINE WILL BE REQUIRED OR AT THE NEXT AVAILABLE SAMPLING POINT BEYOND 1,000 FEET AS DESIGNATED BY THE DESIGN ENGINEER [§290.44(F)(3)].
18. DECHLORINATION OF DISINFECTING WATER SHALL BE IN STRICT ACCORDANCE WITH CURRENT AWWA STANDARD C655-09 OR MOST RECENT.



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
GENERAL
TCEQ GENERAL NOTES

NO.	ISSUE	BY	DATE	REV.	NO.	ISSUE	BY	DATE	REV.
PRP18708	PRP18708								
MAY 2020	MAY 2020								
DESIGNED	DESIGNED								
MDS	MDS								
NIRM	NIRM								
REVISION	REVISION								
CHECKED	CHECKED								
CCB	CCB								
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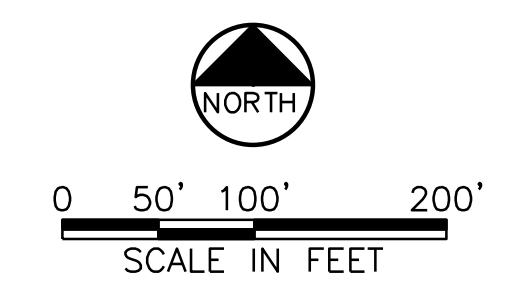
TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
GENERAL
HORIZONTAL CONTROL PLAN

PRP18708
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HORIZONTAL AND VERTICAL CONTROL DATUM BASE NOTE:
HORIZONTAL AND VERTICAL DATA SHOWN HEREON IS BASED ON THE STATE PLANE COORDINATE SYSTEM (NAD 83) FOR THE TEXAS NORTH CENTRAL ZONE (4202). ALL DISTANCES AND COORDINATES ARE SURFACE. SURFACE SCALE FACTOR=1.00015271 GRID SCALE FACTOR=0.999847313316783394 HELD @ 0,0,

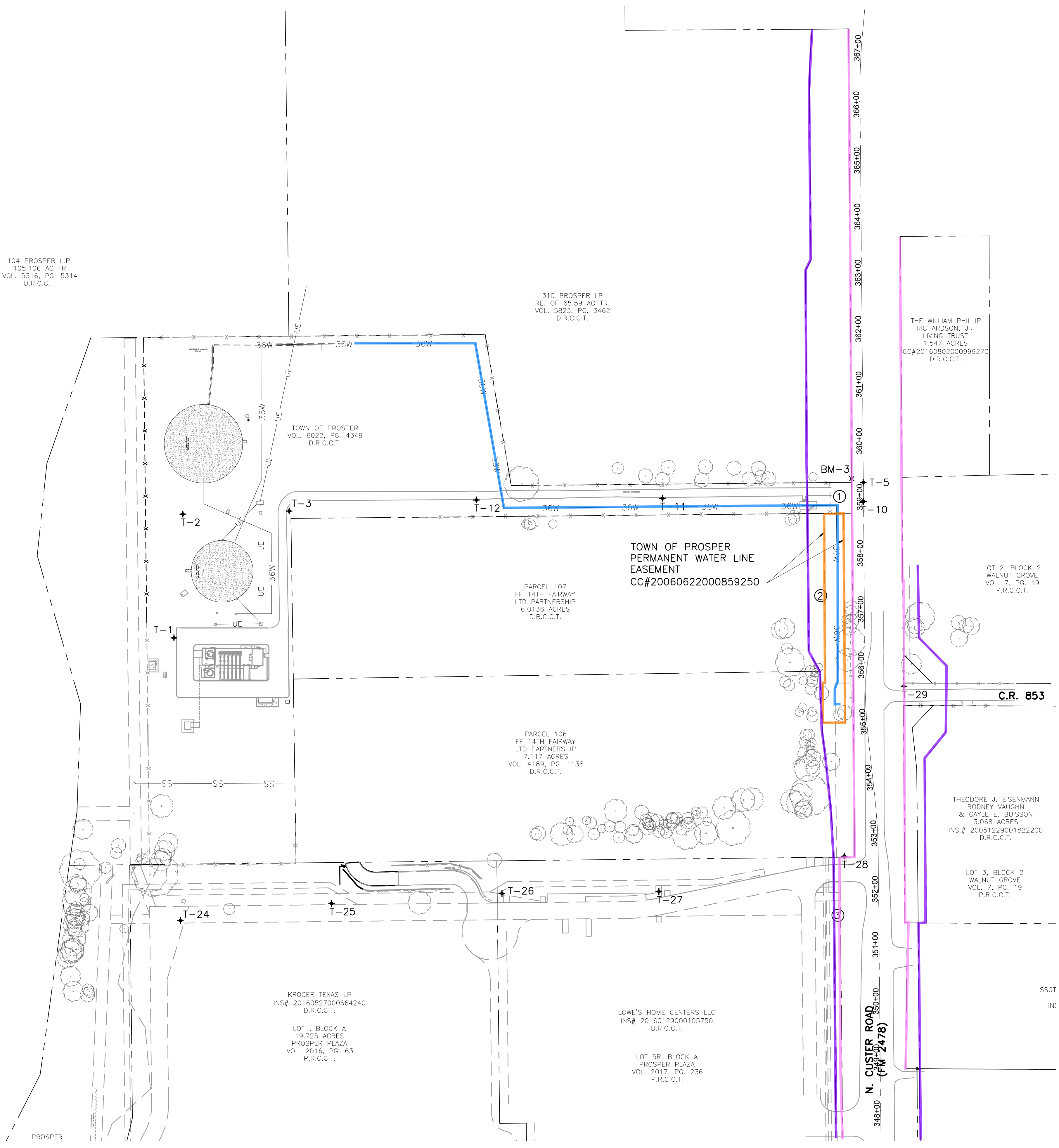


BENCHMARK TABLE				
NUMBER	NORTHING	EASTING	ELEVATION	DESCRIPTION
BM-1	7131988.52	2507889.13	719.46	CHISELED BOX CUT ON THE EAST END OF A CURB RETURN, 130' NORTH OF THE CENTERLINE OF UNIVERSITY DR. (HWY 380), APPROXIMATELY 1390' WEST OF THE CENTERLINE OF CUSTER ROAD (FM-2478).
BM-2	7132060.53	2509175.11	735.81	CHISELED BOX CUT ON EAST END OF CONCRETE CURB NEAR TACO BUENO RESTAURANT PARKING LOT, APPROX. 100' WEST OF THE CENTERLINE OF CUSTER ROAD, AND APPROX. 175' NORTH OF THE CENTERLINE OF UNIVERSITY DRIVE.
BM-3	7133780.19	2509220.88	693.62	CHISELED BOX CUT IN THE CENTER OF 24" RCP ON THE NORTH SIDE OF DRIVE ENTRANCE TO PROSPER WATER TANK SITE, APPROX. 45' WEST OF THE EXISTING CENTERLINE OF CUSTER ROAD.

CONTROL POINT TABLE				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
T-1	7133496.34	2508012.78	680.78	1/2" IRON ROD WITH RED PLASTIC CAP
T-2	7133716.92	2508028.68	675.73	1/2" IRON ROD WITH RED PLASTIC CAP
T-3	7133722.44	2508218.19	673.43	1/2" IRON ROD WITH RED PLASTIC CAP
T-5	7133773.40	2509241.38	699.45	1/2" IRON ROD WITH RED PLASTIC CAP
T-10	7133739.61	2509242.03	699.89	1/2" IRON ROD WITH RED PLASTIC CAP
T-11	7133745.26	2508883.40	675.31	1/2" IRON ROD WITH RED PLASTIC CAP
T-12	7133742.17	2508551.82	671.26	1/2" IRON ROD WITH RED PLASTIC CAP
T-24	7132992.14	2508024.11	714.07	1/2" IRON ROD WITH RED PLASTIC CAP
T-25	7133022.89	2508293.83	717.38	1/2" IRON ROD WITH RED PLASTIC CAP
T-26	7133040.32	2508597.44	721.87	1/2" IRON ROD WITH RED PLASTIC CAP
T-27	7133043.97	2508877.11	723.70	1/2" IRON ROD WITH RED PLASTIC CAP
T-28	7133107.06	2509207.49	710.88	1/2" IRON ROD WITH RED PLASTIC CAP
T-29	7133409.95	2509313.83	702.91	1/2" IRON ROD WITH RED PLASTIC CAP

TxDOT PARCEL ID

- ① TxDOT PARCEL #10
- ② TxDOT PARCEL #7
- ③ TxDOT PARCEL #1



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5 AC TR
VOL. 2016, PG. 63
D.R.C.C.T.

104 PROSPER L.P.
105.106 AC TR
VOL. 5316, PG. 5314
D.R.C.C.T.

KROGER TEXAS LP
INS# 20160527000664240
D.R.C.C.T.

LOT , BLOCK A
19.725 ACRES
PROSPER PLAZA
VOL. 2016, PG. 63
P.R.C.C.T.

LOWE'S HOME CENTERS LLC
INS# 20160129000105750
D.R.C.C.T.

LOT 5R, BLOCK A
PROSPER PLAZA
VOL. 2017, PG. 236
P.R.C.C.T.

PARCEL 106
FF 14TH FAIRWAY
LTD PARTNERSHIP
7.117 ACRES
VOL. 4189, PG. 1138
D.R.C.C.T.

PARCEL 107
FF 14TH FAIRWAY
LTD PARTNERSHIP
6.0136 ACRES
D.R.C.C.T.

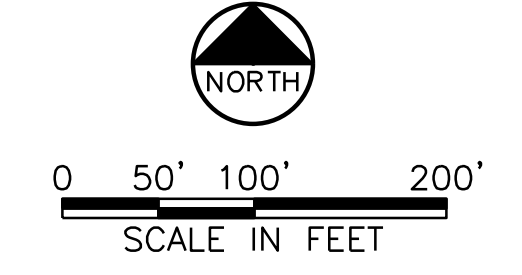
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RE. OF 65.59 AC TR.
VOL. 5823, PG. 3462
D.R.C.C.T.

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LIVING TRUST
1.547 ACRES
CC#2016080200099270
D.R.C.C.T.

LOT 2, BLOCK 2
WALNUT GROVE
VOL. 7, PG. 19
P.R.C.C.T.

THEODORE J. EISENMANN
RODNEY VAUGHN
& GAYLE E. BUISSON
3.068 ACRES
INS.# 20051229001822200
D.R.C.C.T.

LOT 3, BLOCK 2
WALNUT GROVE
VOL. 7, PG. 19
P.R.C.C.T.



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
GENERAL
SITE DEMOLITION PLAN

PRP18708	PRP18708	DATE	DATE	DESIGNED	DESIGNED	DRAWN	DRAWN	REVISION	REVISION	CHECKED	CHECKED
MAY 2020	MAY 2020	MDS	MDS	NIRM	NIRM					CCB	CCB

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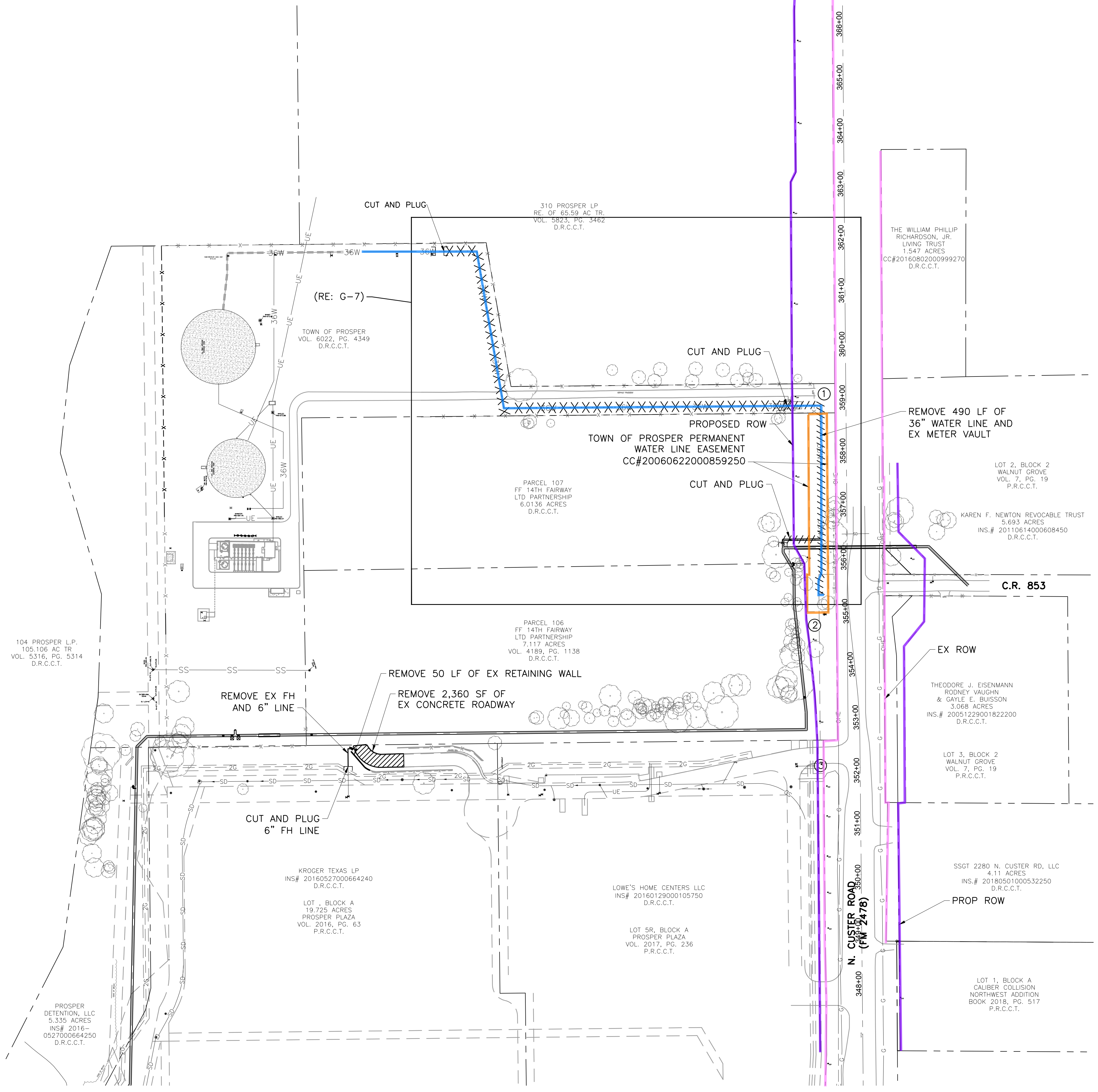
- LEGEND**
- XXXXXXX WATER LINE TO BE ABANDONED IN PLACE.
 - ////////// WATER LINE TO BE REMOVED.

NOTES:

- CONTRACTOR SHALL REMOVE EXISTING METER VAULT AND ALL APPURTENANCES. THE EXISTING SLEEVE VALVE WILL BE RELOCATED TO THE PROPOSED VAULT.
- THE EXISTING PIPELINE MUST STAY IN OPERATION UNTIL THE PROPOSED PIPELINE HAS BEEN TESTED AND ACCEPTED.

TxDOT PARCEL ID

- ① TxDOT PARCEL #10
- ② TxDOT PARCEL #7
- ③ TxDOT PARCEL #1



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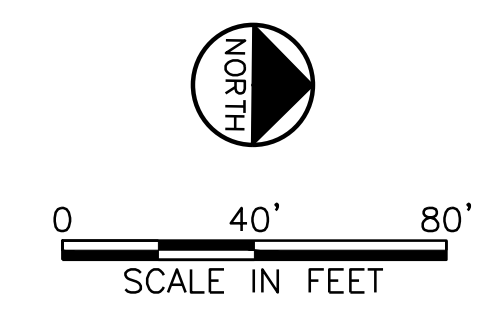
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LTD PARTNERSHIP
7.117 ACRES
VOL. 4189, PG. 1138
D.R.C.C.T.

FF 14TH FAIRWAY
LTD PARTNERSHIP
6.0136 ACRES
D.R.C.C.T.

TOWN OF PROSPER
VOL. 6022, PG. 4349
D.R.C.C.T.

310 PROSPER LP
RE. OF 65.59 AC TR.
VOL. 5823, PG. 3462
D.R.C.C.T.



LEGEND

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- ////////// · WATER LINE TO BE REMOVED.

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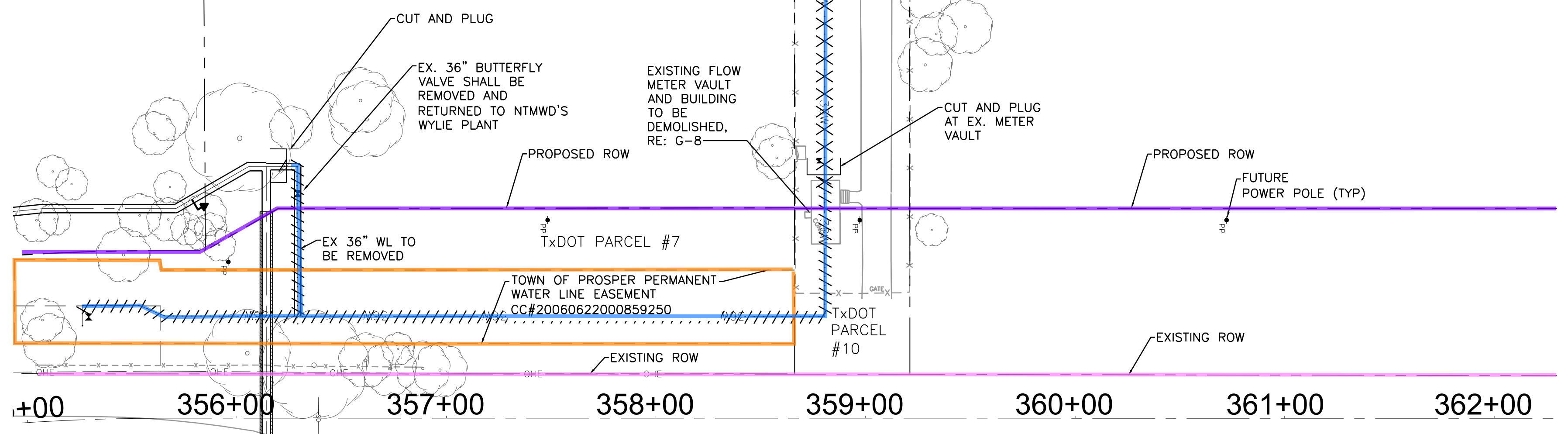


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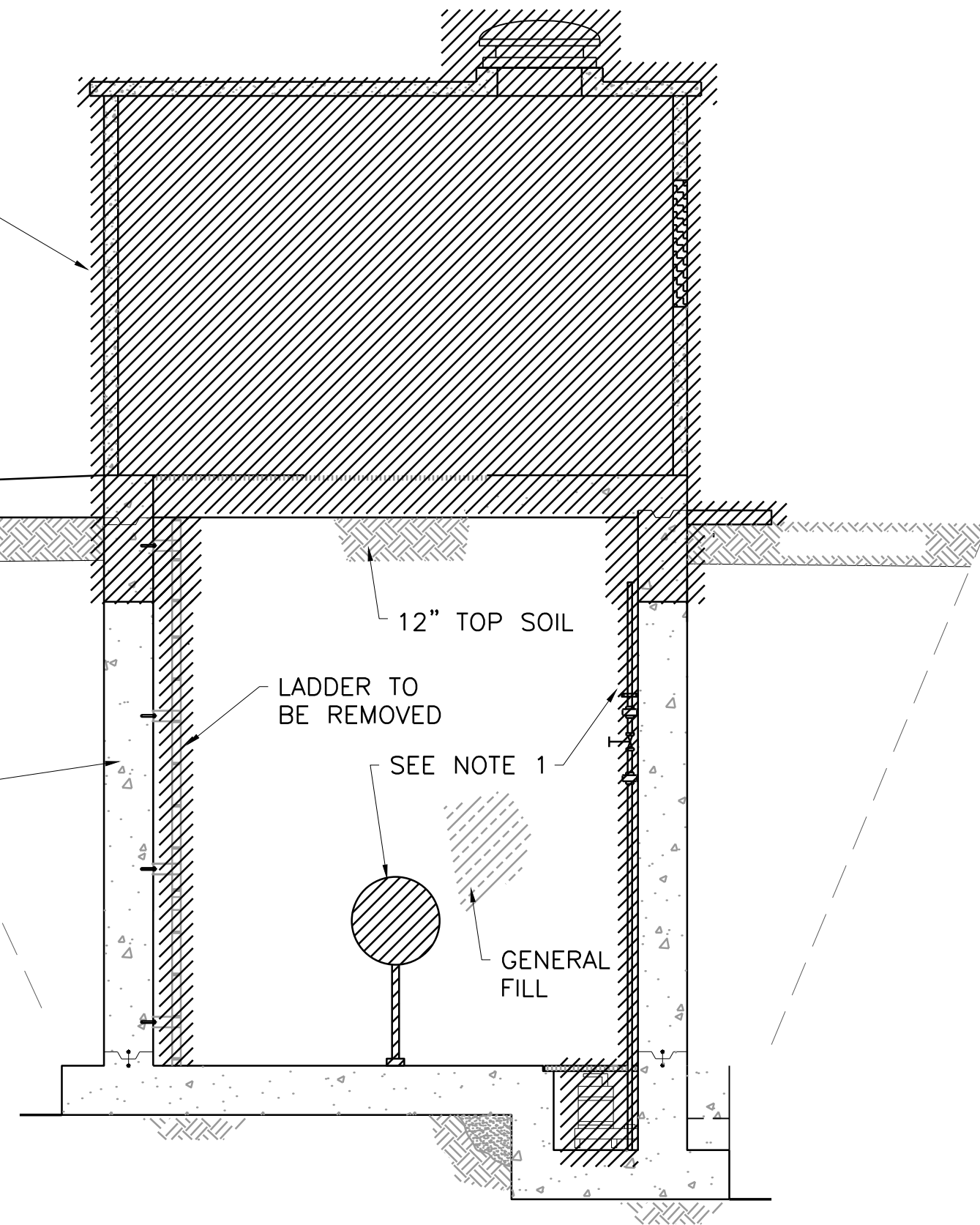
TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
CIVIL

SITE DEMOLITION PLAN II

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			NRM	
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EXISTING BUILDING AND VAULT TO BE DEMOLISHED AND REMOVED TO 3' BELOW GRADE

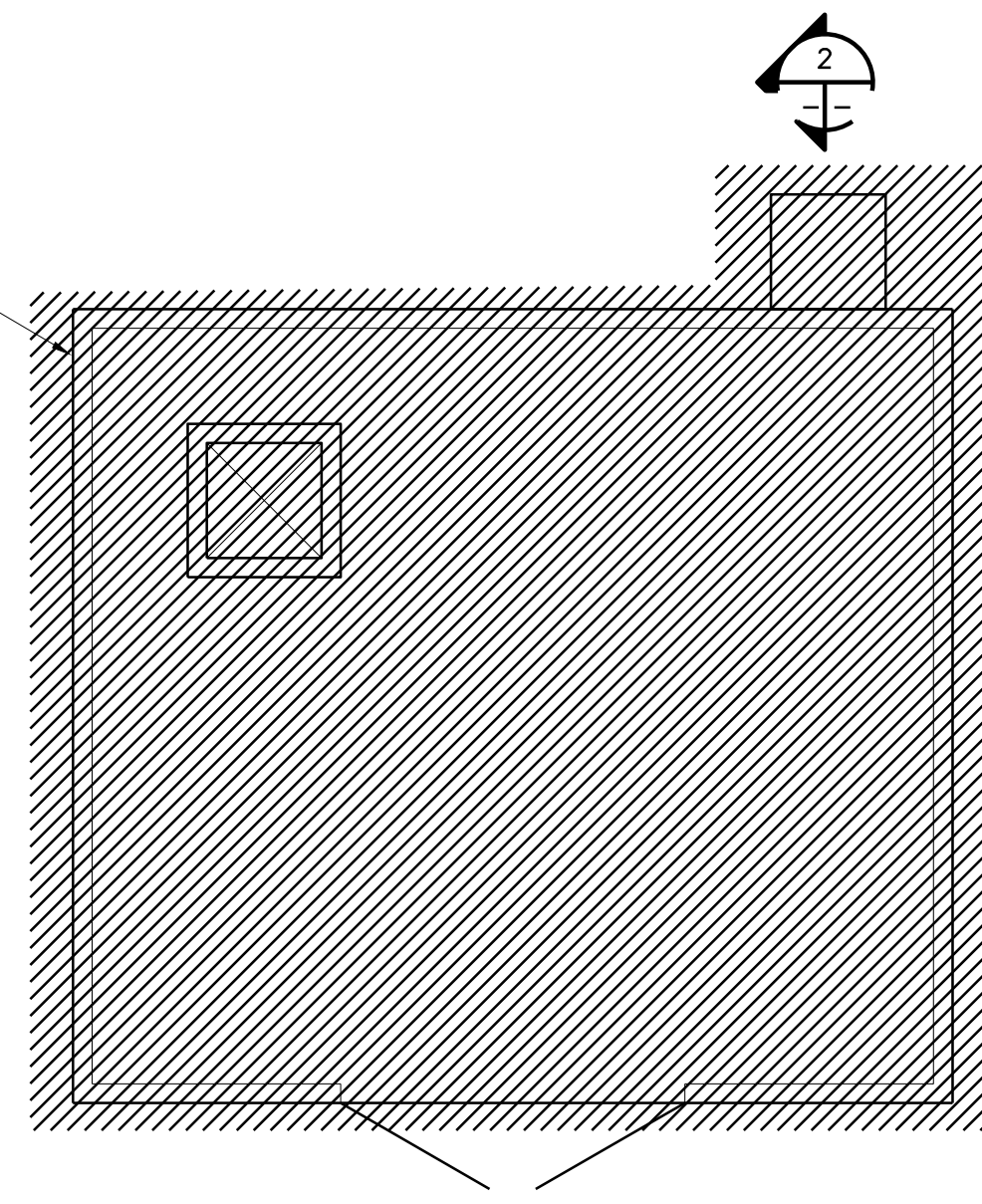


EXISTING VAULT BEYOND 3' TO BE ABANDONED IN PLACE

12" TOP SOIL
LADDER TO BE REMOVED
SEE NOTE 1
GENERAL FILL

EXISTING NTMWD FLOW METER VAULT-SECTION
NOT TO SCALE

EXISTING BUILDING ROOF TO BE DEMOLISHED AND REMOVED



EXISTING NTMWD FLOW METER BUILDING-ROOF PLAN VIEW
NOT TO SCALE

LEGEND

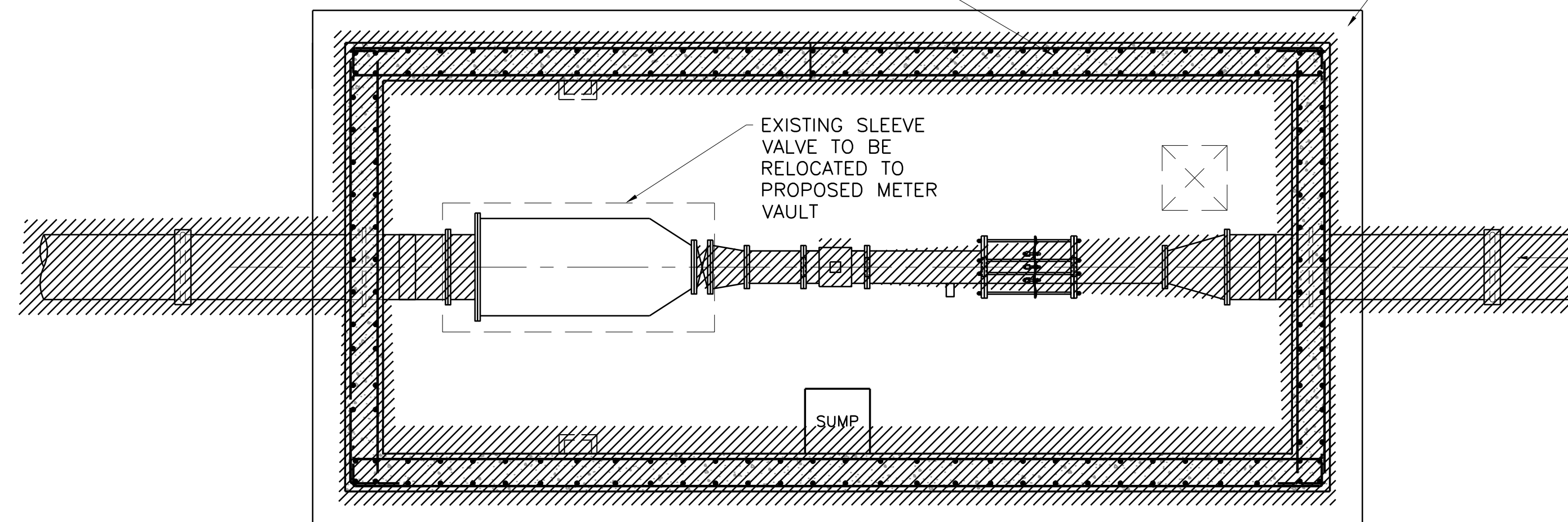
////////// TO BE DEMOLISHED AND REMOVED

NOTES:

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- 2. THE EXISTING PIPELINE MUST STAY IN OPERATION UNTIL THE PROPOSED PIPELINE HAS BEEN TESTED AND ACCEPTED.

EXISTING BUILDING AND VAULT TO BE DEMOLISHED AND REMOVED TO 3' BELOW GRADE

SLAB TO BE ABANDONED IN PLACE



EXISTING SLEEVE VALVE TO BE RELOCATED TO PROPOSED METER VAULT

SUMP

EXISTING NTMWD FLOW METER VAULT-PLAN
NOT TO SCALE

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TOWN OF PROSPER, TEXAS
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
CIVIL
EXISTING NTMWD METER VAULT DEMOLITION

NO.	ISSUE	BY	DATE	PRP18708	DESIGNED	DRAWN	CHECKED	FILE NAME
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Texas Registered Engineering Firm F-2144

Clayton C. Barnard

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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
CIVIL
SITE PLAN

NO.	ISSUE	BY	DATE	PRJ. JOB NO.	DATE	DESIGNED	ATC	DRAWN	NIRM	REVISION	CHECKED	CCB
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Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.												
FILE NAME: GN-ALL-PL-SITE.dwg												
SHEET: G-9												
SEQ. 10												

Freeze and Nichols, Inc. Texas Registered Engineering Firm F-2144



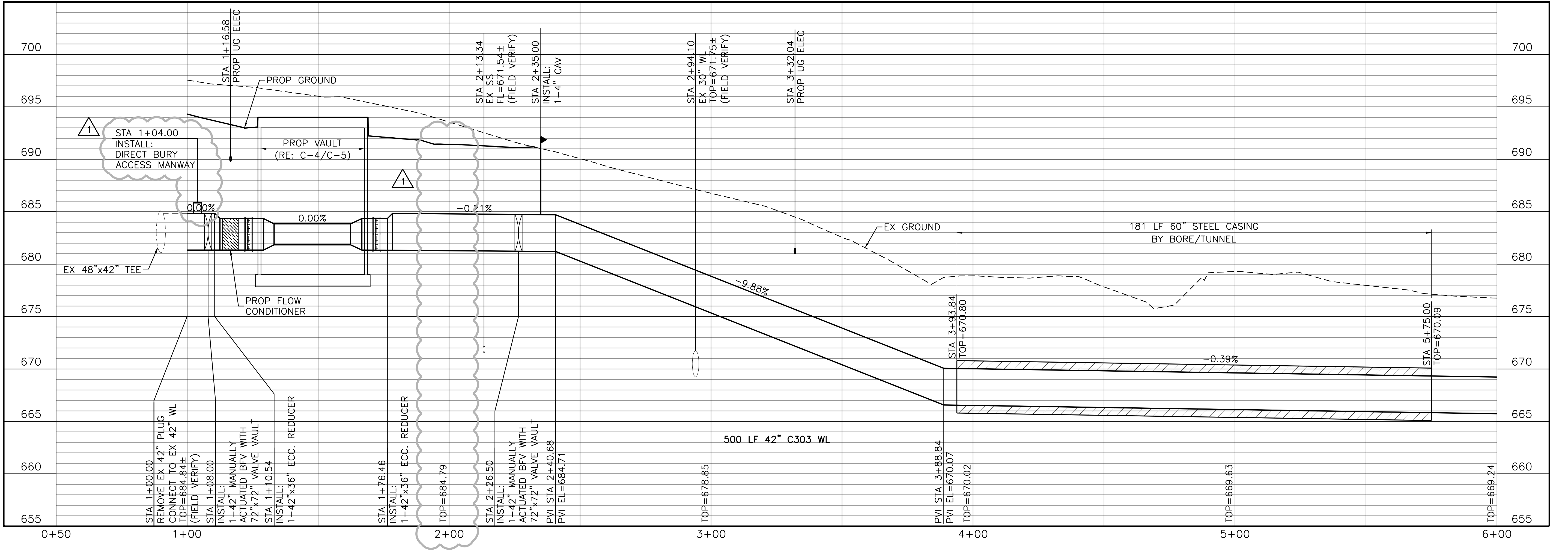
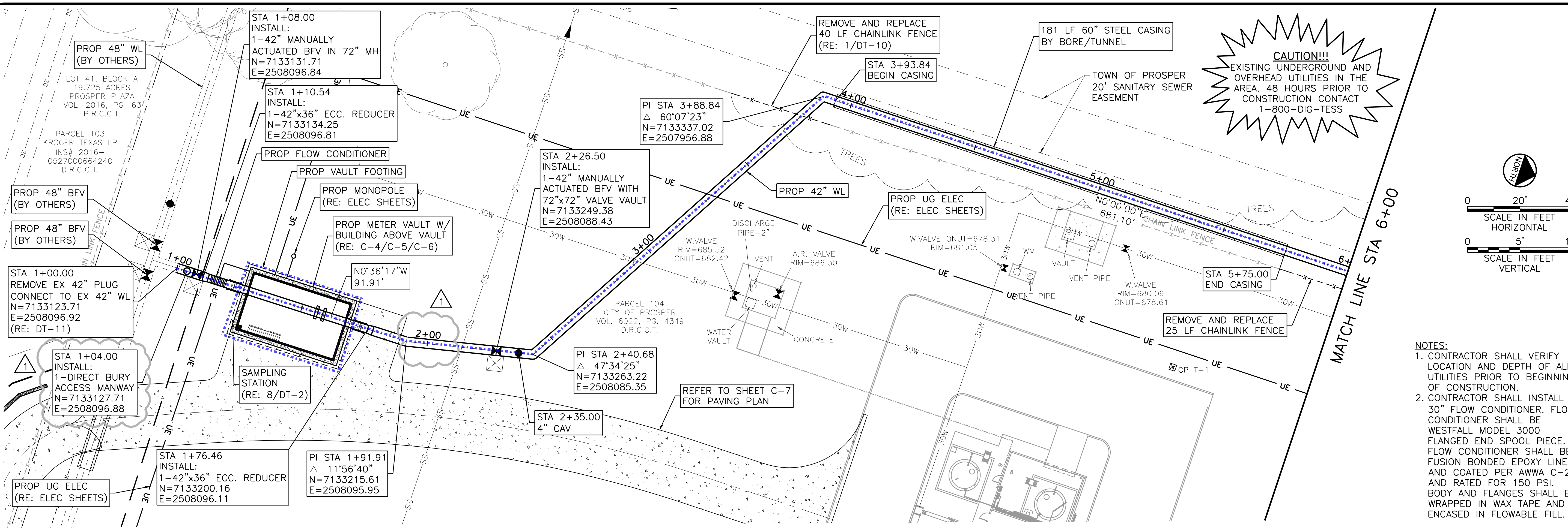
FREEZE & NICHOLS
5805 Main Street, Suite B
Frisco, Texas 75034
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Fax - (972) 624-9202
Web - www.freeze.com

TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
CIVIL
**PROP 42" WL PLAN AND PROFILE
STA 1+00 TO STA 6+00**

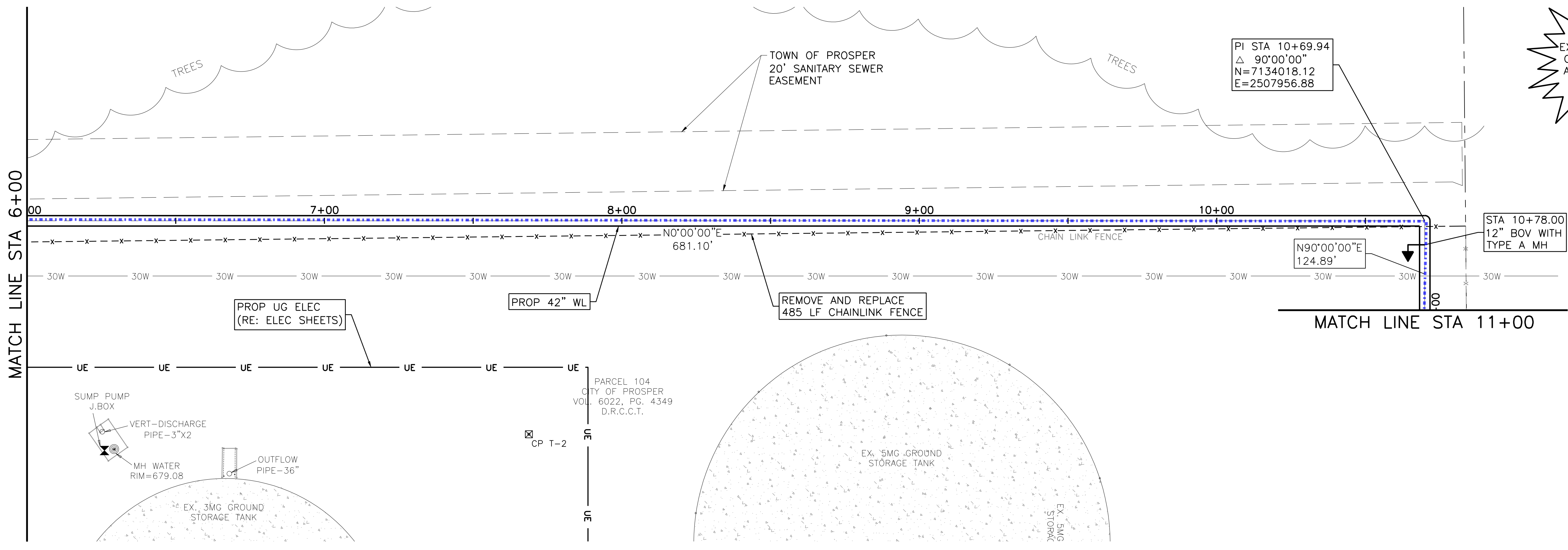
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				FILE NAME	CV-PPL-PP-WTRL1.dwg
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ADDENDUM NO.	1
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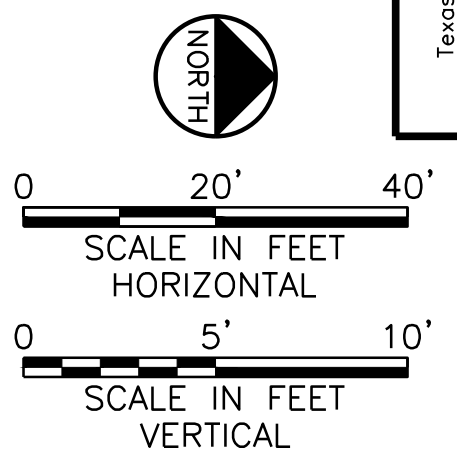
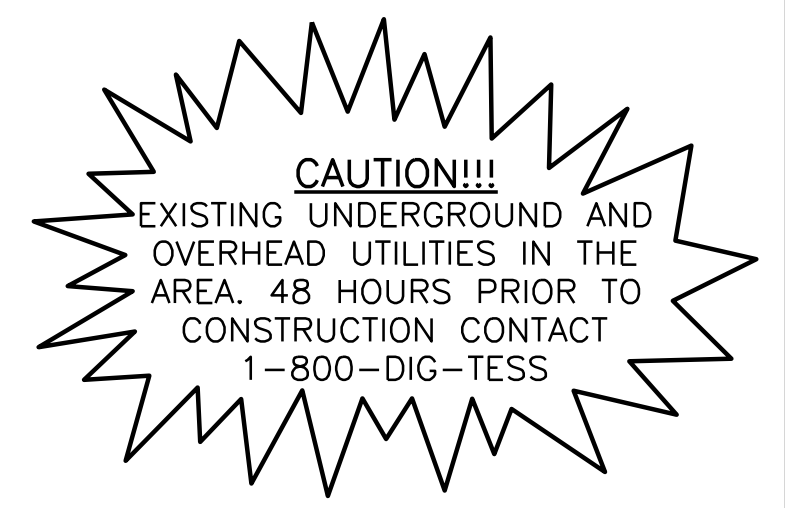
SHEET **C-1**
SEQ. 11
Page 945



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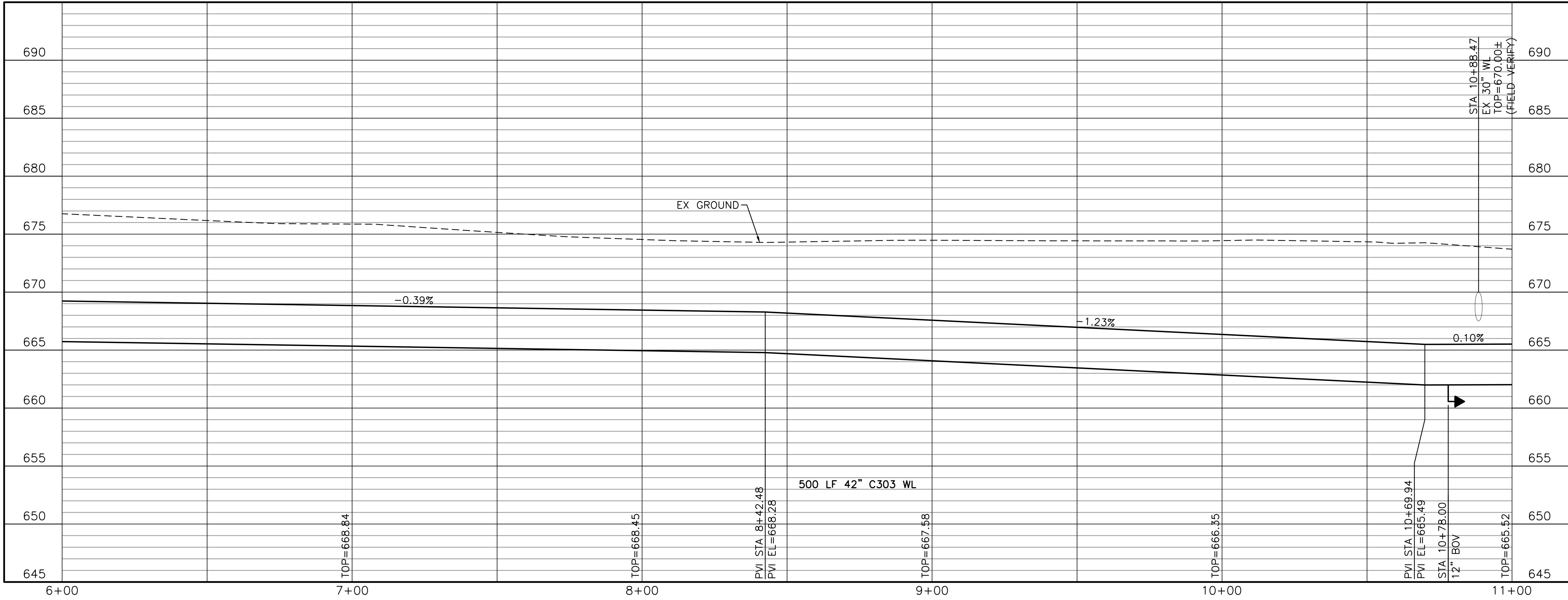


PI STA 10+69.94
 Δ 90°00'00"
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NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION.
2. CONTRACTOR WILL PROTECT AND SUPPORT EXISTING PIPE IN PLACE DURING DEMOLITION OF EXISTING VAULT.



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
 METER VAULT RELOCATION**
 CIVIL
**PROP 42" WL PLAN AND PROFILE
 STA 6+00 TO STA 11+00**

NO.	ISSUE	BY	DATE	PRJ JOB NO.	DATE	DESIGNED	DRAWN	REVISION	CHECKED	FILE NAME
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C-2										
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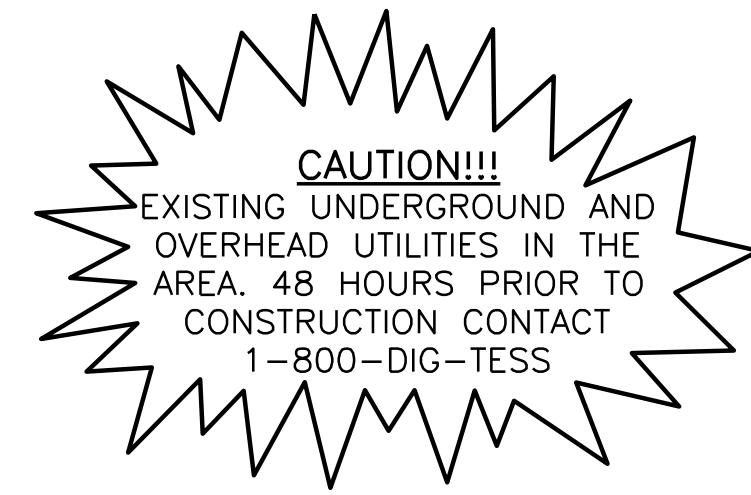
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104 PROSPER L.P.
105.106 AC TR
VOL. 5316, PG. 5314, D.R.C.C.T.

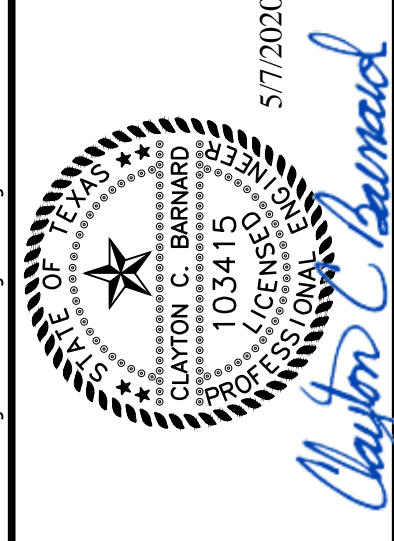
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105.106 AC TR
VOL. 5316, PG. 5314
D.R.C.C.T.

310 PROSPER LP
RE. OF 65.59 AC TR.
VOL. 5823, PG. 3462
D.R.C.C.T.

PARCEL 104
CITY OF PROSPER
VOL. 6022, PG. 4349
D.R.C.C.T.

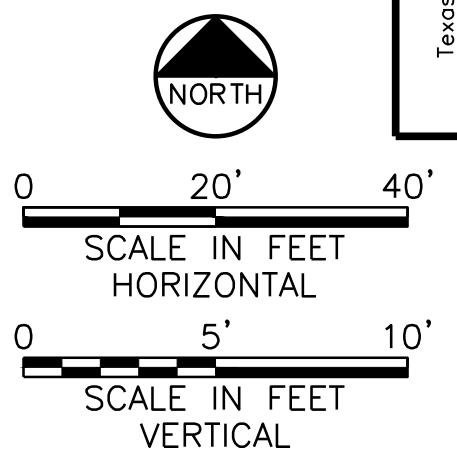
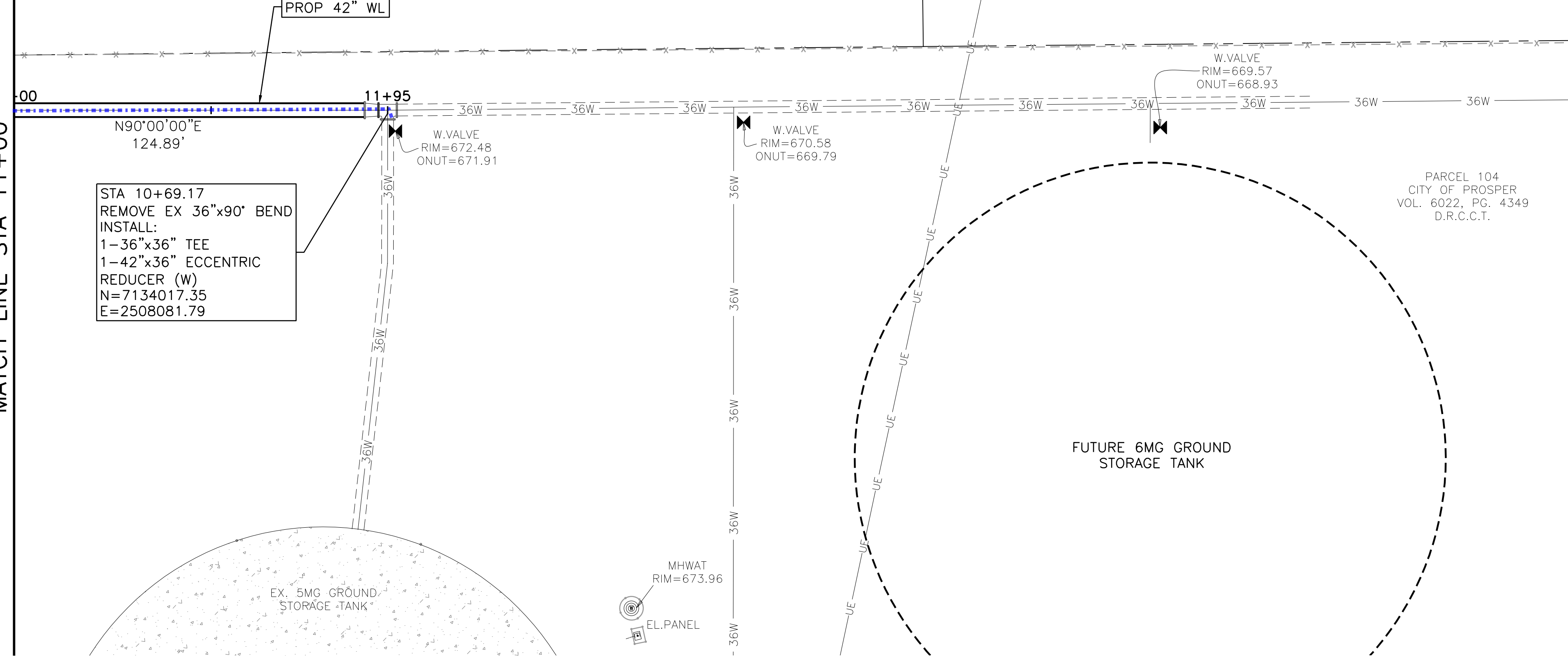


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MATCH LINE STA 11+00



- NOTES:**
- 1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION.
 - 2. CONTRACTOR SHALL INSTALL 30" FLOW CONDITIONER. FLOW CONDITIONER SHALL BE WESTFALL MODEL 3000 FLANGED END SPOOL PIECE. FLOW CONDITIONER SHALL BE FUSION BONDED EPOXY LINED AND COATED PER AWWA C-213 AND RATED FOR 150 PSI. BODY AND FLANGES SHALL BE WRAPPED IN WAX TAPE AND ENCASED IN FLOWABLE FILL.

STATION	DESCRIPTION	STATION
690		690
685		685
680		680
675		675
670		670
665		665
660		660
655	95 LF 42" C303 WL	655
650		650
645		645

Profile view showing EX GROUND, pipe slope (0.10%, 2.61%), and vertical curve data.

INSTALL:
1-42"x36" ECC. REDUCER
1-36"x36" TEE
CONNECT TO EX 36" WL
TOP=667.00±
(FIELD VERIFY)

TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
CIVIL
**PROP 42" WL PLAN AND PROFILE
STA 11+00 TO END**

NO.	ISSUE	DATE	BY	DATE	PRJ. JOB NO.	DESIGNED	DRAWN	CHECKED	FILE NAME
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VERIFY SCALE: Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.

SHEET **C-3**

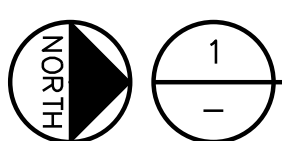
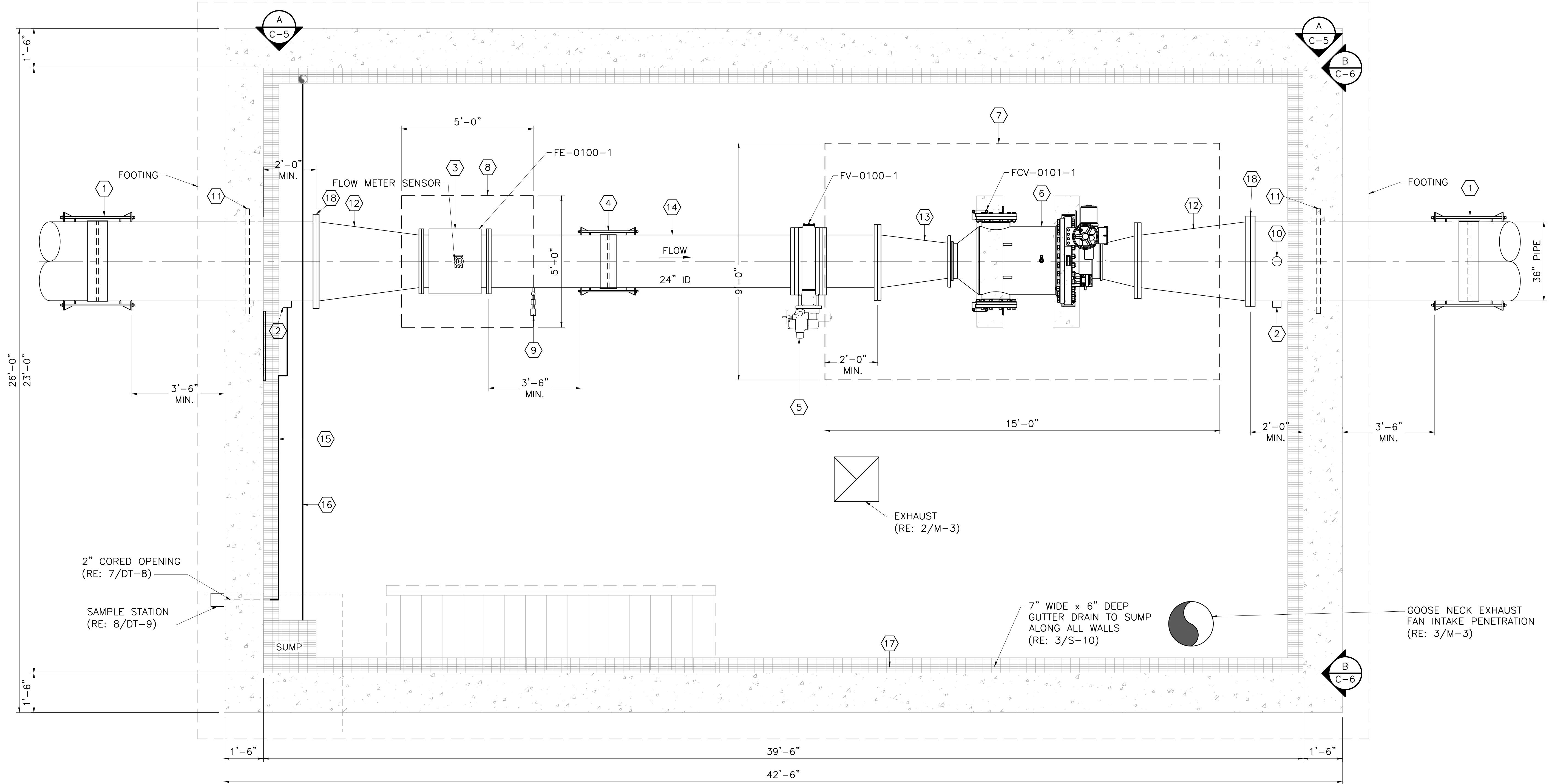
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NOTES:

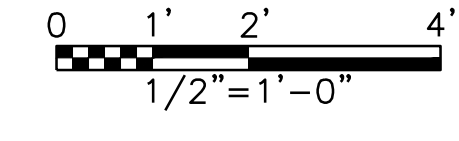
1. PROVIDE ALL NECESSARY PIPE, VALVES, AND APPURTENANCES REQUIRED FOR A COMPLETE AND SECURE INSTALLATION. PROVIDE PIPING SUPPORTS FOR RIGID INSTALLATION.
2. PIPE WITHIN VAULT SHALL BE 24" STEEL PIPE
3. PROVIDE A SPOOL PIECE THE SAME LENGTH AS THE FLOW METER THAT WILL BE STORED ON SITE AT A LOCATION DETERMINED BY THE OWNER.

NOTES BY "⬡":

- | | |
|---|---|
| 1 THRUST HARNESS W/ FLEXIBLE COUPLING | 9 PRESSURE TRANSMITTER |
| 2 2" SAMPLE TAP | 10 PRESSURE PORT |
| 3 24" MAGNETIC FLOW METER | 11 WALL FLANGE |
| 4 THRUST HARNESS W/ FLEX. COUPLING, OR IF APPROVED, DISMANTLING JOINT | 12 36"x24" CONCENTRIC REDUCER |
| 5 24" BUTTERFLY VALVE | 13 24"x16" CONCENTRIC REDUCER |
| 6 16" SLEEVE VALVE (BAILEY) | 14 24" STEEL PIPE |
| 7 15'x9' HATCH OPENING | 15 1/2" STAINLESS STEEL SAMPLE LINE ROUTED ALONG WALL |
| 8 5'x5' HATCH OPENING | 16 1.5" SCHEDULE 80 SUMP PIPING |
| | 17 1.5" GALVANIZED STEEL GRATING |
| | 18 INSULATING GASKET |



SECTIONAL PLAN
1/2" = 1'-0"



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Texas Registered Engineering Firm F-2144

Clayton C. Barnard

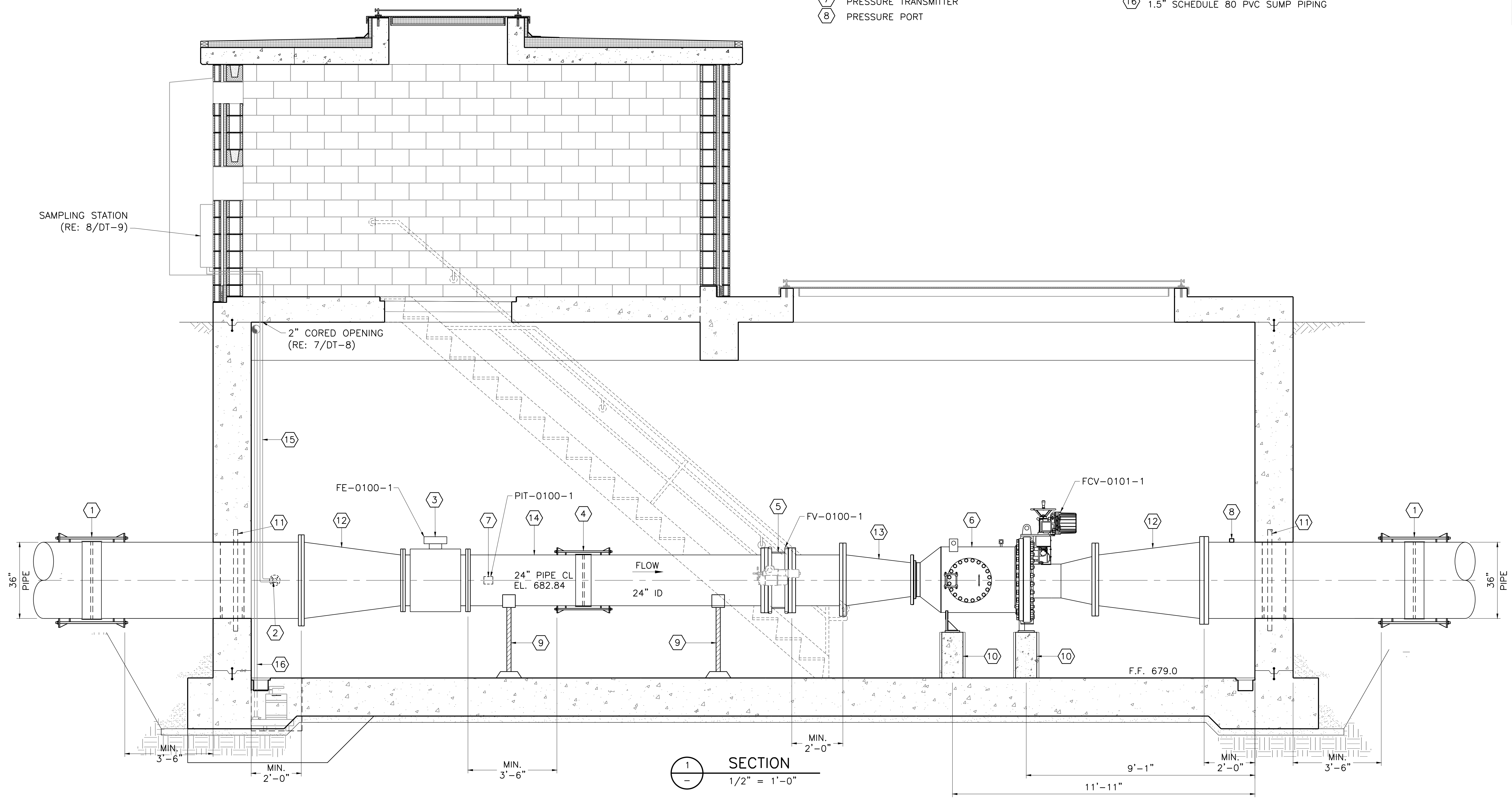
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
CIVIL
**PROPOSED METER VAULT
SECTIONAL PLAN**

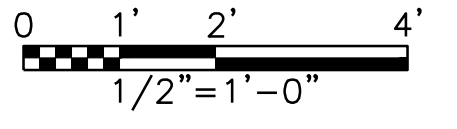
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				PRP18708	MAY 2020	MDS	NRM		CCB	CV-VLT-XS-VAULT.dwg
VERIFY SCALE: Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.										
SHEET										C-4
SEQ.										14

NOTES BY "◯":

- ◯1 THRUST HARNESS W/ FLEXIBLE COUPLING
- ◯2 2" SAMPLE TAP
- ◯3 24" MAGNETIC FLOW METER
- ◯4 THRUST HARNESS W/ FLEX. COUPLING, OR IF APPROVED, DISMANTLING JOINT
- ◯5 24" BUTTERFLY VALVE
- ◯6 16" SLEEVE VALVE (BAILEY)
- ◯7 PRESSURE TRANSMITTER
- ◯8 PRESSURE PORT
- ◯9 ADJUSTABLE PIPE SUPPORT
- ◯10 CONCRETE BLOCK SUPPORT
- ◯11 WALL FLANGE
- ◯12 36"x24" CONCENTRIC REDUCER
- ◯13 24"x16" CONCENTRIC REDUCER
- ◯14 24" STEEL PIPE
- ◯15 1/2" STAINLESS STEEL SAMPLE LINE ROUTED ALONG THE WALL
- ◯16 1.5" SCHEDULE 80 PVC SUMP PIPING



SECTION 1
1/2" = 1'-0"



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TOWN OF PROSPER, TEXAS
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
CIVIL
PROPOSED METER VAULT SECTION

NO.	ISSUE	BY	DATE	PRP18708	DESIGNED	MDS	DRAWN	NIRM	CHECKED	CCB
			MAY 2020							
FILE NAME CV-VLT-XS-VAULT2.dwg										
VERIFY SCALE Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.										

SHEET C-5

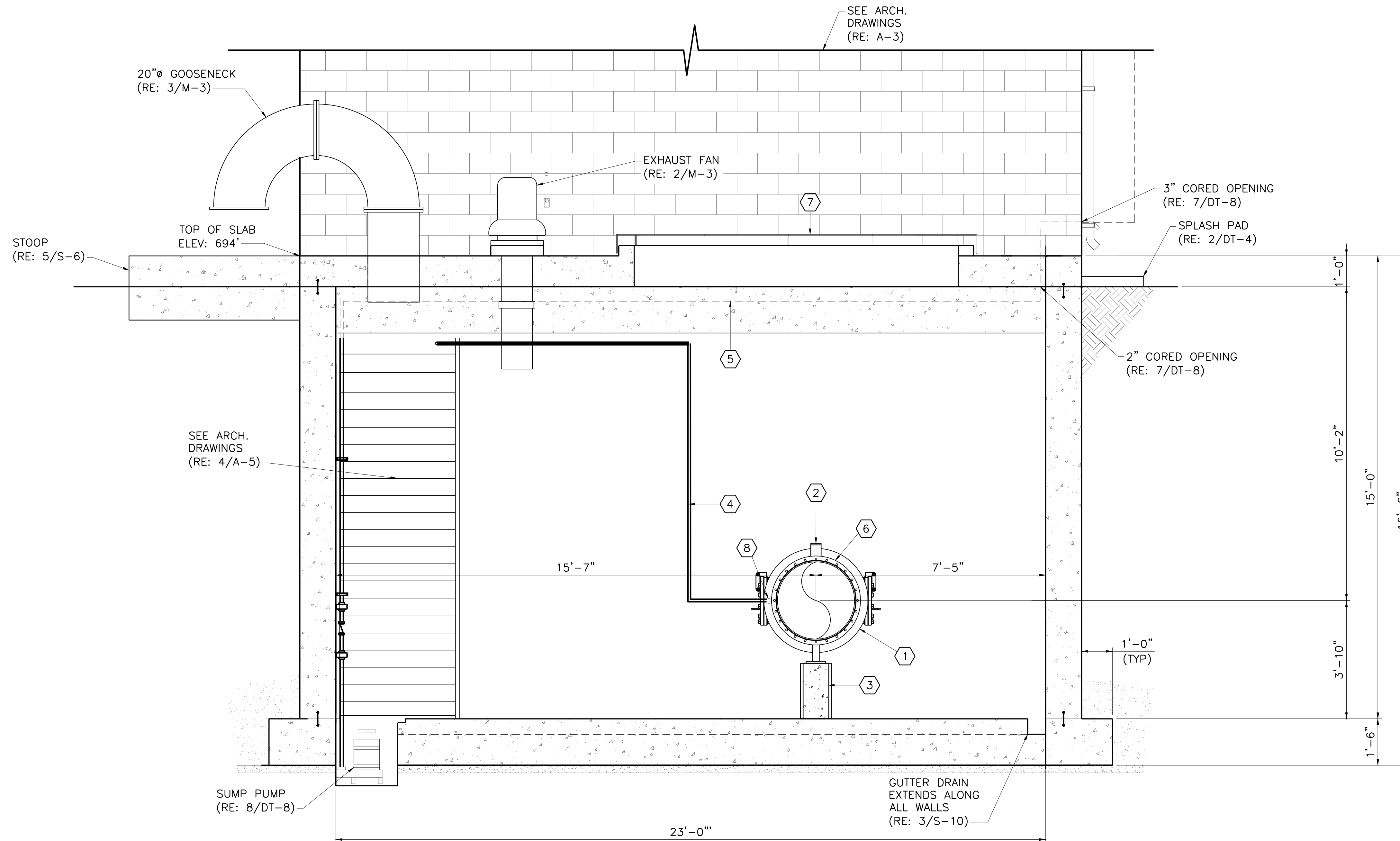
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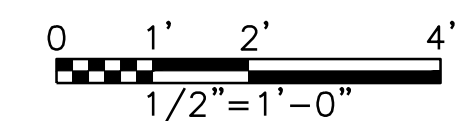
1. PROVIDE ALL NECESSARY PIPE, VALVES, AND APPURTENANCES REQUIRED FOR A COMPLETE AND SECURE INSTALLATION. PROVIDE PIPING SUPPORTS FOR RIGID INSTALLATION.
2. PIPE WITHIN VAULT SHALL BE 24" STEEL PIPE.
3. PROVIDE A SPOOL PIECE THE SAME LENGTH AS THE FLOW METER THAT WILL BE STORED ON SITE AT A LOCATION DETERMINED BY THE OWNER.

NOTES BY "⬡":

- 1 16" SLEEVE VALVE (BAILEY)
- 2 PRESSURE PORT
- 3 CONCRETE BLOCK SUPPORT
- 4 1/2" STAINLESS STEEL SAMPLE LINE ROUTED ALONG WALL
- 5 1.5" SCHEDULE 80 PVC SUMP PIPING
- 6 24" STEEL PIPING
- 7 15'x9' HATCH OPENING
- 8 2" SAMPLE TAP



SECTION B-B
1/2" = 1'-0"



Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

5/7/2020

CLAYTON C. BARNARD
103415
PROFESSIONAL ENGINEER
LICENSE NO. 103415

Clayton C. Barnard

FREES & NICHOLS

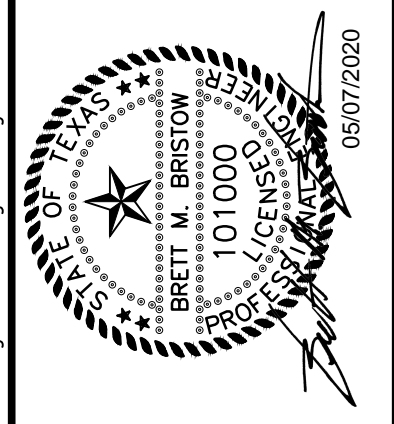
5805 Main Street, Suite B
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CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
CIVIL
PROPOSED METER VAULT SECTION

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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
CIVIL

PAVING AND DIMENSIONAL CONTROL PLAN

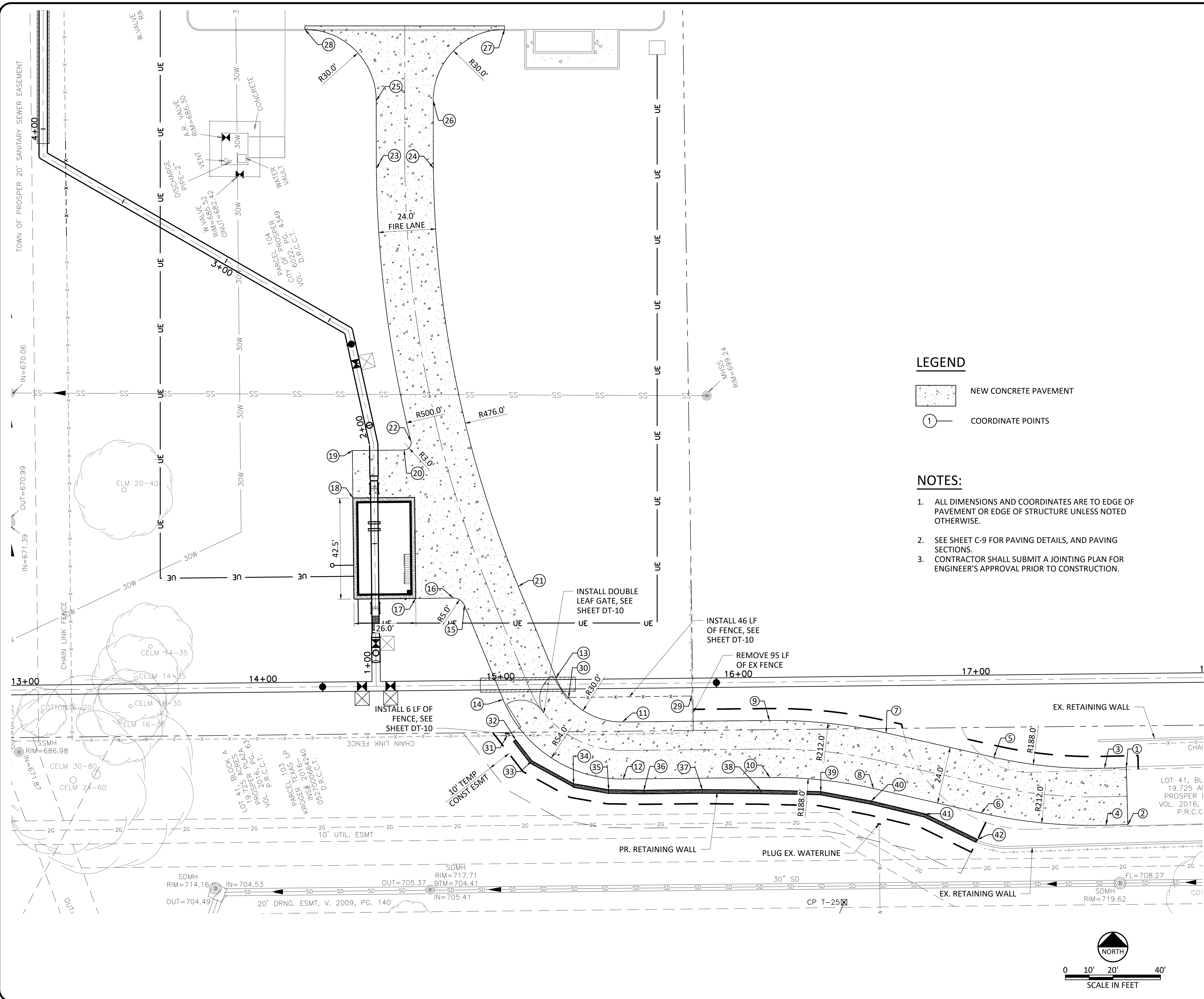
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MAY 2020
DESIGNED MDS
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REVISED
CHECKED CCB

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SHEET **C-7**

SEQ. 17

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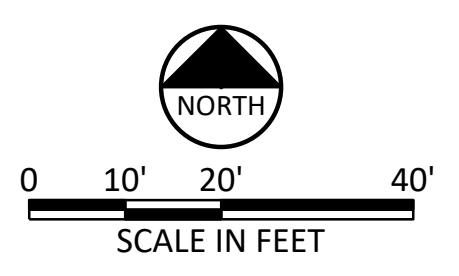
LEGEND

- NEW CONCRETE PAVEMENT
- COORDINATE POINTS

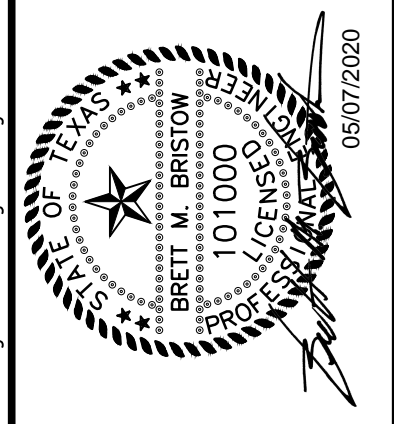
NOTES:

- ALL DIMENSIONS AND COORDINATES ARE TO EDGE OF PAVEMENT OR EDGE OF STRUCTURE UNLESS NOTED OTHERWISE.
- SEE SHEET C-9 FOR PAVING DETAILS, AND PAVING SECTIONS.
- CONTRACTOR SHALL SUBMIT A JOINTING PLAN FOR ENGINEER'S APPROVAL PRIOR TO CONSTRUCTION.

POINT TABLE			
PNT	NORTHING	EASTING	DESCRIPTION
1	7133079.47	2508412.60	EDGE OF PAVEMENT
2	7133055.48	2508413.23	EDGE OF PAVEMENT
3	7133079.22	2508403.42	EDGE OF PAVEMENT
4	7133055.23	2508404.05	EDGE OF PAVEMENT
5	7133083.82	2508356.83	EDGE OF PAVEMENT
6	7133060.42	2508351.51	EDGE OF PAVEMENT
7	7133094.10	2508311.58	EDGE OF PAVEMENT
8	7133070.69	2508306.28	EDGE OF PAVEMENT
9	7133099.35	2508262.42	EDGE OF PAVEMENT
10	7133075.35	2508262.66	EDGE OF PAVEMENT
11	7133098.70	2508200.66	EDGE OF PAVEMENT
12	7133074.70	2508200.91	EDGE OF PAVEMENT
13	7133117.29	2508172.59	EDGE OF PAVEMENT
14	7133108.16	2508150.40	EDGE OF PAVEMENT
15	7133147.74	2508134.12	EDGE OF PAVEMENT
16	7133150.84	2508129.45	EDGE OF PAVEMENT
17	7133150.67	2508113.64	EDGE OF PAVEMENT
18	7133192.90	2508087.19	EDGE OF PAVEMENT
19	7133212.90	2508086.98	EDGE OF PAVEMENT
20	7133213.11	2508108.74	EDGE OF PAVEMENT
21	7133155.75	2508156.78	EDGE OF PAVEMENT
22	7133216.83	2508111.68	EDGE OF PAVEMENT
23	7133331.47	2508097.05	EDGE OF PAVEMENT
24	7133331.73	2508121.05	EDGE OF PAVEMENT
25	7133360.03	2508097.02	EDGE OF PAVEMENT
26	7133360.03	2508121.02	EDGE OF PAVEMENT
27	7133390.03	2508151.02	EDGE OF PAVEMENT
28	7133390.03	2508067.02	EDGE OF PAVEMENT
29	7133109.61	2508229.79	FENCE CORNER
30	7133108.99	2508177.96	FENCE CORNER
31	7133092.94	2508152.07	FENCE CORNER
32	7133091.18	2508155.68	FACE OF WALL
33	7133082.34	2508162.50	FACE OF WALL
34	7133072.71	2508180.03	FACE OF WALL
35	7133070.18	2508194.82	FACE OF WALL
36	7133069.98	2508209.56	FACE OF WALL
37	7133070.24	2508234.23	FACE OF WALL
38	7133070.03	2508258.73	FACE OF WALL
39	7133069.39	2508284.05	FACE OF WALL
40	7133065.44	2508305.27	FACE OF WALL
41	7133060.01	2508327.97	FACE OF WALL
42	7133049.27	2508349.96	FACE OF WALL



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**

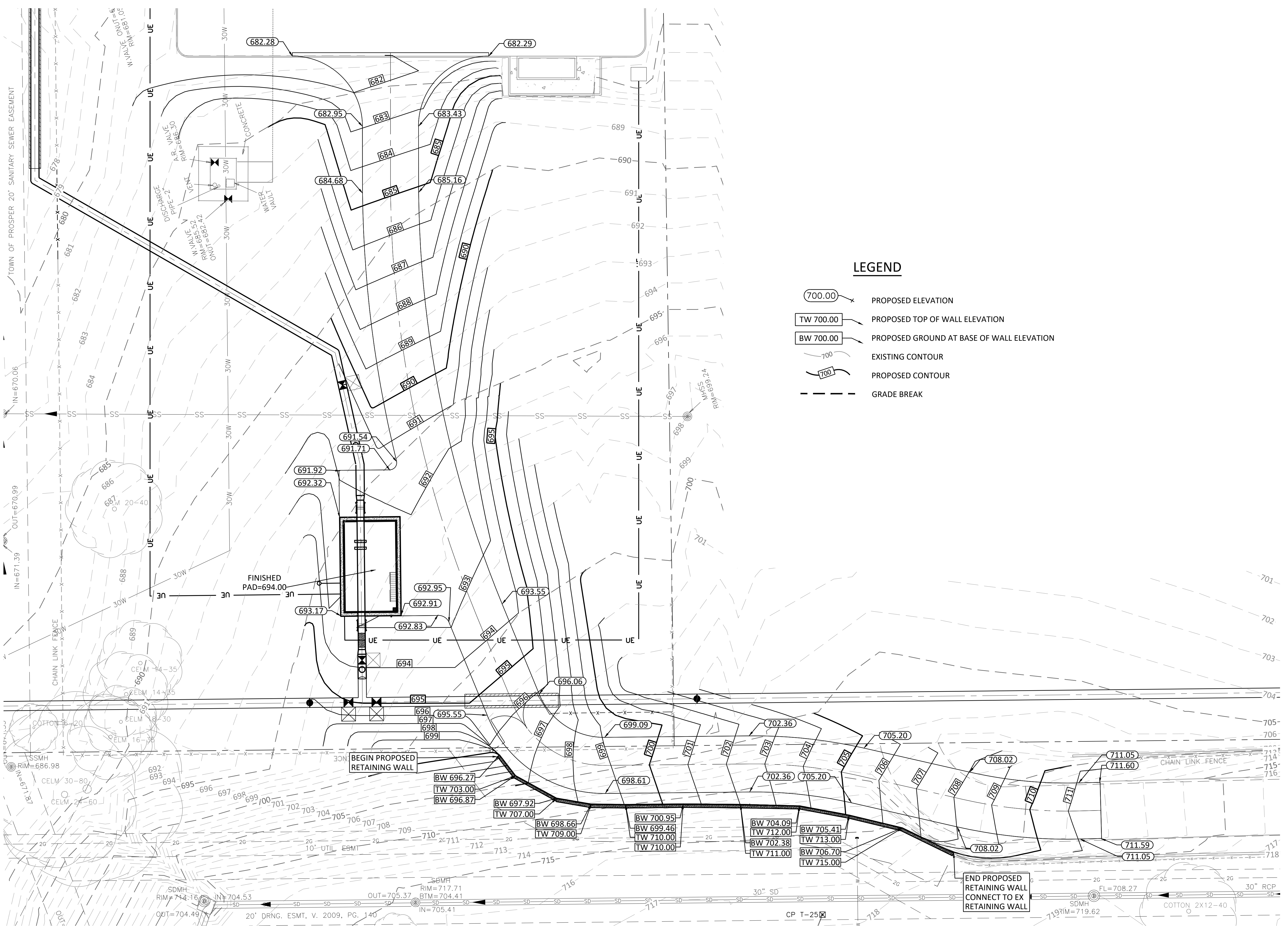
CIVIL

GRADING AND EROSION

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DATE	MAY 2020
DESIGNED	MDS
DRAWN	NRM
CHECKED	CCB
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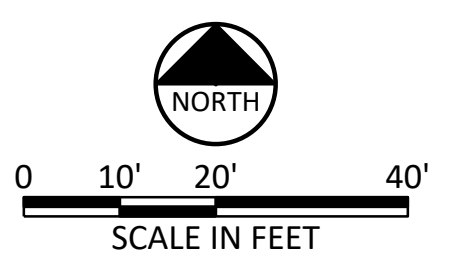
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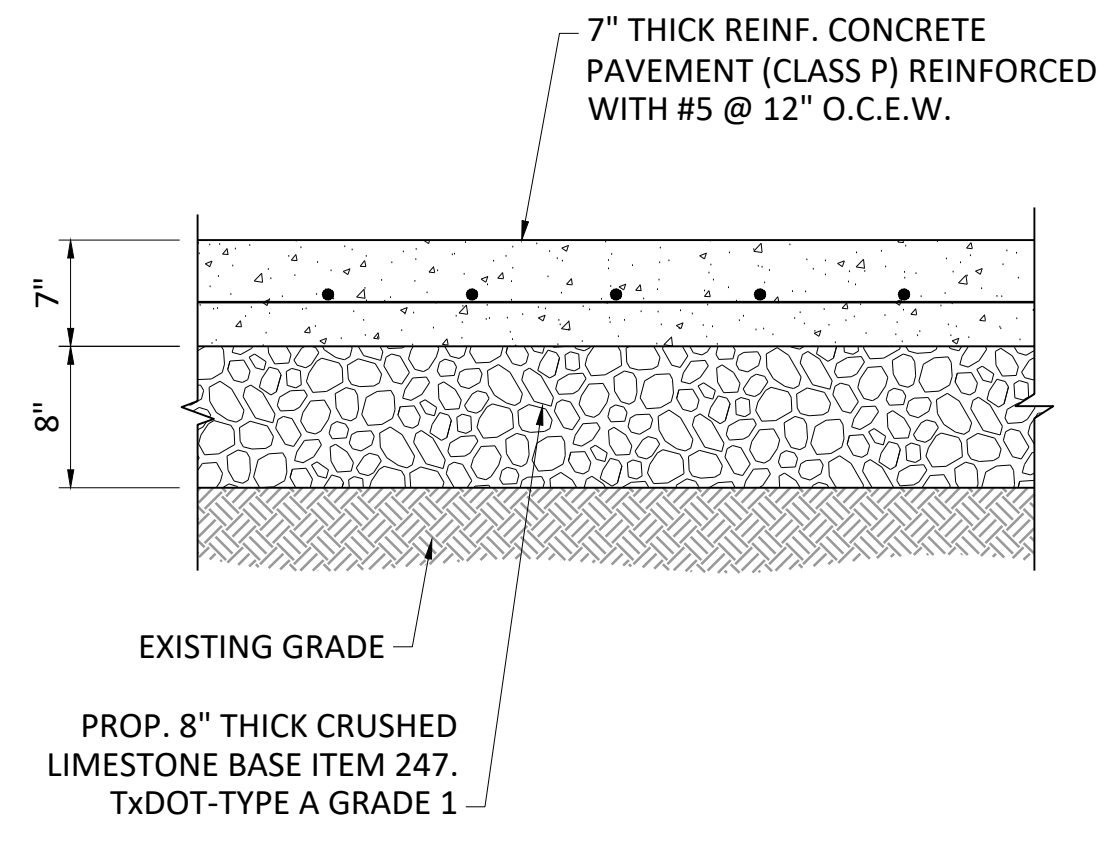


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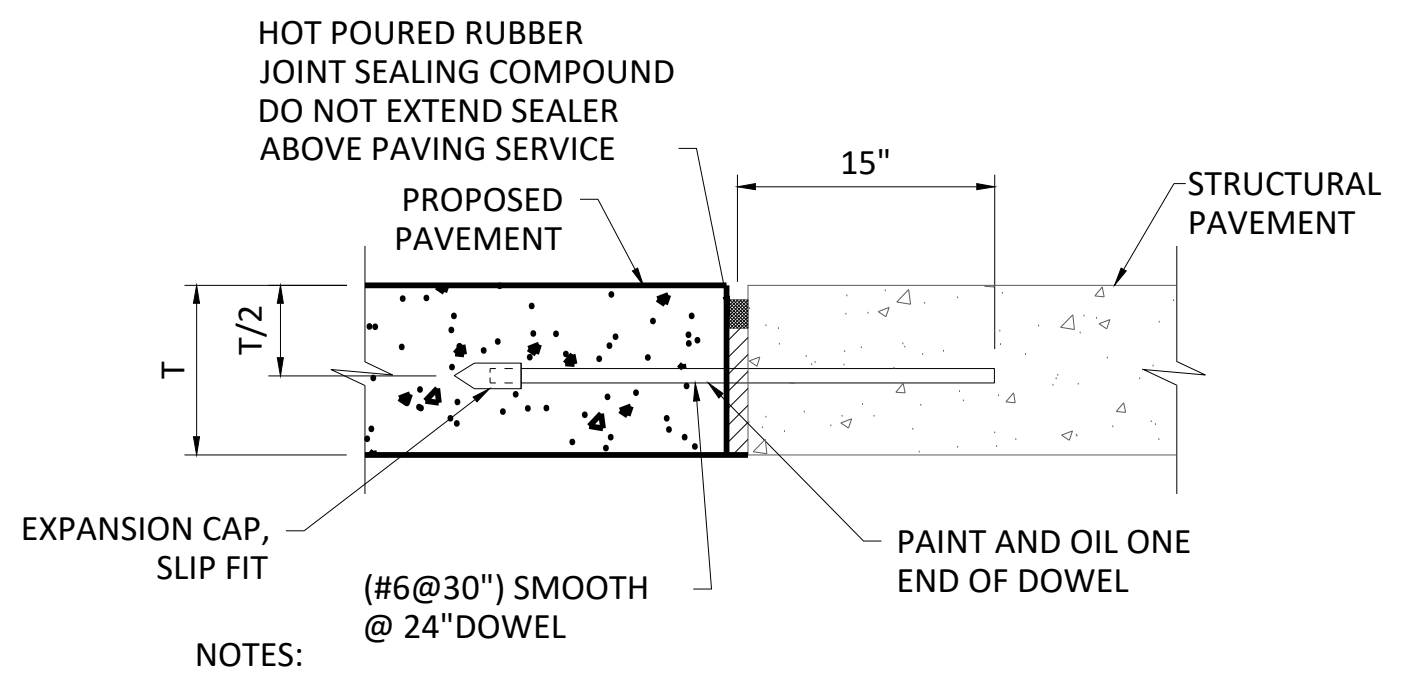
- 700.00 PROPOSED ELEVATION
- TW 700.00 PROPOSED TOP OF WALL ELEVATION
- BW 700.00 PROPOSED GROUND AT BASE OF WALL ELEVATION
- - - - - EXISTING CONTOUR
- 700 PROPOSED CONTOUR
- - - - - GRADE BREAK



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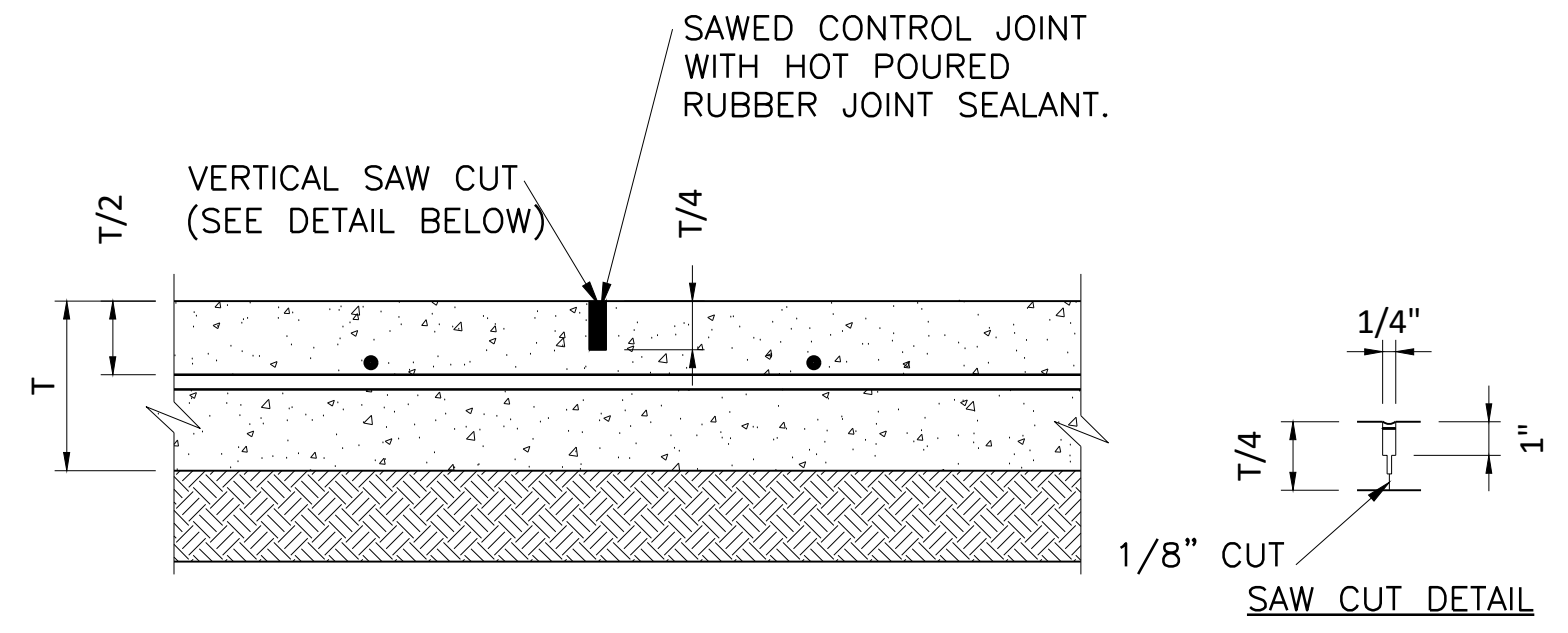


1 CONCRETE DRIVEWAY PAVEMENT DETAIL
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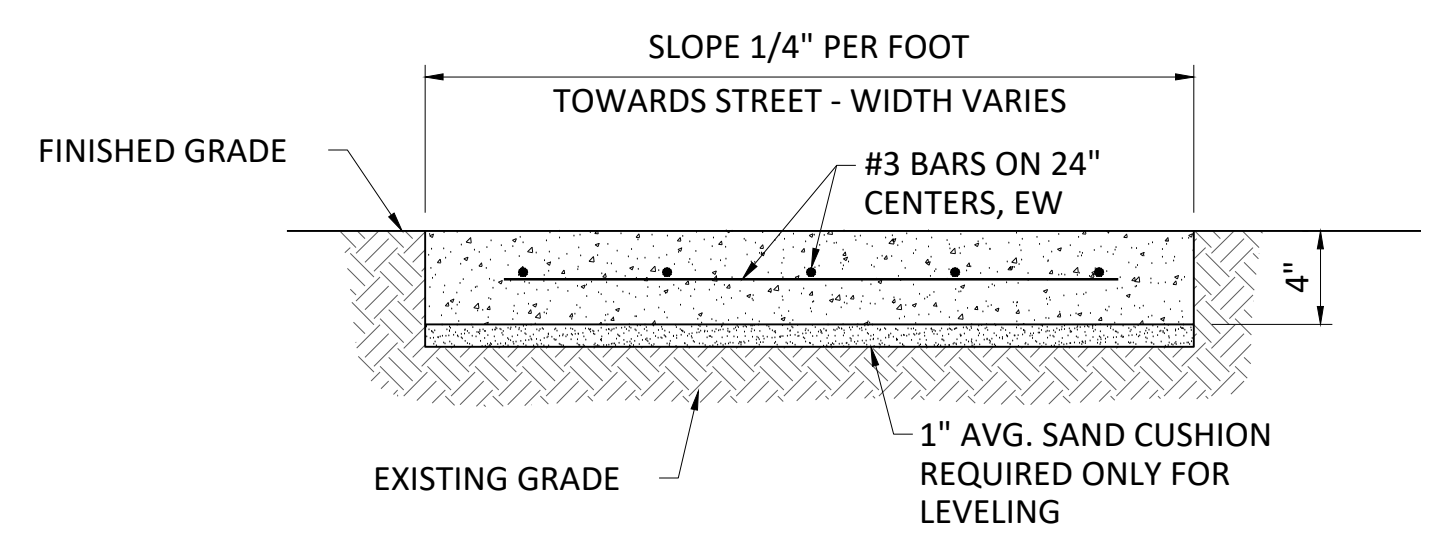


- NOTES:
1. FOR EXISTING PAVEMENT - DRILL AND EPOXY DOWEL IN PLACE.
 2. EXPANSION JOINTS SHALL BE 3/4" THICK FOR FULL DEPTH OF PAVEMENT AND SHALL INCLUDE GREASED 30" SMOOTH 3/4" DIA. DOWEL STEEL BARS WITH CAPS.

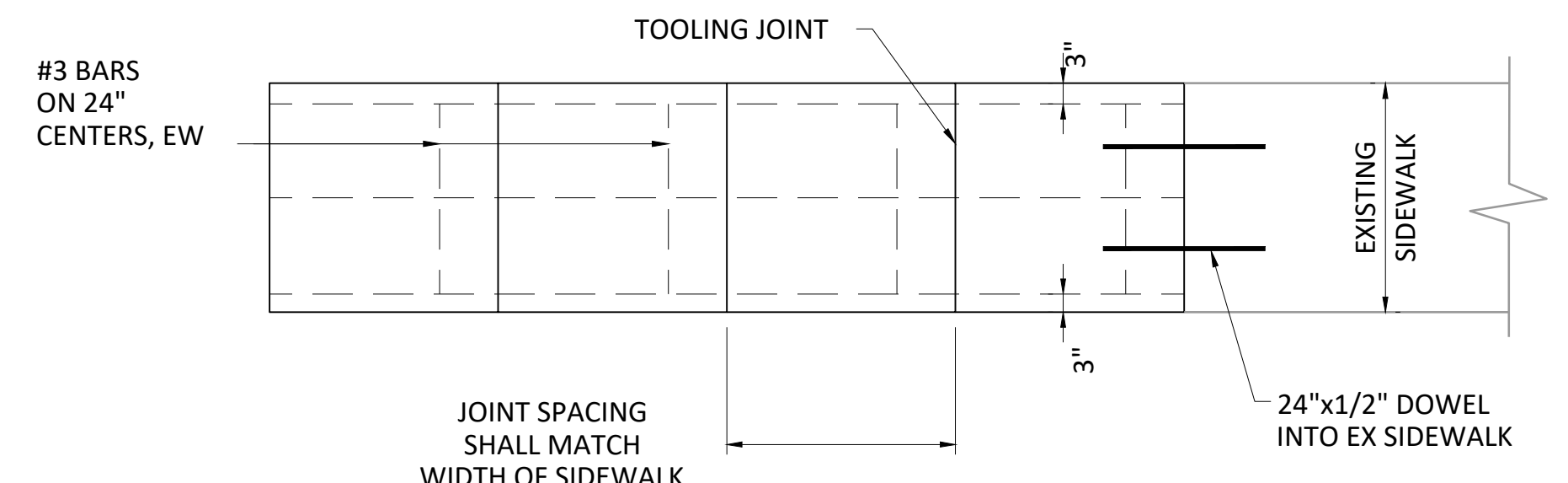
2 EXPANSION JOINT AT CONCRETE
NOT TO SCALE



3 SAWED CONTROL JOINT
NOT TO SCALE

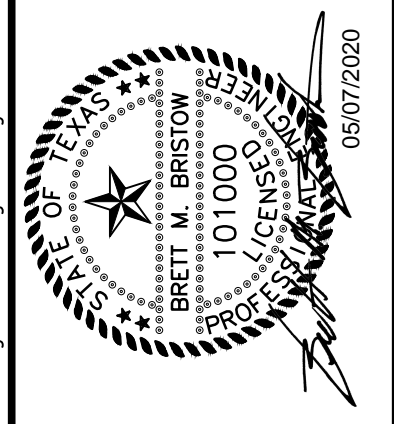


- NOTES:
1. CONCRETE STRENGTH SHALL BE A MINIMUM OF 3000 PSI AT 28 DAYS.
 2. EXPANSION JOINTS SHALL BE 1/2" THICK REDWOOD FOR FULL DEPTH OF SIDEWALK AND SHALL INCLUDE GREASED 24" SMOOTH 1/2" DIA. DOWEL STEEL BARS WITH CAPS.



4 SIDEWALK DETAIL
NOT TO SCALE

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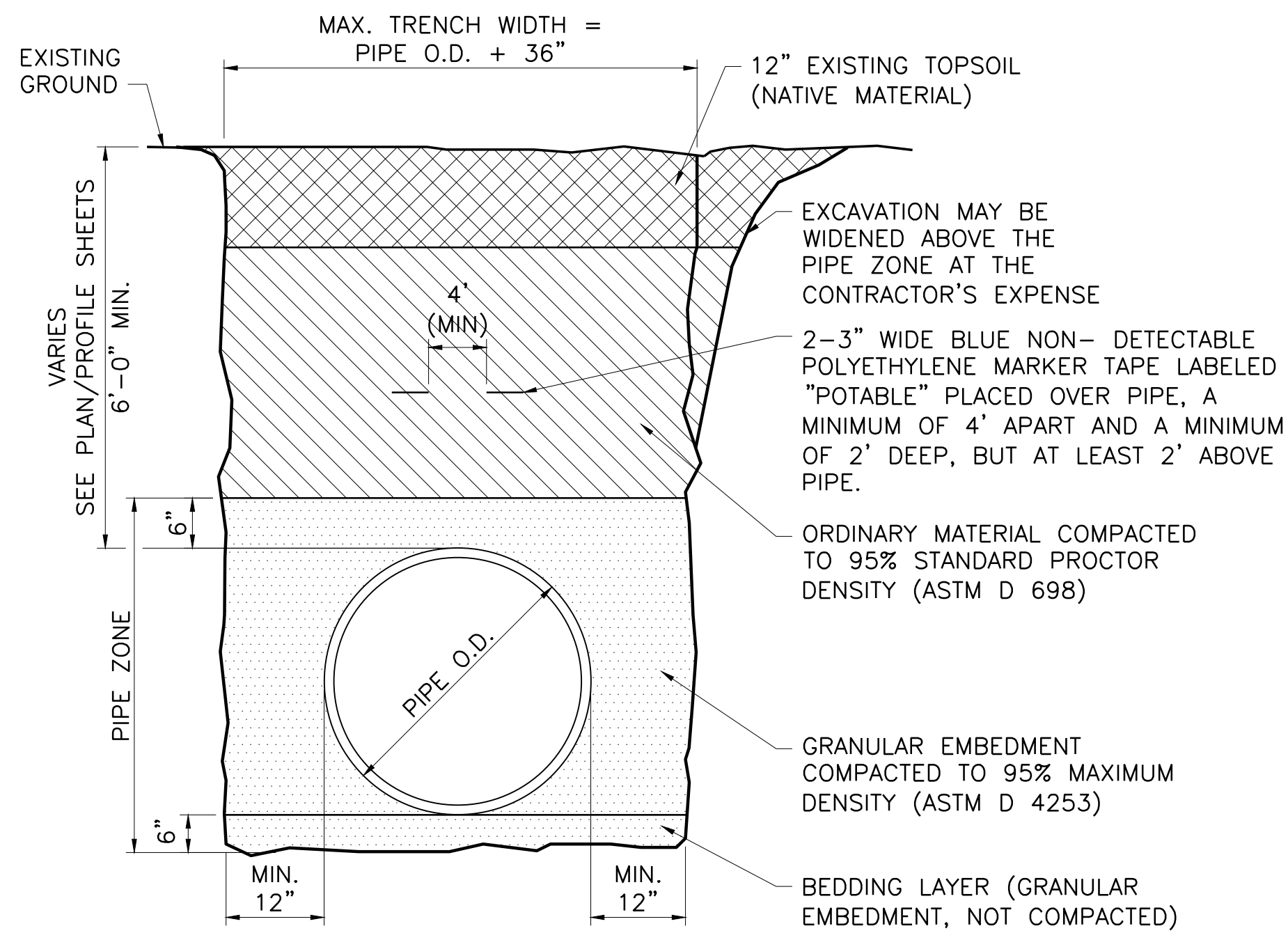
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Frisco, Texas 75034
Phone - (972) 624-9201
Fax - (972) 624-9202
Web - www.freese.com

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CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
CIVIL

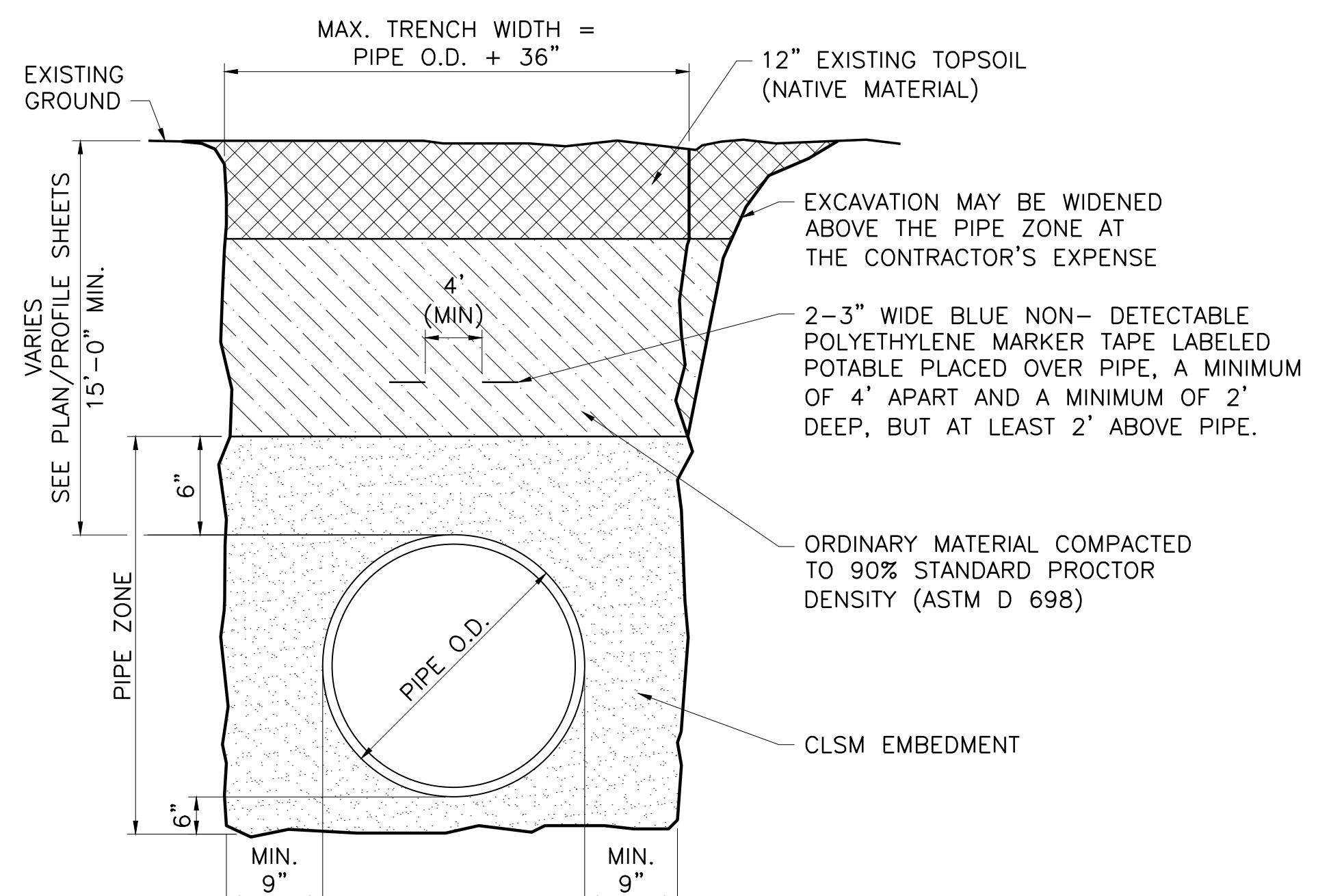
PAVING DETAILS

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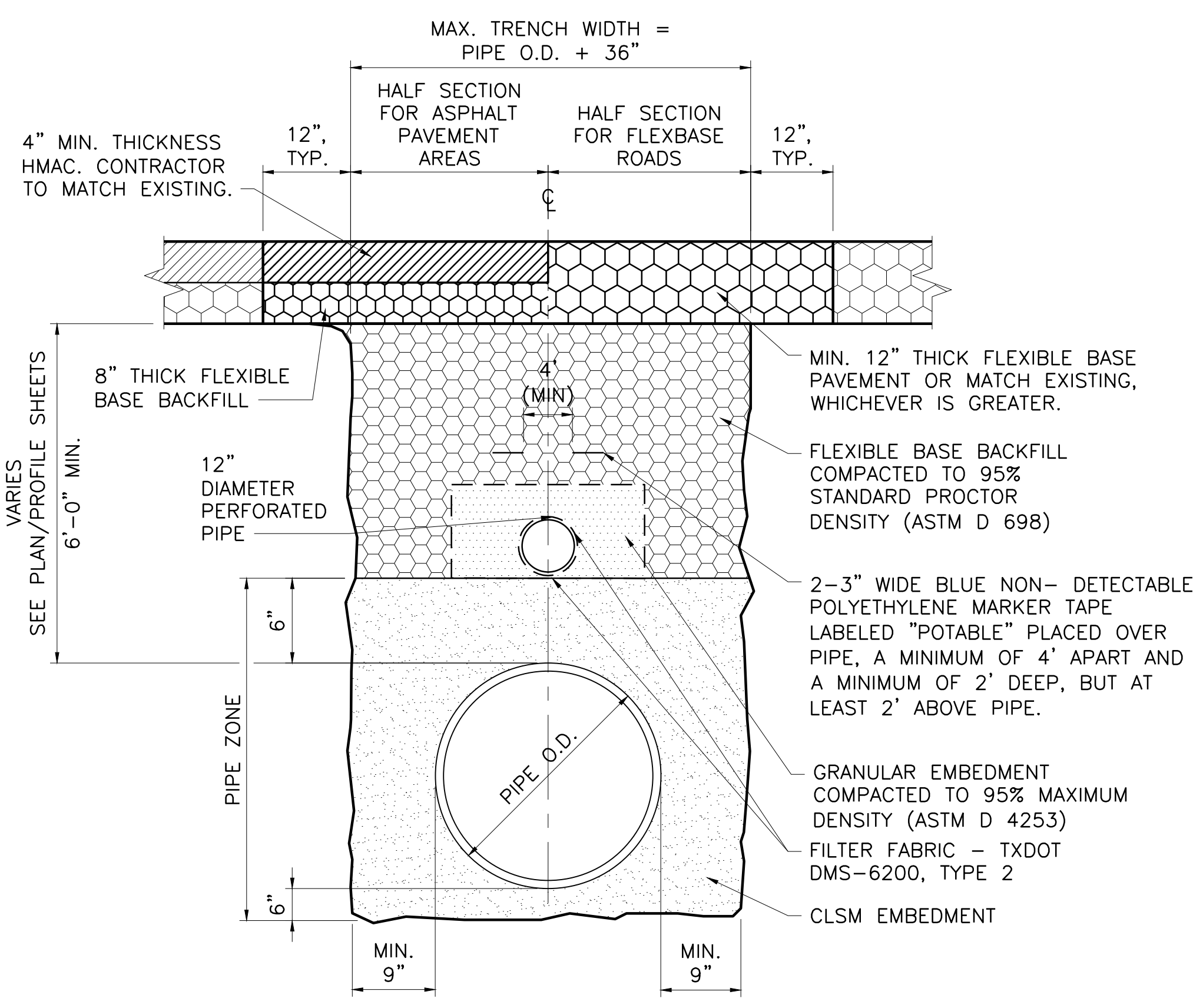
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SEQ. 19



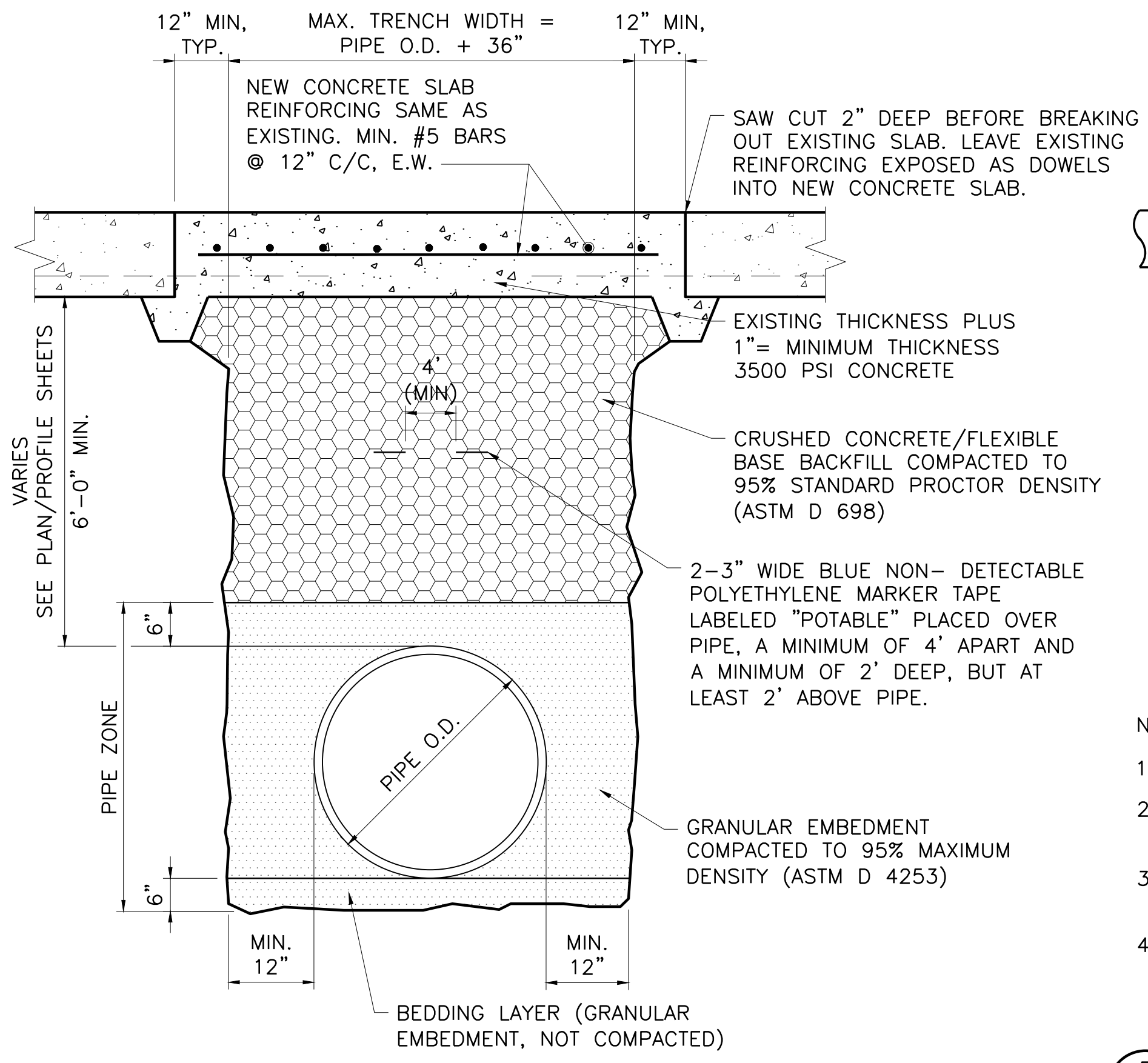
1 BAR-WRAPPED PIPE TYPICAL TRENCH SECTION FOR DEPTH OF COVER 6 TO 15 FEET
NOT TO SCALE



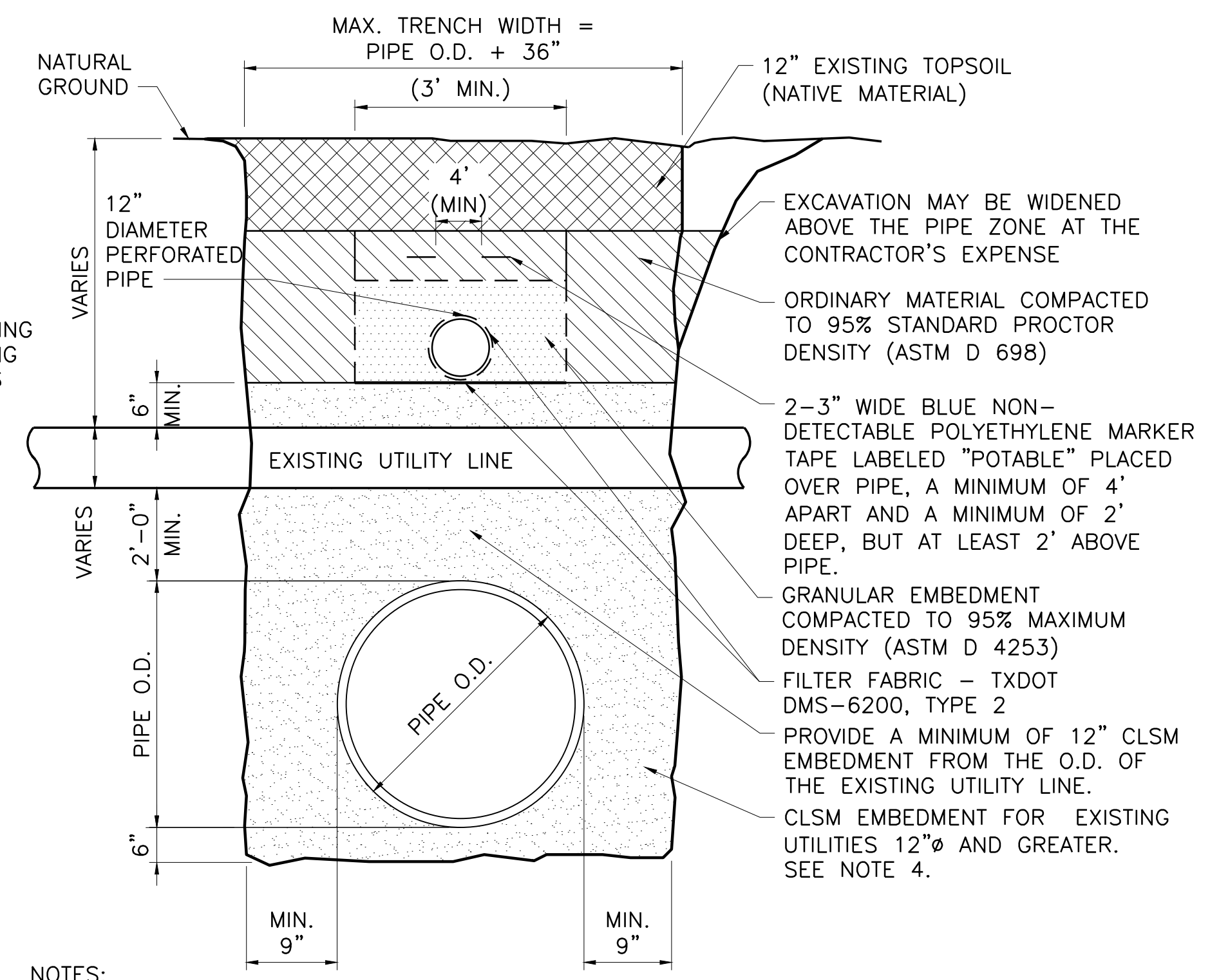
2 BAR-WRAPPED PIPE TYPICAL TRENCH SECTION FOR DEPTH OF COVER OVER 15 FEET
NOT TO SCALE



3 TYPICAL TRENCH SECTION FOR OPEN CUT FLEX BASE OR DIRT PRIVATE ROADS, CHIP-SEAL ROADS, AND ASPHALT PAVEMENT AREAS
NOT TO SCALE

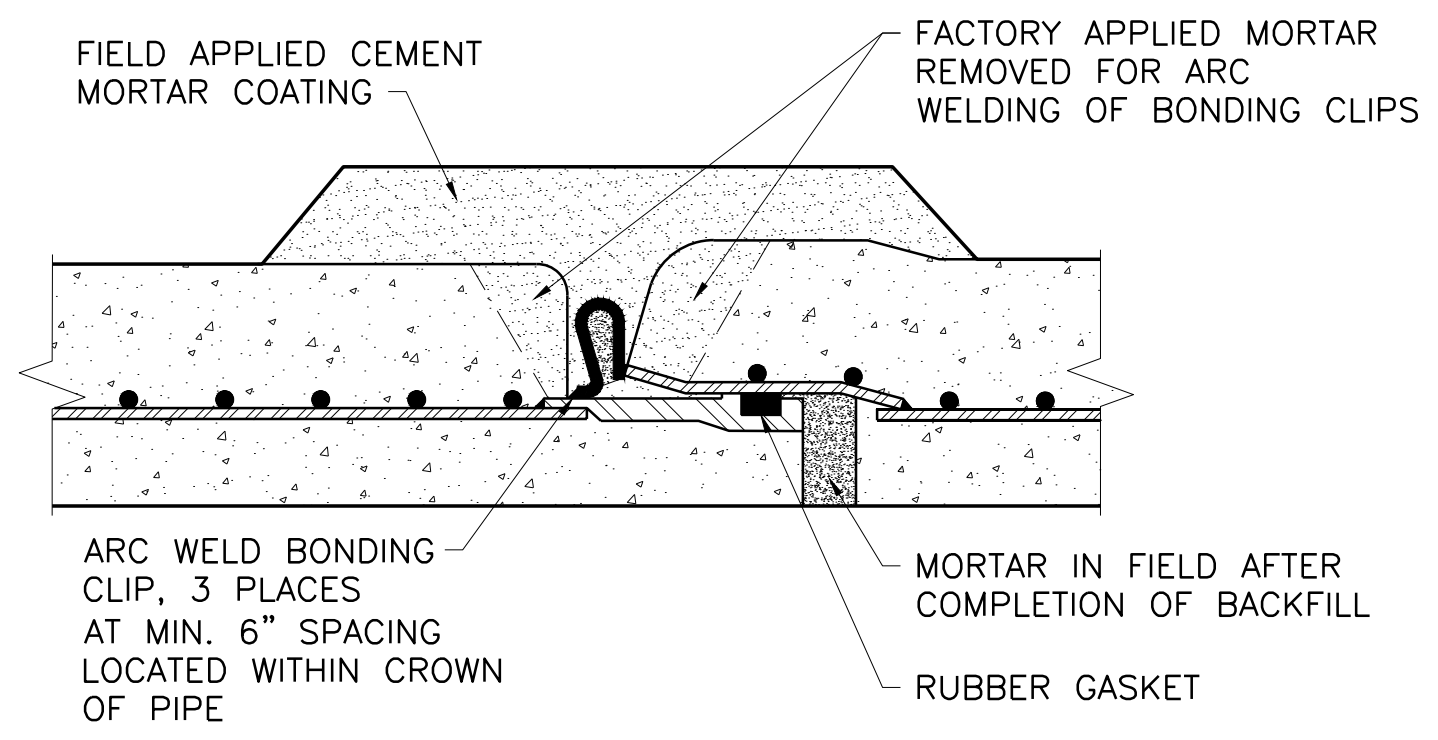


4 TYPICAL TRENCH SECTION FOR OPEN CUT CONCRETE ROADS
NOT TO SCALE

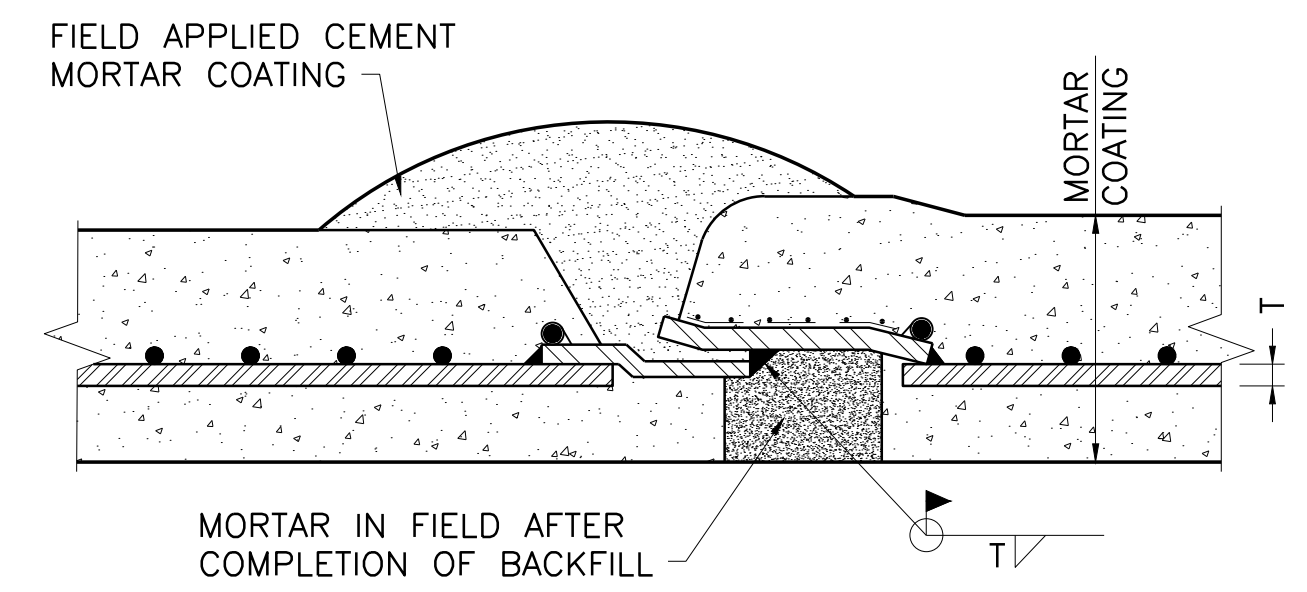


5 TYPICAL TRENCH SECTION FOR UTILITY LINE CROSSING BY OPEN CUT FOR UTILITIES 12" OR LARGER
NOT TO SCALE

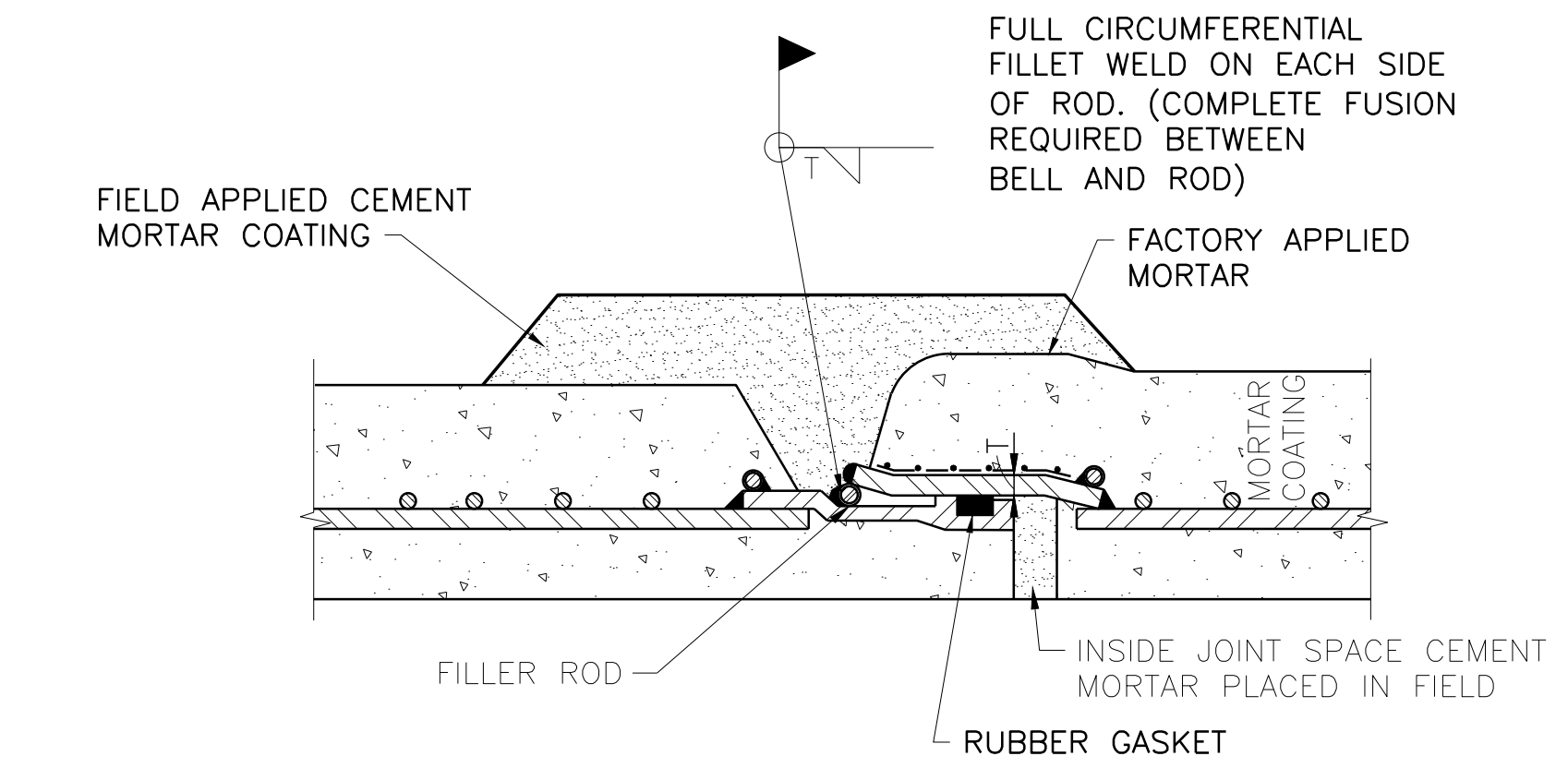
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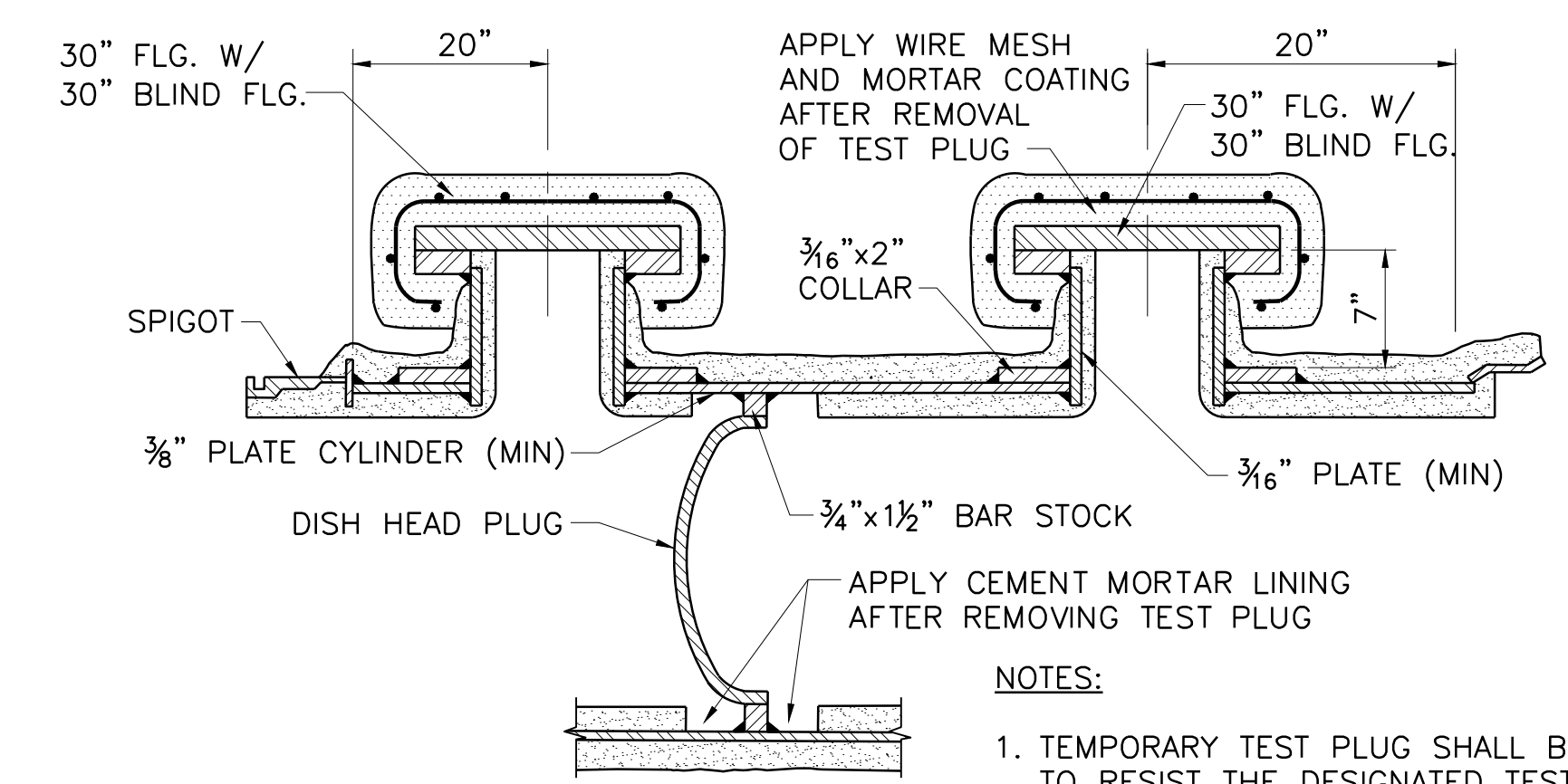
1 JOINT DETAIL BAR-WRAPPED CONCRETE PIPE NOT TO SCALE



2 WELDED JOINT DETAIL BAR-WRAPPED CONCRETE PIPE (ID > 36") NOT TO SCALE

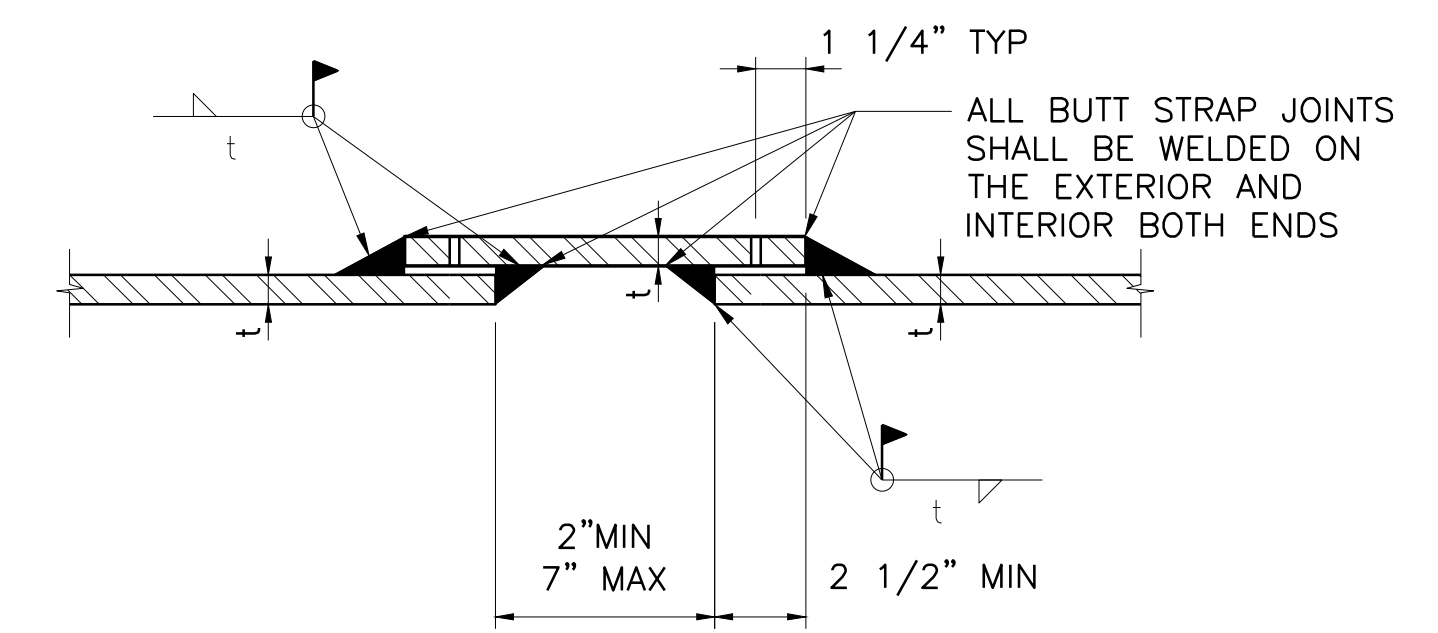


3 WELDED JOINT DETAIL BAR-WRAPPED CONCRETE PIPE (ID ≤ 36") NOT TO SCALE



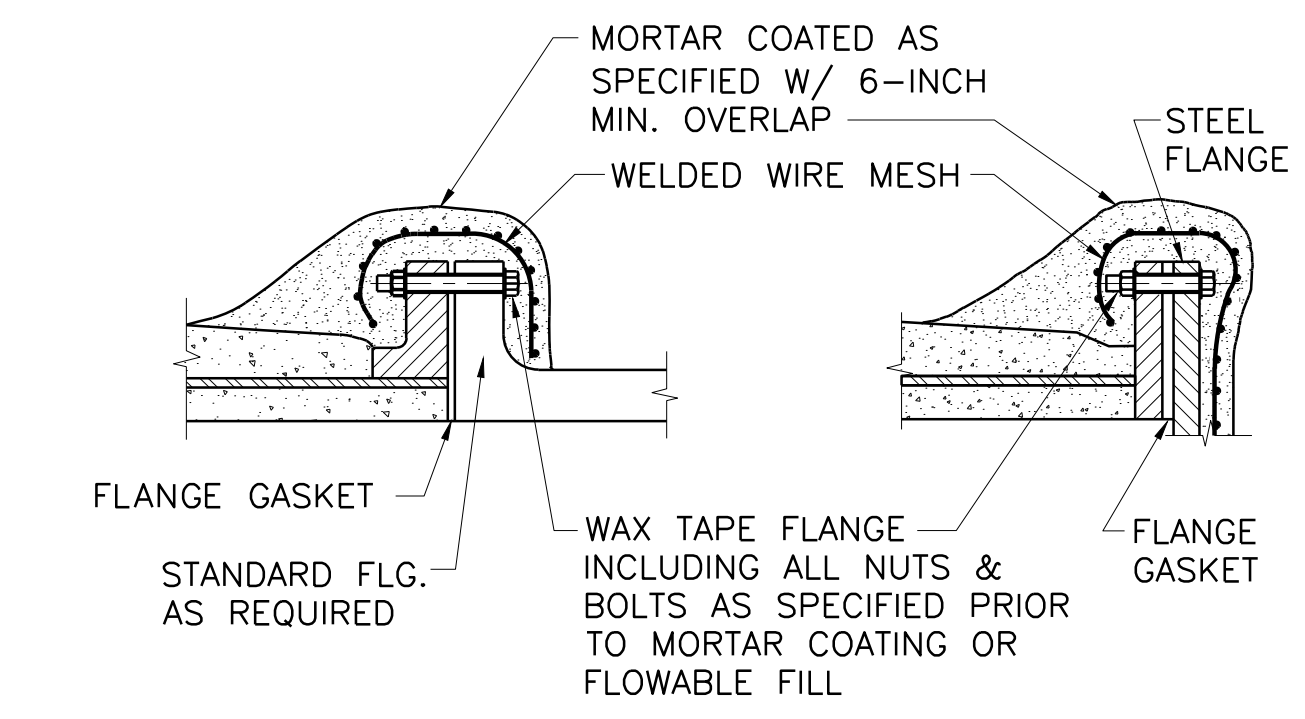
4 TEMPORARY TEST PLUG FOR BAR-WRAPPED PIPE NOT TO SCALE

- NOTES:
1. TEMPORARY TEST PLUG SHALL BE DESIGNED TO RESIST THE DESIGNATED TEST PRESSURE ON EITHER SIDE, ASSUMING PIPE SECTION NOT BEING TESTED IS EMPTY. CONCRETE PIPE SHOWN. WELD JOINTS FOR THRUST.
 2. FOR INTERMEDIATE PLUG ONLY ONE (1) MANWAY IS REQUIRED ON THE SIDE OF TEST PLUG WITH A GATE VALVE.



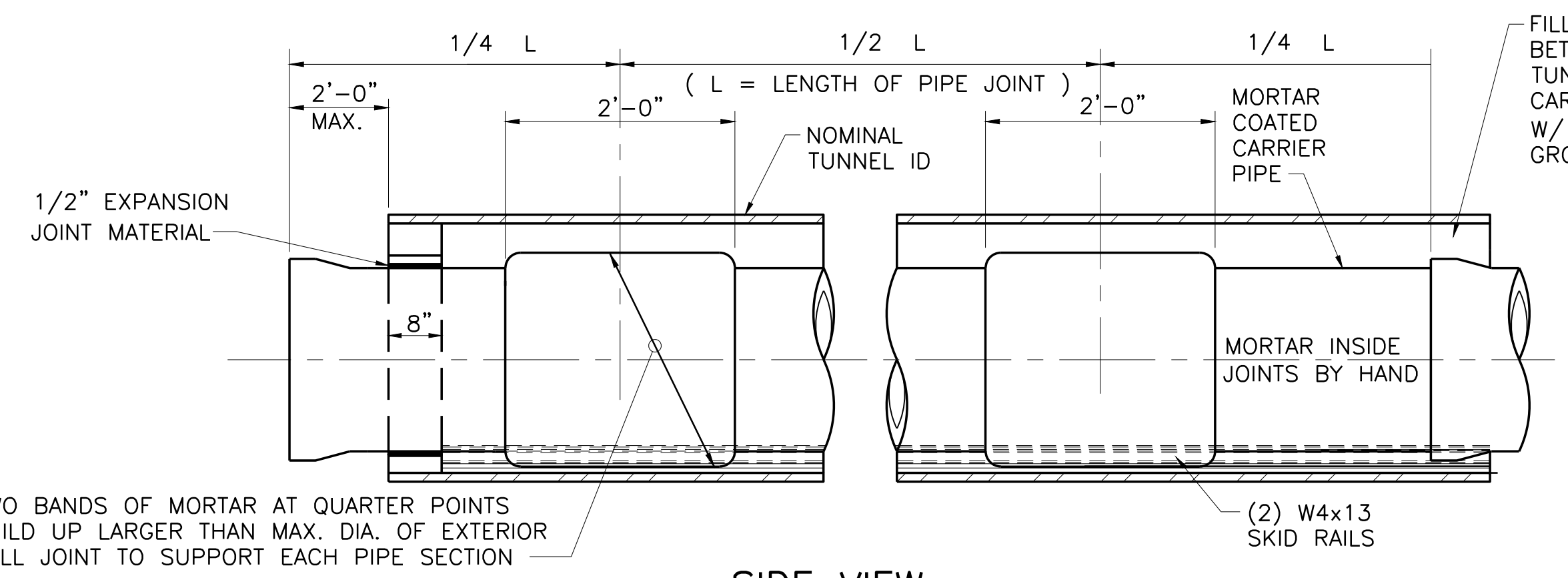
- NOTES:
1. BUTT STRAPS TO BE FURNISHED IN TWO PIECES AND SHIPPED LOOSE FOR FIELD WELDING. BUTT STRAPS TO INCLUDE TABS TO ACCEPT ALL-THREAD FOR BOLTED CONNECTION TO FACILITATE FIELD LINE-UP AND WELDING.
 2. 12" MAXIMUM LENGTH OF TYPICAL BUTT STRAP FOR FIELD CLOSING SECTION (SEE SPECIFICATIONS).
 3. SEE JOINT DETAILS FOR TYPICAL LAP WELD ON MORTAR COATED STEEL PIPE AND FOR ADDITIONAL INFORMATION ON COATINGS, LININGS AND OTHER REQUIREMENTS.
 4. "t" INDICATES THE THICKNESS OF THE STEEL PIPE AT THE SECTION WHERE USED.

5 JOINT DETAIL WELDED BUTT STRAP NOT TO SCALE



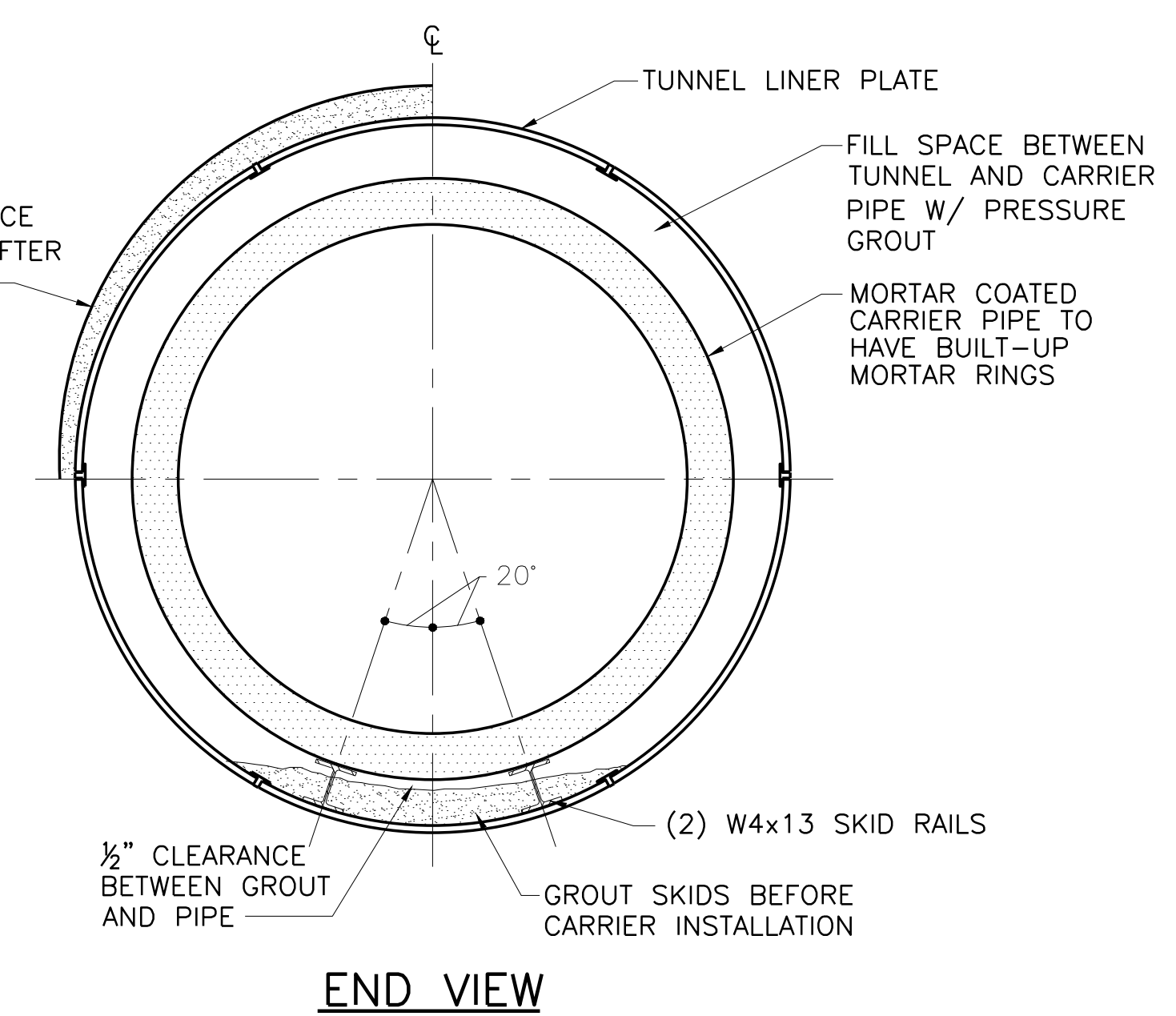
- NOTE:
1. INCLUDE INSULATED FLANGE GASKET, 2 INSULATING WASHERS, 2 STEEL WASHERS, AND INSULATED BOLT SLEEVES PER THE SPECIFICATIONS AT LOCATIONS INDICATED ON THE PLANS.

6 FLANGED CONNECTIONS FOR BAR-WRAPPED PIPE NOT TO SCALE



- NOTES:
1. CONTRACTOR SHALL VERIFY ELECTRICAL ISOLATION BETWEEN THE CARRIER PIPE AND THE CASING PIPE PRIOR TO SEALING ENDS AND BACKFILLING AS SPECIFIED IN SECTION 26 42 10 CORROSION MONITORING.
 2. LEAVE STULLS IN CARRIER PIPE UNTIL AFTER GROUTING ANNULAR SPACE.
 3. CONTRACTOR SHALL BE RESPONSIBLE FOR PREVENTING PIPE FROM FLOATING DURING GROUTING OF ANNULAR SPACE.

7 TYPICAL INSTALLATION IN TUNNEL LINER FOR BAR-WRAPPED PIPE NOT TO SCALE



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5/7/2020

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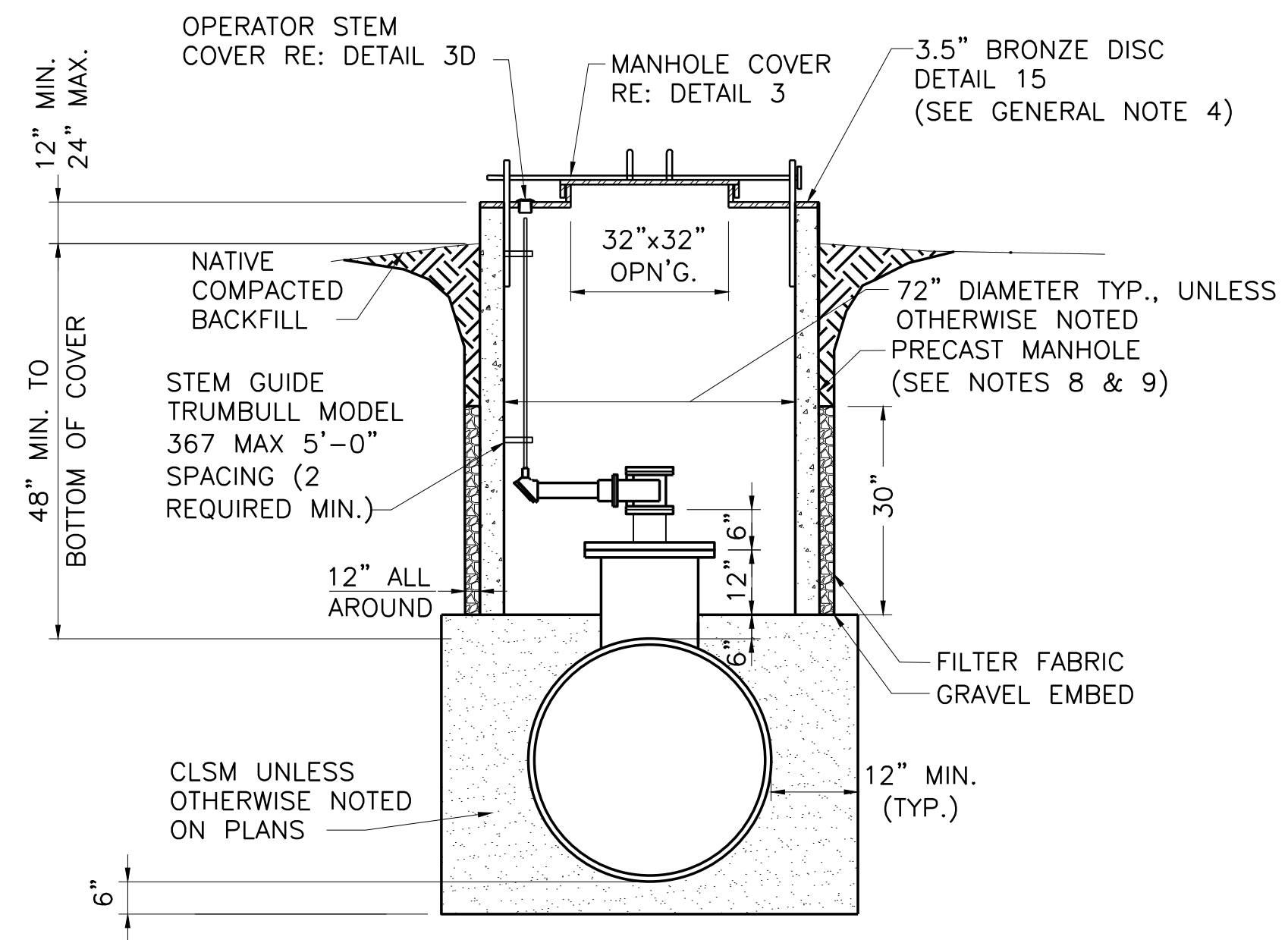
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION

DETAILS

BAR-WRAPPED PIPE DETAILS

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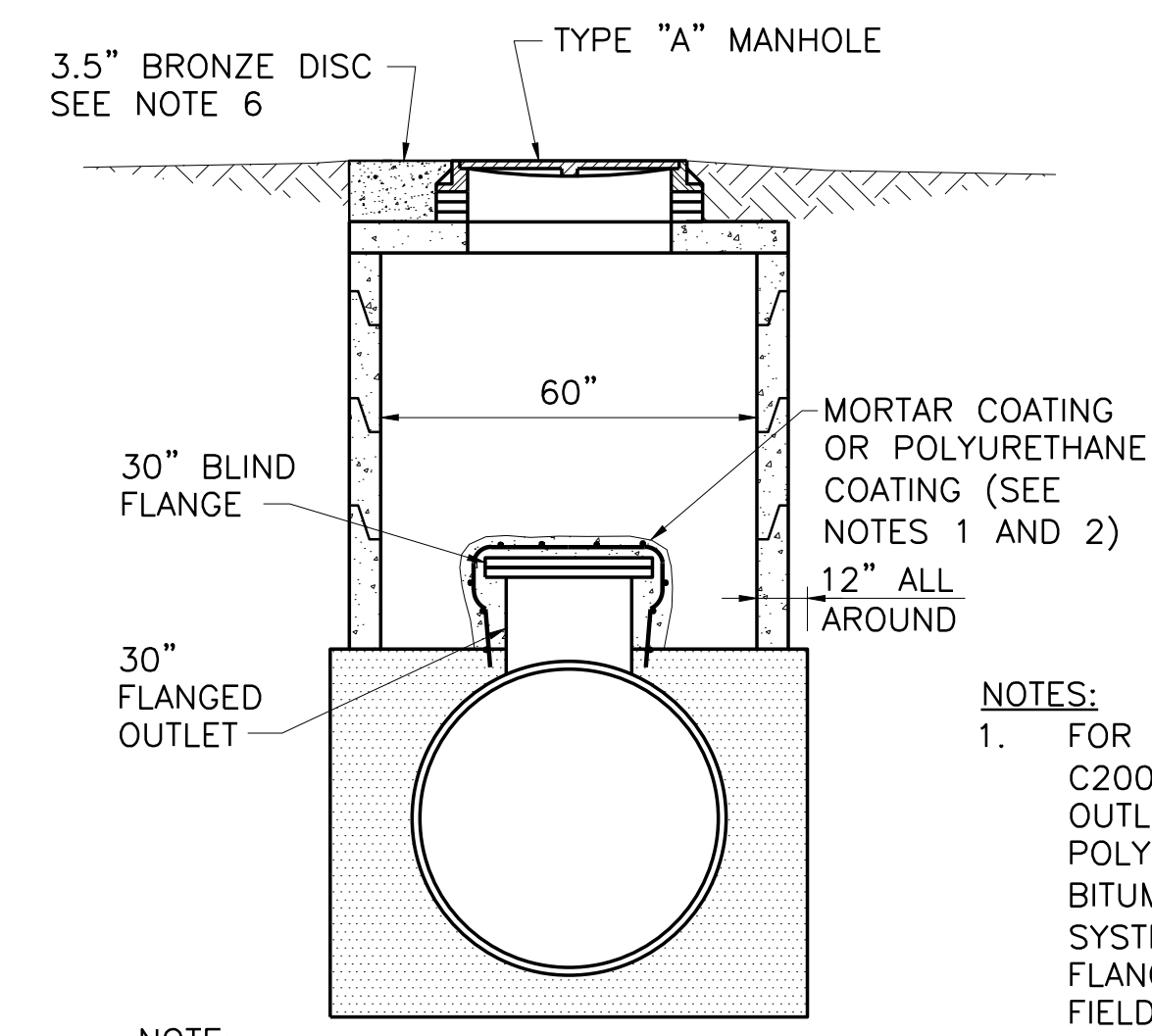
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1
TYPE "A" MANHOLE
NON-TRAFFIC RATED
NOT TO SCALE

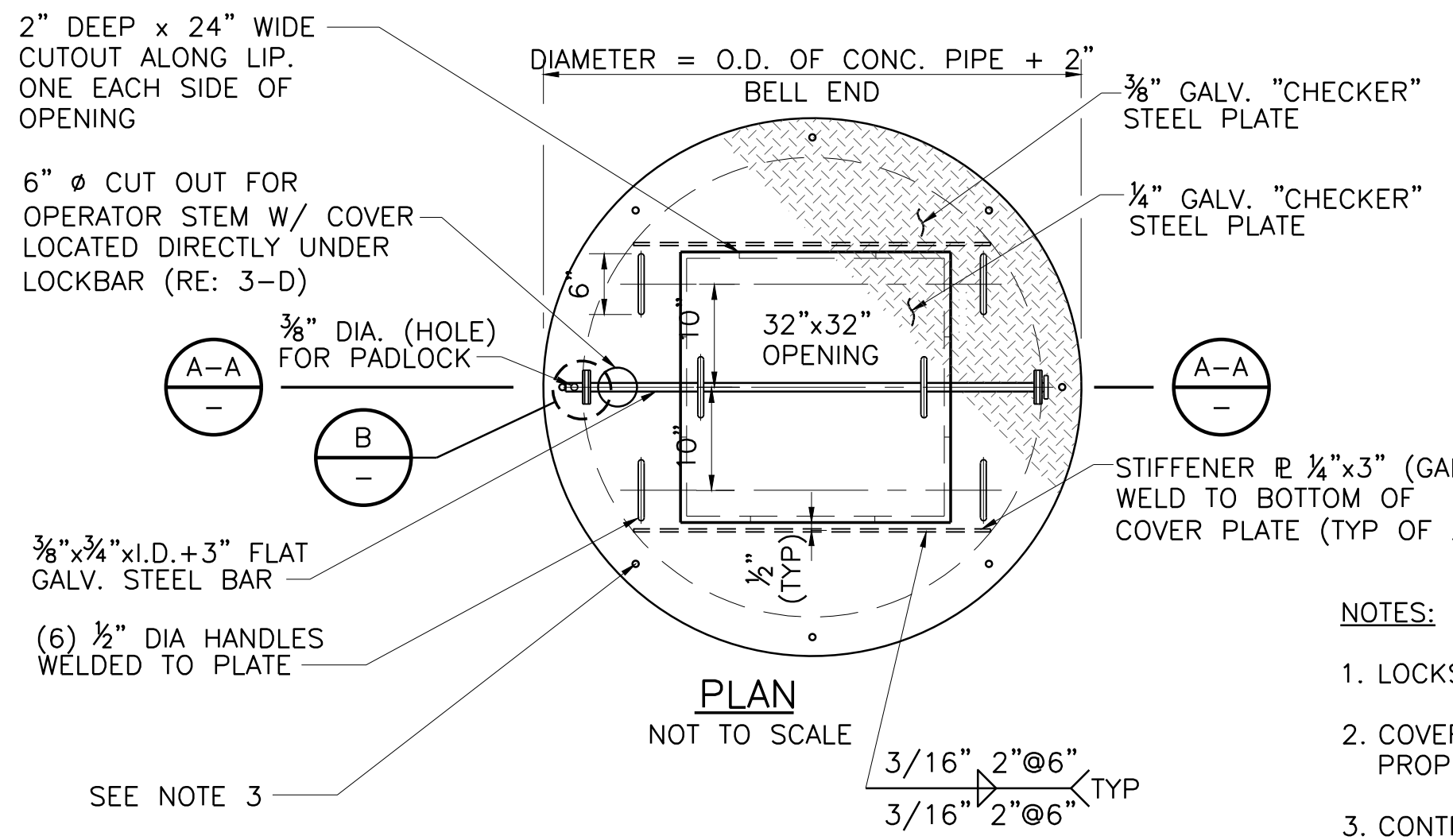
SHEET GENERAL NOTES FOR TYPE A MANHOLE AND TYPE B MANHOLE:

- ALL METAL SURFACES INSIDE OF MANHOLES, EXCEPT STAINLESS STEEL AND BRONZE, SHALL RECEIVE TWO (2) COATS OF POLYURETHANE OR BITUMASTIC COATING (KOPPERS 50 OR APPROVED EQUAL). CARE SHALL BE TAKEN TO APPLY THE COATING IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
- THE VALVE EXTENSION SHALL BE ONE PIECE ROD AND POSITIONED INSIDE THE MANHOLE SUCH THAT THE VALVE CAN BE OPERATED FROM GROUND LEVEL THROUGH THE MANHOLE TOP. VALVE STEM EXTENSION SHALL EXTEND TO WITHIN 4" OF THE MANHOLE TOP. ACCESS TO VALVE EXTENSION SHALL NOT BE THROUGH MANHOLE COVER.
- ALL BLOW OFF AND AIR VALVE PIPING SHALL BE CLASS 53 MORTAR-LINED DUCTILE IRON PIPE WITH FLANGED JOINTS EXCEPT WHERE SPECIFICALLY NOTED. PIPING INSIDE MANHOLE AND BURIED PIPE SHOWN HAVE FACTORY APPLIED STANDARD COATING. ABOVE-GROUND PIPING SHALL BE FACTORY-PRIMED AND PAINTED SILVER. ALL BLOW OFF AND AIR VALVE PIPING SHALL BE CLASS 53 DUCTILE IRON PIPE WITH FLANGED JOINTS EXCEPT WHERE SPECIFICALLY NOTED. PIPING INSIDE MANHOLE AND BURIED PIPE SHOWN HAVE FACTORY APPLIED STANDARD COATING. IN ADDITION TO THE FACTORY APPLIED ASPHALTIC COATING, ALL BURIED DUCTILE IRON PIPE AND FITTINGS SHALL HAVE A TUBE-TYPE POLYETHYLENE ENCASEMENT IN ACCORDANCE WITH AWWA C105. POLYETHYLENE ENCASEMENT SHALL BE 8 MILS THICK. BOTH ENDS OF THE PIPE SHALL BE THOROUGHLY SEALED WITH ADHESIVE TAPE OR PLASTIC TIE STRAPS AT THE JOINT OVERLAP. PLACE CIRCUMFERENTIAL WRAPS OF TAPE AT 2-FOOT INTERVALS ALONG THE BARREL OF THE PIPE TO MINIMIZE THE SPACE BETWEEN THE ENCASEMENT AND THE PIPE.
- CONTRACTOR SHALL INSTALL BLANK 3.5" (BERNTSEN C35DB OR APPROVED EQUAL) BRASS DISC ON TOP OF MANHOLE COVER. CONTRACTOR WILL BE RESPONSIBLE FOR STAMPING DISC AT END OF PROJECT WITH IDENTIFICATION PROVIDED BY NTMWD.
- INSTALL STEM GUIDES USING STAINLESS STEEL ANCHOR BOLTS. DO NOT TIE STEM GUIDE INTO MANHOLE REINFORCEMENT.
- CONTRACTOR SHALL USE WAX TAPE AS SPECIFIED ON ALL DIRECT BURIED OR MORTAR COATED BOLTS AND CONNECTIONS.
- CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING TOP OF PRECAST MANHOLE ELEVATIONS.
- PRECAST MANHOLE SECTIONS SHALL BE PLACED WITH BELLS FACING DOWNWARD. CONTRACTOR SHALL GROUT ALL INTERIOR MANHOLE JOINTS. TOP SHALL BE CAST FLAT OR HAVE SPIGOT END REMOVED AT TOP TO MAKE FLAT SURFACE FOR LID MOUNTING.
- TYPE "B" PRECAST MANHOLE AND LID SHALL BE RATED FOR HS-20 LOADING.
- TOP 4- FEET OF MANHOLE RISERS SHALL BE PROVIDED IN 2-FOOT VERTICAL SECTIONS.



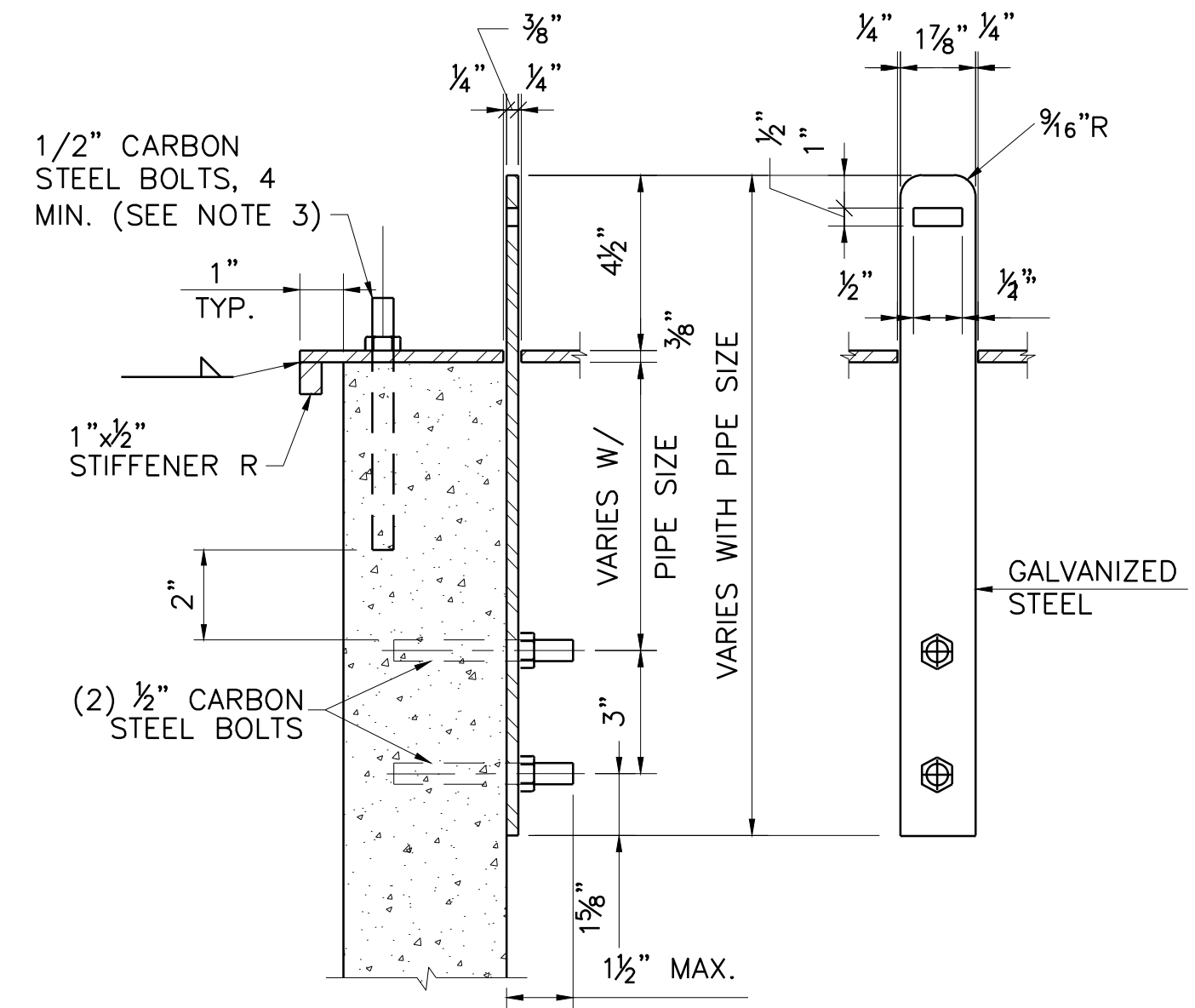
2
ACCESS MANWAY
NOT TO SCALE

- NOTES:**
- FOR POLYURETHANE COATED STEEL PIPE (AWWA C200), THE TOP AND BOTTOM OF THE 30" FLANGED OUTLET AT CAVS SHALL RECEIVE A FIELD-APPLIED POLYURETHANE COATING OR TWO COATS OF BITUMASTIC COATING (KOPPERS 50 OR PAINT PER SYSTEM NO. 4). THE TOP AND BOTTOM OF THE 30" FLANGED OUTLET AT BOVS SHALL RECEIVE A FIELD-APPLIED POLYURETHANE COATING, TWO COATS OF BITUMASTIC COATING (KOPPERS 50 OR APPROVED EQUAL), ALL COATINGS SHALL OVERLAP FACTORY APPLIED COATINGS BY A MINIMUM OF 6".
 - FOR BAR-WRAPPED CONCRETE CYLINDER PIPE (AWWA C303), THE TOP AND BOTTOM OF THE 30" FLANGED OUTLET AT CAVS SHALL RECEIVE TWO COATS OF BITUMASTIC COATING (KOPPERS 50 OR APPROVED EQUAL). THE TOP AND BOTTOM OF THE 30" FLANGED OUTLET AT BOVS SHALL RECEIVE TWO COATS OF BITUMASTIC COATING (KOPPERS 50 OR APPROVED EQUAL), OR A 1" THICK MORTAR COATING CONSISTING OF ONE PART PORTLAND CEMENT TO TWO AND ONE HALF PARTS FINE, SHARP (PLASTER) SAND, REINFORCED WITH WIRE MESH AS NECESSARY. ALL COATINGS SHALL OVERLAP FACTORY APPLIED COATINGS BY A MINIMUM OF 6".

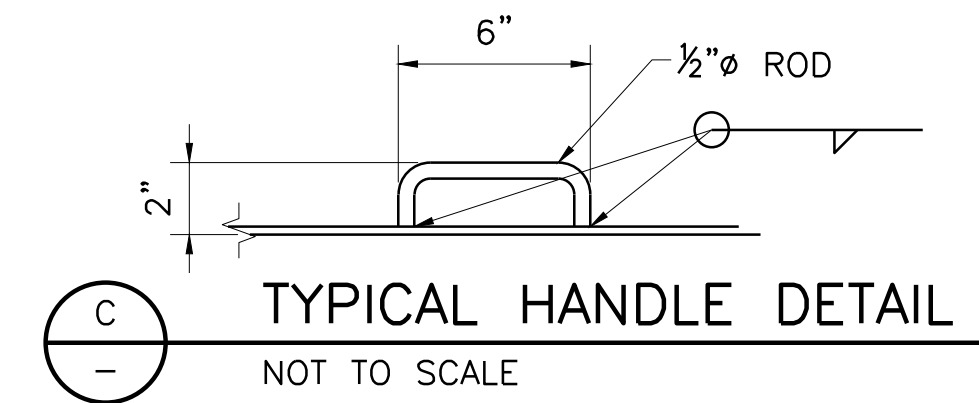


PLAN
NOT TO SCALE

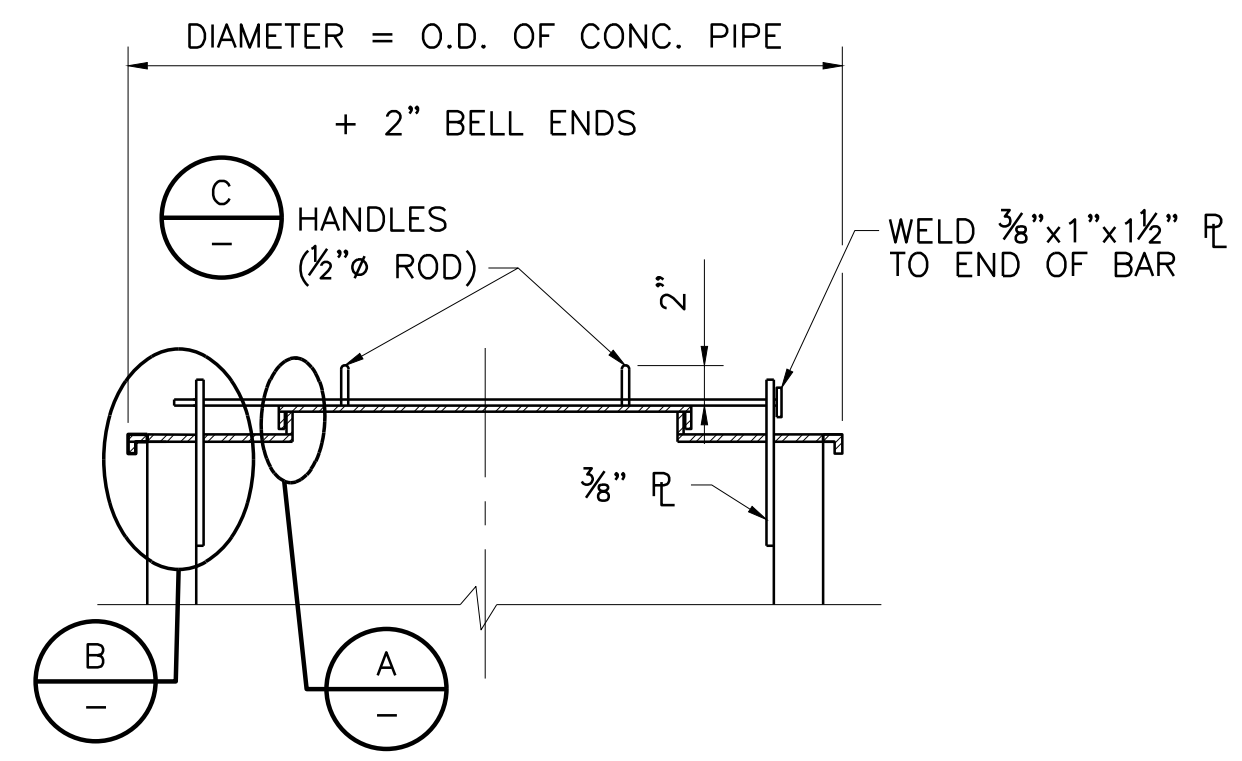
- NOTES:**
- LOCKS WILL BE PROVIDED BY THE OWNER.
 - COVERS THAT ARE WARPED OR DO NOT PROPERLY FIT WILL BE REJECTED.
 - CONTRACTOR SHALL FASTEN VAULT LID TO CONCRETE VAULT WITH BOLTS.
 - OPERATOR STEM COVER SHALL BE PER DETAIL 3D.



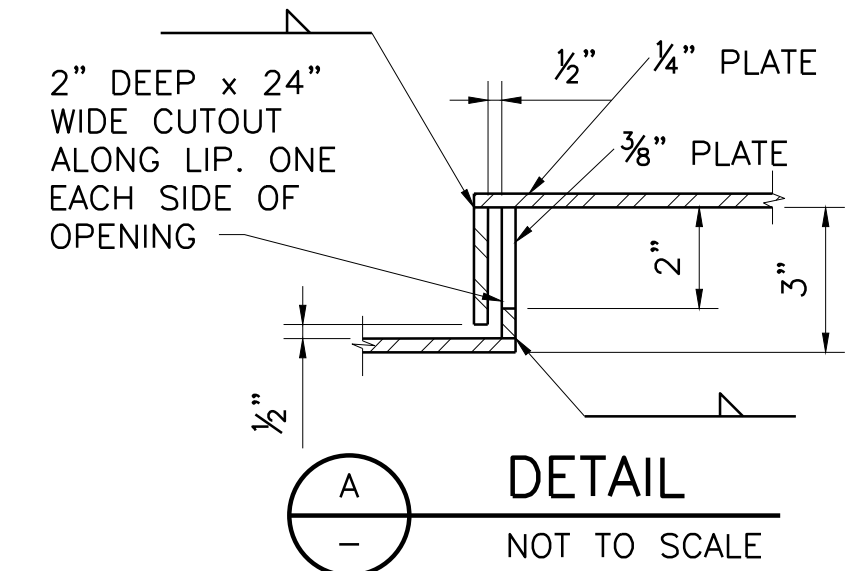
B
DETAIL
NOT TO SCALE



C
TYPICAL HANDLE DETAIL
NOT TO SCALE

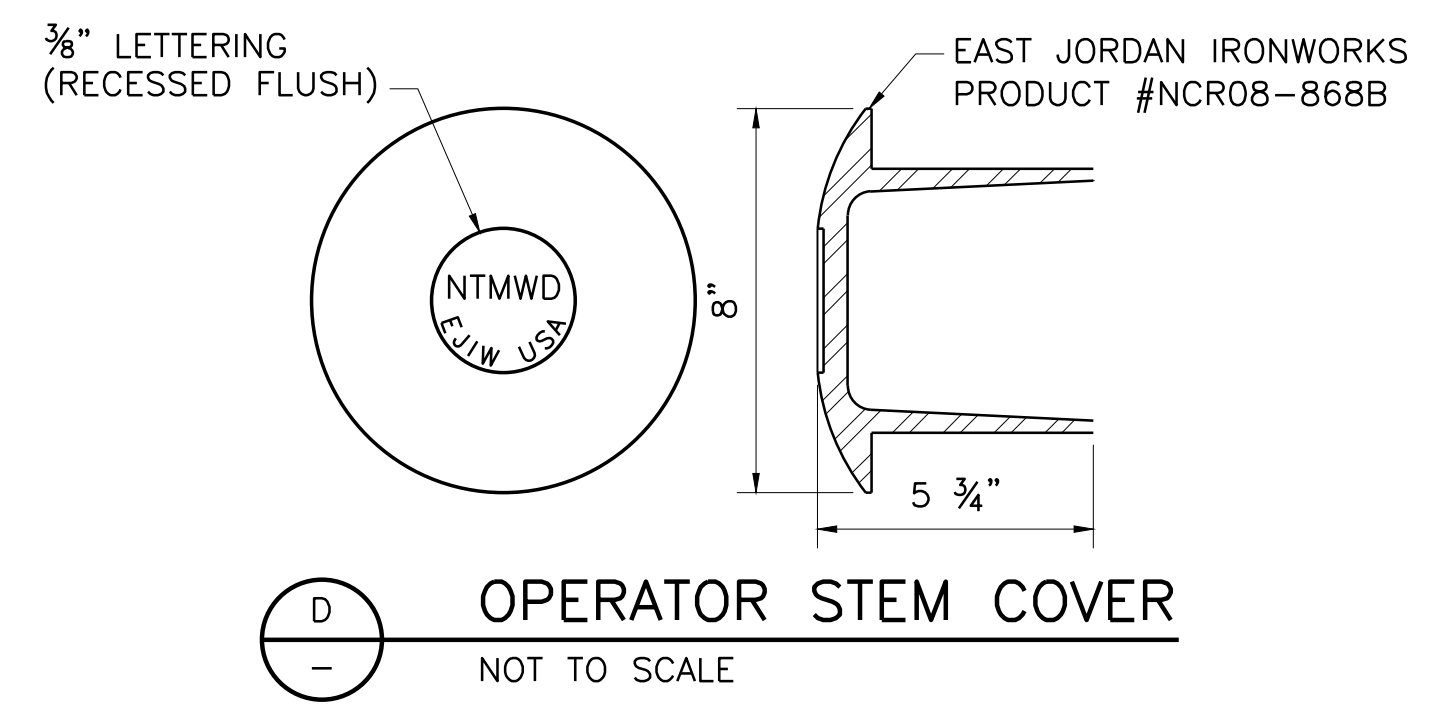


SECTION A-A
NOT TO SCALE



A
DETAIL
NOT TO SCALE

3
TYPE A
MANHOLE COVER
NOT TO SCALE



D
OPERATOR STEM COVER
NOT TO SCALE

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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
DETAILS
PIPELINE APPURTENANCES

PRP18708	MAY 2020	MDS	NIRM	CCB
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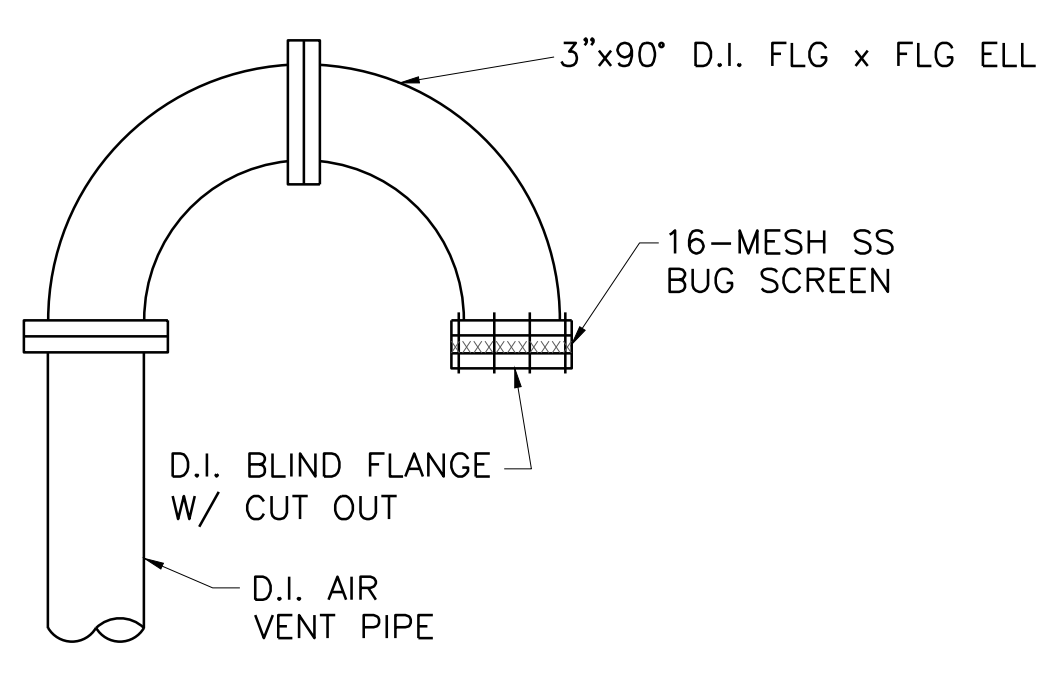
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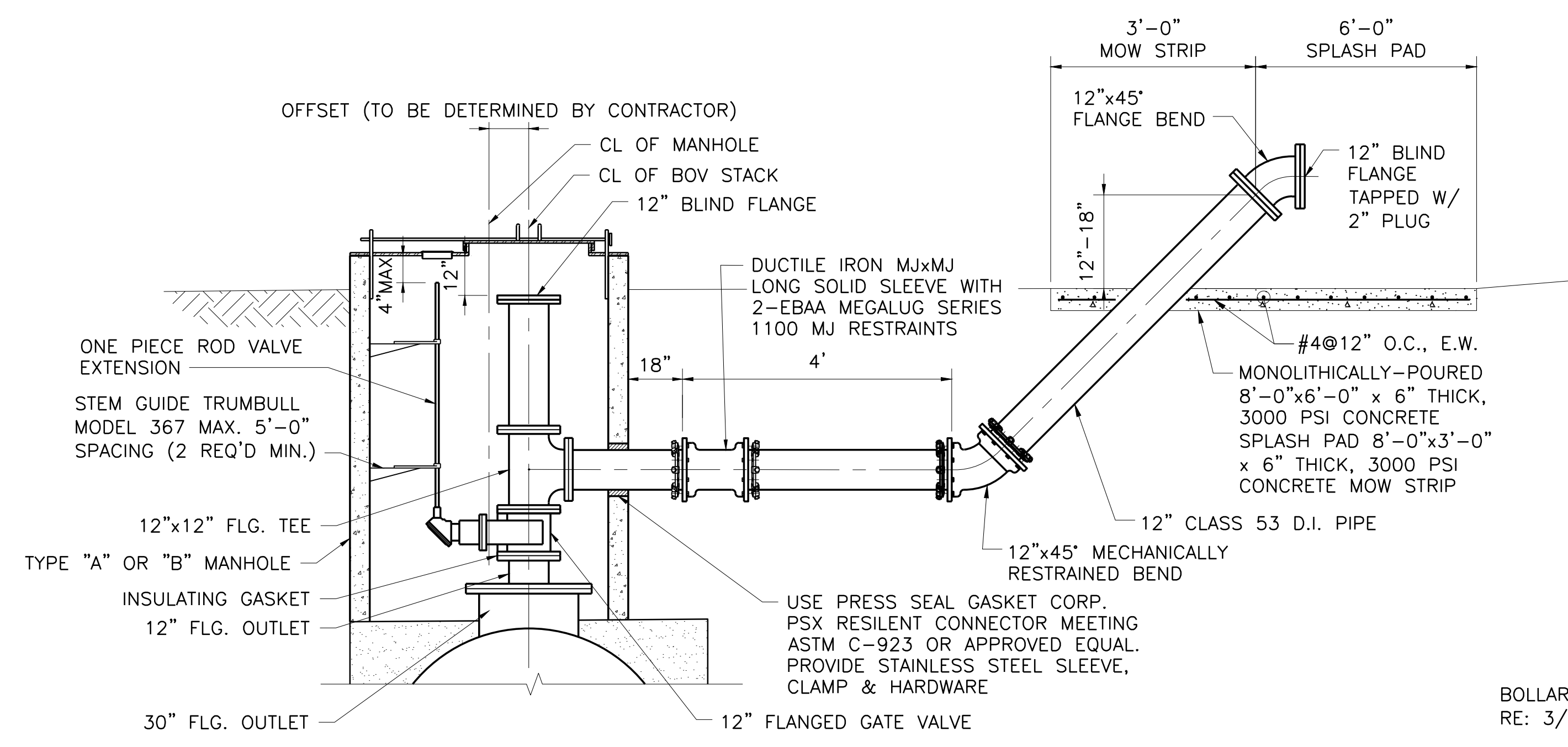
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
CIVIL
PIPELINE APPURTENANCES II

NO.	ISSUE	BY	DATE	PRP18708	DESIGNED	MD/S	DRAWN	N/R/M	CHECKED	CCB
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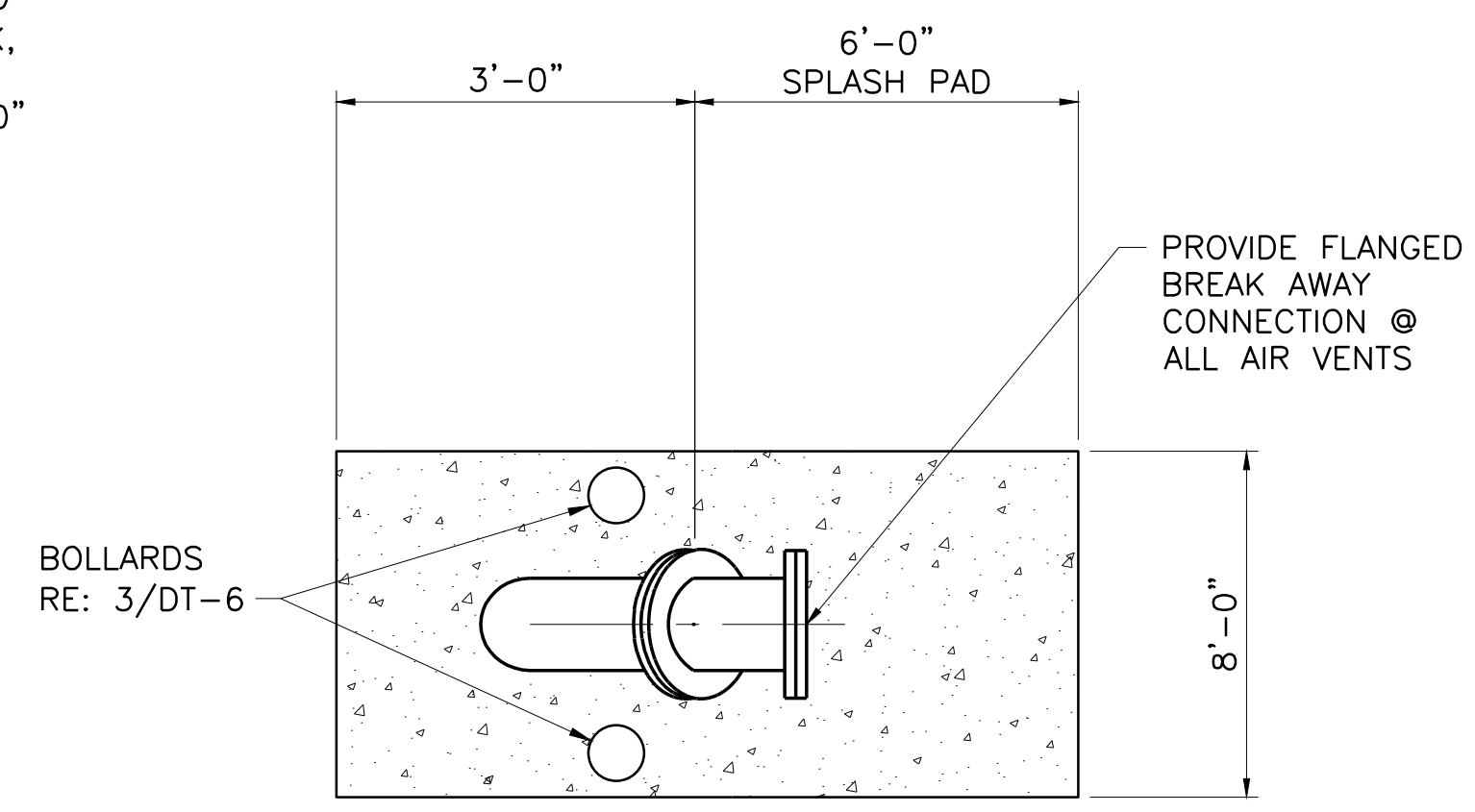


1
SCREENED VENT
NOT TO SCALE



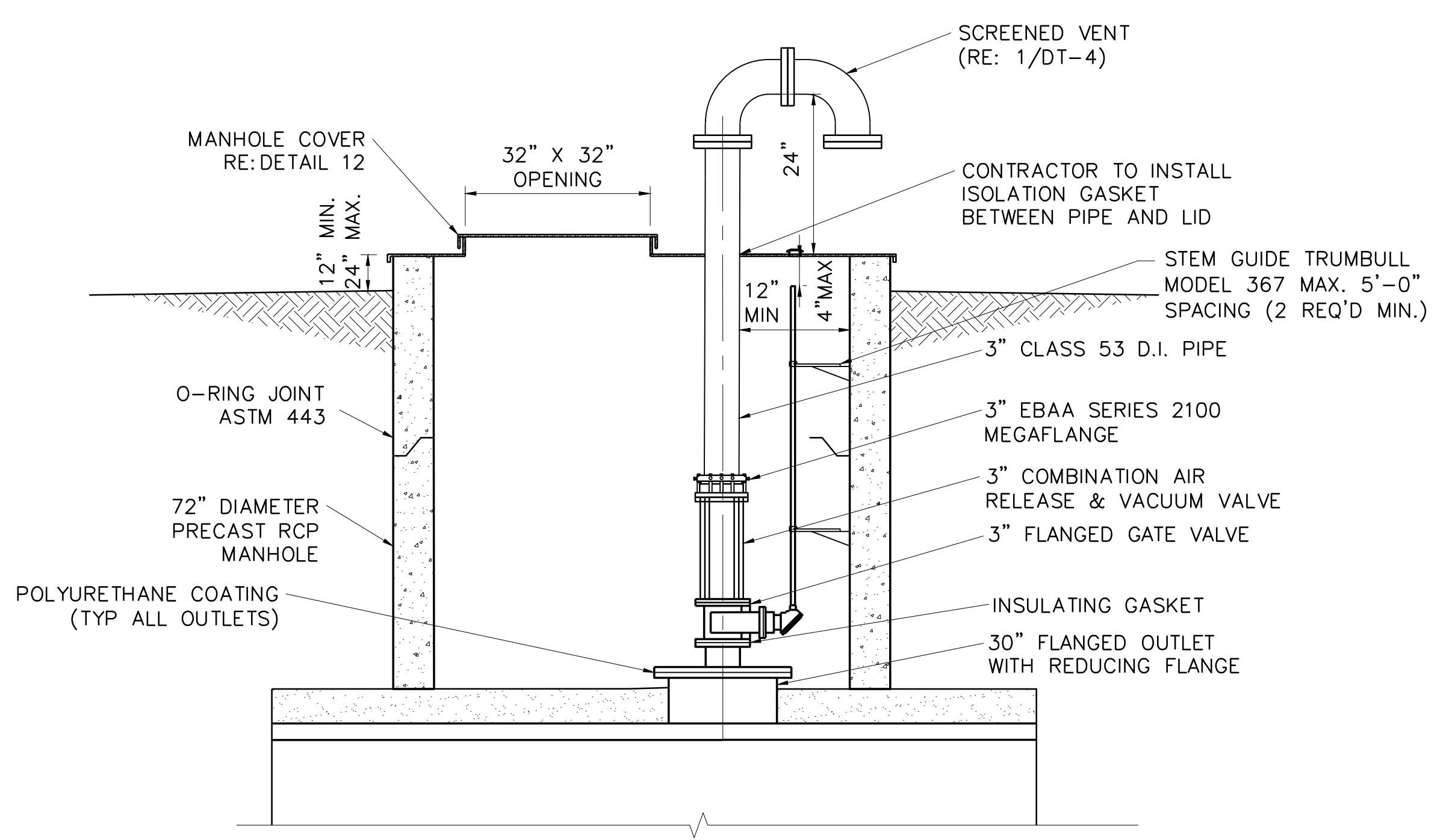
- NOTES:**
- DISCHARGE PIPING DIRECTION SHALL BE ROUTED AWAY FROM FIBER OPTIC LINE.
 - INSPECTOR SHALL COORDINATE DISCHARGE PIPING DIRECTION.
 - A PERMANENTLY ATTACHED VALVE STEM EXTENSION SHALL BE REQUIRED FOR ANY VALVE WHOSE OPERATING NUT IS LOCATED IN EXCESS OF 4 FEET BELOW THE TOP OF VALVE BOX. THIS EXTENSION SHALL BE OF SUFFICIENT LENGTH TO ENSURE THAT ITS TOP IS WITHIN 4" OF THE VALVE BOX COVER. VALVE STEM EXTENSIONS SHALL BE 1" DIA. SOLID STEEL ROD.
 - CENTER MANHOLE OPENING OVER B.O.V. RISER PIPE.
 - REFERENCE TYPE A OR TYPE B MANHOLE DETAIL FOR MANHOLE RING AND BACKFILL REQUIREMENTS.

2
BLOW OFF VALVE ASSEMBLY
NOT TO SCALE



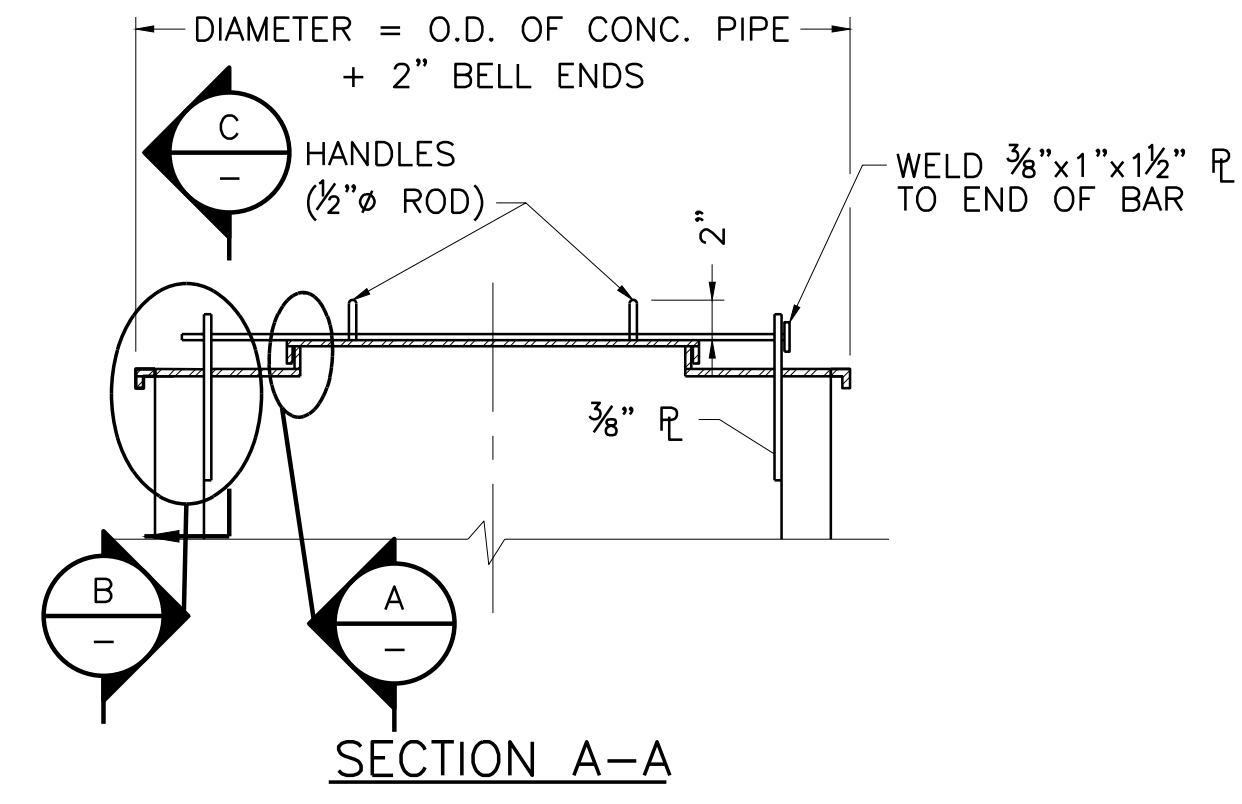
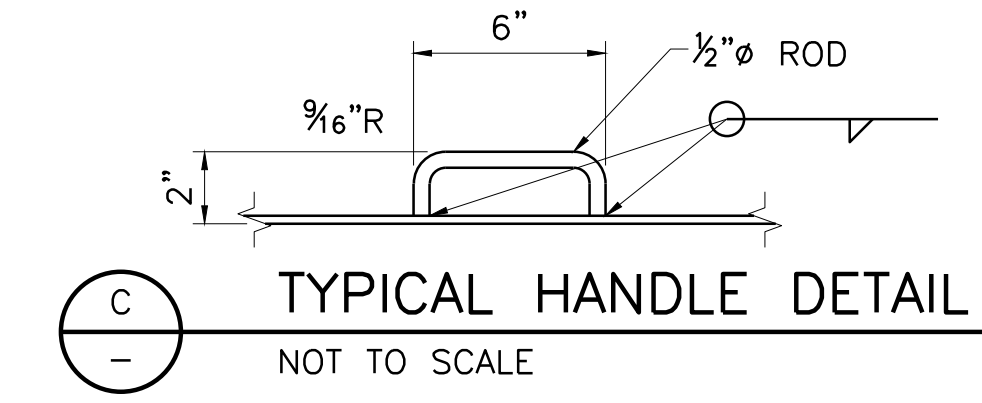
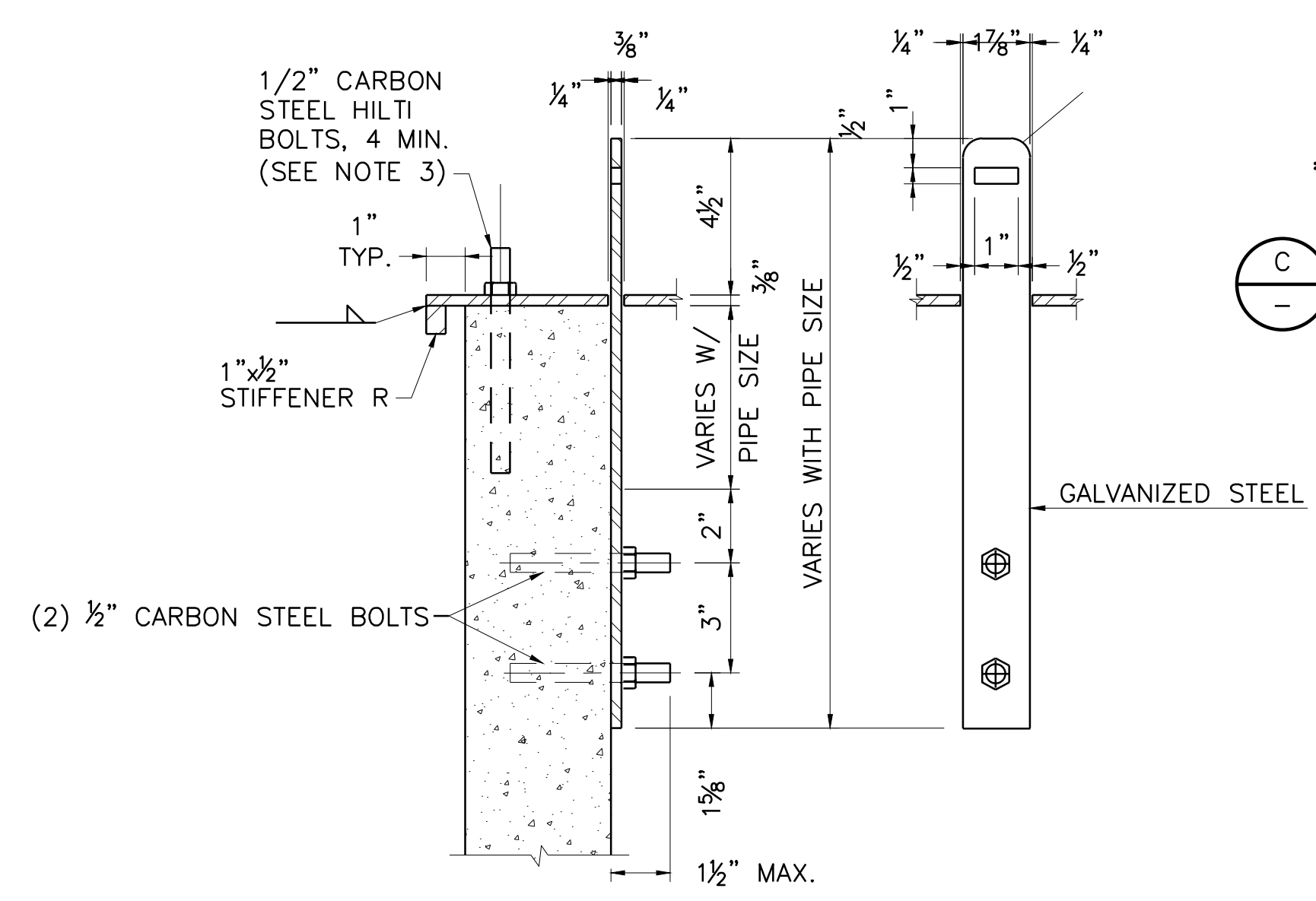
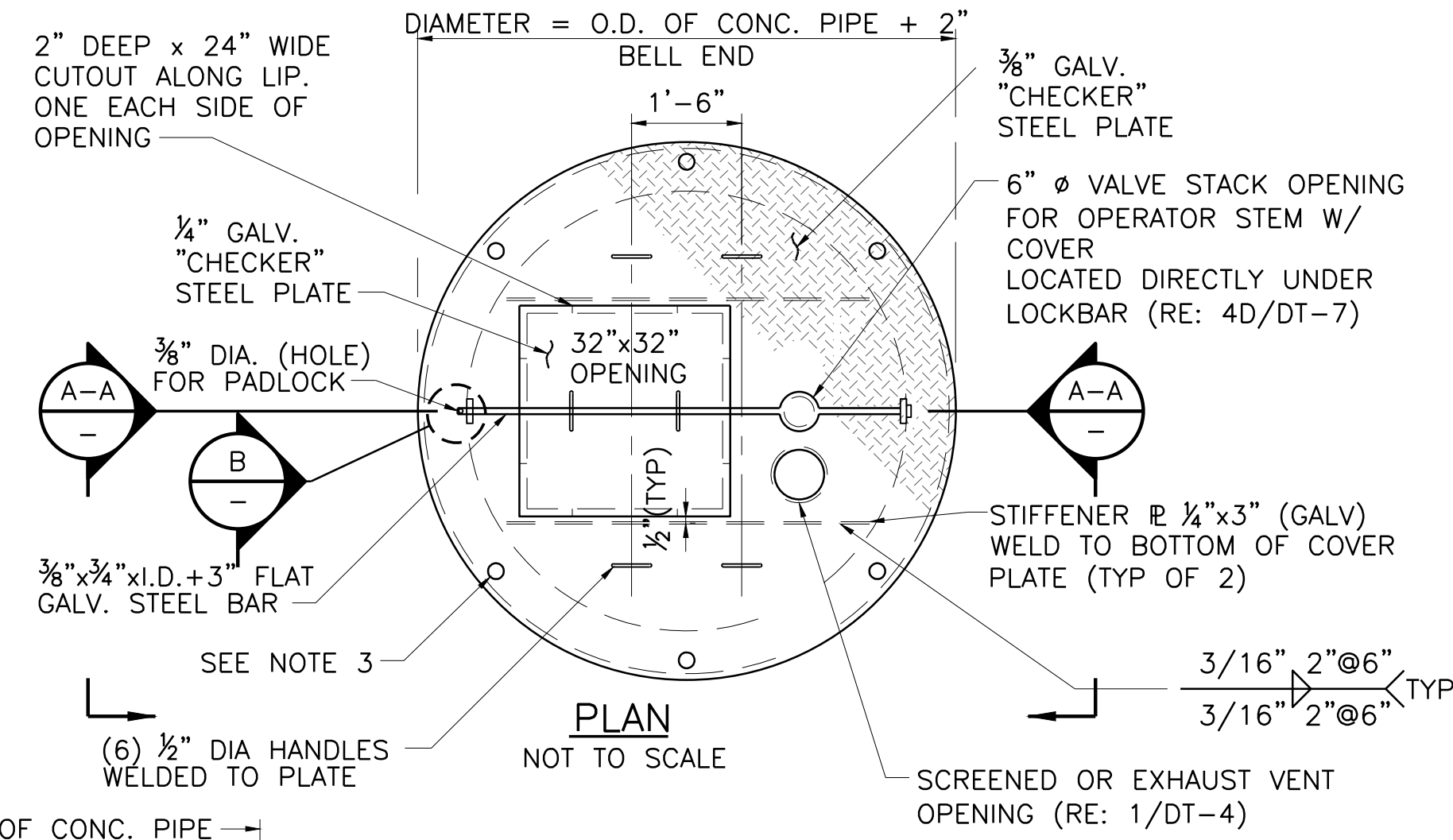
- NOTES:**
- BOLLARDS NOT REQUIRED WHEN BLOW OFF VALVE IS LOCATED NEAR OR ADJACENT TO A DRAINAGE WAY

3
CONCRETE SPLASH PAD
NOT TO SCALE

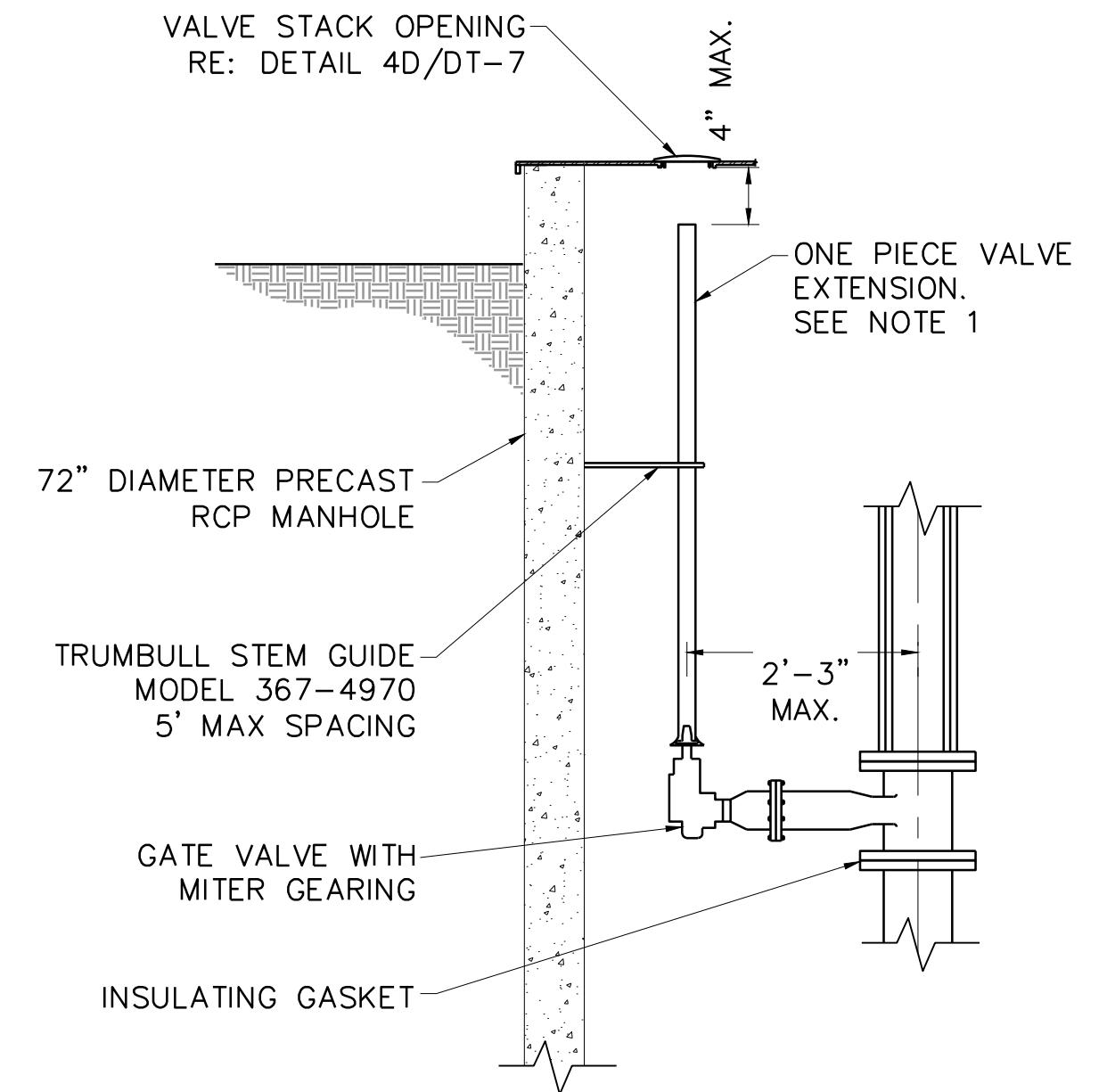
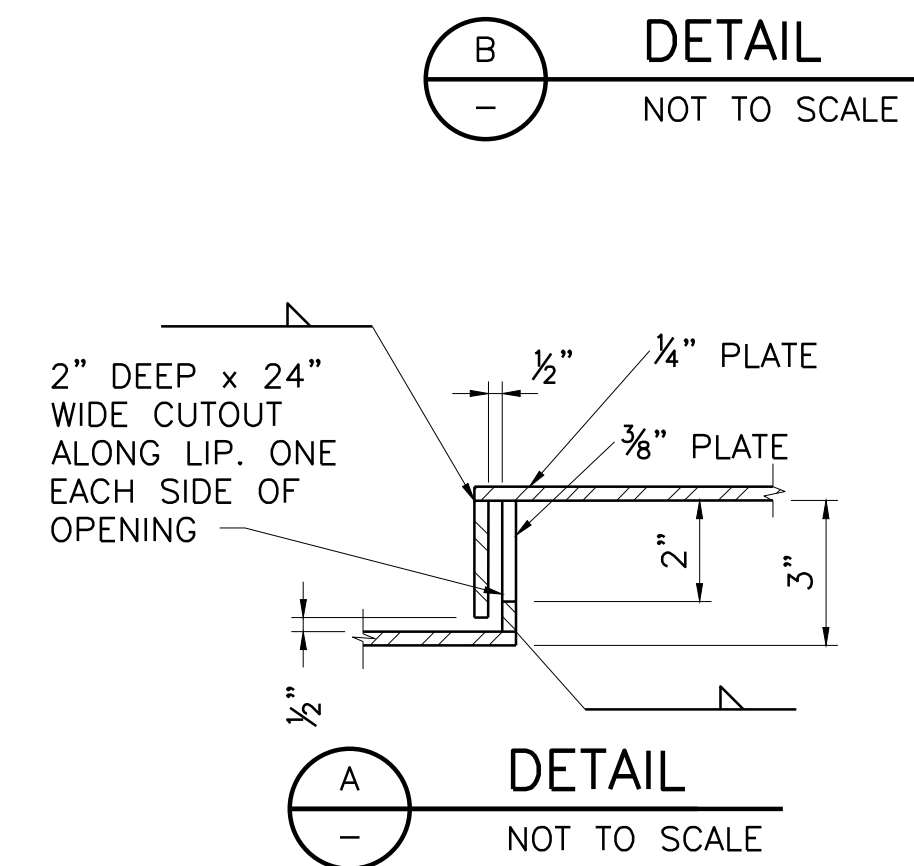


4
CAV FOR TREATED WATER PIPELINE - SECTION VIEW
NOT TO SCALE

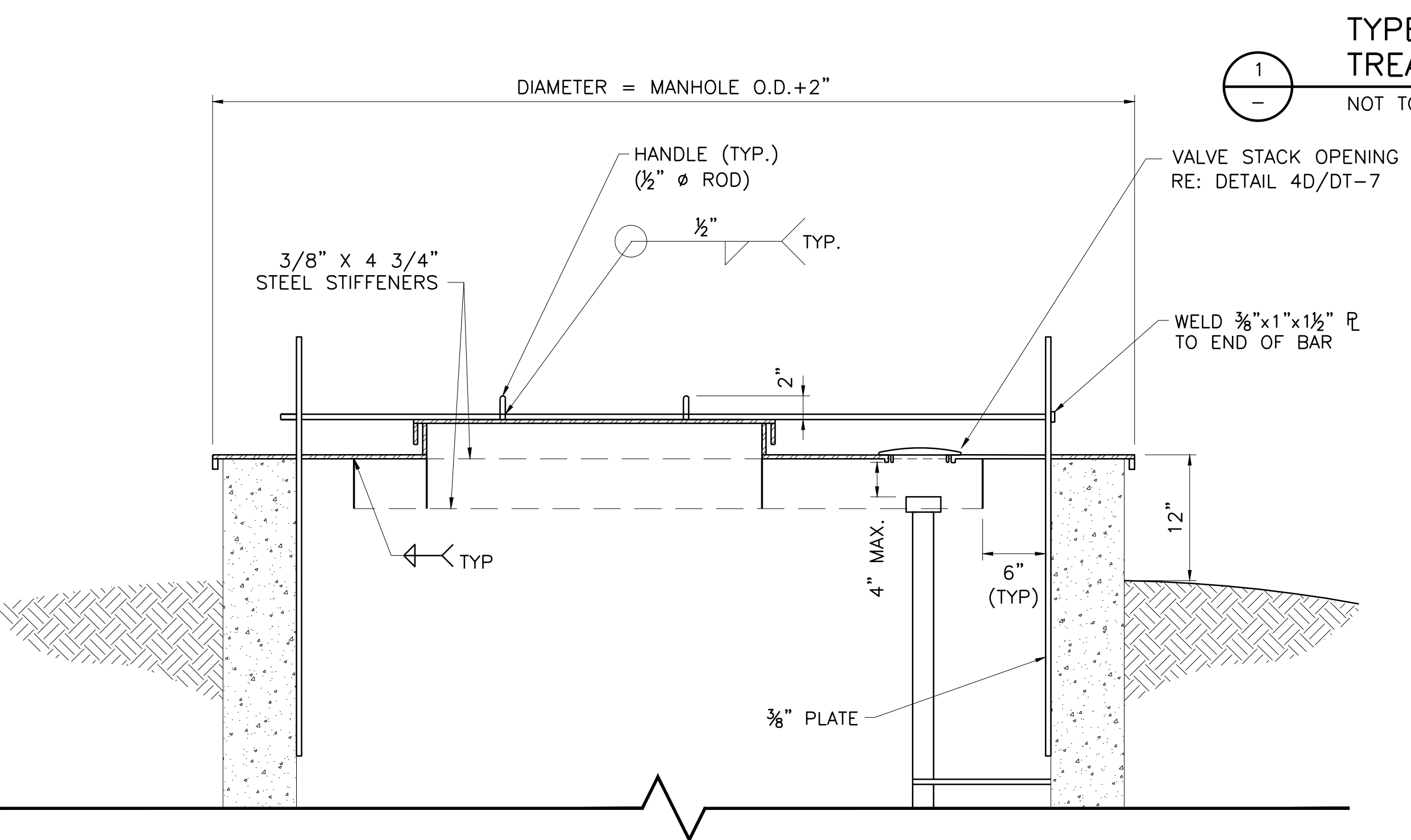
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- NOTES:**
- LOCKS WILL BE PROVIDED BY THE OWNER.
 - COVERS THAT ARE WARPED OR DO NOT PROPERLY FIT WILL BE REJECTED.
 - CONTRACTOR SHALL FASTEN VAULT LID TO CONCRETE VAULT WITH BOLTS.
 - OPERATOR STEM COVER SHALL BE PER DETAIL 4D/DT-7.
 - THE VALVE STACK OPENING SHOWN ABOVE IS SCHEMATIC. CONTRACTOR SHALL COORDINATE VALVE STACK OPENING LOCATION WITH VALVE MANUFACTURER AND MANHOLE COVER MANUFACTURER PRIOR TO MANHOLE COVER FABRICATION. CONTRACTOR SHALL SUBMIT SHOP DRAWING OF MANHOLE AND MANHOLE COVER TO ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.
 - CONTRACTOR SHALL INSTALL BLANK 3.5" (BERNTSEN C35DB OR APPROVED EQUAL) BRASS DISC ON TOP OF MANHOLE COVER. CONTRACTOR WILL BE RESPONSIBLE FOR STAMPING DISC AT END OF PROJECT WITH IDENTIFICATION PROVIDED BY NTMWD. SEE DETAIL 15.



- NOTES:**
- THE VALVE EXTENSION SHALL BE ONE PIECE AND POSITIONED INSIDE THE MANHOLE SUCH THAT THE VALVE CAN BE OPERATED FROM GROUND LEVEL THROUGH THE MANHOLE TOP. THE VALVE EXTENSION SHALL EXTEND TO WITHIN 4-INCHES OF THE MANHOLE TOP. ACCESS TO VALVE EXTENSION SHALL NOT BE THROUGH MANHOLE COVER.
 - CONTRACTOR SHALL CENTER VALVE STACK OPENING OVER GATE VALVE OPERATING STEM. CONTRACTOR SHALL COORDINATE VALVE STACK OPENING LOCATION WITH GATE VALVE MANUFACTURER AND MANHOLE COVER MANUFACTURER PRIOR TO MANHOLE COVER FABRICATION. CONTRACTOR SHALL SUBMIT SHOP DRAWING OF AIR RELEASE VALVE MANHOLE AND MANHOLE COVER TO ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. IF OPENINGS ARE FIELD CUT, CONTRACTOR SHALL PROTECT PIPE COATINGS FROM DAMAGE.



TYPE A MANHOLE COVER FOR WATER TREATED PIPELINE CAV - SECTION VIEW
NOT TO SCALE

TYPE A MANHOLE COVER FOR TREATED WATER PIPELINE CAV
NOT TO SCALE

STEM GUIDE DETAIL
NOT TO SCALE

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Texas Registered Engineering Firm F-2144

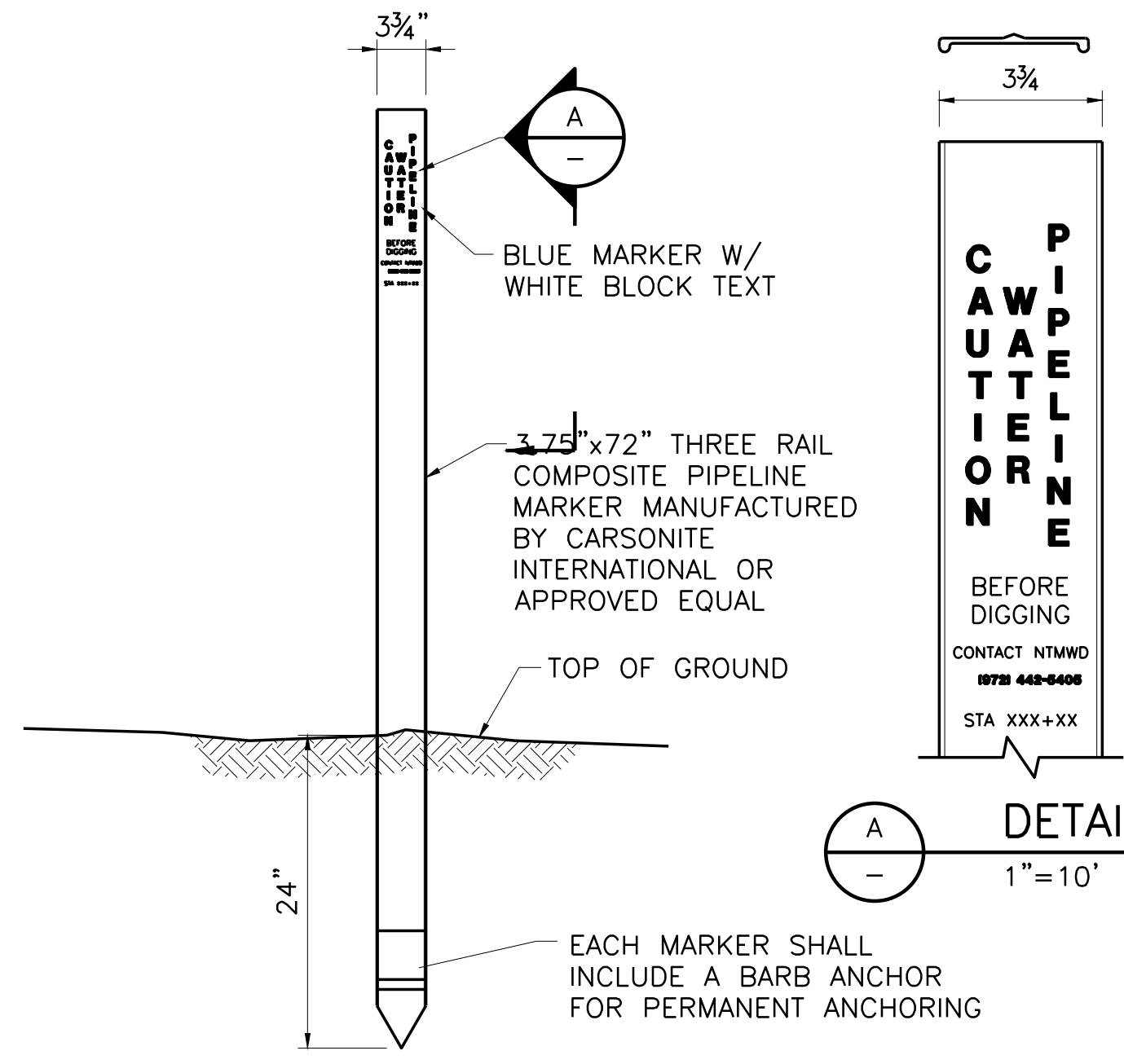


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**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
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NO.	ISSUE	DATE	BY	FILE NAME
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3	DRAWN	MDS		
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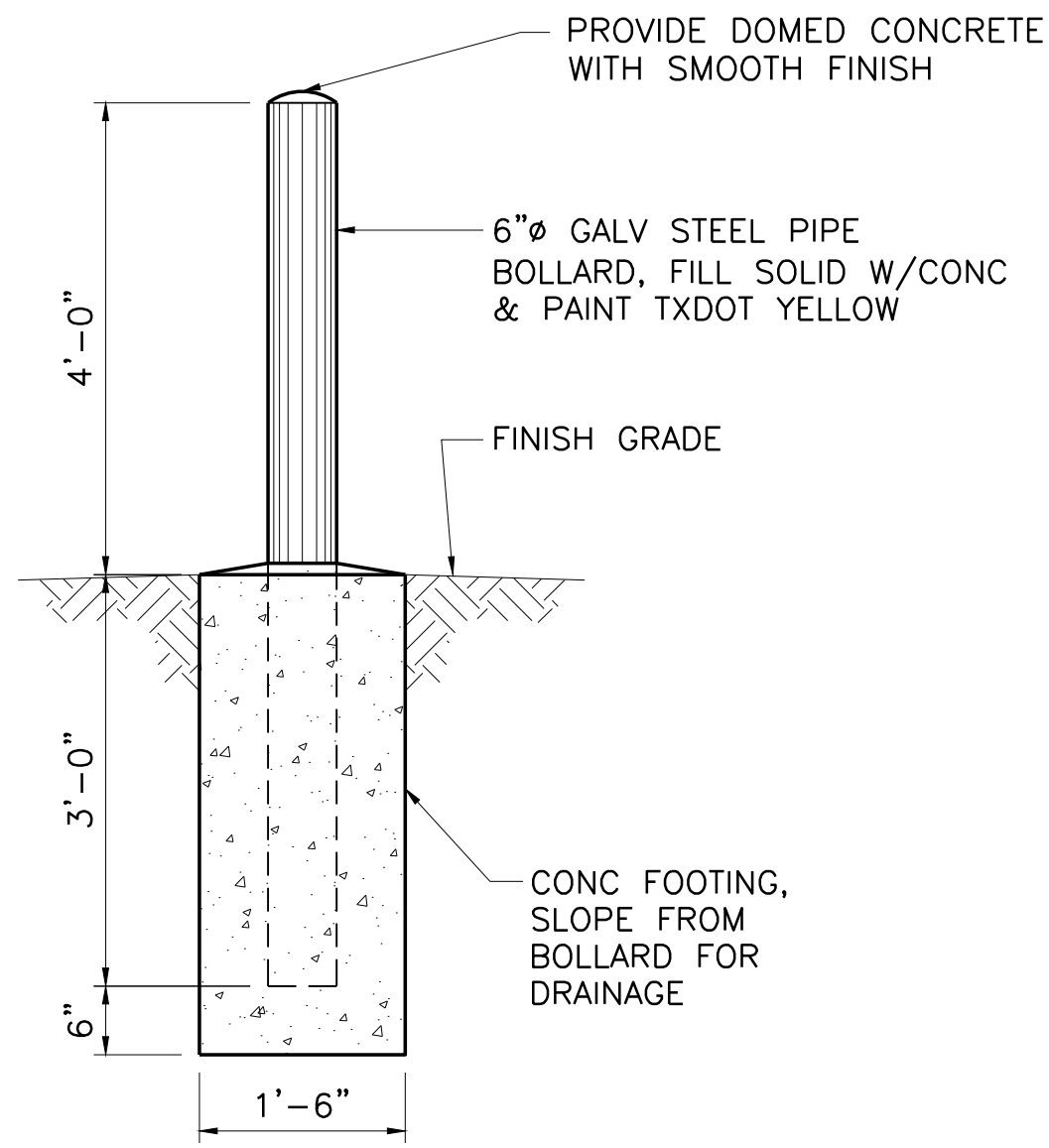
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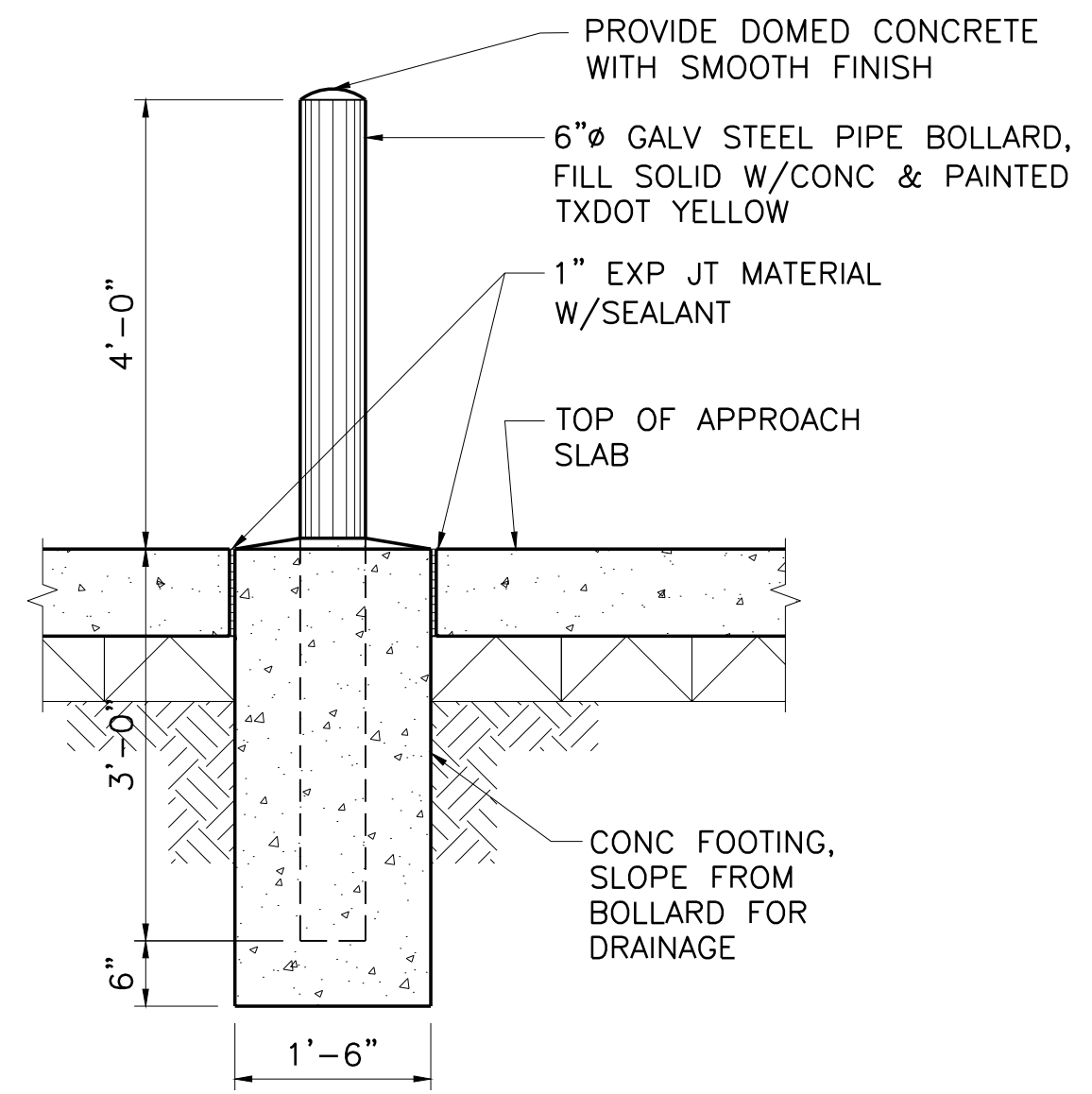
NOTES:

1. MARKER SHALL BE LOCATED ON BOTH SIDES OF ALL ROADS AND RAILROADS, AT ALL MAINLINE VALVES, AIR VALVES, AND BLOWOFF VALVES, AT ALL HORIZONTAL BENDS, AND MAX SPACING OF 2000' ALONG PIPELINE ALIGNMENT.
2. EACH MARKER SHALL HAVE A STICKER WITH THE FOLLOWING INFORMATION "CAUTION WATER PIPELINE BEFORE DIGGING CONTACT NTMWD (972) 442-5405, STA. XX+XX" ALL INFORMATION MUST BE TYPED OR STAMPED WITH NON-FADING INK, NOT HAND WRITTEN.

1
-
PIPELINE MARKER
NOT TO SCALE



2
-
TYPICAL BOLLARD DETAIL
NOT TO SCALE



3
-
TYPICAL BOLLARD IN PAVEMENT DETAIL
NOT TO SCALE

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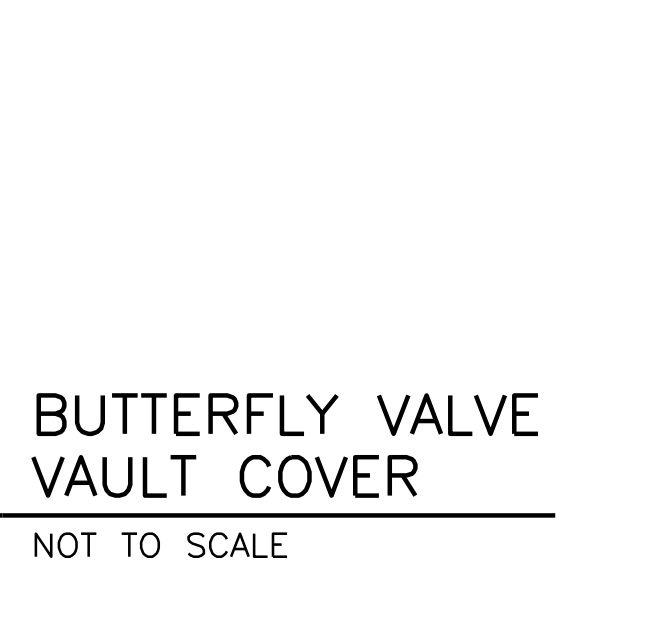
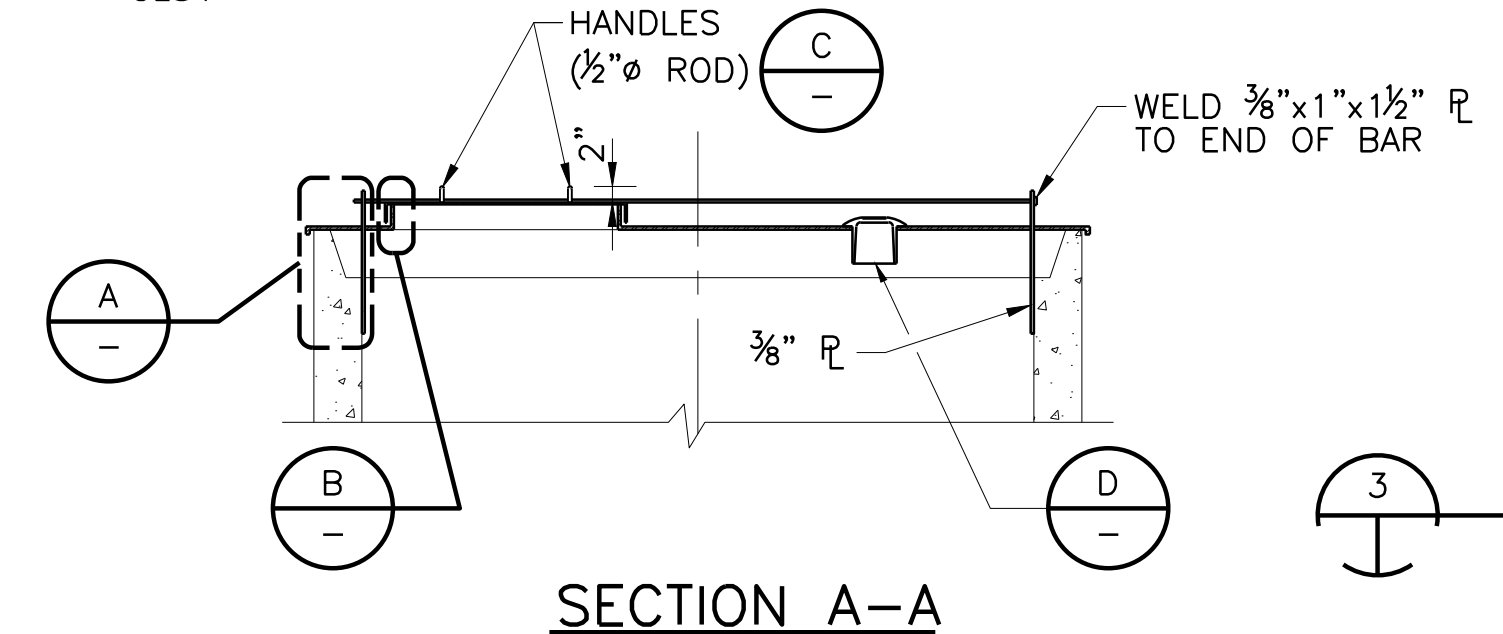
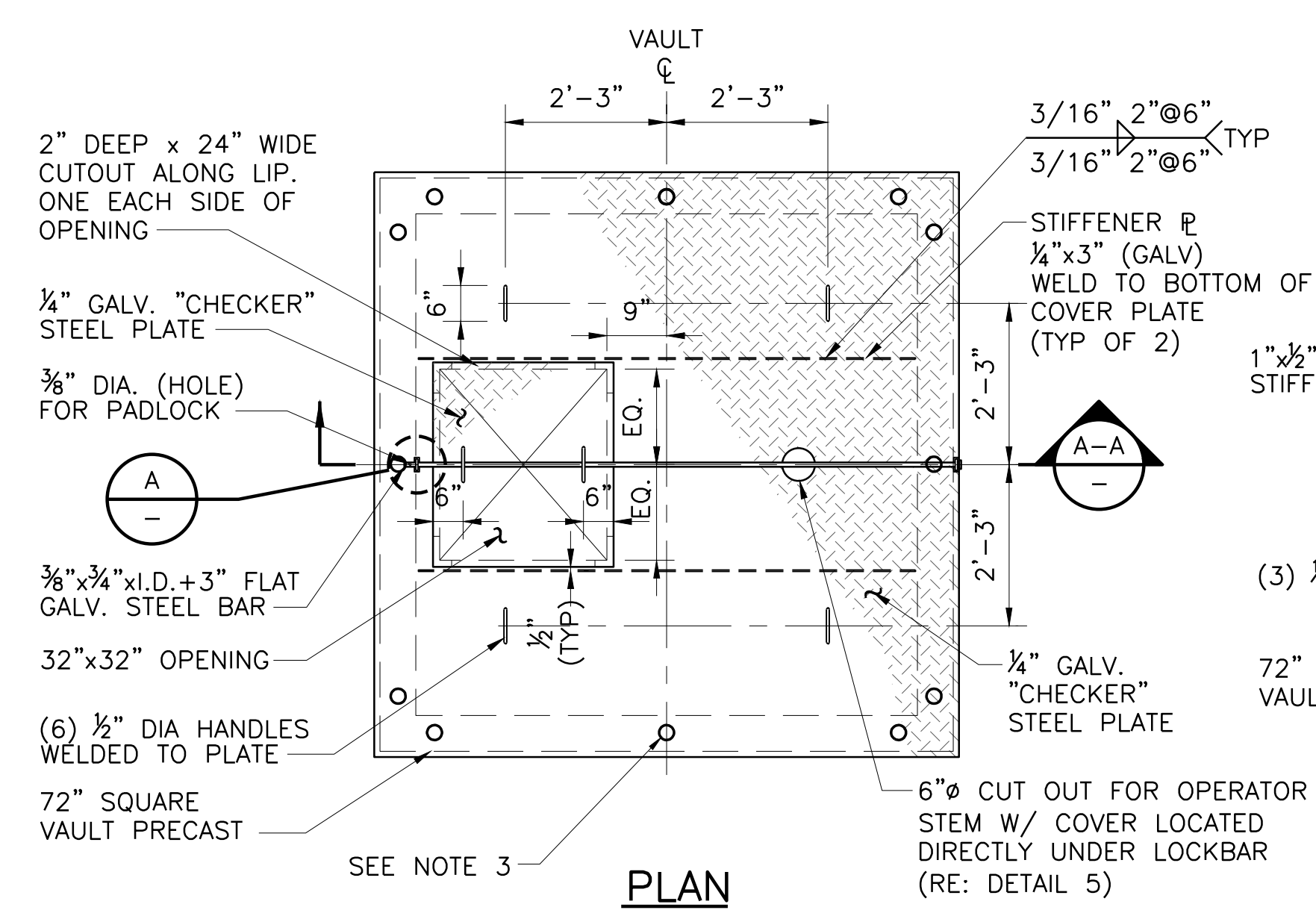
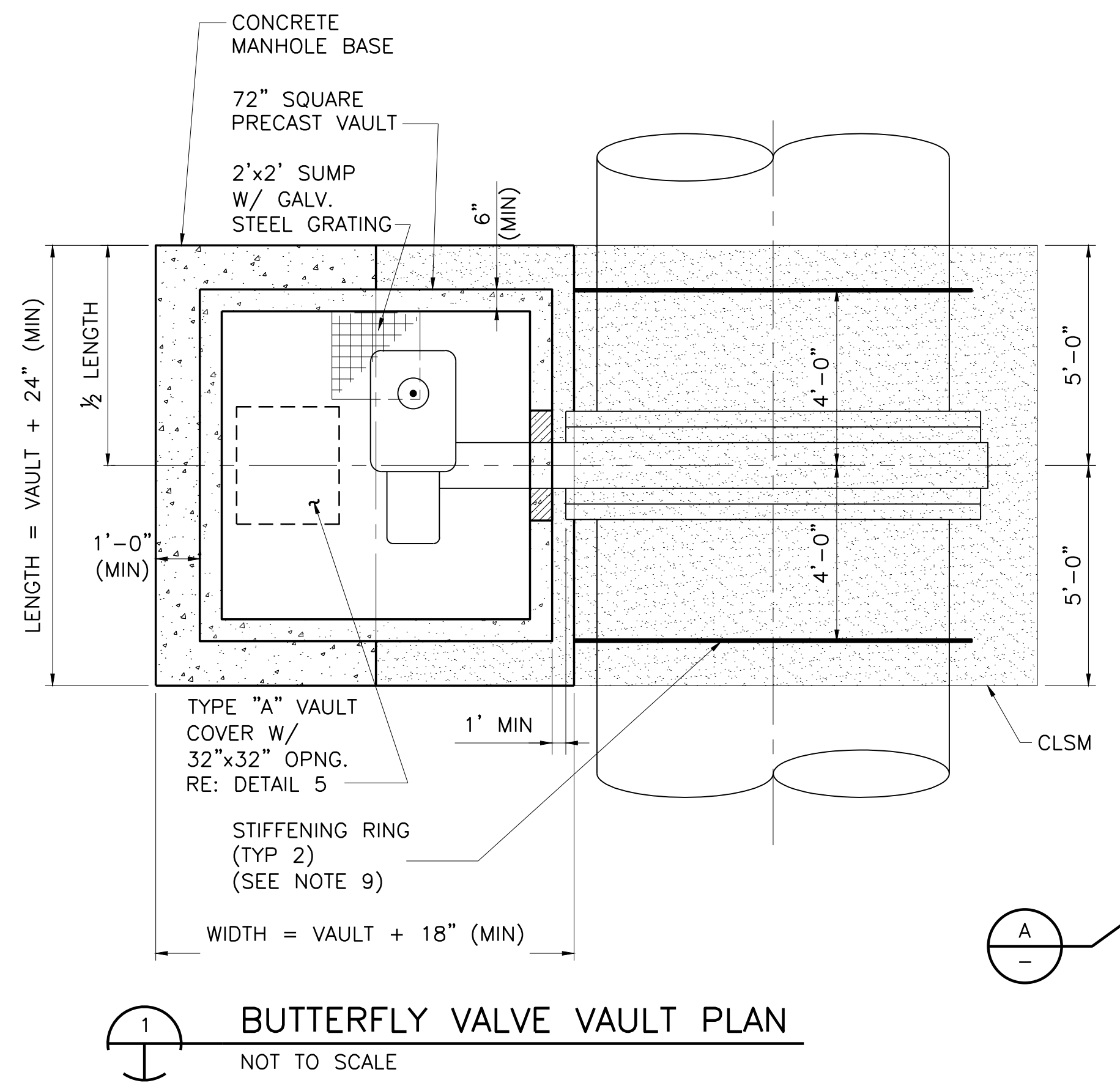
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TOWN OF PROSPER, TEXAS
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
CIVIL
PIPELINE APPURTENANCES IV

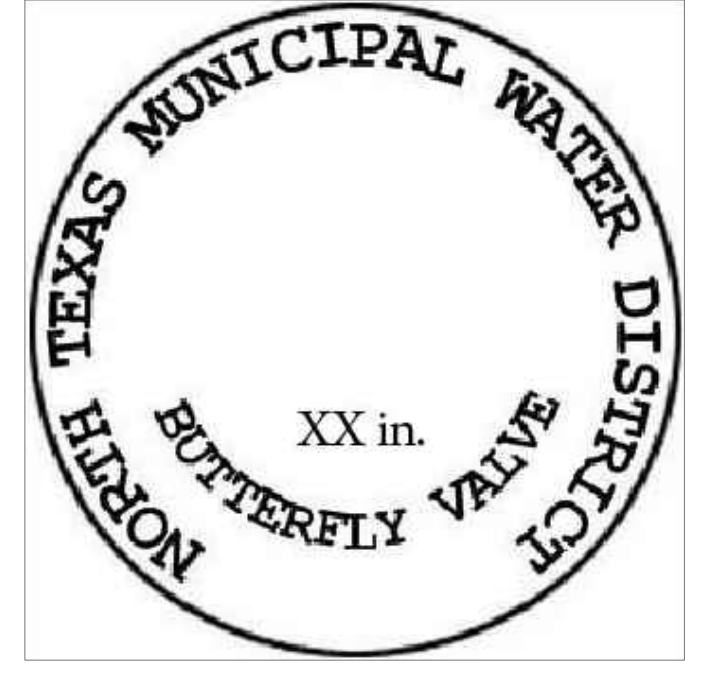
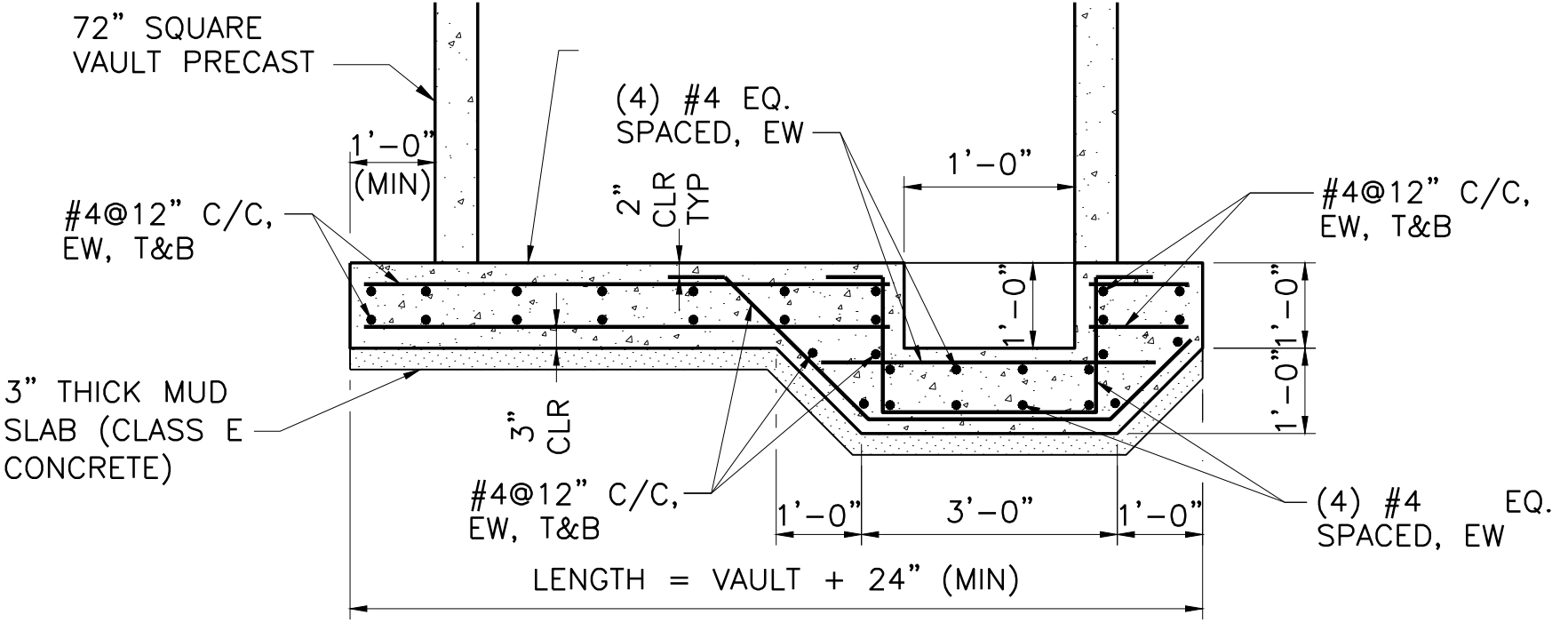
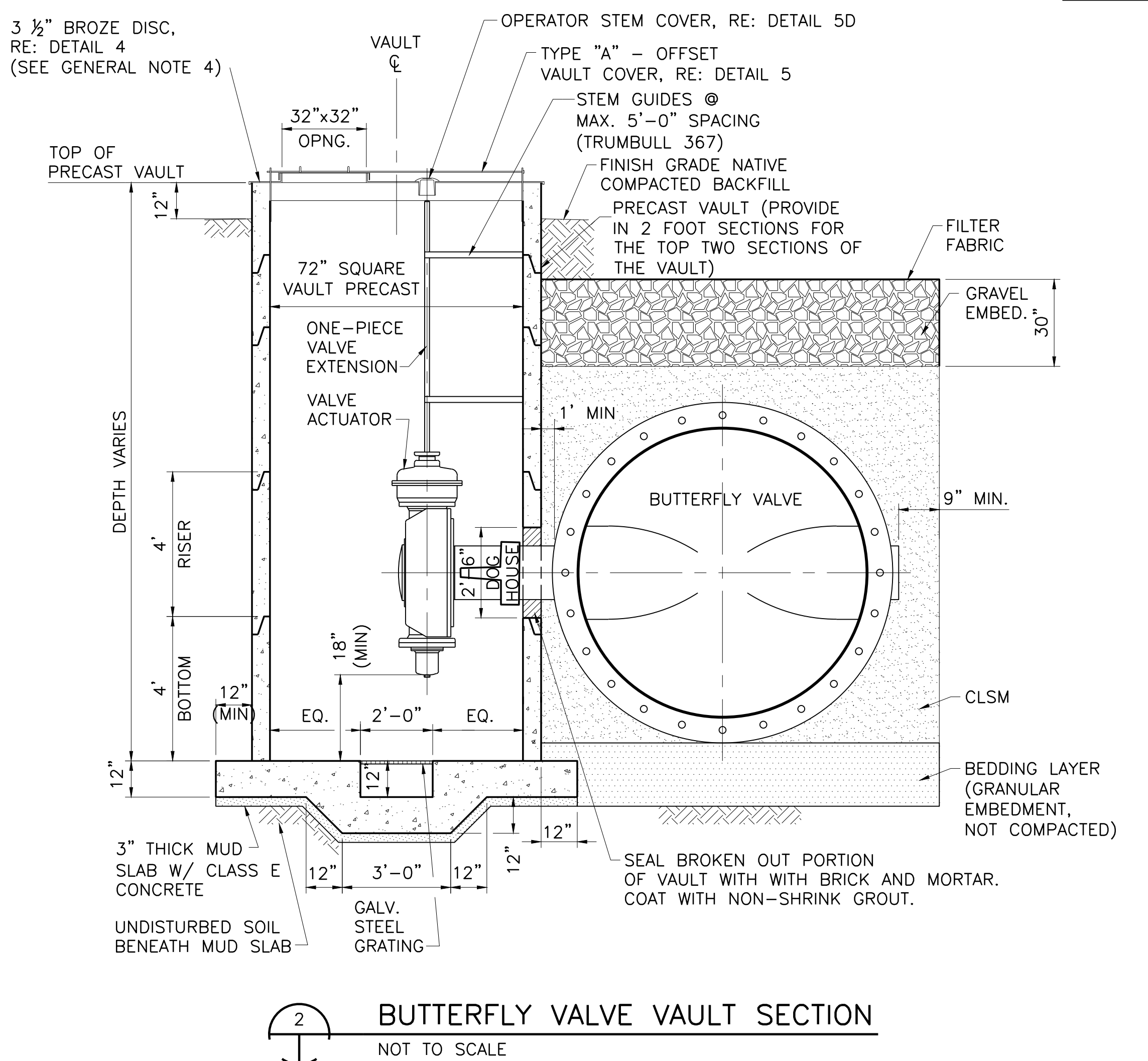
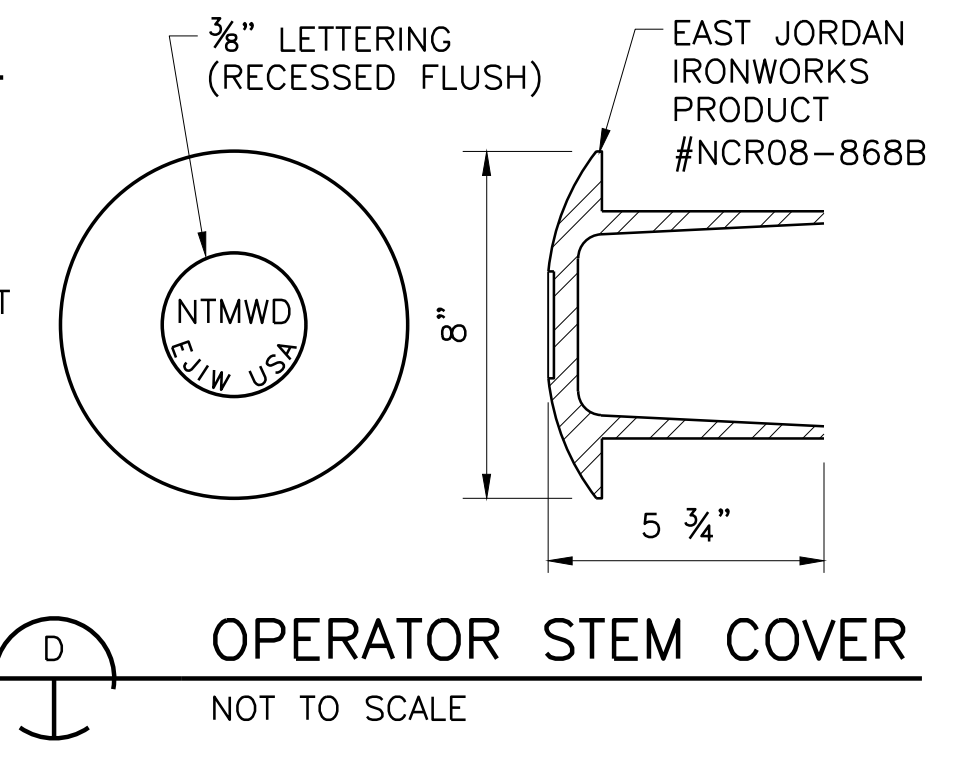
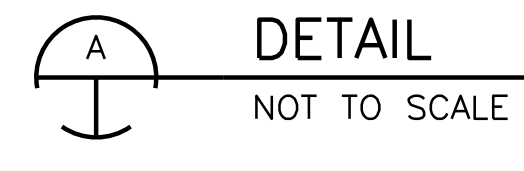
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					MAY 2020				

VERIFY SCALE
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Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.

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25



- NOTES:
- LOCKS WILL BE PROVIDED BY THE CONTRACTOR.
 - COVERS THAT ARE WARPED OR DO NOT PROPERLY FIT WILL BE REJECTED.
 - CONTRACTOR SHALL FASTEN VAULT LID TO CONCRETE VAULT WITH BOLTS. 3 AS SHOWN ON EACH SIDE.



- NOTES:
- INSTALL 3 1/2" BRONZE MARKERS, BERNTSEN C35DB. OR APPROVED EQUAL.
 - MARKER SHALL BE STAMPED WITH CHARACTERS 3/16" SIZE. VALVE SIZE SHALL BE STAMPED IN PLACE OF XX.
 - BRONZE MARKER TO ONLY BE PLACED ON BFV UPSTREAM OF THE METER VAULT



SHEET GENERAL NOTES FOR BUTTERFLY VALVE VAULTS:

- ALL METAL SURFACES INSIDE OF VAULTS, EXCEPT THE VALVE ACTUATOR, SHALL RECEIVE A MINIMUM OF TWO (2) COATS OF BITUMASTIC COATING (KOPPERS 50 OR APPROVED EQUAL). CARE SHALL BE TAKEN TO APPLY THE COATING IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
- VALVES SHALL BE COMPLETELY WRAPPED IN WAX TAPE PER SPECIFICATION 09 97 16.
- THE VALVE EXTENSION SHALL BE ONE PIECE AND POSITIONED INSIDE THE VAULT SUCH THAT THE VALVE CAN BE OPERATED FROM GROUND LEVEL THROUGH THE VAULT TOP. THE VALVE EXTENSION SHALL EXTEND TO WITHIN 4" OF THE VAULT TOP. ACCESS TO VALVE EXTENSION SHALL NOT BE THROUGH VAULT COVER.
- CONTRACTOR SHALL INSTALL BLANK 3.5" (BERNTSEN C35DB OR APPROVED EQUAL) BRASS DISC ON TOP OF VAULT COVER. CONTRACTOR WILL BE RESPONSIBLE FOR STAMPING DISC AT END OF PROJECT WITH IDENTIFICATION PROVIDED BY NTMWD.
- CONTRACTOR SHALL INSTALL 1" THICK NEOPRENE PAD AROUND PIPE WHEN IN AREAS OF CONTACT WITH VAULT. PAD SHALL EXTEND 12" PAST VAULT.
- THE BUTTERFLY VALVE SHAFT EXTENSION SHALL PROVIDE ENOUGH LENGTH THAT THE ACTUATOR HAS A MINIMUM CLEARANCE OF 6" FROM THE INSIDE OF THE VAULT.
- THE VAULT SECTION WITH THE ACTUATOR PENETRATION SHALL HAVE A HEIGHT TO ALLOW 12" MINIMUM OF VAULT PRIOR TO THE JOINT ABOVE & BELOW PENETRATION.
- INSTALL STEM GUIDES USING EPOXY COATED BOLT ANCHOR. DO NOT TIE STEM GUIDE INTO VAULT REINFORCEMENT.
- ON STEEL PIPE, PIPE MANUFACTURERS SHALL SUPPLY PIPE OR FITTING/ADAPTORS CONNECTED TO THE BUTTERFLY VALVE WITH MINIMUM 5/8" THICK X 6" TALL STIFFENING RINGS UPSTREAM AND DOWNSTREAM OF BUTTERFLY VALVE. THESE RINGS SHALL BE PLACED 4' FROM THE CENTERLINE OF THE BUTTERFLY VALVE AND SHALL BE DESIGNED SUCH THAT THE PIPE ADJACENT TO VALVE IS LIMITED TO NO MORE THAN 0.25% DEFLECTION AT THE DEPTH OF COVER SHOWN ON THE PLANS.
- THE CONTRACTOR SHALL ENSURE ALL STULLING IN PIPE ADJACENT TO VALVES REMAINS IN PLACE UNTIL FLOWABLE FILL HAS BEEN PLACED AND CURED.
- CONTRACTOR SHALL PLACE FLOWABLE FILL IN EQUAL LIFTS ON EITHER SIDE OF PIPE AND VALVE AND ENSURE THE PIPE AND VALVE REMAIN ROUND WITHOUT DEFLECTION UNTIL FLOWABLE FILL CURES.
- VALVE FLANGE BOLTS SHALL BE TIGHTENED AS DESCRIBED BY THE VALVE MANUFACTURER.
- BOND FLANGED JOINTS PER DETAIL 3, SHEET DT-2.
- CONTRACTOR SHALL PROVIDE EQUIPMENT INSTALLATION REPORTS AND SHALL VERIFY SEAL OF BUTTERFLY VALVE PRIOR TO FINAL ACCEPTANCE.

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

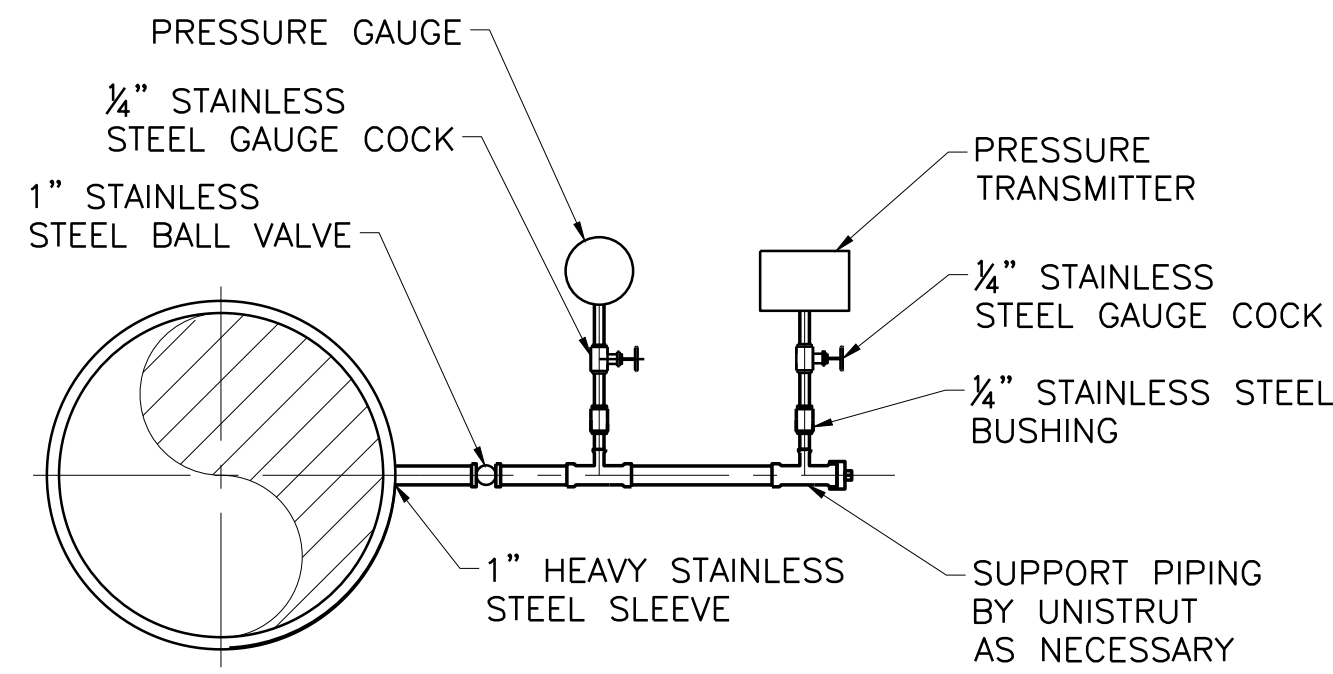
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5/7/2020

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TOWN OF PROSPER, TEXAS
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
DETAILS

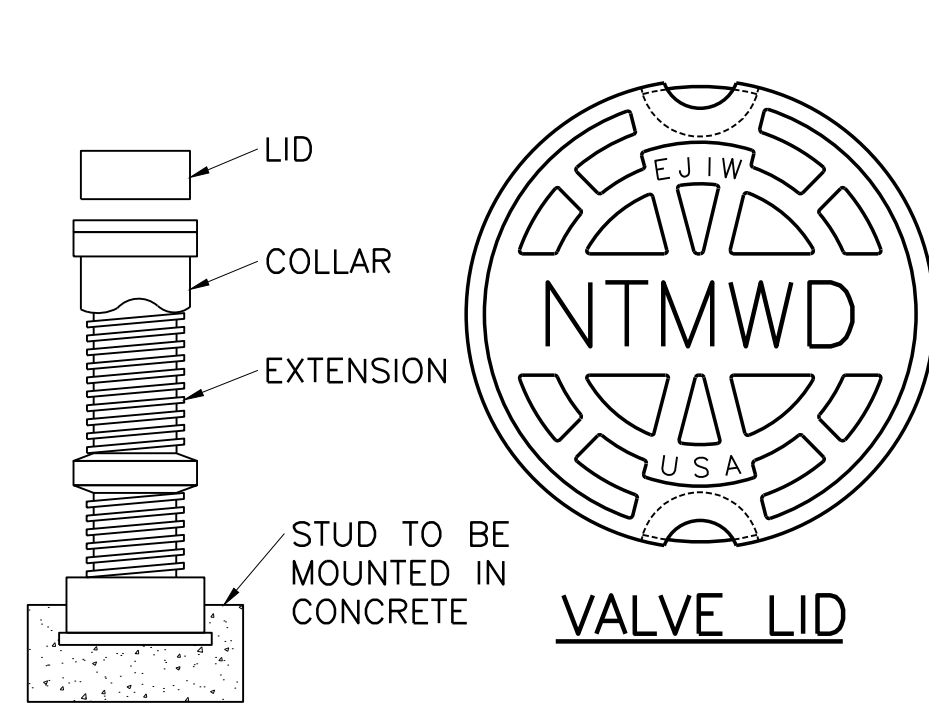
BUTTERFLY VALVE DETAILS

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- NOTE:
1. LENGTH OF 1" PIPE NIPPLES AS NECESSARY TO PREVENT CONTACT BETWEEN VALVE OPERATING LEVER, PRESSURE GAUGE, PRESSURE TRANSMITTER, OR ADJACENT PIPING.
 2. PRESSURE TRANSMITTER CAN BE MOUNTED REMOTE VIA FLEXIBLE TUBING.

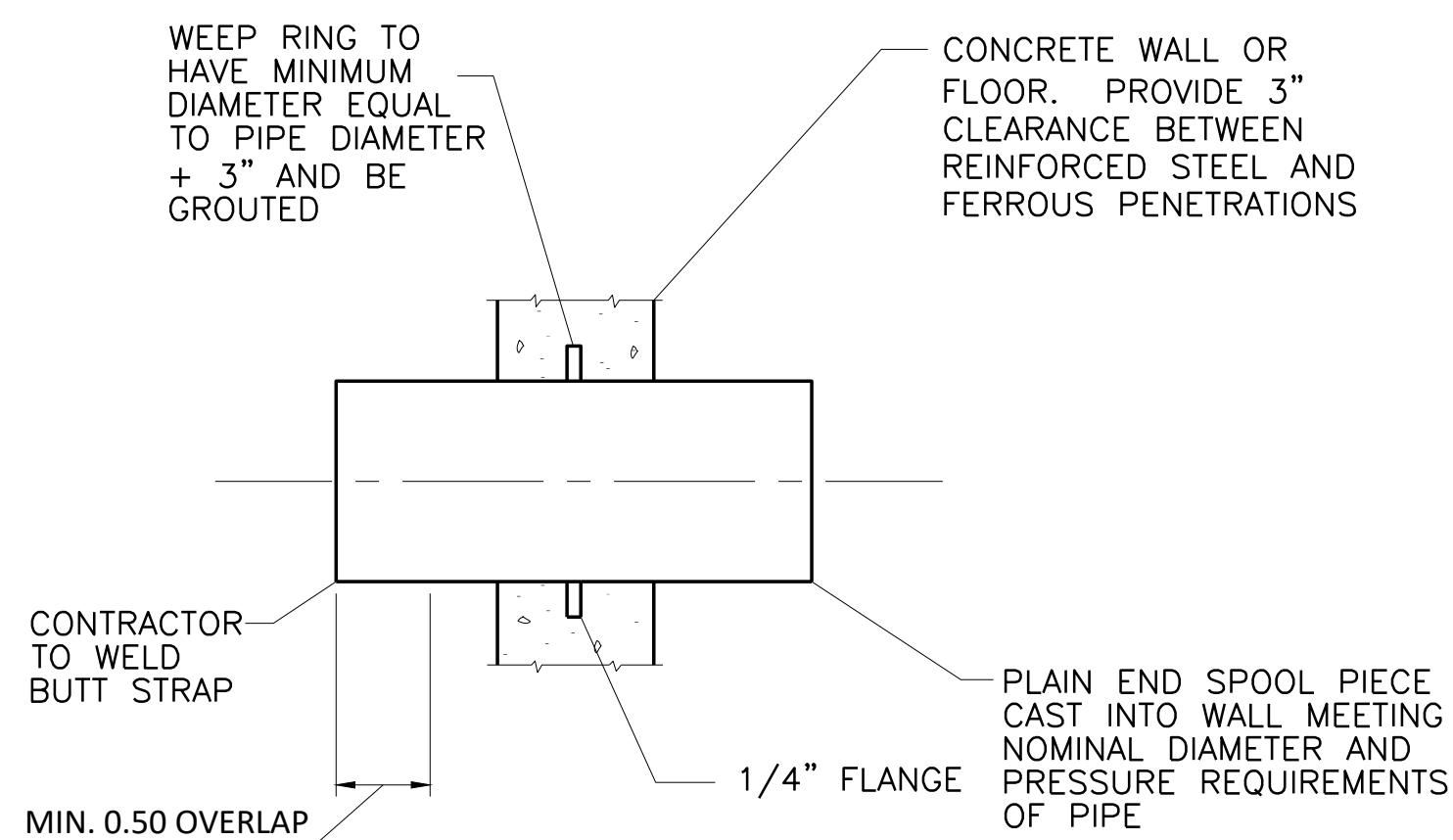
1 PRESSURE GAUGE AND TRANSMITTER
NOT TO SCALE



DETAIL 2 NOTES:

1. A PERMANENTLY ATTACHED VALVE STEM EXTENSION SHALL BE REQUIRED FOR ANY VALVE WHOSE OPERATING NUT IS LOCATED IN EXCESS OF 2 FEET BELOW THE TOP OF VALVE BOX. THIS EXTENSION LENGTH SHALL BE OF SUFFICIENT LENGTH TO ENSURE THAT ITS TOP IS WITHIN 4" OF THE VALVE BOX COVER. VALVE STEM EXTENSION SHALL BE 1" DIA. SOLID STEEL ROD.
2. INSTALL 3/8" Ø BRONZE MARKERS, BERNTSEN C35DB.

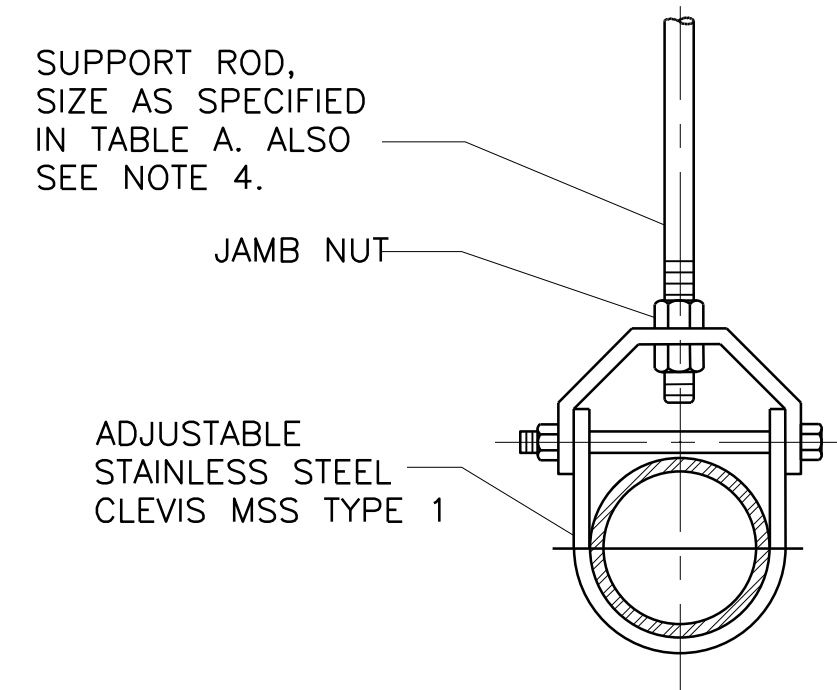
2 VALVE STEM EXTENSION
NOT TO SCALE



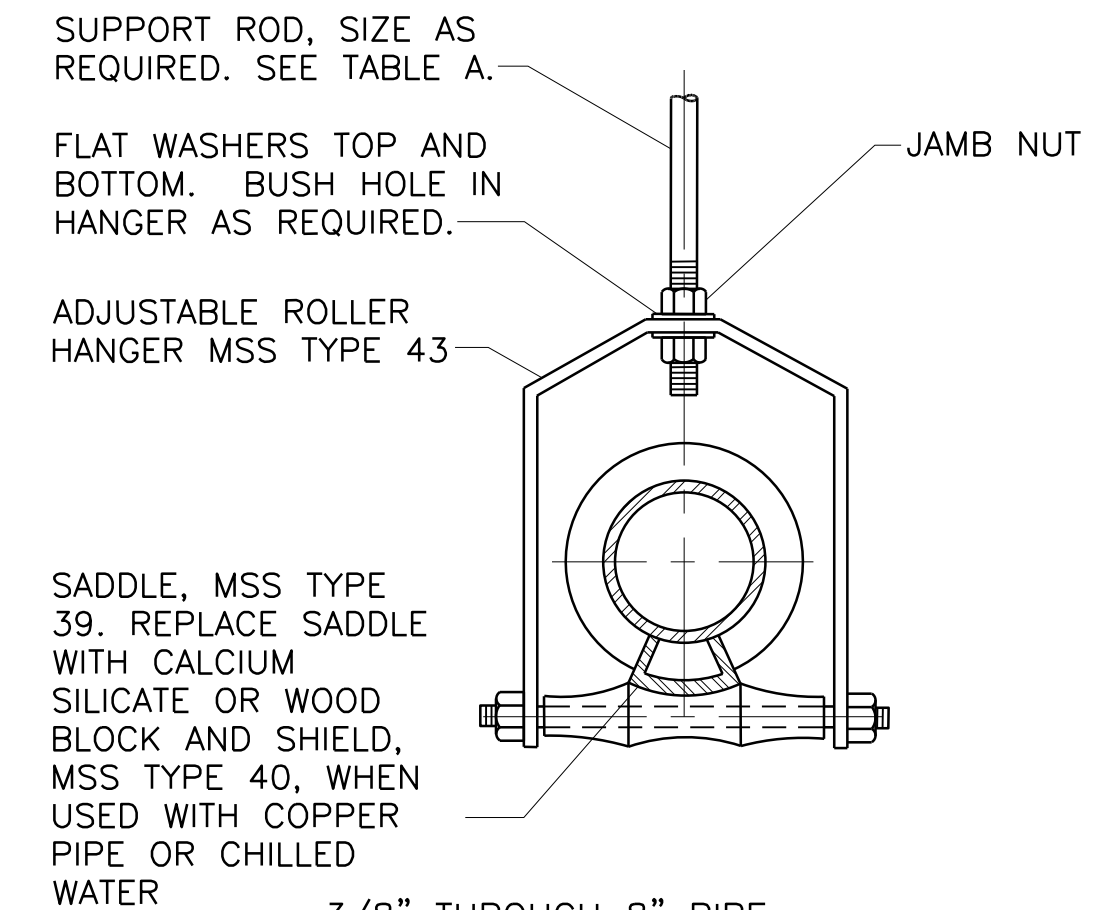
6 PIPE PENETRATION DETAIL
NOT TO SCALE

PIPE SUPPORT/HANGER NOTES

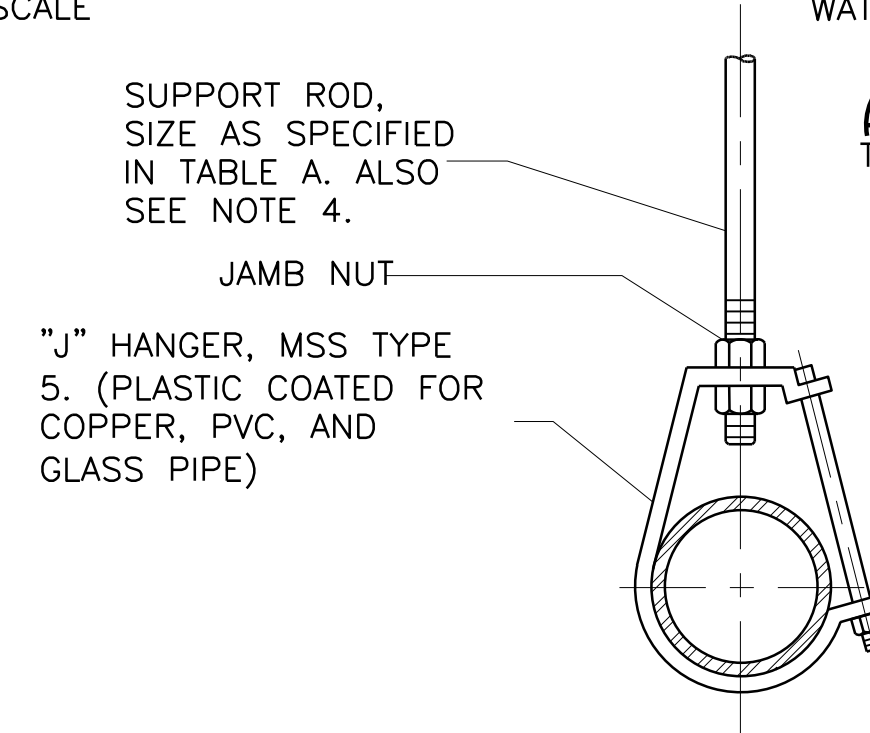
1. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY SUPPORTS FOR A COMPLETE SYSTEM. WHERE NO REFERENCE TO PIPE SUPPORT SYSTEMS IS GIVEN ON THE DRAWINGS, THE CONTRACTOR SHALL USE AN APPROPRIATE SYSTEM AS RECOMMENDED BY THE PIPE MANUFACTURER. PIPE AND CONDUIT SUPPORT SYSTEMS SHALL BE UNISTRUT, B-LINE, POWER STRUT, SUPER STRUT OR APPROVED EQUAL, AND SHALL BE DESIGNED BY THE CONTRACTOR TO MEET THE LOAD AND SPAN REQUIREMENTS. SYSTEMS SHALL CONFORM TO PIPE AND SUPPORT MANUFACTURER'S RECOMMENDATIONS.
2. UNLESS OTHERWISE SPECIFIED, HANGERS AND SUPPORTS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION. NUT, BOLTS, WASHERS AND ALL EMBEDDED ITEMS SHALL BE TYPE 316 STAINLESS STEEL.
3. UNLESS OTHERWISE SPECIFIED, EXPANSION ANCHORS SHALL NOT BE USED.
4. MSS REFERS TO THE MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY, STANDARD PRACTICE SP58 AND SP69.
5. HANGER BRACKETS AND SUPPORT COMPONENTS MAY BE INTERCHANGED.
6. ALL PIPING SUPPORTED BY HANGERS AND/OR STRUCTURAL ATTACHMENTS SHALL BE BRACED AGAINST HORIZONTAL, VERTICAL, AXIAL, AND LONGITUDINAL SWAY. BRACING'S SHALL BE CALCULATED TO RESIST ZONE 1 SEISMIC LOADINGS AS SPECIFIED BY SMACNA AND AS INDICATED IN THE SPECIFICATIONS.
7. FITTINGS SHALL NOT BE LESS THAN MSS CL. B.
8. NOT ALL PIPE HANGERS/STRUCTURAL SUPPORTS MAY BE USED IN THESE PLANS.



3 1/2" THROUGH 12" PIPE
PIPE HANGER DETAIL
TYPE A NOT TO SCALE

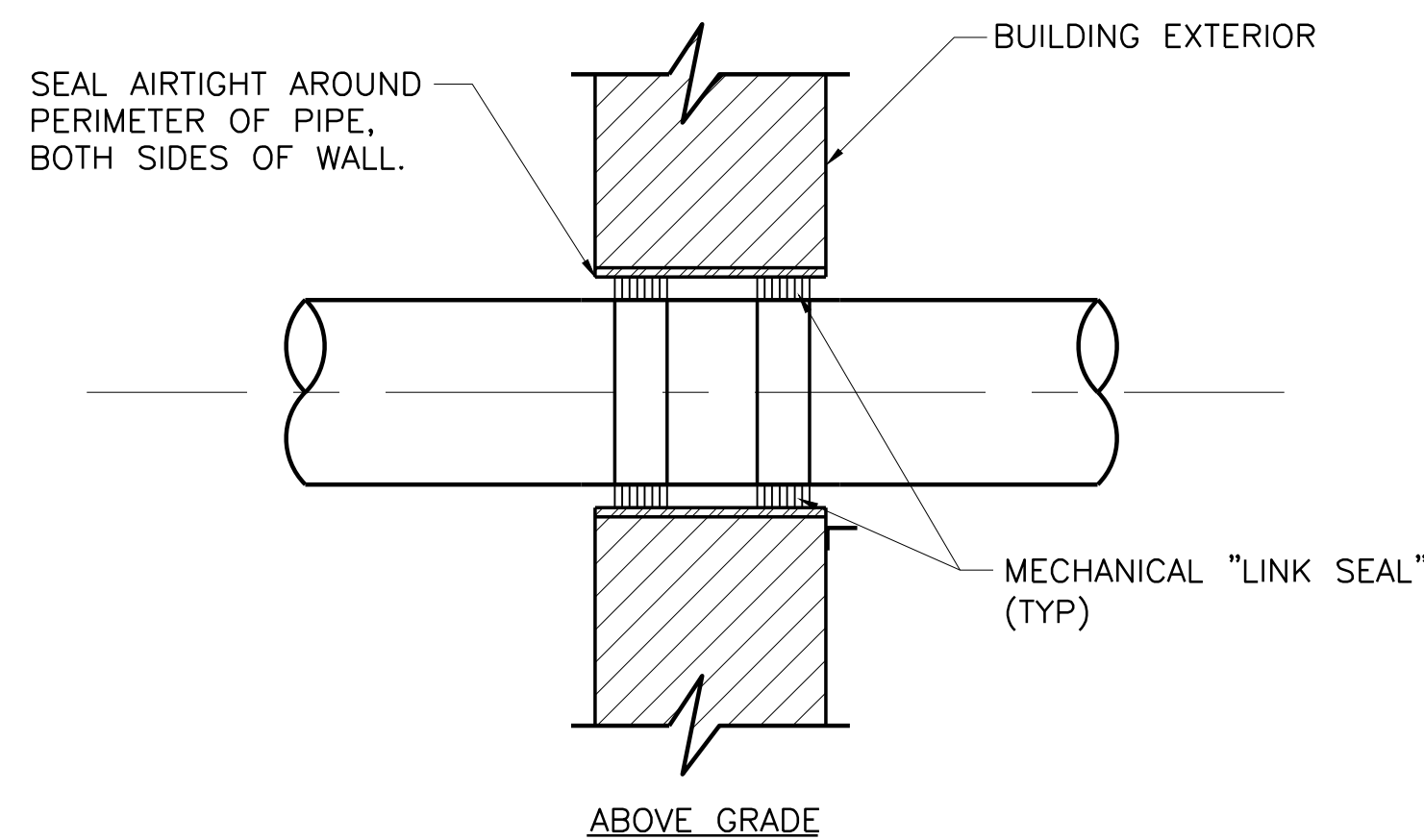


4 3/8" THROUGH 8" PIPE
PIPE HANGER DETAIL
TYPE C NOT TO SCALE

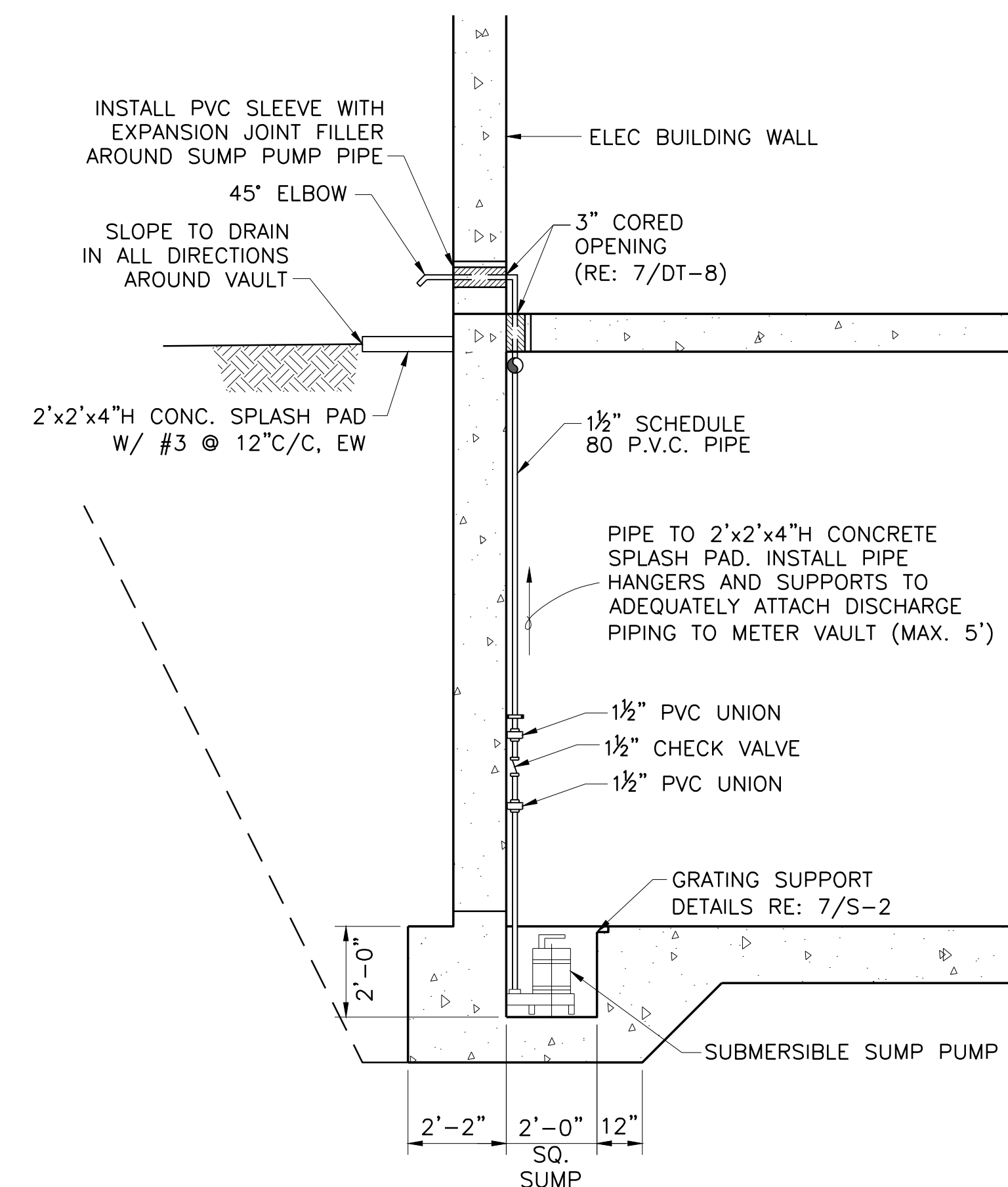


5 1/2" THROUGH 8" PIPE
PIPE HANGER DETAIL
TYPE B NOT TO SCALE

- NOTES:
1. CONTRACTOR SHALL USE THIS DETAIL IF THE CITY STANDARD DETAILS ARE NOT INCLUDED IN APPENDIX OF SPECIFICATIONS.



7 SMALL PIPE DIAMETER PENETRATIONS
NOT TO SCALE



8 SECTION SUMP PUMP DISCHARGE PIPING
NOT TO SCALE

Item 12

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

5/7/2020

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TOWN OF PROSPER, TEXAS

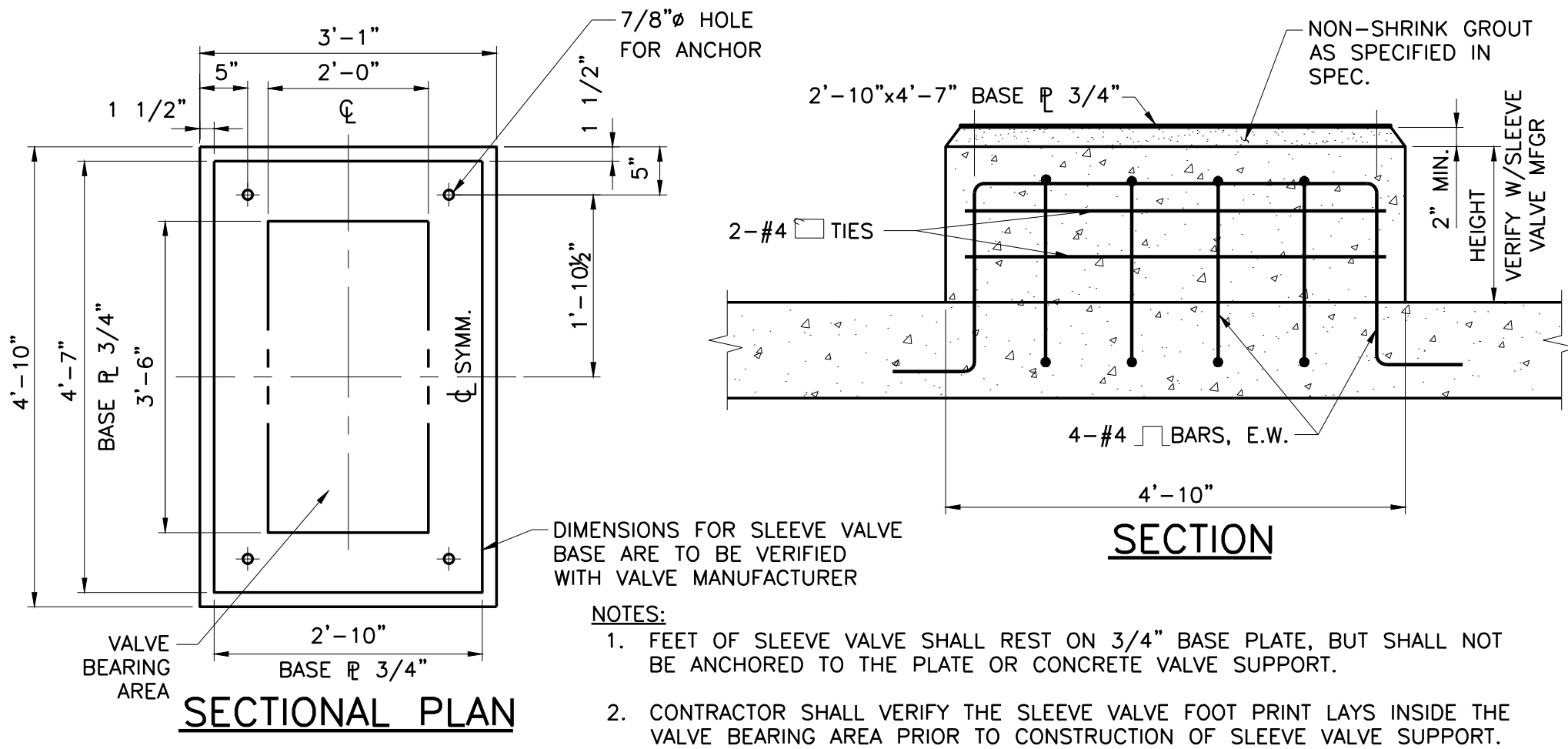
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION

DETAILS

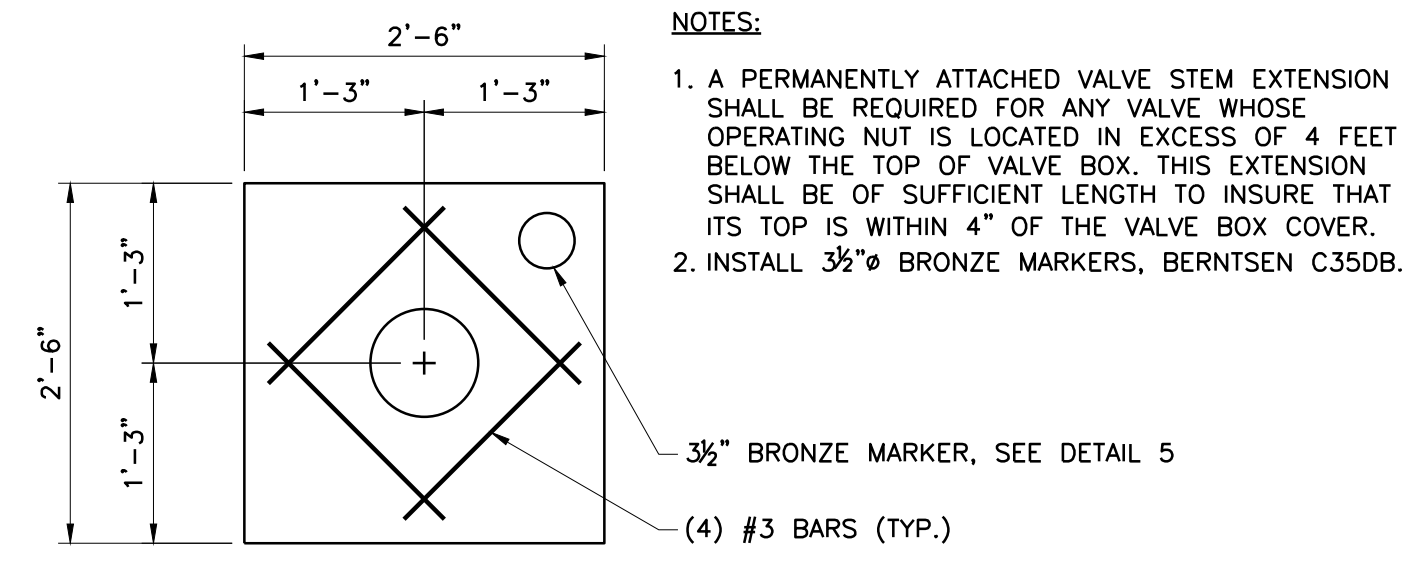
MISCELLANEOUS DETAILS I

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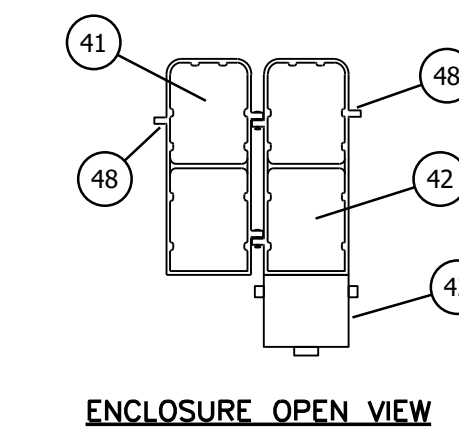
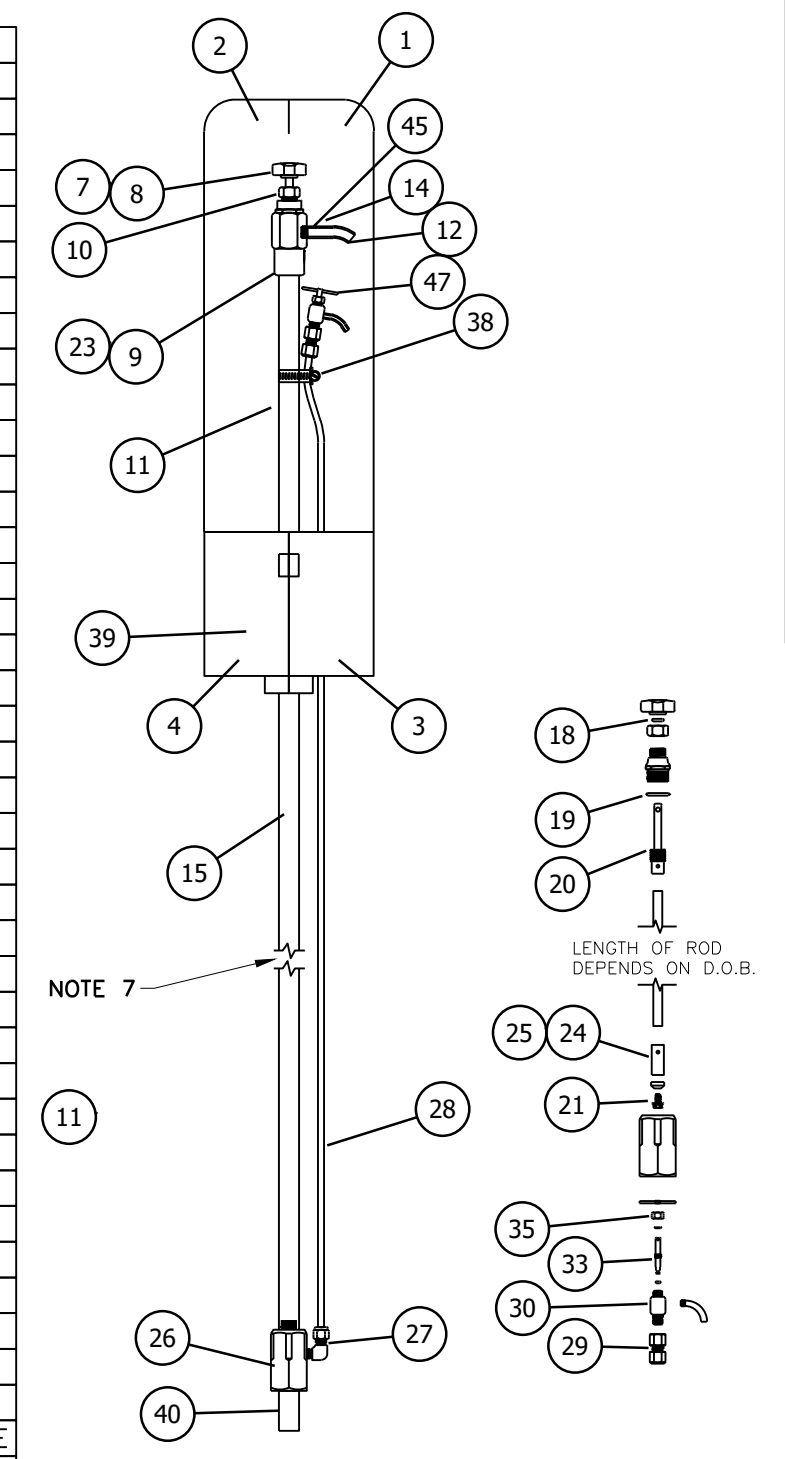
1 SLEEVE VALVE SUPPORT DETAILS
NOT TO SCALE



2 VALVE PAD PLAN
NOT TO SCALE

ITEM	ITEM / DESCRIPTION	NOTES	PART #
1	88 FRONT DOOR (COVER A)		88-1-A
2	88 REAR DOOR (COVER B)		88-1-B
3	88 FRONT BASE (COVER A)		88-2
4	88 REAR BASE (COVER B)		88-2
5	3/8" S.S. SOLID ROD		3/8SSR
6	NOT USED		
7	HANDLE ROD PIN	NOT SHOWN	66S14
8	KNOB		66S42
9	HEADSTOCK		66S11
10	PACKING NUT		66S15
11	U-BOLT FOR 1/2" PIPE	NOT SHOWN	66S20
12	PLASTIC NOZZLE CAP	NOT SHOWN	66S35
13	NOT USED		
14	NOZZLE		66S12
15	1/2" S.S. WATERWAY		1/2SSP
16	PIANO HINGE		66S21
17	HEADSTOCK TOP NUT		66S16
18	STEM O-RING		66S07
19	HEADSTOCK O-RING		66S09
20	COLD CLIMATE STEM		66S32
21	PLUNGER SCREW		66S28
22	SEAT RUBBER		66S27
23	THREADED PLUG	NOT SHOWN	66S31
24	PLUNGER		66S26
25	SPRING PIN	NOT SHOWN	66S30
26	INLET VALVE		66S25
27	S.S. 1/4" TUBEX1/8" MIP ELBOW		88-8-SS
28	S.S. 1/4" TUBING		88-7-SS
29	S.S. 1/4" TUBE x 1/8" FIP		66S33
30	PETCOCK BODY		66S01
31	PETCOCK O-RING 003 N 70		66S10
32	PETCOCK NOZZLE		66S05
33	PETCOCK PLUNGER		66S03
34	PETCOCK O-RING 008 N 70		66S08
35	PETCOCK NUT		66S02
36	PETCOCK ROD PIN		66S04
37	PETCOCK PLASTIC CAP	NOT SHOWN	66S22
38	HOSE CLAMP		66S34
39	MOUNTING ANGLE	NOT SHOWN	4 ALUM ANGLE
40	3/4" SS NIPPLE		BY OTHERS

NOTE: RIVETS, NUTS, BOLTS, AND WASHERS NOT SHOWN

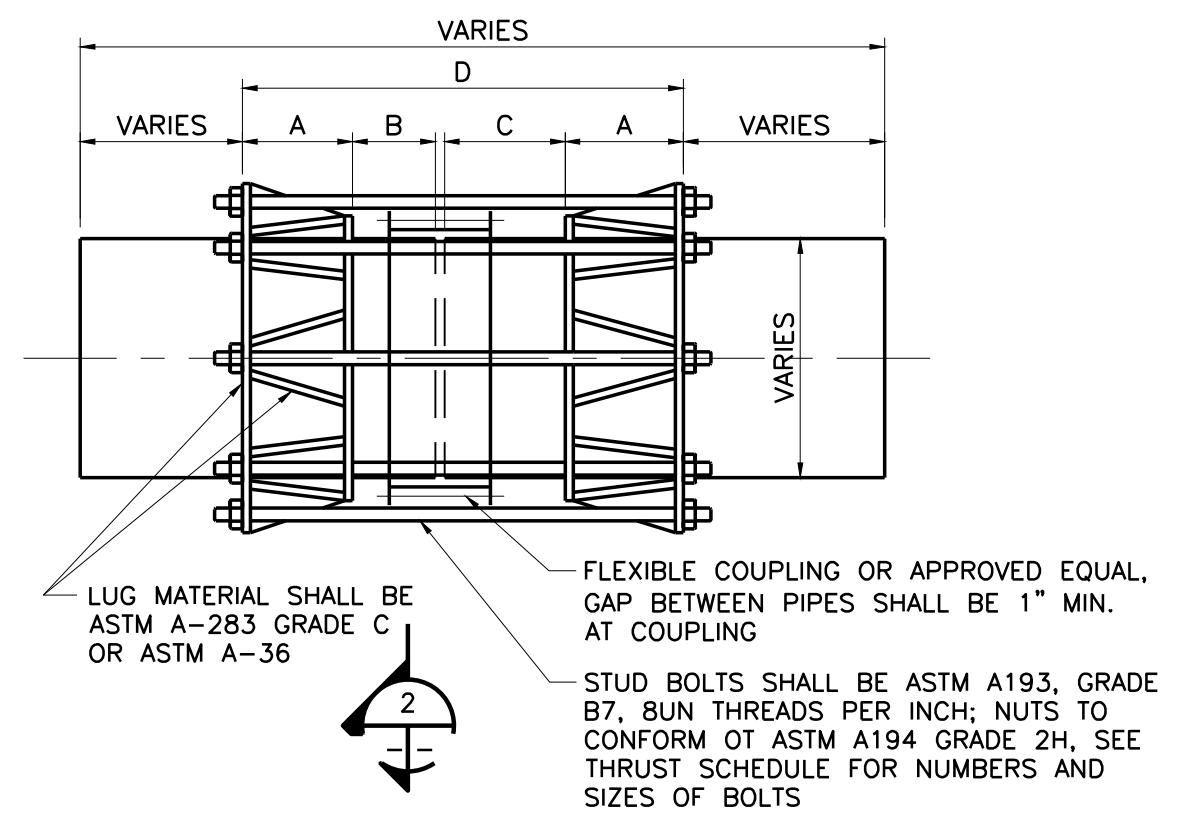


ITEM	ITEM / DESCRIPTION	NOTES
41	88 FRONT DOOR (COVER A)	
42	88 REAR DOOR (COVER B)	
43	88 BASE	2 PIECES
44	1/2" S.S. WATERWAY	
45	BLOW OFF & SAMPLING BIBB	
46	1/4" S.S. TUBING	
47	PET COCK	
48	LOCKING HOLE	

- NOTES:**
- STATION SHALL BE ENCLOSED IN A LOCKABLE, NON-REMOVABLE ALUMINUM BOX WITH HINGED OPENINGS.
 - WHEN OPEN, THE STATION SHALL REQUIRE NO KEY FOR OPERATION, AND ALL WATER FLOW SHALL PASS THRU AN ALL STAINLESS STEEL WATERWAY.
 - ALL WORKING PARTS SHALL BE OF STAINLESS STEEL AND SERVICEABLE FROM ABOVE GROUND WITH NO DIGGING OR REPLACEMENT NEEDED.
 - A STAINLESS STEEL PET COCK WILL BE LOCATED BELOW THE SAMPLING BIBB TO ALLOW PUMPING OF ANY WATER REMAINING INSIDE THE STATION TO INSURE NON-FREEZING.
 - THE STATION SHALL BE MODEL #88-SS AS MANUFACTURED BY THE KUPFERLE FOUNDRY, ST. LOUIS MO. 63102 OR APPROVED EQUAL.
 - IN LOCATIONS WHERE SAMPLING STATION CORES THROUGH VAULT CEILING, 2" NON-SHRINK GROUT TO BE PLACED UNDERNEATH THE ENCLOSURE.
 - PIPING TO BE ROUTED FROM THE VAULT TO THE EXTERIOR SAMPLE STATION THROUGH THE ELECTRICAL BUILDING. SEE SAMPLE LINE ROUTING DETAIL (9/DT-9).

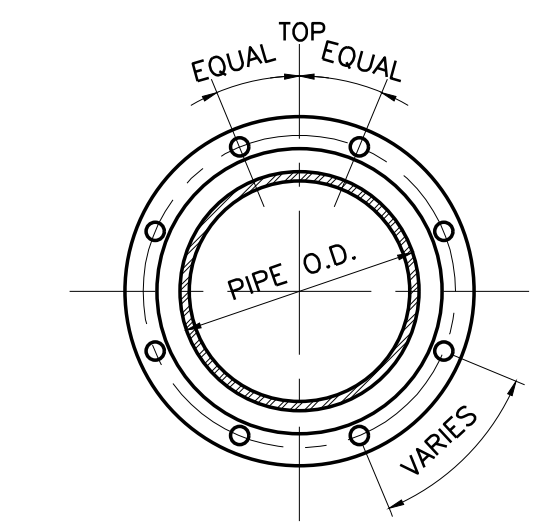
8 SAMPLING STATION
NOT TO SCALE

Type RR Thrust Harness Schedule															
PIPE SIZE (IN)	DESIGN PRESSURE	NUMBER OF BOLTS	BOLT DIAMETER (IN)	STUD HOLE DIAMETER (IN)	BOLT SPACING	T	A	B	C	W	D MIN.	HB	E	HF	MIN. CYLINDER THICKNESS UNDER LUG (IN)
24	150	8	7/8	1	45	1/2	5 1/2	8	12	1 5/8	32	4 1/4	3 1/8	2	0.135
36	150	8	1 1/4	1 3/8	45	5/8	7 1/2	8	14	2	38	5	3 3/4	2 1/2	0.135

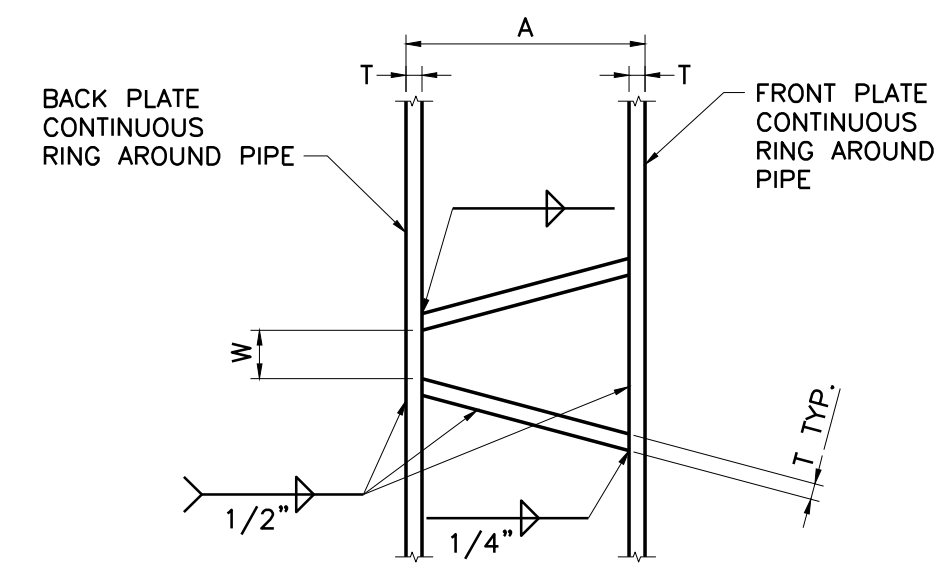


- NOTES:**
- VERIFY THAT CENTER OF SLEEVE WILL BE ABLE TO CLEAR PLAIN END OF PIPE WHEN MOVED ONE DIRECTION.
 - CONTRACTOR SHALL PROVIDE COUPLING NUTS FOR THRUST RODS THAT ARE OBSTRUCTED AND DO NOT ALLOW FOR EASE OF DISASSEMBLY/ASSEMBLY.

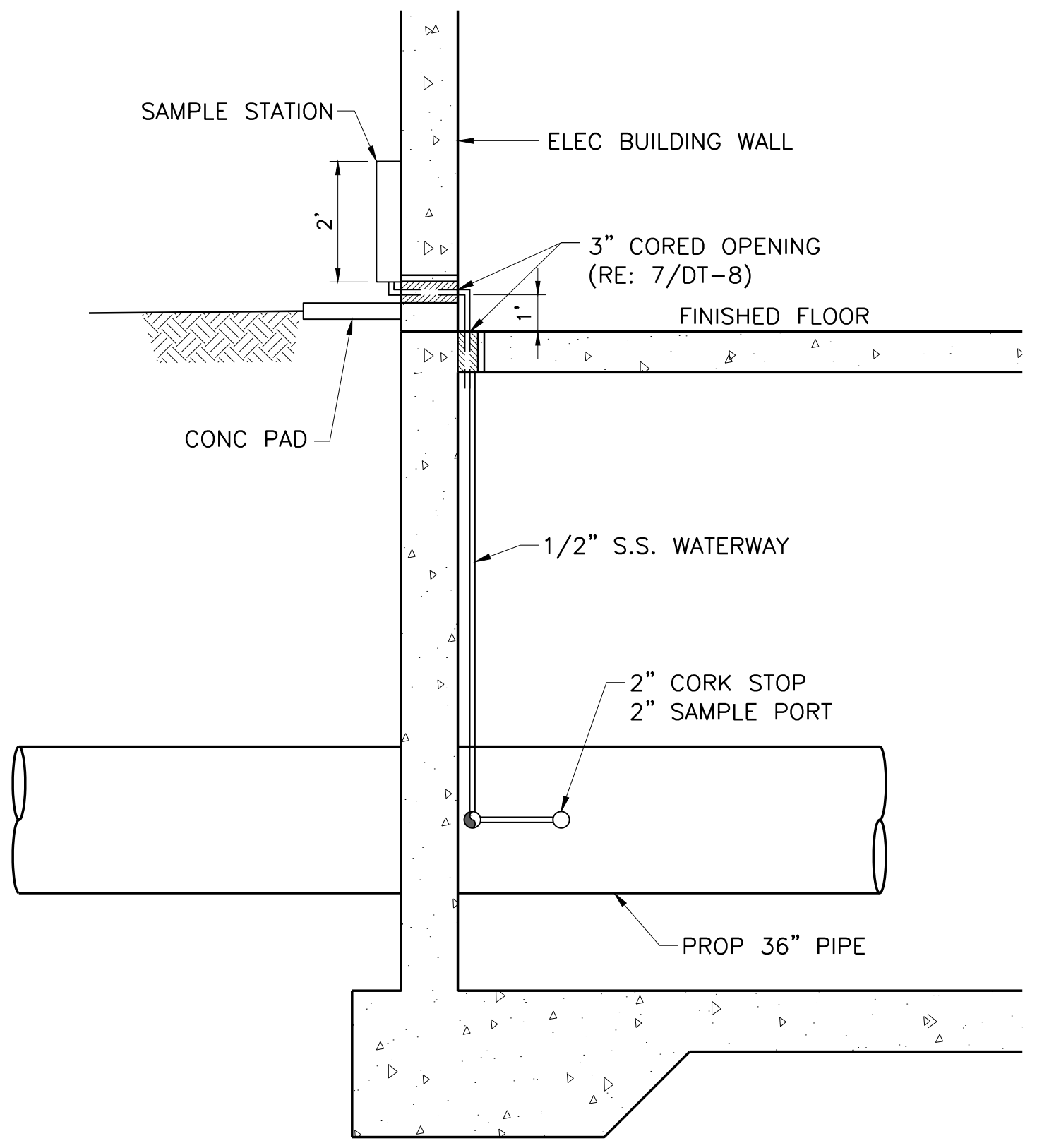
3 THRUST HARNESS DETAIL
NOT TO SCALE



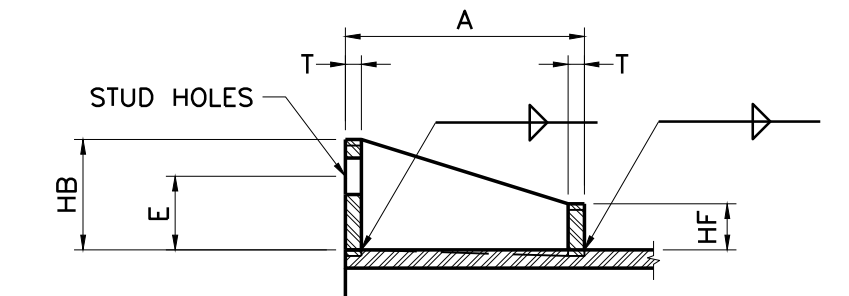
5 TYPICAL SECTION
NOT TO SCALE



6 TYPE RR LUG DETAIL
NOT TO SCALE



9 SAMPLING LINE ROUTING
NOT TO SCALE



4 TYPE RR LUG GUSSET DETAIL
NOT TO SCALE

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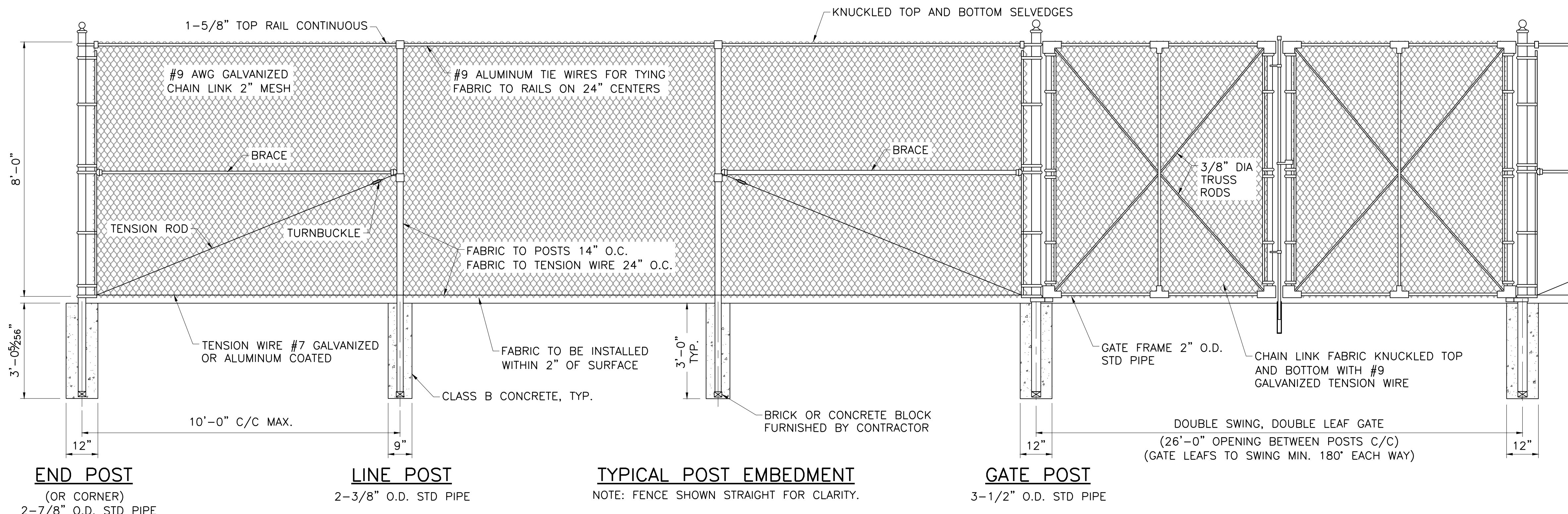
5/7/2020
Clayton C. Barnard

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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
DETAILS
MISCELLANEOUS DETAILS II

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- NOTES:**
1. ALL METAL PARTS SHALL BE HOT DIP GALVANIZED.
 2. FENCES AND GATES SHALL BE FURNISHED COMPLETE WITH ALL NECESSARY FITTINGS AND HARDWARE.
 3. FOR GATES, SIZES OF PIPES, SAG RODS AND TURNBUCKLES SHALL BE MANUFACTURER'S STANDARD WHICH ALSO MEET THE REQUIREMENTS OF THIS DRAWING.
 4. POSTS SHALL BE ROLLED OR EXTRUDED SECTIONS OR TUBING OF STEEL OR ALUMINUM CAPABLE OF WITHSTANDING A LATERAL FORCE OF 100 POUNDS APPLIED AT THE TOP. ALL HOLLOW POSTS SHALL BE CAPPED.
 5. STANDARD PIPE SIZES INDICATED ARE NOMINAL DIAMETER, SCHEDULE 40, PER AMERICAN STANDARDS ASSOCIATION (ASA) B 36.10.
 6. PROVIDE PLUNGE ROD AND CATCHES FOR ALL GATES IN OPEN AND CLOSED POSITION.

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5/7/2020

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TOWN OF PROSPER, TEXAS
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METER VAULT RELOCATION
CIVIL

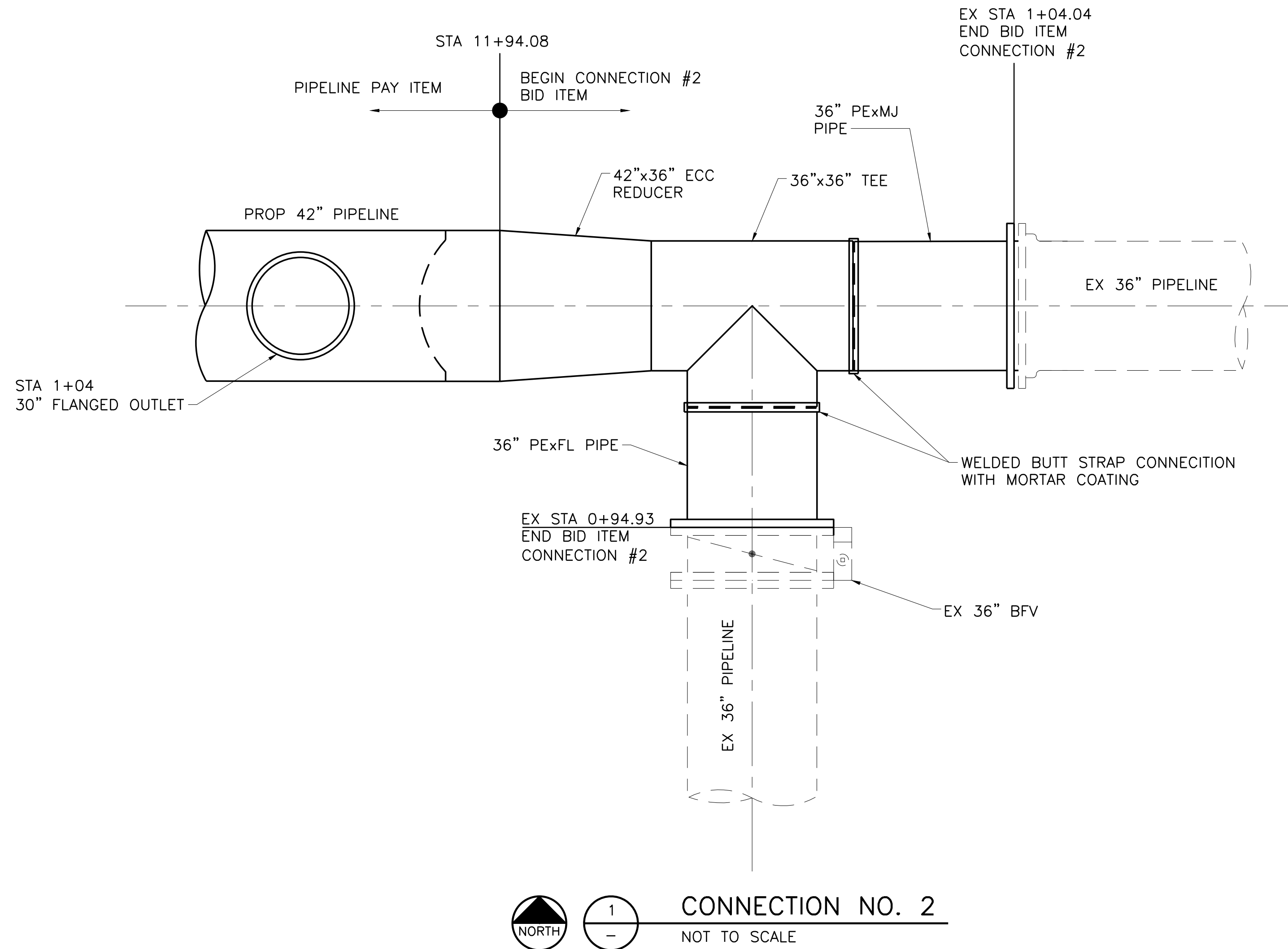
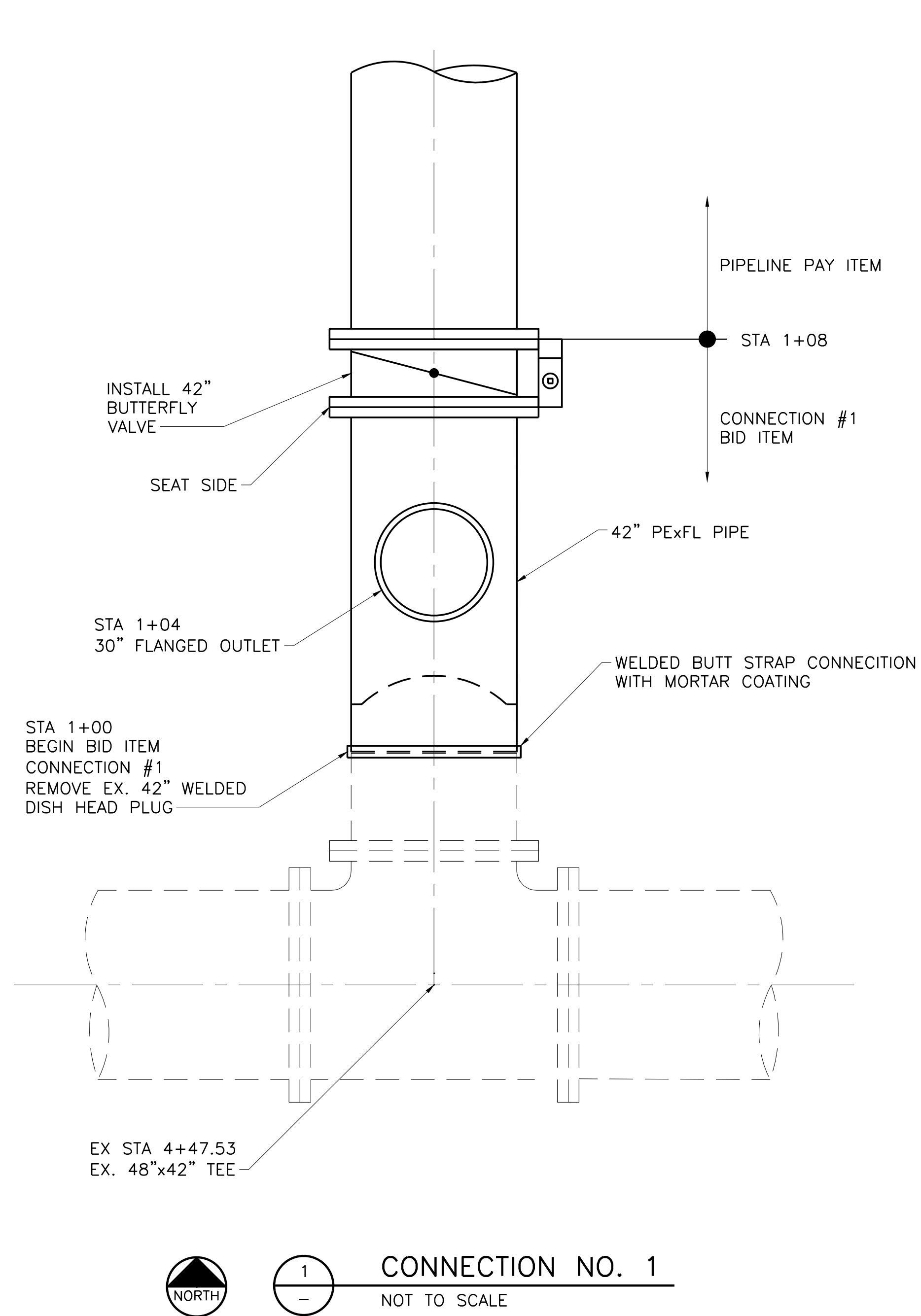
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GENERAL CONNECTION NOTES:

1. CONTRACTOR SHALL PROVIDE NECESSARY THRUST RESTRAINT BY WELDING PIPE JOINTS ON NEW PIPE. FITTINGS SHALL BE WELDED EXCEPT WHERE FLANGE OR HARNESSED COUPLING IS SHOWN. ALL BOLTS SHALL BE STAINLESS STEEL.
2. CONTRACTOR SHALL UNCOVER AND FIELD VERIFY HORIZONTAL AND VERTICAL DIMENSIONS AND EXISTING JOINT LOCATIONS FOR CONNECTION TIE-INS PRIOR TO MANUFACTURING OF NEW PIPE AND CONSTRUCTION. ALL EXISTING UTILITIES IN AREA TO BE LOCATED AND COORDINATED BEFORE PIPE CONSTRUCTION TO ALLOW CHANGES, IF CONFLICTS EXIST.
3. CONTRACTOR SHALL USE TEMPORARY TEST PLUGS TO HYDROTEST THE PIPELINE. CONTRACTOR SHALL REMOVE PLUG AFTER TEST COMPLETION AND REPAIR THE PIPE.
4. CONTRACTOR WILL BE RESPONSIBLE FOR FILLING AND TESTING WATER LINE FROM CITY DISTRIBUTION SYSTEM. CONTRACTOR WILL NOT BE RESPONSIBLE FOR PROVIDING TEMPORARY BYPASS TO FILL OFF-SITE WATER LINES.
5. COAT INTERIOR OF PIPE AT INSULATION FLANGES PER SECTION 09 97 16 PIPELINE COATINGS AND LININGS.
6. COAT PIPELINE TO MATCH EXISTING PIPELINE COATING UP TO INSULATING FLANGE.
7. CONTRACTOR WILL PROVIDE 42" WELDED BUTT-STRAP FOR CONNECTION NO. 1.



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
CIVIL
CONNECTION DETAILS

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3	CHECKED	ATC		
4	REVISION	NRM		
5	CCB			

VERIFY SCALE: Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.

ACAD_Ret: 23.0s (LMS_Tech)
Filename: N:\WTU\Drawings\CV-PPL-DT-CONN.dwg
Last Saved: 4/8/2020 12:17 PM Saved By: 02132

HVAC SYMBOLS (ALL SYMBOLS SHOWN ARE NOT NECESSARILY USED ON THE DRAWINGS)

ABBREVIATIONS

A/C	AIR CONDITIONING	KW	KILOWATT
AFF	ABOVE FINISHED FLOOR	LAT	LEAVING AIR TEMPERATURE
APPROX	APPROXIMATELY	LWT	LEAVING WATER TEMPERATURE
ARCH	ARCHITECTURE/ARCHITECTURAL	MAX	MAXIMUM
BAS	BUILDING AUTOMATION SYSTEM	MECH	MECHANICAL
BHP	BRAKE HORSEPOWER	MCA	MINIMUM CIRCUIT AMPACITY
BTUH	BRITISH THERMAL UNIT PER HOUR	MBH	THOUSANDS BTU's PER HOUR
C	CENTIGRADE	MIN	MINIMUM
CC	COOLING COIL	NFPA	NATIONAL FIRE PROTECTION ASSOC.
CFM	CUBIC FEET PER MINUTE	NC	NOISE CRITERIA
CD	CONDENSATE DRAIN	NOM	NOMINAL
CONN	CONNECTION	NTS	NOT TO SCALE
dB	DECIBELS	NO	NUMBER
DIA	DIAMETER	N.C.	NORMALLY CLOSED
DB	DRY BULB	N.O.	NORMALLY OPEN
DDC	DIRECT DIGITAL CONTROL	OA	OUTSIDE AIR
DEG	DEGREE	P/PH	PHASE
DX	DIRECT EXPANSION	PLBG	PLUMBING
DWGS	DRAWINGS	PSI	POUNDS PER SQUARE INCH
ELEC	ELECTRIC/ELECTRICAL	RE	REFER/REFERENCE
EAT	ENTERING AIR TEMPERATURE	RA	RETURN AIR
EWT	ENTERING WATER TEMPERATURE	RPM	REVOLUTIONS PER MINUTE
EFF	EFFICIENCY	SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOC.
EL	ELEVATION	SQ FT	SQUARE FEET
EMCS	ENERGY MONITORING AND CONTROL SYSTEM	SP	STATIC PRESSURE
EXH	EXHAUST	SA	SUPPLY AIR
F	FAHRENHEIT	TEMP	TEMPERATURE
FLEX	FLEXIBLE	T-STAT	THERMOSTAT
FPM	FEET PER MINUTE	TYP	TYPICAL
FT	FEET, FOOT	UNO	UNLESS NOTED OTHERWISE
GPM	GALLONS PER MINUTE	VAV	VARIABLE AIR VOLUME
HC	HEATING COIL	VFD	VARIABLE FREQUENCY DRIVE
HVAC	HEATING, VENTILATION AND AIR CONDITIONING	VD	VOLUME DAMPER
HZ	HERTZ	WT	WATTS
HP	HORSEPOWER	WTR	WATER
HTG	HEATING	WC	WATER COLUMN
IN	INCHES	WG	WATER GAUGE
		WB	WET BULB

DUCTWORK SYMBOLS

	SUPPLY AIR DIFFUSER - ARROWS INDICATE PATTERN. NO ARROWS SHOWN EQUALS 4-WAY.		FLEXIBLE DUCT CONNECTION TO EQUIPMENT
	RETURN/TRANSFER AIR GRILLE		SUPPLY OR OUTSIDE AIR DUCT UP
	EXHAUST GRILLE		SUPPLY OR OUTSIDE AIR DUCT DOWN
	SUPPLY AIR PLENUM SLOT DIFFUSER		RETURN AIR DUCT UP
	ROUND DUCTWORK		RETURN AIR DUCT DOWN
	RECTANGULAR DUCTWORK. SIZE INDICATED IN INCHES, FIRST NUMBER IS SIDE SHOWN		RELIEF OR EXHAUST AIR DUCT UP
	FLEXIBLE DUCT		RELIEF OR EXHAUST AIR DUCT DOWN
	SUPPLY OR OUTSIDE AIR DUCT		IN-LINE 90 DEGREE RISE OR DROP IN DUCT
	RETURN/TRANSFER AIR DUCT		INCLINED RISE IN DUCT
	RELIEF OR EXHAUST AIR DUCT		INCLINED DROP IN DUCT
	RADIUS DUCTWORK ELBOW ROUND OR RECTANGULAR		90° ELBOW WITH TURNING VANES
	RECTANGULAR DUCTWORK BRANCH TAKE-OFF W/DAMPER AND 45 DEGREE BRANCH INLET		MOTORIZED DAMPER
	FLARED SPIN-IN TAP WITH DAMPER		MANUAL VOLUME (BALANCE) DAMPER
	SPIN-IN TAP WITH DAMPER		FD - FIRE DAMPER
	ROUND DUCT BRANCH TAKE-OFF FROM RECTANGULAR OR FLAT OVAL MAIN WITH CONICAL TAP. PROVIDE BALANCE DAMPER FOR LOW PRESSURE DUCTWORK ONLY		SD - SMOKE DAMPER
	DUCTWORK SIZE TRANSITION.		CD - COMBINATION FIRE/SMOKE DAMPER

GENERAL NOTES

- THIS PROJECT IS DESIGNED BASED ON THE FOLLOWING CODES: INTERNATIONAL MECHANICAL CODE 2015, INTERNATIONAL ENERGY CONSERVATION CODE 2015, AND LOCAL AMENDMENTS.
 - ALL DUCT SIZES SHOWN ON THE DRAWINGS ARE NET INSIDE CLEAR DIMENSIONS.
 - UTILIZE LONG RADIUS ELBOWS WHERE SPACE PERMITS UNLESS OTHERWISE NOTED. ALL RECTANGULAR ELBOWS SHALL CONTAIN TURNING VANES.
 - COORDINATE WITH OTHER UTILITIES TO AVOID INTERFERENCES WHEN INSTALLING DUCTWORK, PIPING AND EQUIPMENT.
 - FURNISH AND INSTALL ALL EQUIPMENT AS PER MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS.
 - VERIFY DIMENSIONS, LOCATIONS, ELEVATIONS AND CONFIGURATION OF ALL ITEMS ASSOCIATED WITH THE INSTALLATION OF THE DUCTWORK AND EQUIPMENT.
 - PROVIDE MODIFICATIONS AND ACCESSORIES AS REQUIRED AND RECOMMENDED BY THE MANUFACTURER TO ASSURE PROPER OPERATION OF EQUIPMENT.
 - PAINT ALL EQUIPMENT VISIBLE THRU AIR DEVICES MATTE BLACK.
 - PROVIDE MANUAL VOLUME DAMPERS IN DUCTWORK AT ALL DUCT SPLITS, BRANCH RUNOUTS AND DUCT COLLARS FOR REGISTERS.
 - ALL DUCTWORK SHALL BE CONSTRUCTED, SEALED AND INSTALLED IN CONFORMANCE TO SMACNA DUCT CONSTRUCTION STANDARDS.
 - TO RESOLVE FIELD PROBLEMS IN ROUTING DUCTWORK THE CONTRACTOR SHALL USE THE SAME CIRCULAR EQUIVALENT DIAMETER TO TRANSFORM DUCT SIZE FROM THAT SPECIFIED ON THE DRAWINGS.
- $$DE = \frac{1.30 (AB)^{0.625}}{(A + B)^{0.250}}$$
- DE = CIRCULAR EQUIVALENT OF RECTANGULAR DUCT IN INCHES
 A = LENGTH OF ONE SIDE OF DUCT IN INCHES
 B = LENGTH OF OTHER SIDE OF DUCT IN INCHES
- DUCT RUNOUTS TO LINEAR/RECTANGULAR SUPPLY DIFFUSERS SHALL BE THE SAME SIZE AS THE INLET DIAMETER OF THE DIFFUSER. THE LENGTH OF FLEXIBLE DUCTS TO THE DIFFUSERS SHALL NOT EXCEED 5'-0".
 - PROVIDE FIRE RESISTANT FLEXIBLE CONNECTION WHENEVER DUCTWORK IS CONNECTED TO MOTORIZED EQUIPMENT.
 - DUCT MATERIAL SHALL BE ZINC-COATED STEEL, WITH METAL AND GALVANIZING THICKNESS AS PER SMACNA CONSTRUCTION STANDARDS.
 - PROVIDE OSHA-REQUIRED CLEARANCES AROUND ALL HVAC EQUIPMENT AND COMPONENTS FOR PERSONNEL ACCESS AND MAINTENANCE.
 - PIPING HANGERS AND SUPPORTS - ALL HANGERS AND SUPPORTS SHALL COMPLY WITH MANUFACTURER'S STANDARDIZATION SOCIETY (MSS) STANDARDS. VERTICAL PIPES MUST BE SUPPORTED AT EACH FLOOR WITH PIPE CLAMPS.
 - INSULATE BACKS AND PLENUMS OF SUPPLY AIR DEVICES WITH MINIMUM 1" MINERAL FIBER.
 - FOR ALL MECHANICAL EQUIPMENT PROVIDE LOCAL DISCONNECT MOUNTED ON UNIT OR INTEGRAL TO UNIT CONTROL PANEL.
 - ALL AIR MOVING EQUIPMENT CONTAINING PARTICULATE FILTERS SHALL NOT BE OPERATED WITHOUT PARTICULATE FILTERS IN PLACE. REFER TO TECHNICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION RELATED TO FILTERS.
 - SLOPE ALL CONDENSATE PIPING HORIZONTALLY IN THE DIRECTION OF DISCHARGE 1/8" VERTICAL PER FT. CONDENSATE SHALL NOT DISCHARGE INTO A STREET, ALLEY OR OTHER AREAS SO AS TO CAUSE A NUISANCE.
 - INSTALL ALL THERMOSTATS AT 4'-0" AFF. UNLESS OTHERWISE NOTED ON THE DRAWINGS. FIELD VERIFY LOCATION SHOWN ON DRAWINGS TO ENSURE THAT THERMOSTAT DOES NOT CONFLICT WITH OTHER UTILITIES. IF IT DOES, COORDINATE WITH ENGINEER FOR NEW LOCATION.
 - PROVIDE TEMPORARY CONSTRUCTION FILTERS TO BE REMOVED AND REPLACED WITH NEW FILTERS AT SUBSTANTIAL CONSTRUCTION. NEW FILTERS SHALL BE 2", MERV 8, PLEATED FILTERS UNLESS OTHERWISE NOTED.

EQUIPMENT DESIGNATIONS

EF	EXHAUST FAN
WP	WALL PACK

MISCELLANEOUS

	THERMOSTAT		DRAWING NOTE REFERENCE
ϕ	DIAMETER/PHASE		

PLAN SYMBOLOGY

		SINGLE LINE	DOUBLE LINE
DUCTWORK	EXISTING TO REMAIN		
	NEW		
PIPING	EXISTING TO REMAIN		
	NEW		

PIPING SYMBOLS

	ELBOW UP		BALL VALVE
	ELBOW DOWN		CAP ON END LINE

PIPING TYPES

	CONDENSATE DRAIN (COLD)
--	-------------------------

Item 12.

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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
 METER VAULT RELOCATION**
 HVAC

LEGEND

NO. ISSUE	BY	DATE	PRJ NO.	DATE	DESIGNED	CHECKED	FILE NAME
			PRP18708	MAY 2020	RWE	VRN	HV-VAL-GN-LGND.dwg
					CPB		

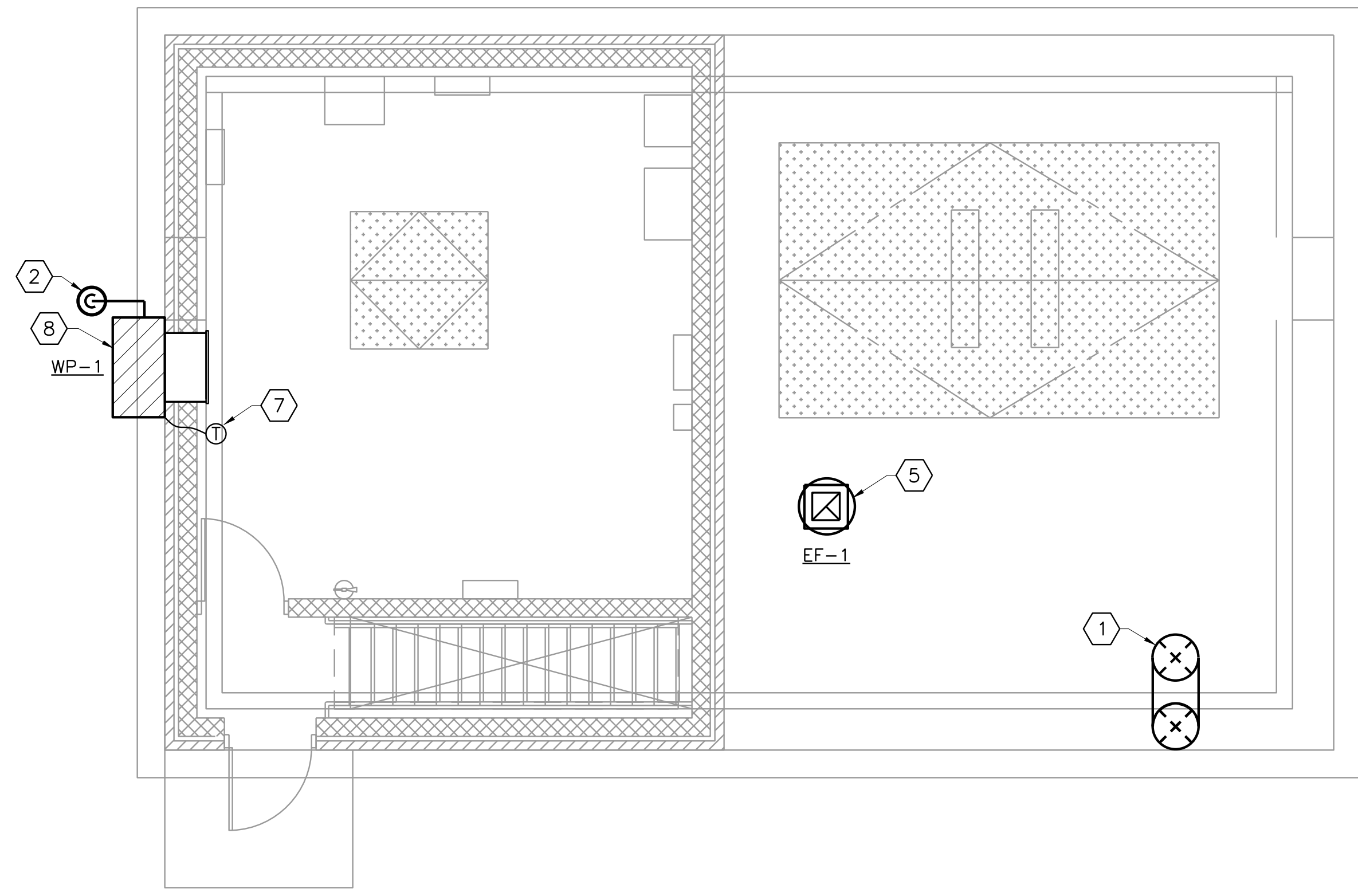
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SHEET **M-1**

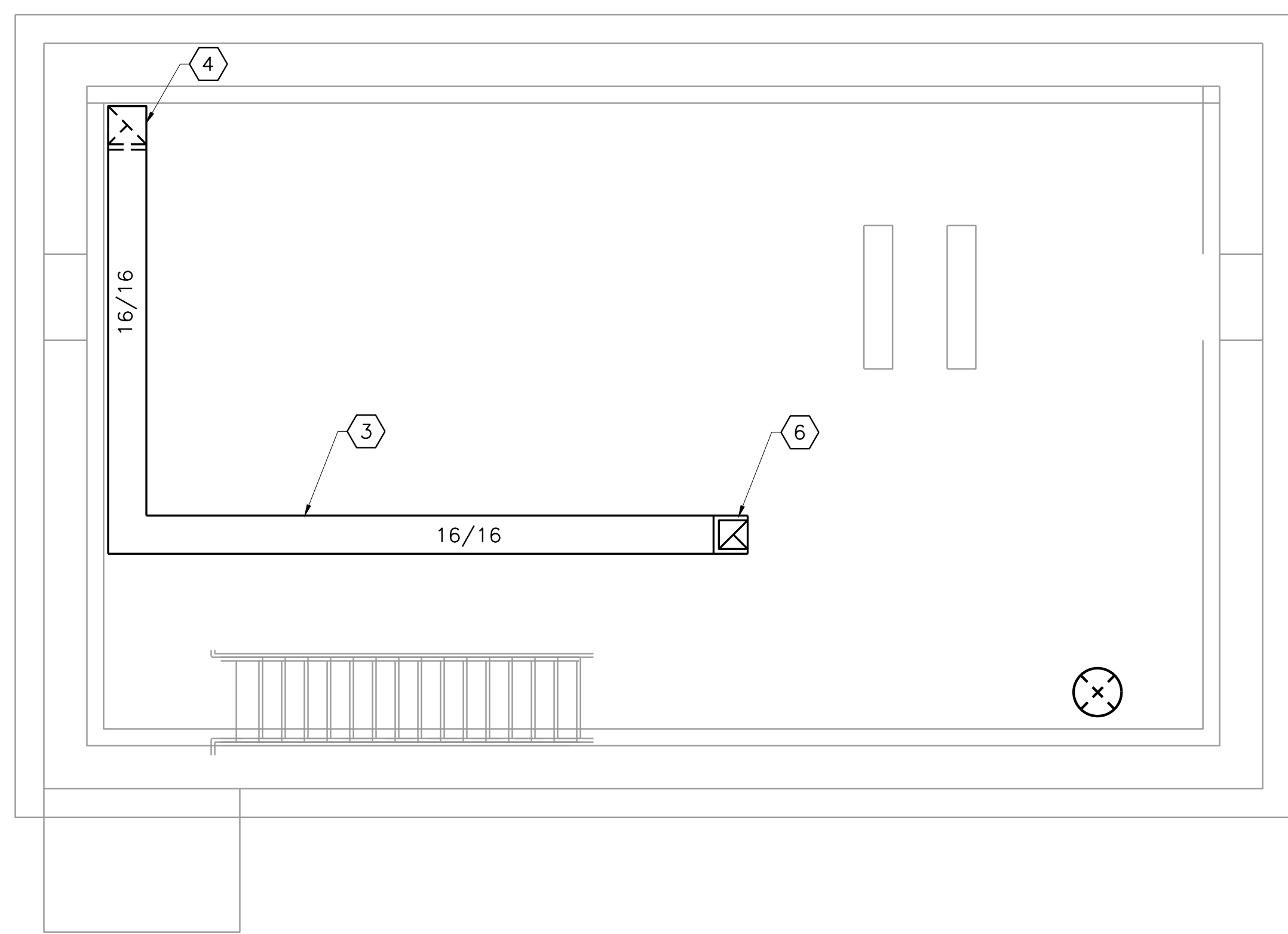
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Page 965

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ELECTRICAL ROOM FLOOR PLAN
 1
 -
 1/4"=1'-0"



VAULT FLOOR PLAN
 2
 -
 1/4"=1'-0"

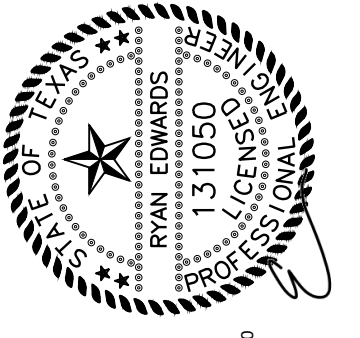
GENERAL NOTES:

1. REFER TO M-1 FOR LEGEND, GENERAL NOTES AND ABBREVIATIONS.
2. REFER TO TECHNICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION RELATED TO THIS SCOPE OF WORK.

NOTES BY SYMBOL "⬡"

1. 20"Ø GOOSENECK, COVER OPEN END WITH STAINLESS STEEL 16-MESH BUG SCREEN. TERMINATE 6" BELOW VAULT CEILING. RE: 3/M-3 FOR DETAIL.
2. PROVIDE FULL-SIZE CONDENSATE DRAIN AND P-TRAP. TERMINATE ON PEA GRAVEL. DO NOT TERMINATE CONDENSATE DRAIN ON PAVEMENT OR CONCRETE SURFACES. REFER TO DETAIL 4/M-3.
3. SUPPORT DUCTWORK FROM CEILING. ROUTE DUCT ALONG UNDERSIDE OF SLAB FLUSH TIGHT TO CEILING. AVOID STRUCTURAL BEAMS.
4. ROUTE DUCT DOWN WALL. SECURE DUCTWORK TO WALL SURFACE USING STAINLESS STEEL METAL DUCT SUPPORTS AND TERMINATE AT 12" AFF. COVER OPENING WITH HARDWARE CLOTH.
5. INSTALL FAN MIN. 10' FROM GOOSENECK INLET. INSTALL ON CURB. RE: 2/M-3.
6. ROUTE TO EXHAUST FAN ABOVE. TRANSITION FROM 16"x16" DUCTWORK TO 12"x12" DUCTWORK TO CONNECT TO FAN.
7. MOUNT THERMOSTAT AT 48" AFF.
8. PROVIDE WALL PACK AS SCHEDULED AND INSTALL PER DETAIL 1/M-3.

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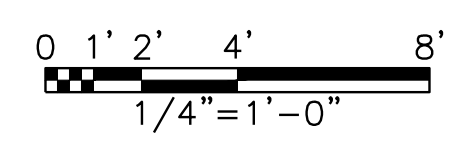
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
 METER VAULT RELOCATION**
 HVAC

HVAC FLOOR PLAN

NO.	ISSUE	BY	DATE	PRJ	DATE	DESIGNED	DRAWN	REVISION	CHECKED	FILE NAME
				PRP18708	MAY 2020	RWE	CPB		VRN	HV-VAL-PL-FLOOR.dwg

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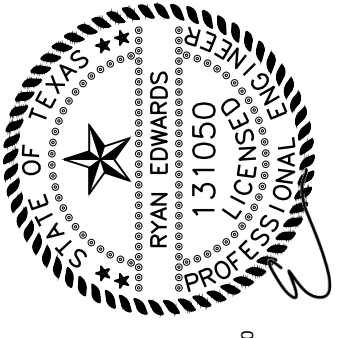


SHEET **M-2**
 SEQ. 32

GENERAL NOTES:

- REFER TO M-1 FOR LEGEND, GENERAL NOTES AND ABBREVIATIONS.
- REFER TO TECHNICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION RELATED TO THIS SCOPE OF WORK.

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PACKAGED DX A/C WALL-PACK UNIT SCHEDULE

MARK	SERVES	NOM SIZE (TONS)	AIRFLOW		EXT S.P. (IN WG)	FAN HP	COOLING				COOLING AMBIENT (°F)	HEATING			HEATING			UNIT ELECTRICAL			MANUFACTURER\MODEL	NOTES
			SUPPLY (CFM)	OUTSIDE (CFM)			TOTAL CAP (MBH)	SENS CAP (MBH)	EAT DB/WB (°F)	LAT DB/WB (°F)		TOTAL CAP (KW)	EAT (°F)	LAT (°F)	AMBIENT (°F)	VOLT/PH	MCA	MFS				
WP-1	ELECTRICAL ROOM	2	1000	50	0.20	0.50	27.8	21.2	80.0/67.0	58.4/57.9	101.0	6.0	45.0	63.9	29.8	460/3	10.4	15	MARVAIR/HVEA30ACD060	1,2,3,4,5,6,7		

REMARKS:

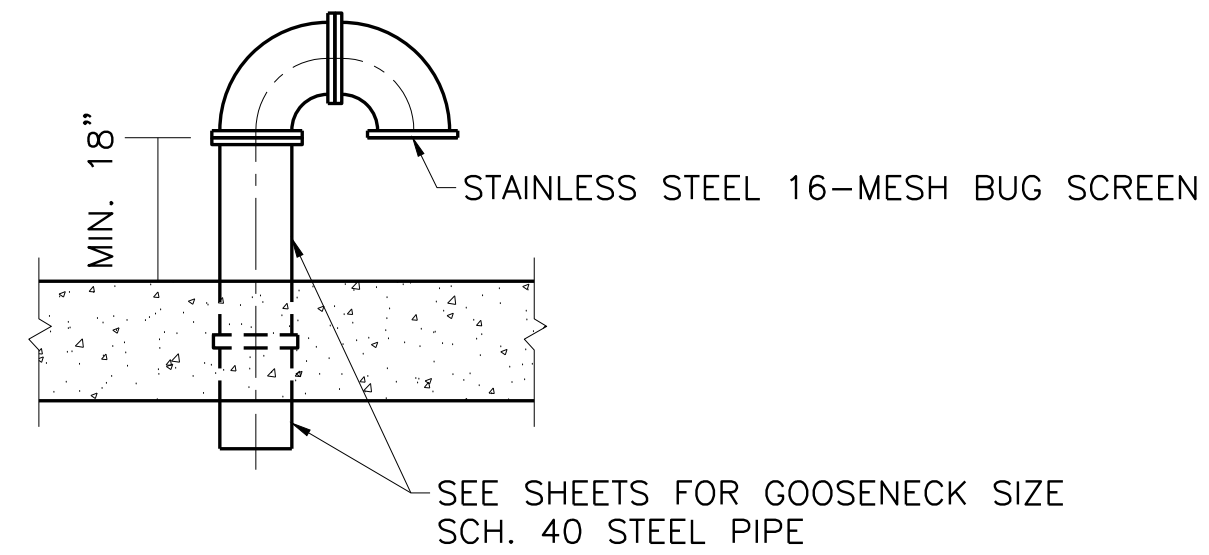
- PROVIDE WITH WALL MOUNTED THERMOSTAT. SET POINT 80°F (ADJUSTABLE).
- PROVIDE WITH SUPPLY AND RETURN GRILLES.
- PROVIDE WITH WALL SLEEVES.
- PROVIDE WITH 2" THICK MERV 8, DISPOSABLE FILTERS.
- PROVIDE WITH ECONOMIZER AND ALL CONTROLS AND ACCESSORIES FOR ECONOMIZER OPERATION
- PROVIDE WITH LOW AMBIENT CONTROL FOR OPERATION DOWN TO 20°F.
- PROVIDE WITH INTEGRAL DISCONNECT.

EXHAUST/SUPPLY FAN SCHEDULE

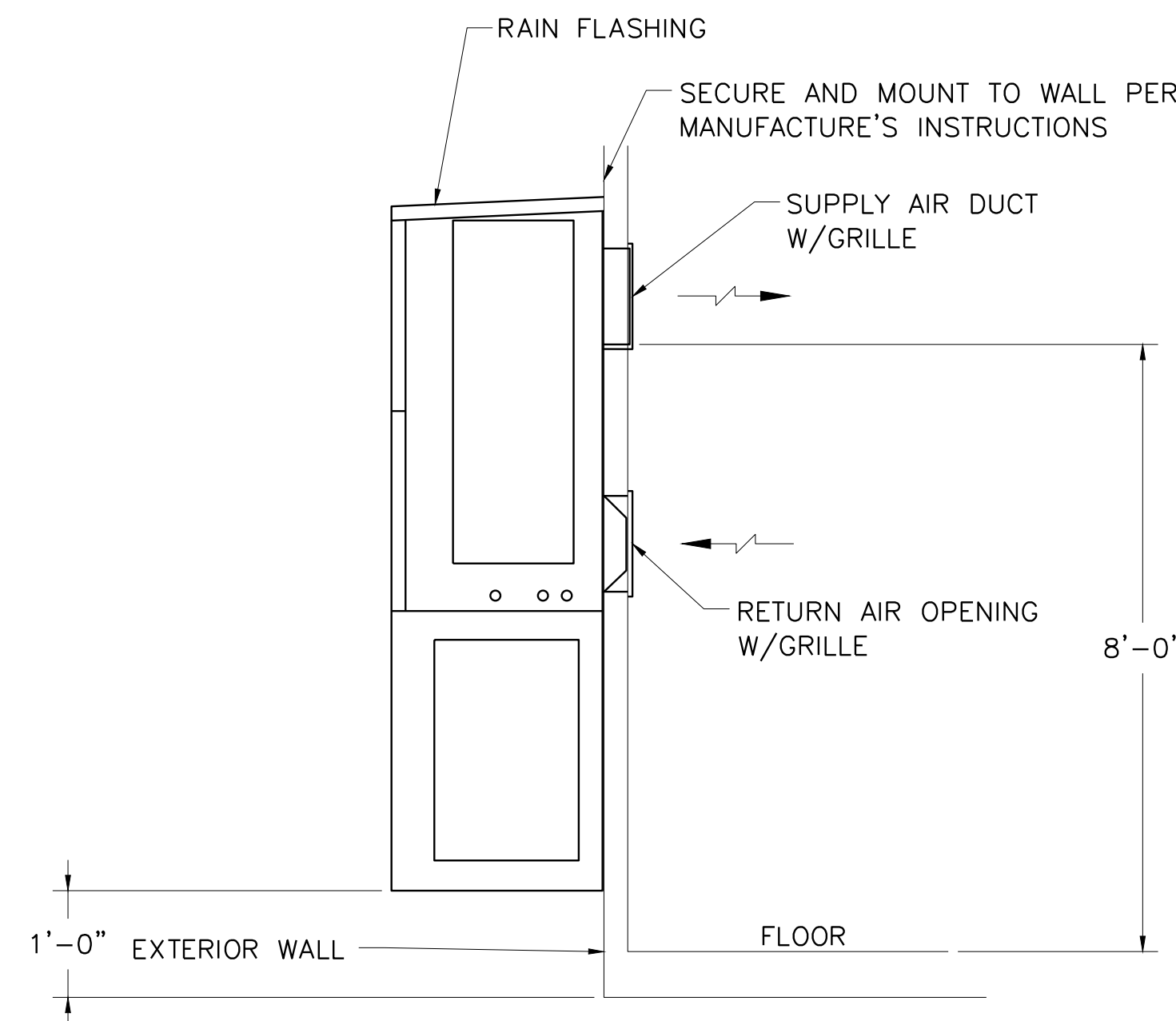
MARK	SERVES	CFM	EXT SP IN. WG	MOTOR DATA				MAX. SONES	MANUFACTURER/MODEL	NOTES
				HP	RPM	VOLTS	PH			
EF-1	VAULT	1,300	0.14	1/2	1725	115	1	12.7	GREENHECK/G-123-VG	1,2,3

NOTES:

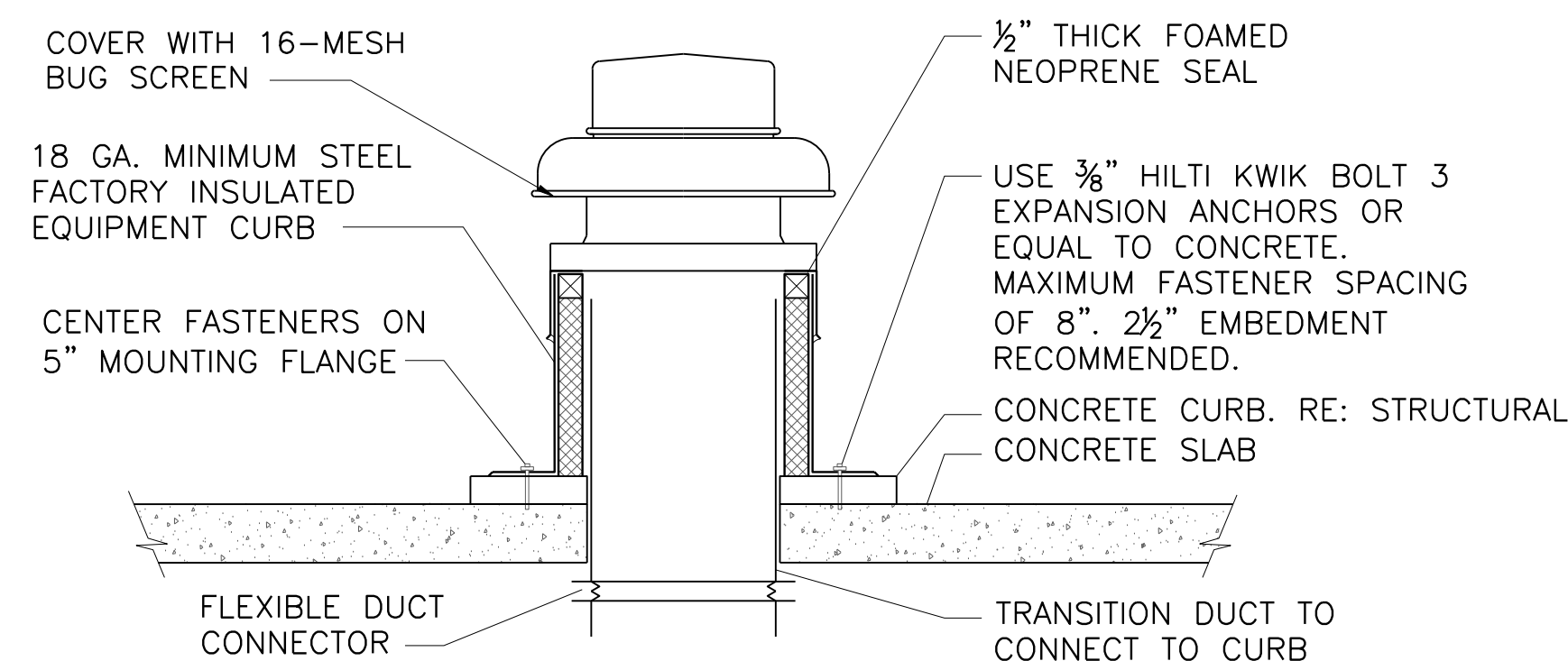
- PROVIDE 17" CURB AND APPROPRIATE ACCESSORIES FOR MOUNTING, INCLUDING BRACKETS, FASTENERS, AND FLASHING. PROVIDE WITH 16-MESH BUG SCREEN.
- FAN SHALL OPERATE CONTINUOUSLY.
- PROVIDE UNIT MOUNTED NEMA 4X STAINLESS STEEL DISCONNECT.



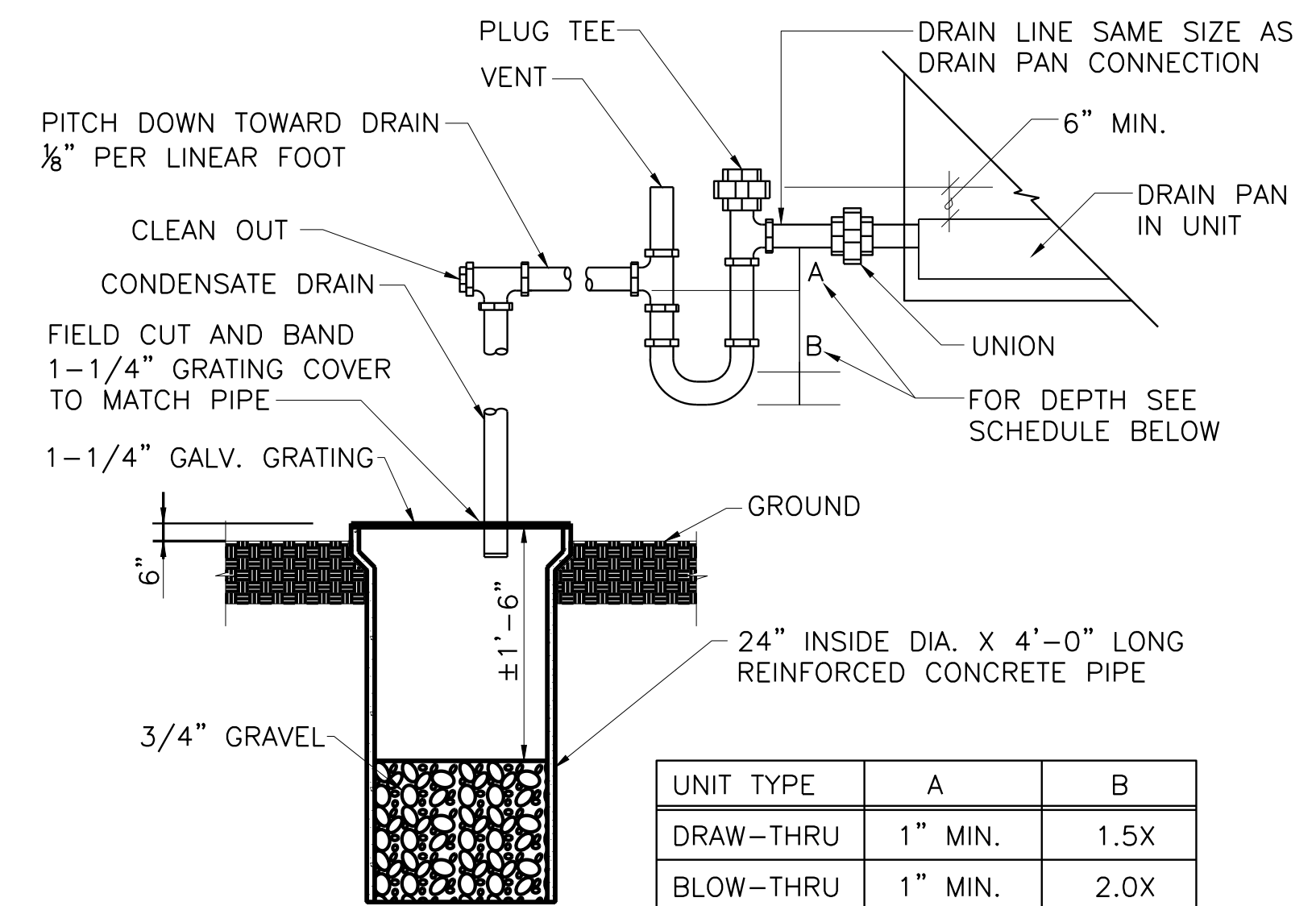
3 AIR INTAKE DETAIL
NOT TO SCALE



1 WALL-PACK UNIT
NOT TO SCALE



2 CURB MOUNTED EXHAUST FAN
NOT TO SCALE



UNIT TYPE	A	B
DRAW-THRU	1" MIN.	1.5X
BLOW-THRU	1" MIN.	2.0X

WHERE X = SCHEDULED FAN STATIC PRESS.

4 TYPICAL A/C CONDENSATE PIPING
NOT TO SCALE

TOWN OF PROSPER, TEXAS
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
HVAC

DETAILS

NO.	ISSUE	BY	DATE	PRJ	DATE	DESIGNED	RWE	DRAWN	CPB	CHECKED	VRN	FILE NAME
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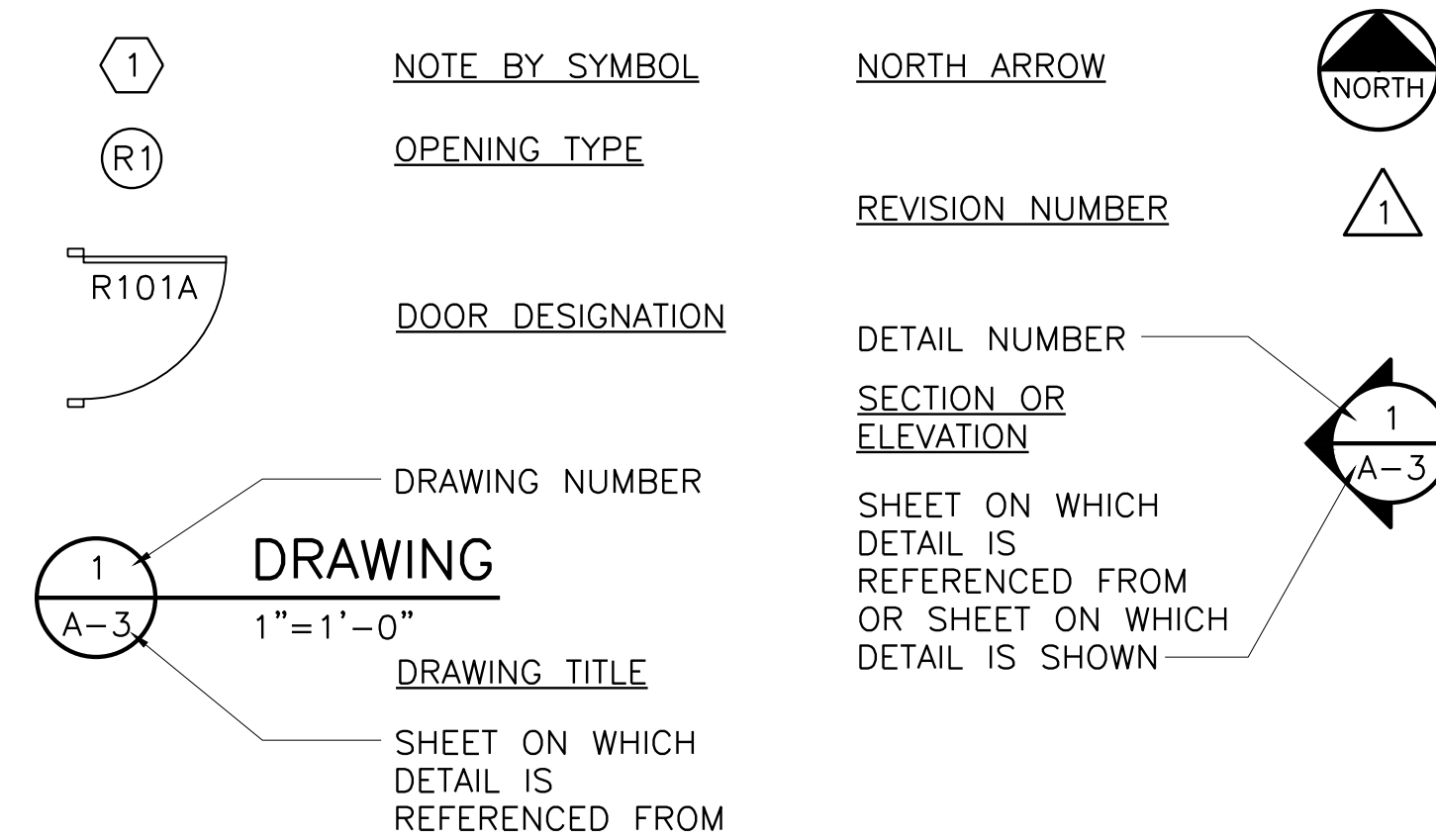
ARCHITECTURAL GENERAL NOTES

1. ALL DIMENSIONS ARE GIVEN TO:
 - A. FACE OF CONCRETE OR MASONRY.
 - B. CENTER LINE OF COLUMNS WHERE INDICATED.
 - C. FINISHED FACE OF GYPSUM BOARD.
 - D. CONCRETE FLOOR LINE.

FINISHES

1. INTERIOR SURFACES OF MASONRY AND WALLS: ACRYLIC PAINT FINISH.
2. EXTERIOR MASONRY SURFACES: HAVE INTEGRAL COLOR AND ARE NOT PAINTED.
3. CONCRETE FLOOR SLAB AND HOUSEKEEPING PADS: CLEAR SEALER.
4. ALL SWINGING DOORS AND FRAMES: HOLLOW METAL WITH FACTORY PRIMER AND FIELD PAINTED FINISH.

ARCHITECTURAL GRAPHICS



ARCHITECTURAL ABBREVIATIONS

AFF	ABOVE FINISH FLOOR	MIN	MINIMUM
CMU	CONCRETE MASONRY UNIT	NOM	NOMINAL
CONC	CONCRETE	OC	ON CENTER
COND	CONDITION	OH	OPPOSITE HAND
CONT	CONTINUOUS	OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
DIA, Ø	DIAMETER	R	RISER
ELEC	ELECTRIC(AL)	SCHED	SCHEDULE
EQ	EQUAL, EQUALLY	SIM	SIMILAR
EXST	EXISTING	SQ	SQUARE
FF	FINISH FLOOR	SS	STAINLESS STEEL
FT	FOOT, FEET	STL	STEEL
GALV	GALVANIZE OR GALVANIZED	STRUCT	STRUCTURE, STRUCTURAL
H	HEIGHT OR HIGH	T	TREAD
HM	HOLLOW METAL	TOM	TOP OF MASONRY
HORZ	HORIZONTAL, HORIZONTALLY	TOS	TOP OF STEEL
L	LONG, LENGTH	TYP	TYPICAL
MAS	MASONRY	VERT	VERTICAL, VERTICALLY
MAX	MAXIMUM	W	WIDE, WIDTH
MECH	MECHANICAL		
MFR	MANUFACTURER		

CODE DATA

OWNER CONTACT INFORMATION PER SITE: REFER TO SHEET G-2
 PROJECT ADDRESSES: REFER TO CIVIL SITE SHEETS.

TOWN OF PROSPER 2015 INTERNATIONAL BUILDING CODE
 BUILDING CODES WITH 2015 INTERNATIONAL MECHANICAL CODE
 AMENDMENTS AND 2015 INTERNATIONAL PLUMBING CODE
 DELETIONS 2015 INTERNATIONAL FIRE CODE
 2015 INTERNATIONAL ENERGY CONSERVATION CODE (STATE MANDATE)
 2017 NATIONAL ELECTRICAL CODE

PROJECT: TOWN OF PROSPER, TEXAS – CUSTER ROAD PUMP STATION METER VAULT RELOCATION

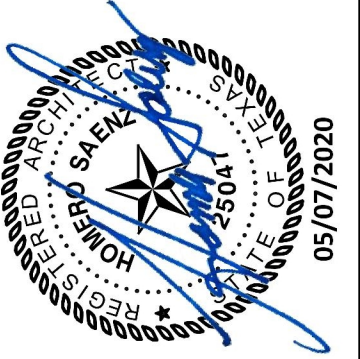
OCCUPANCY: F-1, FACTORY INDUSTRIAL (SEC 306)

TOTAL BUILDING AREAS: BUILDING – 260 SQ FT
 VAULT – 592 SQ FT

CONSTRUCTION TYPE: TYPE II-B (NON-COMBUSTIBLE)

AUTOMATIC FIRE SUPPRESSION: NONE

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TOWN OF PROSPER, TEXAS
 CUSTER ROAD PUMP STATION
 METER VAULT RELOCATION
 ARCHITECTURE
 VALVE VAULT
 GENERAL NOTES AND CODE DATA

NO.	ISSUE	DATE	BY	FILE NAME
PRP18708	DESIGNED	MAY 2020		Ar-Vol-Gn.dwg
	DRAWN			
	CHECKED			
	REVISION			

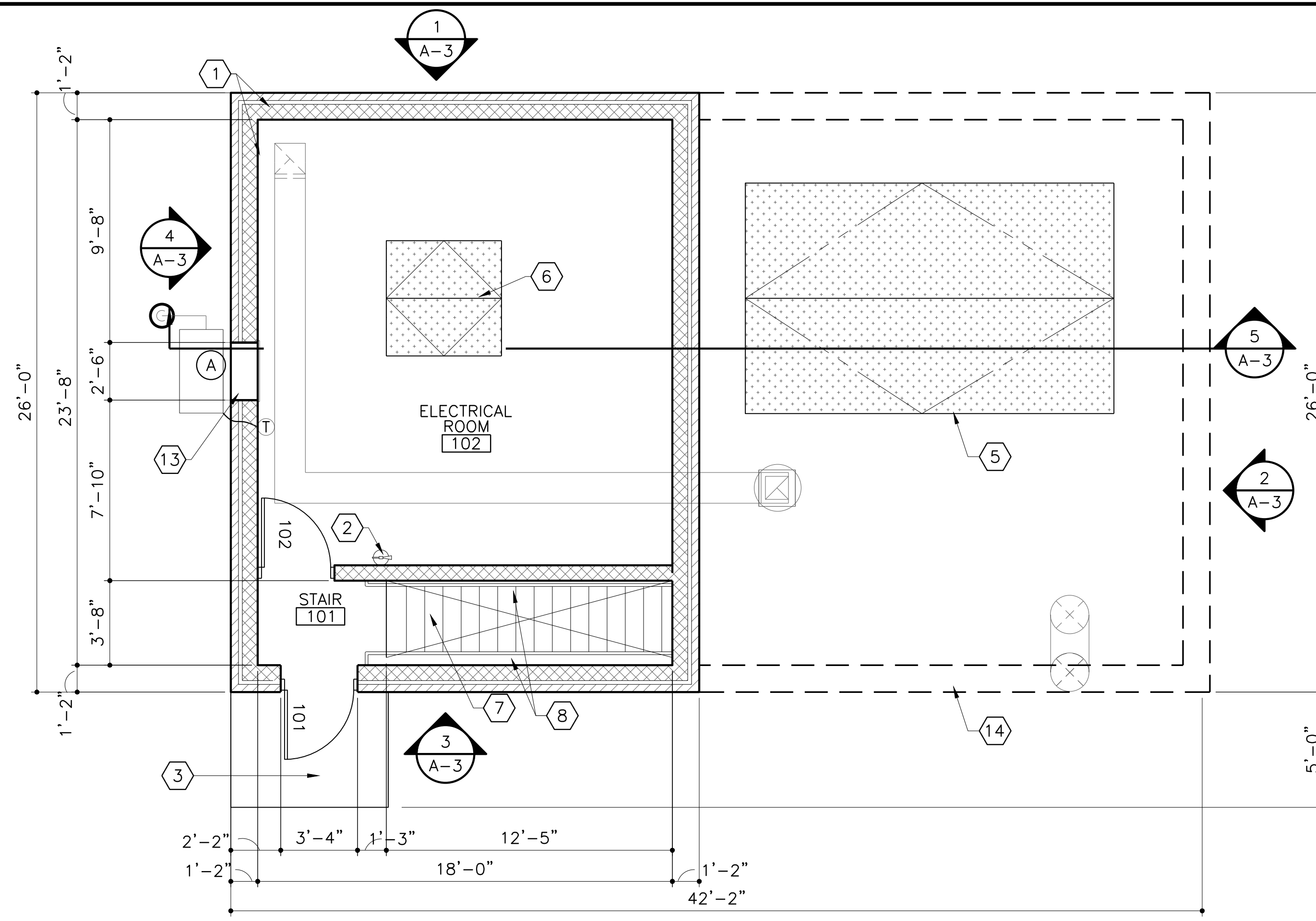
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SHEET: A-1

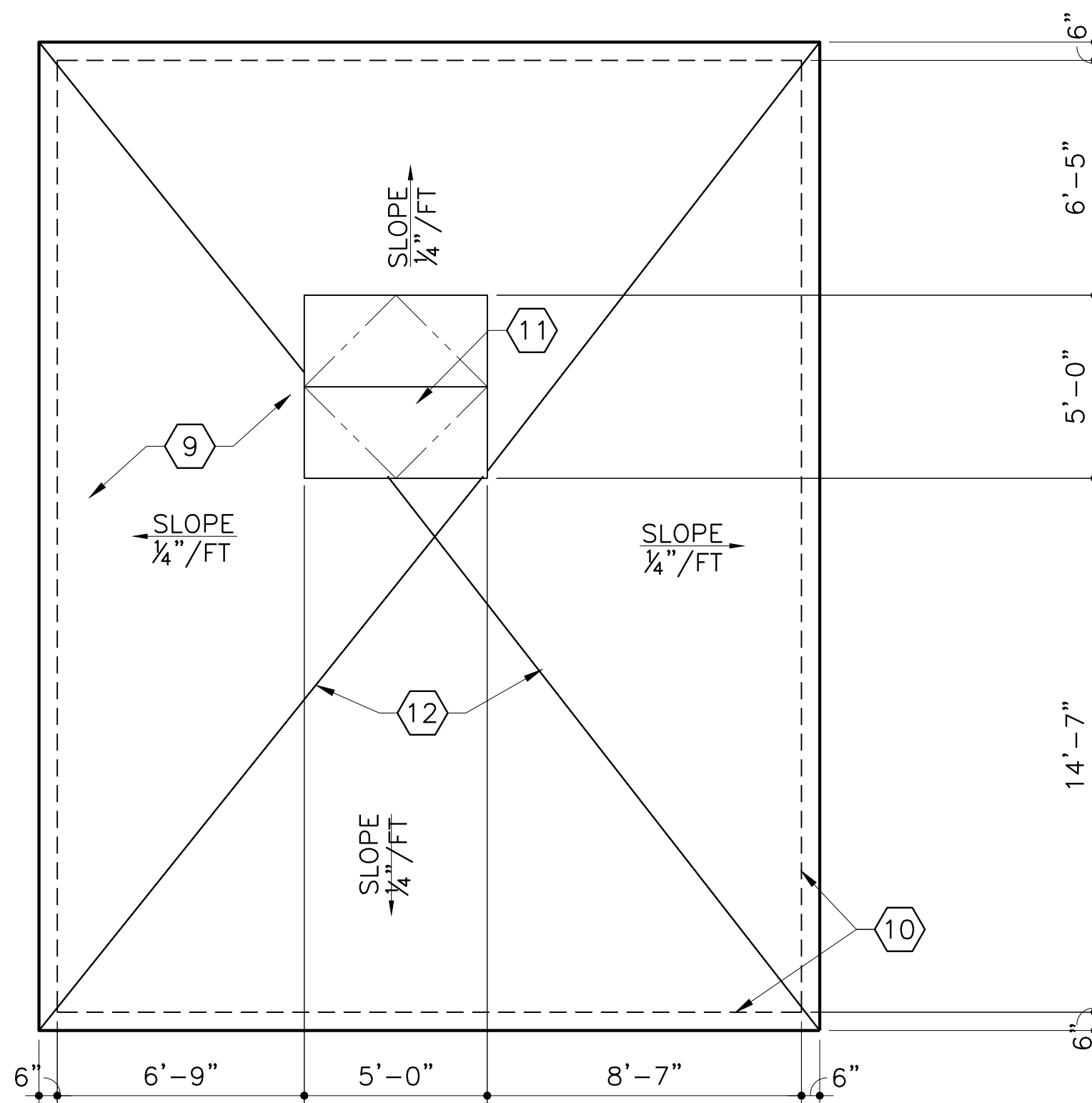
SEQ.: 34

NOTES BY SYMBOL

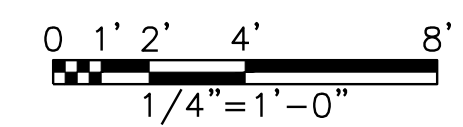
1. EXTERIOR WALL, TYPICAL: 8" NOM CMU, C MEMBRANE, AIR BARRIER, 1½" RIGID INSULATION, AIR SPACE AND 4" NOM CMU VENEER RE: 1,2/A-5.
2. FIRE EXTINGUISHER AND BRACKET. MOUNT AT 3'-6" AFF TO THE HANDLE.
3. CONCRETE LANDING AT EXTERIOR DOOR, SLOPE AWAY FROM BUILDING AT ¼"/FT MAXIMUM. RE: STRUCTURAL
4. -
5. RAISED EQUIPMENT ACCESS HATCH. SLOPE OF SLAB AND CURB SHALL ALLOW HATCH TO SIT LEVEL. RE: STRUCTURAL.
6. FLUSH FLOOR HATCH, RE: STRUCTURAL.
7. METAL STAIR, RE: 4/A-5. AND 5/A-3.
8. 1½"Ø HANDRAIL BOTH SIDES OF STAIR, RE: 4/A-4.
9. SBS MODIFIED BITUMEN ROOFING.
10. BUILDING OUTLINE BELOW.
11. ROOF HATCH, RE: 5/A-5.
12. ROOF SLOPE FORMED WITH TAPERED INSULATION.
13. MECHANICAL EQUIPMENT AND OPENINGS, RE: HVAC.
14. OUTLINE OF VAULT FOUNDATION WALL. RE: STRUCTURAL



FLOOR PLAN
1
A-2
1/4"=1'-0"



ROOF PLAN
2
A-2
1/4"=1'-0"



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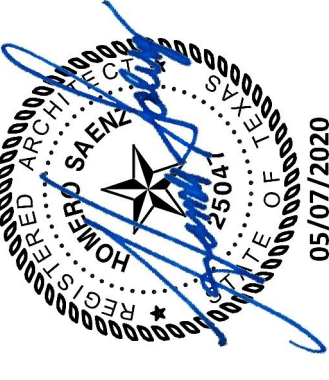
TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ARCHITECTURE
**METER VAULT
FLOOR AND ROOF PLANS**

NO.	ISSUE	BY	DATE	TRN. JOB NO.	PRP18708
				DATE	MAY 2020
				DESIGNED	PKJ
				DRAWN	CT
				REVISION	
				CHECKED	JWW
				FILE NAME	Ar-Vol-Pl-Floor.dwg

VERIFY SCALE
Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.

SHEET
A-2

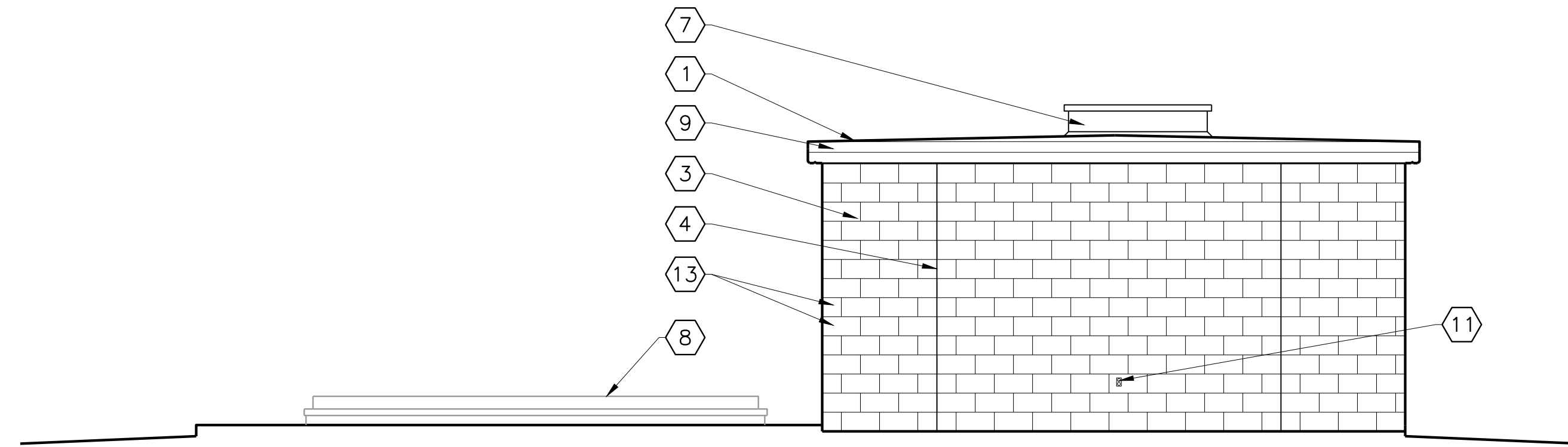
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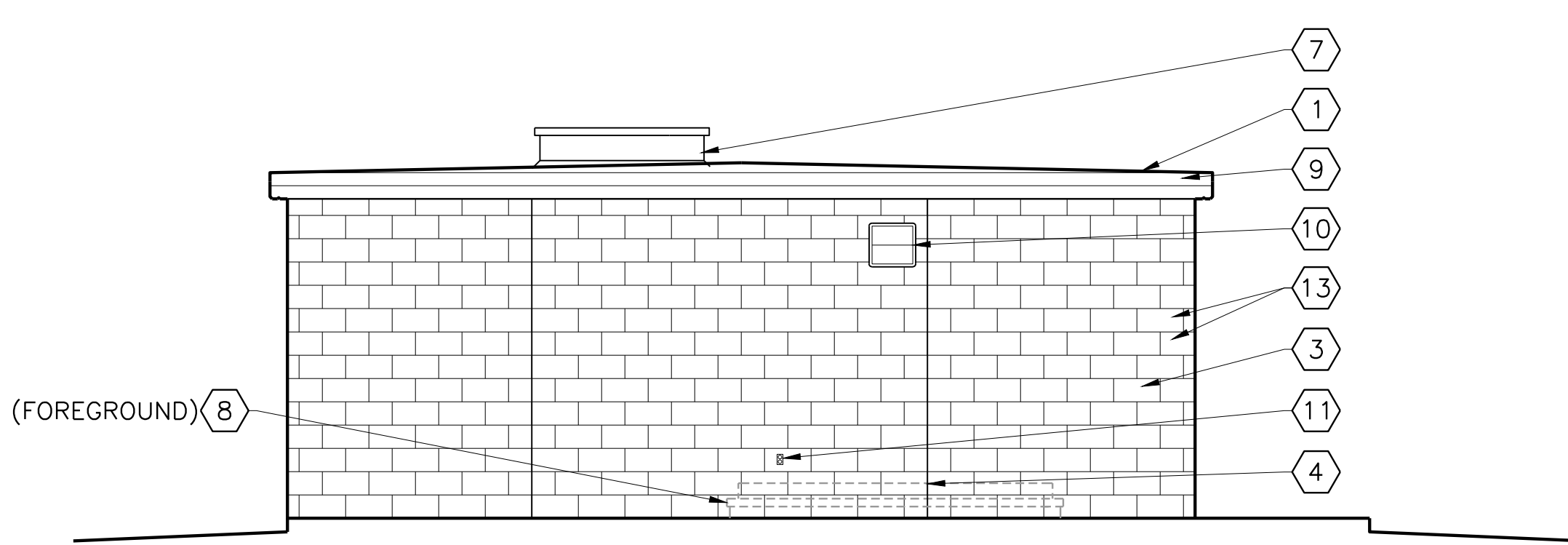
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ARCHITECTURE
**VALVE VAULT
ELEVATIONS AND SECTIONS**

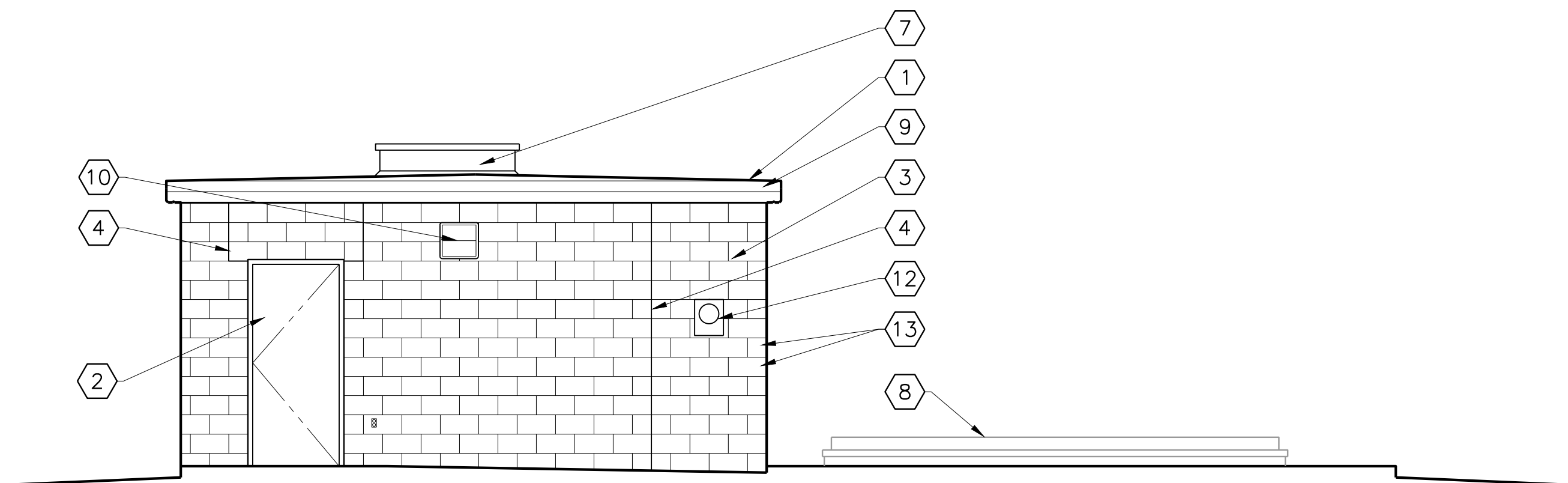
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				PRP18708				
				DATE	DATE			
				REVISED	REVISED			
				FILE NAME	FILE NAME			
				Ar-Vol-El-Bldg.dwg	Ar-Vol-El-Bldg.dwg			
VERIFY SCALE: Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.								
SHEET								A-3
SEQ.								36



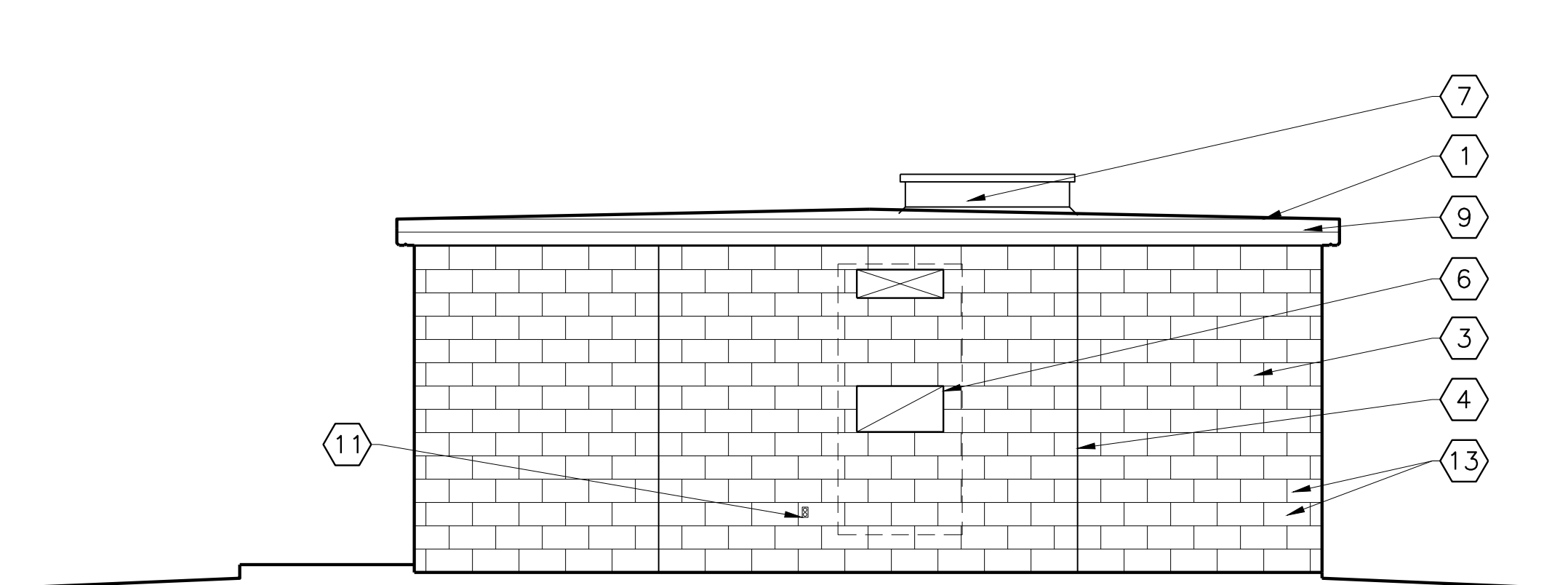
1 WEST ELEVATION
A-3 1/4"=1'-0"



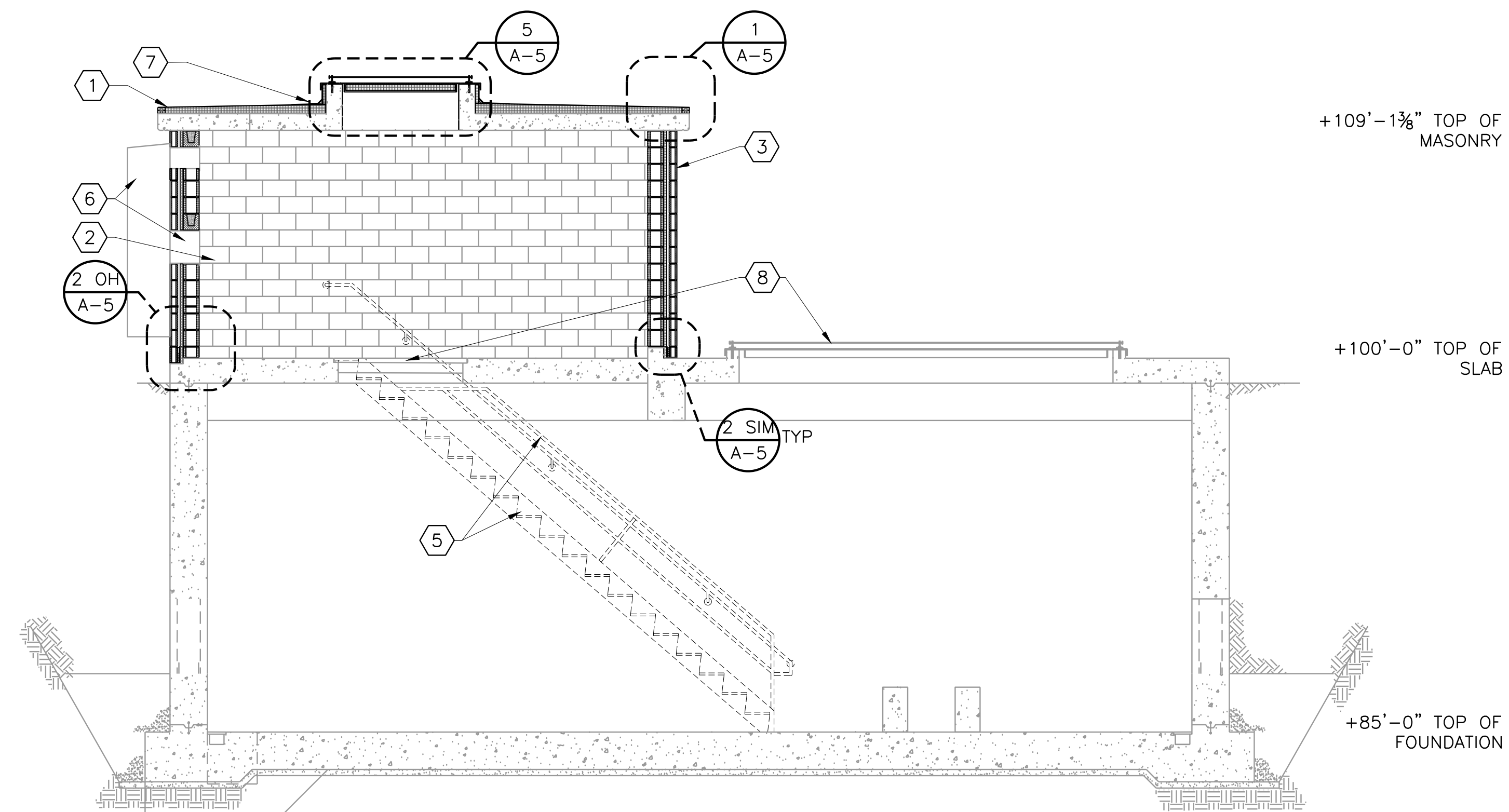
2 NORTH ELEVATION
A-3 1/4"=1'-0"



3 EAST ELEVATION
A-3 1/4"=1'-0"



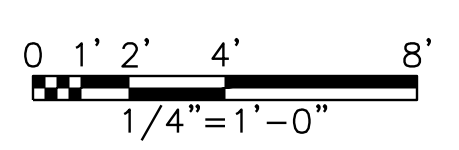
4 SOUTH ELEVATION
A-3 1/4"=1'-0"



5 BUILDING SECTION
A-3 1/4"=1'-0"

NOTES BY SYMBOL "⬡"

- SBS MODIFIED BITUMEN ROOFING ON INSULATION ON CONCRETE ROOF, RE: 1/A-5.
- DOOR AND FRAME AS SCHEDULED.
- CMU RUNNING BOND VENEER.
- CONTROL JOINT, TYPICAL.
- METAL STAIR WITH HANDRAIL AND GUARDRAIL (BEFORE SECTION). REFER TO 4/A-5 FOR TYPICAL DETAILS.
- MECHANICAL EQUIPMENT AND OPENINGS, RE: HVAC AND SHEET A-5.
- ROOF HATCH, RE: 5/A-5.
- RAISED EQUIPMENT ACCESS HATCH AND FLUSH FLOOR HATCH, RE: STRUCTURAL.
- METAL FASCIA.
- LIGHT FIXTURE, RE: ELECTRICAL AND 3/A-5.
- POWER OUTLET, RE: ELECTRICAL AND 3/A-5.
- POWER METER, RE: ELECTRICAL AND 3/A-5.
- 8"x16" NOMINAL L-SHAPE CMU CUT-DOWN TO 6"x14" AT CORNERS, TYPICAL.



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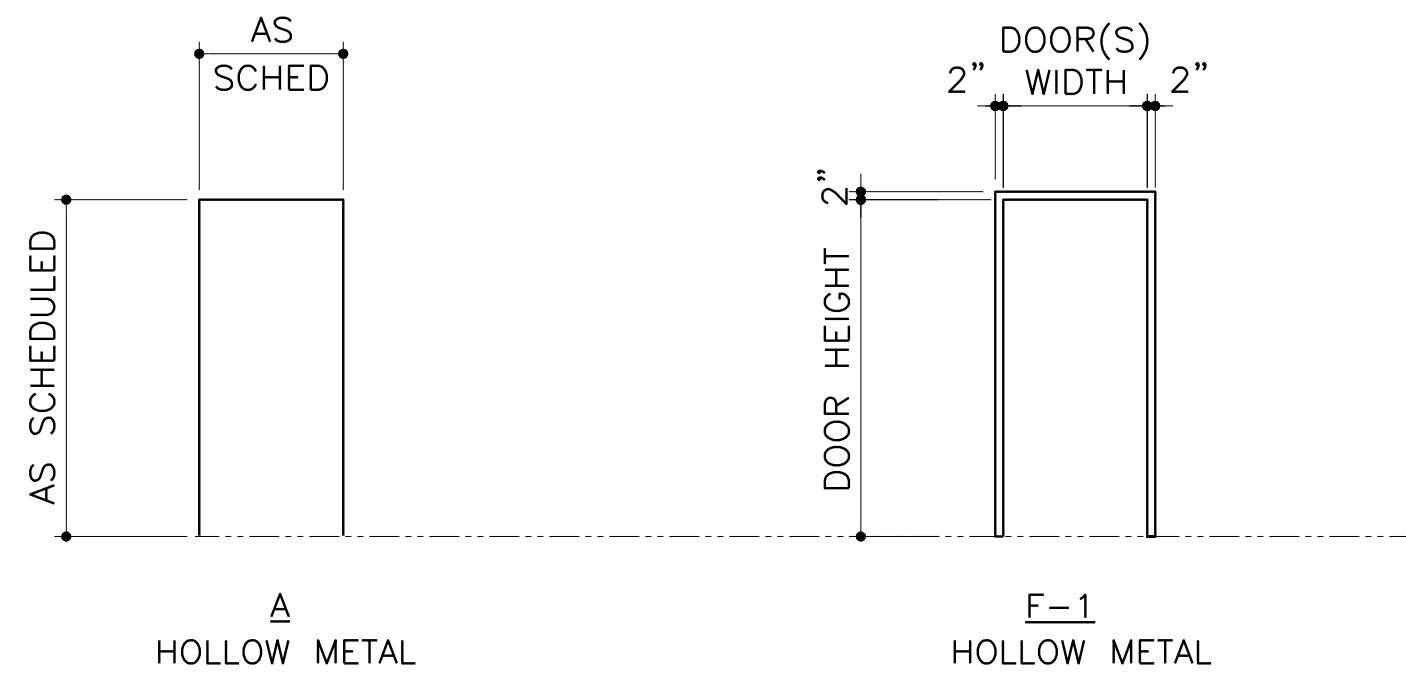
DOOR AND FRAME SCHEDULE

MARK	DOOR DESCRIPTION				FRAME DESCRIPTION			UL LABEL	HARDWARE NUMBER	REMARKS		
	SIZE			MAT	TYPE	DOOR DETAILS						
	WIDTH	HEIGHT	THICKNESS			HEAD	JAMB				SILL	
101	1@3'-0"	x7'-0"	-0"	HM	A	HM	F-1	5/A-4	6/A-4	7/A-4	-	RE: SPECS
102	1@3'-0"	x7'-0"	-0"	HM	A	HM	F-1	2/A-4	3/A-4	4/A-4	-	RE: SPECS

DOOR GENERAL NOTES:

- ALL DOORS ARE 1 3/4" THICK UNLESS NOTED OTHERWISE.
- ALL DOORS ARE INSULATED.

DOOR REMARKS:



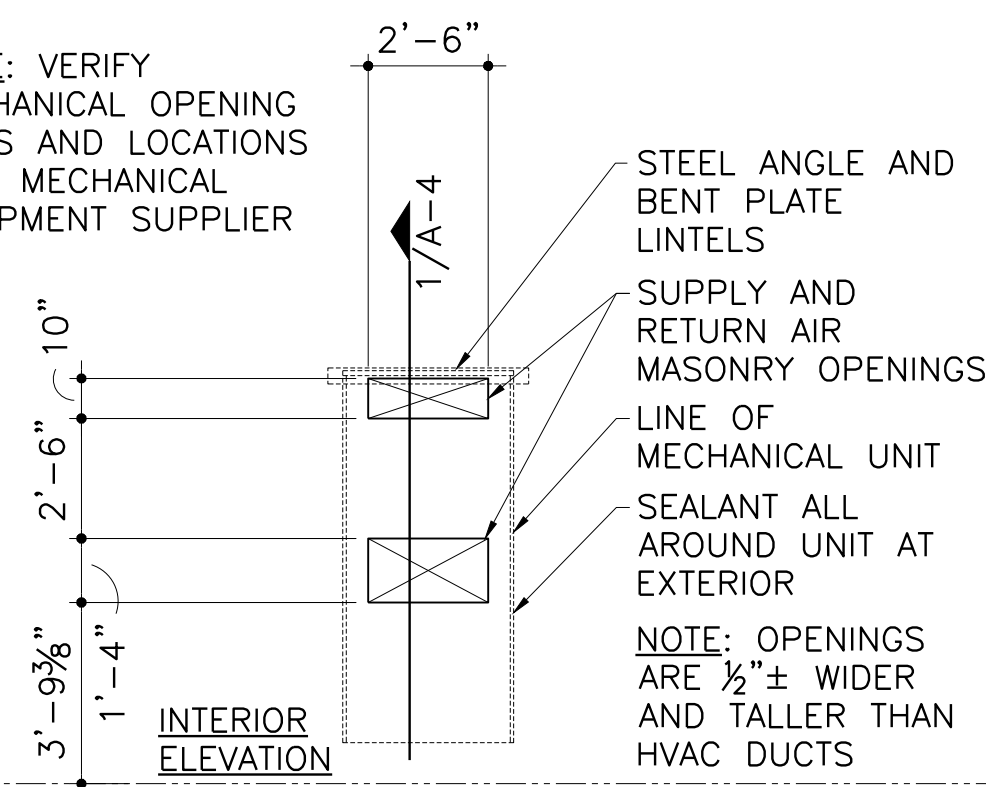
DOOR TYPES

1/4" = 1'-0"

FRAME TYPES

1/4" = 1'-0"

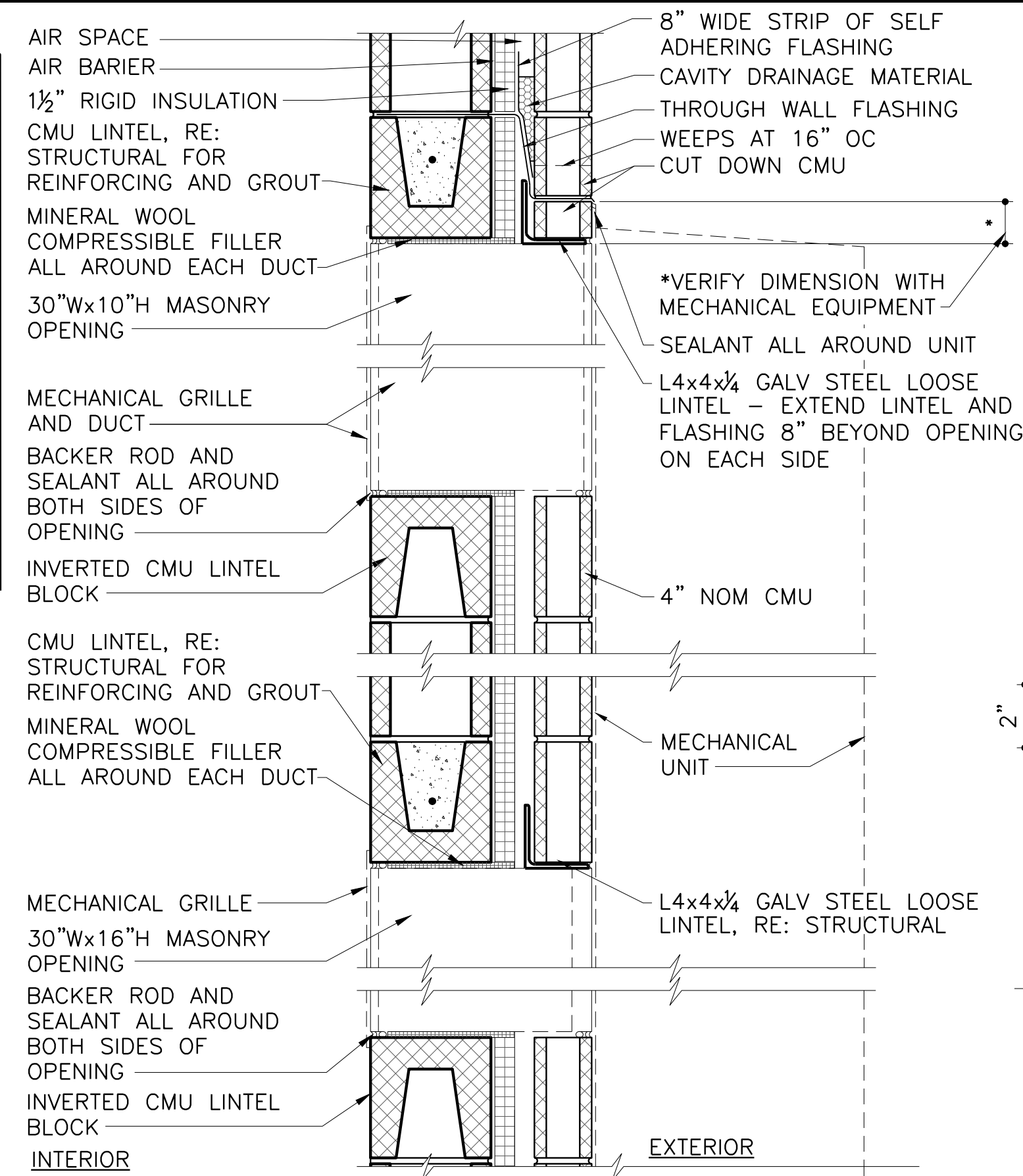
NOTE: VERIFY MECHANICAL OPENING SIZES AND LOCATIONS WITH MECHANICAL EQUIPMENT SUPPLIER



THROUGH WALL HVAC

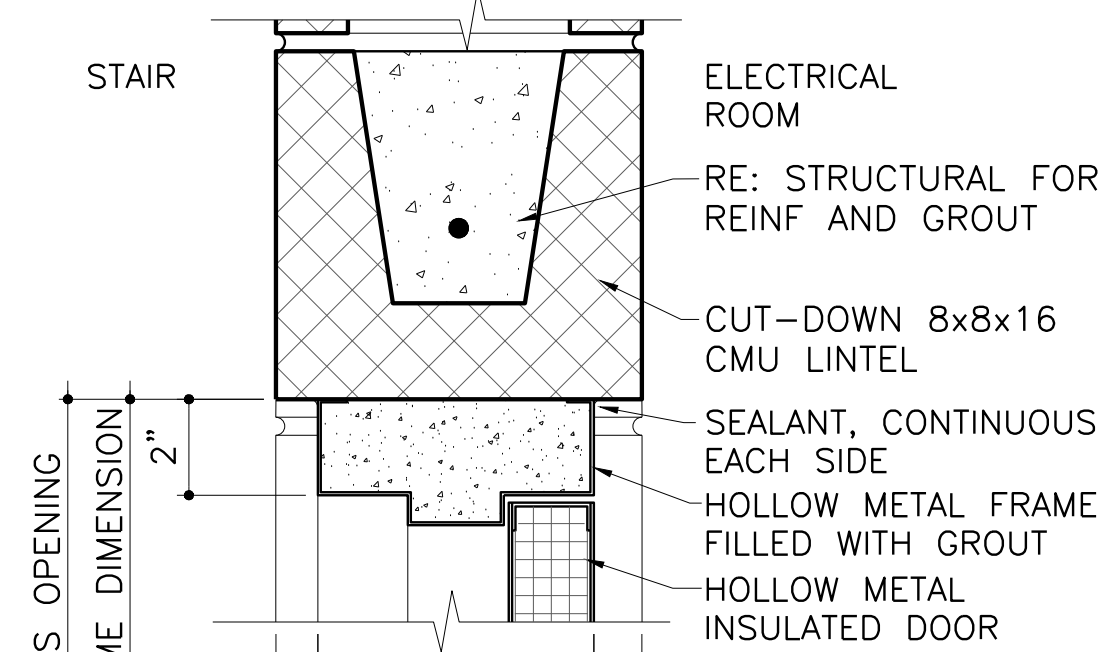
OPENING TYPES

1/4" = 1'-0"



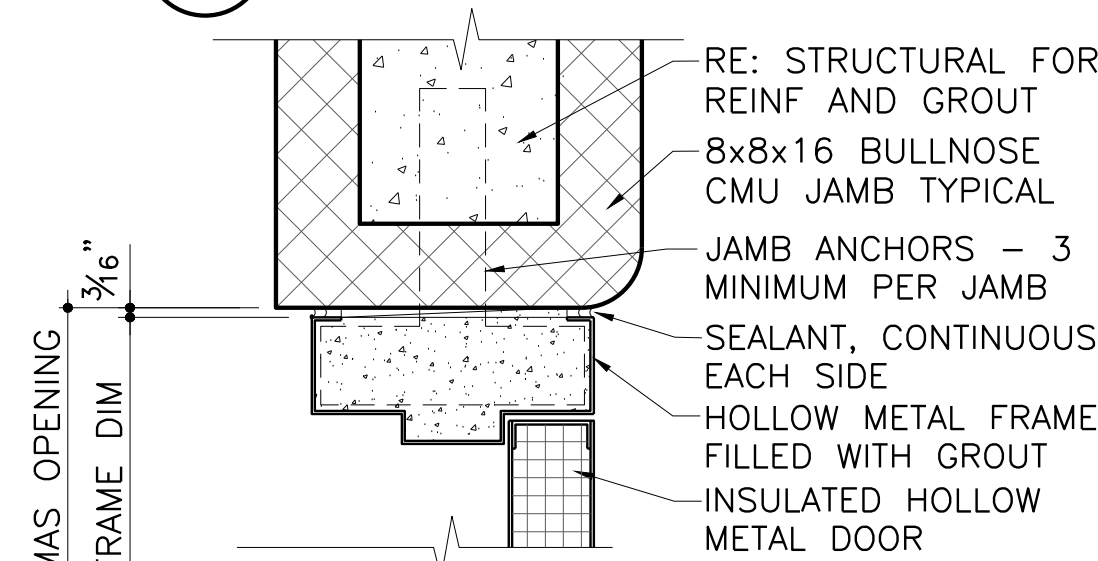
1 THROUGH WALL HVAC

1 1/2" = 1'-0"



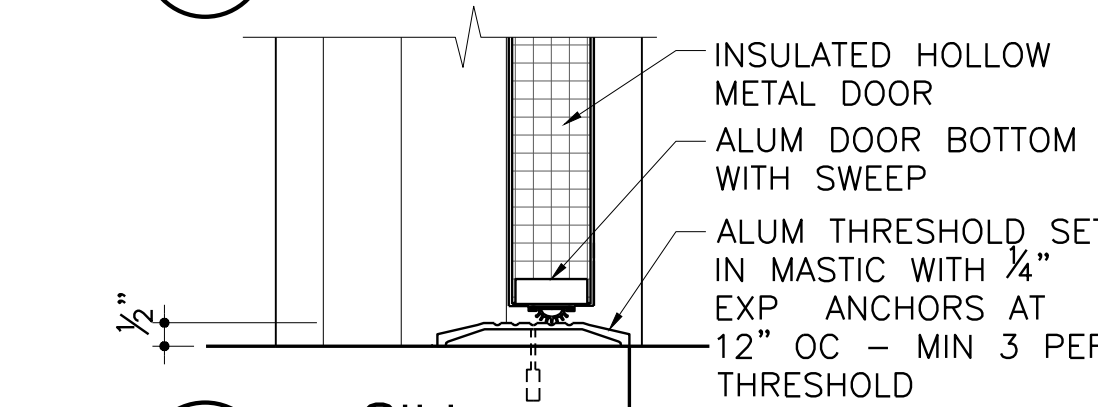
2 HEAD

3" = 1'-0"



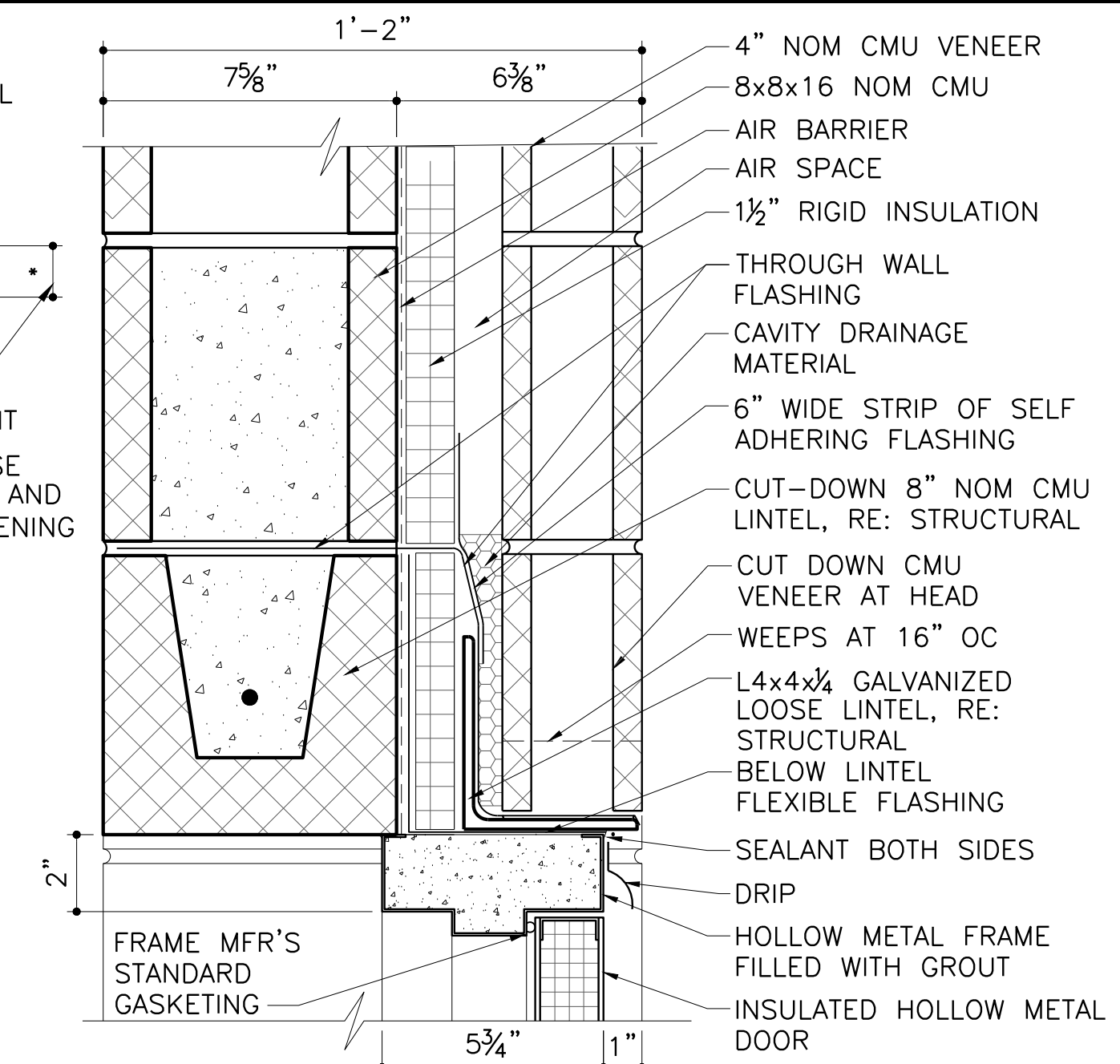
3 JAMB

3" = 1'-0"



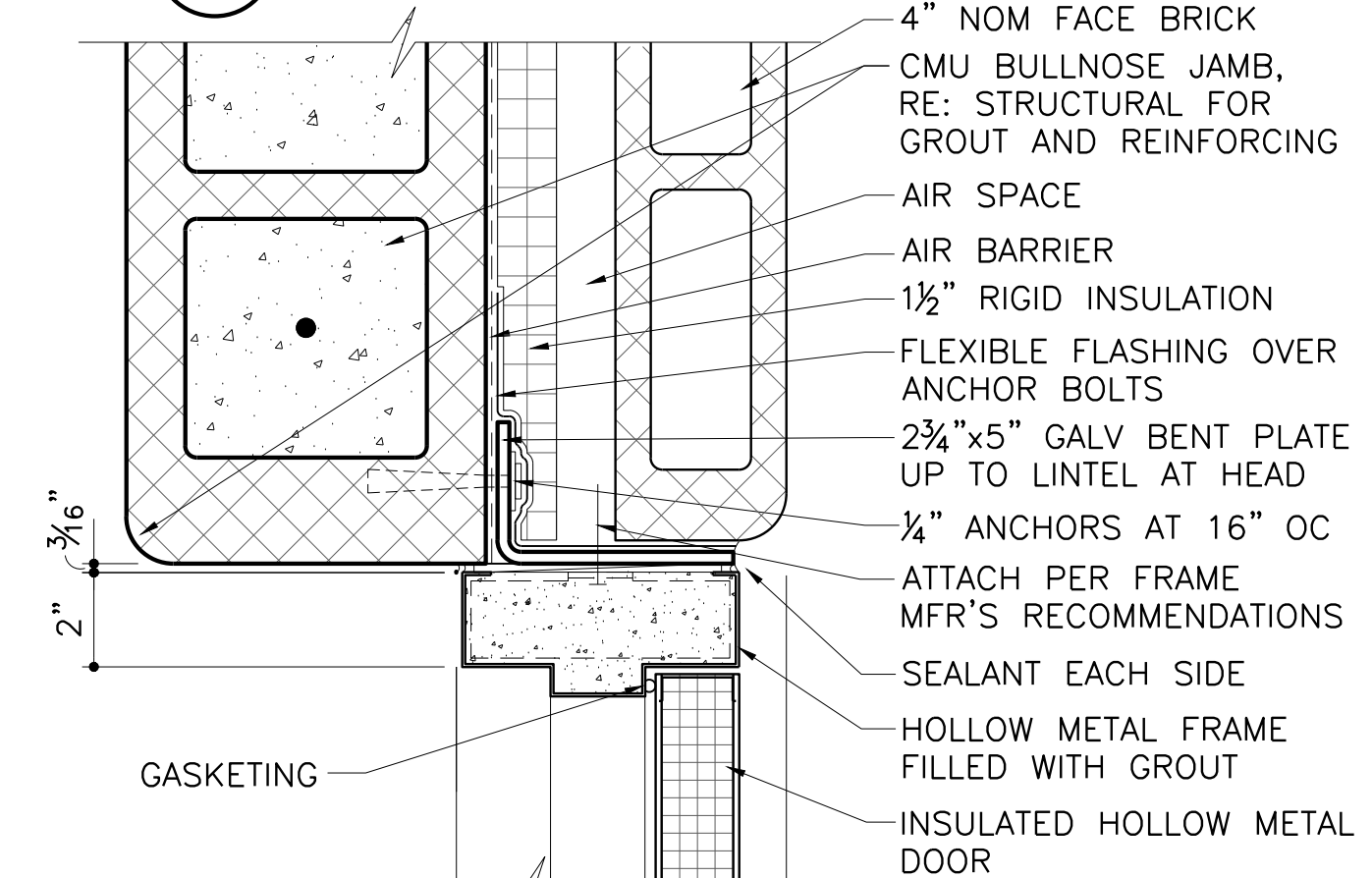
4 SILL

3" = 1'-0"



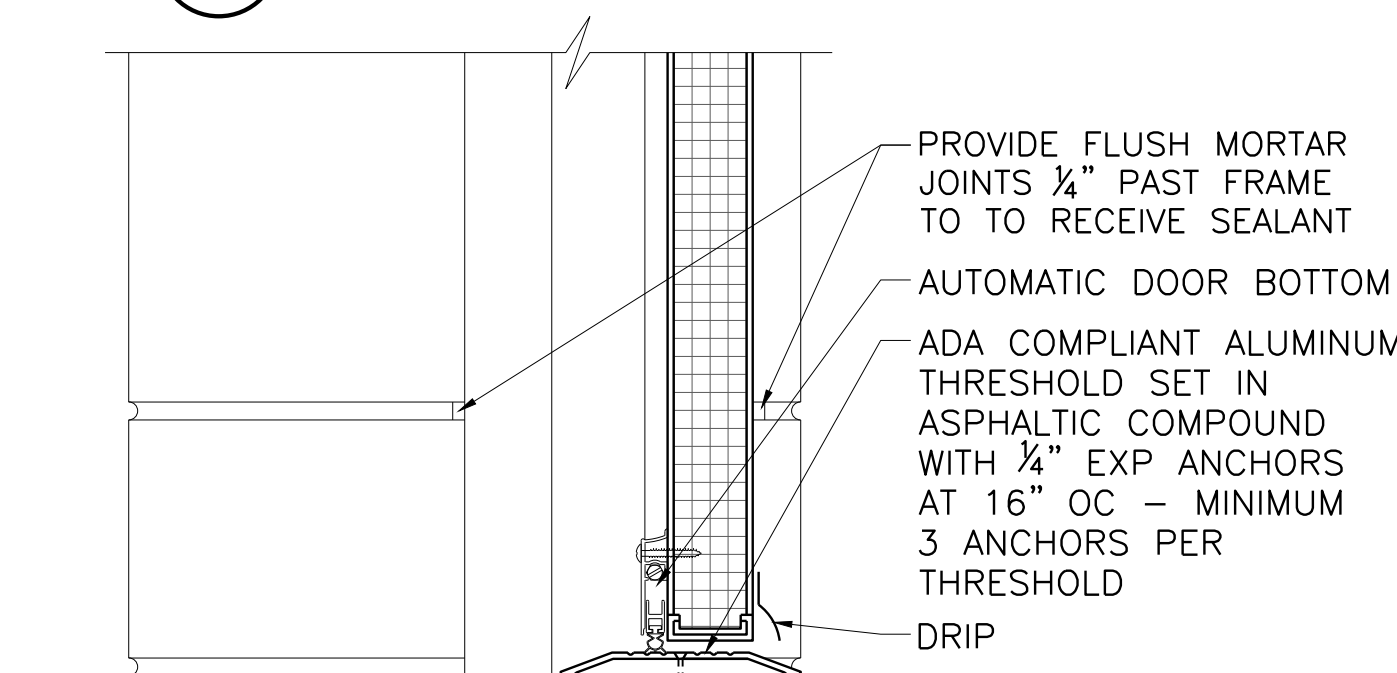
5 HEAD

3" = 1'-0"



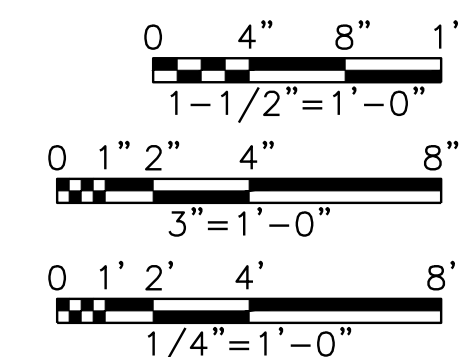
6 JAMB

3" = 1'-0"



7 SILL

3" = 1'-0"



Item 12

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Texas Registered Engineering Firm F-2144
05/07/2020

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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ARCHITECTURE
**VALVE VAULT
DOOR SCHEDULE AND DETAILS**

PRJ18708	DATE	DESIGNED	DRAWN	CHECKED	FILE NAME
MAY 2020		PKJ	BRAWN	NEL	Ar-Vol-Dt-Door.dwg
NO. ISSUE	BY	DATE	DESIGNED	DRAWN	CHECKED
SHEET A-4					
SEQ. 37					

GENERAL NOTES

- DESIGN IS IN ACCORDANCE WITH THE 2015 INTERNATIONAL BUILDING CODE (IBC), INCLUDING LOCAL AMENDMENTS AND APPLICABLE CODE REFERENCED STANDARDS.
- DEAD LOADS: ACTUAL WEIGHTS OF MATERIALS OF CONSTRUCTION AND FIXED SERVICE EQUIPMENT.
- LIVE LOADS:
 - ELECTRICAL BUILDING ROOF: 20 PSF
 - ELECTRICAL BUILDING FLOOR; VAULT TOP SLAB: 150 PSF
 - VAULT FLOOR SLAB: 150 PSF
 - STAIRS: 100 PSF
 - GRATING: SAME AS SURROUNDING AREA BUT NOT LESS THAN 100 PSF.
- GROUND SNOW LOAD: $P_g = 5$ PSF
- LATERAL LOADS:
 - RISK CATEGORY III
 - WIND LOAD:
 - ULTIMATE DESIGN WIND SPEED (3-SEC PEAK GUST): $V_{ULT} = 120$ MPH
 - WIND EXPOSURE: C
 - INTERNAL PRESSURE COEFFICIENT: $G_{CPI} = +/-0.18$
 - COMPONENTS AND CLADDING PRESSURES, FOR VARIOUS ZONES AS DEFINED BY ASCE 7-10 FIGURE 30.4 ARE AS FOLLOWS:

STRENGTH DESIGN WIND PRESSURE FOR COMPONENTS AND CLADDING (PSF)		
ZONE	POSITIVE PRESSURE	NEGATIVE PRESSURE
1	+21.49	-39.19
2	+21.49	-59.42
3	+21.49	-84.71
4	+36.66	-38.94
5	+36.66	-45.77

PRESSURES SHOWN HAVE BEEN MULTIPLIED BY A 1.0 LOAD FACTOR

- SEISMIC LOAD
 - SEISMIC IMPORTANCE FACTOR: $I = 1.25$
 - MAPPED SPECTRAL ACCELERATIONS: $S_s = 0.104$, $S_1 = 0.055$
 - SITE CLASS: C
 - SPECTRAL RESPONSE COEFFICIENTS: $S_{D1} = 0.083$, $S_{D2} = 0.062$
 - SEISMIC DESIGN CATEGORY: A
 - BASIC SEISMIC FORCE-RESISTING SYSTEM:
 - ORDINARY REINFORCED CONCRETE SHEAR WALLS
 - ORDINARY REINFORCED MASONRY SHEAR WALLS
 - DESIGN BASE SHEAR $V = 0.01W$
- VERIFY ALL DIMENSIONS, ELEVATIONS, OPENING SIZES, AND MECHANICAL AND ELECTRICAL EQUIPMENT WEIGHTS PRIOR TO STARTING WORK.
- REMOVE ALL ABANDONED FOUNDATIONS, UTILITIES, PIPELINES, ETC. THAT INTERFERE WITH NEW CONSTRUCTION.
- FIELD VERIFY ALL EXISTING CONDITIONS, INCLUDING LOCATIONS AND DIMENSIONS OF ALL EXISTING CONSTRUCTION AND UTILITIES. NOTIFY ENGINEER IF THERE IS A CONFLICT BETWEEN THE CONTRACT DOCUMENTS AND EXISTING CONDITIONS BEFORE PROCEEDING WITH WORK.
- PROVIDE EXCAVATION SHORING TO PROTECT AND SUPPORT FOUNDATION SOILS UNDER EXISTING STRUCTURES.
- THE STRUCTURES ARE DESIGNED FOR STABILITY IN THE FINAL CONDITION ONLY. PROVIDE TEMPORARY BRACING AND SHORING AS REQUIRED FOR STABILITY DURING CONSTRUCTION.
- PLANS, SECTIONS, AND DETAILS ARE NOT TO BE SCALED FOR DETERMINATION OF QUANTITIES, LENGTHS, OR FIT OF MATERIALS.
- SEE OTHER DISCIPLINE DRAWINGS FOR SIZE AND LOCATION OF ALL OPENINGS, DEPRESSIONS, OFFSETS, SLEEVES, CURBS, PADS, INSERTS, ETC. NOT SHOWN ON STRUCTURAL DRAWINGS. BEFORE FABRICATION OF MATERIALS, COORDINATE WITH MECHANICAL AND ELECTRICAL EQUIPMENT REQUIREMENTS.
- THE GENERAL NOTES AND TYPICAL DETAILS ARE GENERAL AND APPLY TO THE ENTIRE PROJECT EXCEPT WHERE THERE ARE SPECIFIC INDICATIONS TO THE CONTRARY.

CONCRETE

- CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI, UNLESS SPECIFIED OTHERWISE.
- REINFORCING SHALL BE IN ACCORDANCE WITH ASTM A615, GRADE 60, DEFORMED.
- CONCRETE CLEAR COVER OVER REINFORCING SHALL BE AS LISTED BELOW, UNLESS NOTED OTHERWISE.
 - CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH: 3"
 - ALL OTHER: 2"
 - SEE DRAWINGS FOR EXCEPTIONS
- ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4" INSIDE FORMS OR TOOLED TO 3/4" RADIUS ON SLABS, UNLESS NOTED OTHERWISE.
- IN CASES WHERE REINFORCING BARS CANNOT BE EXTENDED AS FAR AS REQUIRED DUE TO THE LIMITED EXTENT OF THE ADJACENT CONCRETE STRUCTURE, THE BARS SHALL EXTEND AS FAR AS POSSIBLE AND END IN STANDARD HOOKS.

- HOOKS SHOWN ON DRAWINGS SHALL BE ASSUMED TO BE STANDARD HOOKS PER ACI 318, UNLESS NOTED OTHERWISE.
- LAP SPLICES IN WALLS SHALL BE STAGGERED, UNLESS NOTED OTHERWISE.
- ALL REINFORCING SHALL BE CONTINUOUS. CONTINUOUS BARS SHALL LAP 48 BAR DIAMETERS OF SMALLER BAR LAPPED, UNLESS NOTED OTHERWISE. ALL REBAR EMBEDMENT LENGTHS SHALL BE 36 BAR DIAMETERS, UNLESS NOTED OTHERWISE.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF ALL FORMING, TEMPORARY BRACING, AND SHORING.

FOUNDATION

- FOUNDATIONS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE TECHNICAL MEMORANDUM "GEOTECHNICAL INVESTIGATION - METER VAULT RELOCATION", DATED MAY 2019 PREPARED BY FREESE AND NICHOLS, INC. (REPORT NO. PRP18708).
- EXCAVATION, SUBGRADE PREPARATION, AND BACKFILL
 - REMOVE THE SURFICIAL VEGETATION, WASTE AND LOOSE SOILS TO A MINIMUM DEPTH OF 12".
 - EXCAVATE THE SITE TO THE PROPOSED FINISHED SUBGRADE. EXTEND THE LATERAL LIMITS OF THE EXCAVATION 2'-0" BEYOND THE PERIMETER OF THE FOUNDATION.
 - PROOF ROLL THE EXPOSED SUBGRADE IN ACCORDANCE WITH TXDOT ITEM 216. SOFT OR PUMPING SUBGRADE AREAS SHALL BE EXCAVATED IN BOTH HORIZONTAL AND VERTICAL DIRECTIONS EXPOSING COMPETENT SUBGRADE. GRADE SHALL BE RESTORED WITH COMPACTED EXCAVATED ONSITE SOIL.
 - BACKFILL MATERIALS:
 - NON-EXPANSIVE SELECT FILL (CLASS 4 EARTH FILL): MAXIMUM OF 70 PERCENT PASSING THE NO. 200 SIEVE, LIQUID LIMIT LESS THAN OR EQUAL TO 35, PLASTICITY INDEX BETWEEN A MINIMUM OF 7 AND A MAXIMUM OF 15, MAXIMUM AGGREGATE SIZE OF 2", NO ORGANICS. COMPACT TO A MINIMUM OF 95 PERCENT TO A MAXIMUM OF 100 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698 (STANDARD PROCTOR), AND AT A MOISTURE CONTENT WITHIN 1 PERCENT BELOW TO 2 PERCENT ABOVE THE OPTIMUM MOISTURE CONTENT.
 - GENERAL FILL: ON-SITE CLAYS, MAXIMUM AGGREGATE SIZE OF 2", NO ORGANICS. COMPACT TO A MINIMUM OF 95 PERCENT TO A MAXIMUM OF 100 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698 (STANDARD PROCTOR), AND AT A MOISTURE CONTENT WITHIN OPTIMUM TO 3 PERCENT ABOVE THE OPTIMUM MOISTURE CONTENT.
 - CRUSHED LIMESTONE BASE MATERIAL: TXDOT STANDARD SPECIFICATION ITEM 247, GRADE 1 OR 2, TYPE A. COMPACT TO A MINIMUM OF 100 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY TEX-113-E, AND AT A MOISTURE CONTENT WITHIN 2 PERCENT BELOW TO OPTIMUM OF THE OPTIMUM MOISTURE CONTENT.
 - FLOWABLE FILL: AS SPECIFIED IN SECTION 31 23 23.34 FLOWABLE FILL.
- BACKFILL SHALL BE PLACED IN MAXIMUM 8" LOOSE LIFTS FOR HEAVY EQUIPMENT AND 4" LOOSE LIFTS FOR HAND-DIRECTED EQUIPMENT. USE HAND-DIRECTED EQUIPMENT WITHIN 5' OF STRUCTURES.
- IN-PLACE FIELD DENSITY TESTS SHALL BE CONDUCTED AT A RATE OF ONE TEST PER 1,000 SQUARE FEET FOR EVERY LIFT, WITH A MINIMUM OF 3 TESTS FOR EVERY LIFT.
- MAINTAIN THE SUBGRADE MOISTURE CONTENT AND DENSITY DURING CONSTRUCTION.
- ALL BELOW GRADE FOUNDATION ELEMENTS ARE DESIGNED WITH FORMED SIDES.
- DO NOT BACKFILL FOUNDATION WALLS UNTIL CONCRETE HAS REACHED ITS SPECIFIED 28-DAY COMPRESSIVE STRENGTH OR 7 DAYS, WHICHEVER IS LONGER, OR UNTIL THE RESTRAINING SLABS OR ADEQUATE BRACING ARE IN PLACE.
- EXTERIOR SLABS SHALL SLOPE AWAY FROM THE STRUCTURES A MINIMUM OF 1/4" PER FOOT UNLESS NOTED OTHERWISE. GRADING AROUND STRUCTURES SHALL BE SLOPED TO DRAIN ALL WATER AWAY FROM STRUCTURES.
- ALLOWABLE NET BEARING PRESSURE:
 - ALLOWABLE NET BEARING PRESSURE IS 3500 PSF. PLACE 3" MUD SLAB WITHIN 8 HOURS OF COMPLETING EXCAVATION.
 - SUITABLE BEARING MATERIALS SHALL BE VERIFIED BY A LICENSED PROFESSIONAL GEOTECHNICAL ENGINEER.
- DEWATERING: AFTER COMPLETION OF EXCAVATION, WATER FROM ALL SOURCES AT ALL TIMES SHALL BE MAINTAINED AT LEAST 2 FEET BELOW THE LOWEST FOUNDATION BOTTOM ELEVATION.

POST-INSTALLED ANCHORS (EXPANSION OR ADHESIVE)

- INSTALL IN ACCORDANCE WITH MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII), BUT NOT LESS THAN THAT INDICATED BELOW.
- ADHESIVE ANCHORS SHALL ONLY BE INSTALLED BY CONSTRUCTION PERSONNEL CERTIFIED UNDER ACI/CRSI ADHESIVE ANCHOR INSTALLER CERTIFICATION PROGRAM. SUBMIT CERTIFICATIONS AS RECORD DATA.
- ANCHOR DIAMETER AND EMBEDMENT SHALL BE AS INDICATED. USE STANDARD EMBEDMENT DEPTH AS RECOMMENDED BY MANUFACTURER IF EMBEDMENT DEPTH IS NOT INDICATED.
- HOLES SHALL BE DRILLED USING ROTARY HAMMER DRILLS WITH ANSI MATCHED TOLERANCE CARBIDE-TIPPED DRILL BITS. DRILL BIT DIAMETER SHALL MATCH DIAMETER RECOMMENDED BY MANUFACTURER.
- USE CARE AND CAUTION WHEN INSTALLING TO AVOID CUTTING OR DAMAGING EXISTING REINFORCING STEEL.
- AS INDICATED BLOW HOLES CLEAN WITH COMPRESSED AIR, 80 PSI MINIMUM. START BLOWING WITH NOZZLE AT BACK OF HOLE AND SLOWLY EXTRACT NOZZLE.
- EXPANSION ANCHORS SHALL BE A STUD BOLT TYPE WITH HEX HEAD NUT AND SHALL BE TYPE 316 STAINLESS STEEL, UNLESS NOTED OTHERWISE, AND AS NOTED BELOW:
 - ANCHORS SHALL BE HILTI KWIK BOLT TZ, OR AN APPROVED EQUAL.
 - BLOW HOLES CLEAN. REPEAT 3 TIMES.
 - DRIVE ANCHOR INTO HOLE WITH A HAMMER AND THEN TIGHTEN TO SPECIFIED TORQUE.

- ADHESIVE ANCHORS SHALL BE ASTM A615, GRADE 60, DEFORMED REINFORCING BARS OR TYPE 316 STAINLESS STEEL THREADED ROD, UNLESS OTHERWISE NOTED, AND AS NOTED BELOW:
 - ADHESIVE SHALL BE HILTI HIT-RE 500 V3 OR AN APPROVED EQUAL. USE HILTI HIT-HY 70 FOR HOLLOW OR GROUTED MASONRY OR AN APPROVED EQUAL.
 - PRIOR TO INSTALLATION: ALL DEFORMED BARS AND THREADED ROD SHALL BE CLEAN, FREE OF OIL, GREASE, OR OTHER RESIDUE, IN ACCORDANCE WITH MPII.
 - CLEAN HOLES BEFORE INSTALLING ANCHOR PER MPII, BUT NOT LESS THAN THE FOLLOWING:
 - BLOW HOLE CLEAN. REPEAT 3 TIMES.
 - BRUSH HOLE WITH SPECIFIED BRUSH. REPEAT 3 TIMES.
 - BLOW HOLE CLEAN. REPEAT 3 TIMES.
 - INSTALL EPOXY STARTING AT BACK OF HOLE. AS REQUIRED BY MPII, USE MANUFACTURER SUPPLIED PISTON PLUG INJECTION SYSTEM FOR ALL HORIZONTAL AND VERTICALLY INCLINED HOLES.
 - INSTALL ANCHOR BY SIMULTANEOUSLY TWISTING AND INSERTING INTO HOLE.
 - ALLOW ANCHOR TO SET REQUIRED TIME. DO NOT DISTURB.
 - TIGHTEN NUT. DO NOT OVER-TORQUE.
 - MINIMUM CONCRETE AGE AT TIME OF INSTALLATION: 28 DAYS
 - CONCRETE TEMPERATURE RANGE AT TIME OF INSTALLATION SHALL BE: 41DEG F TO 104DEG F.
 - CONCRETE MOISTURE CONDITION AT TIME OF INSTALLATION: DRY.

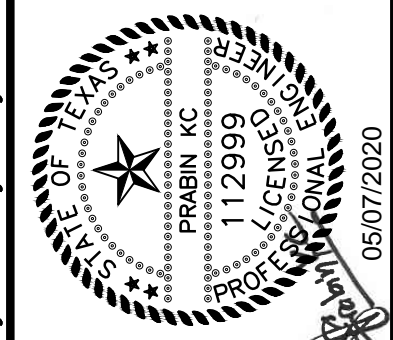
REINFORCED HOLLOW CMU

- CONCRETE MASONRY UNITS SHALL BE IN ACCORDANCE WITH ASTM C90 AND HAVE A MINIMUM NET AREA COMPRESSIVE STRENGTH OF 1,900 PSI.
- LINTEL BLOCKS SHALL NOT BE USED AS BOND BEAM BLOCKS EXCEPT WHERE BOTTOM OF BOND BEAM EQUALS TOP OF OPENING.
- TYPE S PORTLAND CEMENT-LIME MORTAR SHALL BE USED AND SHALL BE PROPORTIONED ACCORDING TO THE PROPORTIONING SPECIFICATION REQUIREMENTS GIVEN IN ASTM C270.
- CELLS WHICH CONTAIN REINFORCING STEEL SHALL BE FILLED SOLIDLY WITH GROUT, INCLUDING BOND BEAMS AND LINTELS. GROUT SHALL BE PROPORTIONED BY VOLUME ACCORDING TO ASTM C476.
- MASONRY DESIGN IS BASED ON A SPECIFIED COMPRESSIVE STRENGTH OF MASONRY, f'_m , EQUAL TO 1,900 PSI.
- REINFORCING SHALL BE IN ACCORDANCE WITH ASTM A615, GRADE 60, DEFORMED.
- VERTICAL CELLS TO BE FILLED SHALL HAVE VERTICAL ALIGNMENT SUFFICIENT TO MAINTAIN A CLEAR UNOBSTRUCTED CONTINUOUS VERTICAL CELL NOT LESS THAN 3" x 3" IN PLAN DIMENSIONS.
- FOUNDATION DOWELS SHALL EXTEND A MINIMUM OF 30 BAR DIAMETERS INTO THE FOUNDATION CONCRETE AND 60 BAR DIAMETERS INTO THE MASONRY WALL, UNLESS NOTED OTHERWISE. REFER TO MASONRY LAP SPLICE SCHEDULE FOR LAP SPLICE LENGTHS FOR REINFORCING.
- THERE SHALL BE A FOUNDATION DOWEL FOR EACH VERTICAL REINFORCING BAR EXCEPT AS NOTED FOR JAMB BARS. FOUNDATION DOWELS FOR JAMB BARS ARE ONLY REQUIRED WHEN BAR DEVELOPMENT LENGTH DOES NOT EXIST BELOW OPENING.
- VERTICAL WALL REINFORCING SHALL EXTEND CONTINUOUSLY FROM THE TOP OF FOUNDATION TO 2" BELOW TOP OF WALL.
- AN ADDITIONAL VERTICAL BAR WITH FOUNDATION DOWEL, SAME SIZE AND LENGTH AS THE NORMAL REINFORCING BAR SHALL BE PLACED:
 - ON EACH SIDE OF CONTROL JOINTS
 - AT INTERSECTION OF EXTERIOR WALLS
- CONTROL JOINTS SHALL NOT EXTEND THROUGH BOND BEAMS AND LINTELS. INSTEAD THE JOINT SHALL EXTEND TO THE BOTTOM OF THE BOND BEAM/LINTEL AND THEN RESUME ABOVE THE BOND BEAM/LINTEL. WHERE BOND BEAM/LINTEL ARE EXPOSED TO VIEW, SAW A VERTICAL GROOVE IN THE BOND BEAM/LINTEL, APPROXIMATELY 3/8" DEEP AND THE SAME WIDTH AS THE CONTROL JOINT, TO RESEMBLE THE CONTROL JOINT. FILL CONTROL JOINTS AND SAWED JOINT WITH SEALANT.
- BOND BEAMS SHALL BE CONTINUOUS AT ALL CORNERS, UNLESS NOTED OTHERWISE. USE CORNER BARS SAME SIZE AND NUMBER AS BOND BEAM REINFORCING, 2'-0" EACH LEG. STAGGER HORIZONTAL LAPS IN BOND BEAMS.
- BRACE TOP OF CMU WALLS UNTIL ROOF FRAMING AND DECK ARE INSTALLED.

IBC CHAPTER 17 SPECIAL INSPECTION REQUIREMENTS

- THE OWNER OR THE OWNER'S REPRESENTATIVE IS REQUIRED TO PERFORM SPECIAL INSPECTIONS IN ACCORDANCE WITH THE INTERNATIONAL BUILDING CODE.
- THE CONTRACTOR IS REQUIRED TO ENABLE THE ABOVE INSPECTIONS TO OCCUR BY PROVIDING ACCESS TO THE ELEMENTS REQUIRING INSPECTION. IN ADDITION, THE CONTRACTOR SHALL PROVIDE 48 HOURS ADVANCED NOTICE TO THE OWNER OR THE OWNER'S REPRESENTATIVE REGARDING ALL CONSTRUCTION ACTIVITIES RELATED TO AND/OR AFFECTING THE REQUIRED SPECIAL INSPECTIONS.

Item 12.

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TOWN OF PROSPER, TEXAS
STRUCTURAL

CUSTER ROAD PUMP STATION
GENERAL NOTES

METER VAULT RELOCATION

PRP18708
DATE MAY 2020
DESIGNED PKC
DRAWN JLM
REUSED
CHECKED MFR

NO. ISSUE
DATE
BY
FILE NAME

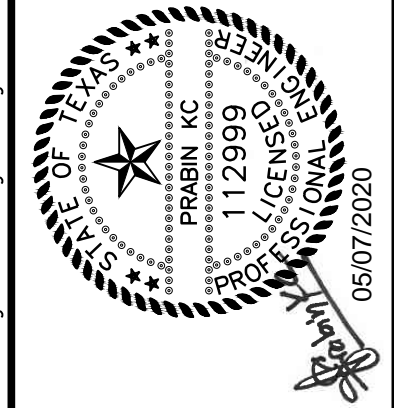
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
STRUCTURAL
**VALVE VAULT
SECTIONAL PLAN**

PRP18708	PRP18708
DATE MAY 2020	DATE MAY 2020
DESIGNED PKC	DESIGNED PKC
DRAWN JLM	DRAWN JLM
CHECKED MFR	CHECKED MFR

NO.	ISSUE	DATE	BY

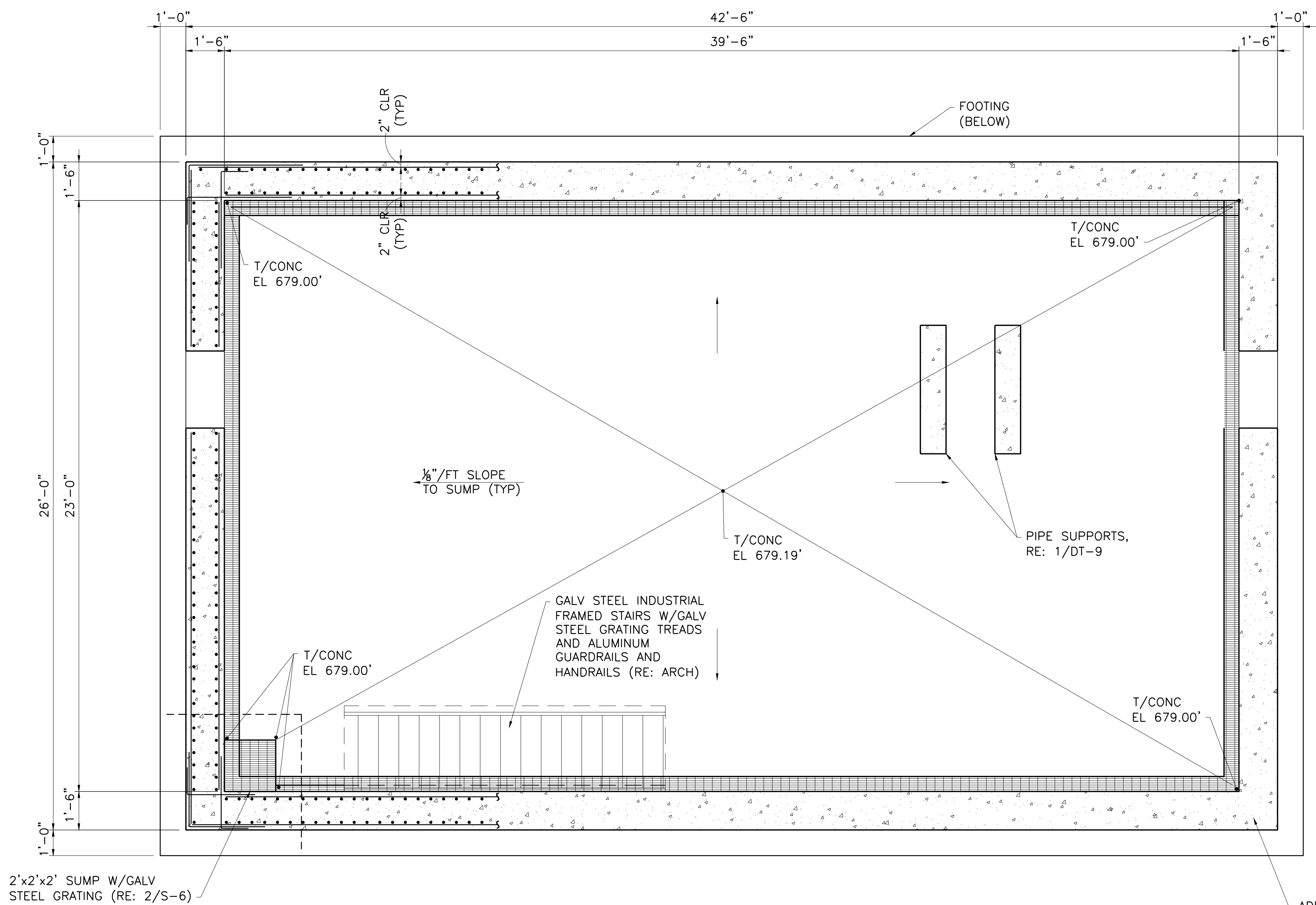
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VERIFY SCALE


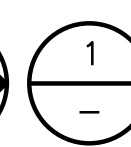
0 1 2 3 4

3/8" = 1'-0"

SHEET	S-2
SEQ.	40

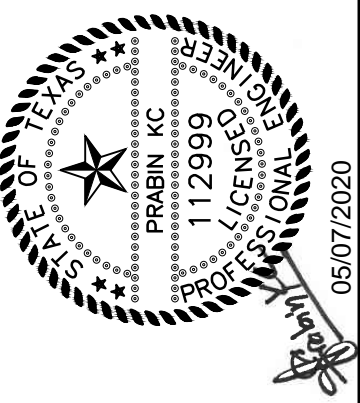


- NOTES:**
1. PIPE SUPPORT NOT SHOWN, REFER TO CIVIL FOR LOCATION AND DETAILS.
 2. GROUND PAD FOR INTERNAL CONNECTIONS TO VAULTS. GROUND WIRE WILL NEED TO BE INSTALLED PRIOR TO POURING OF CONCRETE.

  **SECTIONAL PLAN**
3/8" = 1'-0"

0 1' 2' 4'
3/8" = 1'-0"

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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
STRUCTURAL
**VALVE VAULT
TOP PLAN**

PRJ NO.	PRP18708
DATE	MAY 2020
DESIGNED	PKC
DRAWN	JLM
REVISION	
CHECKED	MFR
FILE NAME	ST-VAL-PL-TOPP.dwg

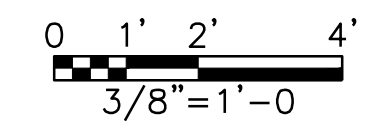
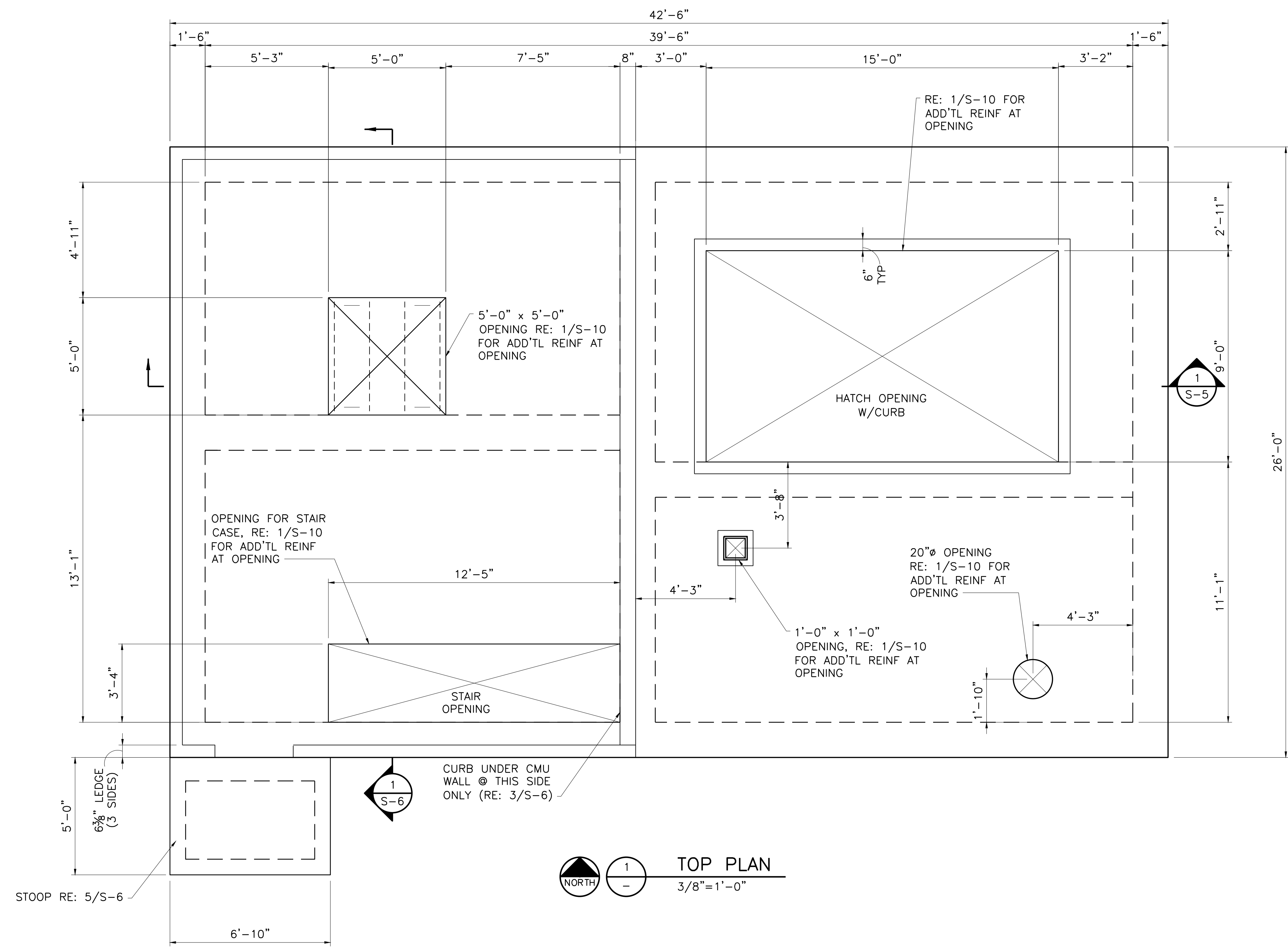
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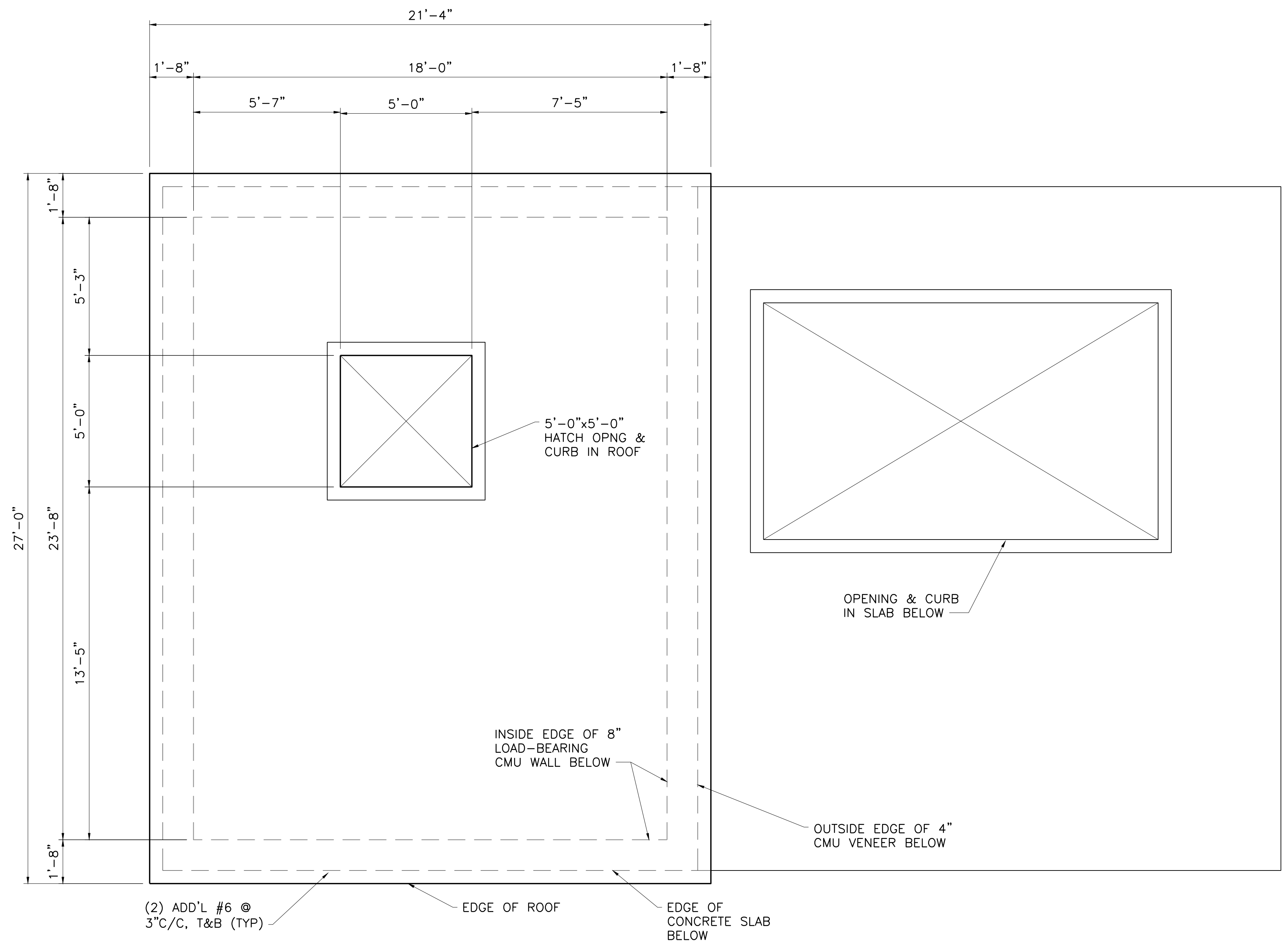
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SHEET S-3

SEQ. 41





(2) ADD'L #6 @ 3"C/C, T&B (TYP)

EDGE OF ROOF

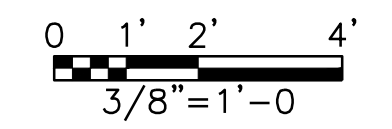
EDGE OF CONCRETE SLAB BELOW



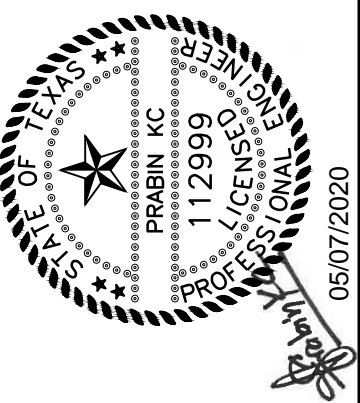
1
-

BUILDING ROOF PLAN

3/8"=1'-0"



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
STRUCTURAL
**VALVE VAULT
ROOF PLAN**

PRJ JOB NO.	PRP18708
DATE	MAY 2020
DESIGNED	PKC
DRAWN	JLM
REVISION	
CHECKED	MFR
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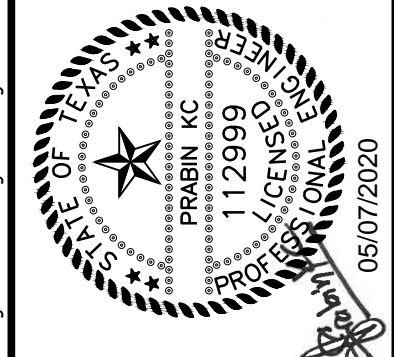
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VERIFY SCALE

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NO.	ISSUE	BY	DATE
SHEET			
S-4			
SEQ.			
42			

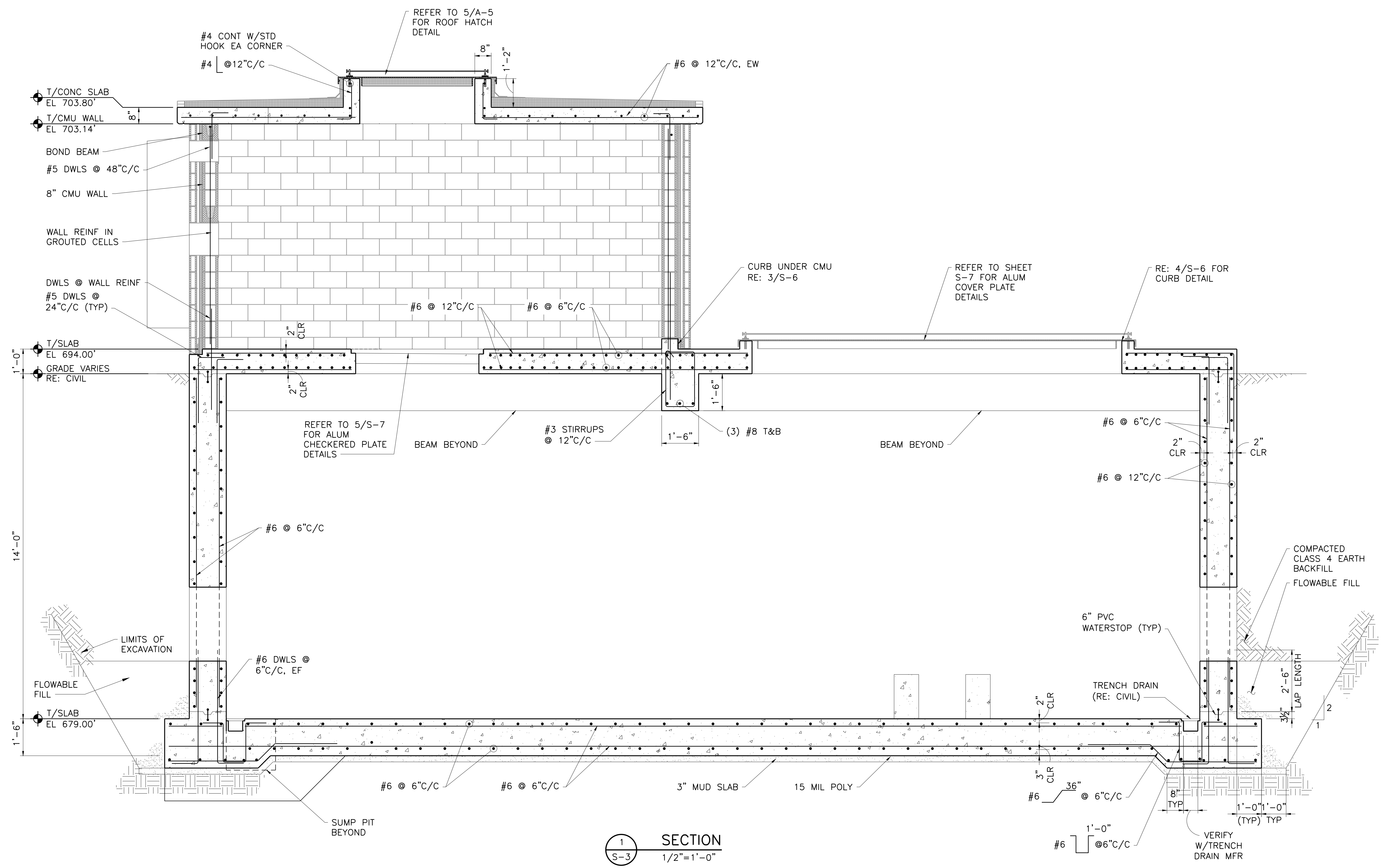
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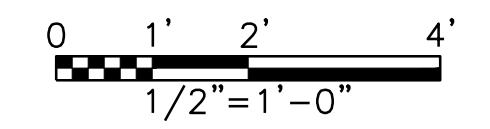
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
STRUCTURAL
**VALVE VAULT
SECTION**

PRJ NO.	PRP18708	DATE	MAY 2020	DESIGNED	PKC	DRAWN	JLM	REVISION		CHECKED	MFR
FILE NAME	ST-VAL-SC-CONC03.dwg										
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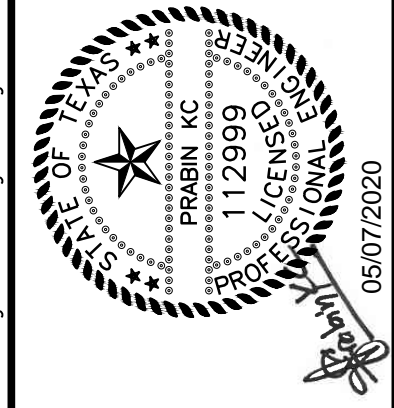


SECTION
1/2" = 1'-0"



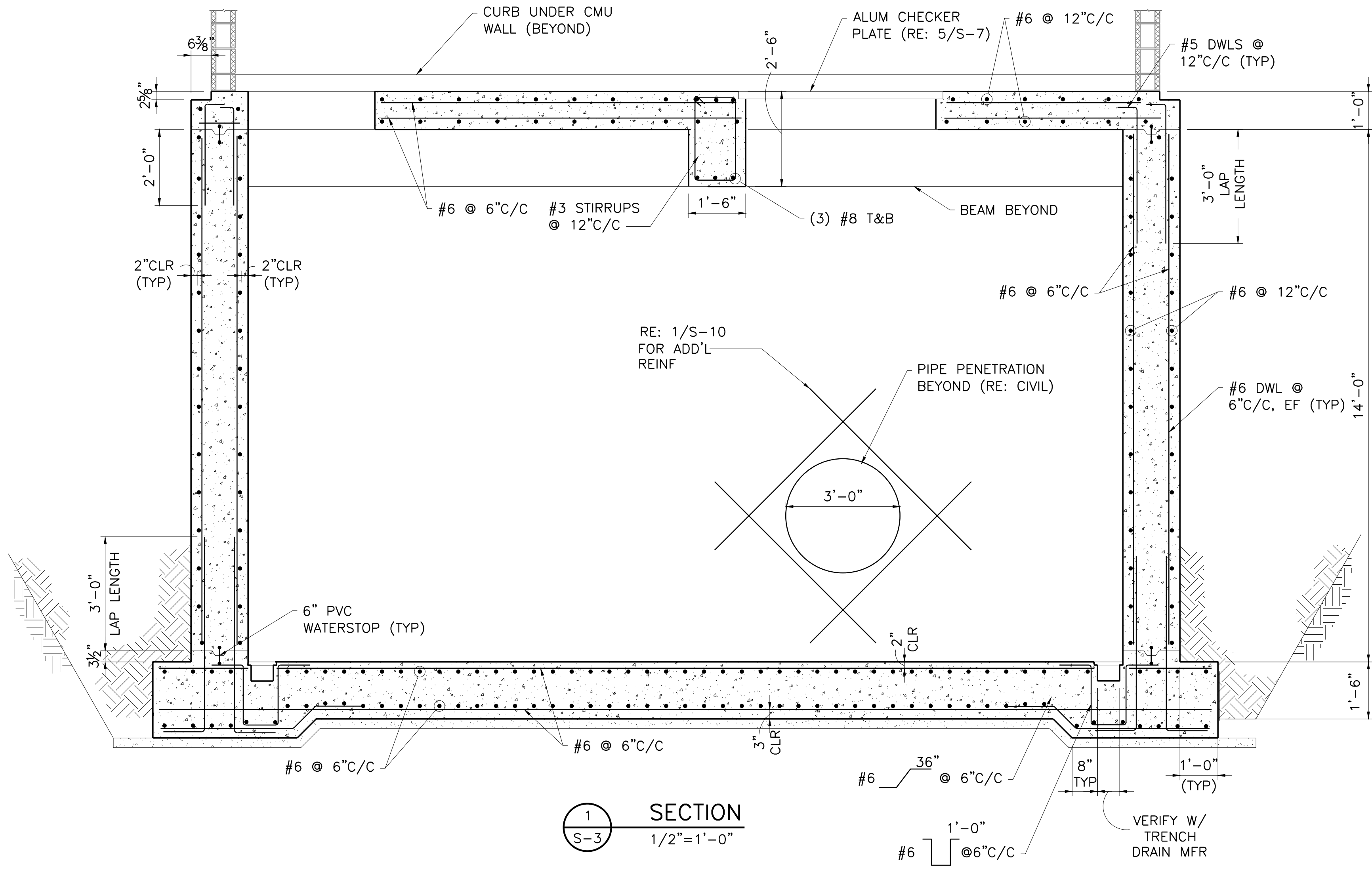
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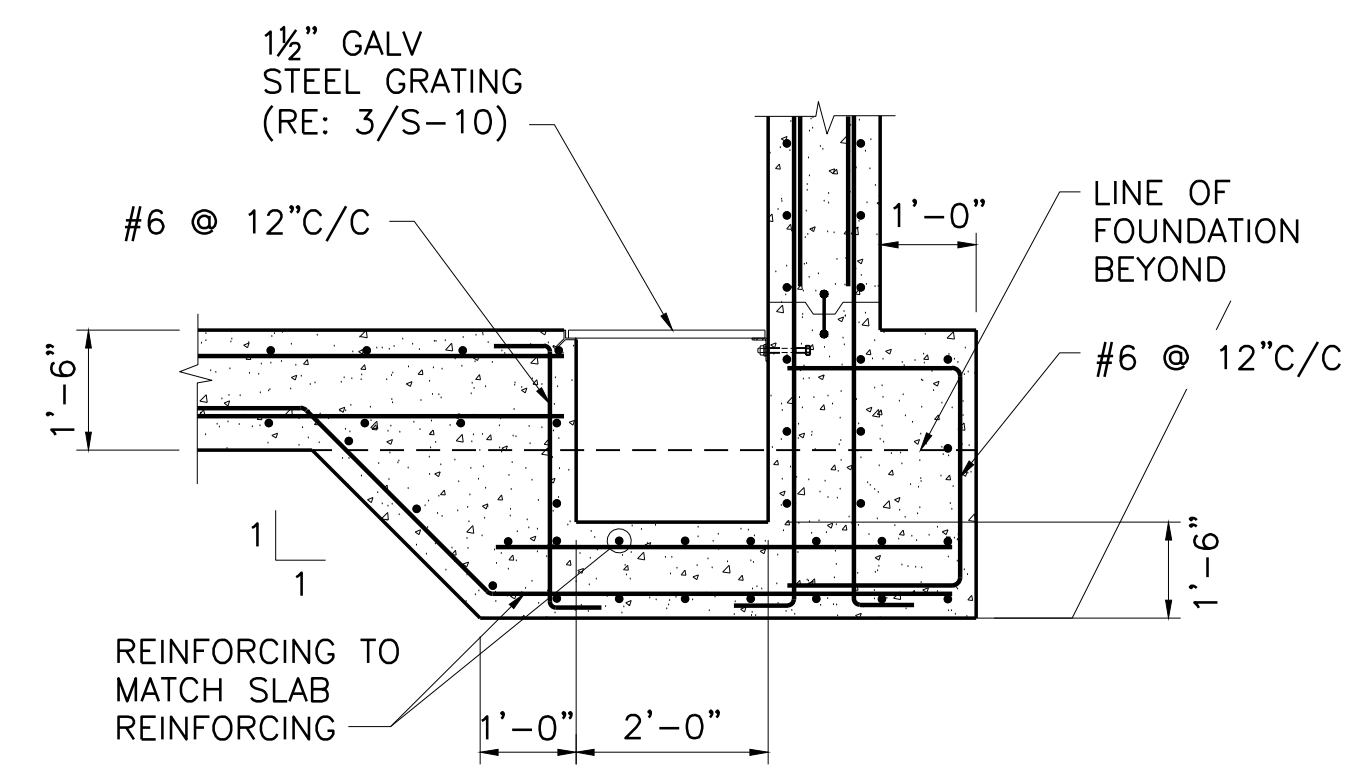


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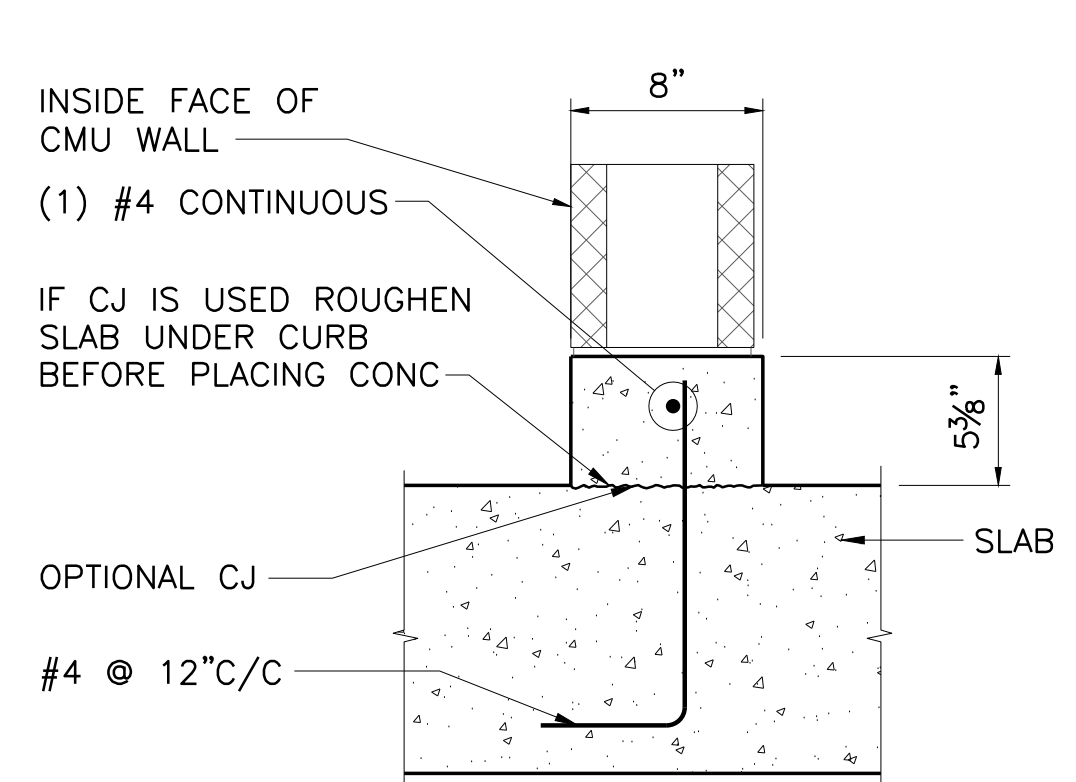
TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
STRUCTURAL
**VALVE VAULT
SECTIONS AND DETAILS**



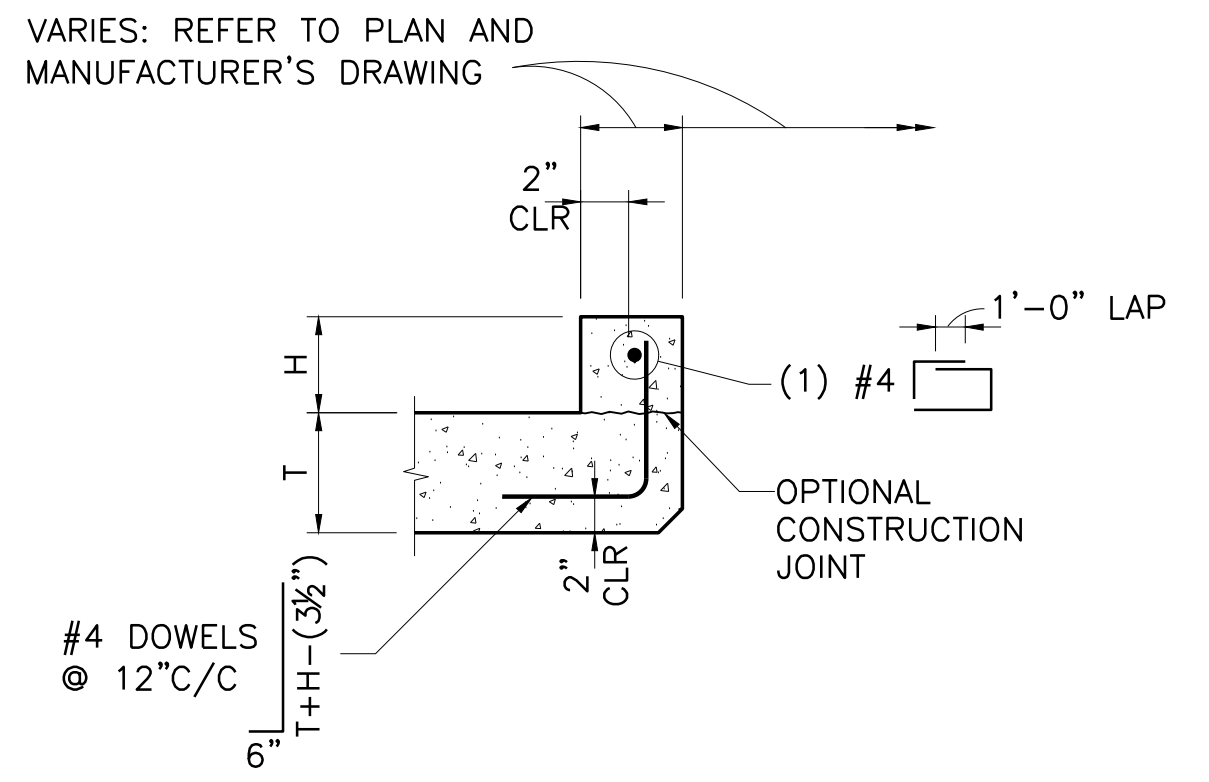
1 SECTION
1/2"=1'-0"



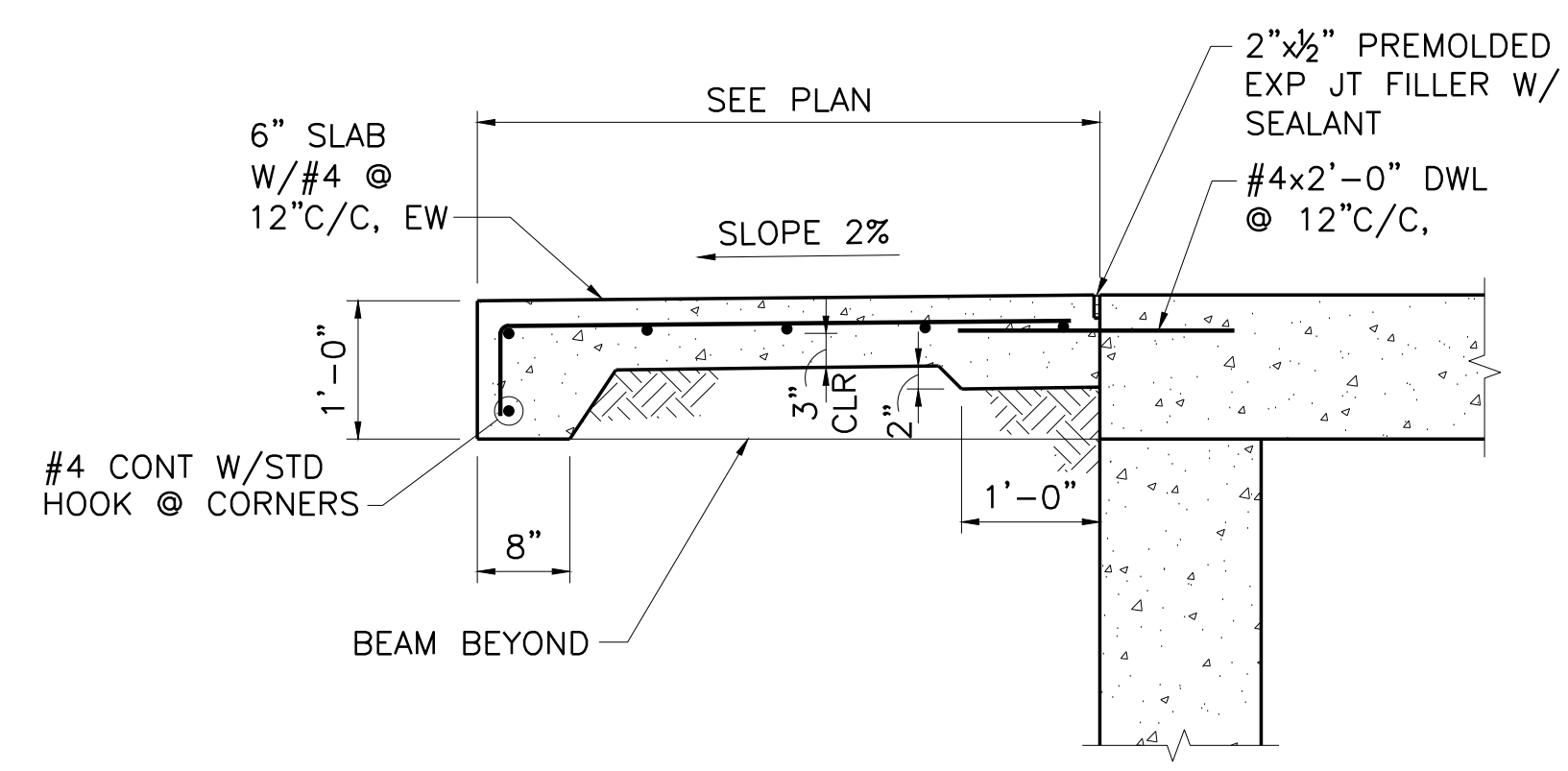
2 SUMP SECTION
1/2"=1'-0"



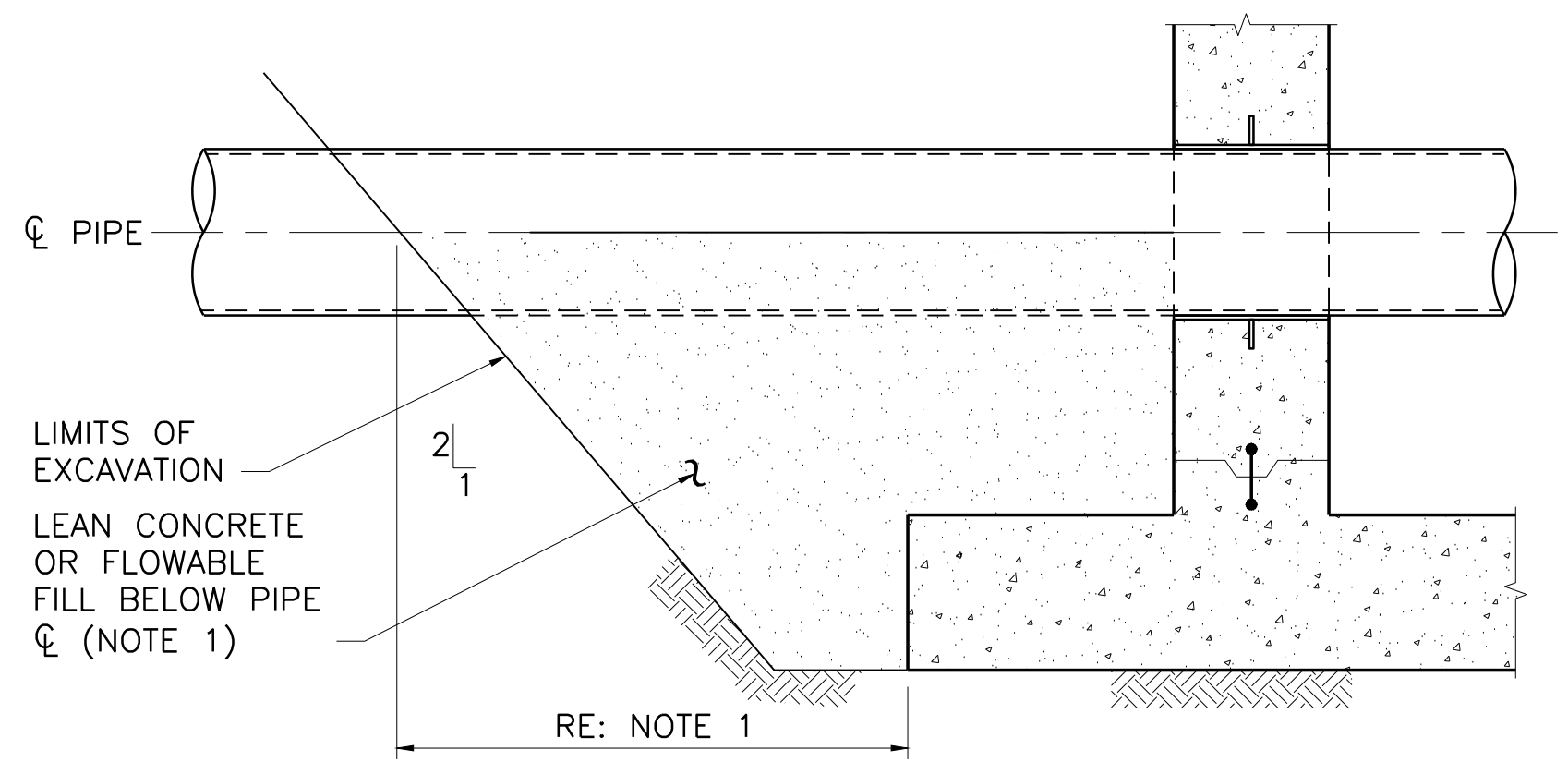
3 CURB AT CMU WALL
NOT TO SCALE



4 CURB AT OPENINGS
NOT TO SCALE

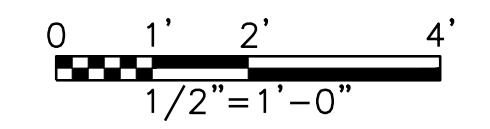


5 STOOP DETAIL
NOT TO SCALE



DETAIL NOTE:
1. CONCRETE FILL SHALL EXTEND TO THE LIMITS OF THE EXCAVATION, BUT NOT LESS THAN THE PIPE DIAMETER OR 1'-0", WHICHEVER IS GREATER. THE WIDTH OF FILL BELOW PIPE SHALL NOT BE LESS THAN 2'-0" PLUS THE WIDTH OF PIPE OUTSIDE DIAMETER.
2. DO NOT ENCASE RESTRAINED OR UNRESTRAINED COUPLINGS.

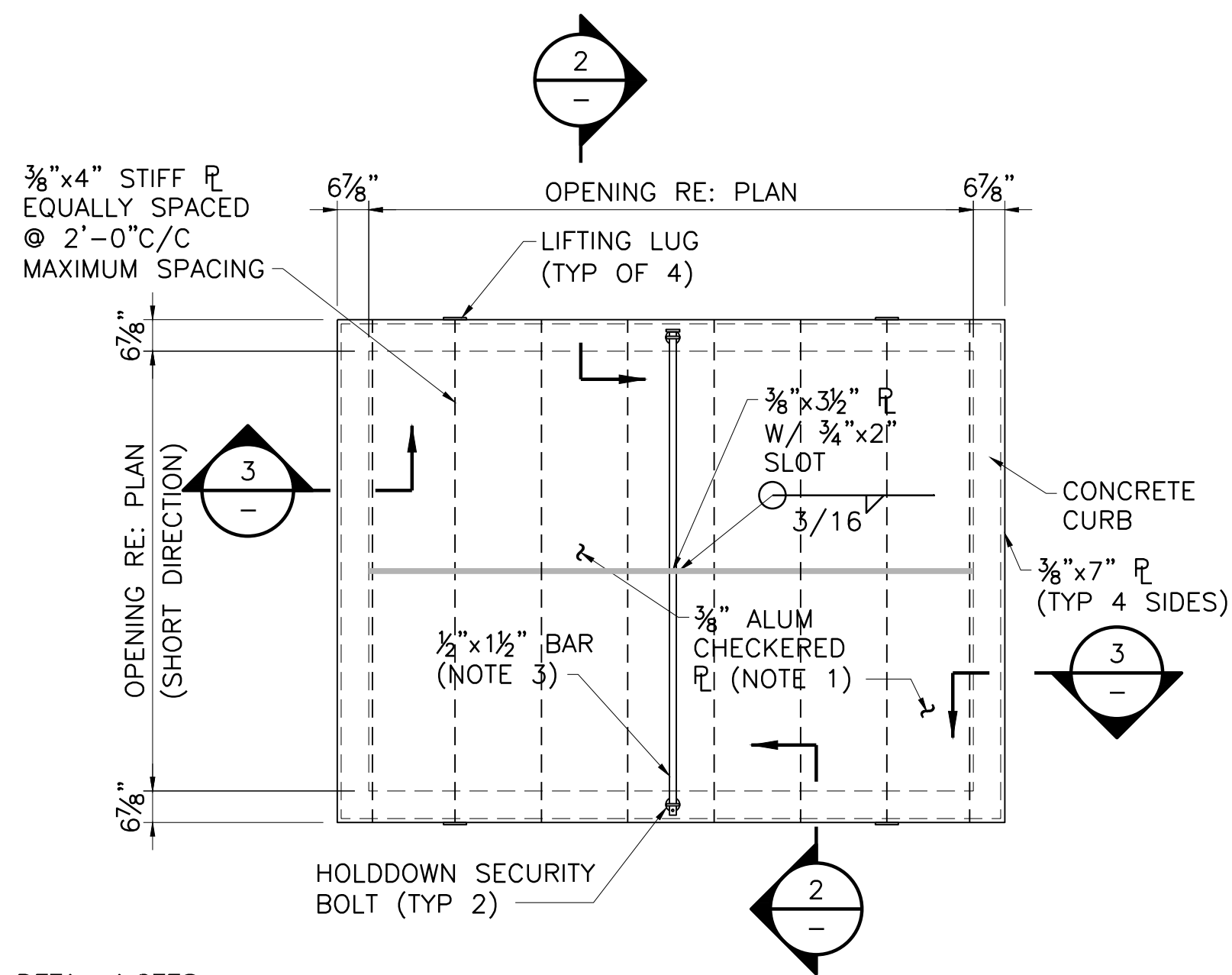
6 PIPE PENETRATION DETAIL
NOT TO SCALE



PRJ NO.	PRP18708	DATE	MAY 2020	DESIGNED	PKC	DRAWN	JLM	CHECKED	MFR	FILE NAME	ST-VAL-SC-CONC02.dwg
BY		DATE		DESIGNED		DRAWN		CHECKED		VERIFY SCALE	Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
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SHEET										1	
SEQ.										44	

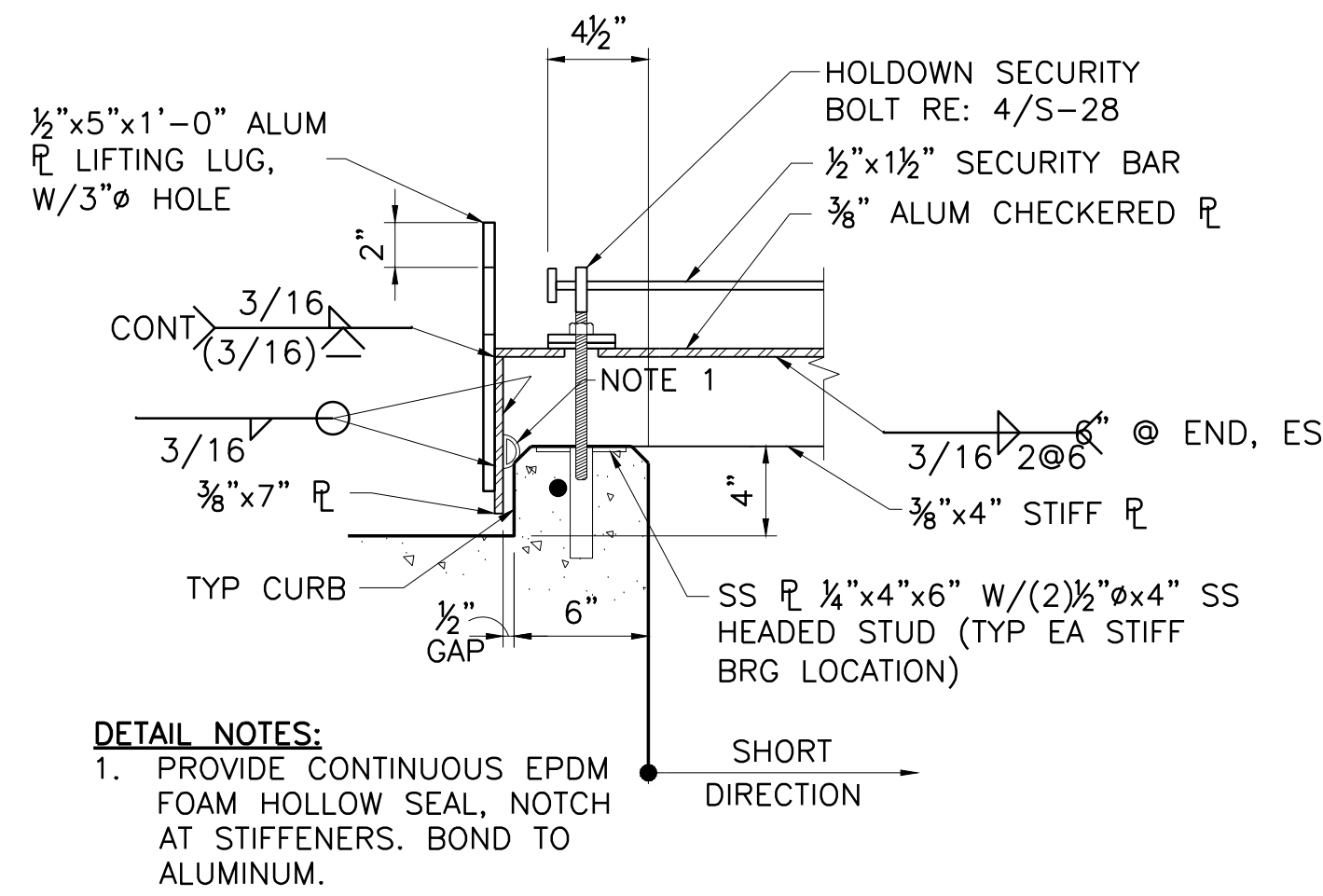
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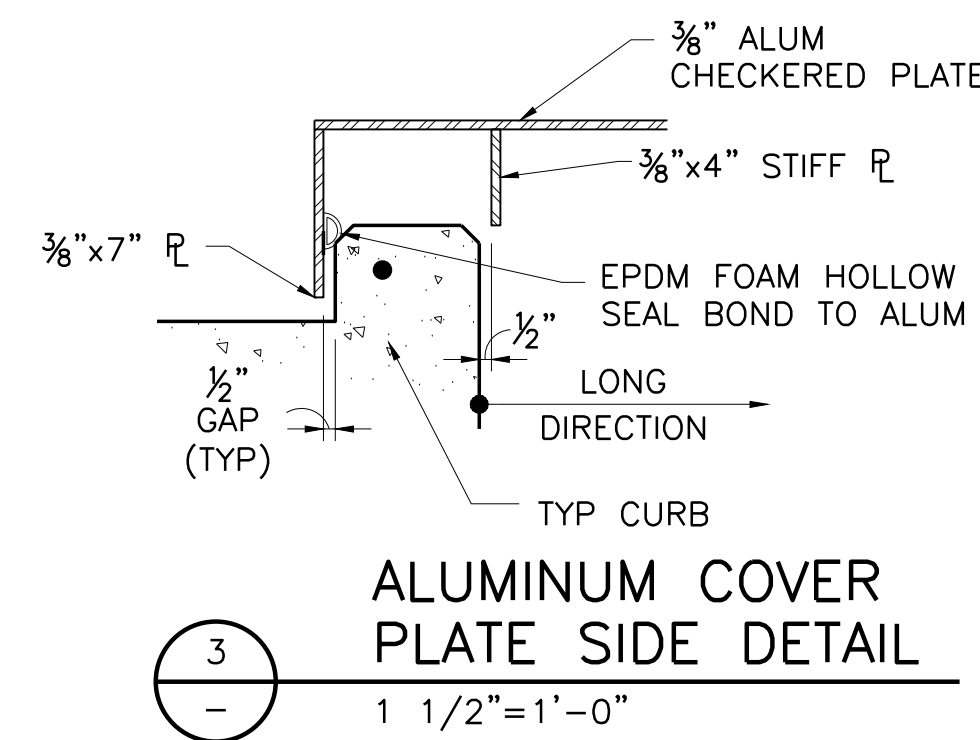
- DETAIL NOTES:**
- IF MULTIPLE PLATES ARE REQUIRED TO FABRICATE THE LID THEN PROVIDE A FULL PENETRATION BUTT WELD. THIS JOINT SHALL BE PERPENDICULAR TO ITS SUPPORTS AND NEAR THE LID'S MID-SPAN.
 - THE LID HAS BEEN DESIGNED FOR A LIVE LOAD OF 100 PSF.
 - PROVIDE 3/8" Ø HOLE AT ONE END FOR PADLOCK AND 1 1/2" x 3" STOP BAR AT OTHER END.
 - COAT ALUMINUM WHERE IN CONTACT WITH CONCRETE.
 - ALL MEMBERS SHALL BE ALUMINUM UNLESS NOTED OTHERWISE.

1
—
ALUMINUM COVER PLATE PLAN
3/8"=1'-0"

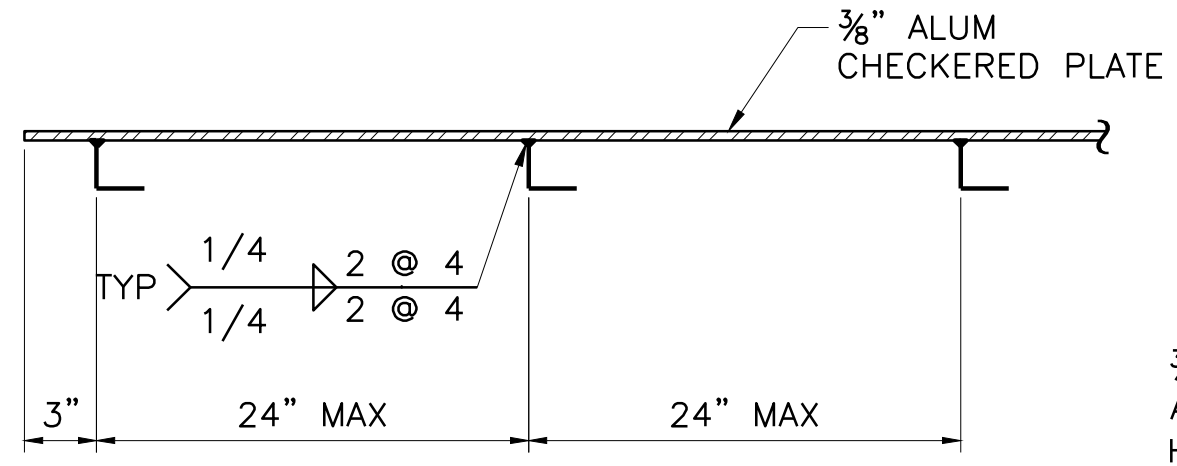


- DETAIL NOTES:**
- PROVIDE CONTINUOUS EPDM FOAM HOLLOW SEAL, NOTCH AT STIFFENERS. BOND TO ALUMINUM.

2
—
ALUMINUM COVER PLATE END DETAIL
1 1/2"=1'-0"

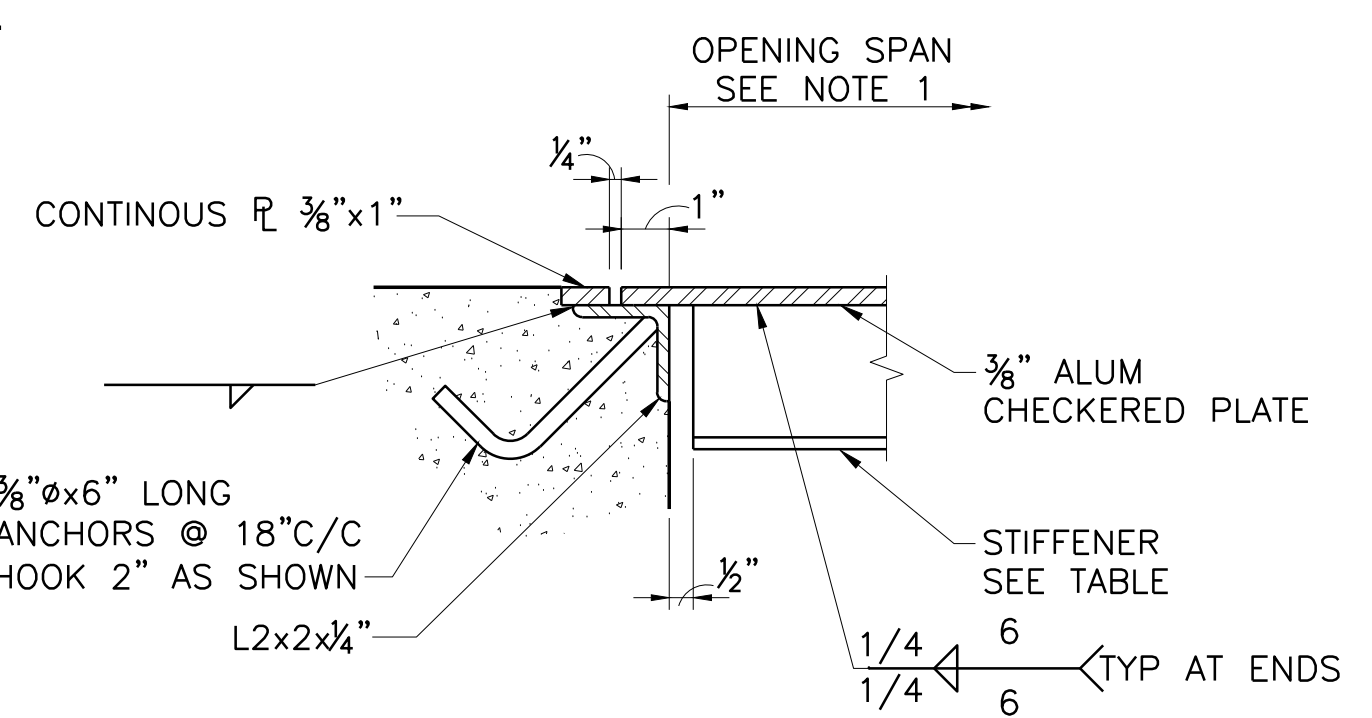


3
—
ALUMINUM COVER PLATE SIDE DETAIL
1 1/2"=1'-0"

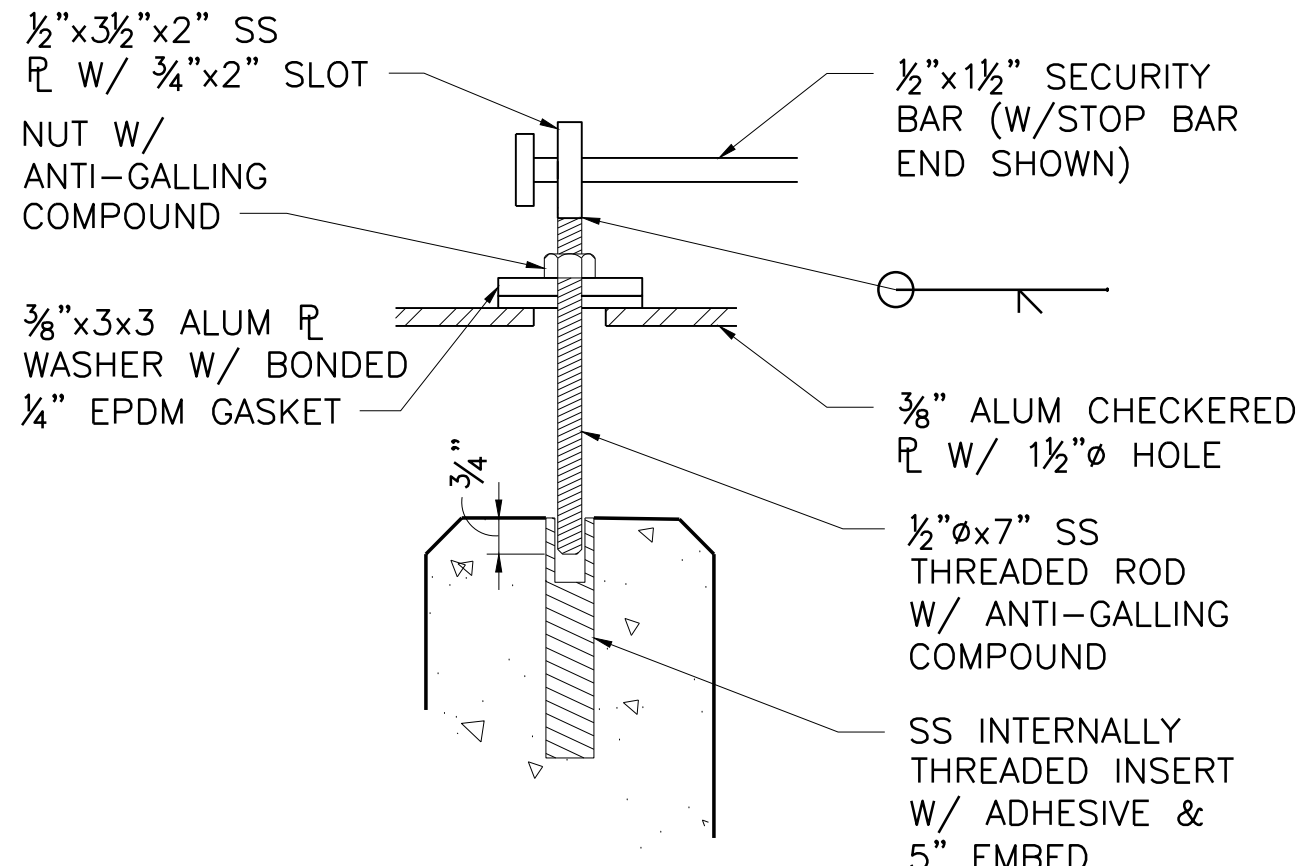


SPAN	STIFFENER SIZE
≤ 3'-6"	2 1/2" x 1 1/2" x 3/8" LLV
≤ 4'-0"	3 x 2 x 3/8" LLV
≤ 5'-0"	3 1/2 x 3 x 3/8" LLV

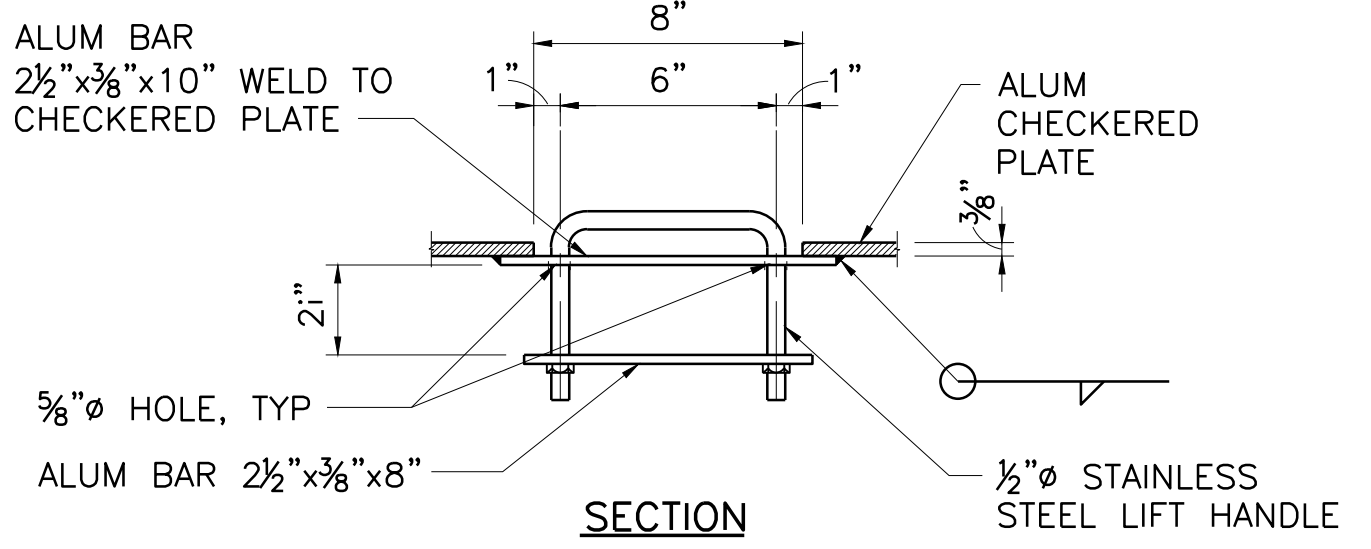
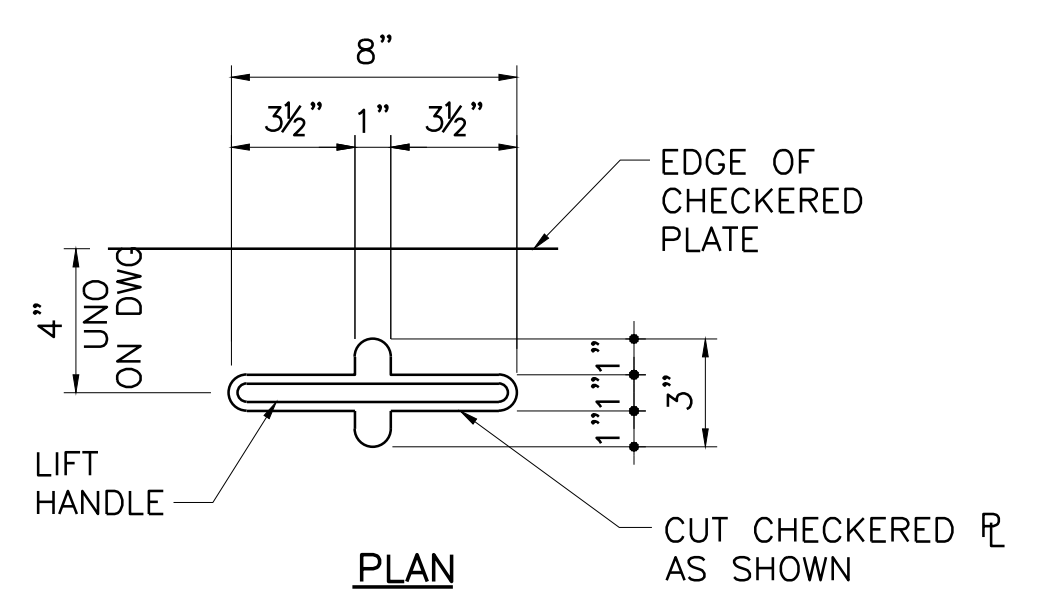
5
—
ALUMINUM CHECKERED PLATE DETAIL
NOT TO SCALE



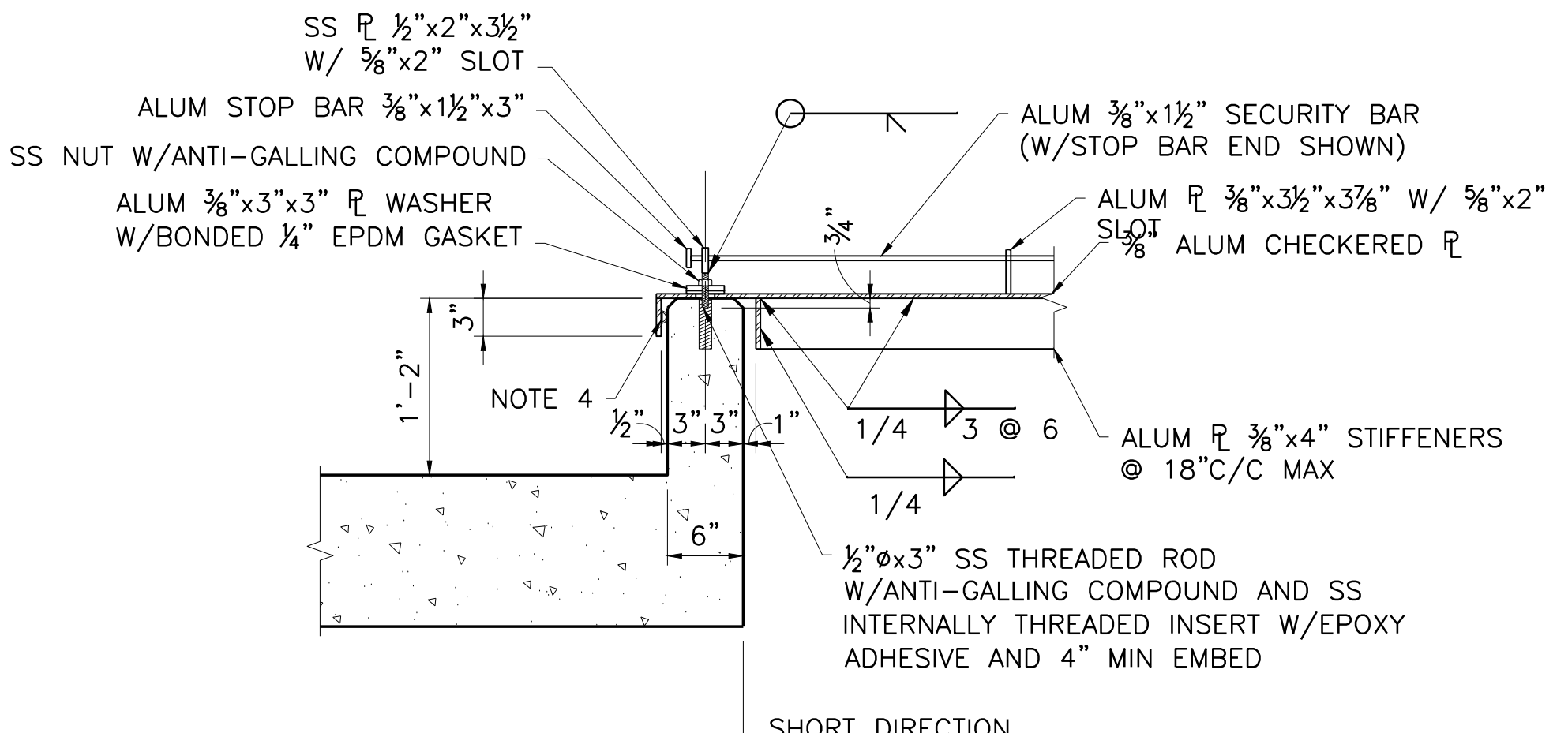
- DETAIL NOTES:**
- STIFFENERS TO BE PLACED PARALLEL TO SHORT EDGE OF OPENING. LONG LEG OF STIFFENERS SHALL BE PLACED PERPENDICULAR TO THE PLATE.
 - MAXIMUM ALLOWABLE UNIFORM DESIGN LIVE LOAD = 100 PSF.
 - PROVIDE A MINIMUM OF 2 LIFTING HANDLES IN PLATES ALONG THE LONG EDGE FOR LIFTING PURPOSES.
 - ALL MEMBERS SHALL BE ALUMINUM, UNLESS NOTED OTHERWISE.



4
—
HOLDOWN SECURITY BOLT
3"=1'-0"

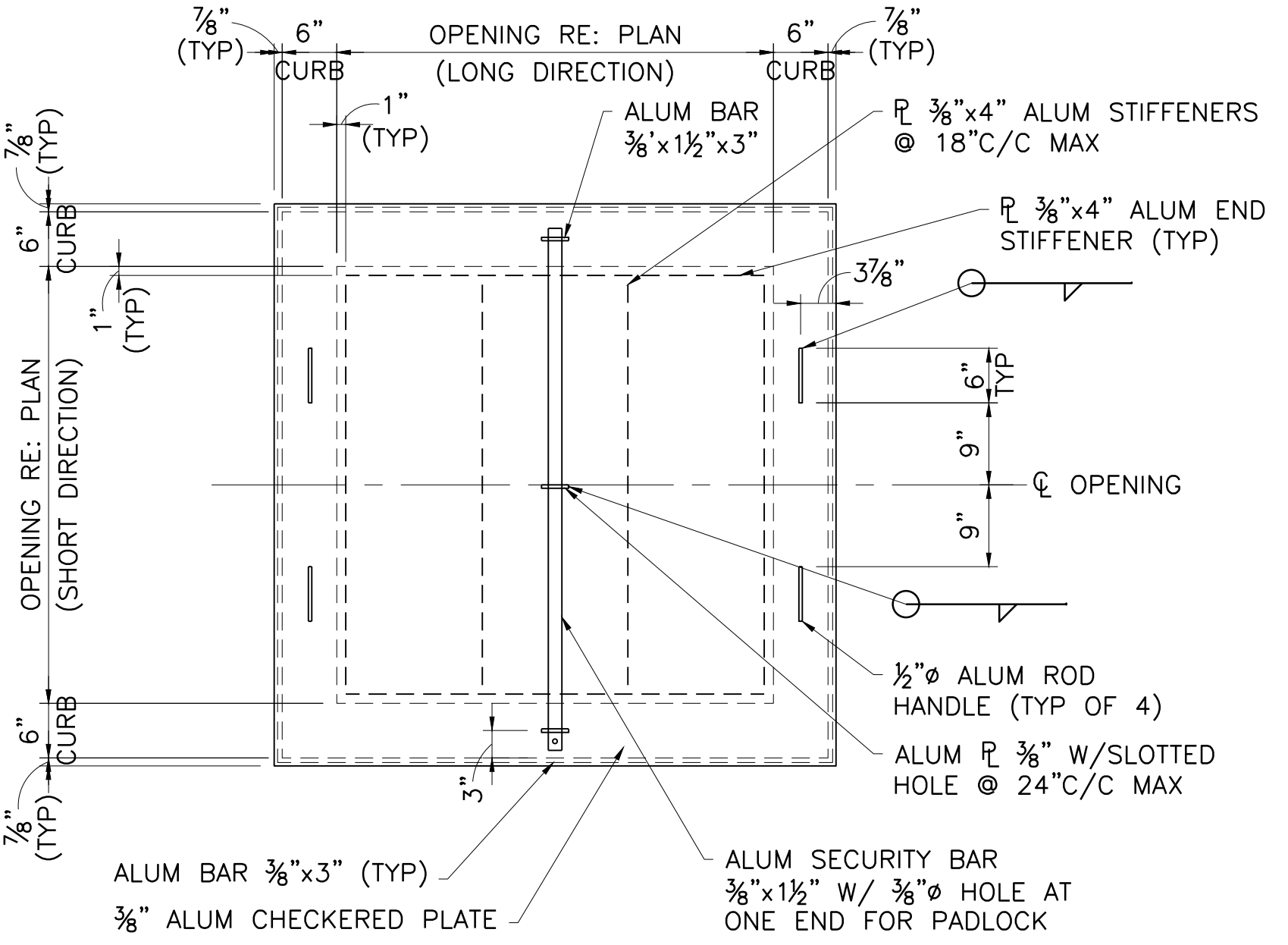


6
—
LIFTING HANDLE DETAIL
NOT TO SCALE

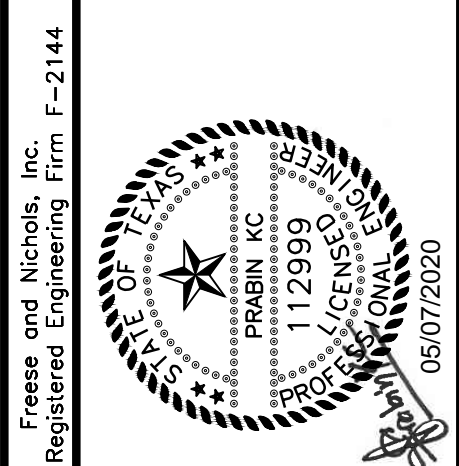
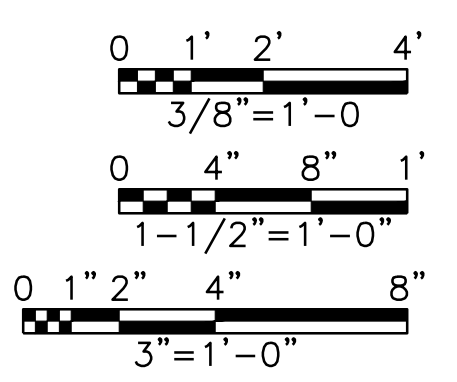


- NOTES:**
- REFER TO ARCHITECTURAL FOR ROOFING MATERIALS (ROOFING MEMBRANE, SUBSTRATE, INSULATION, FLASHING, ETC.) EXTEND FLASHING TO TOP OF CURB AND BEND 1" OVER TOP OF CURB.
 - COAT ALUMINUM WHERE IN CONTACT WITH CONCRETE.
 - ALL MEMBERS SHALL BE ALUMINUM UNLESS NOTED OTHERWISE.
 - PROVIDE CONTINUOUS EPDM FOAM HOLLOW SEAL. BOND TO ALUMINUM.

7
—
ALUMINUM COVER PLATE DETAIL
1"=1'-0"



8
—
ROOF COVER PLATE PLAN
3/4"=1'-0"



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
STRUCTURAL
**VALVE VAULT
SECTIONS AND DETAILS**

PRJ NO.	PRP18708	DATE	MAY 2020	DESIGNED	PKC	DRAWN	JLM	REVIEWED	FILE NAME
ISSUE		BY		DATE		DATE		DATE	ST-VAL-DT-CONCO1.dwg
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VERIFY SCALE

S-7

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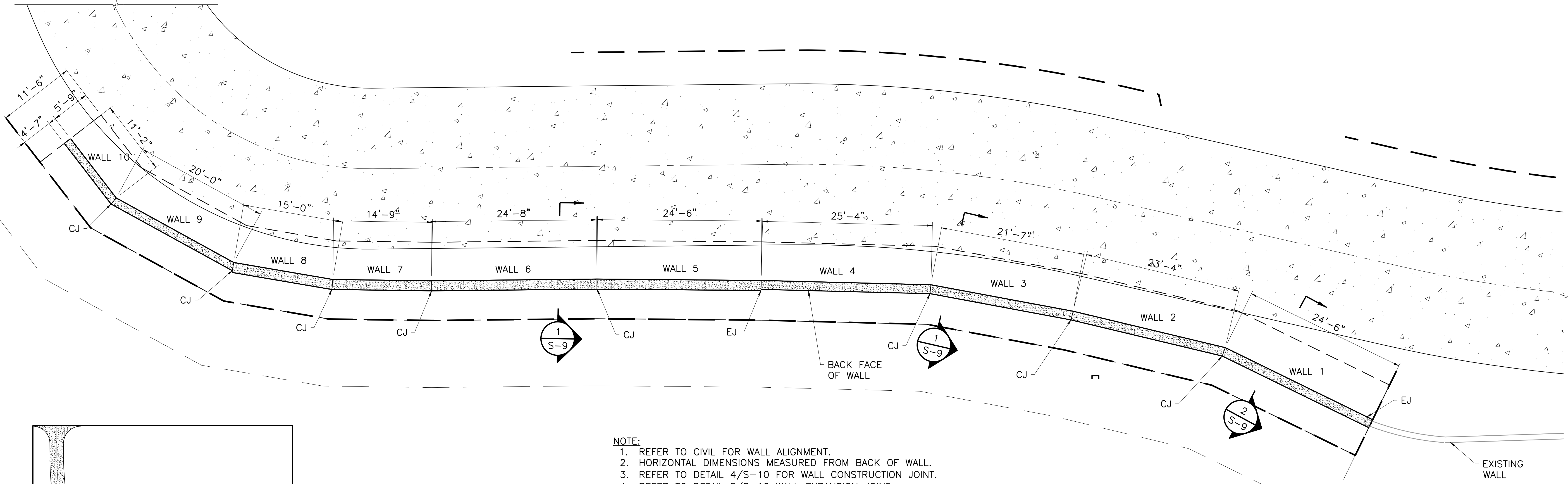
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
STRUCTURAL
**RETAINING WALL
PLAN AND ELEVATION**

NO.	ISSUE	BY	DATE	PRP18708	DESIGNED	PKC	DRAWN	JLM	REVISION	CHECKED	MFR	FILE NAME
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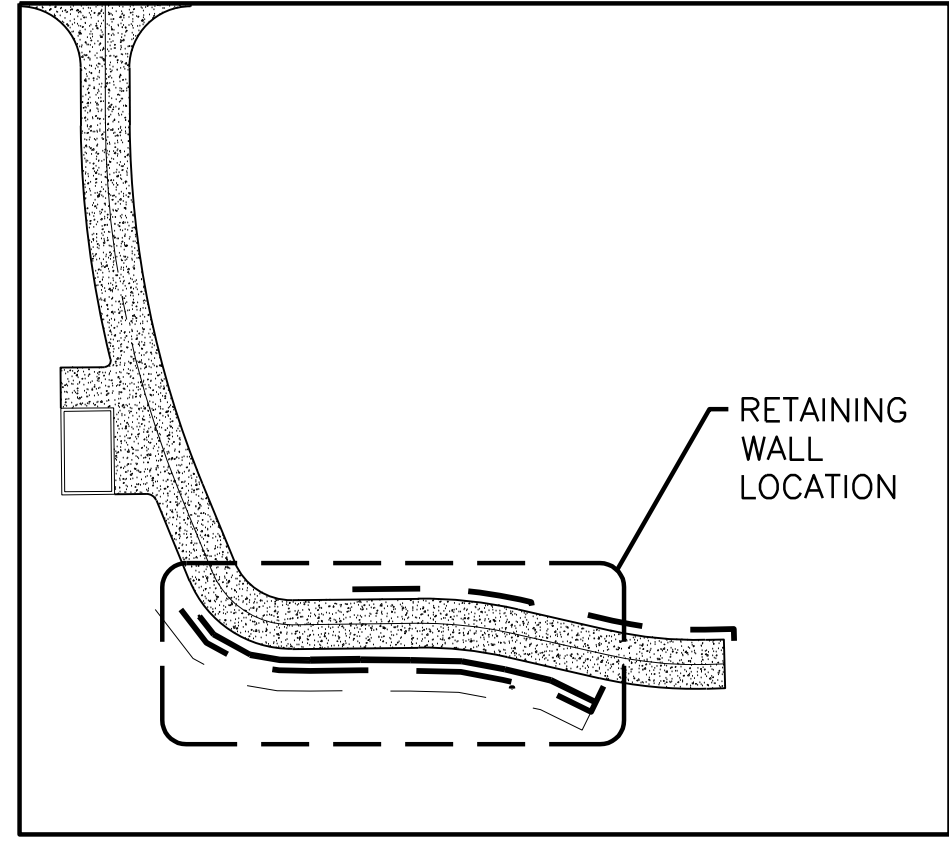
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SEQ. 46

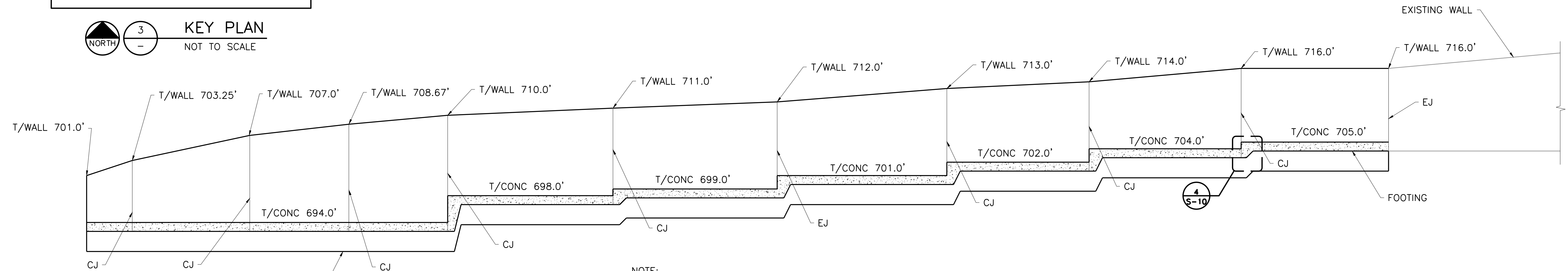


- NOTE:**
1. REFER TO CIVIL FOR WALL ALIGNMENT.
 2. HORIZONTAL DIMENSIONS MEASURED FROM BACK OF WALL.
 3. REFER TO DETAIL 4/S-10 FOR WALL CONSTRUCTION JOINT.
 4. REFER TO DETAIL 5/S-10 WALL EXPANSION JOINT.

1 TOP PLAN
1/8"=1'-0"

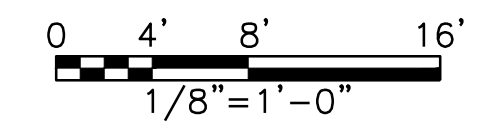


3 KEY PLAN
NOT TO SCALE

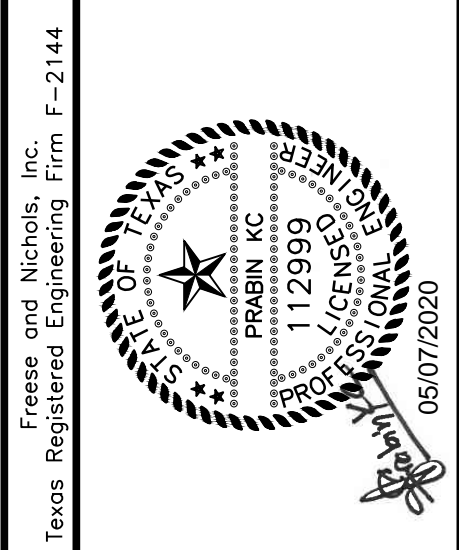


- NOTE:**
1. REFER TO CIVIL FOR WALL ALIGNMENT.
 2. REFER TO DETAIL 4/S-10 FOR WALL CONSTRUCTION JOINT.
 3. REFER TO DETAIL 5/S-10 AND 6/S-10 FOR WALL EXPANSION JOINT.

2 ELEVATION VIEW
1/8"=1'-0"



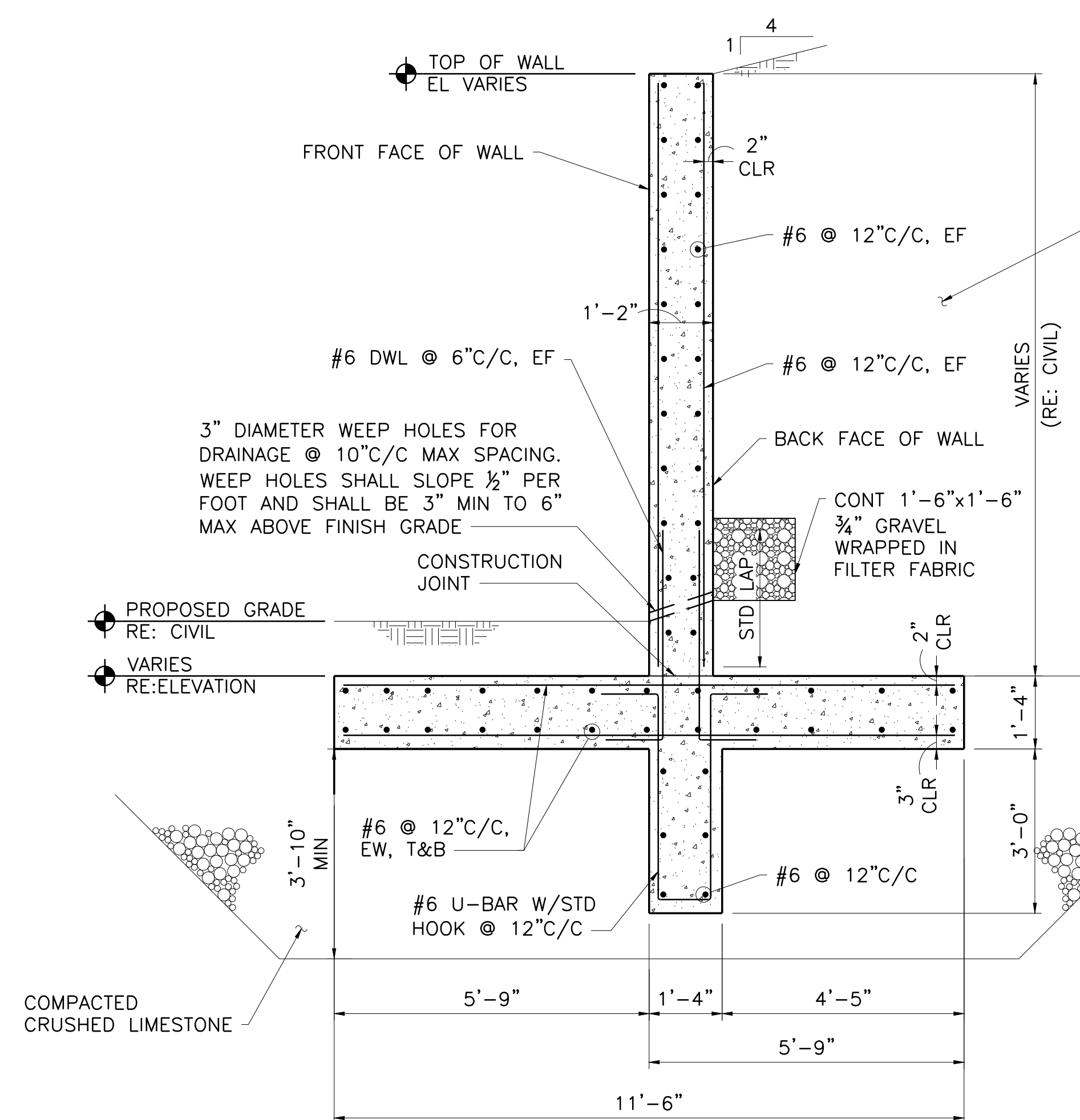
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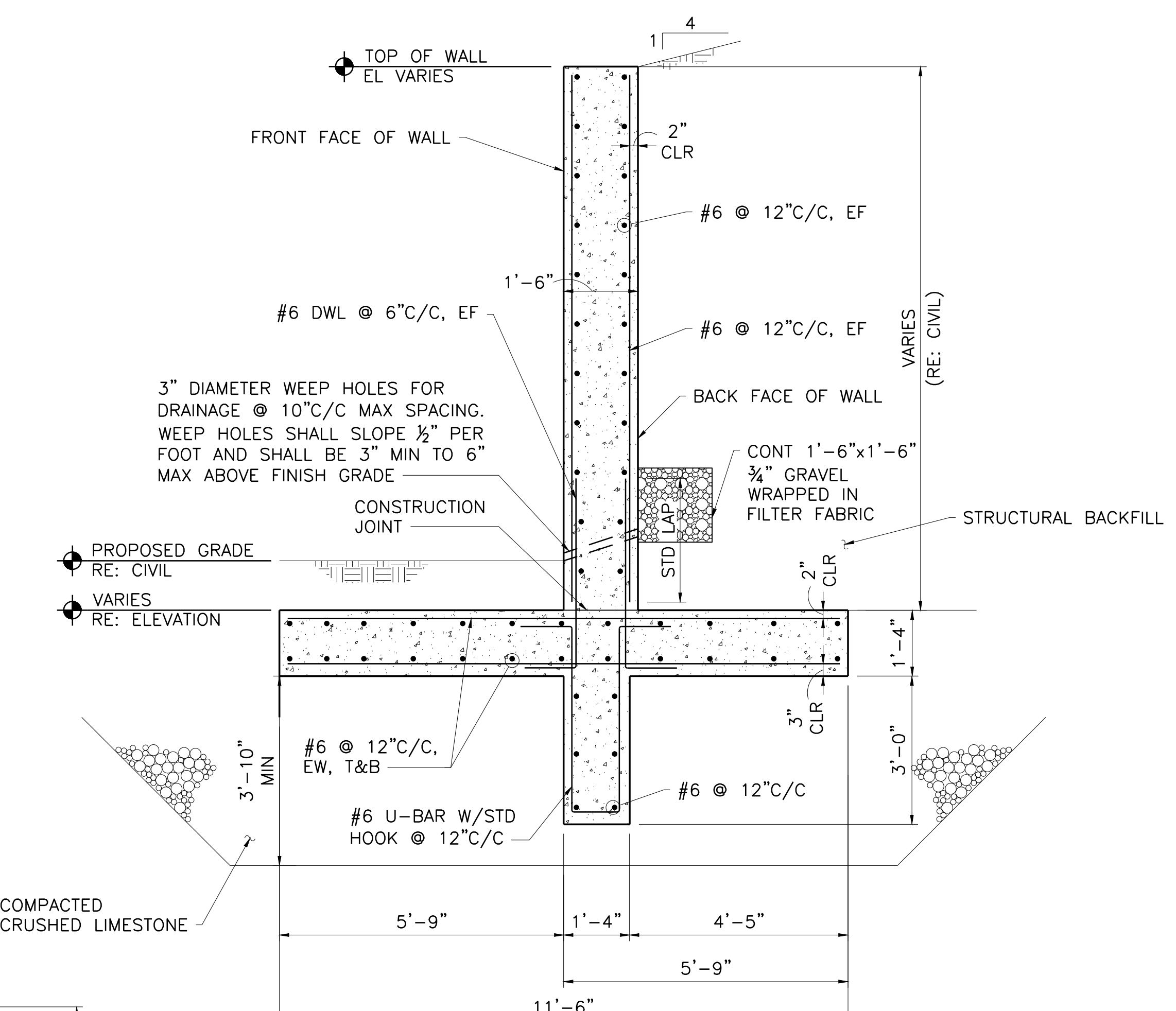
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
 METER VAULT RELOCATION**
 STRUCTURAL
**RETAINING WALL
 SECTIONS**

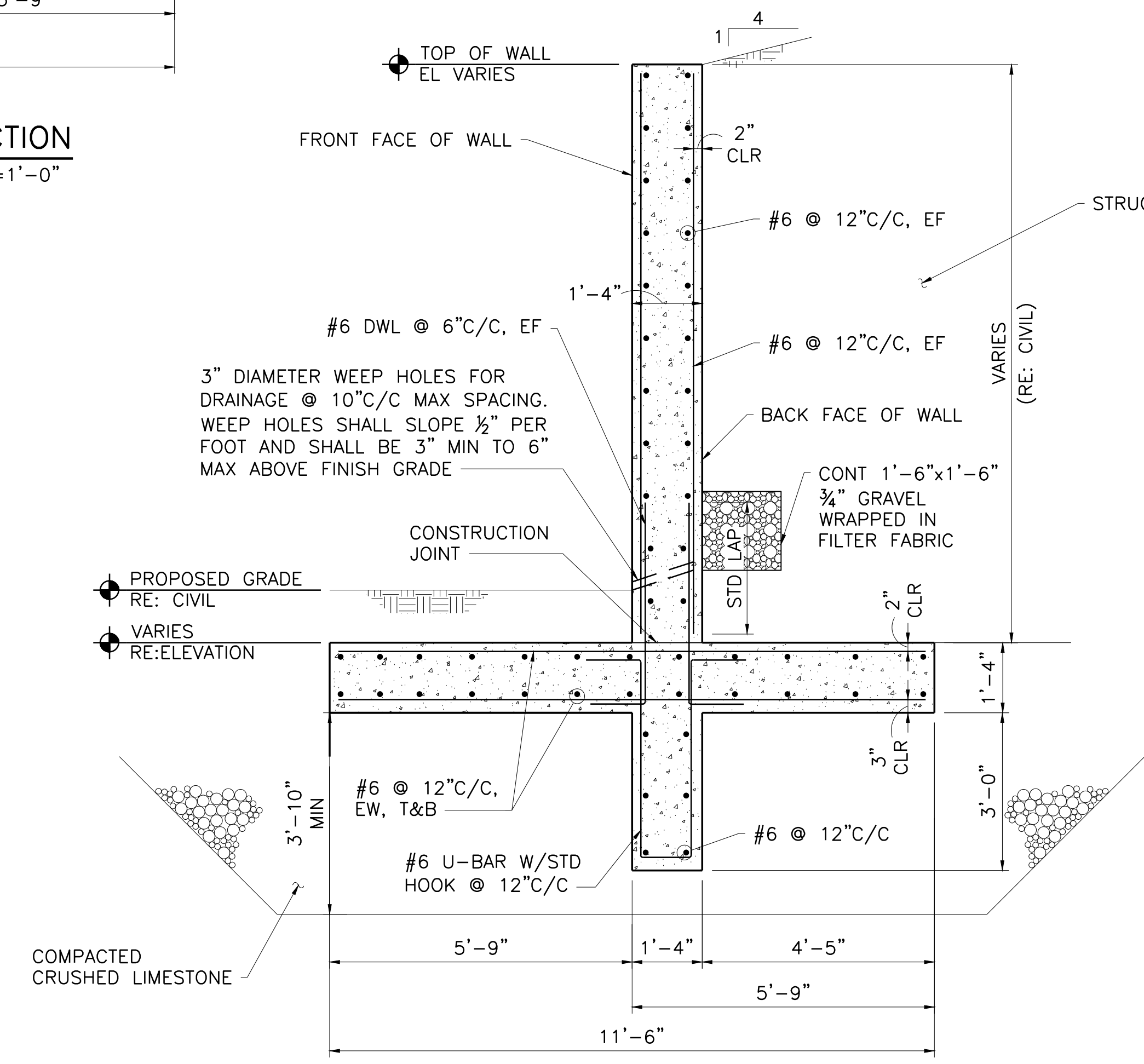
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NO.	ISSUE	VERIFY SCALE 0 1 2 4 1/2" = 1'-0"							
SHEET	S-9								
SEQ.	47								



SECTION 1
 1/2" = 1'-0"



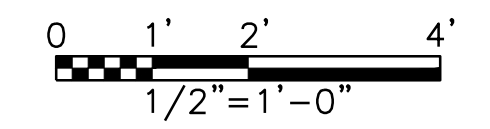
SECTION 2
 1/2" = 1'-0"

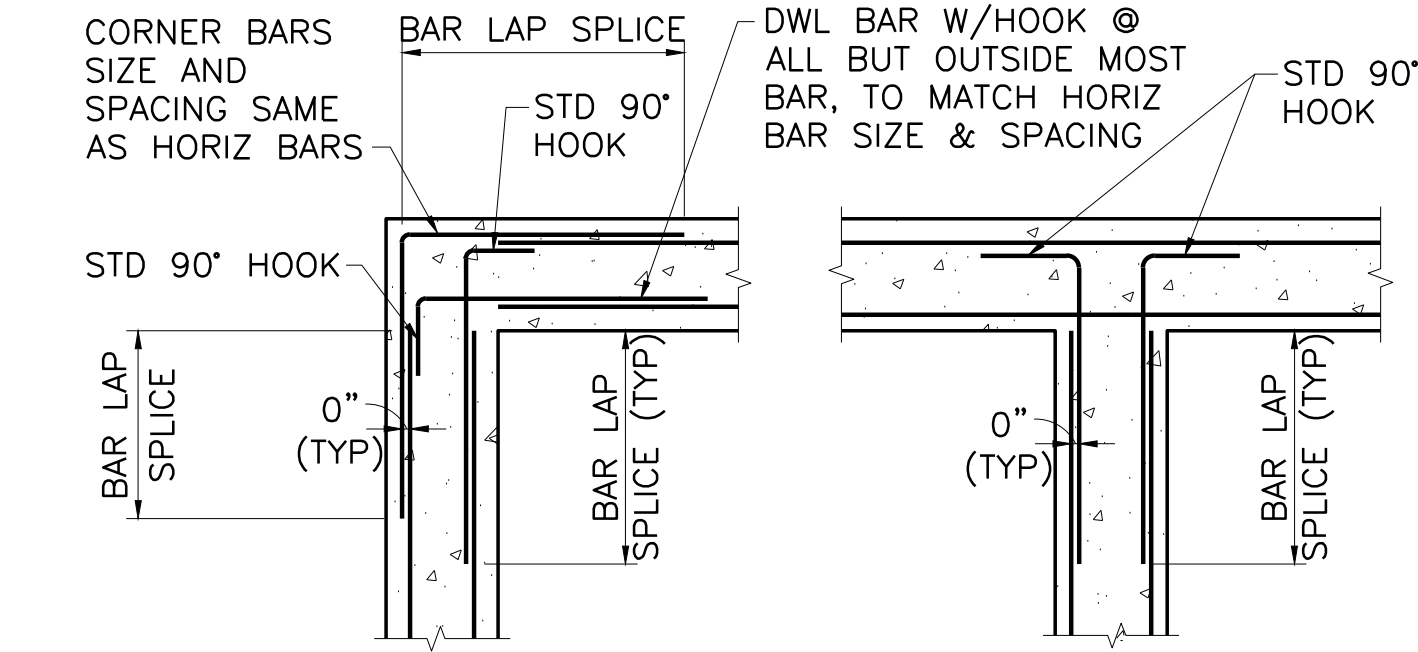
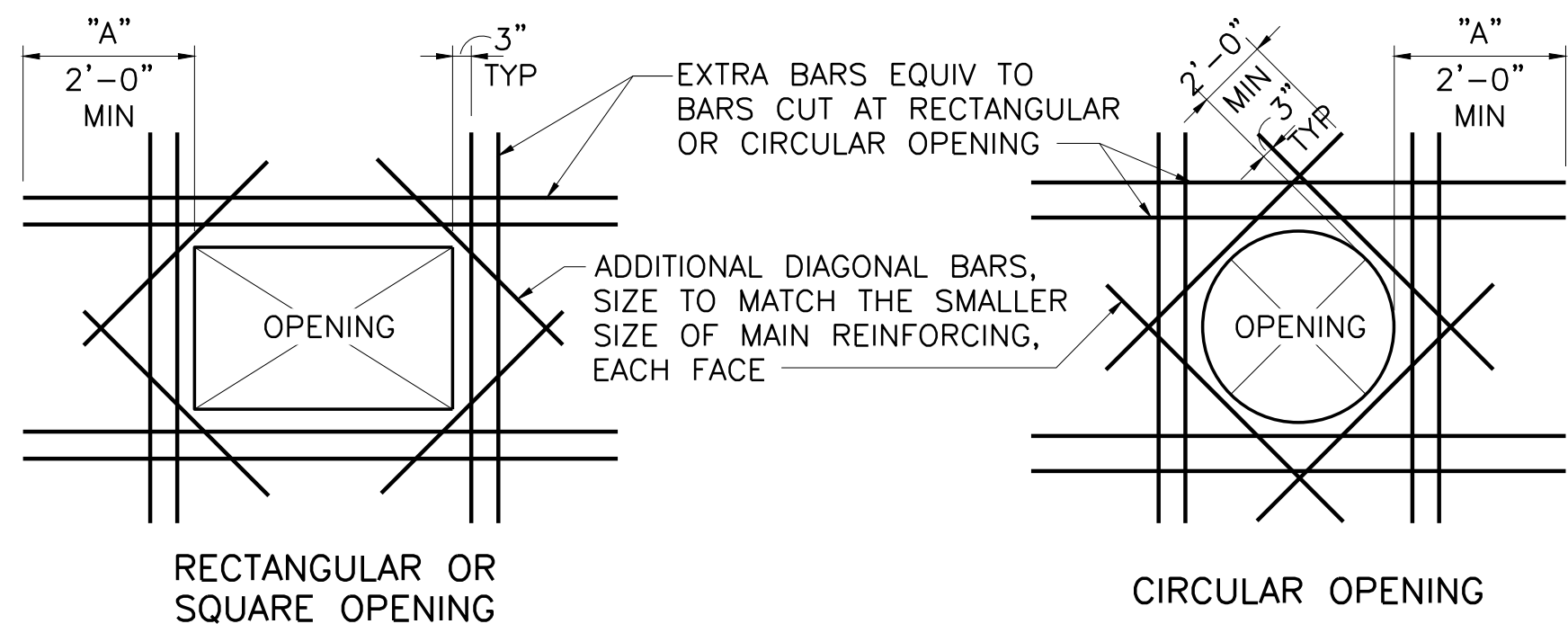


SECTION 3
 1/2" = 1'-0"

WALL LABEL	SECTION
1	3/S-9
2	3/S-9
3	3/S-9
4	3/S-9
5	2/S-9
6	2/S-9
7	2/S-9
8	2/S-9
9	1/S-9
10	1/S-9

NOTES:
 1. REFER TO PLAN VIEW 1/S-8 FOR WALL LABEL.



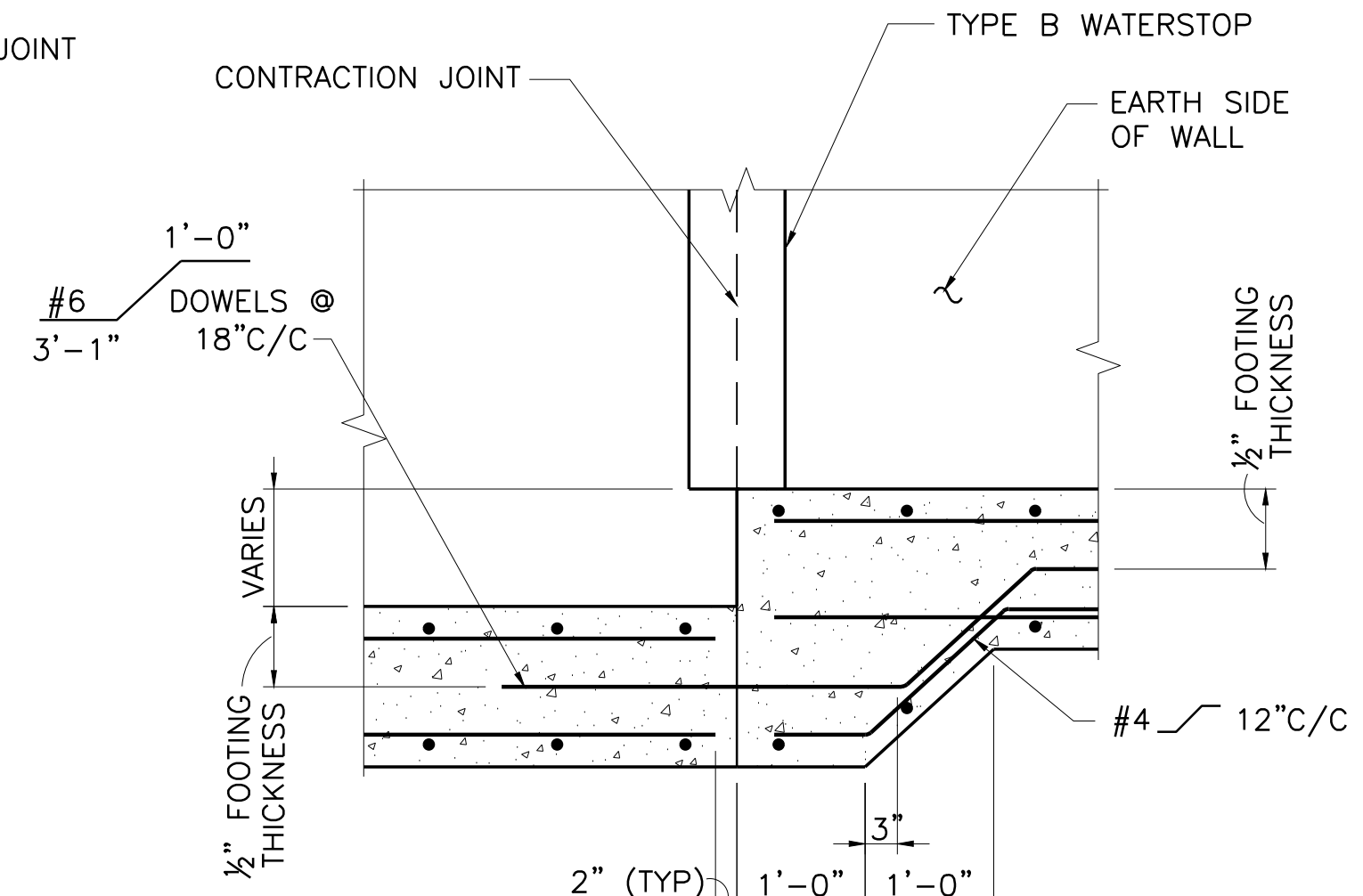
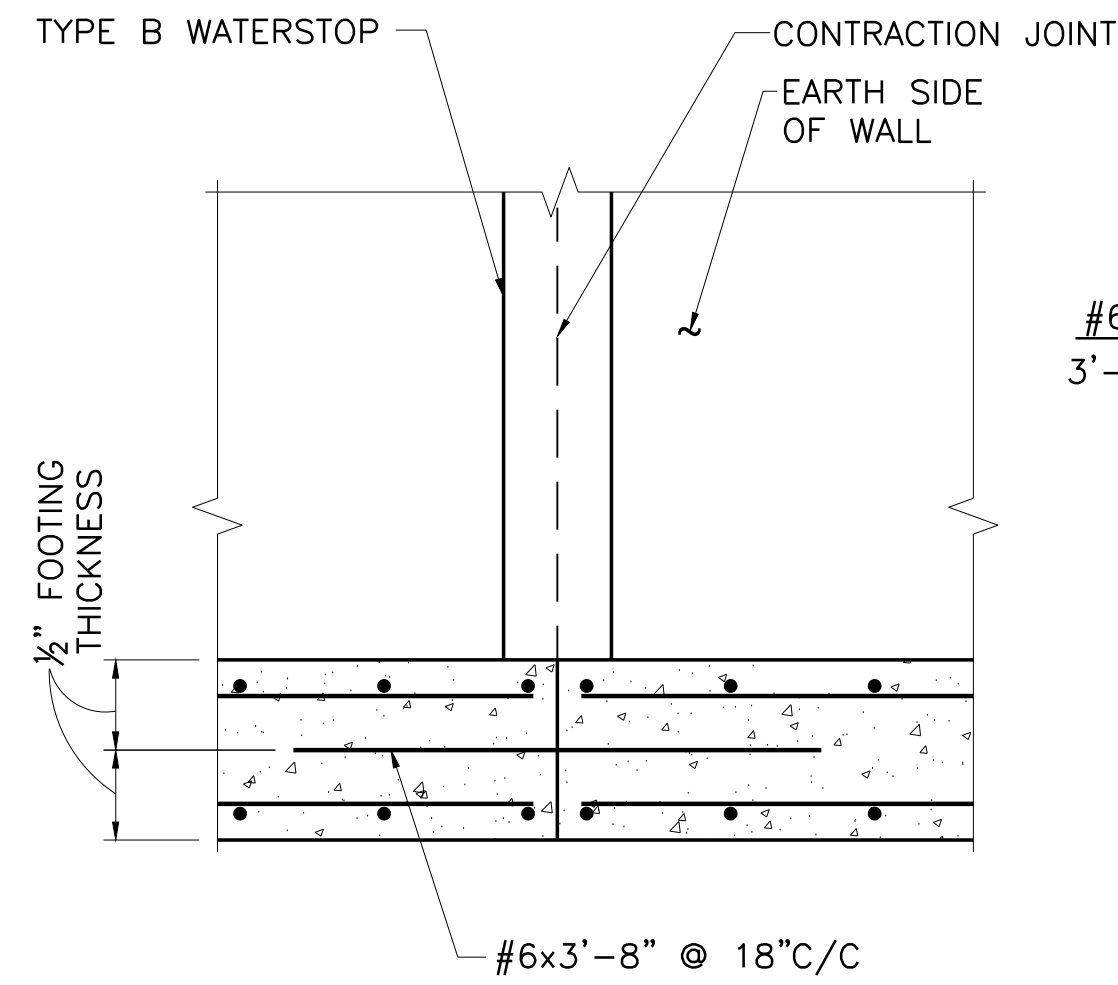
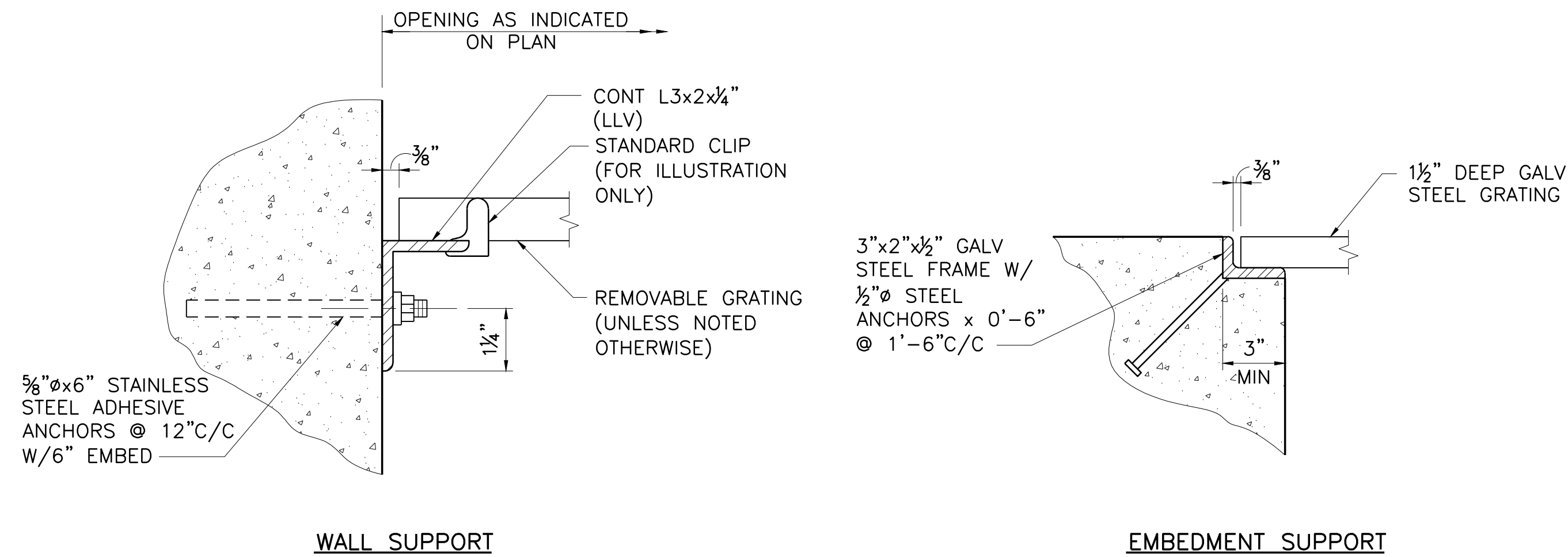


- NOTES:**
- DISCONTINUE TYPICAL REINFORCING AT OPENING.
 - PLACE ADDITIONAL BARS IN SAME ORIENTATION AND POSITION AS BARS CUT BY OPENING. PROVIDE ONE SET OF BARS FOR EACH LAYER OF REINFORCING CUT.
 - "A" = 36 BAR DIAMETERS EMBEDMENT LENGTH (24" MINIMUM). PROVIDE STANDARD HOOK IF FULL EMBEDMENT LENGTH IS NOT POSSIBLE.
 - REINFORCING STEEL IS TO BE CARRIED ACROSS ALL CONSTRUCTION JOINTS.
 - SEE MECHANICAL AND ARCHITECTURAL DRAWINGS FOR SLAB AND WALL OPENINGS NOT SHOWN ON STRUCTURAL DRAWINGS.
 - ADDITIONAL REINFORCING MAY BE OMITTED ONLY WHERE OPENING IS FRAMED BY BEAMS OR WALLS.
 - ADDITIONAL REINFORCING NOT REQUIRED WHEN SPECIFIED REINFORCING IS NOT CUT.
 - ALL REINFORCING SPACING SHALL BE NOT LESS THAN 3" CENTER TO CENTER.

- DETAIL NOTES:**
- REINFORCING SHOWN APPLIES TO ALL TOP, BOTTOM AND SIDE BARS.
 - AT CONTRACTOR'S OPTION, UNLESS NOTED OTHERWISE, ELIMINATE DOWELS AND TERMINATE HORIZONTAL BARS WITH STANDARD HOOKS.

1
-
TYPICAL WALL OR SLAB OPENING
ADDITIONAL REINFORCEMENT
NOT TO SCALE

2
-
CORNER & INTERSECTION REINFORCEMENT
NOT TO SCALE

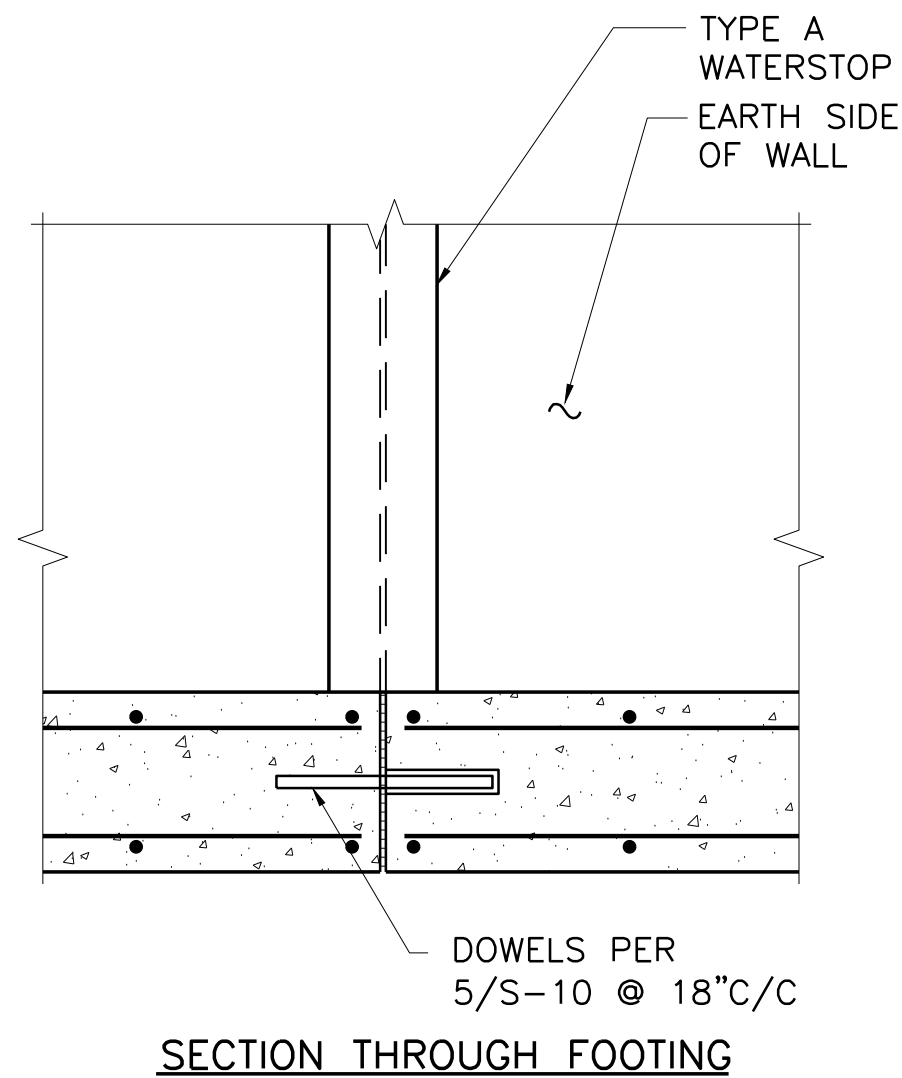
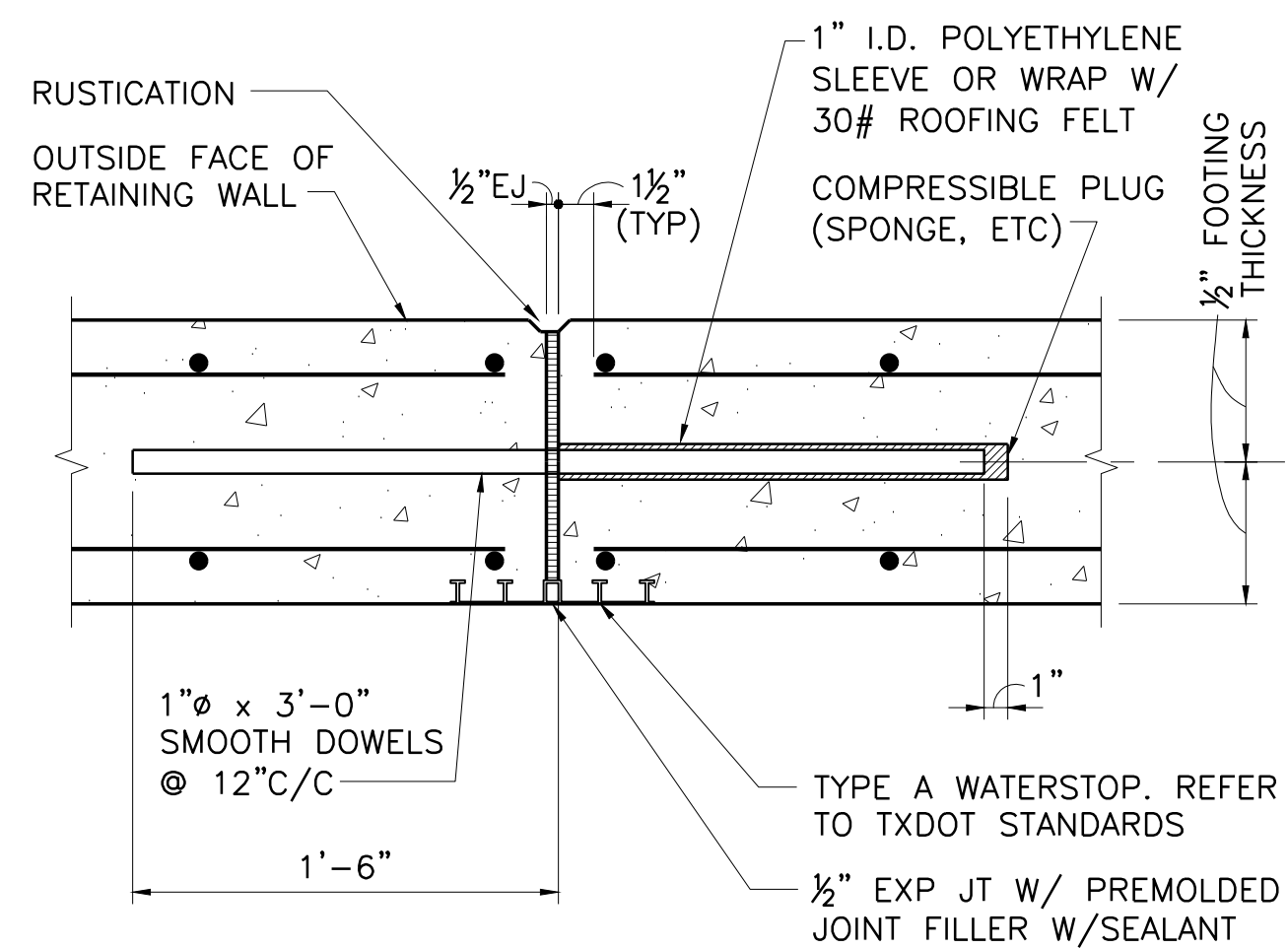


SECTION THROUGH FOOTING

SECTION THROUGH FOOTING AT STEP

3
-
GALVANIZED STEEL GRATING SUPPORT DETAILS
NOT TO SCALE

4
-
BASE OF WALL DETAIL AT CONTRACTION JOINT
3/4" = 1'-0"



SECTION THROUGH FOOTING

BASE OF WALL DETAIL
AT EXPANSION JOINT
3/4" = 1'-0"

5
-
EXPANSION JOINT DETAIL
NOT TO SCALE

6
-
BASE OF WALL DETAIL
AT EXPANSION JOINT
3/4" = 1'-0"

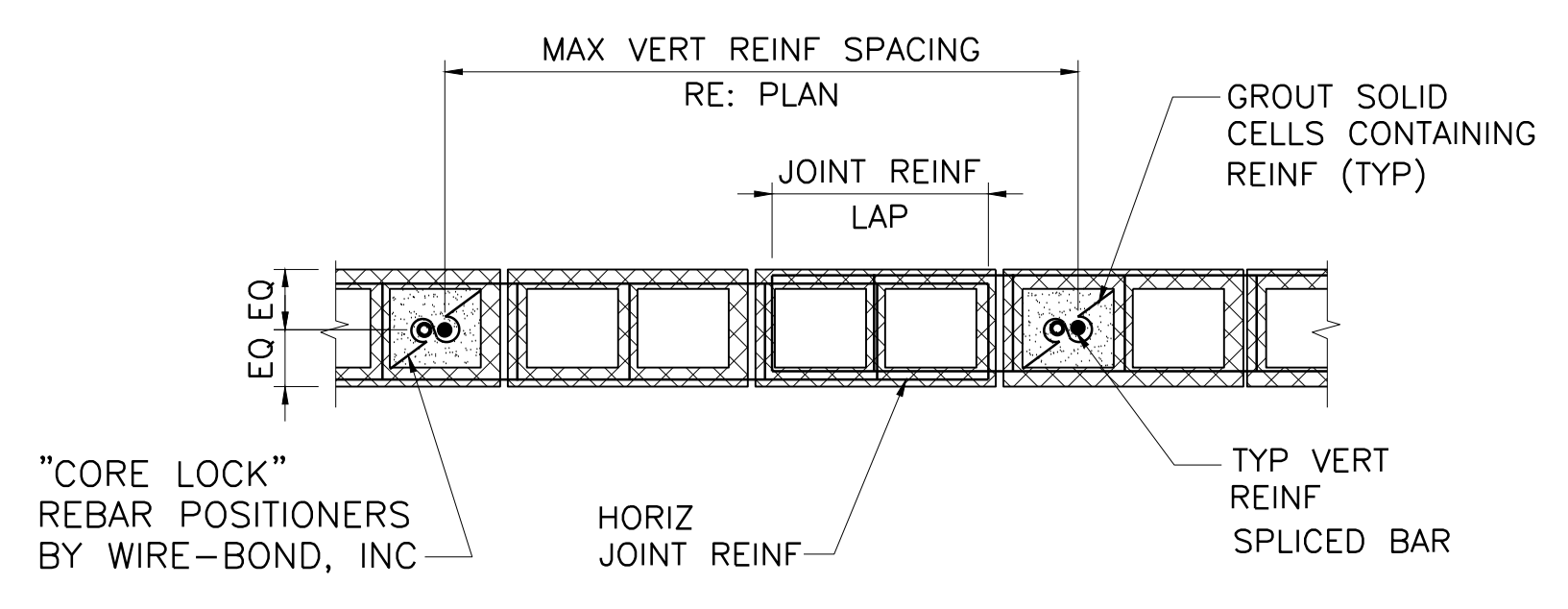
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TOWN OF PROSPER, TEXAS
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METER VAULT RELOCATION
STRUCTURAL
TYPICAL SECTIONS AND DETAILS I

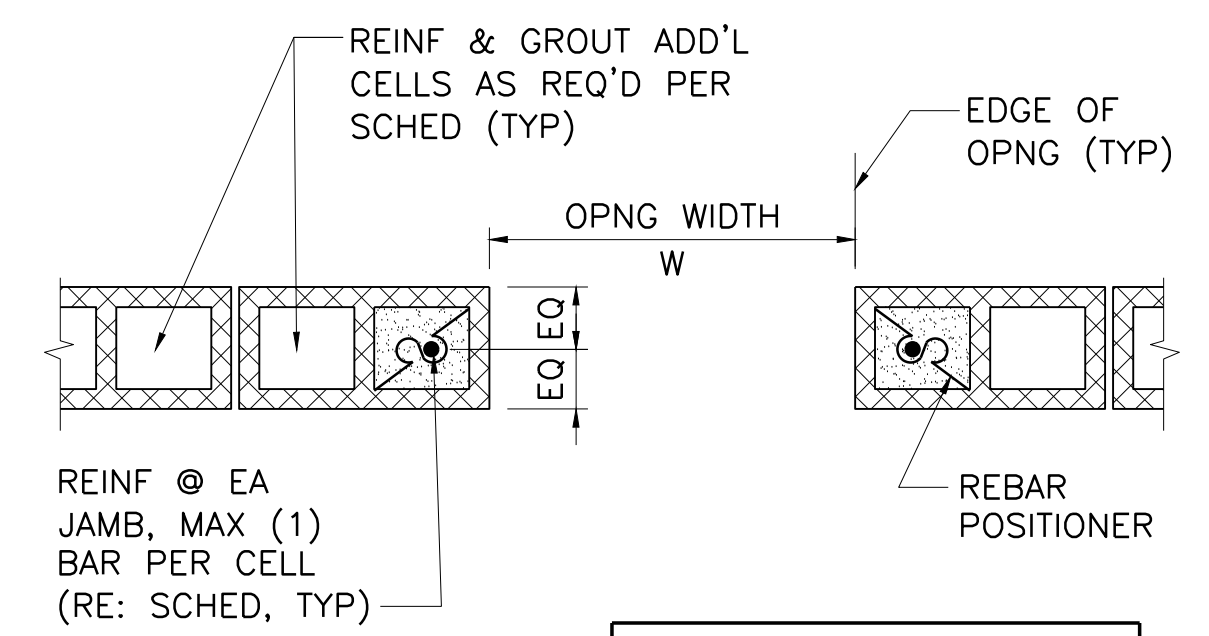
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Last Saved: 5/6/2020 6:49 PM Saved By: 02833



- DETAIL NOTES:**
1. MAINTAIN MINIMUM 3"x3" CLEAR UNOBSTRUCTED CONTINUOUS VERTICAL CELL AT EACH REBAR. PLACE WALLS TO MAXIMUM 5'-0" HEIGHT BEFORE GROUTING.
 2. PLACE REBAR IN WALL WITH LAP SPLICE LENGTH PER SCHEDULE.
 3. STOP GROUT POUR 1 1/2" BELOW TOP OF COURSE, AT EACH GROUT LIFT, EXCEPT AT LINTELS AND BOND BEAMS EXTEND GROUT TO TOP OF GROUTED COURSE.
 4. PROVIDE REBAR POSITIONERS AT MANUFACTURER RECOMMENDED SPACING, BUT NOT TO EXCEED 48"C/C.

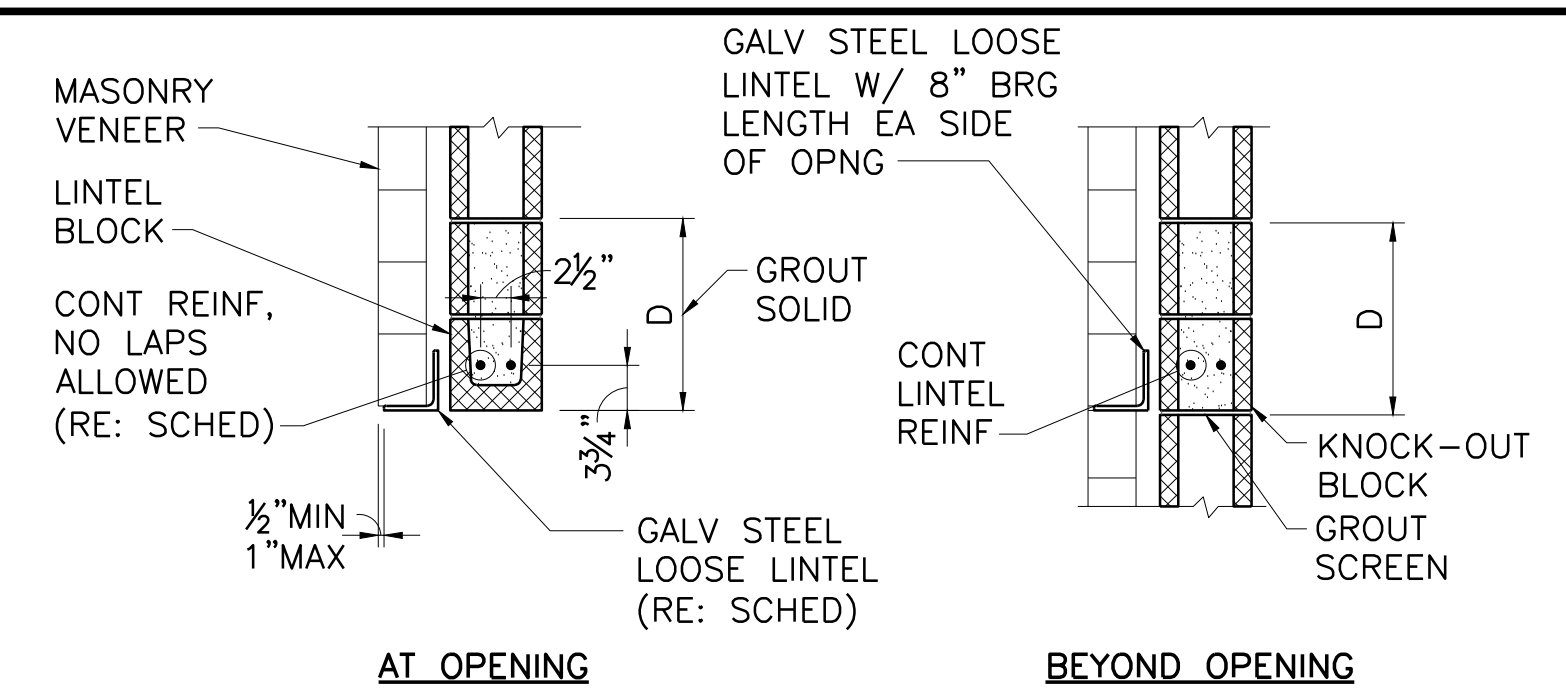
1
-
TYPICAL 8" CMU WALL REINFORCING DETAIL
NOT TO SCALE



JAMB REINFORCING SCHEDULE

W	REINFORCING
3'-4"	(1) #5

2
-
TYPICAL 8" CMU JAMB DETAIL
NOT TO SCALE



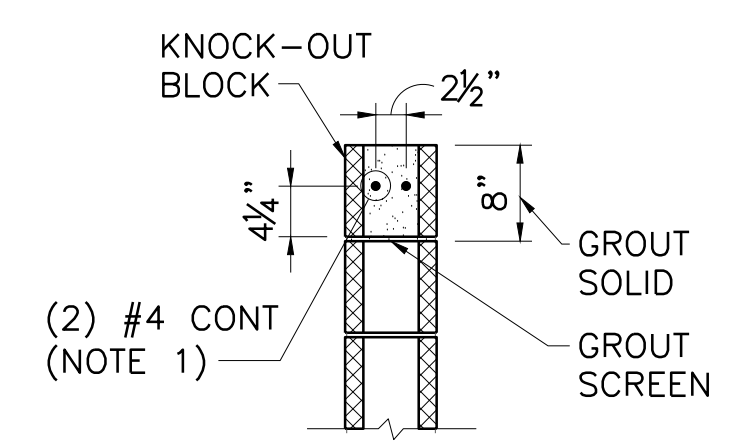
LINTEL REINFORCING SCHEDULE

W	D	REINF	LOOSE LINTEL
3'-4"	8"	(2) #5	L4x4x1/4"

W = CLEAR WIDTH OF CMU OPENING.

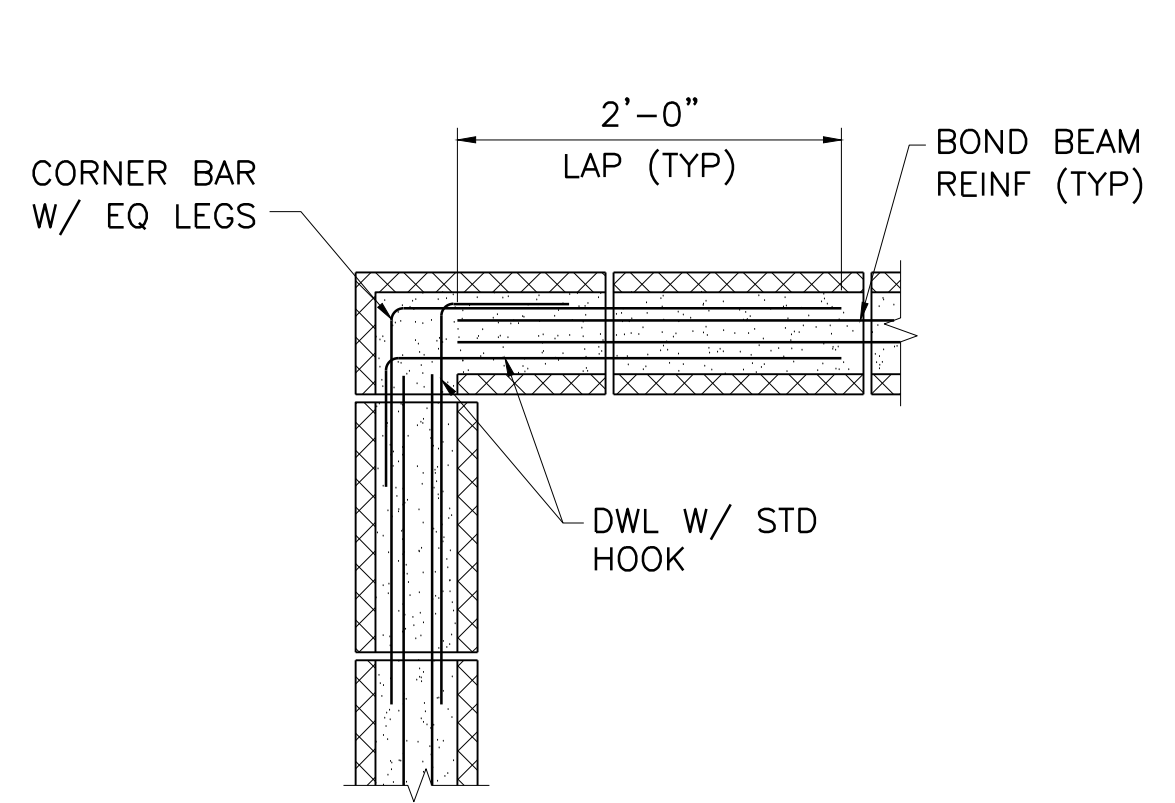
- DETAIL NOTES:**
1. LOOSE LINTEL ONLY REQUIRED WHEN MASONRY VENEER IS PRESENT.

3
-
TYPICAL 8" CMU LINTEL DETAIL
NOT TO SCALE



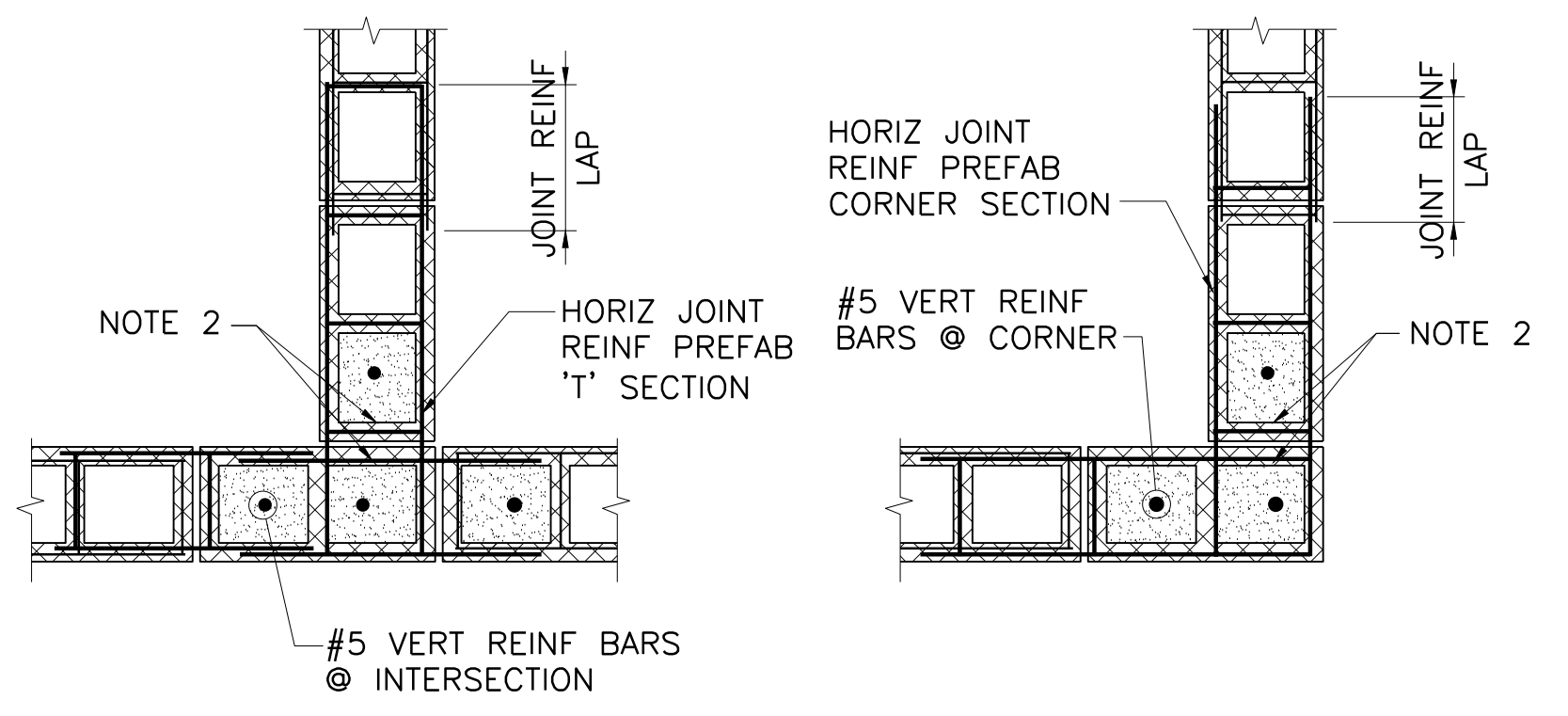
- DETAIL NOTES:**
1. LAP SPLICE REINFORCING AS REQUIRED. STAGGER LAP SPLICES.

4
-
TYPICAL 8" CMU BOND BEAM
NOT TO SCALE



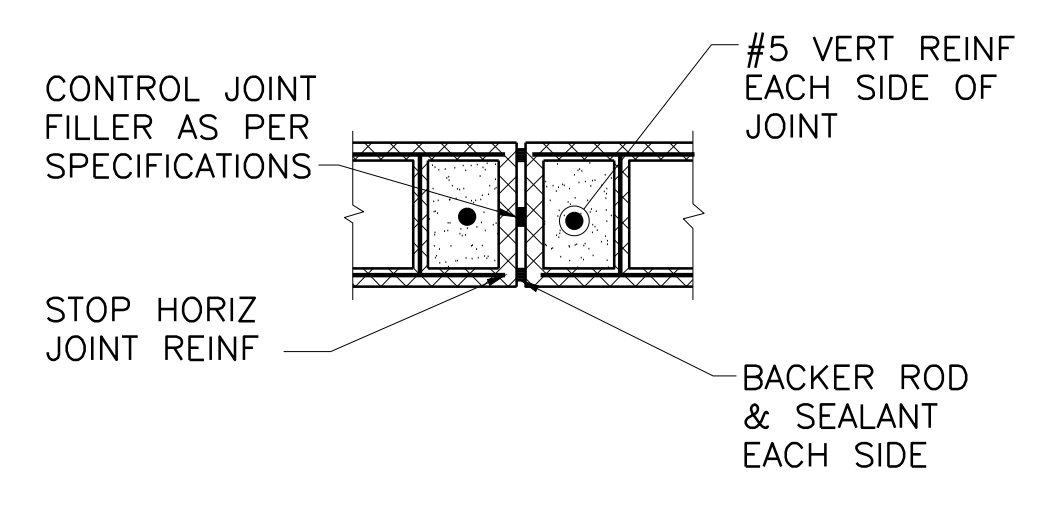
- DETAIL NOTES:**
1. CORNER BAR AND DOWELS SHALL MATCH SIZE OF TYPICAL BOND BEAM REINFORCING.

5
-
TYPICAL BOND BEAM CORNER REINFORCEMENT
NOT TO SCALE



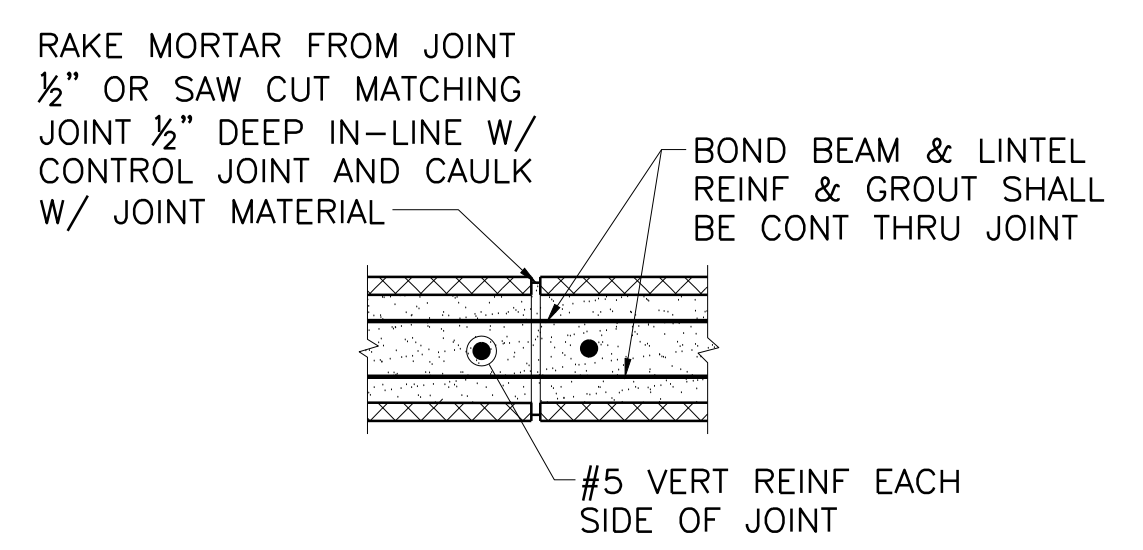
- DETAIL NOTES:**
1. INTERSECTING WALL CMU BLOCKS SHALL BE INTERLOCKED WITH INTERSECTED CMU WALL, UNLESS SPECIFICALLY NOTED AS A CONTROL OR EXPANSION JOINT.
 2. AT CONTRACTOR'S OPTION, IN LIEU OF INTERLOCKING CMU COURSING, REMOVE WEB AND FACE SHELL AT INTERFACE AND GROUT MONOLITHICALLY.

6
-
8" CMU WALL CORNER REINFORCING DETAIL
NOT TO SCALE

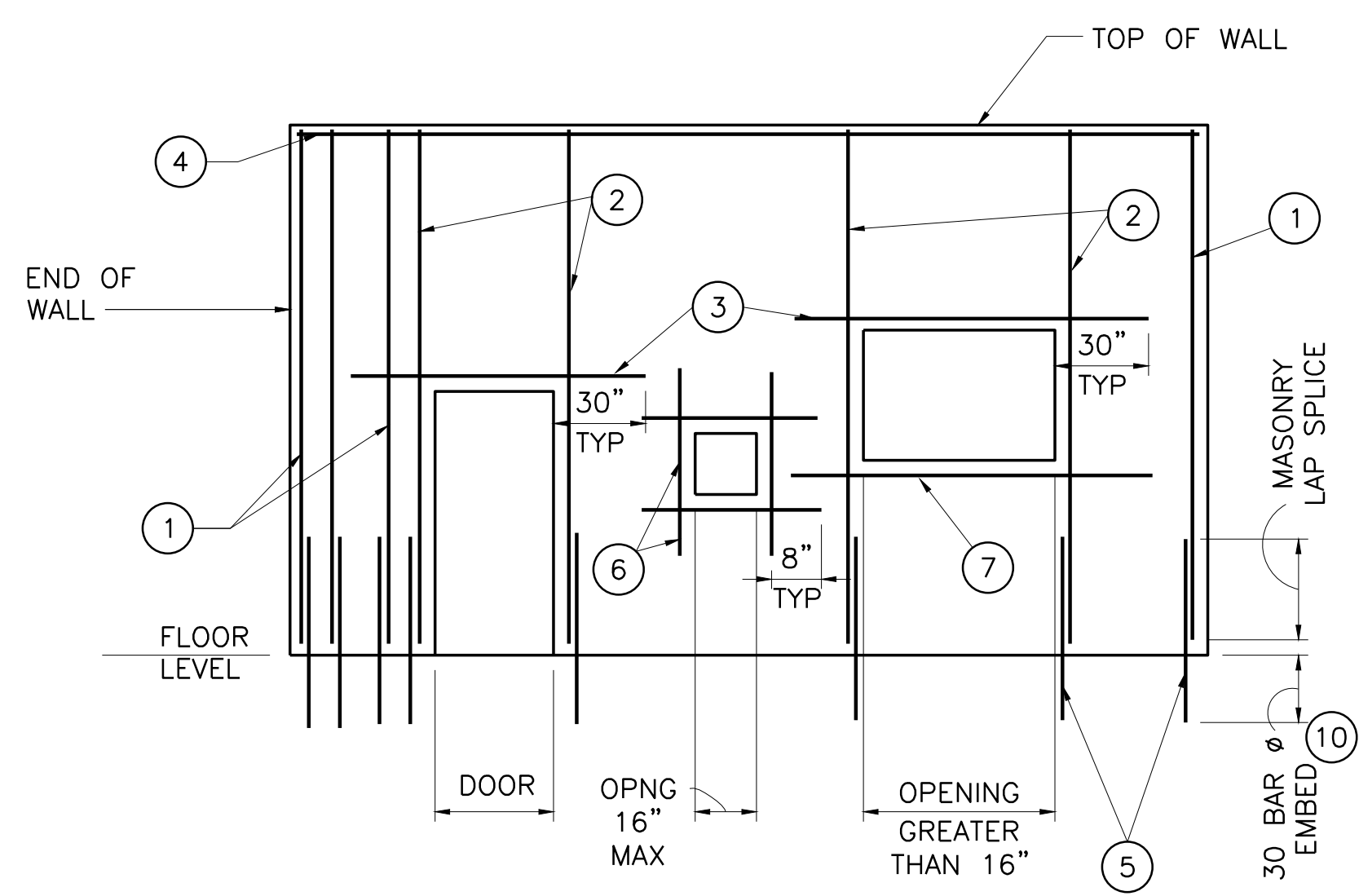


- DETAIL NOTES:**
1. REFER TO PLAN FOR CMU CONTROL JOINT LOCATIONS.

7
-
CMU CONTROL JOINT DETAIL
NOT TO SCALE



SECTION AT BOND BEAMS & LINTELS



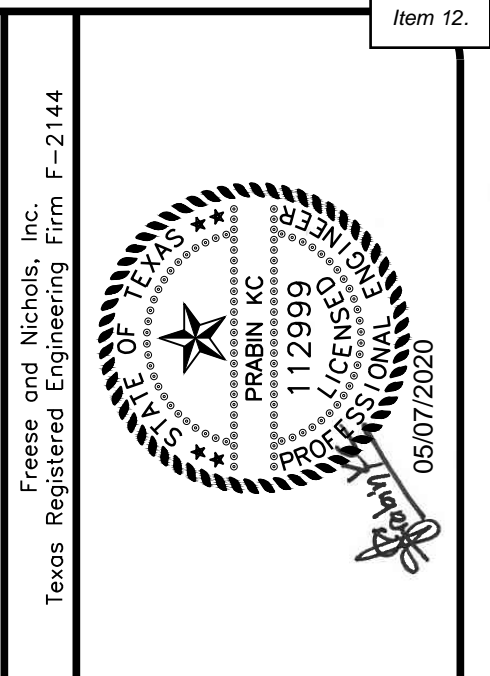
8
-
TYPICAL REINFORCED CMU WALL ELEVATION
NOT TO SCALE

1. TYPICAL WALL REINFORCEMENT SHALL BE (1) #5 BAR @ 48"C/C. ADDITIONAL REINFORCEMENT AT CORNERS AND INTERSECTIONS.
2. JAMB REINFORCEMENT. SEE JAMB DETAIL.
3. LINTEL REINFORCEMENT. SEE LINTEL DETAIL.
4. BOND BEAM REINFORCEMENT. SEE BOND BEAM DETAIL.
5. DOWEL SIZE AND QUANTITY TO MATCH VERTICAL REINFORCEMENT WITH REQUIRED LAP SPLICE.
6. (1) #4 EACH SIDE, TOP & BOTTOM.
7. SILL REINFORCEMENT: (2)#4 SIMILAR TO BOND BEAM.
8. ALL CELLS WITH REINFORCING SHALL BE SOLIDLY GROUTED.
9. ALL COURSES WITH REINFORCING SHALL BE SOLIDLY GROUTED, PROVIDE GROUT SCREEN AS REQUIRED.
10. EPOXY SHALL BE HILTI HIT-RE 500 V3. INSTALL PER MANUFACTURER INSTRUCTIONS.

ACI 530 MASONRY LAP SPLICE LENGTHS f'm=1500 psi, fy=60000 psi

BAR SIZE	LAP
#3	18"
#4	24"
#5	30"
#6	44"
#7	60"

9
-
MASONRY LAP SPLICE SCHEDULE
NOT TO SCALE



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TOWN OF PROSPER, TEXAS
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
STRUCTURAL
TYPICAL SECTIONS AND DETAILS II

PRJ NO.	PRP18708	DATE	MAY 2020	DESIGNED	PKC	DRAWN	JLM	CHECKED	MFR
BY		DATE		FILE NAME	ST-PRP-DT-CMU1.dwg				
NO.	ISSUE	Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.							
SHEET	S-11								
SEQ.	49								

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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ELECTRICAL

LEGEND I

NO. ISSUE	BY	DATE	FBN JOB NO.	DATE	DESIGNED	DRAWN	REVISION	CHECKED	TWZ	FILE NAME
			PRP18708	MAY 2020						EL-ALL-GN-LGND01.dwg

SHEET **E-1**

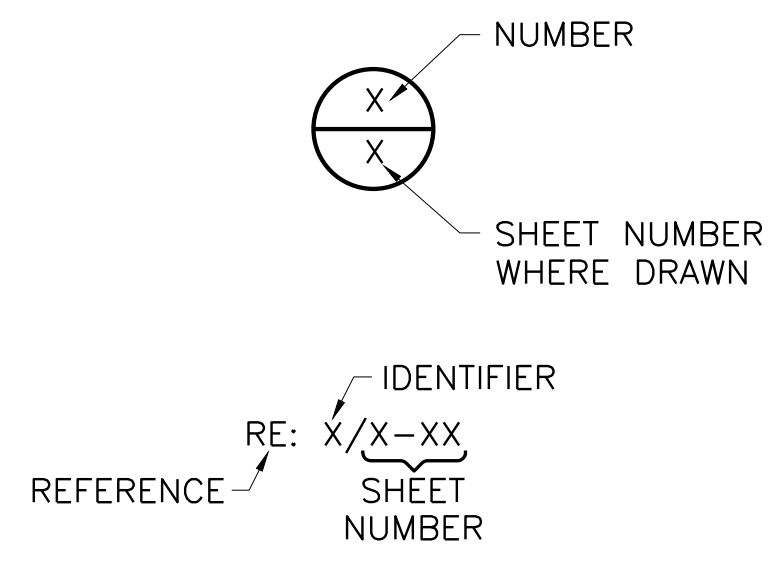
SEQ. 50

PLAN SYMBOL	DESCRIPTION
	JUNCTION BOX
	PULL BOX
	TERMINAL CABINET
	OCCUPANCY SENSOR
	PHOTOCELL
	PREWIRED
	MANHOLE
	UTILITY METER
	MOTORIZED LOUVER
	INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE OF NEMA 12 CONSTRUCTION UNLESS OTHERWISE NOTED
	INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE OF NEMA 4 CONSTRUCTION UNLESS OTHERWISE NOTED
	INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE OF NEMA 4X CONSTRUCTION UNLESS OTHERWISE NOTED
	INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL CONFORM TO N.E.C REQUIREMENTS FOR THE HAZARDOUS AREA CLASSIFICATION SHOWN

ONE-LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION
	OR	PANEL
		MOTOR, NUMBER DESIGNATES HORSEPOWER
		VOLTMETER (WITH SWITCH IF 3-PHASE)
		AMMETER (WITH SWITCH IF 3-PHASE)
		METER * WM - WATTMETER WHM - WATTHOUR METER WHDM - WATTHOUR DEMAND METER WHDR - WATTHOUR DEMAND RECORDER PF - POWER FACTOR METER ETM - ELAPSED TIME METER TRANSDUCER AX - CURRENT TRANSDUCER WX - WATT TRANSDUCER
		RELAY, NO. AS INDICATED 25 - SYNCHRONISM CHECK RELAY 27 - UNDER VOLTAGE RELAY 38 - BEARING PROTECTIVE DEVICE 40 - LOSS OF EXCITATION RELAY 42 - RUNNING CONTACTOR/PILOT RELAY 46 - REVERSE PHASE/PHASE BALANCE/CURRENT RELAY 47 - PHASE SEQUENCE VOLTAGE RELAY 48 - MACHINE OR TRANSFORMER THERMAL RELAY 50 - INSTANTANEOUS OVERCURRENT RELAY 50G - INSTANTANEOUS GROUND 51 - TIME OVER CURRENT RELAY, GROUNDING RESISTOR TYPE 51N - TIME OVERCURRENT RELAY, RESIDUAL TYPE 51V - TIME OVERCURRENT RELAY WITH VOLTAGE RESTRAINT 59 - OVER VOLTAGE RELAY 60 - NEGATIVE SEQUENCE VOLTAGE RELAY 62 - TIME DELAY RELAY 63 - OVER PRESSURE RELAY 67 - AC DIRECTIONAL OVERCURRENT RELAY 83 - AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY 86 - LOCKING-OUT RELAY 87 - DIFFERENTIAL PROTECTIVE RELAY B - SUFFIX INDICATES "BUS" G - SUFFIX INDICATES "GENERATOR" GF - GROUND FAULT IR - INTERPOSING RELAY PFR - PHASE FAILURE, PHASE REVERSAL, UNDERVOLTAGE, OVERVOLTAGE RELAY ST - SHUNT TRIP T - SUFFIX INDICATES "TRANSFORMER" TRP CAP - CAPACITOR TRIP X - SUFFIX INDICATES "AUXILIARY"

PLAN SYMBOL	DESCRIPTION
	LIGHTING FIXTURE "A" - FIXTURE TYPE "b" - SWITCH NUMBER
	EMERGENCY BATTERY PACK LIGHT FIXTURE "A" - FIXTURE TYPE
	CEILING MOUNTED EXIT SIGN "X" - FIXTURE TYPE
	WALL MOUNTED EXIT SIGN ARROW INDICATES DIRECTION OF EGRESS "X" - FIXTURE TYPE
	FIRE ALARM CONTROL PANEL
	MANUAL PULL STATION
	CEILING MOUNTED STROBE
	WALL MOUNTED STROBE
	SMOKE DETECTOR
	HEAT DETECTOR
	HORN
	COMBINATION STROBE/HORN
	CONDUIT, EXPOSED/SURFACE MOUNTED
	CONDUIT OR DUCTBANK, CONCEALED
	CONDUIT, EXPOSED/SURFACE MOUNTED, TURNING UP
	CONDUIT, EXPOSED/SURFACE MOUNTED, TURNING DOWN
	CONDUIT STUBBED OUT AND CAPPED
	OVERHEAD ELECTRIC LINE
	UNDERGROUND ELECTRIC LINE
	OVERHEAD PRIMARY LINE
	UNDERGROUND PRIMARY LINE
	OVERHEAD SECONDARY LINE
	UNDERGROUND SECONDARY LINE
	OVERHEAD COMMUNICATION LINE
	UNDERGROUND COMMUNICATION LINE
	OVERHEAD FIBER OPTIC LINE
	UNDERGROUND FIBER OPTIC LINE
	FLEXIBLE METAL CONDUIT
	HEAT TRACE
	DENOTES A QUANTITY OF TWO (2) 3-INCH CONDUITS EACH CONTAINING THREE NO. 3/0 AWG CONDUCTORS AND ONE NO.2 AWG GROUND CONDUCTOR
	DENOTES A QUANTITY OF TWO INSTRUMENT CABLES. EACH CONSISTS OF TWO NO.16 AWG CONDUCTORS
	THREE 4-INCH CONDUITS
	CABLE TAG FOUR #14 CONTROL OR POWER CONDUCTORS, ONE #14 GROUND CONDUCTOR. ALL CONDUCTORS IN A 3/4" CONDUIT. TWO OF THE FOUR #14 CONTROL OR POWER CONDUCTORS ARE SPARE.
	HOMERUN, CIRCUITS 1 AND 3 RUN TO PANEL LA 2 #12, #12G., 3/4"C. UNLESS NOTED OTHERWISE
	SINGLE POLE SWITCH "b" - INDICATES SWITCH LEG SHALL CONTROL LIGHT FIXTURES WITH "b" - DESIGNATION
	MULTI POLE SWITCH "x" - INDICATES NUMBER OF POLE "c" - INDICATES SWITCH SHALL CONTROL LIGHT FIXTURES WITH "c" DESIGNATION
	MANUAL MOTOR STARTER /DISCONNECT
	3 WAY SWITCH
	4 WAY SWITCH
	DIMMER LIGHTING CONTROL SWITCH
	TIME SWITCH
	DUPLEX RECEPTACLE, 20A, 120V, 2P, 3W * "C" - MOUNTED ABOVE COUNTERTOP "GFI" OR "GF" - GROUND FAULT INTERRUPTER TYPE "WP" - WEATHERPROOF
	FLOOR MOUNTED RECEPTACLE
	SIMPLEX RECEPTACLE, GROUNDED TYPE
	QUADPLEX RECEPTACLE

NOTE:
THIS IS A STANDARD LEGEND. THEREFORE, NOT ALL OF THIS INFORMATION MAY BE USED ON THIS PROJECT.



ABBREVIATIONS	ABBREVIATIONS
NC or N.C.	NORMALLY CLOSED
NF	NON-FUSED
NO or N.O.	NORMALLY OPEN OR NUMBER
NO.	NUMBER
OD	OUTSIDE DIAMETER
OHE	OVERHEAD ELECTRIC
OL	OVERLOAD
OLX	OVERLOAD CONTROL RELAY
P	POLE
PB	PULL BOX OR PUSH BUTTON
PC	PHOTOCELL
PCC	PUMP CONTROL CONSOLE
PFCC	POWER FACTOR CORRECTION CAPACITOR
PFR	PHASE FAILURE RELAY
PH	PHASE
PL	PLATE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PoE	POWER OVER ETHERNET
PPR	PHASE PROTECTIVE RELAY
PQM	POWER QUALITY METER
PR	PAIR OR PAIR CABLE
PT	POTENTIAL TRANSFORMER
PTT	PUSH TO TEST TYPE
PVC	POLYVINYL CHLORIDE
QTY	QUANTITY
RC	REMOTE CONTROL
RCP	RELAY CONTROL PANEL
REC.	CIRCUIT RECLOSURE
RECP	RECEPTACLES
REQD.	REQUIRED
RTD	RESISTANCE TEMPERATURE DETECTOR
RTU	REMOTE TERMINAL UNIT
SC	SURGE CAPACITOR
SCH	SCHEMATIC
SCTB	SHORT CIRCUIT TERMINAL BLOCK
SEC	SECONDS OR SECONDARY
SHLD. OR SH	SHIELD OR SHIELDED
SHT	SHEET
SN OR S/N	SOLID NEUTRAL
SPD	SURGE PROTECTION DEVICES
SSRVS	SOLID-STATE REDUCED VOLTAGE STARTER
SS	STAINLESS STEEL
ST	STARTER
STA.	STATION
STC	SIGNAL TERMINATION CABINET
SV	SOLENOID VALVE
SW	SWITCH
SWGR	SWITCHGEAR
Sz#	MOTOR STARTER WITH SIZE
TC	TERMINATION CABINET OR TRAY CABLE
TEL	TELEPHONE
TO	TIME DELAY ON OPENING
TR.	TRIAD
TS	TEMPERATURE SWITCH
TW	TWISTED
TYP	TYPICAL
UG	UNDERGROUND
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTP	UNSHIELDED TWISTED PAIR CABLE
V	VOLTS
VAR.	VARIABLE
VFD	VARIABLE FREQUENCY DRIVE
VFI	VACUUM FAULT INTERRUPTER
VO	VALVE OPERATOR
W	WITH, WIRE OR WATT
WP	WEATHERPROOF
WR	WEATHER RESISTANT
XFMR	TRANSFORMER
XMTR	TRANSMITTER
XP	EXPLOSION PROOF

ABBREVIATIONS	ABBREVIATIONS
AC	ALTERNATING CURRENT
AF	AMP FRAME
AFD	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISHED FLOOR OR GRADE
AG	ABOVE GRADE
AGSB	ABOVE GROUND SPLICE BOX
AIC	AMPERES INTERRUPTING CAPACITY
AL OR ALUM	ALUMINUM
AMP OR A	AMPERE
AT	AMP TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
C.	CONDUIT
CB	CIRCUIT BREAKER
C/C	CENTER TO CENTER
CHH	COMMUNICATION MANHOLE/HANDHOLE
CKT	CIRCUIT
CLF	CURRENT LIMITING FUSE
CONT.	CONTINUATION
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CS	CONTROL SWITCH OR COMBINATION STARTER
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
DI	DOOR INTERLOCK
DN	DOWN
DP	DIFFERENTIAL PRESSURE
DWG	DRAWING
EMH	ELECTRICAL MANHOLE/HANDHOLE
EC	EMPTY CONDUIT
ELEC	ELECTRICAL
ELEV	ELEVATION
EM	EMERGENCY
EHH	ELECTRICAL MANHOLE
EO	ELECTRICALLY OPERATED
ETM	ELAPSED TIME METER
EUC	ELECTRIC UTILITY CO.
EXIST.	EXISTING
FBO	FURNISHED BY OTHERS
FO	FIBER OPTIC
FRP	FIBERGLASS REINFORCED POLYESTER
FT	FEET
FU	FUSE
G. OR GRD	GROUND
GA.	GAUGE
GCP	GENERATOR CONTROL PANEL
GEN	GENERATOR
GFI	GROUND FAULT INTERRUPTER
GFS	GROUND FAULT SENSING
GO	GATE OPERATOR
GRS	GALVANIZED RIGID STEEL
HH	HANDHOLE
HP	HORSEPOWER
HT	HEIGHT
HTP	HEAT TRACE PANEL
HTR	HEATER
HZ	HERTZ
ID	INTERNAL DIAMETER
IMH	INSTRUMENT MANHOLE
INST	INSTRUMENT
IRP	INTERPOSING RELAY PANEL
JB	JUNCTION BOX
KAIC	KILO AMPERE INTERRUPTING CAPACITY
KVA	KILOVOLT-AMPERE
KW	KILOWATT
LA	LIGHTNING ARRESTER
LC	LIGHTNING CONTACTOR
LED	LIGHT EMITTING DIODE
LGTS ON LTG	LIGHTS/LIGHTING
LP	LIGHTING PANEL
LSI	LONG, SHORT, INSTANTANEOUS
LSIG	LONG, SHORT, INSTANTANEOUS, GROUND
MBFV	MOTOR OPERATED BUTTERFLY VALVE
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MFR	MANUFACTURER
MFR'S	MANUFACTURER'S
MH	MANHOLE
ML	MULTILIN
MOV	MOTOR OPERATED VALVE
MLO	MAIN LUGS ONLY
MPR	MOTOR PROTECTION RELAY
MR	MULTIRATIO
MTD	MOUNTED
MTC	MOUNTING
MTS	MANUAL TRANSFER SWITCH

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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ELECTRICAL
LEGEND II

NO. ISSUE	BY	DATE	FBN JOB NO.	PRP18708
			DATE	MAY 2020
			DESIGNED	DFP
			DRAWN	MHC
			REVISD	
			CHECKED	TWZ
			FILE NAME	EL-ALL-GN-LGND02.dwg

Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.
VERIFY SCALE
SHEET
F-2
SEQ. 51

ONE-LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION																
	-	AC INDUSTRIAL CONTROL RELAY COIL, # - NUMBER AS INDICATED																
	-	MOTOR STARTER COIL, # - NUMBER AS INDICATED																
	-	SPECIAL CAPACITOR *SC - SURGE CAPACITOR PF - POWER FACTOR CORRECTION CAPACITOR																
	-	PUSH BUTTON, MOMENTARY CONTACT, SPRING RETURN, NORMALLY CLOSED																
	-	PUSH BUTTON, MOMENTARY CONTACT, SPRING RETURN, NORMALLY OPEN																
	-	EMERGENCY STOP PUSH BUTTON WITH RED MUSHROOM HEAD OPERATOR (MAINTAINED CONTACT)																
	-	OFF/ON SELECTOR SWITCH																
	-	3 POSITION SELECTOR SWITCH, MAINTAINED CONTACT O-OPEN X-CLOSED <table border="1"> <thead> <tr> <th>POSITION</th> <th>TOP CONTACT</th> <th>MIDDLE CONTACT</th> <th>BOTTOM CONTACT</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>X</td> <td>O</td> <td>O</td> </tr> <tr> <td>B</td> <td>O</td> <td>O</td> <td>O</td> </tr> <tr> <td>C</td> <td>O</td> <td>O</td> <td>X</td> </tr> </tbody> </table> (A/B/C) HOA - HAND/OFF/AUTO HOR - HAND/OFF/REMOTE LOR - LOCAL/OFF/REMOTE OCS - OPEN/CLOSE/STOP OOA - ON/OFF/AUTO NOTE: 2 POSITION MULTI-CONTACT SWITCH FOLLOWS SAME CONVENTION	POSITION	TOP CONTACT	MIDDLE CONTACT	BOTTOM CONTACT	A	X	O	O	B	O	O	O	C	O	O	X
POSITION	TOP CONTACT	MIDDLE CONTACT	BOTTOM CONTACT															
A	X	O	O															
B	O	O	O															
C	O	O	X															
	-	INDICATING LAMP, COLOR INDICATED *R - RED G - GREEN B - BLUE W - WHITE A - AMBER O - ORANGE PTT - PUSH TO TEST																
	-	MEDIUM VOLTAGE DRAWOUT TYPE POWER CIRCUIT BREAKER																
		LOW VOLTAGE CIRCUIT BREAKER, 3 POLE UNLESS OTHERWISE NOTED A - AMP TRIP, P - POLES																
		MOTOR CIRCUIT PROTECTOR																
		COMBINATION MOTOR CIRCUIT PROTECTOR AND MAGNETIC MOTOR STARTER, FULL VOLTAGE NON-REVERSING UNLESS OTHERWISE NOTED: *FVR - FULL VOLTAGE REVERSING FVNR - FULL VOLTAGE, NON REVERSING RVNR - REDUCED VOLTAGE NON-REVERSING 2S1W - TWO SPEED, ONE WINDING 2S2W - TWO SPEED, TWO WINDING Sz# - NEMA SIZE OF STARTER																
		NON-FUSIBLE DISCONNECT SWITCH, 600 VOLT, 3 POLE *AMPERE RATING NOTED																
		FUSIBLE DISCONNECT SWITCH, 600 VOLT, 3 POLE, AMPERE RATING AND FUSE SIZE AS NOTED *AMPERE RATING NOTED *FUSE RATING																
	-	DRAWOUT TYPE EQUIPMENT OR DEVICE																
	-	MEDIUM VOLTAGE CABLE TERMINATION																
	-	MEDIUM VOLTAGE AIR INTERRUPTER SWITCH																
	-	MEDIUM VOLTAGE FUSED AIR INTERRUPTER SWITCH																
	-	MEDIUM VOLTAGE FUSED MOTOR CONTROLLER FUSED CONTACTOR DRAWOUT TYPE																
	-	VACUUM CONTACTOR																
	-	SPEED POTENTIOMETER																

ONE-LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION
		TIMING RELAY RANGE AS NOTED, SET POINT AS NOTED #-NUMBER AS INDICATED TDD-TIME DELAY AFTER DE-ENERGIZATION-OFF DELAY TDE-TIME DELAY AFTER ENERGIZATION-ON DELAY
	-	NOTC-NORMALLY OPEN, TIMED CLOSING WHEN ENERGIZED NCTO-NORMALLY CLOSED, TIMED OPENING WHEN ENERGIZED NOTO-NORMALLY OPEN, TIMED OPENING WHEN DE-ENERGIZED NCTC-NORMALLY CLOSED, TIMED CLOSING WHEN DE-ENERGIZED
		FIELD INSTRUMENT, TAG NO. OR LOOP NO. AS INDICATED * - INDICATES INSTRUMENT TYPE DEFINED ON LOOP SHEETS ## - INDICATES LOOP NO.
		LIQUID LEVEL (FLOAT) SWITCH NORMALLY CLOSED, OPENS ON FALLING LEVEL NORMALLY OPEN, CLOSSES ON FALLING LEVEL NORMALLY CLOSED, OPENS ON RISING LEVEL NORMALLY OPEN, CLOSSES ON RISING LEVEL
		PRESSURE OR VACUUM SWITCH NORMALLY OPEN, CLOSSES ON RISING PRESSURE NORMALLY CLOSED, OPENS ON RISING PRESSURE NORMALLY OPEN, CLOSSES ON DROPPING PRESSURE NORMALLY CLOSED, OPENS ON DROPPING PRESSURE
		TEMPERATURE SWITCH OR THERMOSTAT NORMALLY OPEN, CLOSSES ON RISING TEMPERATURE NORMALLY OPEN, CLOSSES ON DROPPING TEMPERATURE NORMALLY CLOSED, OPENS ON RISING TEMPERATURE NORMALLY CLOSED, OPENS ON DROPPING TEMPERATURE
		FLOW SWITCH (AIR, WATER, ETC.) NORMALLY OPEN, CLOSSES ON INCREASED FLOW NORMALLY CLOSED, OPENS ON INCREASED FLOW
		POSITION (LIMIT) SWITCH NORMALLY OPEN NORMALLY OPEN - HELD CLOSED NORMALLY CLOSED NORMALLY CLOSED - HELD OPEN
		TORQUE SWITCH NORMALLY CLOSED, OPENS ON HIGH TORQUE
		TRANSFORMER, RATINGS AND CONNECTIONS AS NOTED
	-	CURRENT TRANSFORMER # - QUANTITY A - RATIO
	-	POTENTIAL TRANSFORMER # - QUANTITY
	-	GROUND CURRENT SENSOR TRANSFORMER # - QUANTITY A - RATIO
	-	CONTROL TRANSFORMER
	-	CONTROL POWER TRANSFORMER
		GENERATOR, RATINGS AND CONNECTIONS AS NOTED
	-	TRANSFER SWITCH ATS - AUTOMATIC TRANSFER SWITCH MTS - MANUAL TRANSFER SWITCH "N" - INDICATES NORMAL SOURCE "S" - INDICATES STANDBY SOURCE #A - INDICATES CONTINUOUS CURRENT RATING
	-	MOTOR OVERLOAD OVERLOAD RELAY HEATER

SYMBOL	DESCRIPTION
	DATA
	TELEPHONE
	COMBINATION TELEPHONE/DATA
	FLOOR MOUNTED DATA OUTLET
	FLOOR MOUNTED TELEPHONE OUTLET
	POKE-THRU DEVICE COMBINATION POWER/DATA/VOICE OUTLET
	FLOOR COMBINATION POWER/DATA/VOICE OUTLET
	CATV
	SECURITY CAMERA *F - FIXED Z - PAN/TILT/ZOOM
	SECURITY DEVICE SEC - SECURITY PANEL MAG - MAGNETIC LOCK CR - CARD READERS DR - REMOTE DOOR RELEASE MD - MOTION DETECTOR SK - SECURITY KEYPAD ES - ELECTRIC STRIKE DS - DOOR SWITCH IC - INTERCOM STATION SB - SECURITY PANIC BUTTON

NOTE:
THIS IS A STANDARD LEGEND. THEREFORE, NOT ALL OF THIS INFORMATION MAY BE USED ON THIS PROJECT.

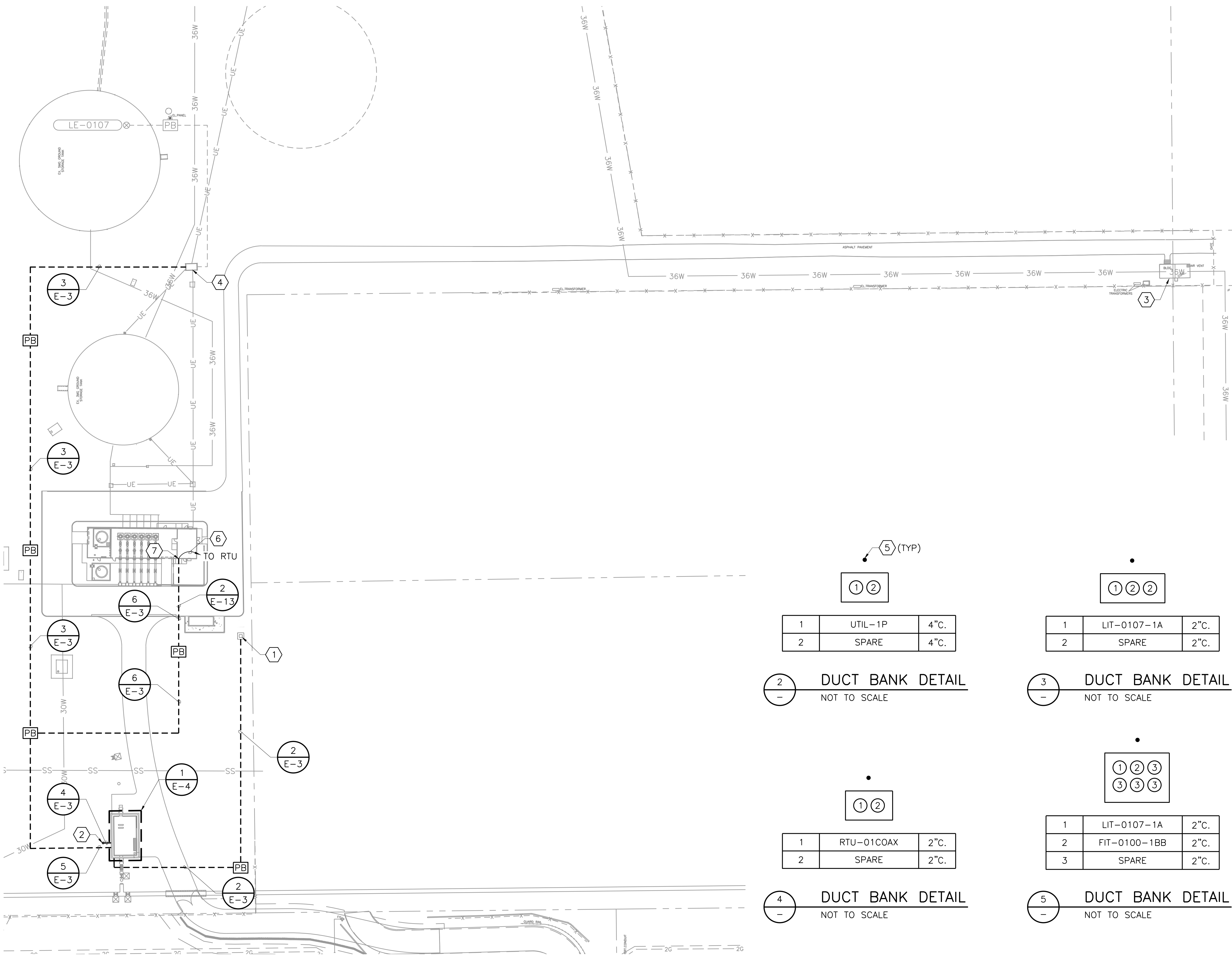
ONE-LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION
	-	CONDUCTORS OR CONDUITS CROSSING PATHS BUT NOT CONNECTED
	-	CONDUCTORS ELECTRICALLY CONNECTED
	-	INDICATES LIMITS OF EQUIPMENT OR WIRING ENCLOSURE
	-	LIGHTNING ARRESTER
		GROUND ROD GROUND ROD TEST WELL
	-	FUSE, AMPERE RATING AS NOTED
	-	HEATER
	-	INDUCTOR
	-	CONTACT, NORMALLY OPEN (NO)
	-	CONTACT, NORMALLY CLOSED (NC)
	-	OVERLOAD CONTACT
	-	KIRK KEY INTERLOCK
	-	MECHANICAL INTERLOCK
	-	TERMINAL
	-	NODE
	-	TERMINAL OR TEST BLOCK
	-	PUSH BUTTON STATION, REFER TO ELECTRICAL SCHEMATIC FOR NUMBER OF DEVICES.
	-	LOCATED AT SCADA RTU
	-	LOCATED REMOTE
	-	LOCATED AT MOTOR
	-	FUSED SWITCH/FUSED CUTOUT
		UTILITY METER



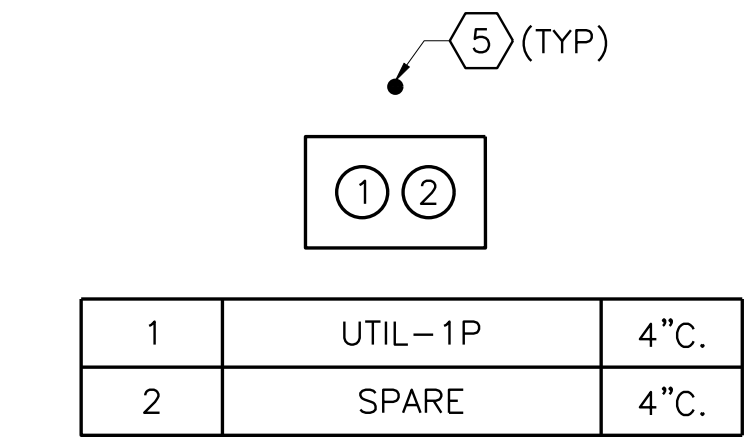
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ELECTRICAL
SITE PLAN

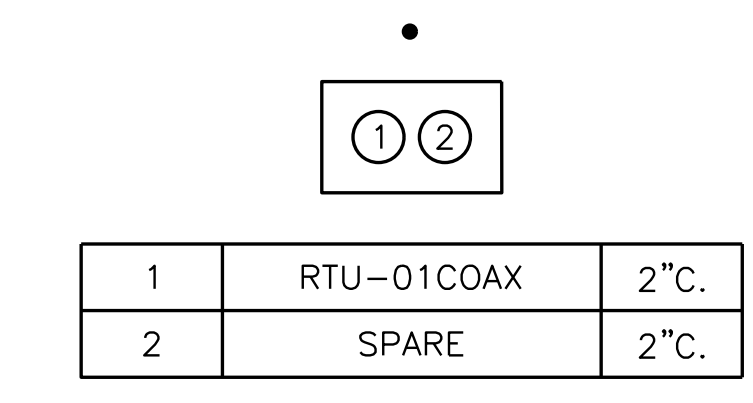
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SHEET	E-3								
SEQ.	52								



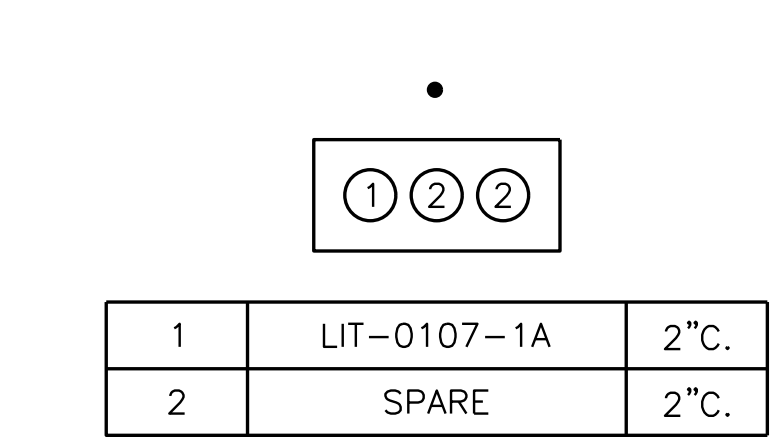
1 SITE PLAN
1" = 50'



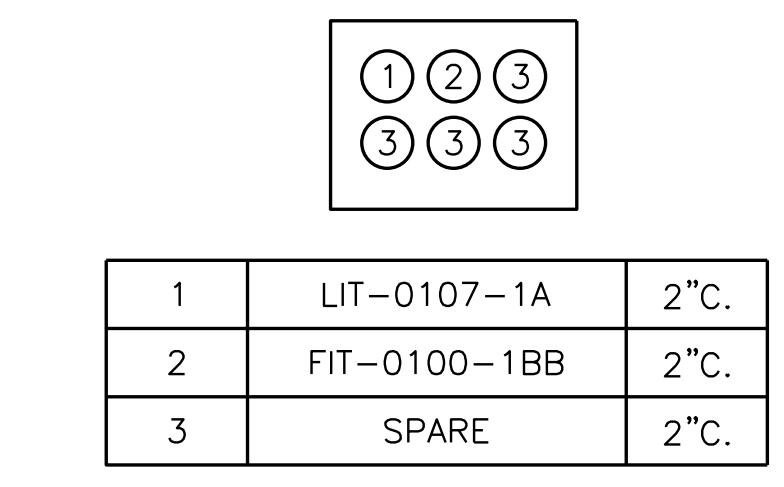
2 DUCT BANK DETAIL
NOT TO SCALE



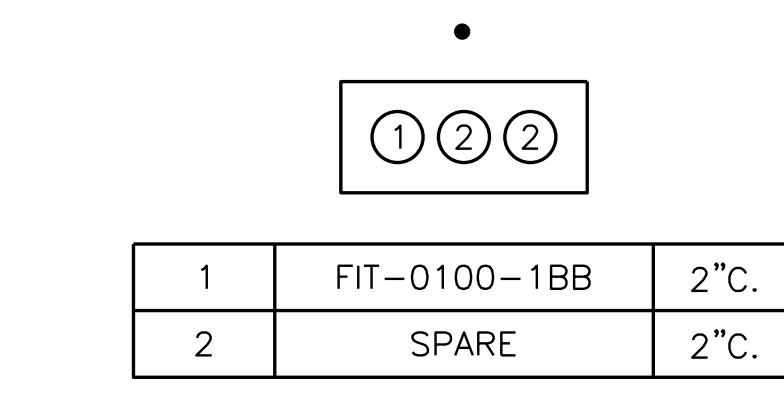
4 DUCT BANK DETAIL
NOT TO SCALE



3 DUCT BANK DETAIL
NOT TO SCALE



5 DUCT BANK DETAIL
NOT TO SCALE



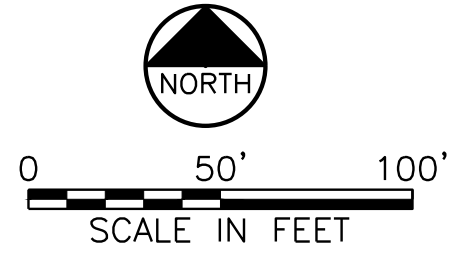
6 DUCT BANK DETAIL
NOT TO SCALE

GENERAL NOTES:

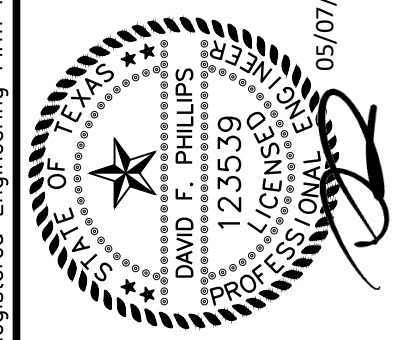
- ALL EQUIPMENT AND CABLE/CONDUIT TAGS ARE PRECEDED BY "WA3560".
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND SIZING ALL MANHOLES, PULL BOXES AND JUNCTION BOXES AS REQUIRED BY THE NATIONAL ELECTRICAL CODE.
- ALL PULL BOXES AND MANHOLES SHALL BE AASHTO HS-20 RATED.
- INSTALLATION CONTRACTOR SHALL VERIFY THE FINAL DIMENSIONS BASED UPON THE FINAL EQUIPMENT DIMENSIONS PROVIDED BY THE EQUIPMENT MANUFACTURER.
- ALL EQUIPMENT SHOWN DARK SHALL BE PROVIDED UNDER THIS CONTRACT. ALL EQUIPMENT SHOWN LIGHT ARE EXISTING TO REMAIN.
- RE: 1/E-13 FOR CONCRETE ENCASED DUCT BANK DETAILS. APPLIES TO ALL DUCT BANKS.
- CONTACT COSERV REPRESENTATIVE KEVITT VALLEY (940)321-7800 EXT. 7543 FOR QUESTIONS REGARDING UTILITY CONNECTION. THE CONTRACTOR SHALL INCLUDE ALL COSTS AND FEES ASSOCIATED WITH THE ELECTRIC UTILITY CONNECTION. COORDINATE REQUIREMENTS WITH COSERV.

NOTES BY SYMBOL "◇"

- 480Y/277V, 3P, 4W SECONDARY UTILITY TRANSFORMER. TRANSFORMER AND PAD ARE PROVIDED BY COSERV ELECTRIC UTILITY. CONTRACTOR SHALL COORDINATE TRANSFORMER AND PAD PLACEMENT WITH COSERV. CONTRACTOR TO TERMINATE DUCT BANK AT THE TRANSFORMER SUCH THAT COSERV CAN TERMINATE CABLES ON THE TRANSFORMER SECONDARY.
- RE: 1/E-12 FOR MONOPOLE/RADIO ANTENNA DETAIL.
- EXISTING METER VAULT.
- EXISTING ELECTRIC CONTROL PANEL AND RTU-2. RE: 7/E-10 AND 3/PI-2 FOR DETAILS.
- #4/0 BARE TIN-PLATED COPPER GROUND CONDUCTOR RUN ALONG THE TOP OF THE DUCT BANK REBAR CAGE. CONNECT TO THE POWER SYSTEM GROUND. TYPICAL FOR ALL DUCT BANKS.
- ROUTE TO THE EXISTING PROSPER PUMP STATION RTU CABINET. PROSPER'S SYSTEM INTEGRATOR TO RESCALE FLOW SIGNAL.
- RE: 4/E-10 FOR DUCT BANK RISER / ABOVE GRADE CONDUIT TERMINATION AND ENTRY INTO PUMP STATION ELECTRICAL ROOM.



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ELECTRICAL
ELECTRICAL ROOM PLAN

NO.	ISSUE	BY	DATE	FERN JOB NO.	PRP18708
				DATE	MAY 2020
				DESIGNED	DFP
				DRAWN	MHC
				REVISD	
				CHECKED	TWZ
				FILE NAME	EL-FMV-PL-ELB.dwg

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VERIFY SCALE

0 1' 2' 4'
3/8" = 1'-0"

SHEET **E-4**

SEQ. 53

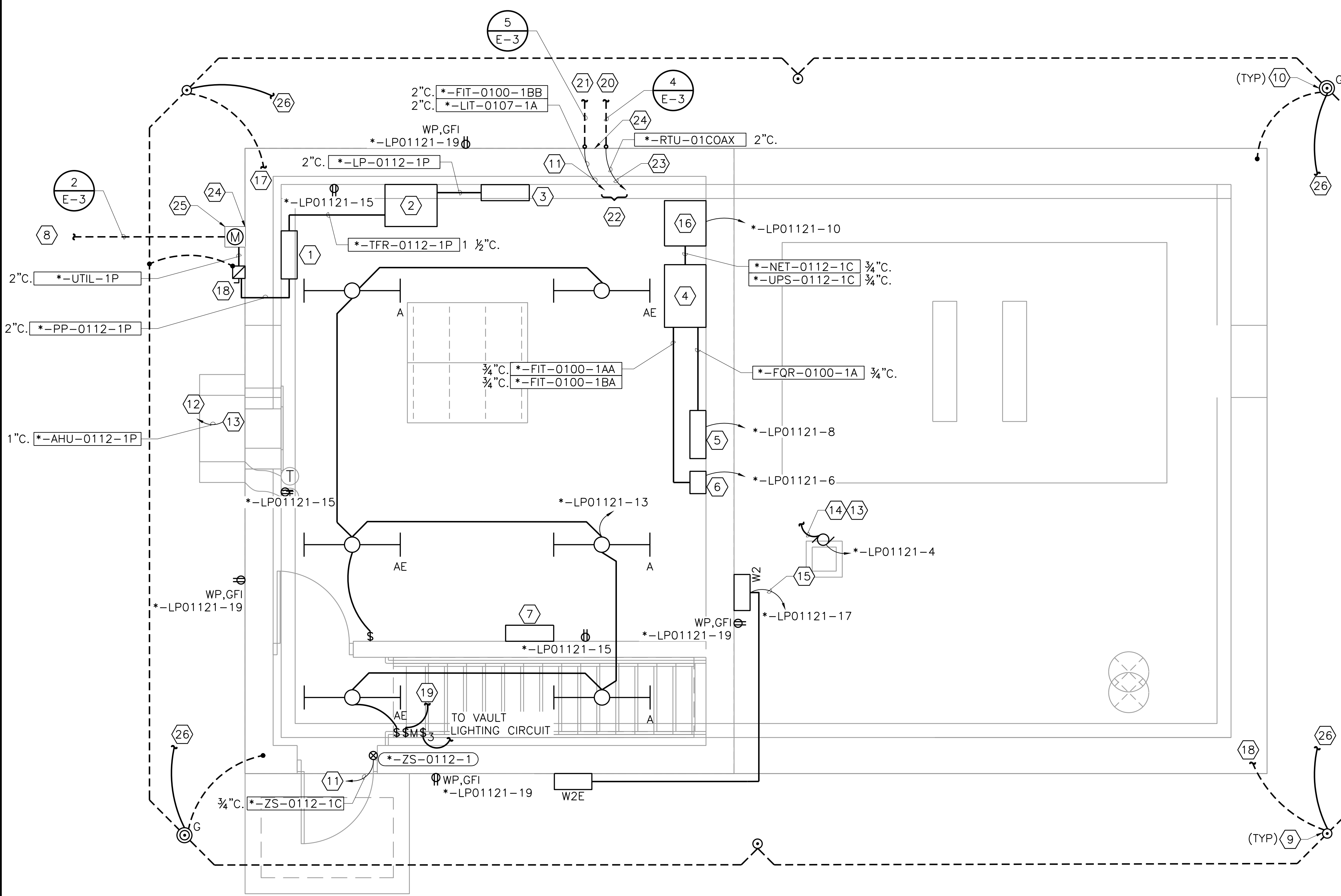
Page 987

GENERAL NOTES:

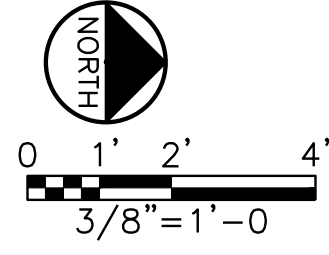
1. ALL EQUIPMENT AND CABLE/CONDUIT TAGS ARE PRECEDED BY "WA3560".
2. ALL CONDUITS FOR LIGHTING CIRCUITING SHALL BE LOCATED INSIDE THE BUILDING.
3. ALL LIGHTING 120V WIRING SHALL BE #12, #12G., 3/4"C. PROVIDE CONDUCTORS AS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM.
4. ALL RECEPTACLE AND MISCELLANEOUS 120V WIRING SHALL BE 2 #12, #12G., 3/4"C., UNLESS NOTED OTHERWISE.
5. MOUNT ELECTRICAL EQUIPMENT 1/2" OFF THE ELECTRICAL ROOM WALL.
6. MOUNT ALL LIGHT FIXTURES TYPE "A" AND "AE" TO ELECTRICAL ROOM AND STAIRWAY CEILING SURFACE.
7. MOUNT EXTERIOR FIXTURE "W2E" AND "W2" 8'-0" AFF.
8. EMERGENCY LIGHT FIXTURES TYPE "E" WILL BE NON-SWITCHED AND WILL BE CONNECTED TO THE LIGHTING CIRCUIT FOR THE VAULT.
9. CONNECT BATTERY PACK ON EMERGENCY LIGHTING FIXTURE TYPES "AE" AND "W2E" TO UNSWITCHED LEG OF THE CIRCUIT SERVING THE ROOM/AREA AS SHOWN.
10. THE CONTRACTOR SHALL SIZE AND PROVIDE JUNCTION BOXES AND PULL BOXES AS REQUIRED BY THE NATIONAL ELECTRICAL CODE.

NOTES BY SYMBOL "E"

1. 480Y/277V, 3P, 4W PANEL "*-PP-0112-1",
2. 480V-208Y/120V TRANSFORMER "*-TFR-0112-1". TRANSFORMER SHALL BE PAD MOUNTED. CONTRACTOR SHALL PROVIDE MOUNTING HARDWARE AS REQUIRED.
3. 208Y/120V PANEL "*-LP-0112-1",
4. PROVIDE CONTROL/RTU PANEL "CP-001-1". PROVIDE WIRES AND CONDUITS FOR COMPLETE CONNECTION OF CONTROL PANEL, UPS PANEL AND NETWORK PANEL. RE: 1/PI-2 FOR DETAILS.
5. CHART RECORDER "*-FQR-0100-1",
6. FLOW METER TRANSMITTER "*-FIT-0100-1",
7. LIGHTING CONTACTOR.
8. 480V INCOMING POWER. RE: 1/E-3 FOR CONTINUATION.
9. PROVIDE A 3/4" X 10' COPPER CLAD GROUND ROD.
10. GROUND TEST WELL. RE: 5/E-11 FOR ADDITIONAL INFORMATION.
11. TO CONTROL PANEL "*-CP-001-1".
12. TO PANEL "*-PP-0112-1".
13. MANUFACTURER PROVIDED INTEGRAL DISCONNECT. CONTRACTOR TO PROVIDE AN EXTERNAL 30A/3P/NF DISCONNECT WITH A NEMA 4X 304 STAINLESS STEEL ENCLOSURE.
14. TO SWITCH IN STAIRWELL.
15. VIA LIGHTING CONTACTOR. RE: 3/E-8 FOR DETAILS.
16. PROVIDE UPS PANEL AND NETWORK PANEL. PROVIDE WIRES AND CONDUITS FOR COMPLETE CONNECTION OF CONTROL PANEL, UPS PANEL AND NETWORK PANEL. RE: 1&2/PI-2 FOR DETAILS.
17. TO NEAREST VAULT GROUND PLATE. RE: 1/E-5.
18. LOCAL DISCONNECT IN A NEMA 4X 304 STAINLESS STEEL ENCLOSURE.
19. TO EXHAUST FAN.
20. COAXIAL CABLE TO MONOPOLE. RE: 1/E-3 FOR CONTINUATION.
21. GST LEVEL FROM RTU-2 AND FLOW METER FLOW TO PROSPER RTU. RE: 1/E-3 FOR CONTINUATION.
22. TERMINATE SPARE CONDUITS INSIDE BUILDING.
23. ROUTE COAXIAL CABLE TO NETWORK PANEL.
24. RE: 4/E-10 FOR DUCT BANK RISER / STUB UP DETAIL.
25. PROVIDE WEATHER-PROOF NEMA 4X 304 STAINLESS STEEL METER BASE. COORDINATE THE METER BASE SIZE SELECTION WITH COSERV.
26. TO LIGHTNING PROTECTION SYSTEM. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.



1 ELECTRICAL ROOM PLAN
3/8" = 1'-0"



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TOWN OF PROSPER, TEXAS
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
ELECTRICAL
FLOW METER VAULT PLAN

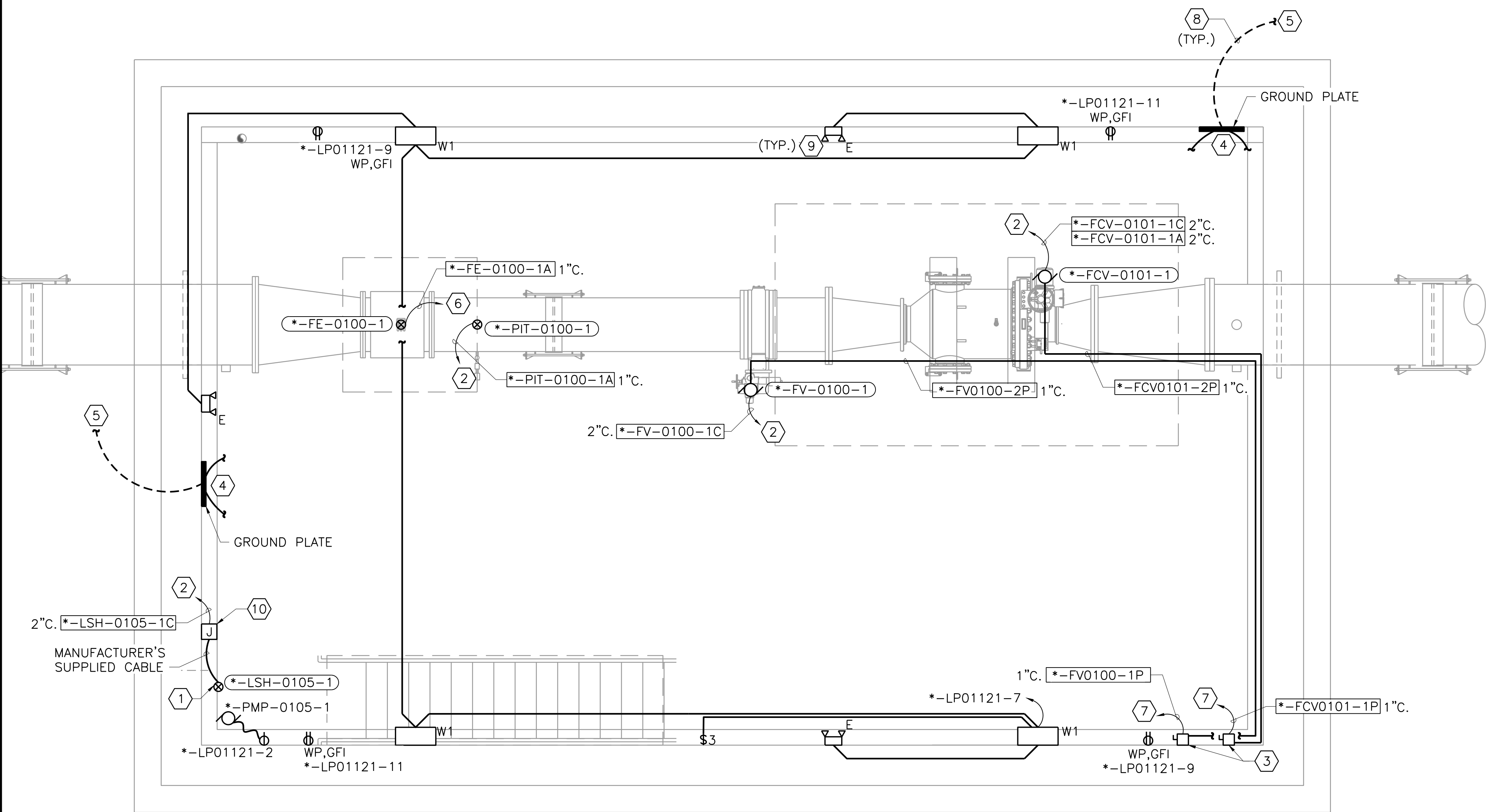
NO. ISSUE	BY	DATE	FERN JOB NO.	PRP18708
			DATE	MAY 2020
			DESIGNED	DFP
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			REVISOR	
			CHECKED	TWZ
			FILE NAME	EL-FMV-PL-VLT.dwg
Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.				
VERIFY SCALE				
SHEET E-5				
SEQ. 54				

GENERAL NOTES:

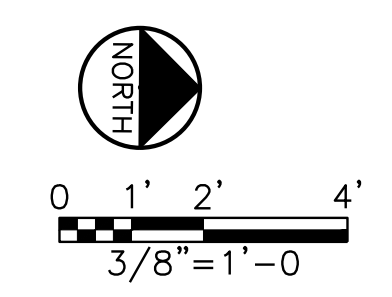
1. ALL EQUIPMENT AND CABLE/CONDUIT TAGS ARE PRECEDED BY "WA3560".
2. ALL CONDUITS FOR LIGHTING CIRCUITING WILL BE LOCATED INSIDE THE BUILDING.
3. ALL LIGHTING 120V WIRING SHALL BE #12, #12G., 3/4"C. PROVIDE CONDUCTORS AS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM.
4. ALL RECEPTACLE AND MISCELLANEOUS 120V WIRING WILL BE 2 #12, #12G., 3/4"C., UNLESS NOTED OTHERWISE.
5. MOUNT LIGHT FIXTURES TYPE "W1" AND "E" 10'-0" ABOVE METER VAULT FLOOR.
6. MOUNT ALL RECEPTACLES, JUNCTION BOXES AND SWITCHES IN METER VAULT AT 4'-0" ABOVE METER VAULT FLOOR AND 1/4" OFF THE WALL UNLESS NOTED OTHERWISE.
7. EMERGENCY LIGHT FIXTURES TYPE "E" WILL BE NON-SWITCHED AND WILL BE CONNECTED TO THE LIGHTING CIRCUIT FOR THE VAULT.
8. THE CONTRACTOR SHALL SIZE AND PROVIDE JUNCTION BOXES AS REQUIRED BY THE NATIONAL ELECTRICAL CODE.

NOTES BY SYMBOL "⬡"

1. MOUNT LEVEL SWITCH TO ACTIVATE AT 3" AFF.
2. TO CONTROL PANEL "*-CP-001-1".
3. PROVIDE A 30A/3P/NF DISCONNECT SWITCH WITH A NEMA 4X 304 SS ENCLOSURE. MOUNT DISCONNECT ON WALL, BELOW LIGHTING FIXTURE TYPE "A". INSTALL DISCONNECT SUCH THAT A MINIMUM OF 3'-6" OF CLEARANCE IS PROVIDED IN FRONT OF DISCONNECT.
4. GROUND ALL METAL PARTS PER THE NATIONAL ELECTRICAL CODE. RE: 7/E-11 FOR GROUNDING REQUIREMENTS. GROUND WIRE SHALL BE INSTALLED PRIOR TO POURING OF CONCRETE. CORE DRILLING FOR GROUND WIRE AFTER POURING OF CONCRETE SHALL NOT BE ALLOWED.
5. CONNECT TO GROUND COUNTERPOISE. RE: 7/E-11.
6. TO FLOW TRANSMITTER "*-FIT-0100-1".
7. TO PANEL "*-PP-0112-1".
8. RE: 6/E-10 FOR ALL GROUND CONDUCTOR PENETRATIONS INTO VAULT.
9. EMERGENCY LIGHTING SHALL BE CONNECTED TO AN UNSWITCHED LEG OF A LIGHTING CIRCUIT.
10. PROVIDE A NEMA 4X 304 STAINLESS STEEL JUNCTION BOX.

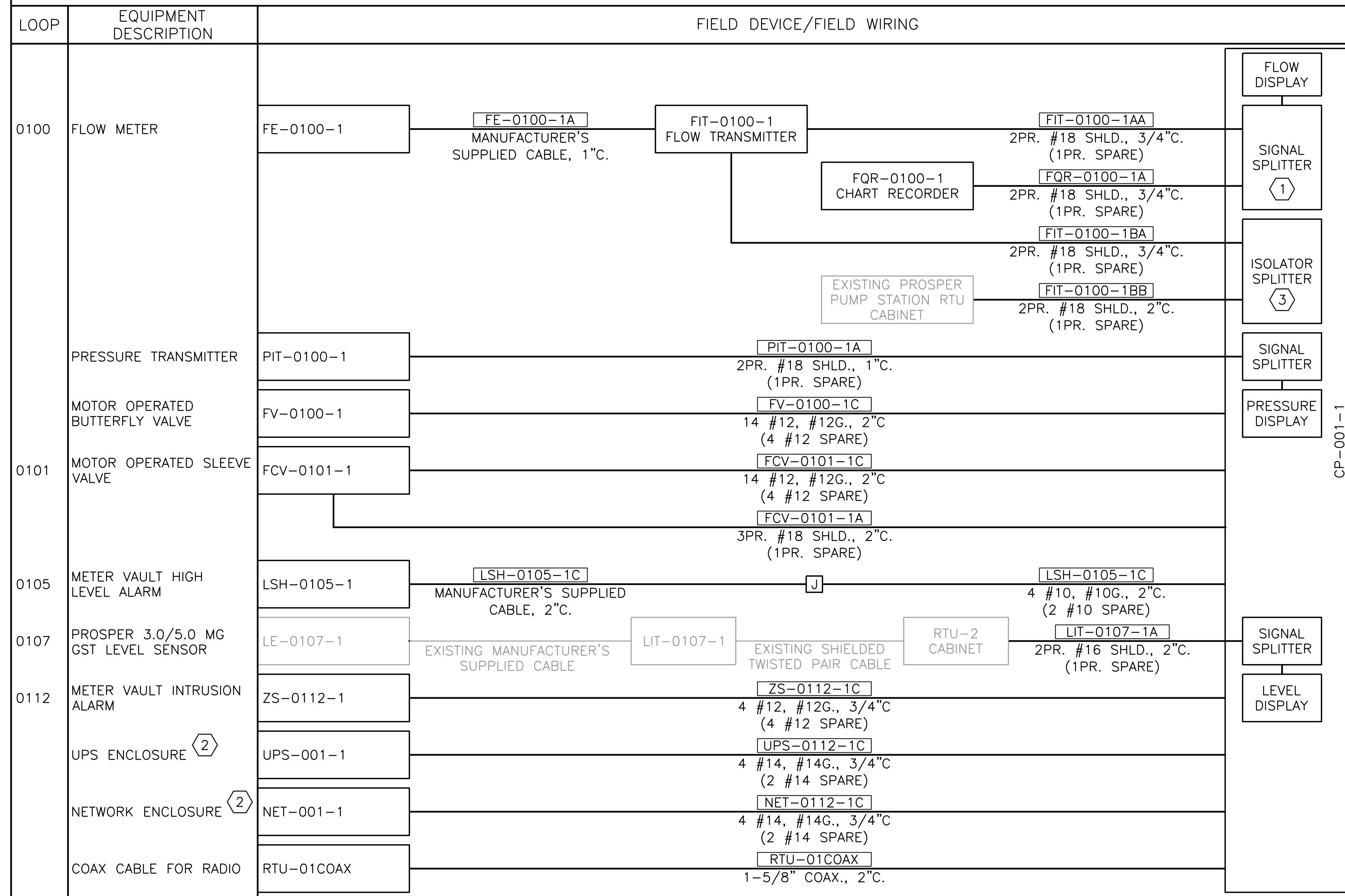


1 FLOW METER VAULT PLAN
3/8" = 1'-0"



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INTERCONNECTION DIAGRAM



CP-001-1

GENERAL NOTES:

1. ALL EQUIPMENT AND CABLE/CONDUIT TAGS ARE PRECEDED BY "WA3560-".
2. CONDUIT SIZES ARE MINIMUM SIZE. PROVIDE LARGER SIZE CONDUIT WHERE INDICATED IN DUCT BANK DETAILS/PLAN SHEETS.
3. ALL EQUIPMENT SHOWN DARK SHALL BE PROVIDED UNDER THIS CONTRACT. ALL EQUIPMENT SHOWN LIGHT ARE EXISTING TO REMAIN.

NOTES BY SYMBOL "⬡"

1. PROVIDE 2-CHANNEL SIGNAL SPLITTER.
2. RE: PI-3 FOR SIGNALS BETWEEN RTU, UPS AND NETWORK ENCLOSURES.
3. COORDINATE SIGNAL INPUT WITH CUSTOMER. THE SIGNAL TO THE CUSTOMER IS REQUIRED TO BE ISOLATED FROM THE SIGNAL TO NTMWD.

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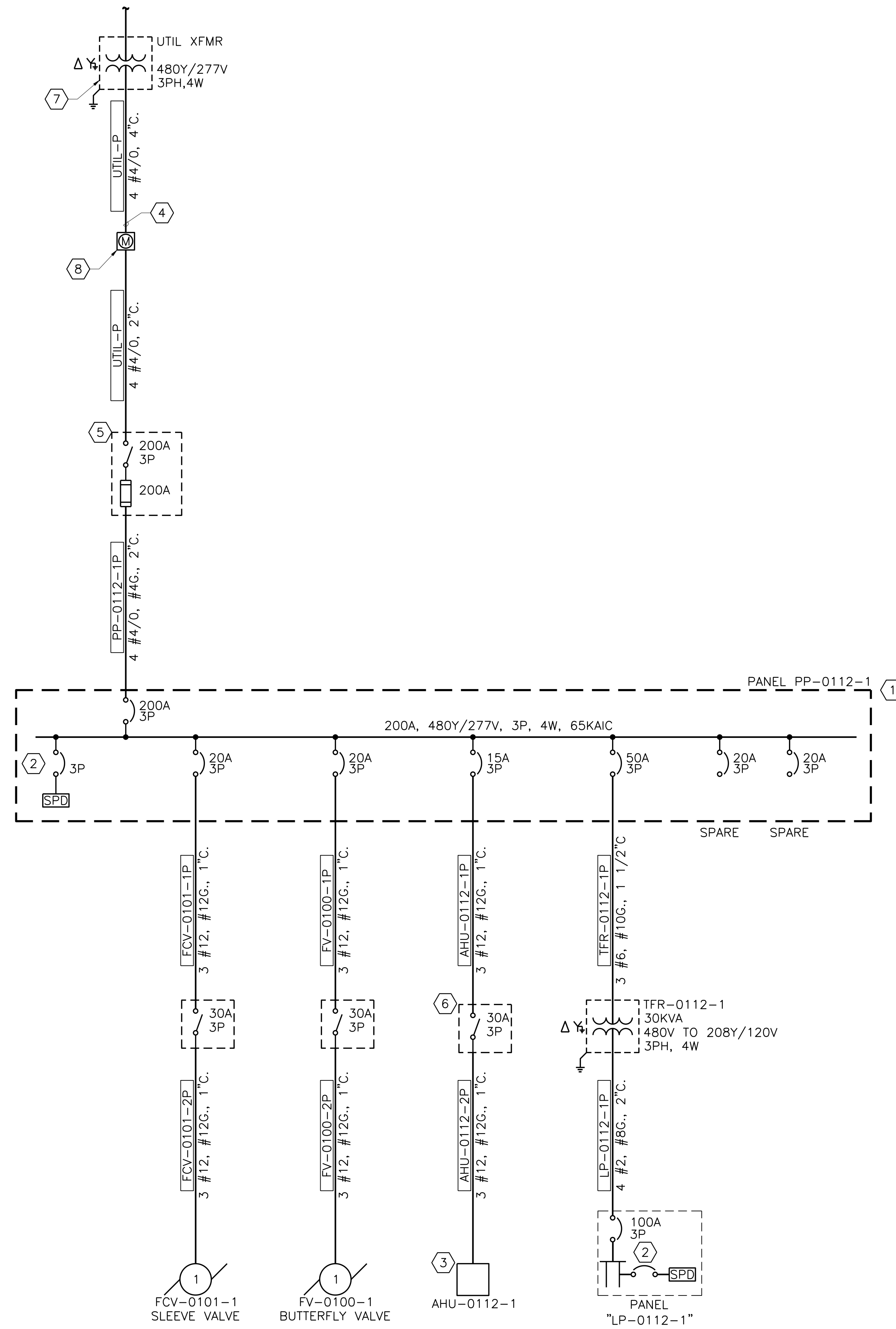
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ELECTRICAL
INTERCONNECTION DIAGRAM

NO. ISSUE	BY	DATE	F&N JOB NO. PRP18708	DATE MAY 2020	DESIGNED DFP	DRAWN MHC	CHECKED TWZ	FILE NAME EL-FMV-DG-INTC.dwg
Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.								
VERIFY SCALE								
SHEET F-6								
SEQ. 55								

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File: N:\ELEC\EL-FMV-DG-ONEL.dwg
Last Saved: 5/6/2020 4:06 PM Saved By: 03823



1 FLOW METER VAULT ONE-LINE DIAGRAM
NOT TO SCALE

GENERAL NOTES:

1. ALL EQUIPMENT AND CABLE/CONDUIT TAGS ARE PRECEDED BY "WA3560".
2. ALL EQUIPMENT SHOWN DARK WILL BE PROVIDED UNDER THIS CONTRACT. ALL EQUIPMENT SHOWN LIGHT IS EXISTING AND WILL REMAIN.
3. CONDUIT SIZES ARE MINIMUM SIZE. PROVIDE LARGER SIZE CONDUIT WHERE INDICATED IN DUCT BANK DETAILS/PLAN SHEETS.

NOTES BY SYMBOL "⬡"

1. PANEL WILL BE PROVIDED WITH A MINIMUM OF 24 POLES.
2. COORDINATE CIRCUIT BREAKER SIZE WITH SPD MANUFACTURER.
3. AC UNIT WILL INCLUDE AN INTEGRAL DISCONNECT PROVIDED BY THE MANUFACTURER.
4. CABLE/CONDUIT FROM UTILITY TRANSFORMER TO METER BASE PROVIDED AND INSTALLED BY CONTRACTOR.
5. PROVIDE SERVICE ENTRANCE RATED DISCONNECT IN A NEMA 4X, 304 STAINLESS STEEL ENCLOSURE.
6. CONTRACTOR PROVIDED EXTERNAL DISCONNECT, AS REQUIRED, IN A NEMA 4X STAINLESS STEEL ENCLOSURE. SIZE SHOWN FOR INFORMATION ONLY. REFER TO NOTE BY SYMBOL #3.
7. COSERV ELECTRIC UTILITY TO INSTALL PAD MOUNTED TRANSFORMER. CONTRACTOR SHALL COORDINATE WITH COSERV ELECTRIC ON TRANSFORMER INSTALLATION INCLUDING TERMINATION OF CABLES ON THE TRANSFORMER SECONDARY. CONTRACTOR SHALL SUPPLY ALL REQUIRED TERMINATION LUGS.
8. PROVIDE WEATHER-PROOF NEMA 304 STAINLESS STEEL METER BASE. COORDINATE THE METER BASE SIZE SELECTION WITH COSERV.

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TOWN OF PROSPER, TEXAS
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
ELECTRICAL

ONE-LINE DIAGRAM

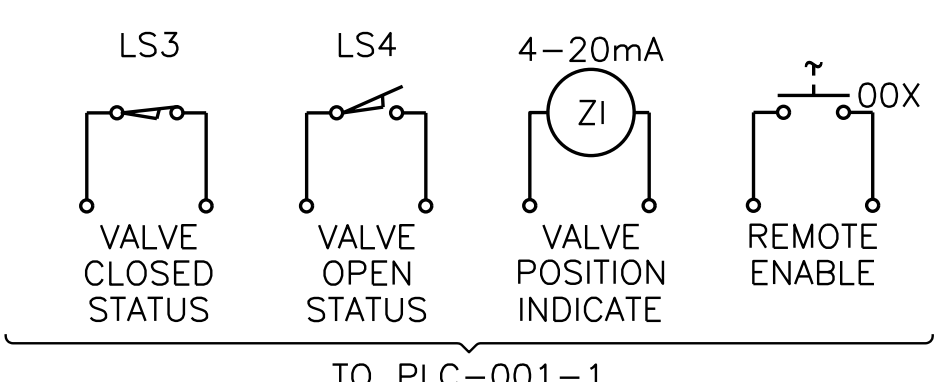
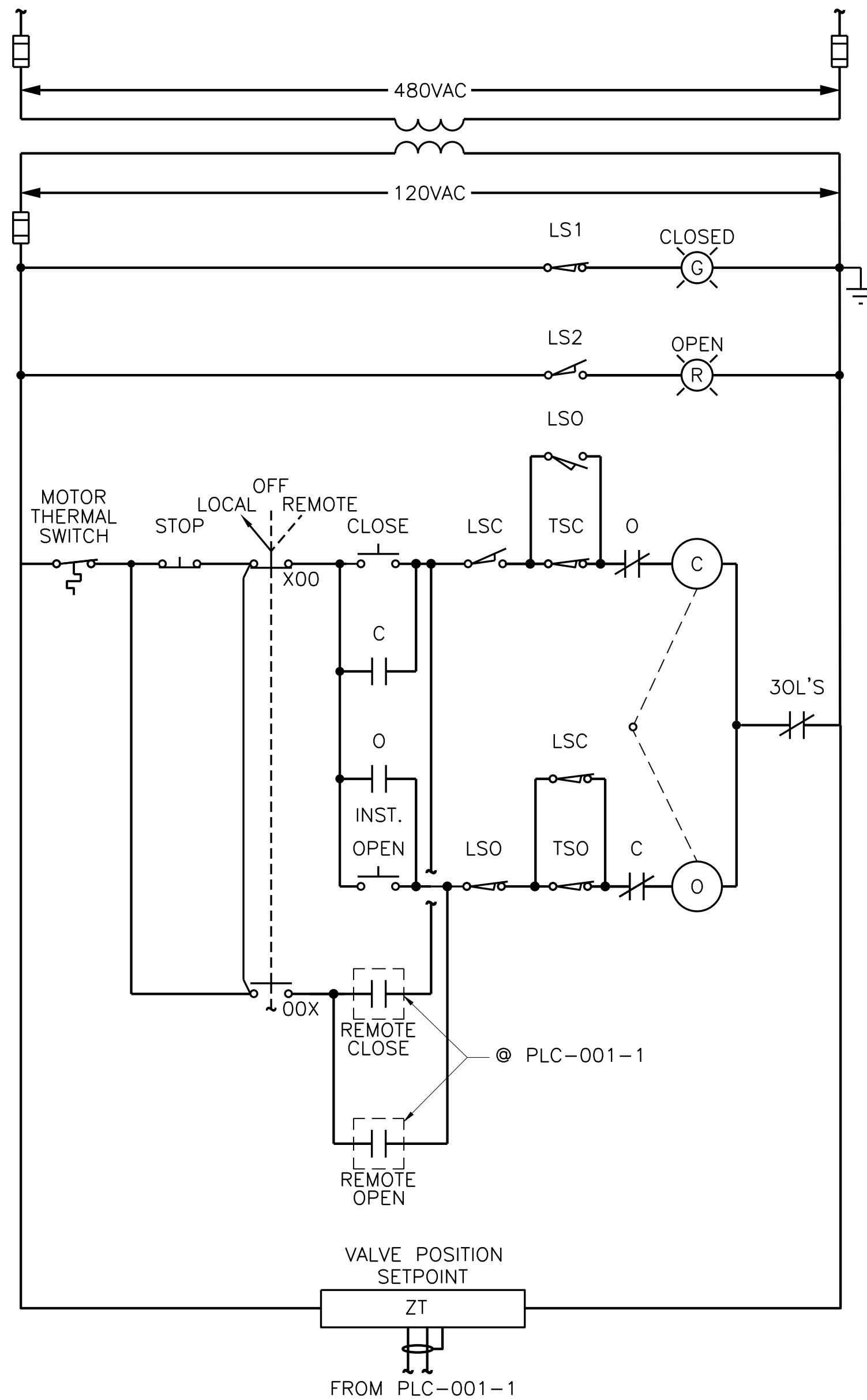
NO.	ISSUE	BY	DATE	FRN JOB NO.	PRP18708
				DATE	MAY 2020
				DESIGNED	DFP
				DRAWN	MHC
				REVISD	
				CHECKED	TWZ

Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.

FILE NAME
EL-FMV-DG-ONEL.dwg

SWITCH NUMBERS	VALVE POSITION					FUNCTION
	LIMIT CLOSE	INTERMEDIATE	LIMIT OPEN	PERCENT OPEN		
	0%	5%	50%	95%	100%	
LS1	█	█	█	█	█	VALVE CLOSED
LS2	█	█	█	█	█	VALVE OPEN
LS3	█	█	█	█	█	VALVE CLOSED
LS4	█	█	█	█	█	VALVE OPEN

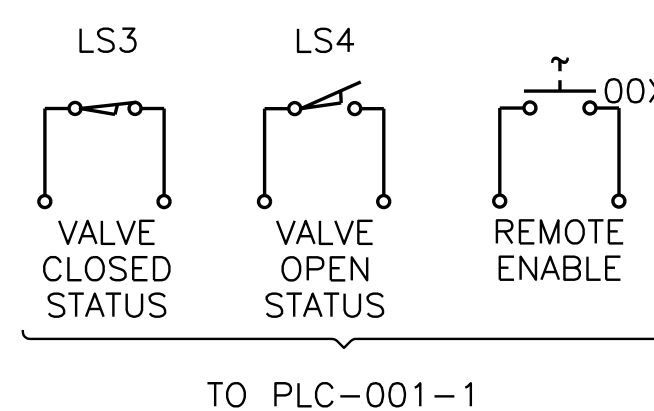
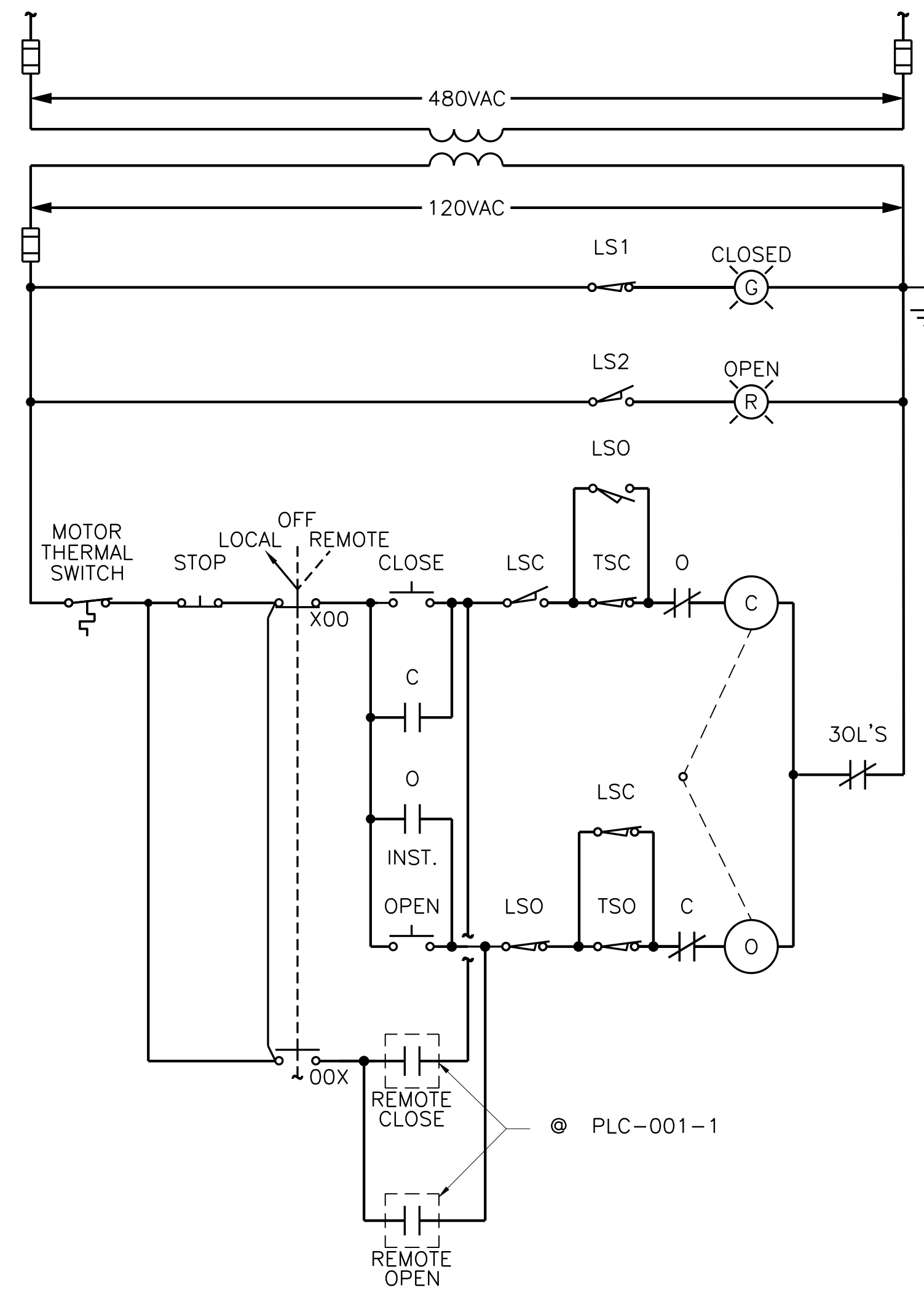
NOTES:
 1. — INDICATES OPEN CONTACTS.
 2. █ INDICATES CLOSED CONTACTS.



1 MOTOR OPERATED MODULATING VALVE CONTROL SCHEMATIC
 NOT TO SCALE (FOR FCV-0100-1)

SWITCH NUMBERS	VALVE POSITION					FUNCTION
	LIMIT CLOSE	INTERMEDIATE	LIMIT OPEN	PERCENT OPEN		
	0%	5%	50%	95%	100%	
LS1	█	█	█	█	█	VALVE CLOSED
LS2	█	█	█	█	█	VALVE OPEN
LS3	█	█	█	█	█	VALVE CLOSED
LS4	█	█	█	█	█	VALVE OPEN

NOTES:
 1. — INDICATES OPEN CONTACTS.
 2. █ INDICATES CLOSED CONTACTS.



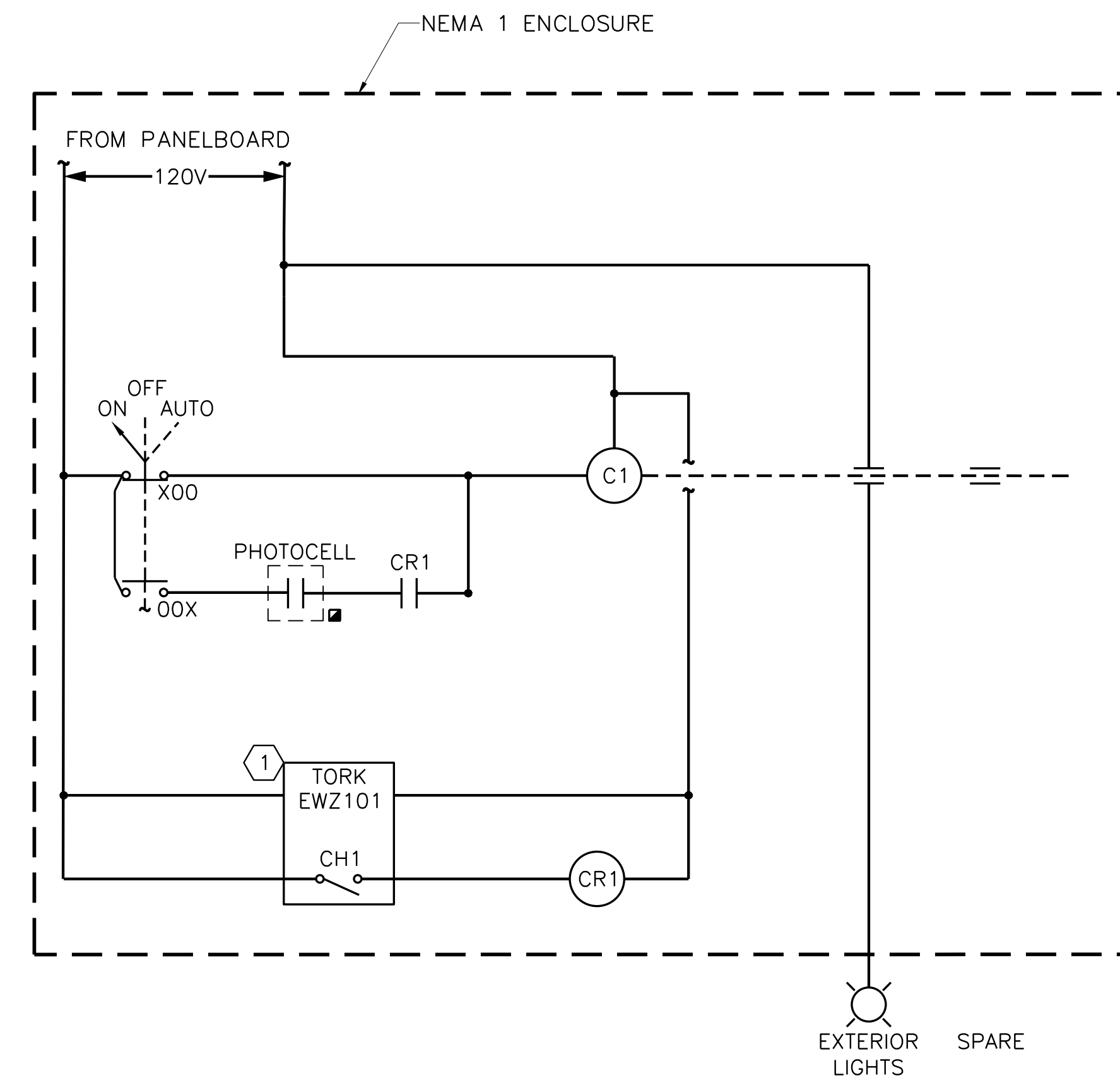
2 MOTOR OPERATED VALVE CONTROL SCHEMATIC
 NOT TO SCALE (FOR FV-0100-1)

GENERAL NOTES:

- ALL EQUIPMENT AND CABLE/CONDUIT TAGS ARE PRECEDED BY "WA3560".
- ALL EQUIPMENT SHOWN DARK WILL BE PROVIDED UNDER THIS CONTRACT. ALL EQUIPMENT SHOWN LIGHT IS EXISTING AND WILL REMAIN.

NOTES BY SYMBOL "⬡"

- INSTALL TORK DIGITAL TIME SWITCH WITH 40AMP CONTACTS, MODELS EWZ101.



NO.3 GENERAL NOTES:

- CONTACTS SHALL BE RATED FOR 30AMPS AT 120V.

3 EXTERIOR LIGHTING CONTROL SCHEMATIC
 NOT TO SCALE

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TOWN OF PROSPER, TEXAS
 CUSTER ROAD PUMP STATION
 METER VAULT RELOCATION
 ELECTRICAL

CONTROL SCHEMATICS

NO.	ISSUE	BY	DATE	FILE NAME
1				EL-FMV-SM-CTRL.dwg

PRJ18708
 DATE MAY 2020
 DESIGNED DFP
 DRAWN MHC
 CHECKED TWZ
 REVISIONS

Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.

VERIFY SCALE

SHEET 0

SEQ. 57

F-8

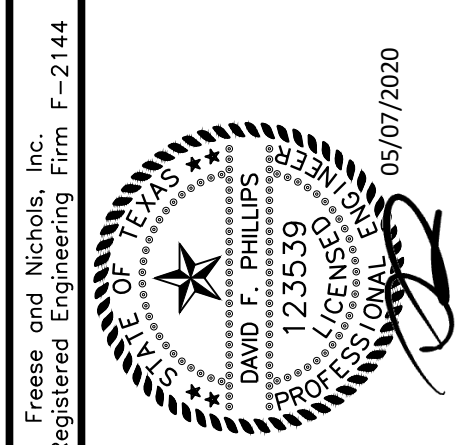
Page 991

LIGHTING FIXTURE SCHEDULE						
TYPE	MANUFACTURER	CATALOG NO.	VOLT.	DESCRIPTION	LAMPS	INPUT WATTS
A	HOLOPHANE	HZL1D L48 3000LM FST 120 40K 90 CRI	120	LED LIGHT FIXTURE, 48" LENGTH, 3000 LUMEN, 4000K, WHITE PAINT FINISH	1	34
AE	HOLOPHANE	HZL1N L48 3000LM FST 120 40K 90CRI E7W	120	LED LIGHT FIXTURE, 48" LENGTH, 3000 LUMEN, 4000K, WHITE PAINT FINISH WITH EMERGENCY BATTERY PACK	1	34
E	ISOLITE	ELN-12-NC54-2-H8W-SD-VA	120	STEEL EMERGENCY UNIT WITH SELF-DIAGNOSTICS, VOLT METER, AMMETER, TEST SWITCH, LED CHARGE INDICATOR, 8W HALOGEN LAMPS, NIKEL CADMIUM BATTERY	2	16
W1	HOLOPHANE	W4G LED 30C 1000 40K T3M 120 GYSDP	120	LED WALL PACK, 30LED, 1A DRIVE CURRENT, 4000K, TYPE III MEDIUM DISTRIBUTION, PRISMATRIC GLASS LENS, GRAY FINISH	1	104
W2	HOLOPHANE	W4G LED 20C 1000 40K T3M 120 GYSDP	120	LED WALL PACK, 20LED, 1A DRIVE CURRENT, 4000K, TYPE III MEDIUM DISTRIBUTION, PRISMATRIC GLASS LENS, GRAY FINISH	1	73
W2E	HOLOPHANE	W4G LED 20C 1000 40K T3M 120 ELCW GYSDP	120	LED WALL PACK, 20 LED, 1A DRME CURRENT, 4000K, TYPE III MEDIUM DISTRIBUTION, PRISMATRIC GLASS LENS, GRAY FINISH WITH EMERGENCY BATTERY BACKUP	1	73

LIGHTING FIXTURE SCHEDULE NOTES:

1. LIGHT FIXTURES PROVIDED SHALL BE APPROVED EQUAL TO THE FIXTURE INDICATED IN THE SCHEDULE ABOVE.
2. FIXTURE MODEL NUMBERS ARE USED TO ESTABLISH MINIMUM QUALITY AND PERFORMANCE STANDARDS AND NOT TO ESTABLISH MOUNTING TYPE. MOUNTING REQUIREMENTS MAY VARY FOR THE SAME TYPE OF FIXTURE THROUGHOUT THE PROJECT. CONTRACTOR SHALL VERIFY INSTALLATION LOCATION AND PROVIDE APPROPRIATE MOUNTING HARDWARE FIXTURE TYPE DESIGN FOR EACH LOCATION.

PANEL NO. *LP-0112-1		MAIN			100			AMPS MCB			LOCATION FLOW METER VAULT			
SERVICE VOLTAGE 208Y/120 VOLTS		BUS RATING 100			AMPS			ELECTRICAL ROOM			FEED FROM *PP-0112-1			
A.I.C. 22,000		NEUTRAL BUS 100			AMPS									
DESCRIPTION	BREAKER POLE	AMP	VOLT AMPS			CKT NO	BUSS CONN	CKT NO	VOLT AMPS			BREAKER POLE	AMP	DESCRIPTION
			A	B	C				A	B	C			
SPD	3	1000				1	●	2	528			1	20	VAULT SUMP PUMP
						3	●	4	713			1	20	VAULT EXHAUST FAN
					1000	5	●	6		200			1	20
VAULT LIGHTS	1	20	448			7	●	8	500			1	20	CHART RECORDER
VAULT RECEPTACLES	1	20		360		9	●	10	1000			1	20	UPS FOR PLC CONTROL PANEL
VAULT RECEPTACLES	1	20			360	11	●	12		1000		1	20	SPARE
ELECTRICAL ROOM LIGHTS	1	20	204			13	●	14	1000			1	20	SPARE
ELECTRICAL ROOM RECEPTACLES	1	20		540		15	●	16	1000			1	20	SPARE
BUILDING EXTERIOR LIGHTS	1	20			146	17	●	18		1000		1	20	SPARE
BUILDING EXTERIOR RECEPTACLES	1	20	720			19	●	20	1000			1	20	SPARE
SPARE	1	20		1000		21	●	22	1000			1	20	SPARE
SPARE	1	20			1000	23	●	24		1000		1	20	SPARE
SPARE	1	20	1000			25	●	26	1000			1	20	SPARE
SPARE	1	20		1000		27	●	28		1000		1	20	SPARE
SPARE	1	20			1000	29	●	30		1000		1	20	SPARE
CONNECTED BUS A	7.400	VA	3372	3900	3506	TOTAL: 23719			4028	4713	4200	DEMAND KVA: 24.0		
CONNECTED BUS B	8.613	VA										DEMAND AMPS: 66.7		
CONNECTED BUS C	7.706	VA										NOTE: * INDICATES GFI BREAKER		



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
 METER VAULT RELOCATION**
 ELECTRICAL
SCHEDULES

NO. ISSUE	BY	DATE	PRP18708	DATE	MAY 2020	DESIGNED	DFP	DRAWN	MHC	REVISID	CHECKED	TWZ
Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.												
FILE NAME: EL-ALL-SH-PNLB01.dwg												

SHEET **F-9**
 SEQ. 58

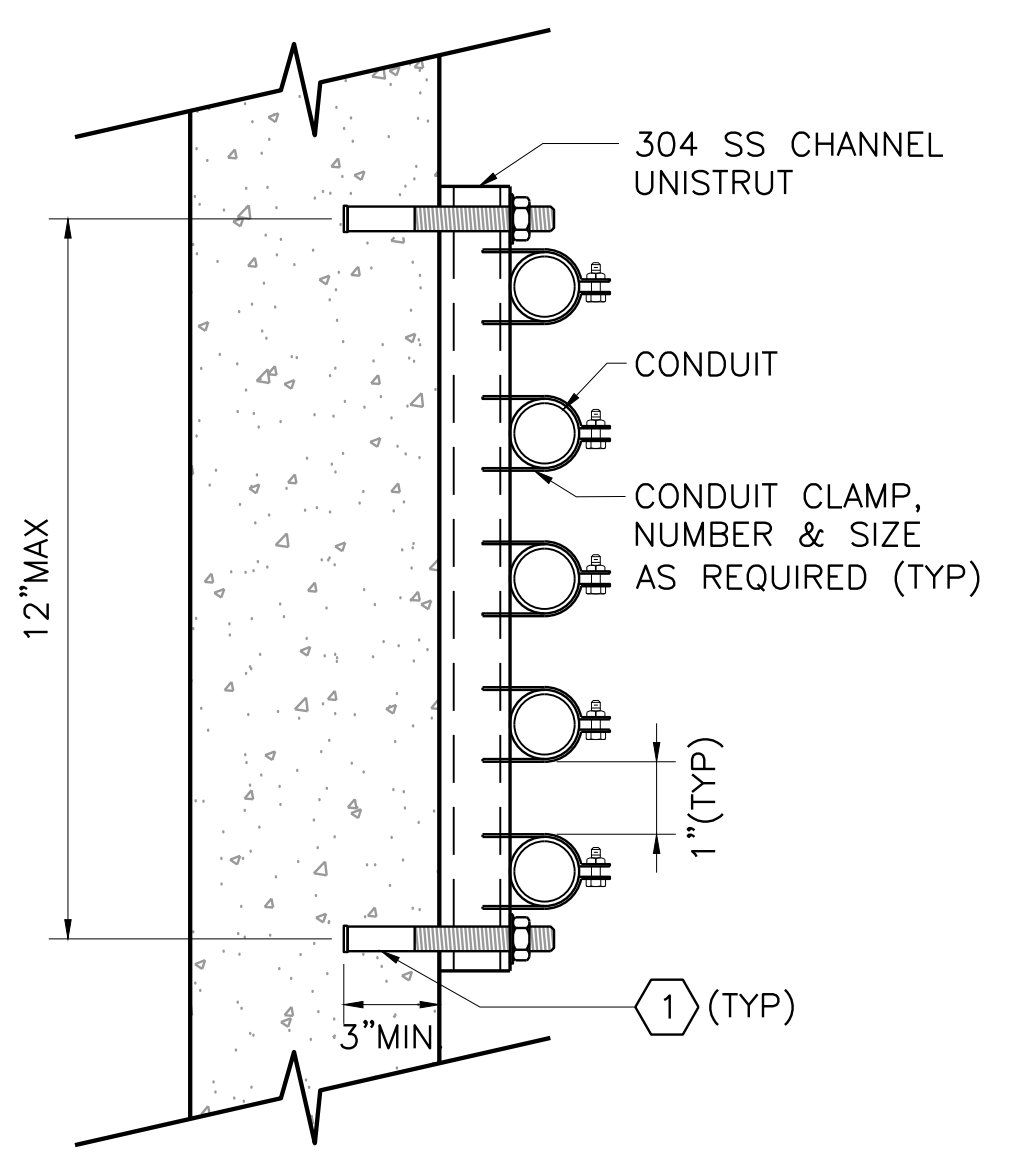
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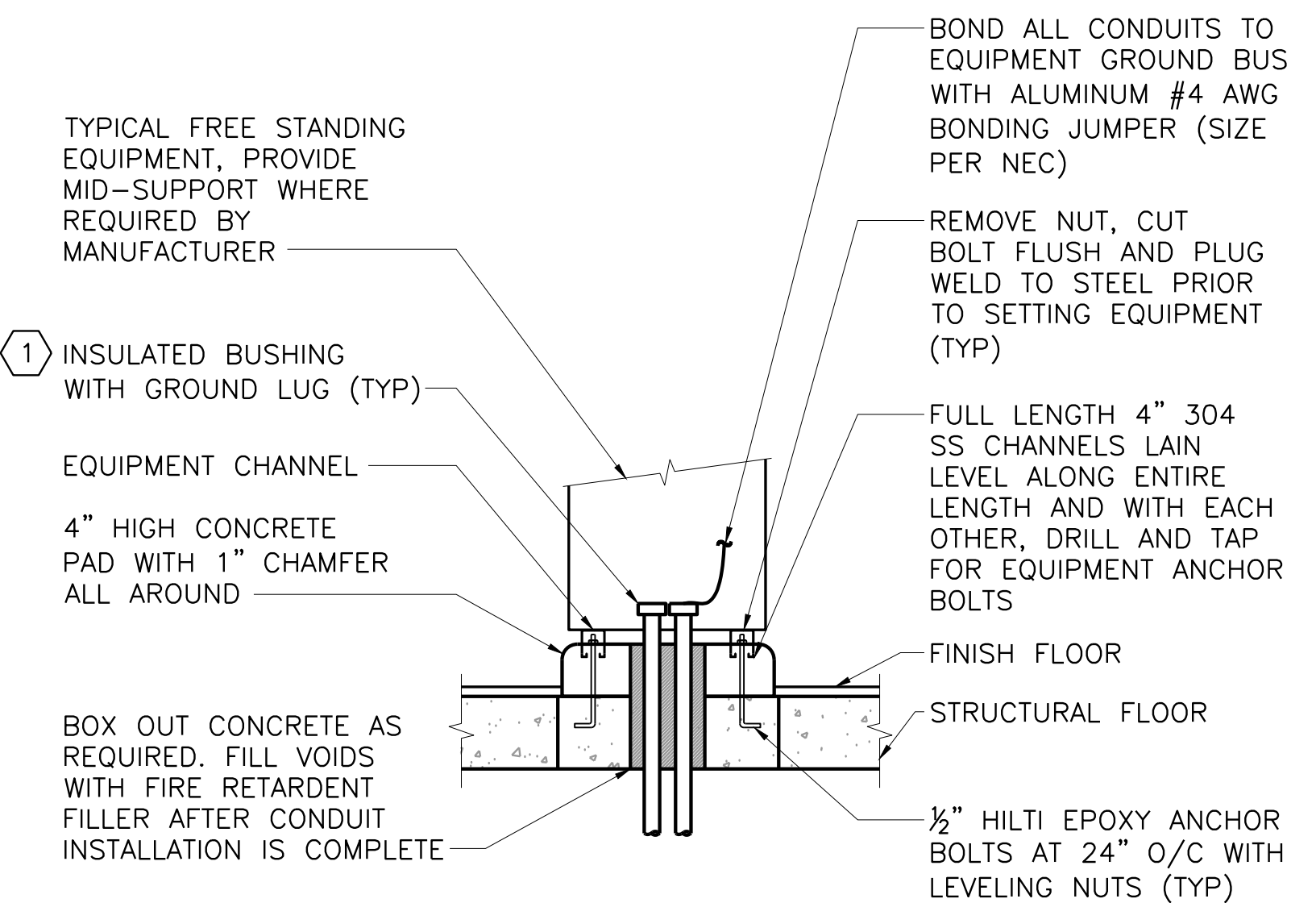
TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ELECTRICAL

DETAILS 1



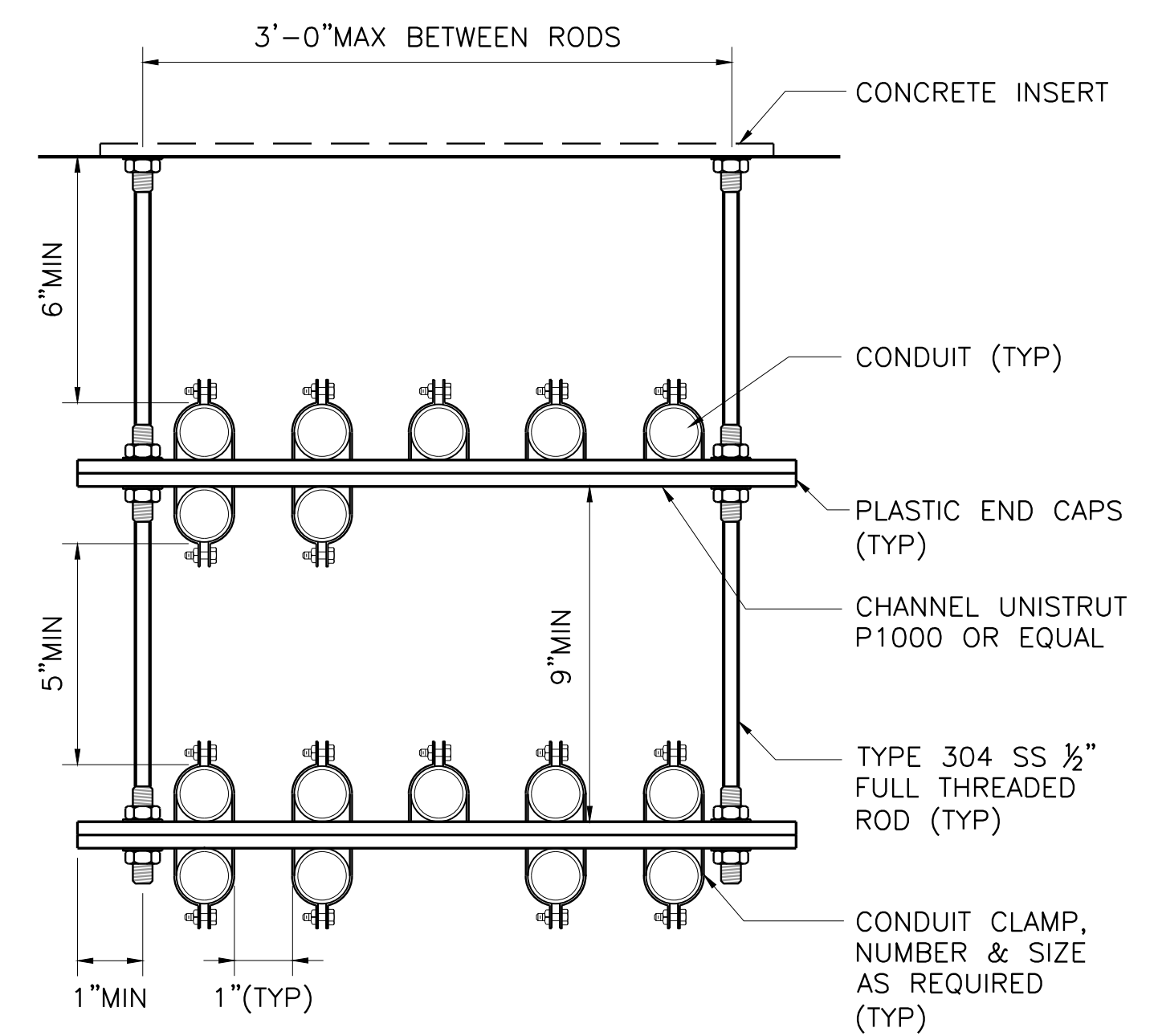
NO.1 NOTES BY SYMBOL "1"
1. ANCHORS SHALL BE 1/2" DIA 304 STAINLESS STEEL HILTI KWIK BOLT TZ EXPANSION WITH 3-5/8" EMBEDMENT.

1 WALL MOUNTED CONDUIT RACK
NOT TO SCALE

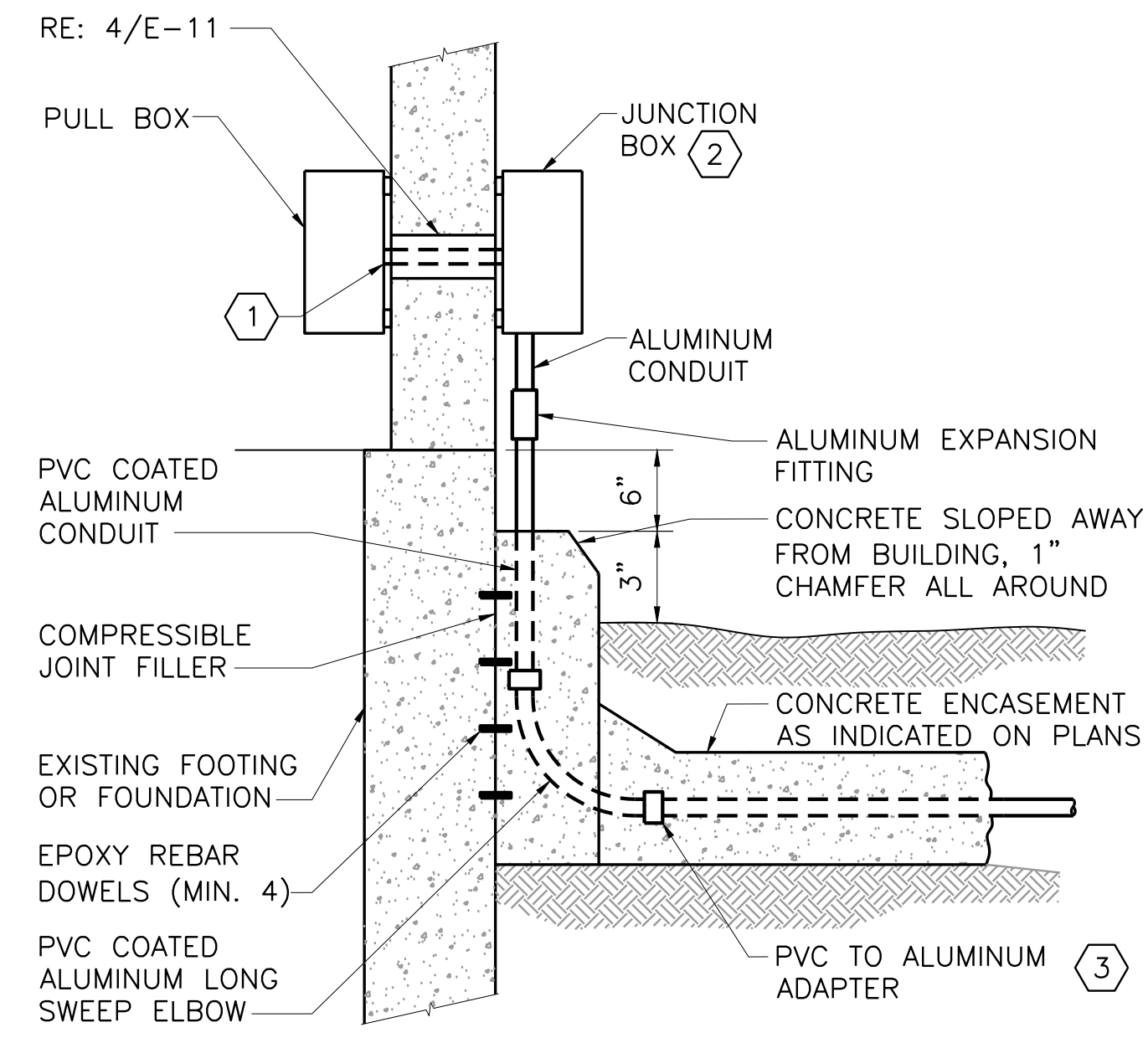


NO.2 NOTES BY SYMBOL "2"
1. SEAL ALL CONDUITS ENTERING ENCLOSURES WITH REMOVABLE SILICON CAULK.

2 EQUIPMENT PAD DETAIL
NOT TO SCALE

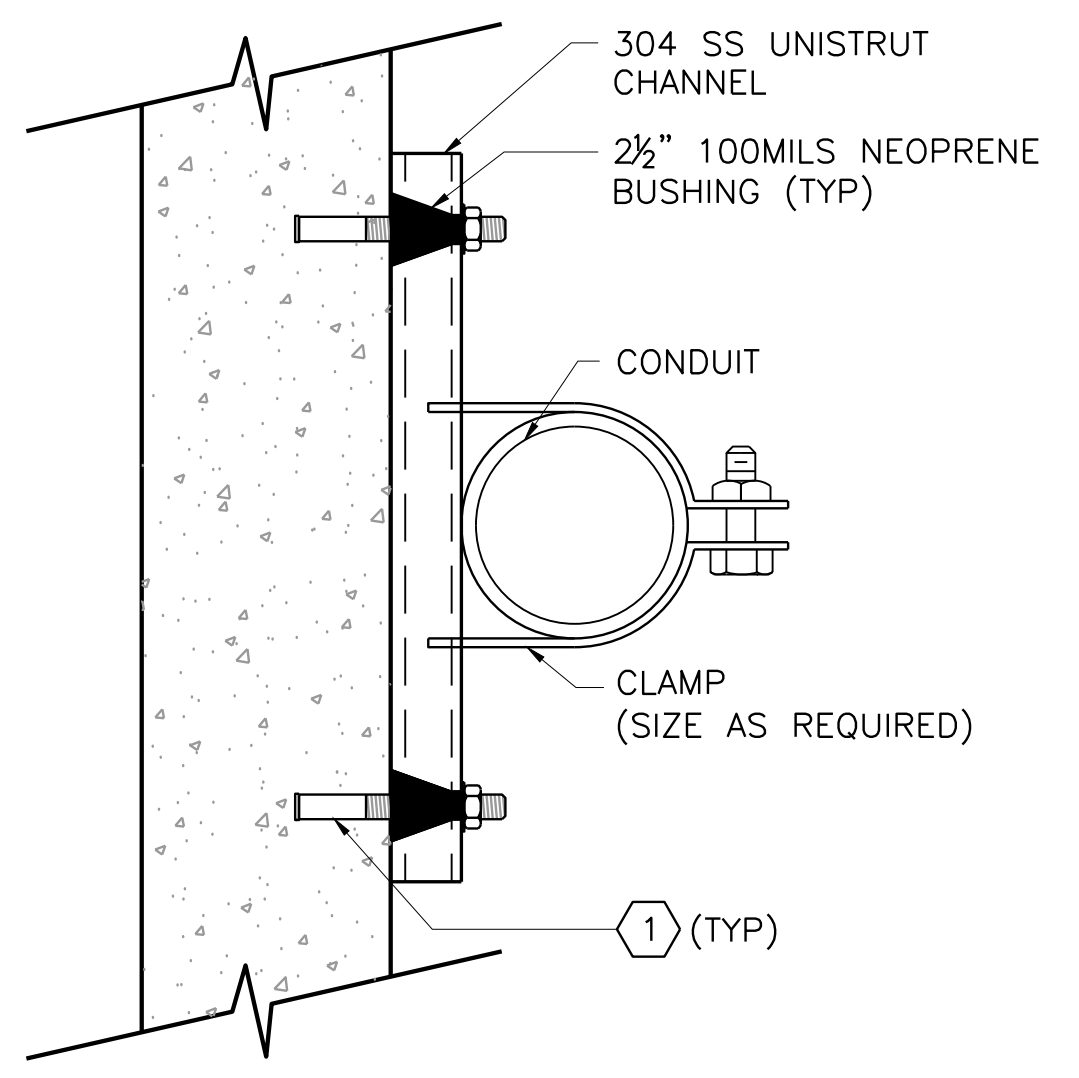


3 CEILING MOUNTED CONDUIT RACK
NOT TO SCALE



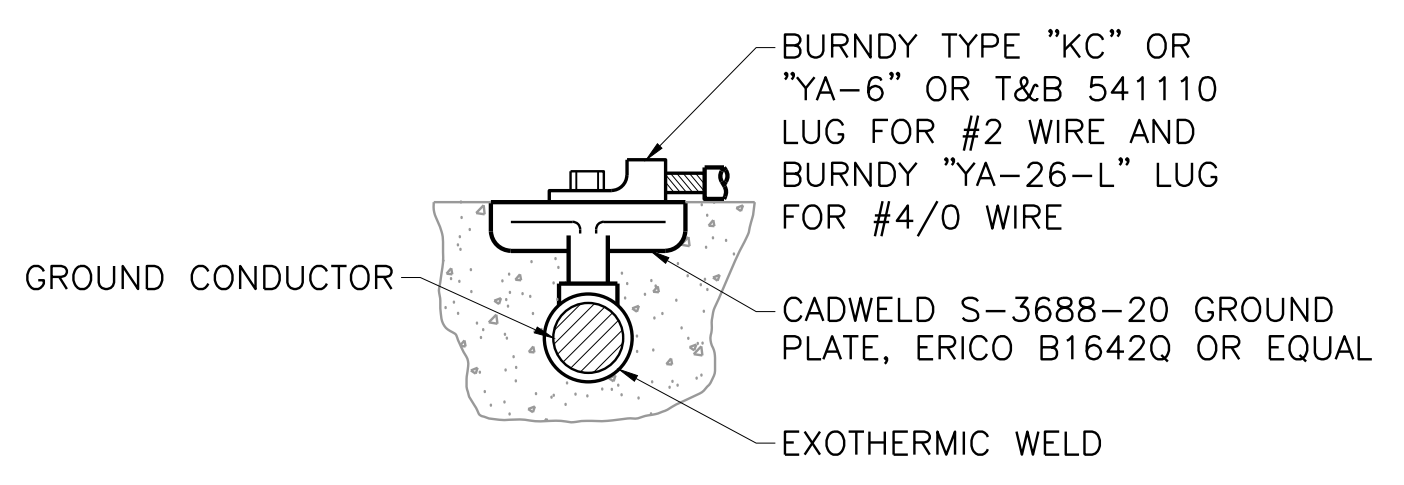
NO.4 NOTES BY SYMBOL "4"
1. SEAL ALL CONDUITS ENTERING ENCLOSURES WITH REMOVABLE SILICON CAULK.
2. ALLOW MINIMUM OF 12" OF WIRES SLACK IN JUNCTION BOX TO ACCOMMODATE EXPANSION JOINT. MOUNT JUNCTION BOX AS HIGH AS POSSIBLE. PROVIDE MOUNTING HARDWARE AS REQUIRED.
3. APPLY RUBBER ELECTRICAL TAPE TO ALL EXPOSED METAL CONDUIT OR CONDUIT THREADS. EXTEND TAPE A MINIMUM 2" IN BOTH DIRECTIONS BEYOND EXPOSED CONDUIT.

4 ABOVE GRADE CONDUIT TERMINATION
NOT TO SCALE



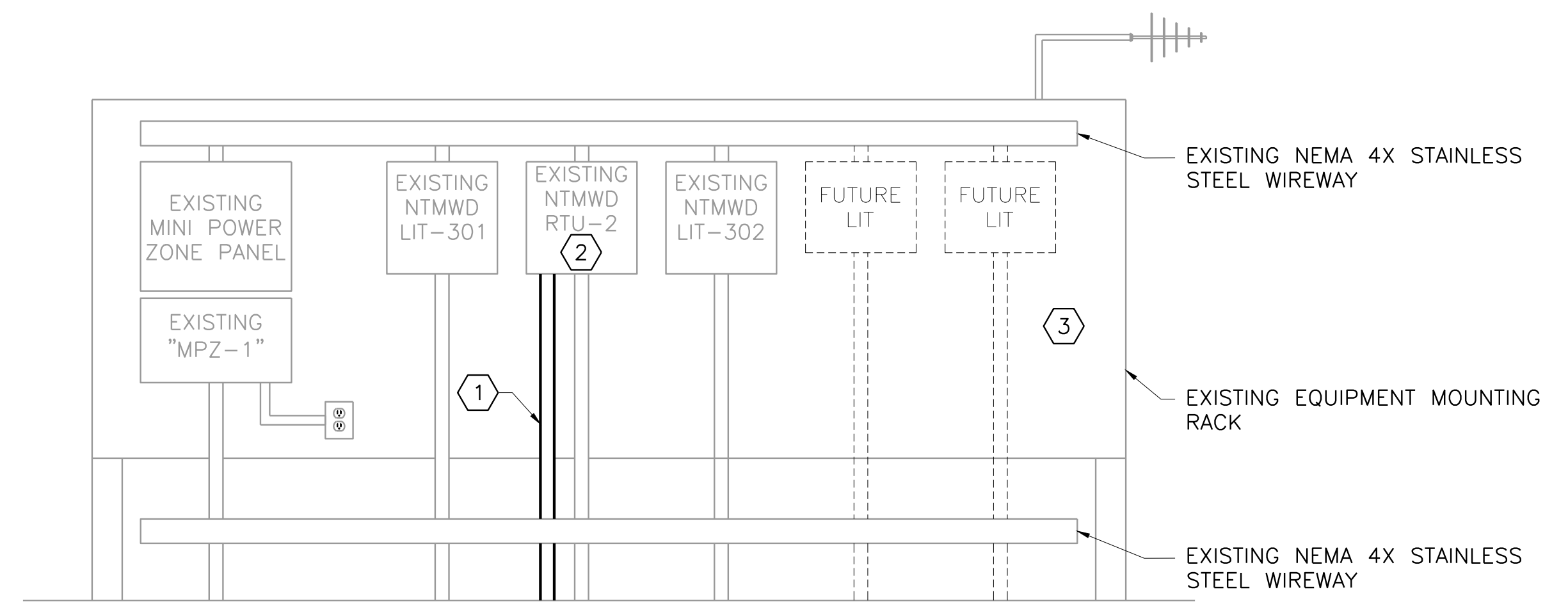
NO.5 NOTES BY SYMBOL "5"
1. ANCHORS SHALL BE 1/2" DIA 304 STAINLESS STEEL HILTI KWIK BOLT TZ EXPANSION WITH 3-5/8" EMBEDMENT.

5 CEILING OR WALL EXPOSED CONDUIT INSTALLATION
NOT TO SCALE



NO.6 GENERAL NOTE:
1. SET GROUND PAD IN CONCRETE PRIOR TO CONCRETE PLACEMENT. PROVIDE PROTECTION SHIELD DURING CONCRETE PLACEMENT. DO NOT PLACE CONCRETE OVER GROUND PAD.
2. CONNECT GROUND PAD TO REINFORCEMENT BAR. REINFORCEMENT BAR SHALL BE A MINIMUM OF 1/2" DIAMETER AND 20'-0" IN LENGTH. CONNECTION TO SMALLER REINFORCEMENT BAR SHALL NOT BE ALLOWED.
3. CONNECT GROUND PAD TO GROUND SYSTEM. PROVIDE A #4/0 BARE TIN-PLATED COPPER CONDUCTOR.
4. PROVIDE EXOTHERMIC WELDS FOR ALL CONNECTIONS..

6 GROUNDING PAD IN SLAB DETAIL
NOT TO SCALE



NO.7 GENERAL NOTES:
1. ALL EQUIPMENT SHOWN LIGHT AND SOLID IS EXISTING. ALL EQUIPMENT SHOWN LIGHT AND DASHED IS FUTURE. ALL EQUIPMENT SHOWN DARK SHALL BE PROVIDED UNDER THIS CONTRACT.
2. FIELD VERIFY EXACT CONDITIONS AT EQUIPMENT RACK.

NO.7 NOTES BY SYMBOL "7"
1. PROVIDE CONDUIT AS REQUIRED. FIELD VERIFY ALL REQUIREMENTS.
2. DEMOLISH INTERNAL REMOTE I/O RADIO. CONFIGURE EXISTING RTU FOR ADDITIONAL HARDWIRED ANALOG OUTPUT GST LEVEL SIGNAL TO NEW FLOW METER VAULT.
3. EXISTING ELECTRICAL EQUIPMENT RACK. FIELD VERIFY EXACT LOCATION AND REQUIREMENTS.

7 EXISTING NTMWD ELECTRICAL EQUIPMENT RACK
NOT TO SCALE

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NO. ISSUE	BY	DATE	FBN JOB NO.	PRP18708
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			DESIGNED	DFP
			DRAWN	MHC
			REVISD	
			CHECKED	TWZ
			FILE NAME	EL-ALL-DT-DTLS01.dwg
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SHEET				
E - 10				
SEQ.				
59				

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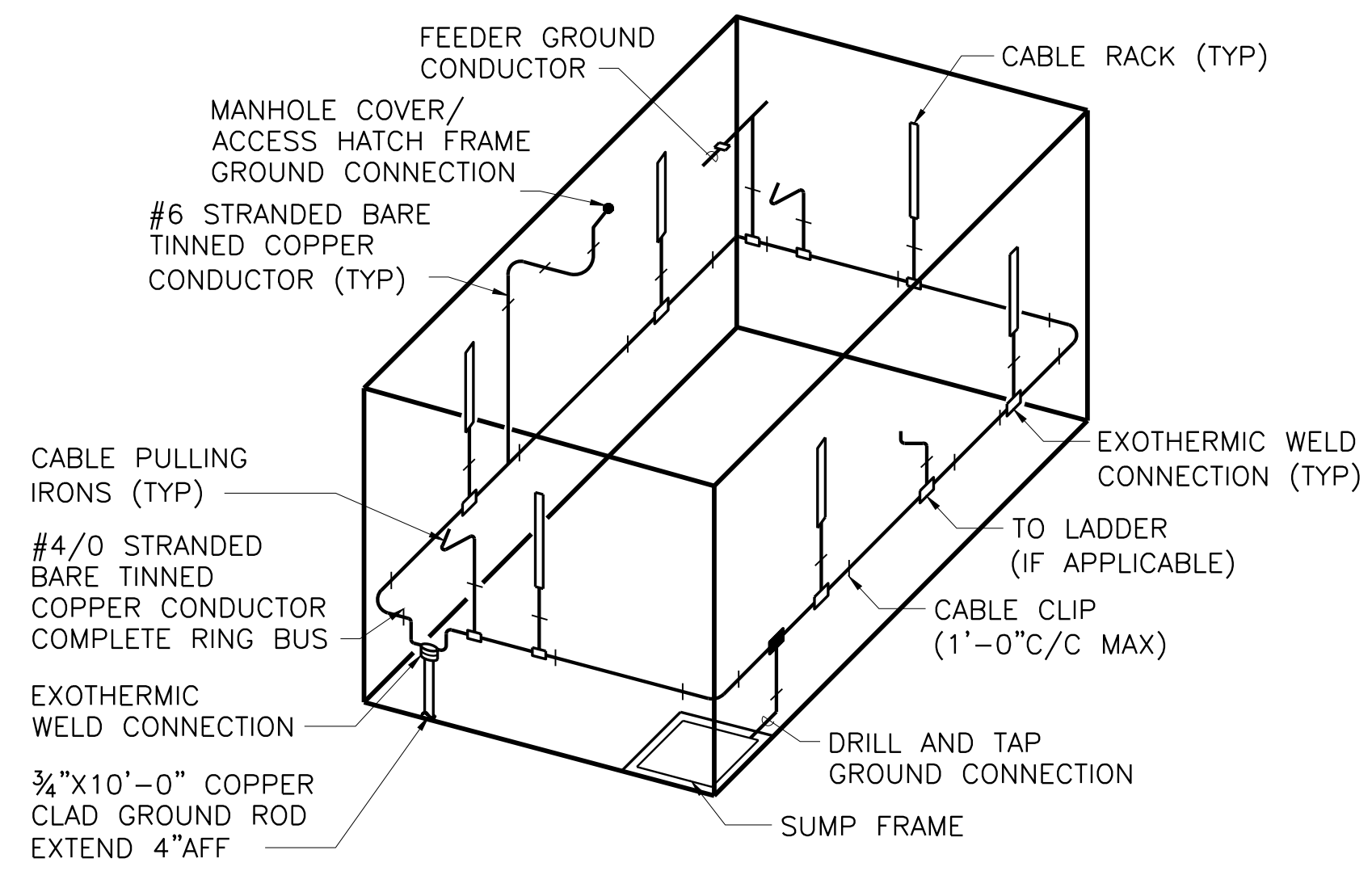


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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ELECTRICAL

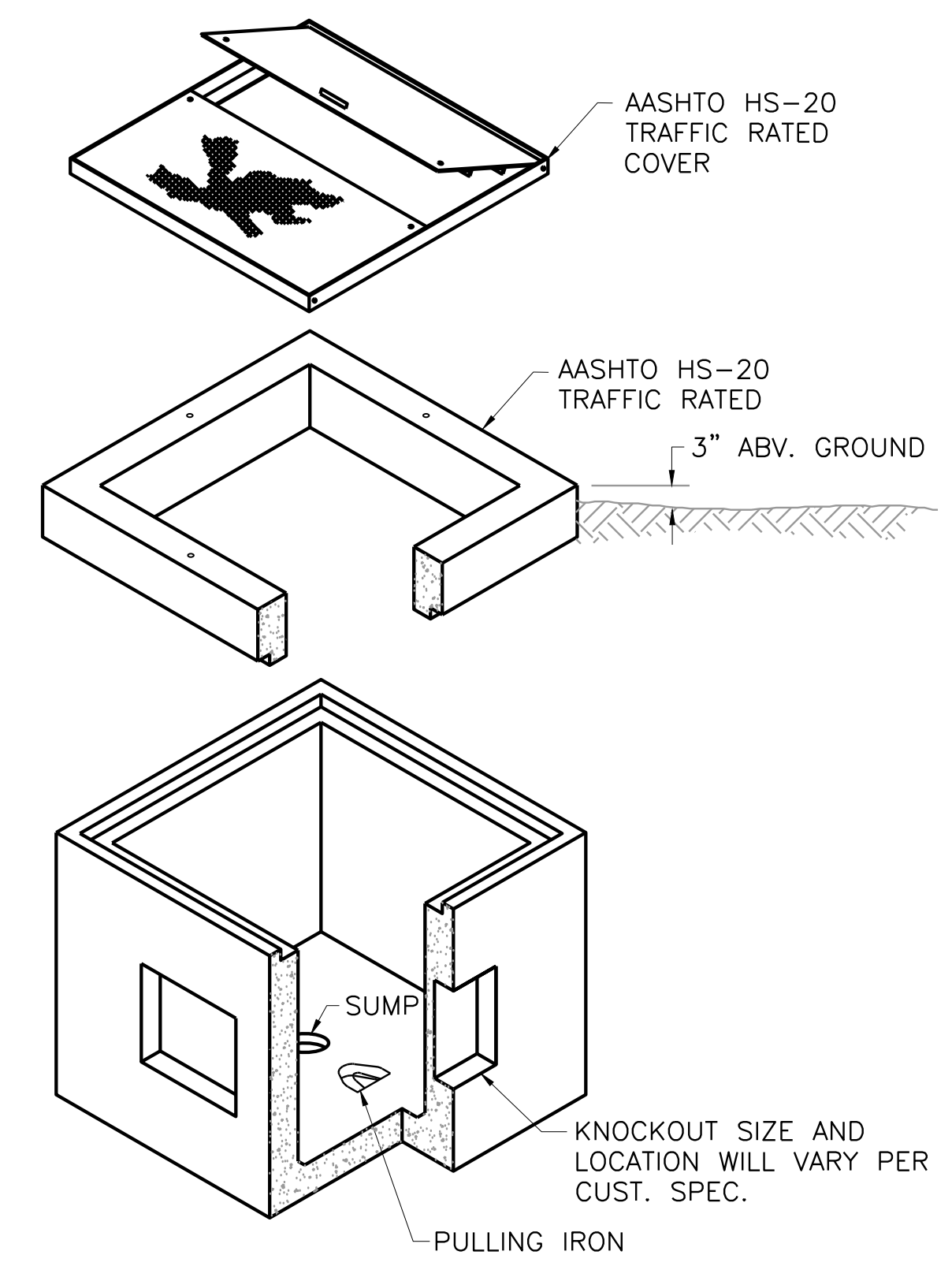
DETAILS II

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VERIFY SCALE			Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.					
SHEET			E-11					
SEQ.			60					



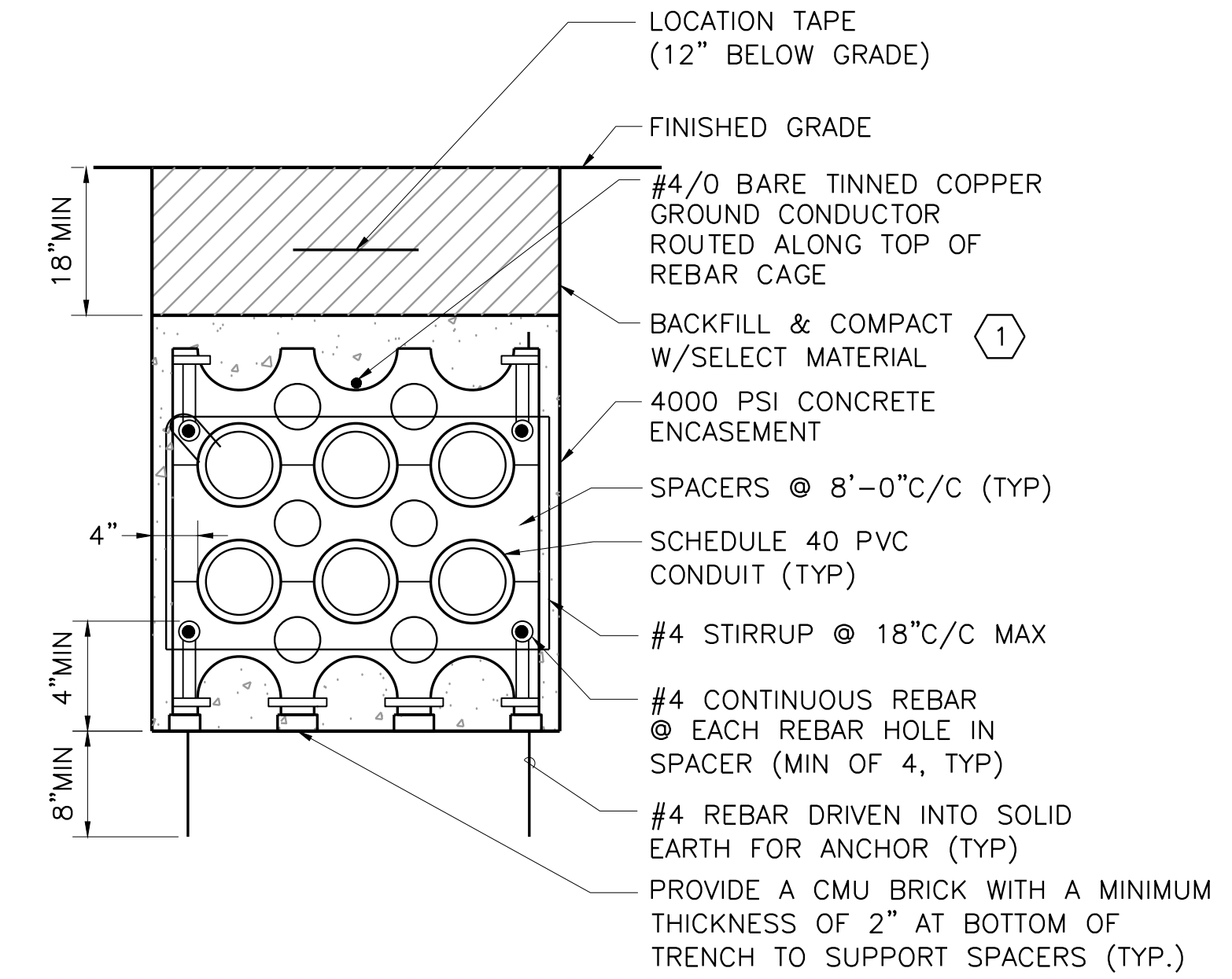
- NO.1 GENERAL NOTES:**
- ALL CONNECTIONS TO METAL PARTS SHALL BE #4 STRANDED BARE TINNED COPPER CONDUCTOR UNLESS NOTED OTHERWISE.
 - ALL GROUNDING SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE ARTICLE 250.

1
-
**MANHOLE/VAULT
GROUNDING DETAIL**
NOT TO SCALE



- NO.2 GENERAL NOTES:**
- PROVIDE PRECAST CONCRETE PULL BOX PER MANUFACTURER OLDCASTLE.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR SIZING AND PROVIDING PULL BOXES IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.
 - PROVIDE LOCKABLE COVER.

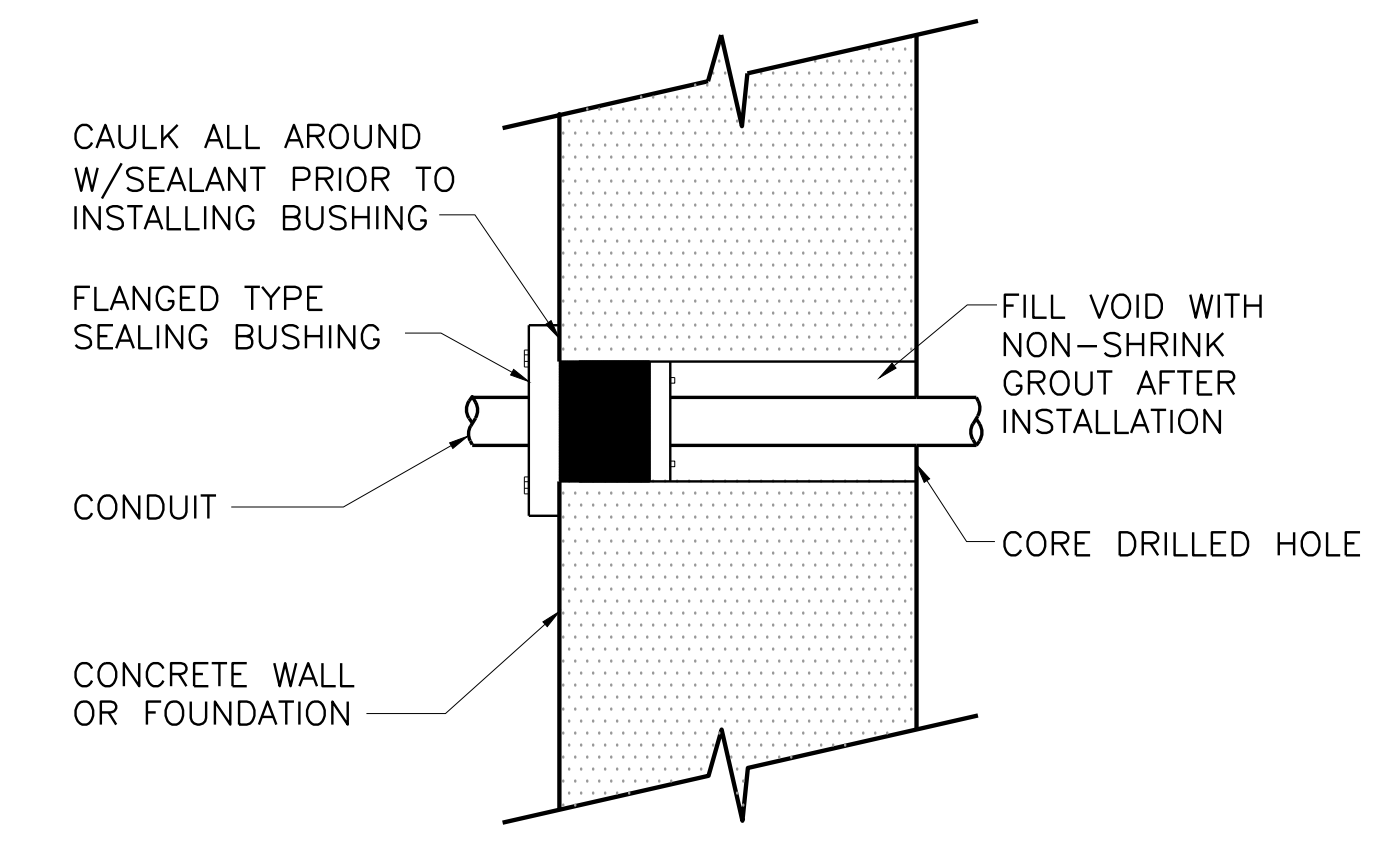
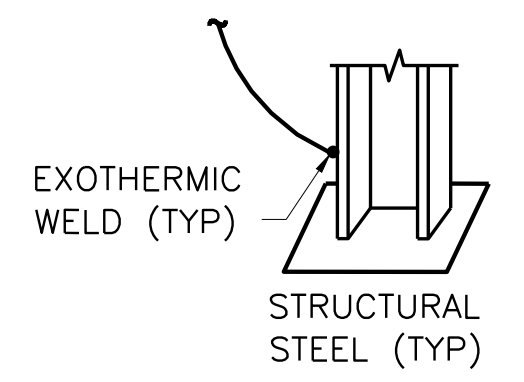
2
-
PULL BOX DETAIL
NOT TO SCALE



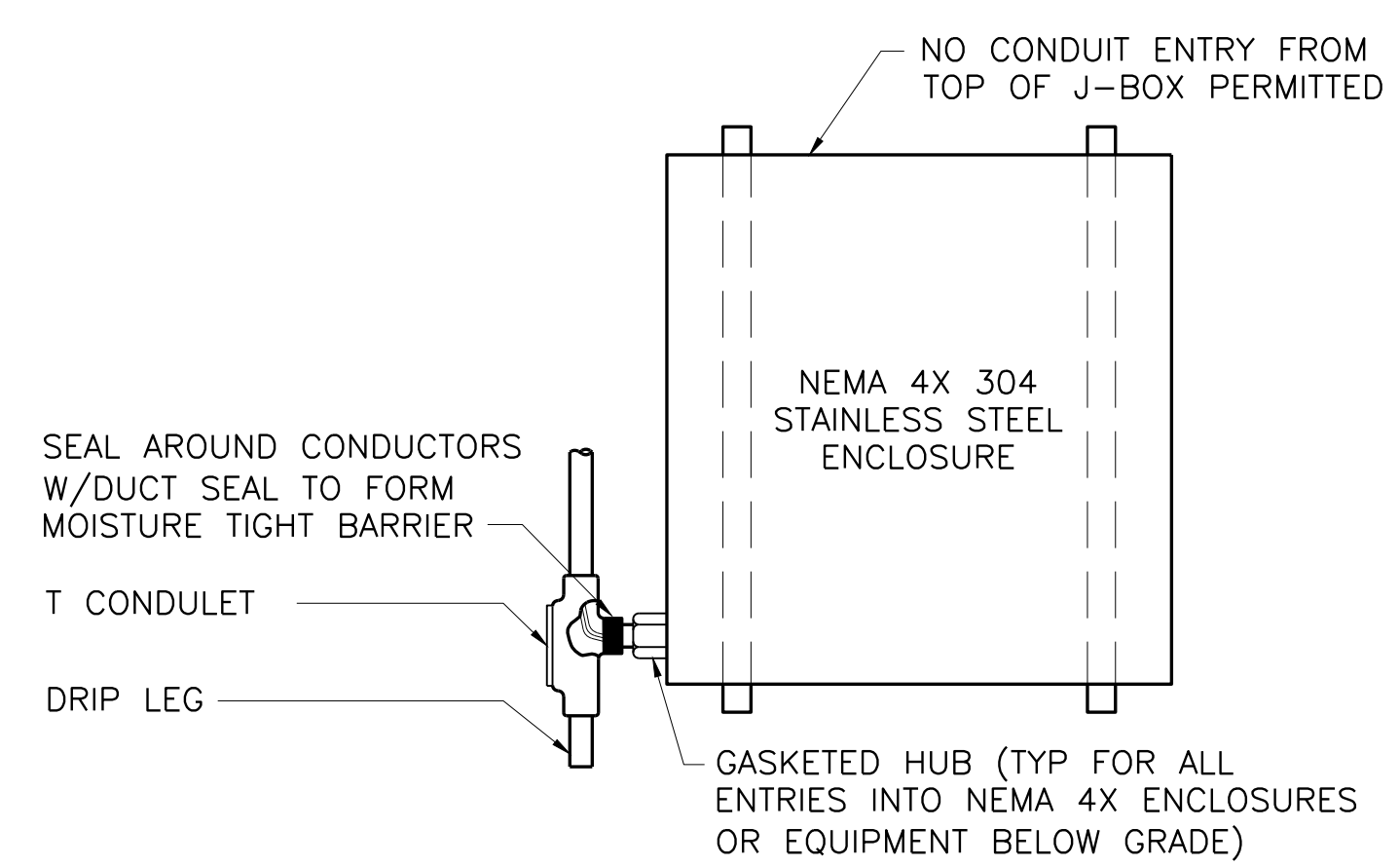
- NO.3 GENERAL NOTES:**
- CONTRACTOR SHALL PROVIDE CHAIRS FOR REBAR ROUTED ALONG BOTTOM OF DUCT BANK TO VERIFY THAT REBAR IS FULLY ENCASED WITH 4" OF CONCRETE.

- NO.3 NOTES BY SYMBOL "◇":**
- SELECT BACKFILL TO BE CLASS 4 EARTH FILL. FILL SHALL CONSIST OF MATERIALS WHICH ARE CLASSIFIED AS SP, SM, SC, CL OR DUAL CLASSIFICATIONS THEREOF, WHICH HAVE A LIQUID LIMIT LESS THAN OR EQUAL TO 35 AND A PLASTICITY INDEX OF A MINIMUM OF 4 AND A MAXIMUM OF 15, WHICH ARE FREE OF ORGANIC MATERIALS.

3
-
**CONCRETE ENCASED
DUCT BANK DETAIL**
NOT TO SCALE

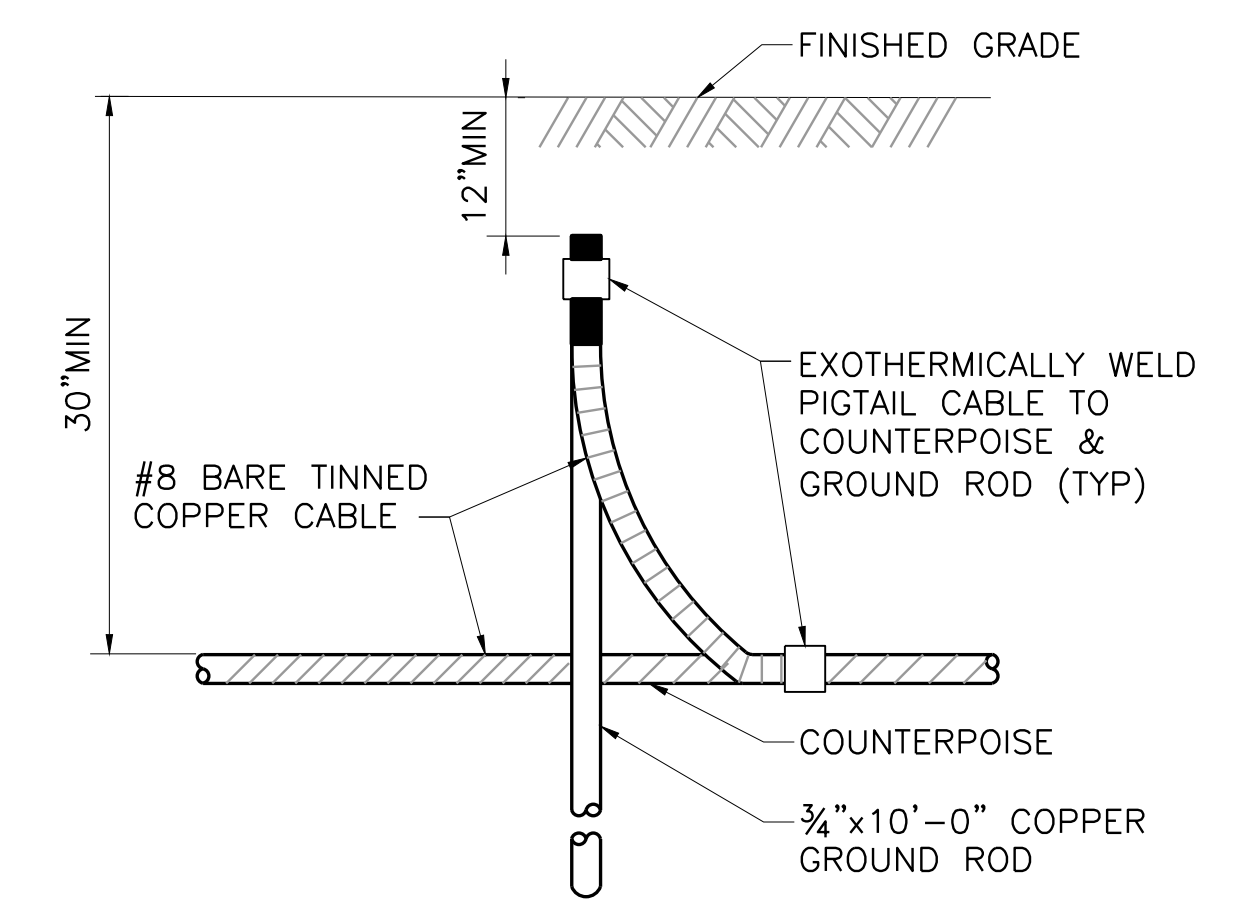


5
-
**GROUND ROD
TEST WELL DETAIL**
NOT TO SCALE



- NO.6 GENERAL NOTES:**
- TYPICAL CONDUIT DRAIN FOR ALL EQUIPMENT BELOW GRADE.

6
-
**TYPICAL JUNCTION BOX
& CONDUIT DRAIN DETAIL**
NOT TO SCALE



7
-
**GROUND ROD/COUNTERPOISE
INSTALLATION (TYPICAL)**
NOT TO SCALE

4
-
**STRUCTURES ABOVE OR BELOW GRADE
WATERTIGHT CONDUIT PENETRATION**
NOT TO SCALE

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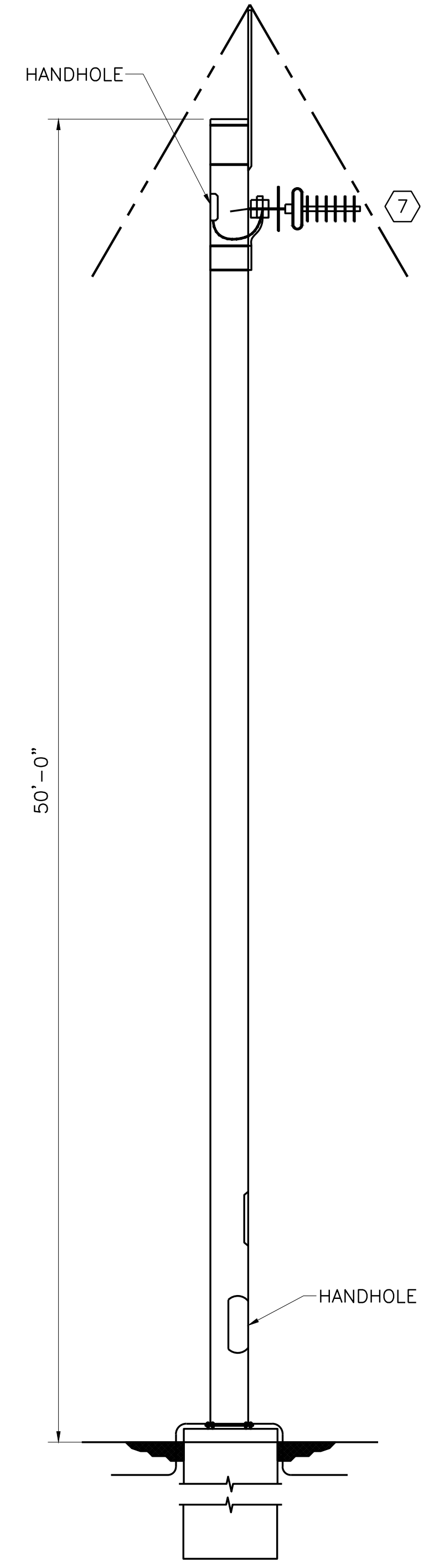
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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ELECTRICAL

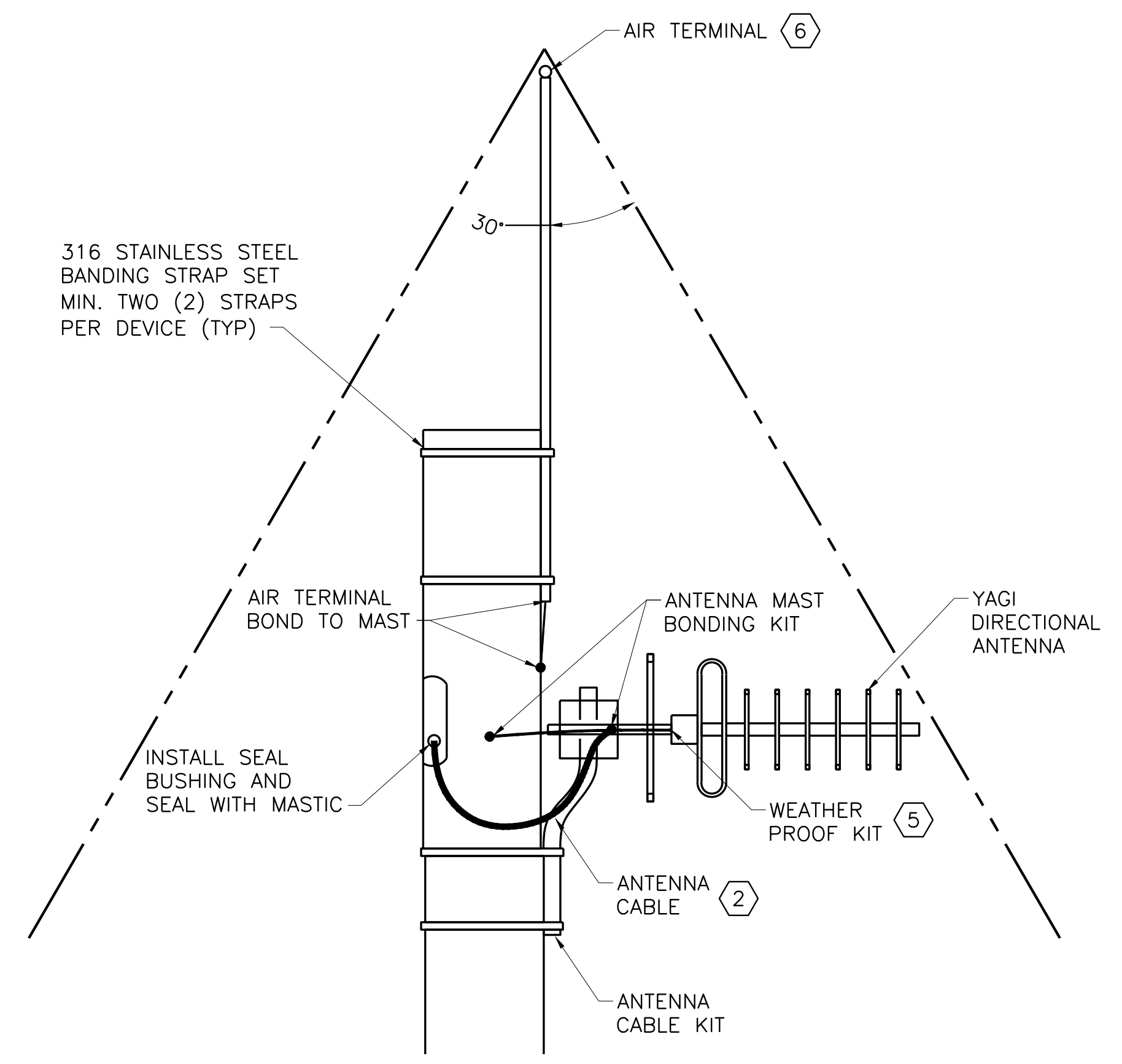
DETAILS III

NOTES BY SYMBOL "⬡"

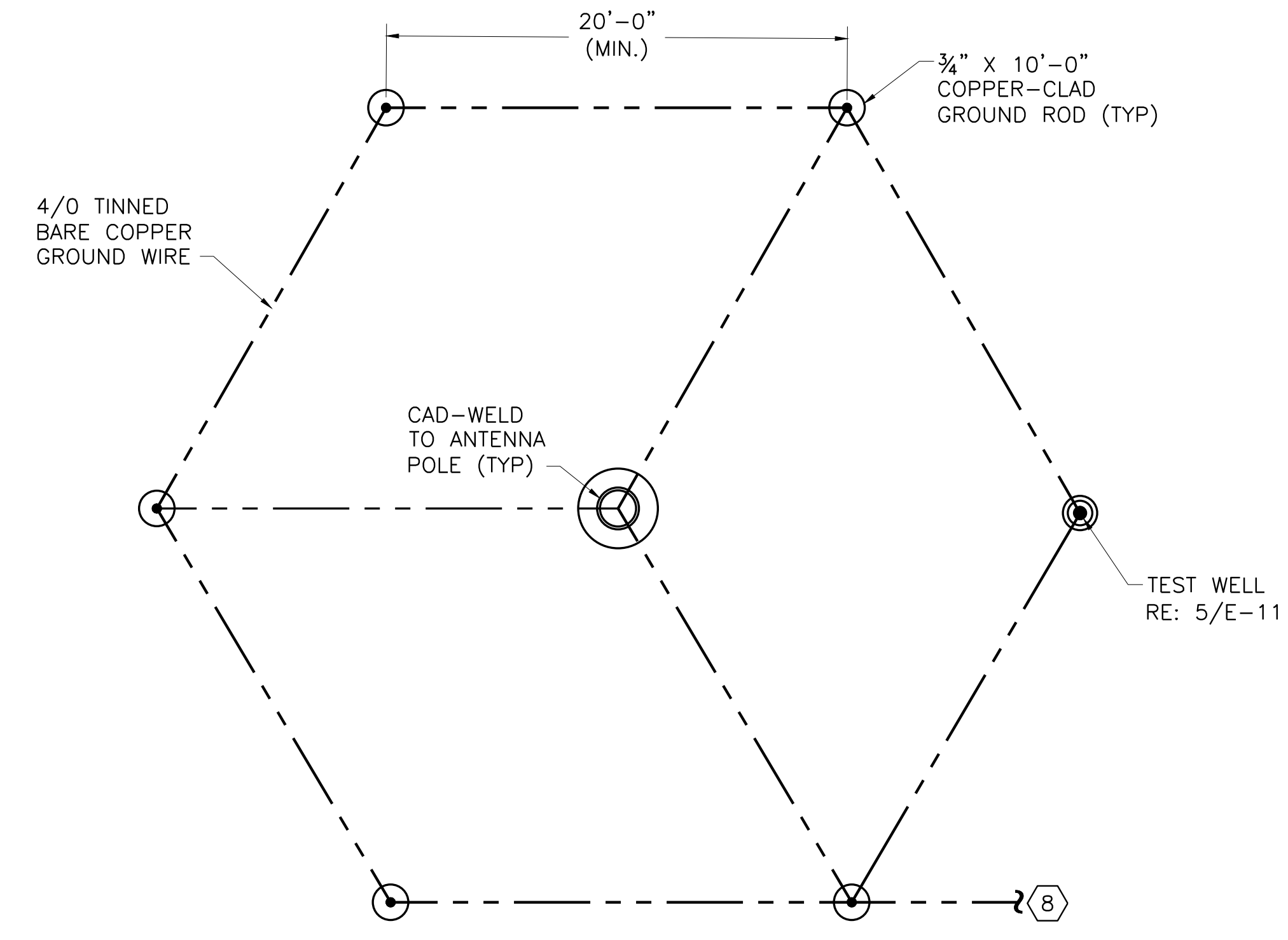
1. THE RADIO TOWER SHALL BE A SELF-SUPPORTING STRUCTURE. THE FINAL TOWER AND BASE DESIGN SHALL BE PERFORMED BY THE CONTRACTOR AND IS TO BE VERIFIED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF TEXAS AND IS TO BE COMPLIANT WITH TIA-222-G, STRUCTURAL STAND FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS. THE TOWER AND BASE DESIGN, ALONG WITH THIS CERTIFICATION, SHALL BE SUBMITTED BY THE CONTRACTOR.
2. ANTENNA CABLE RUNS INSIDE POLE.
3. PROVIDE FULL HEIGHT STEP BOLTS.
4. PROVIDE CABLE TYPE SAFETY CLIMBING DEVICE.
5. THE CONNECTION BETWEEN THE ANTENNA AND ANTENNA CABLE SHALL BE WRAPPED WITH A WEATHER PROOF KIT.
6. THE TOP OF THE AIR TERMINAL SHALL BE A MINIMUM 4'-0" ABOVE THE TOP OF THE SUPPORT POLE AND SHALL BE AT SUCH HEIGHT THAT ALL POLE-MOUNTED EQUIPMENT IS COMPLETELY COVERED UNDER A 30' CONE BELOW THE TOP OF THE AIR TERMINAL. INTENDED LIGHTING-ENERGY DIVERSION ARRANGEMENT REPRESENTS A MINIMUM REQUIREMENT. PROVIDE ENHANCEMENT AS APPROPRIATE.
7. THE ANTENNA MOUNTING HEIGHT SHALL BE BASED UPON PHYSICAL PATH STUDY TO THE INTENDED RECEIVING ANTENNA. MOUNT THE ANTENNA SUCH THAT SIGNAL STRENGTH IS MAXIMIZED FOR THE RADIO LINK.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND CONNECTING TO GROUND SYSTEM.



1 MONOPOLE INSTALLATION 1 3 4
NOT TO SCALE



2 ANTENNA MOUNTING
NOT TO SCALE



3 COMMUNICATION TOWER GROUNDING
NOT TO SCALE

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	Bar is one inch on original drawing, if not one inch on this sheet, adjust scale.			DESIGNED	DFP
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				CHECKED	TWZ
				FILE NAME	EL-ALL-DT-DTLS03.dwg

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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
METER VAULT RELOCATION**
ELECTRICAL

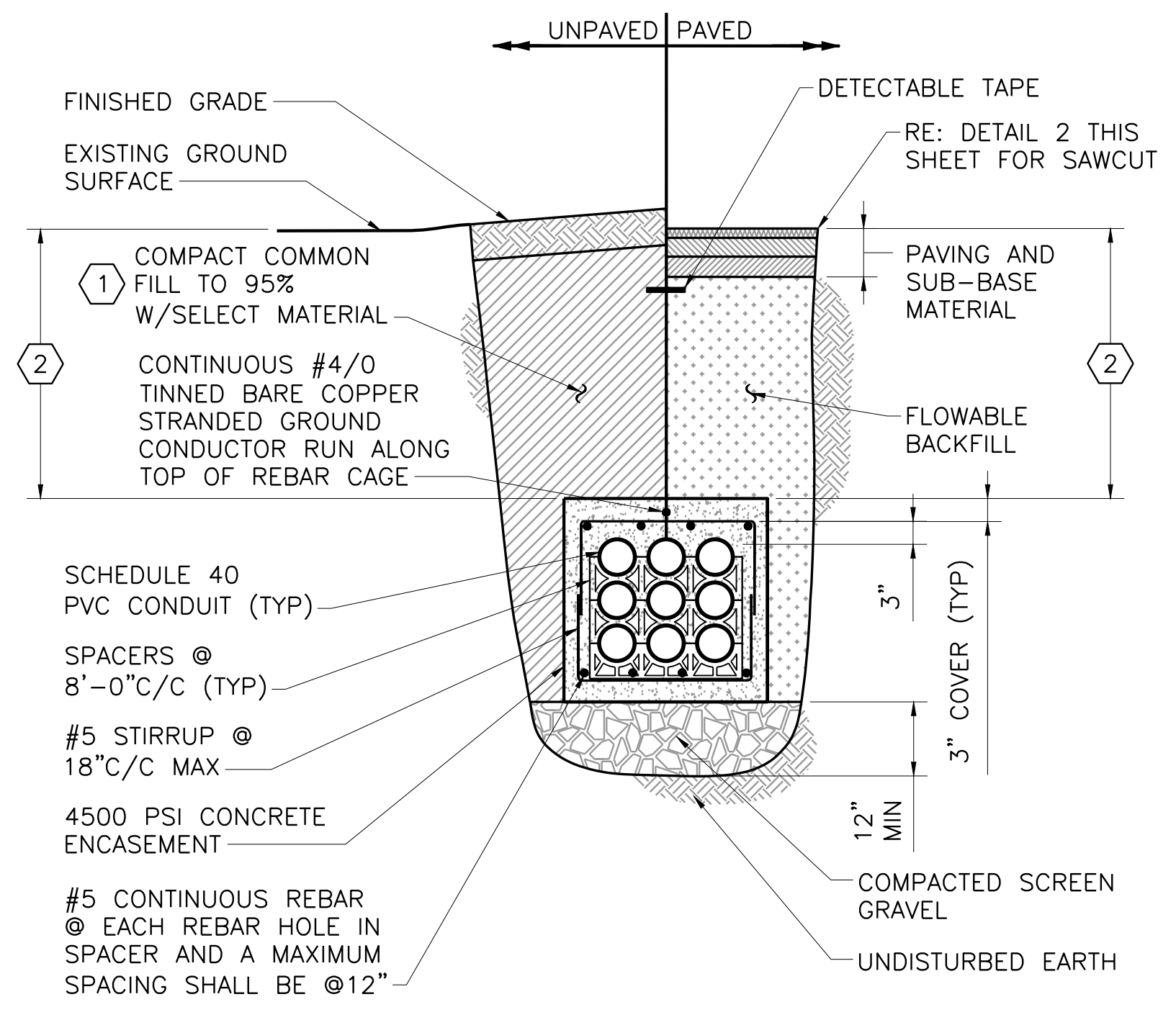
DETAILS IV

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VERIFY SCALE

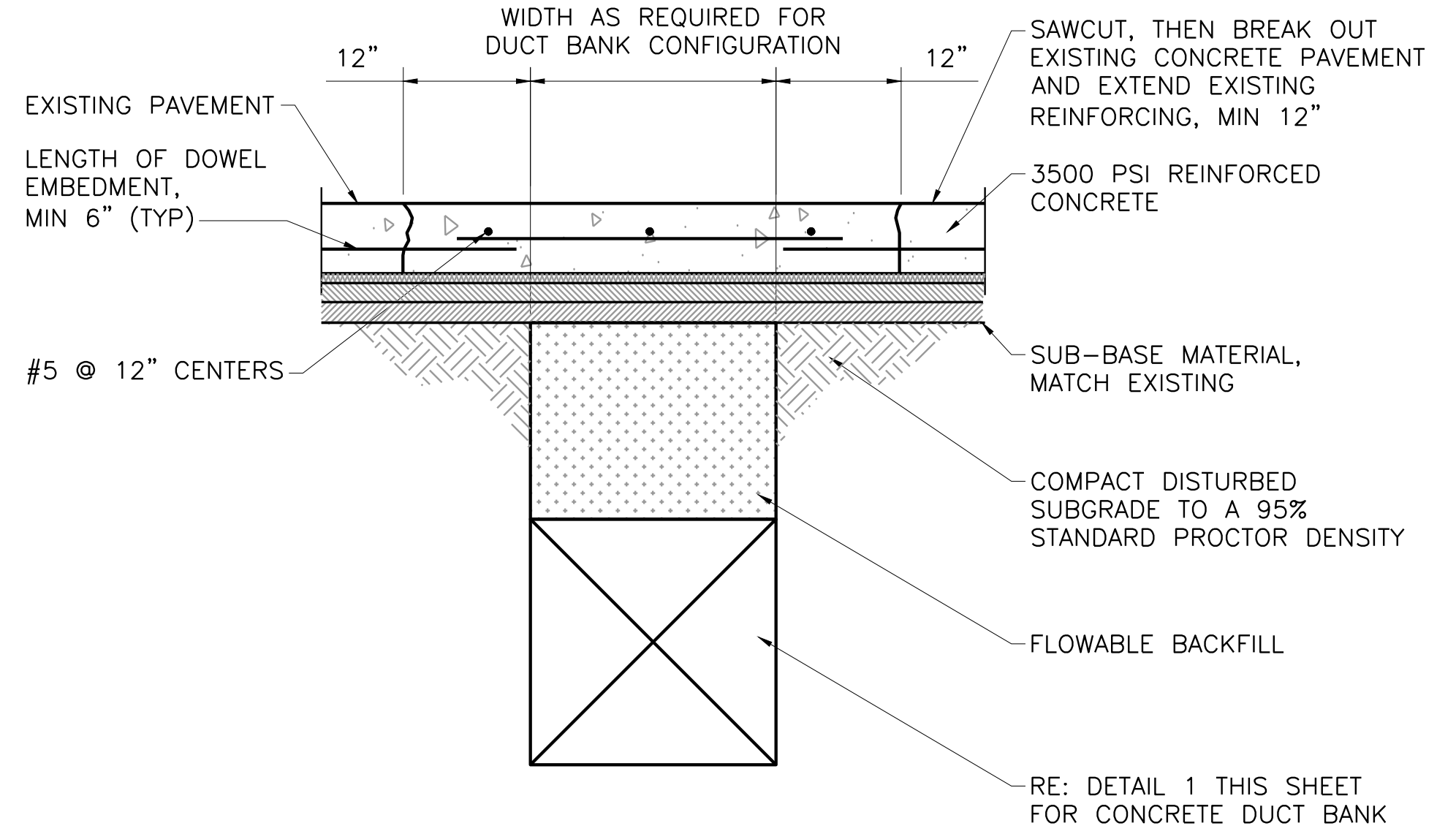
SHEET
E - 13
SEQ.
62



NO.1 NOTES BY SYMBOL "1"

1. SELECT BACKFILL TO BE CLASS 4 EARTH FILL. FILL SHALL CONSIST OF MATERIALS WHICH ARE CLASSIFIED AS SP, SM, SC, CL OR DUAL CLASSIFICATIONS THEREOF, WHICH HAVE A LIQUID LIMIT LESS THAN OR EQUAL TO 35 AND A PLASTICITY INDEX OF A MINIMUM OF 4 AND A MAXIMUM OF 15, WHICH ARE FREE OF ORGANIC MATERIALS.
2. 18" FOR 600V AND BELOW, 36" FOR 15KV.

**CONCRETE ENCASED
DUCT BANK DETAIL**
NOT TO SCALE



NO.2 GENERAL NOTES:

1. RE: 1/C-9 FOR CONCRETE DRIVEWAY PAVEMENT DETAIL.

SAWCUT DETAIL
NOT TO SCALE

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INTERNATIONAL SOCIETY OF AUTOMATION TABLE

LETTER	FIRST LETTER (S)		SUCCEEDING LETTERS		
	PROCESS OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS (+)		ALARM		
B	BURNER, COMBUSTION		USERS CHOICE (+)	USERS CHOICE (+)	USERS CHOICE (+)
C	USER'S CHOICE (+)			CONTROL	
D	USER'S CHOICE (+)	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE (+)		GLASS, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	MOTOR	MOMENTARY			MIDDLE, INTERMEDIATE
N	USERS CHOICE (+)		USERS CHOICE (+)	USERS CHOICE (+)	USERS CHOICE (+)
O	USERS CHOICE (+)		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION (+)
V	VIBRATION MECH. ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED (+)	X AXIS	UNCLASSIFIED	UNCLASSIFIED (+)	UNCLASSIFIED (+)
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

(+) WHEN USED, EXPLANATION IS SHOWN ADJACENT TO INSTRUMENT SYMBOL. SEE ABBREVIATIONS AND LETTER SYMBOLS.

GENERAL ABBREVIATIONS

AS	AIR SUPPLY
CPU	CENTRAL PROCESSOR UNIT
DCU	DISTRIBUTED CONTROL UNIT
ES	ELECTRIC SUPPLY
FOC	FIBER OPTIC CABLE
FOM	FIBER OPTIC MODEM
FV	FLOW CONTROL VALVE
FREQ	FREQUENCY
HDC	HISTORICAL DATA COLLECTION
I/O	INPUT OUTPUT
MC	MOTOR CONTROLLER
ORP	OXYGEN REDUCTION POTENTIAL
OVS	OPERATOR WORK STATION
PE	PRESSURE SENSOR
PIT	PRESSURE INDICATOR TRANSMITTER
PLC	PROGRAMMABLE LOGIC CONTROLLER
PS	POWER SUPPLY
PSH	PRESSURE SWITCH HIGH
PSL	PRESSURE SWITCH LOW
PW	PROCESS WATER
RIO	REMOTE INPUT OUTPUT
RTU	REMOTE TERMINAL UNIT
SE	SPEED SENSOR
SIK	SPEED INDICATE CONTROL STATION
SP	SET POINT
VLV	VALVE (MANUAL AND NO CONTROLS)

LINE SYMBOLS

	(1) INSTRUMENT SUPPLY OR SOLENOID OPERATED VALVE (1)		(9) INTERNAL SYSTEM LINK (SOFTWARE OR DATA LINK)
	(2) UNDEFINED SIGNAL		(10) MECHANICAL LINK
	(3) PNEUMATIC SIGNAL (2)		(11) PNEUMATIC BINARY SIGNAL (ON-OFF)
	(4) ELECTRIC SIGNAL		(12) ELECTRIC BINARY SIGNAL (ON-OFF)
	(5) HYDRAULIC SIGNAL		(13) ELECTRIC ANALOG SIGNAL
	(6) CAPILLARY TUBE		CONNECTING LINES
	(7) ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED) (3)		NON-CONNECTING LINES
	(8) ELECTROMAGNETIC OR SONIC SIGNAL (NOT GUIDED) (3)		

HAND SWITCH ABBREVIATIONS

H/O/A	HAND/OFF/AUTO	L/R	LOCAL/REMOTE
H/O/S	HAND/OFF/SCADA	O/C	OPEN/CLOSE
L/O/C	LOCAL/OFF/COMPUTER	A/H	AUTO/HAND
L/O/R	LOCAL/OFF/REMOTE	L/A	LOCAL/AUTO
O/C/S	OPEN/CLOSE/STOP	O/O/A	ON/OFF/AUTO
L/C	LOCAL/COMPUTER	N/B	NORMAL/BYPASS

GENERAL NOTES

- THE FOLLOWING ABBREVIATIONS ARE SUGGESTED TO DENOTE THE TYPES OF POWER SUPPLY. THESE DESIGNATIONS MAY ALSO BE APPLIED TO PURGE FLUID SUPPLIES.

AS - AIR SUPPLY	HS - HYDRAULIC SUPPLY
IA - INSTRUMENT AIR } OPTIONS	NS - NITROGEN SUPPLY
PA - PLANT AIR	SS - STEAM SUPPLY
ES - ELECTRIC SUPPLY	WS - WATER SUPPLY
GS - GAS SUPPLY	

THE SUPPLY LEVEL MAY BE ADDED TO THE INSTRUMENT SUPPLY LINE, E.G., AS-100, 100-PSIG AIR SUPPLY; ES-24DC, A 24-VOLT DIRECT CURRENT POWER SUPPLY.
- THE PNEUMATIC SIGNAL SYMBOL APPLIES TO A SIGNAL USING ANY GAS AS THE SIGNAL MEDIUM. IF A GAS OTHER THAN AIR IS USED, THE GAS MAY BE IDENTIFIED BY A NOTE ON THE SIGNAL SYMBOL OR OTHERWISE.
- ELECTROMAGNETIC PHENOMENA INCLUDE HEAT, RADIO WAVES, NUCLEAR RADIATION AND LIGHT.

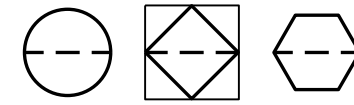
NOTE:
THIS IS A STANDARD LEGEND. THEREFORE, NOT ALL OF THIS INFORMATION MAY BE USED ON THIS PROJECT.

INSTRUMENT IDENTIFICATION

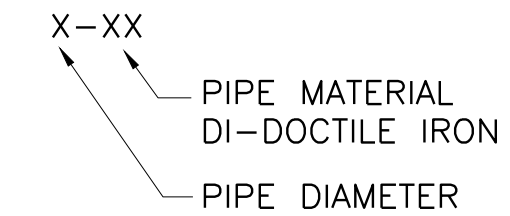
	PRIMARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR (2)	FIELD MOUNTED	AUXILIARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR (2)
DISCRETE INSTRUMENTS			
SHARED DISPLAY SHARED CONTROL			
COMPUTER FUNCTION			
PROGRAMMABLE LOGIC CONTROL			
		INSTRUMENT WITH LONG TAG NUMBERS	INSTRUMENTS SHARING COMMON HOUSING
		PANEL MOUNTED PATCHBOARD POINT 12	PURGE OR FLUSING DEVICE
		DIAPHRAGM SEAL	UNDEFINED INTERLOCK LOGIC

(1) ABBREVIATIONS OF THE USER'S CHOICE SUCH AS IP1 (INSTRUMENT PANEL #1), IC2 (INSTRUMENT CONSOLE #2), CC3 (COMPUTER CONSOLE #3), ETC., MAY BE USED WHEN IT IS NECESSARY TO SPECIFY INSTRUMENT OR FUNCTION LOCATION.

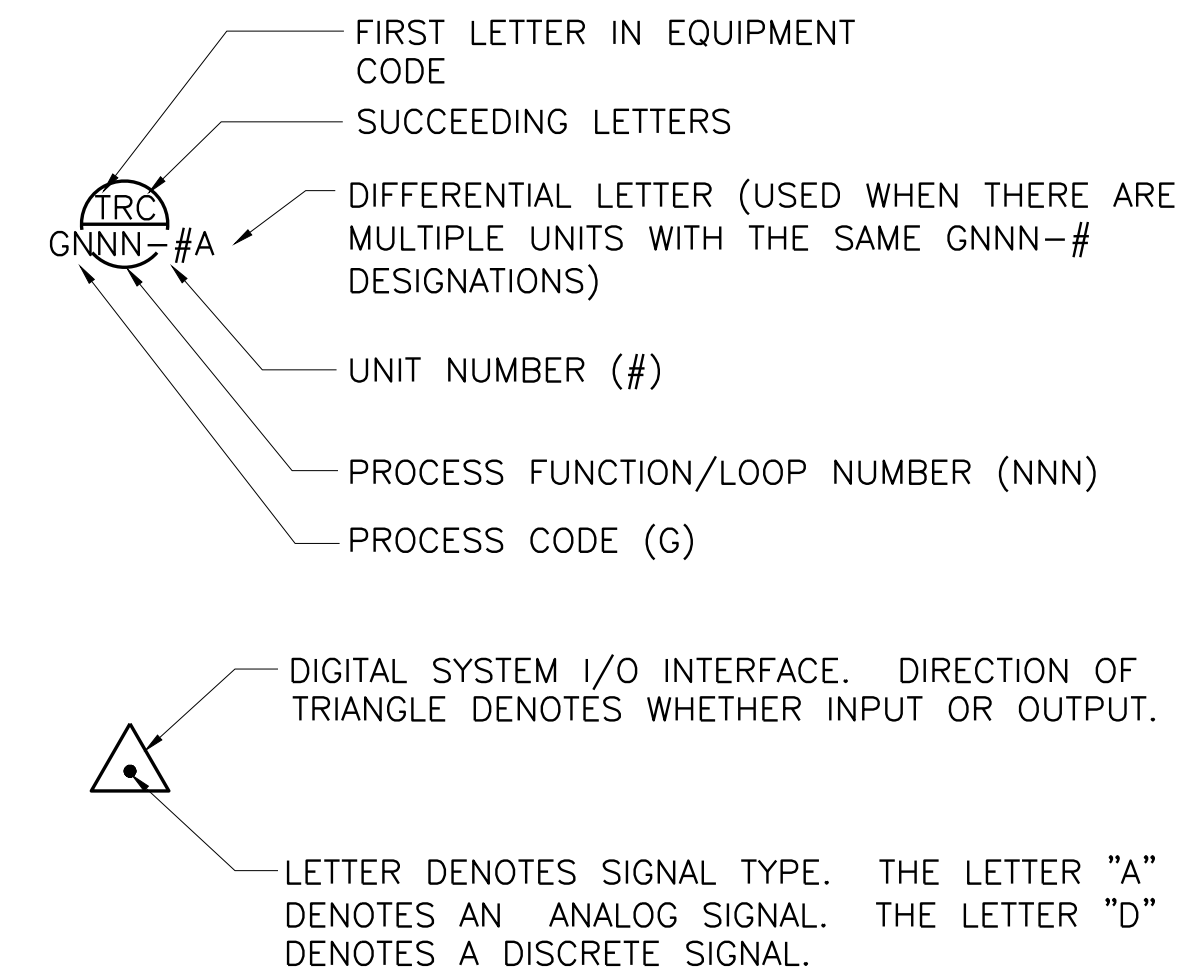
(2) NORMALLY INACCESSIBLE OR BEHIND-THE-PANEL DEVICES OR FUNCTIONS MAY BE DEPICTED BY USING THE SAME SYMBOLS BUT WITH DASHED HORIZONTAL BARS, I.E.



PIPING LABELS



EXAMPLE SYMBOLS



PROCESS SYMBOLS

	CHECK VALVE
	BUTTERFLY VALVE
	SLIDE GATE
	GATE VALVE
	BALL VALVE
	PLUG VALVE
	PRIMARY ELEMENT
	VENTURI FLOW METER
	REDUCER OR INCREASER
	ELECTROMAGNETIC FLOW METER
	MOTOR
	MOTOR-ARROW DENOTES VARIABLE SPEED
	AIR RELEASE VALVE
	SOLENOID OPERATED VALVE
	MOTOR OPERATED VALVE
	MIXER
	SUMP PUMP
	PUMP
	BLOWER
	METERING PUMP
	SUBMERSIBLE PUMP
	VERTICAL TURBINE PUMP

Freesee and Nichols, Inc. Texas Registered Engineering Firm F-2144

Freesee and Nichols
5805 Main Street, Suite B
Frisco, Texas 75034
Phone - (972) 624-9201
Fax - (972) 624-9202
Web - www.freesee.com

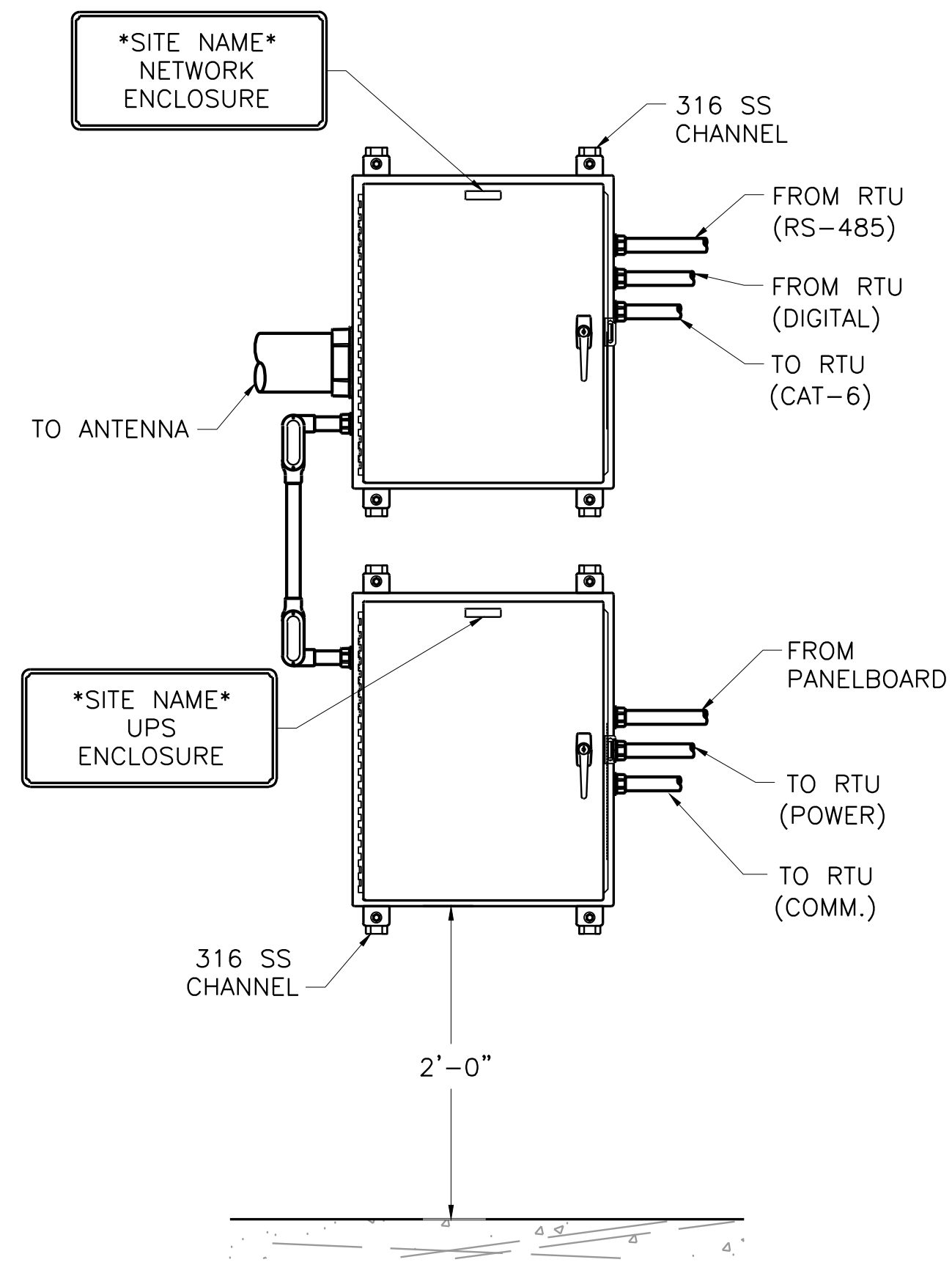
TOWN OF PROSPER, TEXAS
CUSTER ROAD PUMP STATION
METER VAULT RELOCATION
PROCESS & INSTRUMENTATION
LEGEND

NO. ISSUE	BY	DATE	FERN JOB NO. PRP18708	DATE MAY 2020	DESIGNED DFP	DRAWN MHC	CHECKED TWZ
SHEET							
PI - 1							
SEQ. 63							

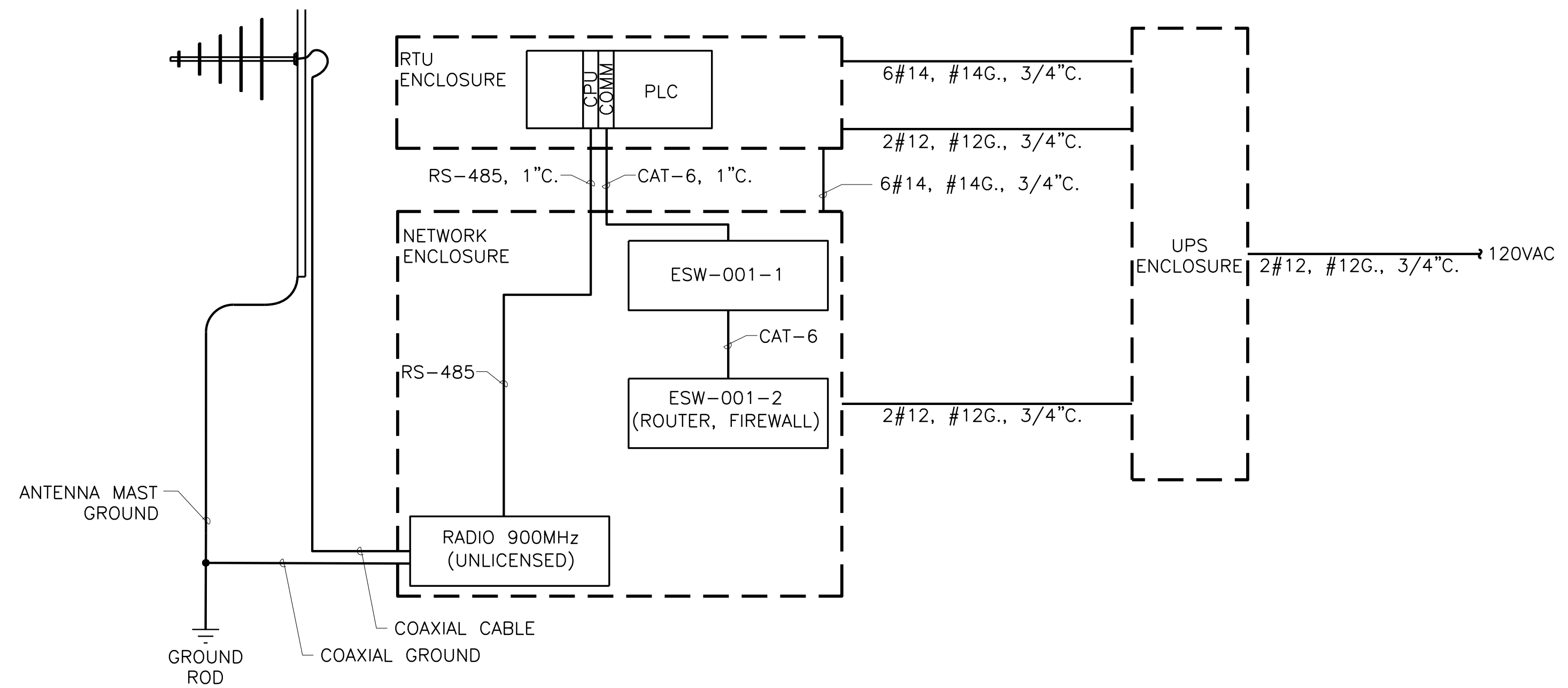
Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.

GENERAL NOTES:

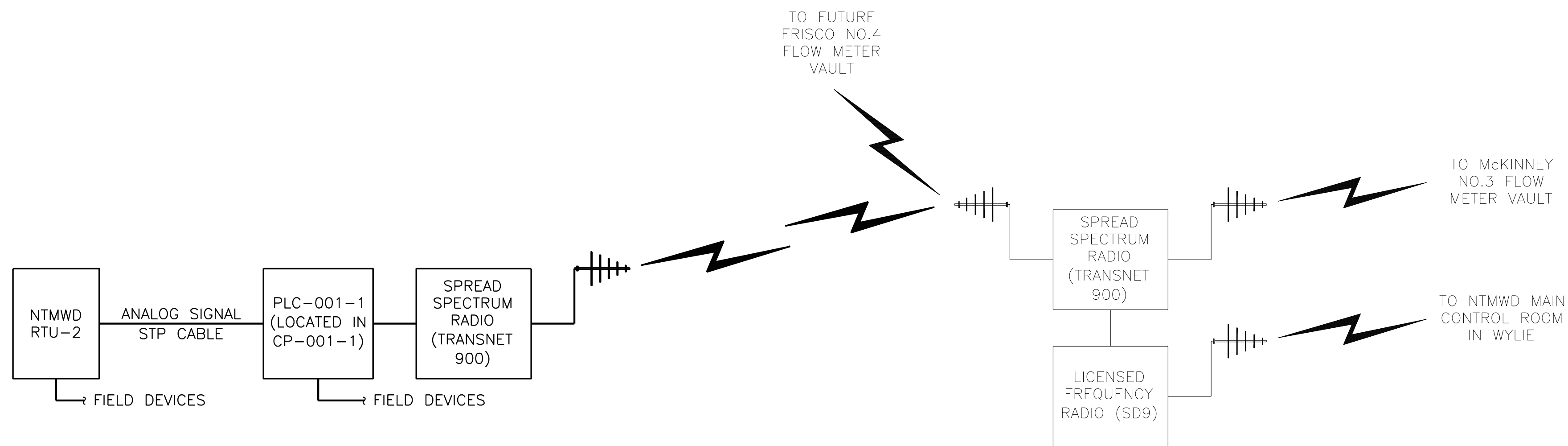
1. ALL EQUIPMENT AND CABLE/CONDUIT TAGS ARE PRECEDED BY "WA3560".



1 UPS & NETWORK ENCLOSURE NOT TO SCALE



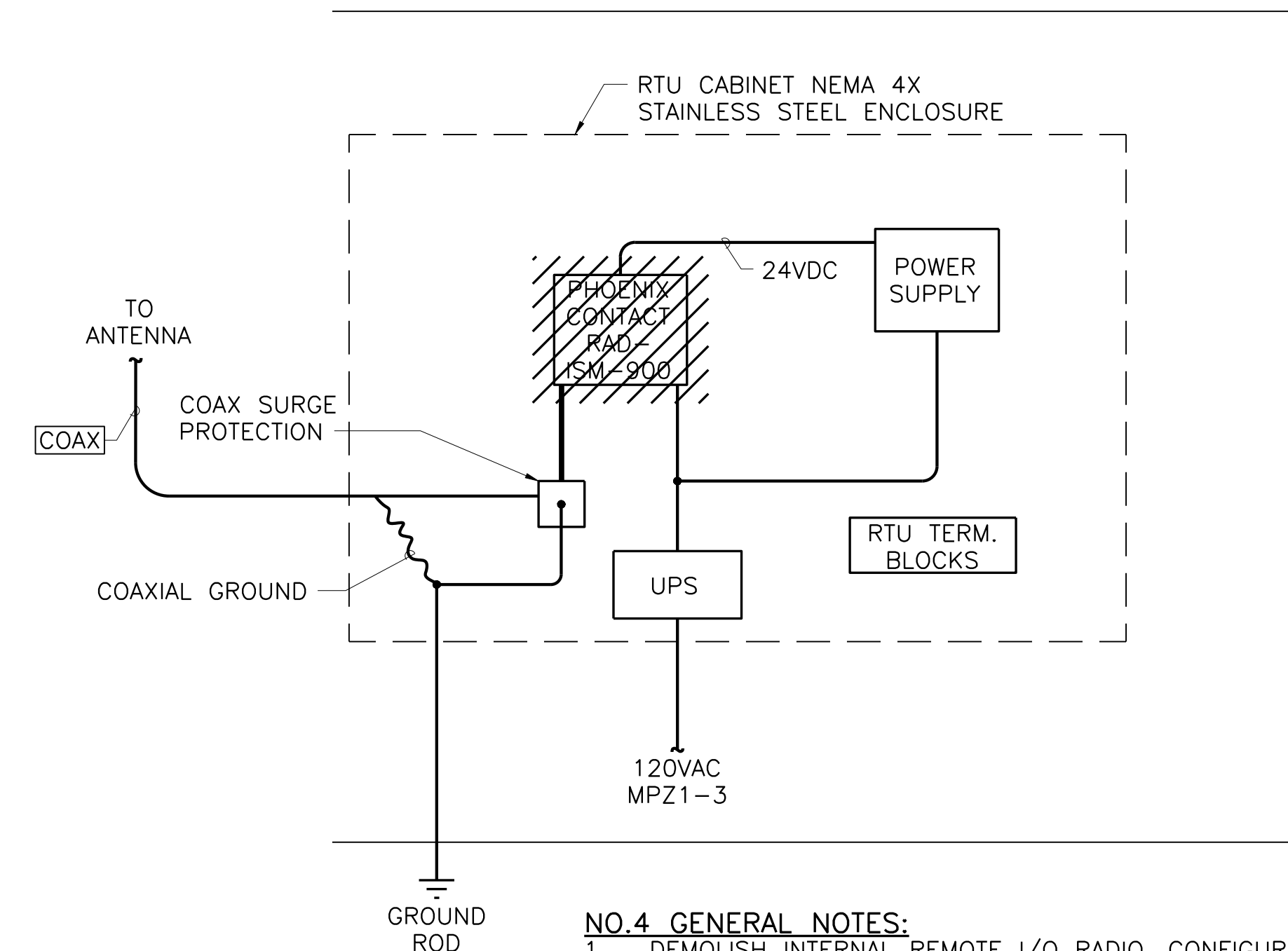
2 TYPICAL COMMUNICATIONS DIAGRAM NOT TO SCALE



3 PROSPER FLOW METER VAULT

NTMWD GROUND STORAGE TANK AT INDEPENDENCE AND VIRGINIA PKWY. (EXISTING)

3 SCADA SYSTEM COMMUNICATIONS NOT TO SCALE



NO.4 GENERAL NOTES:

1. DEMOLISH INTERNAL REMOTE I/O RADIO. CONFIGURE EXISTING RTU FOR ADDITIONAL HARDWIRED ANALOG OUTPUT GST LEVEL SIGNAL TO NEW FLOW METER VAULT. RE: 3/PI-2 FOR COMMUNICATIONS DETAILS.

4 NTMWD ELECTRICAL EQUIPMENT RACK RTU-2 COMMUNICATIONS PANEL DIAGRAM NOT TO SCALE

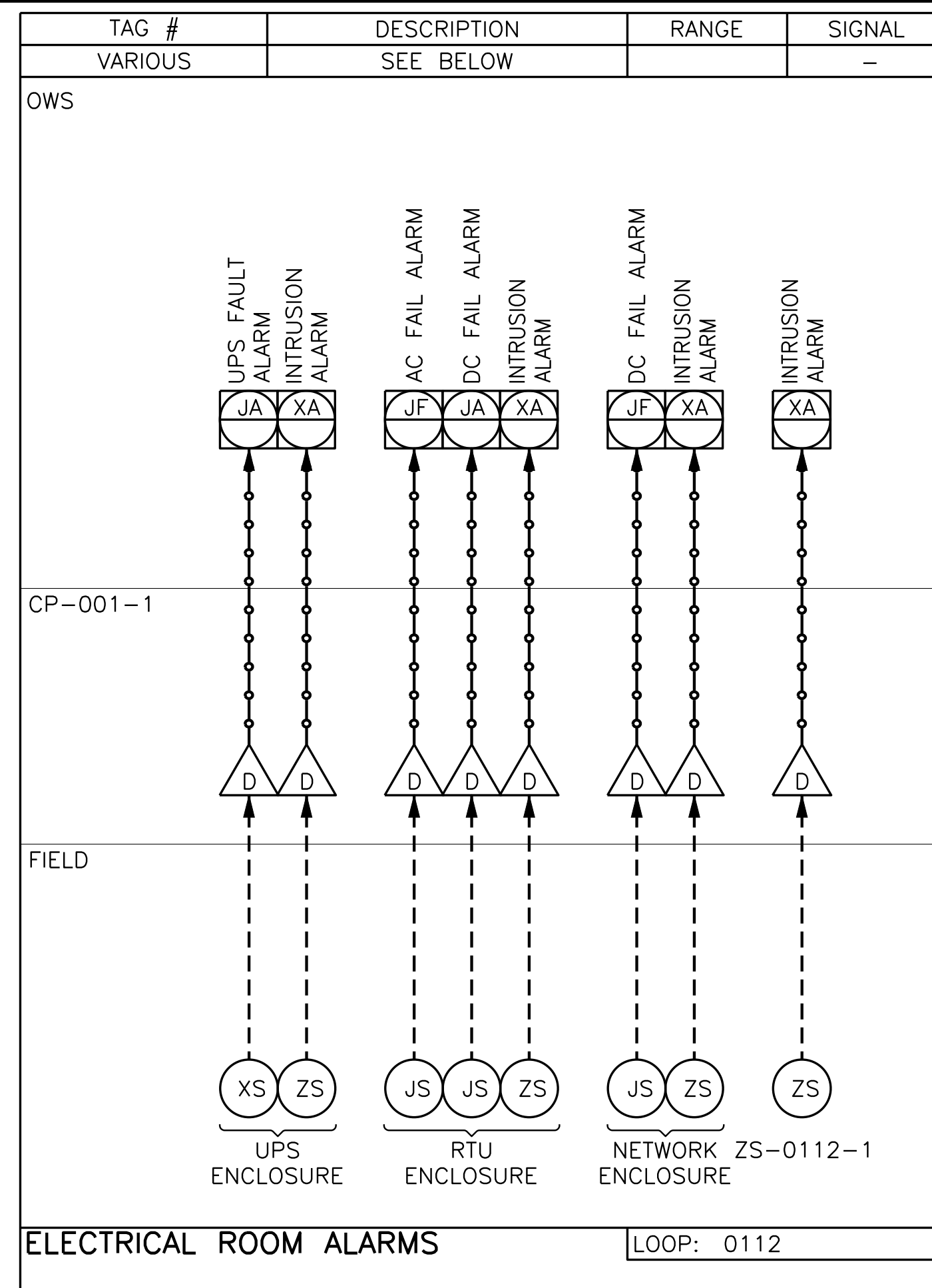
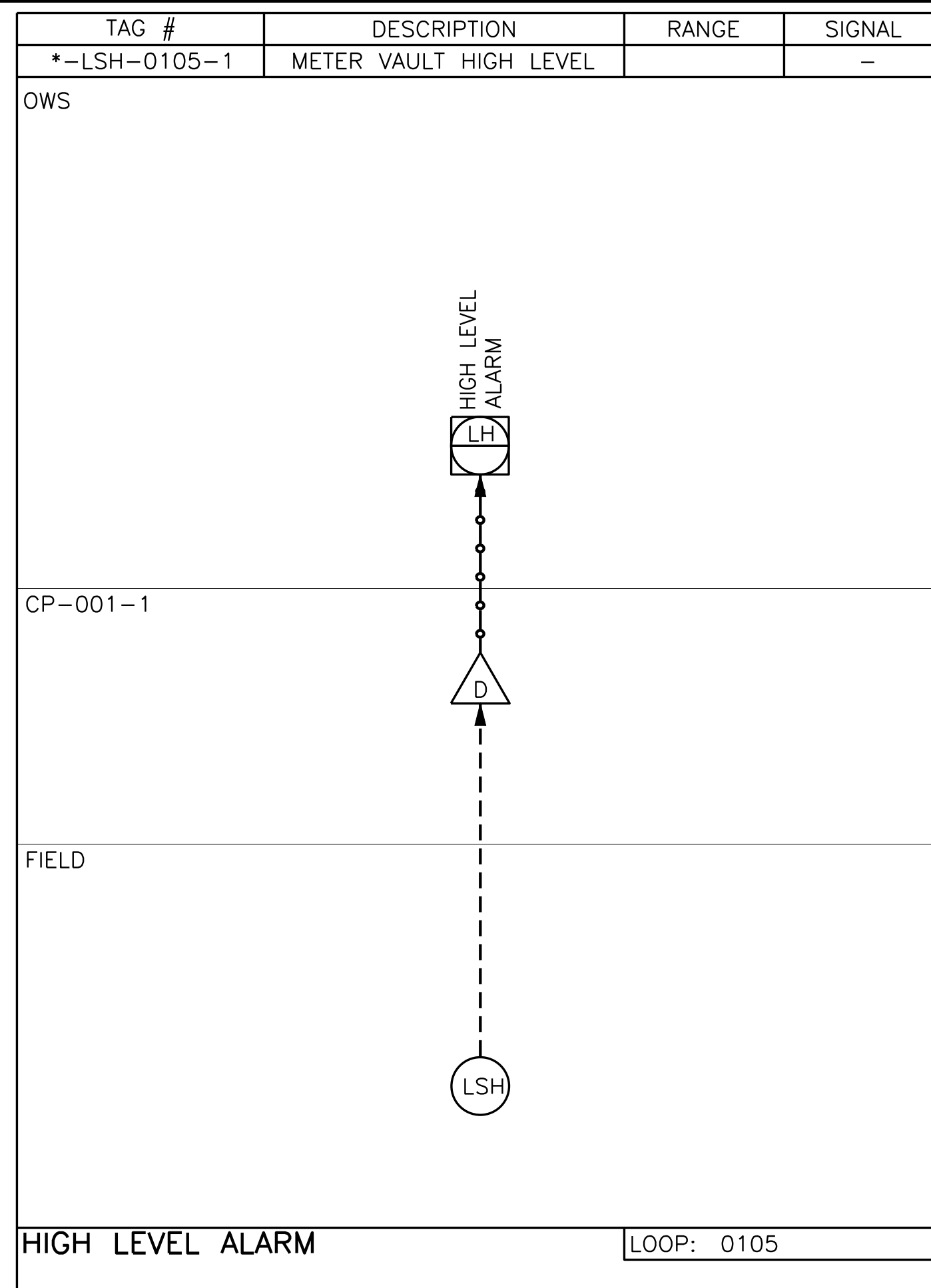
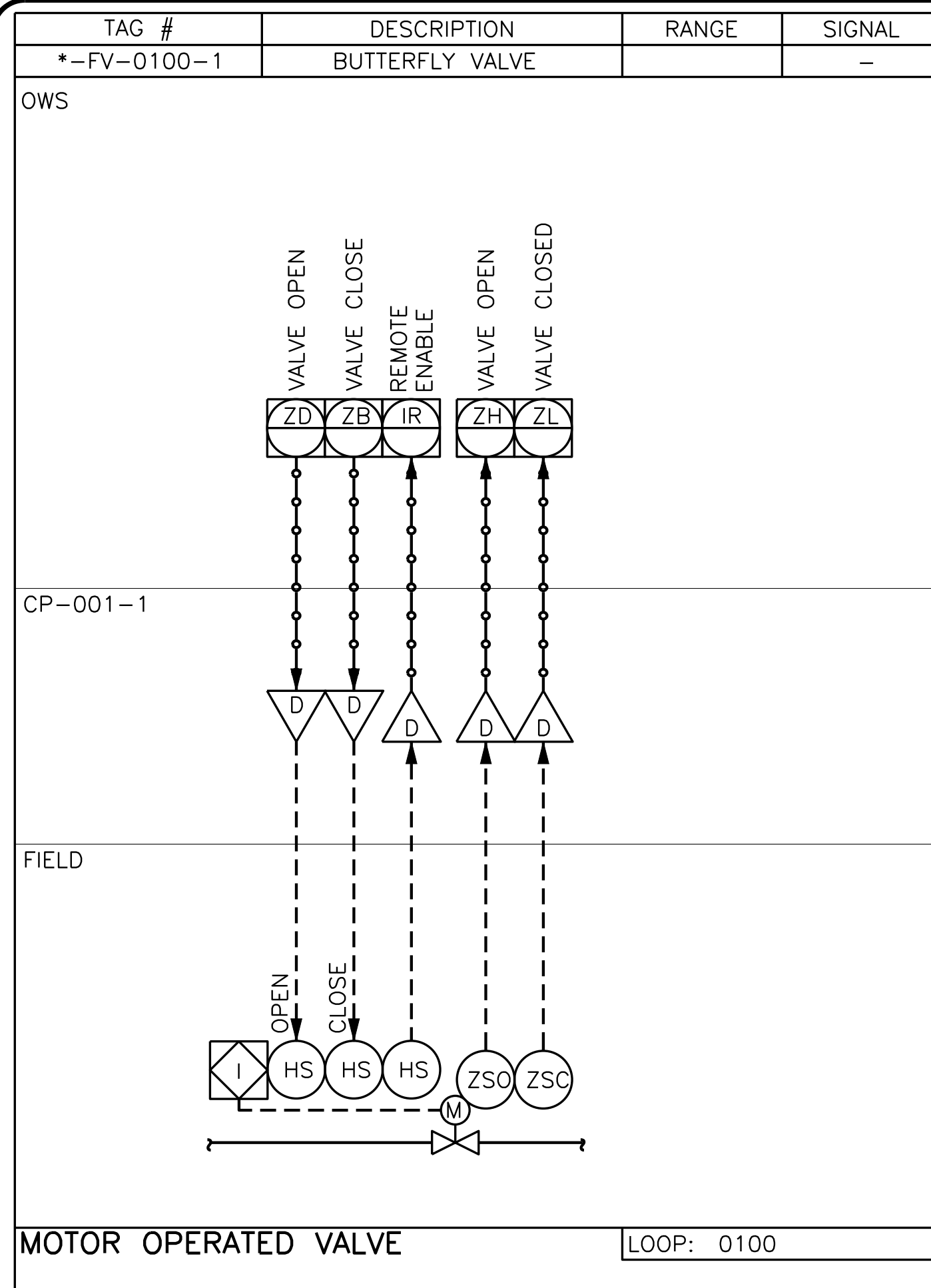
Freese and Nichols, Inc. Texas Registered Engineering Firm F-2144



FREES & NICHOLS 5805 Main Street, Suite B Frisco, Texas 75034 Phone - (972) 624-9201 Fax - (972) 624-9202 Web - www.freese.com

TOWN OF PROSPER, TEXAS CUSTER ROAD PUMP STATION METER VAULT RELOCATION PROCESS & INSTRUMENTATION NETWORK DIAGRAM

NO.	ISSUE	BY	DATE	FILE NAME
0	VERIFY SCALE			EL-FMV-DG-NTWK.dwg
1	Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.			
2				
3				
4				

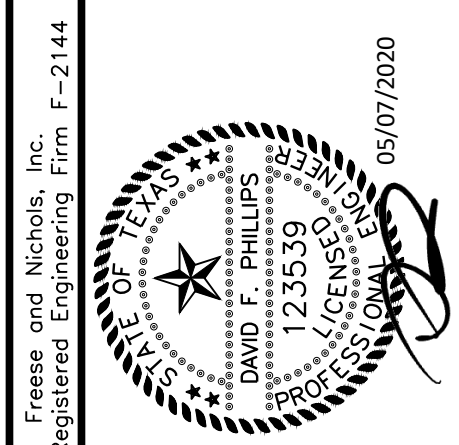
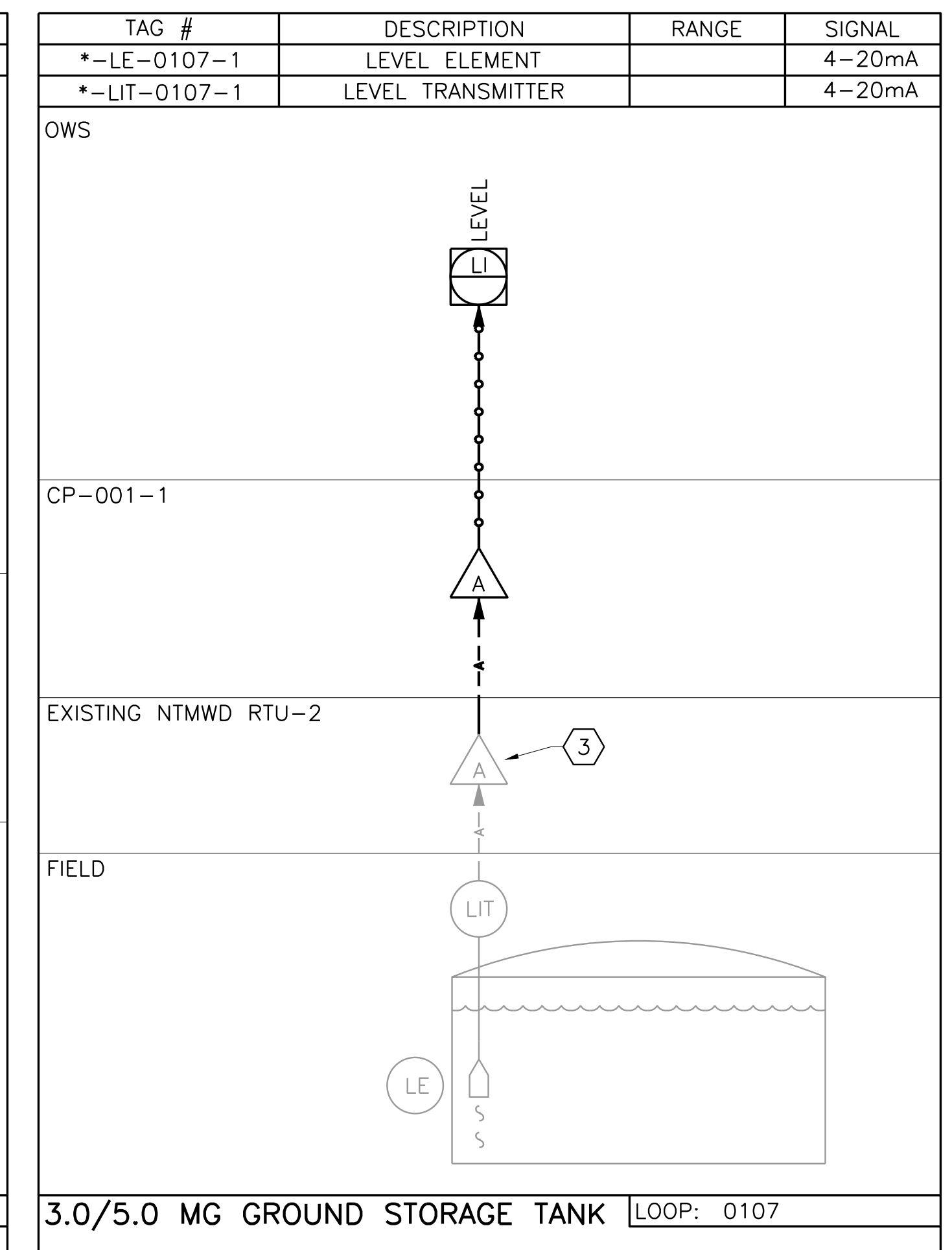
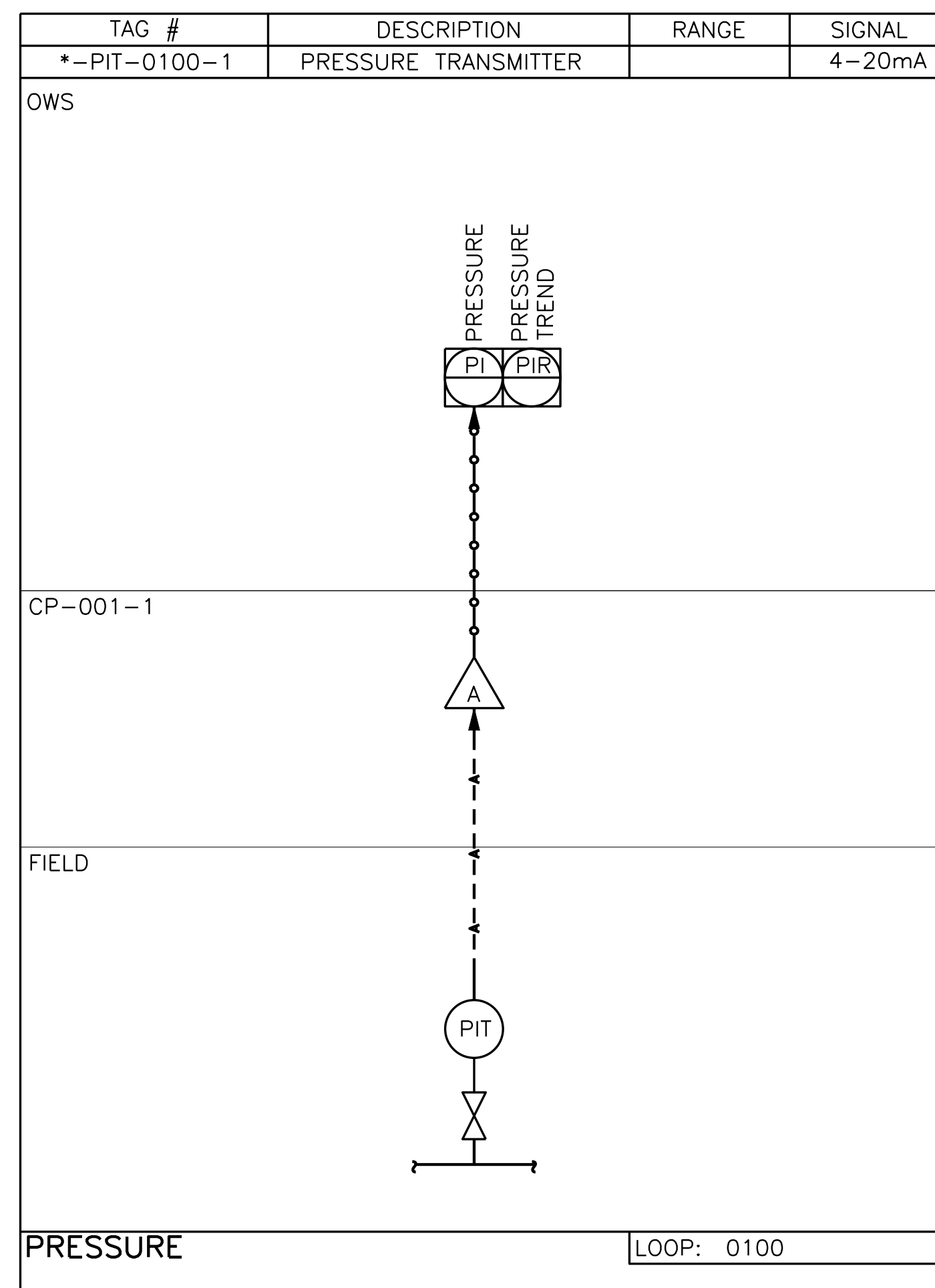
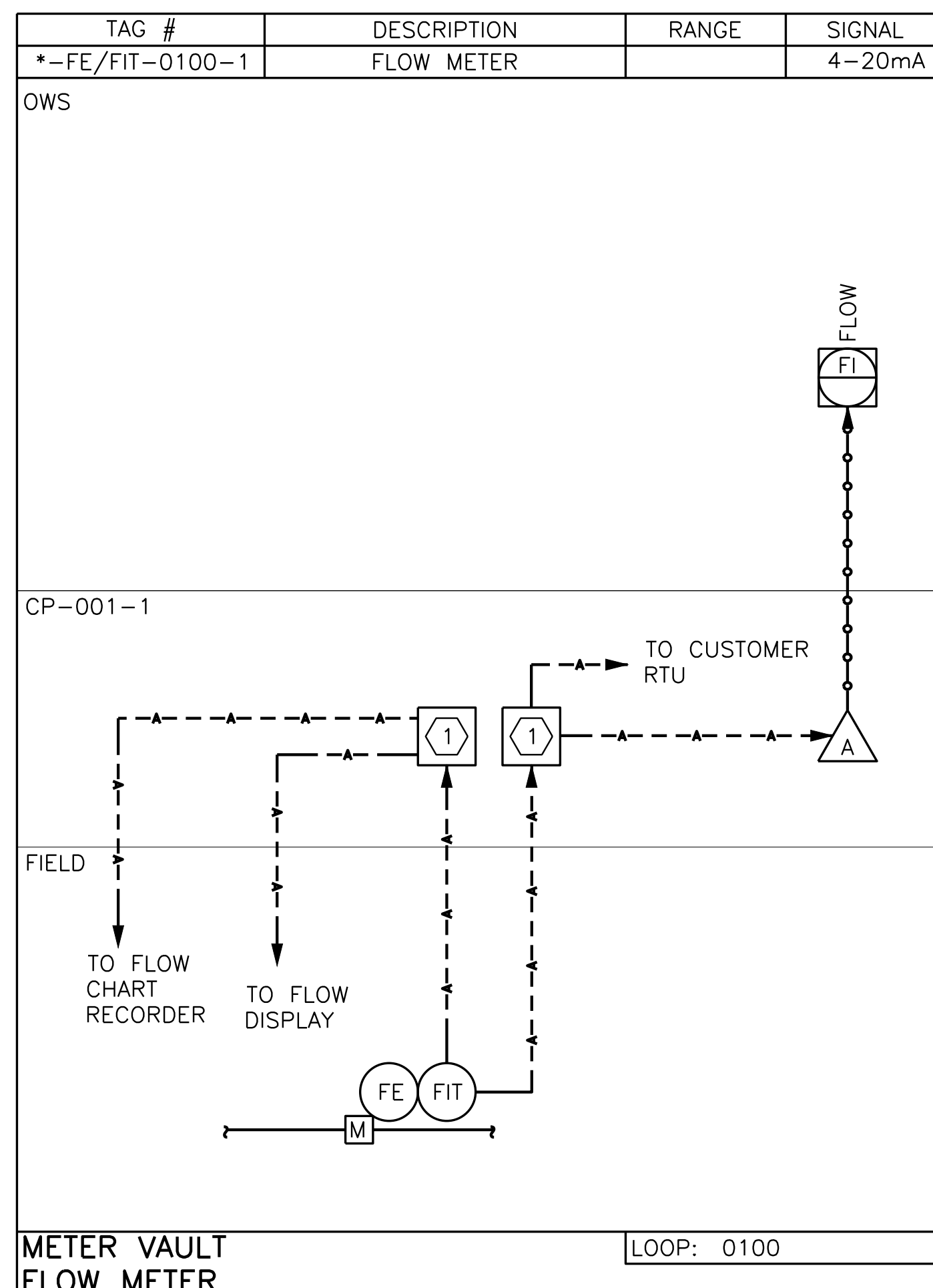
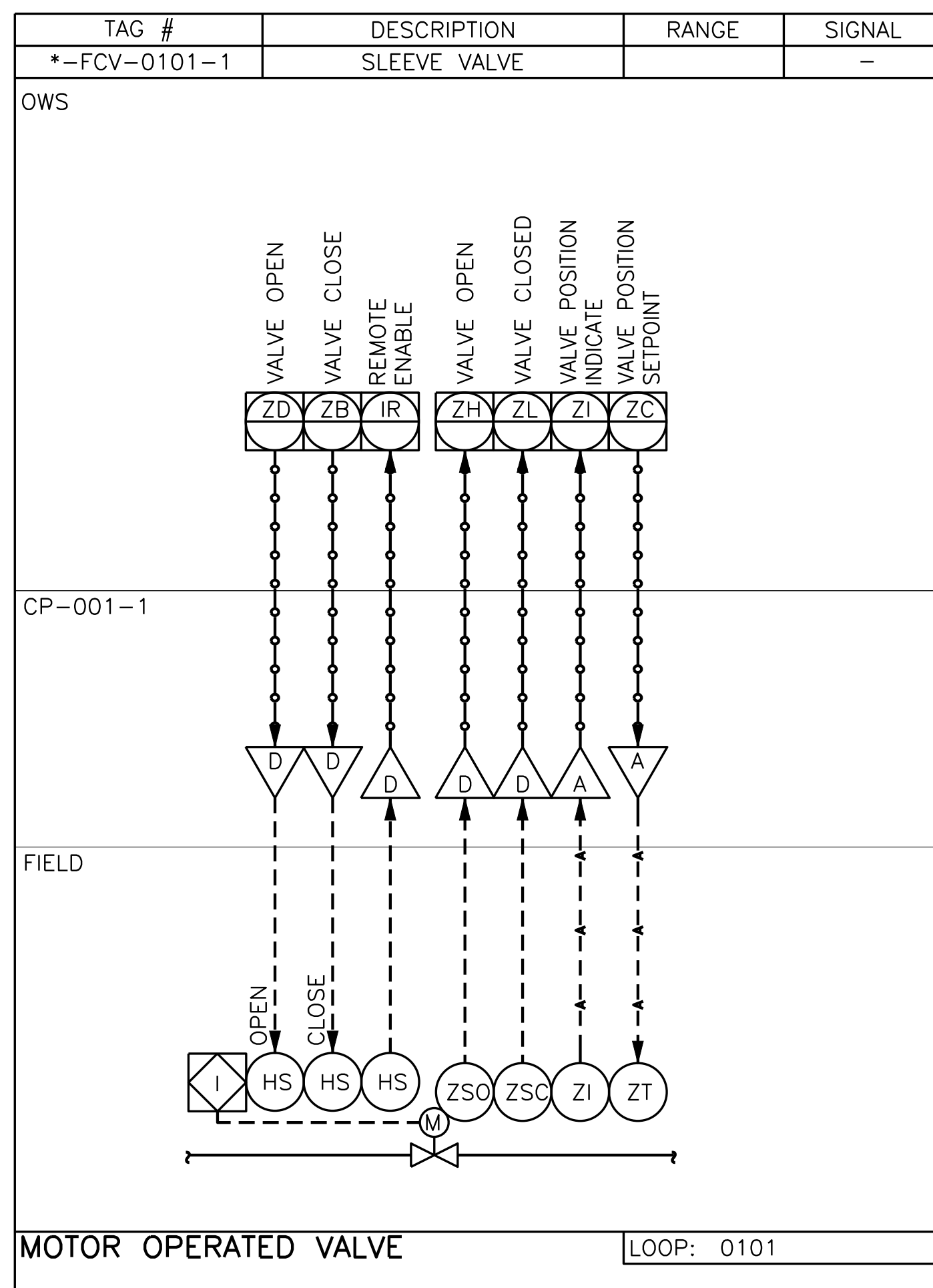


GENERAL NOTES:

1. ALL EQUIPMENT AND CABLE/CONDUIT TAGS ARE PRECEDED BY "WA3560".
2. ALL EQUIPMENT SHOWN DARK SHALL BE PROVIDED UNDER THIS CONTRACT. ALL EQUIPMENT SHOWN LIGHT ARE EXISTING TO REMAIN.

NOTES BY SYMBOL "◇"

1. 2-CHANNEL SIGNAL SPLITTER.
2. FLOW DATA SHALL BE TRANSMITTED OVER HARDWIRE CONNECTION TO AN EXISTING PROSPER RTU. FIELD VERIFY ALL REQUIREMENTS.
3. TANK LEVEL SHALL BE TRANSMITTED OVER HARDWIRE CONNECTION FROM THE EXISTING NTMWD RTU-2 TO THE FLOW METER VAULT PLC INPUT. FIELD VERIFY ALL REQUIREMENTS.



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TOWN OF PROSPER, TEXAS
**CUSTER ROAD PUMP STATION
 METER VAULT RELOCATION**
 PROCESS & INSTRUMENTATION

NO.	ISSUE	BY	DATE	REVISED	FILE NAME
1	NO. ISSUE				PI-FMV-DG-LOOP01.dwg

PRP18708
 DATE: MAY 2020
 DESIGNED: DFP
 DRAWN: MHC
 CHECKED: TWZ
 REVISION: 1

Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.

SHEET: **PI-3**

SEQ. 65

LOOPS 1

ACAD File: 23.0c (LMS Tech)
 File Name: N:\PI\FMV-DG-LOOP01.dwg
 Last Saved: 4/2/2020 6:11 PM Saved By: 03769



PROJECT TITLE	Custer Road PS Meter Station Relocation	DATE	6/4/2020
CLIENT	Town of Prosper	GROUP	1153
% OF SUBMITTAL		PM	CCB

ESTIMATOR	MDS	QC CHECKED BY	CCB	FNI PROJECT NO.	PRP18708
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ITEM	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL
A					
A-1	MOBILIZATION (NOT TO EXCEED 3% OF TOTAL PROJECT COST)	EA	\$ 103,437	1	\$ 103,437
A-2	METER VAULT FACILITY* 1	EA	\$ 1,770,080	1	\$ 1,770,080
A-3	REMOVAL OF EXISTING 36-IN PIPELINE	LF	\$ 140	490	\$ 68,600
A-4	REMOVAL OF EXISTING METER VAULT	EA	\$ 25,000	1	\$ 25,000
A-5	REMOVAL OF EXISTING CONCRETE ROADWAY	SF	\$ 15	2360	\$ 35,400
A-6	REMOVAL OF EXISTING RETAINING WALL	LF	\$ 250	50	\$ 12,500
A-7	36-IN BUTTERFLY VALVE AND MANHOLE* 2	EA	\$ 30,000	2	\$ 60,000
A-8	42-IN BUTTERFLY VALVE AND MANHOLE* 2	EA	\$ 10,000	2	\$ 20,000
A-9	12-IN BLOWOFF VALVE AND MANHOLE*	EA	\$ 30,000	1	\$ 30,000
A-10	4-IN COMBINATION AIR VALVE AND MANHOLE*	EA	\$ 25,000	1	\$ 25,000
A-11	CONNECT TO NTMWD 48-IN PIPELINE*	EA	\$ 75,000	1	\$ 75,000
A-12	CONNECT TO EX. 36-IN PIPELINE*	EA	\$ 75,000	1	\$ 75,000
A-13	HYDROSTATIC TESTING	EA	\$ 5,000	1	\$ 5,000
A-14	SEEDING	AC	\$ 1,500	1	\$ 1,500
A-15	STORM WATER POLLUTION PREVENTION PLAN	EA	\$ 5,000	1	\$ 5,000
A-16	CONCRETE PAVEMENT AND BASE*	SY	\$ 120	1635	\$ 196,200
A-17	36-IN AWWA C303 BAR WRAPPED CONCRETE CYLINDER PIPE BY OPEN CUT* 2	LF	\$ 445	909	\$ 404,505
A-18	36-IN AWWA C303 BAR WRAPPED CONCRETE CYLINDER PIPE BY OTHER THAN OPEN CUT* 2	LF	\$ 480	181	\$ 86,880
A-19	42-IN AWWA C303 BAR WRAPPED CONCRETE CYLINDER PIPE BY OPEN CUT* 2	LF	\$ 75	909	\$ 68,175
A-20	42-IN AWWA C303 BAR WRAPPED CONCRETE CYLINDER PIPE OTHER THAN OPEN CUT* 2	LF	\$ 75	181	\$ 13,575
A-21	60-IN STEEL CASING BY OTHER THAN OPEN CUT* 2	LF	\$ 1,000	181	\$ 181,000
A-22	TRENCH SAFETY	LF	\$ 15	909	\$ 13,635
A-23	REMOVAL OF EXISTING CHAINLINK FENCE	LF	\$ 5	645	\$ 3,225
A-24	INSTALLATION OF 8-FT CHAINLINK FENCE*	LF	\$ 20	602	\$ 12,040
A-25	INSTALLATION OF CHAINLINK GATE*	EA	\$ 1,500	1	\$ 1,500
A-26	RETAINING WALL EXTENSION*	CY	\$ 750	275	\$ 206,250
A-27	CoSERV INSTALLATION 3	EA	\$ 20,000	1	\$ 20,000
A-28	NTMWD INSPECTION	HR	\$ 45	730	\$ 32,850

SUBTOTAL	\$3,551,352
BETTERMENT TOTAL 2	\$282,750
REIMBURSABLE COST	\$3,268,602

B	LAND ACQUISITION				
B-1	24' FIRE UTILITY ACCESS EASEMENT	SF	\$ 12.00	4437	\$53,244
				LAND SUBTOTAL	\$53,244

C	TOWN OF PROSPER ENGINEERING, ADMINSTRATIVE & INSPECTION COSTS				
C-1	ESTIMATED TOWN OF PROSPER ENGINEER, ADMINISTRATIVE & INSPECTION COSTS 4				\$45,174

D	FREESE AND NICHOLS PROFESSIONAL SERVICE COSTS				
D-1	FREESE AND NICHOLS PROFESSIONAL SERVICE COSTS 4				\$359,225

Reimbursement Summary	
Total In Kind Cost	\$3,726,245
Total Betterment Cost (A)	\$282,750
Total Cost (In Kind + Betterment) (B)	4,008,995.00
Betterment Credit Percentage (A/B)	7.05%
Total Cost x Betterment Credit Percent	282,750.00
Composite Eligibility Ratio (CER)	100.00%
Total TxDOT Reimbursement (B-B)	3,726,245.00
Total Cost to Town of Prosper	282,750.00

NOTES	
*	Line Item Must be Buy America compliant in accordance with TxDOT/FHWA guidance letter dated October 3,2019
1	Meter Vault Facility Components which will need to be Buy America compliant include but are not limited to rebar for concrete vault, magnetic meter, butterfly valve, flow conditioner, electric/manual actuators, pipe, vault and building appurtenances, pipeline appurtenances, electrical components and wiring
2	Items associated with betterment. The Town of Prosper has elected to better their pipe from 36" to 42" and encase a portion of the 42" pipe. The unit cost of the three 42-inch line items represents the estimated price difference (betterment cost) between the 36" and 42" options. The encasement unit cost is the estimated betterment cost. The quantity shown for 36" options are only for calculation of reimbursable cost not representative of what will be installed.
3	CoServ Installation Cost Not to Exceed \$20,000
4	See Fee Breakdown for these items on the accompanying sheets

COMPENSATION

Compensation to FNI for Basic Services in Attachment SC shall be the lump sum of Three Hundred Eighteen Thousand Two Hundred Twenty Five Dollars (\$318,225).

Compensation to FNI for Special Services in Attachment SC shall be computed on the basis of the following Schedule of Charges, but shall not exceed Forty One Thousand Dollars (\$41,000).

If FNI sees the Scope of Services changing so that Additional Services are needed, including but not limited to those services described as Additional Services in Attachment SC, FNI will notify OWNER for OWNER's approval before proceeding. Additional Services shall be computed based on the following Schedule of Charges.

Position	Hourly Rate	
	Min	Max
Professional 1	85	153
Professional 2	99	162
Professional 3	120	231
Professional 4	158	249
Professional 5	197	367
Professional 6	207	410
Construction Manager 1	97	181
Construction Manager 2	114	194
Construction Manager 3	159	228
Construction Manager 4	216	294
CAD Technician/Designer 1	70	154
CAD Technician/Designer 2	103	160
CAD Technician/Designer 3	137	211
Corporate Project Support 1	53	128
Corporate Project Support 2	74	176
Corporate Project Support 3	103	271
Intern / Coop	45	89

Rates for In-House Services and Equipment

<u>Mileage</u>	<u>Bulk Printing and Reproduction</u>		<u>Equipment</u>	
Standard IRS Rates		<u>B&W</u>	<u>Color</u>	Valve Crew Vehicle (hour) \$75
	Small Format (per copy)	\$0.10		Pressure Data Logger (each) \$100
<u>Technology Charge</u>	Large Format (per sq. ft.)			Water Quality Meter (per day) \$100
\$8.50 per hour	Bond	\$0.25	\$0.75	Microscope (each) \$150
	Glossy / Mylar	\$0.75	\$1.25	Pressure Recorder (per day) \$200
	Vinyl / Adhesive	\$1.50	\$2.00	Ultrasonic Thickness Gauge (per day) \$275
				Coating Inspection Kit (per day) \$275
	Mounting (per sq. ft.)	\$2.00		Flushing / Cfactor (each) \$500
	Binding (per binding)	\$0.25		Backpack Electrofisher (each) \$1,000
				<u>Survey Grade</u> <u>Standard</u>
				Drone (per day) \$200 \$100
				GPS (per day) \$150 \$50

OTHER DIRECT EXPENSES:

Other direct expenses are reimbursed at actual cost times a multiplier of 1.15. They include outside printing and reproduction expense, communication expense, travel, transportation and subsistence away from the FNI office. For other miscellaneous expenses directly related to the work, including costs of laboratory analysis, test, and other work required to be done by independent persons other than staff members, these services will be billed at a cost times a multiplier of 1.15. For Resident Representative services performed by non-FNI employees and CAD services performed In-house by non-FNI employees where FNI provides workspace and equipment to perform such services, these services will be billed at cost times a multiplier of 2.0. This markup approximates the cost to FNI if an FNI employee was performing the same or similar services.

These ranges and/or rates will be adjusted annually in February. Last updated February 2020.

Town of Prosper
Custer Rd Meter Vault Relocation
5/9/2018
Detailed Cost Breakdown

Project Fee Summary		
Basic Services	\$	318,225
Special Services	\$	41,000
Total Project	\$	359,225

Item 12.

Phase	Task	Basic or Special	Task Description	Tasks														
				Scott Maughn	Clayton Barnard	Mitchell Sawtelle	Luis Rivera	Mike Hagen	Michael Robertson	Prabin KC	Tran Duong	Josh Moore	Wade Zemlock	David Phillips	Alex Trevizo	Jane Jenks	Dan Gise	Richard Aldredge
				QA \$299	PM \$275	Design Eng \$110	PL CAD \$170	PL QC \$257	Struc QC \$230	Struc Lead \$185	Struc DE \$120	Struc CAD \$103	Elec QC \$279	Elec Lead \$192	Elec CAD \$102	CS Admin \$133	ES QC \$299	ES Lead \$191
		Basic	General Requirements															
		Basic	Internal Kickoff	2	2	4	2	2		2				2			2	
		Basic	Client Kickoff		2	2												
		Basic	Existing Data Collection			2	4											
		Basic	ES Desktop			2												
		Basic	Review Front ends		2													
		Basic	TxDOT Meetings		8													
		Basic	NTMWD Coordination Meetings		8													
		Basic	Utility Coordination		8													
		Basic	Preliminary Design															
		Basic	Alignment Selection		1	4	8											
		Basic	Control Valve and Meter Selection		2	4												
		Basic	Field Review		2	2							4					
		Basic	Prepare cost analysis		2	4												
		Basic	Alignment selection Meeting		4	6												
		Basic	QA/QC	2	4			4										
		Basic	Final Design															
		Basic	60% Plans															
		Basic	Coordinate Subs		16													
		Basic	P/P Drawings		2	8	24											
		Basic	Valve Vault Drawings		2	24	32		8	24	24							
		Basic	Electrical & Instrumentation Drawings									6	40	50				
		Basic	General Detail Sheets			4	4											
		Basic	Specification Prep		2	16								16				
		Basic	60% submittal			4	8											
		Basic	OPCC		2	4												
		Basic	Review Meeting		2	4												
		Basic	TxDOT Coordination		40	60	24											
		Basic	QA/QC	4	2			2				2						
		Basic	Prepare alternative meter site options		8	16	32											
		Basic	90% Plans															
		Basic	P/P Drawings	2	2	8	24											
		Basic	Valve Vault Drawings			6	32											
		Basic	Connection Details		2	8	10											
		Basic	Electrical & Instrumentation Drawings									8	40	60				
		Basic	Structural Vault Drawings and Details						16	40	80							
		Basic	Mechanical Drawings and Details															
		Basic	Architectural Drawings and Details															
		Basic	General Detail Sheets			2	2											
		Basic	Specification Prep			6								16				
		Basic	State Agency Coordination (TCEQ)		2	2						2	2	2				
		Basic	90% Submittals			8	16						4	12				
		Basic	OPCC		2	6							2					
		Basic	Review Meeting		2	4												
		Basic	Revise Documents		2	8	24					2	16	24				
		Basic	SUE preparation		2	4	8											
		Basic	QA/QC	4	2			2				2						
		Basic	Constructability Review		2													
		Basic	Issue Bid Docs		2	4	8		2	4	4		2	2				
		Basic	Bid Phase															
		Basic	Bid Invitation			2										4		
		Basic	Advertisement			2									2			
		Basic	Bidders List												2			
		Basic	Bid Questions		2	4						2	4					
		Basic	Addendum		2	4	2		2	2		2	4					
		Basic	Bid Opening		2	4												
		Basic	Review Bid			2												
		Basic	Bid Tab			4												
		Basic	Issue Construction Docs			2	6			2		2	4		8			
		Basic	Construction Phase															
		Basic	Project Admin	2	2	2									12			
		Basic	Review insurance		2													
		Basic	Pre-Con		2	4												

Town of Prosper Custer Rd Meter Vault Relocation 5/9/2018 Detailed Cost Breakdown	Project Fee Summary		
	Basic Services	\$	318,225
	Special Services	\$	41,000
	Total Project	\$	359,225

Item 12.

Tasks																			
Phase	Task	Basic or Special	Task Description	Scott Maughn	Clayton Barnard	Mitchell Sawtelle	Luis Rivera	Mike Hagen	Michael Robertson	Prabin KC	Tran Duong	Josh Moore	Wade Zemlock	David Phillips	Alex Trevizo	Jane Jenks	Dan Gise	Richard Aldredge	
				QA	PM	Design Eng	PL CAD	PL QC	Struc QC	Struc Lead	Struc DE	Struc CAD	Elec QC	Elec Lead	Elec CAD	CS Admin	ES QC	ES Lead	
				\$299	\$275	\$110	\$170	\$257	\$230	\$185	\$120	\$103	\$279	\$192	\$102	\$133	\$299	\$191	
		Basic	Review Schedule			2													
		Basic	Review Sequence			2													
		Basic	Review Pay Aps (12)			6													
		Basic	Site Visits		4	12							4	12					
		Basic	Submittals		2	24				12			4	32					
		Basic	Warrantee Review			1								1					
		Basic	RFI		2	4				8	8		2	4					
		Basic	CO		2	6	4			8	8		2	4					
		Basic	Substantial Completion Inspection		2	4								4					
		Basic	Final Inspection		2	4								4					
		Basic	Record Drawings			4	16			1	2	8	2	4	12				
		Special	Topographical Survey																
		Special	B&C Survey																
		Special	Easement Documents																
		Special	B&C Easement Documents																
		Special	Subsurface Utility Engineering																
		Special	Survwest Level A SUE																
		Special	Environmental Services																
		Special	Compile info and site visit																4
		Special	Prepare tech memo															2	4
		Special	THC letter															2	4
		Special	Project Team Coordination																2
		Special	Geotechnical																
		Special	Project Setup/Kickoff																
		Special	Field Exploration																
		Special	Boring Layout/Site Reconnaissance/Stake Borings																
		Special	Coordination with Utilities and Subconsultant																
		Special	Laboratory Testing																
		Special	Assign/Review Lab Testing																
		Special	Draft/Review Boring Logs																
		Special	Engineering Analysis and Reporting																
		Special	Analysis/Calculations for PL																
		Special	Technical Memorandum for PS																
Total Hours / Quantity				16	167	335	290	6	4	59	90	116	42	221	160	28	4	16	
Total Effort				\$ 4,784	\$ 45,918	\$ 36,944	\$ 49,181	\$ 1,540	\$ 918	\$ 10,891	\$ 10,821	\$ 11,916	\$ 11,707	\$ 42,346	\$ 16,389	\$ 3,714	\$ 1,197	\$ 3,060	

Town of Prosper
Custer Rd Meter Vault Relocation
5/9/2018
Detailed Cost Breakdown

Item 12.

Phase	Task	Basic or Special	Tasks Task Description	Labor															
				Erin Kelly	Melissa Kinzer	Mike Shiflett	Micah Hargrave	Holly Saez	Van Cashen	Ryan Edwards	Vimal Nair	Parris Jones	Chelsea Thorn	Stephen Bundy	Jerry Taylor	Brett Bristow	Christie Ubando	Scott Cole	
				ES	ES GIS	Geo QC	Geo Lead	Geo DE	Mech Lead	Mech DE	Mech QC	Arch QC	Arch Lead	Arch CAD	CS	Civil Lead	Civil CAD	Model QC	
				\$101	\$101	\$313	\$199	\$165	\$188	\$155	\$320	\$270	\$129	\$128	\$259	\$211	\$147	\$331	
		Basic	General Requirements																
		Basic	Internal Kickoff				2				2			2				2	
		Basic	Client Kickoff																
		Basic	Existing Data Collection																
		Basic	ES Desktop																
		Basic	Review Front ends																
		Basic	TxDOT Meetings																
		Basic	NTMWD Coordination Meetings																
		Basic	Utility Coordination																
		Basic	Preliminary Design																
		Basic	Alignment Selection																
		Basic	Control Valve and Meter Selection																2
		Basic	Field Review																
		Basic	Prepare cost analysis																
		Basic	Alignment selection Meeting																
		Basic	QA/QC																
		Basic	Final Design																
		Basic	60% Plans																
		Basic	Coordinate Subs																
		Basic	P/P Drawings																
		Basic	Valve Vault Drawings						8	12			8	12					
		Basic	Electrical & Instrumentation Drawings																
		Basic	General Detail Sheets														4	12	
		Basic	Specification Prep																
		Basic	60% submittal																
		Basic	OPCC																
		Basic	Review Meeting																
		Basic	TxDOT Coordination																
		Basic	QA/QC									2	2						
		Basic	Prepare alternative meter site options																
		Basic	90% Plans																
		Basic	P/P Drawings																
		Basic	Valve Vault Drawings																
		Basic	Connection Details																
		Basic	Electrical & Instrumentation Drawings																
		Basic	Structural Vault Drawings and Details																
		Basic	Mechanical Drawings and Details						8	20			8	20					
		Basic	Architectural Drawings and Details										8	20					
		Basic	General Detail Sheets														8	24	
		Basic	Specification Prep																
		Basic	State Agency Coordination (TCEQ)																
		Basic	90% Submittals						4	20			4	20					
		Basic	OPCC																
		Basic	Review Meeting																
		Basic	Revise Documents							8				8			2	4	
		Basic	SUE preparation																
		Basic	QA/QC									2	2						
		Basic	Constructability Review													24			
		Basic	Issue Bid Docs						2	4			2	4			2	2	
		Basic	Bid Phase																
		Basic	Bid Invitation																
		Basic	Advertisement																
		Basic	Bidders List																
		Basic	Bid Questions																
		Basic	Addendum																
		Basic	Bid Opening																
		Basic	Review Bid																
		Basic	Bid Tab																
		Basic	Issue Construction Docs																
		Basic	Construction Phase																
		Basic	Project Admin																
		Basic	Review insurance																
		Basic	Pre-Con																

Town of Prosper
 Custer Rd Meter Vault Relocation
 5/9/2018
 Detailed Cost Breakdown

Item 12.

Tasks				Labor															
Phase	Task	Basic or Special	Task Description	Erin Kelly	Melissa Kinzer	Mike Shiflett	Micah Hargrave	Holly Saez	Van Cashen	Ryan Edwards	Vimal Nair	Parris Jones	Chelsea Thorn	Stephen Bundy	Jerry Taylor	Brett Bristow	Christie Ubando	Scott Cole	
				ES	ES GIS	Geo QC	Geo Lead	Geo DE	Mech Lead	Mech DE	Mech QC	Arch QC	Arch Lead	Arch CAD	CS	Civil Lead	Civil CAD	Model QC	
				\$101	\$101	\$313	\$199	\$165	\$188	\$155	\$320	\$270	\$129	\$128	\$259	\$211	\$147	\$331	
		Basic	Review Schedule																
		Basic	Review Sequence																
		Basic	Review Pay Aps (12)																
		Basic	Site Visits																
		Basic	Submittals							2			4						
		Basic	Warranty Review							1									
		Basic	RFI						2	4			2						
		Basic	CO						2	4			2						
		Basic	Substantial Completion Inspection																
		Basic	Final Inspection																
		Basic	Record Drawings																
		Special	Topographical Survey																
		Special	B&C Survey																
		Special	Easement Documents																
		Special	B&C Easement Documents																
		Special	Subsurface Utility Engineering																
		Special	Survwest Level A SUE																
		Special	Environmental Services																
		Special	Compile info and site visit	12															
		Special	Prepare tech memo	12	6														
		Special	THC letter	8	6														
		Special	Project Team Coordination	2															
		Special	Geotechnical																
		Special	Project Setup/Kickoff																
		Special	Field Exploration																
		Special	Boring Layout/Site Reconnaissance/Stake Borings				2	2											
		Special	Coordination with Utilities and Subconsultant					4											
		Special	Laboratory Testing																
		Special	Assign/Review Lab Testing				2	4											
		Special	Draft/Review Boring Logs					6											
		Special	Engineering Analysis and Reporting																
		Special	Analysis/Calculations for PL				2	4											
		Special	Technical Memorandum for PS			4	4	8											
Total Hours / Quantity				34	12	4	12	28	26	81	4	4	34	66	24	18	42	2	
Total Effort				\$ 3,438	\$ 1,213	\$ 1,253	\$ 2,393	\$ 4,616	\$ 4,901	\$ 12,527	\$ 1,280	\$ 1,080	\$ 4,372	\$ 8,437	\$ 6,207	\$ 3,795	\$ 6,156	\$ 662	

**Town of Prosper
Custer Rd Meter Vault Relocation
5/9/2018
Detailed Cost Breakdown**

Item 12.

Tasks						
Phase	Task	Basic or Special	Task Description	Melissa Brunger	Total Hours	Total Labor Effort
				Model Lead		
				\$226		
		Basic	General Requirements			\$ -
		Basic	Internal Kickoff	2	28	\$ 5,416
		Basic	Client Kickoff		4	\$ 770
		Basic	Existing Data Collection		6	\$ 899
		Basic	ES Desktop		2	\$ 221
		Basic	Review Front ends		2	\$ 550
		Basic	TxDOT Meetings		8	\$ 2,200
		Basic	NTMWD Coordination Meetings		8	\$ 2,200
		Basic	Utility Coordination		8	\$ 2,200
						\$ -
		Basic	Preliminary Design			\$ -
		Basic	Alignment Selection		13	\$ 2,073
		Basic	Control Valve and Meter Selection	12	20	\$ 4,367
		Basic	Field Review		8	\$ 1,537
		Basic	Prepare cost analysis		6	\$ 991
		Basic	Alignment selection Meeting		10	\$ 1,762
		Basic	QA/QC		10	\$ 2,724
						\$ -
		Basic	Final Design			\$ -
		Basic	60% Plans			\$ -
		Basic	Coordinate Subs		16	\$ 4,399
		Basic	P/P Drawings		34	\$ 5,502
		Basic	Valve Vault Drawings		154	\$ 21,378
		Basic	Electrical & Instrumentation Drawings		96	\$ 14,458
		Basic	General Detail Sheets		24	\$ 3,722
		Basic	Specification Prep		34	\$ 5,380
		Basic	60% submittal		12	\$ 1,798
		Basic	OPCC		6	\$ 991
		Basic	Review Meeting		6	\$ 991
		Basic	TxDOT Coordination		124	\$ 21,685
		Basic	QA/QC		14	\$ 3,943
		Basic	Prepare alternative meter site options		56	\$ 9,391
						\$ -
		Basic	90% Plans			\$ -
		Basic	P/P Drawings		36	\$ 6,100
		Basic	Valve Vault Drawings		38	\$ 6,089
		Basic	Connection Details		20	\$ 3,128
		Basic	Electrical & Instrumentation Drawings		108	\$ 16,040
		Basic	Structural Vault Drawings and Details		136	\$ 15,980
		Basic	Mechanical Drawings and Details		28	\$ 4,601
		Basic	Architectural Drawings and Details		28	\$ 3,585
		Basic	General Detail Sheets		36	\$ 5,764
		Basic	Specification Prep		22	\$ 3,727
		Basic	State Agency Coordination (TCEQ)		8	\$ 1,711
		Basic	90% Submittals		88	\$ 12,509
		Basic	OPCC		10	\$ 1,595
		Basic	Review Meeting		6	\$ 991
		Basic	Revise Documents		98	\$ 14,852
		Basic	SUE preparation		14	\$ 2,348
		Basic	QA/QC		14	\$ 3,943
		Basic	Constructability Review		26	\$ 6,757
		Basic	Issue Bid Docs		44	\$ 6,676
						\$ -
		Basic	Bid Phase			\$ -
		Basic	Bid Invitation		6	\$ 751
		Basic	Advertisement		4	\$ 486
		Basic	Bidders List		2	\$ 265
		Basic	Bid Questions		16	\$ 2,881
		Basic	Addendum		18	\$ 3,264
		Basic	Bid Opening		6	\$ 991
		Basic	Review Bid		2	\$ 221
		Basic	Bid Tab		4	\$ 441
		Basic	Issue Construction Docs		28	\$ 4,428
						\$ -
		Basic	Construction Phase			\$ -
		Basic	Project Admin		18	\$ 2,960
		Basic	Review insurance		2	\$ 550
		Basic	Pre-Con		6	\$ 991

**Town of Prosper
Custer Rd Meter Vault Relocation
5/9/2018
Detailed Cost Breakdown**

Item 12.

Tasks						
Phase	Task	Basic or Special	Task Description	Melissa Brunger	Total Hours	Total Labor Effort
				Model Lead		
				\$226		
		Basic	Review Schedule		2	\$ 221
		Basic	Review Sequence		2	\$ 221
		Basic	Review Pay Aps (12)		6	\$ 662
		Basic	Site Visits		32	\$ 5,837
		Basic	Submittals		80	\$ 13,482
		Basic	Warrantee Review		3	\$ 457
		Basic	RFI		36	\$ 6,006
		Basic	CO		42	\$ 6,905
		Basic	Substantial Completion Inspection		10	\$ 1,757
		Basic	Final Inspection		10	\$ 1,757
		Basic	Record Drawings		49	\$ 6,954
						\$ -
		Special	Topographical Survey			\$ -
		Special	B&C Survey			\$ -
						\$ -
		Special	Easement Documents			\$ -
		Special	B&C Easement Documents			\$ -
						\$ -
		Special	Subsurface Utility Engineering			\$ -
		Special	Survwest Level A SUE			\$ -
						\$ -
		Special	Environmental Services			\$ -
		Special	Compile info and site visit		16	\$ 1,978
		Special	Prepare tech memo		24	\$ 3,184
		Special	THC letter		20	\$ 2,779
		Special	Project Team Coordination		4	\$ 585
						\$ -
		Special	Geotechnical			\$ -
		Special	Project Setup/Kickoff			\$ -
		Special	Field Exploration			\$ -
		Special	Boring Layout/Site Reconnaissance/Stake Borings		4	\$ 729
		Special	Coordination with Utilities and Subconsultant		4	\$ 659
		Special	Laboratory Testing			\$ -
		Special	Assign/Review Lab Testing		6	\$ 1,058
		Special	Draft/Review Boring Logs		6	\$ 989
		Special	Engineering Analysis and Reporting			\$ -
		Special	Analysis/Calculations for PL		6	\$ 1,058
		Special	Technical Memorandum for PS		16	\$ 3,370
						\$ -
Total Hours / Quantity				14	1,959	
Total Effort				\$ 3,167		\$ 316,822

Town of Prosper Custer Rd Meter Vault Relocation 5/9/2018 Detailed Cost Breakdown	Project Fee Summary	
	Basic Services	318,225
	Special Services	41,000
	Total Project	359,225

Item 12.

Phase	Task	Basic or Special	Tasks Task Description	Expenses									Total Expense Effort		
				Tech Charge	Miles	Meals	Hotel	B&W (sheet)	Color (sheet)	Binding (each)	Lg Format - Bond - B&W (sq. ft.)	Lg Format - Glossy/Mylar - B&W (sq. ft.)		Other	
		Basic	General Requirements												\$ -
		Basic	Internal Kickoff	28											\$ 238
		Basic	Client Kickoff	4											\$ 34
		Basic	Existing Data Collection	6											\$ 51
		Basic	ES Desktop	2											\$ 17
		Basic	Review Front ends	2											\$ 17
		Basic	TxDOT Meetings	8	100										\$ 126
		Basic	NTMWD Coordination Meetings	8	100								139		\$ 285
		Basic	Utility Coordination	8	50										\$ 97
															\$ -
		Basic	Preliminary Design												\$ -
		Basic	Alignment Selection	13											\$ 111
		Basic	Control Valve and Meter Selection	20											\$ 170
		Basic	Field Review	8	50										\$ 97
		Basic	Prepare cost analysis	6											\$ 51
		Basic	Alignment selection Meeting	10	50			100					100		\$ 239
		Basic	QA/QC	10											\$ 85
															\$ -
		Basic	Final Design												\$ -
		Basic	60% Plans												\$ -
		Basic	Coordinate Subs	16											\$ 136
		Basic	P/P Drawings	34											\$ 289
		Basic	Valve Vault Drawings	154											\$ 1,309
		Basic	Electrical & Instrumentation Drawings	96											\$ 816
		Basic	General Detail Sheets	24											\$ 204
		Basic	Specification Prep	34											\$ 289
		Basic	60% submittal	12				200							\$ 122
		Basic	OPCC	6											\$ 51
		Basic	Review Meeting	6	100										\$ 109
		Basic	TxDOT Coordination	124											\$ 1,054
		Basic	QA/QC	14											\$ 119
		Basic	Prepare alternative meter site options	56											\$ 476
															\$ -
		Basic	90% Plans												\$ -
		Basic	P/P Drawings	36											\$ 306
		Basic	Valve Vault Drawings	38											\$ 323
		Basic	Connection Details	20											\$ 170
		Basic	Electrical & Instrumentation Drawings	108											\$ 918
		Basic	Structural Vault Drawings and Details	136											\$ 1,156
		Basic	Mechanical Drawings and Details	28											\$ 238
		Basic	Architectural Drawings and Details	28											\$ 238
		Basic	General Detail Sheets	36											\$ 306
		Basic	Specification Prep	22											\$ 187
		Basic	State Agency Coordination (TCEQ)	8											\$ 68
		Basic	90% Submittals	88				200					9		\$ 778
		Basic	OPCC	10											\$ 85
		Basic	Review Meeting	6	100										\$ 109
		Basic	Revise Documents	98											\$ 833
		Basic	SUE preparation	14											\$ 119
		Basic	QA/QC	14											\$ 119
		Basic	Constructability Review	26											\$ 221
		Basic	Issue Bid Docs	44											\$ 374
															\$ -
		Basic	Bid Phase												\$ -
		Basic	Bid Invitation	6											\$ 51
		Basic	Advertisement	4											\$ 34
		Basic	Bidders List	2											\$ 17
		Basic	Bid Questions	16											\$ 136
		Basic	Addendum	18											\$ 153
		Basic	Bid Opening	6	50										\$ 80
		Basic	Review Bid	2											\$ 17
		Basic	Bid Tab	4											\$ 34
		Basic	Issue Construction Docs	28				500					570		\$ 944
															\$ -
		Basic	Construction Phase												\$ -
		Basic	Project Admin	18											\$ 153
		Basic	Review insurance	2											\$ 17
		Basic	Pre-Con	6	100										\$ 109

Town of Prosper Custer Rd Meter Vault Relocation 5/9/2018 Detailed Cost Breakdown	Project Fee Summary	
	Basic Services	318,225
	Special Services	41,000
	Total Project	359,225

Item 12.

Tasks				Expenses										
Phase	Task	Basic or Special	Task Description	Tech Charge	Miles	Meals	Hotel	B&W (sheet)	Color (sheet)	Binding (each)	Lg Format - Bond - B&W (sq. ft.)	Lg Format - Glossy/Mylar - B&W (sq. ft.)	Other	Total Expense Effort
		Basic	Review Schedule	2										\$ 17
		Basic	Review Sequence	2										\$ 17
		Basic	Review Pay Aps (12)	6										\$ 51
		Basic	Site Visits	32	500								253	\$ 850
		Basic	Submittals	80										\$ 680
		Basic	Warrantee Review	3										\$ 26
		Basic	RFI	36										\$ 306
		Basic	CO	42										\$ 357
		Basic	Substantial Completion Inspection	10										\$ 85
		Basic	Final Inspection	10										\$ 85
		Basic	Record Drawings	49				200						\$ 437
														\$ -
		Special	Topographical Survey											\$ -
		Special	B&C Survey										22	\$ 25
														\$ -
		Special	Easement Documents											\$ -
		Special	B&C Easement Documents										9	\$ 10
														\$ -
		Special	Subsurface Utility Engineering											\$ -
		Special	Survwest Level A SUE										41	\$ 47
														\$ -
		Special	Environmental Services											\$ -
		Special	Compile info and site visit	16	200									\$ 251
		Special	Prepare tech memo	24				100					134.5	\$ 369
		Special	THC letter	20										\$ 170
		Special	Project Team Coordination	4										\$ 34
														\$ -
		Special	Geotechnical											\$ -
		Special	Project Setup/Kickoff											\$ -
		Special	Field Exploration											\$ -
		Special	Boring Layout/Site Reconnaissance/Stake Borings	4	200								407	\$ 617
		Special	Coordination with Utilities and Subconsultant	4										\$ 34
		Special	Laboratory Testing											\$ -
		Special	Assign/Review Lab Testing	6										\$ 51
		Special	Draft/Review Boring Logs	6										\$ 51
		Special	Engineering Analysis and Reporting											\$ -
		Special	Analysis/Calculations for PL	6										\$ 51
		Special	Technical Memorandum for PS	16										\$ 136
														\$ -
Total Hours / Quantity				1,959	1,600	-	-	1,300	-	-	-	-	1,685	
Total Effort				\$ 16,652	\$ 920	\$ -	\$ -	\$ 130	\$ -	\$ -	\$ -	\$ -	\$ 1,937	\$ 19,639

Town of Prosper Custer Rd Meter Vault Relocation 5/9/2018 Detailed Cost Breakdown	Project Fee Summary	
	Basic Services	318,225
	Special Services	41,000
	Total Project	359,225

Item 12.

Phase	Task	Basic or Special	Tasks Task Description	Subconsultants					Total Sub Effort	Total Effort
				Brittain and Crawford	Brittain and Crawford	Survwest	GAI	Texplor		
		Basic	General Requirements						\$ -	\$ -
		Basic	Internal Kickoff						\$ -	\$ 5,654
		Basic	Client Kickoff						\$ -	\$ 804
		Basic	Existing Data Collection						\$ -	\$ 950
		Basic	ES Desktop						\$ -	\$ 238
		Basic	Review Front ends						\$ -	\$ 567
		Basic	TxDOT Meetings						\$ -	\$ 2,325
		Basic	NTMWD Coordination Meetings						\$ -	\$ 2,485
		Basic	Utility Coordination						\$ -	\$ 2,296
									\$ -	\$ -
		Basic	Preliminary Design						\$ -	\$ -
		Basic	Alignment Selection						\$ -	\$ 2,183
		Basic	Control Valve and Meter Selection						\$ -	\$ 4,537
		Basic	Field Review						\$ -	\$ 1,634
		Basic	Prepare cost analysis						\$ -	\$ 1,042
		Basic	Alignment selection Meeting						\$ -	\$ 2,000
		Basic	QA/QC						\$ -	\$ 2,809
									\$ -	\$ -
		Basic	Final Design						\$ -	\$ -
		Basic	60% Plans						\$ -	\$ -
		Basic	Coordinate Subs						\$ -	\$ 4,535
		Basic	P/P Drawings						\$ -	\$ 5,791
		Basic	Valve Vault Drawings						\$ -	\$ 22,687
		Basic	Electrical & Instrumentation Drawings						\$ -	\$ 15,274
		Basic	General Detail Sheets						\$ -	\$ 3,926
		Basic	Specification Prep						\$ -	\$ 5,669
		Basic	60% submittal						\$ -	\$ 1,920
		Basic	OPCC						\$ -	\$ 1,042
		Basic	Review Meeting						\$ -	\$ 1,100
		Basic	TxDOT Coordination						\$ -	\$ 22,739
		Basic	QA/QC						\$ -	\$ 4,062
		Basic	Prepare alternative meter site options						\$ -	\$ 9,867
									\$ -	\$ -
		Basic	90% Plans						\$ -	\$ -
		Basic	P/P Drawings						\$ -	\$ 6,406
		Basic	Valve Vault Drawings						\$ -	\$ 6,412
		Basic	Connection Details						\$ -	\$ 3,298
		Basic	Electrical & Instrumentation Drawings						\$ -	\$ 16,958
		Basic	Structural Vault Drawings and Details						\$ -	\$ 17,136
		Basic	Mechanical Drawings and Details						\$ -	\$ 4,839
		Basic	Architectural Drawings and Details						\$ -	\$ 3,823
		Basic	General Detail Sheets						\$ -	\$ 6,070
		Basic	Specification Prep						\$ -	\$ 3,914
		Basic	State Agency Coordination (TCEQ)						\$ -	\$ 1,779
		Basic	90% Submittals						\$ -	\$ 13,288
		Basic	OPCC						\$ -	\$ 1,680
		Basic	Review Meeting						\$ -	\$ 1,100
		Basic	Revise Documents						\$ -	\$ 15,685
		Basic	SUE preparation						\$ -	\$ 2,467
		Basic	QA/QC						\$ -	\$ 4,062
		Basic	Constructability Review						\$ -	\$ 6,978
		Basic	Issue Bid Docs						\$ -	\$ 7,050
									\$ -	\$ -
		Basic	Bid Phase						\$ -	\$ -
		Basic	Bid Invitation						\$ -	\$ 802
		Basic	Advertisement						\$ -	\$ 520
		Basic	Bidders List						\$ -	\$ 282
		Basic	Bid Questions						\$ -	\$ 3,017
		Basic	Addendum						\$ -	\$ 3,417
		Basic	Bid Opening						\$ -	\$ 1,071
		Basic	Review Bid						\$ -	\$ 238
		Basic	Bid Tab						\$ -	\$ 475
		Basic	Issue Construction Docs						\$ -	\$ 5,372
									\$ -	\$ -
		Basic	Construction Phase						\$ -	\$ -
		Basic	Project Admin						\$ -	\$ 3,113
		Basic	Review insurance						\$ -	\$ 567
		Basic	Pre-Con						\$ -	\$ 1,100

Town of Prosper Custer Rd Meter Vault Relocation 5/9/2018 Detailed Cost Breakdown	Project Fee Summary	
	Basic Services	318,225
	Special Services	41,000
	Total Project	359,225

Item 12.

Tasks			Subconsultants						Total		
Phase	Task	Basic or Special	Task Description	Brittain and Crawford	Brittain and Crawford	Survwest	GAI	Texplor	Geoscience	Total Sub Effort	Total Effort
		Basic	Review Schedule							\$ -	\$ 238
		Basic	Review Sequence							\$ -	\$ 238
		Basic	Review Pay Aps (12)							\$ -	\$ 713
		Basic	Site Visits							\$ -	\$ 6,688
		Basic	Submittals							\$ -	\$ 14,162
		Basic	Warranty Review							\$ -	\$ 482
		Basic	RFI							\$ -	\$ 6,312
		Basic	CO							\$ -	\$ 7,262
		Basic	Substantial Completion Inspection							\$ -	\$ 1,842
		Basic	Final Inspection							\$ -	\$ 1,842
		Basic	Record Drawings							\$ -	\$ 7,391
										\$ -	\$ -
		Special	Topographical Survey							\$ -	\$ -
		Special	B&C Survey	7,500						\$ 8,625	\$ 8,650
										\$ -	\$ -
		Special	Easement Documents							\$ -	\$ -
		Special	B&C Easement Documents		4,600					\$ 5,290	\$ 5,300
										\$ -	\$ -
		Special	Subsurface Utility Engineering							\$ -	\$ -
		Special	Survwest Level A SUE			4,350				\$ 5,003	\$ 5,050
										\$ -	\$ -
		Special	Environmental Services							\$ -	\$ -
		Special	Compile info and site visit							\$ -	\$ 2,229
		Special	Prepare tech memo							\$ -	\$ 3,552
		Special	THC letter							\$ -	\$ 2,949
		Special	Project Team Coordination							\$ -	\$ 619
										\$ -	\$ -
		Special	Geotechnical							\$ -	\$ -
		Special	Project Setup/Kickoff							\$ -	\$ -
		Special	Field Exploration					1,680		\$ 1,932	\$ 1,932
		Special	Boring Layout/Site Reconnaissance/Stake Borings							\$ -	\$ 1,346
		Special	Coordination with Utilities and Subconsultant							\$ -	\$ 693
		Special	Laboratory Testing							\$ 920	\$ 920
		Special	Assign/Review Lab Testing							\$ -	\$ 1,109
		Special	Draft/Review Boring Logs							\$ -	\$ 1,040
		Special	Engineering Analysis and Reporting						865	\$ 995	\$ 995
		Special	Analysis/Calculations for PL							\$ -	\$ 1,109
		Special	Technical Memorandum for PS							\$ -	\$ 3,506
										\$ -	\$ -
Total Hours / Quantity				\$ 7,500	\$ 4,600	\$ 4,350	\$ 800	\$ 1,680	\$ 865		
Total Effort				\$ 8,625	\$ 5,290	\$ 5,003	\$ 920	\$ 1,932	\$ 995	\$ 22,764	\$ 359,225

COMPENSATION

Compensation to FNI for Basic Services in Attachment SC shall be the lump sum of Three Hundred Eighteen Thousand Two Hundred Twenty Five Dollars (\$318,225).

Compensation to FNI for Special Services in Attachment SC shall be computed on the basis of the following Schedule of Charges, but shall not exceed Forty One Thousand Dollars (\$41,000).

If FNI sees the Scope of Services changing so that Additional Services are needed, including but not limited to those services described as Additional Services in Attachment SC, FNI will notify OWNER for OWNER's approval before proceeding. Additional Services shall be computed based on the following Schedule of Charges.

Position	Hourly Rate	
	Min	Max
Professional 1	85	153
Professional 2	99	162
Professional 3	120	231
Professional 4	158	249
Professional 5	197	367
Professional 6	207	410
Construction Manager 1	97	181
Construction Manager 2	114	194
Construction Manager 3	159	228
Construction Manager 4	216	294
CAD Technician/Designer 1	70	154
CAD Technician/Designer 2	103	160
CAD Technician/Designer 3	137	211
Corporate Project Support 1	53	128
Corporate Project Support 2	74	176
Corporate Project Support 3	103	271
Intern / Coop	45	89

Rates for In-House Services and Equipment

<u>Mileage</u>	<u>Bulk Printing and Reproduction</u>		<u>Equipment</u>	
Standard IRS Rates		<u>B&W</u>	<u>Color</u>	Valve Crew Vehicle (hour) \$75
	Small Format (per copy)	\$0.10	\$0.25	Pressure Data Logger (each) \$100
<u>Technology Charge</u>	Large Format (per sq. ft.)			Water Quality Meter (per day) \$100
\$8.50 per hour	Bond	\$0.25	\$0.75	Microscope (each) \$150
	Glossy / Mylar	\$0.75	\$1.25	Pressure Recorder (per day) \$200
	Vinyl / Adhesive	\$1.50	\$2.00	Ultrasonic Thickness Gauge (per day) \$275
				Coating Inspection Kit (per day) \$275
	Mounting (per sq. ft.)	\$2.00		Flushing / Cfactor (each) \$500
	Binding (per binding)	\$0.25		Backpack Electrofisher (each) \$1,000
				<u>Survey Grade</u> <u>Standard</u>
				Drone (per day) \$200 \$100
				GPS (per day) \$150 \$50

OTHER DIRECT EXPENSES:

Other direct expenses are reimbursed at actual cost times a multiplier of 1.15. They include outside printing and reproduction expense, communication expense, travel, transportation and subsistence away from the FNI office. For other miscellaneous expenses directly related to the work, including costs of laboratory analysis, test, and other work required to be done by independent persons other than staff members, these services will be billed at a cost times a multiplier of 1.15. For Resident Representative services performed by non-FNI employees and CAD services performed in-house by non-FNI employees where FNI provides workspace and equipment to perform such services, these services will be billed at cost times a multiplier of 2.0. This markup approximates the cost to FNI if an FNI employee was performing the same or similar services.

These ranges and/or rates will be adjusted annually in February. Last updated February 2020.

Prosper Custer Pipeline Relocation Effort				
Employee	Unit	Quantity	Rate	Costs
Engineering Costs				
CIP Manager	Hrs			
Project Manager	Hrs			
Transportation	Miles	100	\$ 0.58	\$ 58.00
Engineering Total				\$ 58.00
Administration Costs				
	Hrs			
Administraion Total				
Inspection Costs				
Senior Inspector	Hrs	500	\$ 90.00	\$ 45,000.00
Transportation	Miles	200	\$ 0.58	\$ 116.00
Insepction Total				\$ 45,116.00
Prosper Total				\$ 45,174.00

Custer Road Pump Station Meter Vault Relocation In Kind Qty Per Sheet

Line Item	Line Item Description	Sheet	G-6	G-8	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	S-8 and S-9	Total
		UNIT														
A-1	Meter Vault	EA			1											1
A-2	24" Magnetic Flow Meter	EA						1								1
A-3	36" Flow Conditioner	EA			1											1
A-4	24" Butterfly Valve (1-Interior)	EA						1								1
A-5	42" Butterfly Valve (2-Exterior)	EA			2											2
A-6	3" Combination Air Valve	EA			1											1
A-7	72"x 72" Valve Vault (For 2-BFY's outside meter vault)	EA			2											2
A-8	Electrical, SCADA, Controls, and Instrumentation	EA														1
A-9	Pipeline Removal	LF	490													490
A-10	Vault Demolition	EA		1												1
A-11	Connect to NTMWD 48" Waterline	EA			1											1
A-12	Flowable Fill	CY														0
A-13	Testing of Pipeline	EA														0
A-14	Seeding	AC			0.333	0.333	0.333									1
A-15	Site Preparation	EA														1
A-16	Storm Water Pollution Prevention Plan	EA														1
A-17	Pipeline Disinfection	EA														1
A-18	South Access Road	SY									1635					1635
A-19	42" AWWA C303 Bar Wrapped Concrete Cylinder Pipe By Open Cut	LF			339	500	69.17									908.17
A-20	42" AWWA C303 Bar Wrapped Concrete Cylinder Pipe By Other than Open Cut	LF			161											161
A-21	60" Steel Casing By Other than Open Cut	LF			161											161
A-22	Relocation of Existing 16" Sleeve Valve	EA		1												1
A-23	Retaining Wall Extension	CY													275	275
A-24	Retaining Wall Excavation	CY													500	500
A-25	Structural Backfill	CY													1100	1100
A-26	Retaining Wall Flexible Base (Crushed Limestone)	CY													500	500
A-27	Removal of Existing Concrete Roadway	SY	265													265
A-28	CoServ Allowance	EA														20000
A-29	NTMWD Insepection Allowance	HR														45

The betterment on this project will be from the increase of pipeline size from 36" to 42" as well as the encasement of the 42" pipeline as shown on C-1 through C-3

Attachment "B" Accounting Method

Actual Cost Method of Accounting

The utility accumulates cost under a work order accounting procedure prescribed by the Federal or State regulatory body and proposes to request reimbursement for actual direct and related indirect costs.

Lump Sum Method of Accounting

Utility proposed to request reimbursement based on an agreed lump sum amount supported by a detailed cost analysis.

Initial _____ Date _____
TxDOT

Initial _____ Date _____
Utility

Attachment "C" Schedule of Work

Estimated Start Date: 07-06-2020

Estimated Duration (days): 149

Estimated Completion Date: 12-01-2020

Initial _____ Date _____
TxDOT

Initial _____ Date _____
Utility

Attachment "D"

Statement Covering Contract Work

(ROW-U-48)
(ROW-U-48-1, if applicable)

Initial _____ Date _____
TxDOT

Initial _____ Date _____
Utility



STATEMENT COVERING UTILITY CONSTRUCTION CONTRACT WORK
(AS APPEARING IN ESTIMATE)

U-Number: U16097

ROW CSJ Number: 2351-01-022, -02-015 District: Dallas
County: Collin Highway No.: FM 2478
Federal Project No.: STP 1702 (848)

I, _____, a duly authorized and qualified representative of
Town of Prosper, hereinafter referred to as Owner, am fully cognizant of the
facts and make the following statements in respect to work which will or may be done on a contract basis as it appears in the
estimate to which this statement is attached.

It is more economical and/or expedient for Owner to contract this adjustment, or Owner is not adequately staffed or equipped to
perform the necessary work on this project with its own forces to the extent as indicate on the estimate.

Procedure to be Used in Contracting Work

- A. Solicitation for bids is to be accomplished through open advertising and contract is to be awarded to the lowest
qualified bidder who submits a proposal in conformity with the requirements and specifications for the work to be
performed. Associated bid tabulations will be provided to the State.
B. Solicitation for bids is to be accomplished by circulating to a list of pre-qualified contractors or known qualified
contractors and such contract is to be awarded to the lowest qualified bidder who submits a proposal in conformity
with the requirements and specifications for the work to be performed. Associated bid tabulations will be provided to
the State. Such presently known contractors are listed below:
1.
C. The work is to be performed under an existing continuing contract under which certain work is regularly performed
for Owner and under which the lowest available costs are developed. The existing continuing contract will be made
available to the State for review at a location mutually acceptable to the Owner and the State. If only part of the
contract work is to be done under an existing contract, give detailed information by attachment hereto.
D. The utility proposes to contract outside the foregoing requirements and therefore evidence in support of its proposal
is attached to the estimate in order to obtain the concurrence of the State, and the Federal Highway Administration
Division Engineer where applicable, prior to taking action thereon (approval of the agreement shall be considered as
approval of such proposal).
E. The utility plans and specifications, with the consent of the State, will be included in the construction contract
awarded by the State. In the best interest of both the State and the Owner, the Owner requests the State to include
the plans and specifications for this work in the general contract for construction of Highway _____ in this area, so
that the work can be coordinated with the other construction operations; and the construction contract is to be
awarded by the State to the lowest qualified bidder who submits a proposal in conformity with the requirements and
specifications for the work to be performed. If this option is chosen, attach form ROW-U-48-1, the terms of which are
incorporated herein by reference.



Signature

Date

Contact/Help

Title

Attachment "E"

Utility Joint Use Acknowledgment – (ROW-U-JUAA) and/or Utility Installation Request – (Form 1082)

- Utility Joint Use Acknowledgment (ROW-U-JUAA)

- Utility Installation Review/Permit Number: Pending UIR Submittal

Initial _____ Date _____
TxDOT

Initial _____ Date _____
Utility

Attachment “F” Eligibility Ratio

Eligibility Ratio established: 100 %

- Non-interstate Highway (Calculation attached)
- Interstate Highway

Initial Date
TxDOT

Initial Date
Utility

Town of Prosper Custer Road Pump Station Meter Vault Relocation
Eligibility Ratio Calculations
U16097
RCSJ: 2351-01-022

48" Line To Be Removed/Grout Filled Along FM 2478 (Custer Road)		
Sheet	G-7	Total
Reimbursable Length of Existing Line (Btwn Ex. & Prop. ROW) to be removed	490	490
Non-Reimbursable Length of Existing Line	0	0
Total Length of Existing Line	490	490
Individual Eligibility Ratio (%)		100%

Attachment "G" Betterment Calculation and Estimate

- Elective Betterment Ratio established 7.05%
(Calculation attached)
- Forced Betterment
(Provide supporting documentation)
- Not Applicable

Initial Date
TxDOT

Initial Date
Utility



PROJECT TITLE	Custer Road PS Meter Station Relocation	DATE	6/4/2020
CLIENT	Town of Prosper	GROUP	1153
% OF SUBMITTAL		PM	CCB

ESTIMATOR	MDS	QC CHECKED BY	CCB	FNI PROJECT NO.	PRP18708
-----------	-----	---------------	-----	-----------------	----------

ITEM	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL
A					
A-1	MOBILIZATION (NOT TO EXCEED 3% OF TOTAL PROJECT COST)	EA	\$ 103,437	1	\$ 103,437
A-2	METER VAULT FACILITY* 1	EA	\$ 1,770,080	1	\$ 1,770,080
A-3	REMOVAL OF EXISTING 36-IN PIPELINE	LF	\$ 140	490	\$ 68,600
A-4	REMOVAL OF EXISTING METER VAULT	EA	\$ 25,000	1	\$ 25,000
A-5	REMOVAL OF EXISTING CONCRETE ROADWAY	SF	\$ 15	2360	\$ 35,400
A-6	REMOVAL OF EXISTING RETAINING WALL	LF	\$ 250	50	\$ 12,500
A-7	36-IN BUTTERFLY VALVE AND MANHOLE* 2	EA	\$ 30,000	2	\$ 60,000
A-8	42-IN BUTTERFLY VALVE AND MANHOLE* 2	EA	\$ 10,000	2	\$ 20,000
A-9	12-IN BLOWOFF VALVE AND MANHOLE*	EA	\$ 30,000	1	\$ 30,000
A-10	4-IN COMBINATION AIR VALVE AND MANHOLE*	EA	\$ 25,000	1	\$ 25,000
A-11	CONNECT TO NTMWD 48-IN PIPELINE*	EA	\$ 75,000	1	\$ 75,000
A-12	CONNECT TO EX. 36-IN PIPELINE*	EA	\$ 75,000	1	\$ 75,000
A-13	HYDROSTATIC TESTING	EA	\$ 5,000	1	\$ 5,000
A-14	SEEDING	AC	\$ 1,500	1	\$ 1,500
A-15	STORM WATER POLLUTION PREVENTION PLAN	EA	\$ 5,000	1	\$ 5,000
A-16	CONCRETE PAVEMENT AND BASE*	SY	\$ 120	1635	\$ 196,200
A-17	36-IN AWWA C303 BAR WRAPPED CONCRETE CYLINDER PIPE BY OPEN CUT* 2	LF	\$ 445	909	\$ 404,505
A-18	36-IN AWWA C303 BAR WRAPPED CONCRETE CYLINDER PIPE BY OTHER THAN OPEN CUT* 2	LF	\$ 480	181	\$ 86,880
A-19	42-IN AWWA C303 BAR WRAPPED CONCRETE CYLINDER PIPE BY OPEN CUT* 2	LF	\$ 75	909	\$ 68,175
A-20	42-IN AWWA C303 BAR WRAPPED CONCRETE CYLINDER PIPE OTHER THAN OPEN CUT* 2	LF	\$ 75	181	\$ 13,575
A-21	60-IN STEEL CASING BY OTHER THAN OPEN CUT* 2	LF	\$ 1,000	181	\$ 181,000
A-22	TRENCH SAFETY	LF	\$ 15	909	\$ 13,635
A-23	REMOVAL OF EXISTING CHAINLINK FENCE	LF	\$ 5	645	\$ 3,225
A-24	INSTALLATION OF 8-FT CHAINLINK FENCE*	LF	\$ 20	602	\$ 12,040
A-25	INSTALLATION OF CHAINLINK GATE*	EA	\$ 1,500	1	\$ 1,500
A-26	RETAINING WALL EXTENSION*	CY	\$ 750	275	\$ 206,250
A-27	CoServ Installation 3	EA	\$ 20,000	1	\$ 20,000
A-28	NTMWD INSPECTION	HR	\$ 45	730	\$ 32,850

SUBTOTAL	\$3,551,352
BETTERMENT TOTAL 2	\$282,750
REIMBURSABLE COST	\$3,268,602

B	LAND ACQUISITION				
B-1	24' FIRE UTILITY ACCESS EASEMENT	SF	\$ 12.00	4437	\$53,244
				LAND SUBTOTAL	\$53,244

C	TOWN OF PROSPER ENGINEERING, ADMINSTRATIVE & INSPECTION COSTS				
C-1	ESTIMATED TOWN OF PROSPER ENGINEER, ADMINISTRATIVE & INSPECTION COSTS 4				\$45,174

D	FREESE AND NICHOLS PROFESSIONAL SERVICE COSTS				
D-1	FREESE AND NICHOLS PROFESSIONAL SERVICE COSTS 4				\$359,225

Reimbursement Summary	
Total In Kind Cost	\$3,726,245
Total Betterment Cost (A)	\$282,750
Total Cost (In Kind + Betterment) (B)	4,008,995.00
Betterment Credit Percentage (A/B)	7.05%
Total Cost x Betterment Credit Percent	282,750.00
Composite Eligibility Ratio (CER)	100.00%
Total TxDOT Reimbursement (B-B)	3,726,245.00
Total Cost to Town of Prosper	282,750.00

NOTES	
*	Line Item Must be Buy America compliant in accordance with TxDOT/FHWA guidance letter dated October 3,2019
1	Meter Vault Facility Components which will need to be Buy America compliant include but are not limited to rebar for concrete vault, magnetic meter, butterfly valve, flow conditioner, electric/manual actuators, pipe, vault and building appurtenances, pipeline appurtenances, electrical components and wiring
2	Items associated with betterment. The Town of Prosper has elected to better their pipe from 36" to 42" and encase a portion of the 42" pipe. The unit cost of the three 42-inch line items represents the estimated price difference (betterment cost) between the 36" and 42" options. The encasement unit cost is the estimated betterment cost. The quantity shown for 36" options are only for calculation of reimbursable cost not representative of what will be installed.
3	CoServ Installation Cost Not to Exceed \$20,000
4	See Fee Breakdown for these items on the accompanying sheets

COMPENSATION

Compensation to FNI for Basic Services in Attachment SC shall be the lump sum of Three Hundred Eighteen Thousand Two Hundred Twenty Five Dollars (\$318,225).

Compensation to FNI for Special Services in Attachment SC shall be computed on the basis of the following Schedule of Charges, but shall not exceed Forty One Thousand Dollars (\$41,000).

If FNI sees the Scope of Services changing so that Additional Services are needed, including but not limited to those services described as Additional Services in Attachment SC, FNI will notify OWNER for OWNER's approval before proceeding. Additional Services shall be computed based on the following Schedule of Charges.

Position	Hourly Rate	
	Min	Max
Professional 1	85	153
Professional 2	99	162
Professional 3	120	231
Professional 4	158	249
Professional 5	197	367
Professional 6	207	410
Construction Manager 1	97	181
Construction Manager 2	114	194
Construction Manager 3	159	228
Construction Manager 4	216	294
CAD Technician/Designer 1	70	154
CAD Technician/Designer 2	103	160
CAD Technician/Designer 3	137	211
Corporate Project Support 1	53	128
Corporate Project Support 2	74	176
Corporate Project Support 3	103	271
Intern / Coop	45	89

Rates for In-House Services and Equipment

<u>Mileage</u>	<u>Bulk Printing and Reproduction</u>		<u>Equipment</u>	
Standard IRS Rates		<u>B&W</u>	<u>Color</u>	Valve Crew Vehicle (hour) \$75
	Small Format (per copy)	\$0.10		Pressure Data Logger (each) \$100
<u>Technology Charge</u>	Large Format (per sq. ft.)			Water Quality Meter (per day) \$100
\$8.50 per hour	Bond	\$0.25	\$0.75	Microscope (each) \$150
	Glossy / Mylar	\$0.75	\$1.25	Pressure Recorder (per day) \$200
	Vinyl / Adhesive	\$1.50	\$2.00	Ultrasonic Thickness Gauge (per day) \$275
				Coating Inspection Kit (per day) \$275
	Mounting (per sq. ft.)	\$2.00		Flushing / Cfactor (each) \$500
	Binding (per binding)	\$0.25		Backpack Electrofisher (each) \$1,000
				<u>Survey Grade</u> <u>Standard</u>
				Drone (per day) \$200 \$100
				GPS (per day) \$150 \$50

OTHER DIRECT EXPENSES:

Other direct expenses are reimbursed at actual cost times a multiplier of 1.15. They include outside printing and reproduction expense, communication expense, travel, transportation and subsistence away from the FNI office. For other miscellaneous expenses directly related to the work, including costs of laboratory analysis, test, and other work required to be done by independent persons other than staff members, these services will be billed at a cost times a multiplier of 1.15. For Resident Representative services performed by non-FNI employees and CAD services performed in-house by non-FNI employees where FNI provides workspace and equipment to perform such services, these services will be billed at cost times a multiplier of 2.0. This markup approximates the cost to FNI if an FNI employee was performing the same or similar services.

These ranges and/or rates will be adjusted annually in February. Last updated February 2020.

Town of Prosper Custer Rd Meter Vault Relocation 5/9/2018 Detailed Cost Breakdown	Project Fee Summary		
	Basic Services	\$	318,225
	Special Services	\$	41,000
	Total Project	\$	359,225

Item 12.

Tasks																			
Phase	Task	Basic or Special	Task Description	Scott Maughn	Clayton Barnard	Mitchell Sawtelle	Luis Rivera	Mike Hagen	Michael Robertson	Prabin KC	Tran Duong	Josh Moore	Wade Zemlock	David Phillips	Alex Trevizo	Jane Jenks	Dan Gise	Richard Aldredge	
				QA	PM	Design Eng	PL CAD	PL QC	Struc QC	Struc Lead	Struc DE	Struc CAD	Elec QC	Elec Lead	Elec CAD	CS Admin	ES QC	ES Lead	
				\$299	\$275	\$110	\$170	\$257	\$230	\$185	\$120	\$103	\$279	\$192	\$102	\$133	\$299	\$191	
		Basic	Review Schedule			2													
		Basic	Review Sequence			2													
		Basic	Review Pay Aps (12)			6													
		Basic	Site Visits		4	12							4	12					
		Basic	Submittals		2	24				12			4	32					
		Basic	Warranty Review			1								1					
		Basic	RFI		2	4				8	8		2	4					
		Basic	CO		2	6	4			8	8		2	4					
		Basic	Substantial Completion Inspection		2	4								4					
		Basic	Final Inspection		2	4								4					
		Basic	Record Drawings			4	16			1	2	8	2	4	12				
		Special	Topographical Survey																
		Special	B&C Survey																
		Special	Easement Documents																
		Special	B&C Easement Documents																
		Special	Subsurface Utility Engineering																
		Special	Survwest Level A SUE																
		Special	Environmental Services																
		Special	Compile info and site visit																4
		Special	Prepare tech memo															2	4
		Special	THC letter															2	4
		Special	Project Team Coordination																2
		Special	Geotechnical																
		Special	Project Setup/Kickoff																
		Special	Field Exploration																
		Special	Boring Layout/Site Reconnaissance/Stake Borings																
		Special	Coordination with Utilities and Subconsultant																
		Special	Laboratory Testing																
		Special	Assign/Review Lab Testing																
		Special	Draft/Review Boring Logs																
		Special	Engineering Analysis and Reporting																
		Special	Analysis/Calculations for PL																
		Special	Technical Memorandum for PS																
Total Hours / Quantity				16	167	335	290	6	4	59	90	116	42	221	160	28	4	16	
Total Effort				\$ 4,784	\$ 45,918	\$ 36,944	\$ 49,181	\$ 1,540	\$ 918	\$ 10,891	\$ 10,821	\$ 11,916	\$ 11,707	\$ 42,346	\$ 16,389	\$ 3,714	\$ 1,197	\$ 3,060	

**Town of Prosper
Custer Rd Meter Vault Relocation
5/9/2018
Detailed Cost Breakdown**

Item 12.

Phase	Task	Basic or Special	Tasks Task Description	Labor															
				Erin Kelly	Melissa Kinzer	Mike Shiflett	Micah Hargrave	Holly Saez	Van Cashen	Ryan Edwards	Vimal Nair	Parris Jones	Chelsea Thorn	Stephen Bundy	Jerry Taylor	Brett Bristow	Christie Ubando	Scott Cole	
				ES	ES GIS	Geo QC	Geo Lead	Geo DE	Mech Lead	Mech DE	Mech QC	Arch QC	Arch Lead	Arch CAD	CS	Civil Lead	Civil CAD	Model QC	
				\$101	\$101	\$313	\$199	\$165	\$188	\$155	\$320	\$270	\$129	\$128	\$259	\$211	\$147	\$331	
		Basic	General Requirements																
		Basic	Internal Kickoff				2						2					2	
		Basic	Client Kickoff																
		Basic	Existing Data Collection																
		Basic	ES Desktop																
		Basic	Review Front ends																
		Basic	TxDOT Meetings																
		Basic	NTMWD Coordination Meetings																
		Basic	Utility Coordination																
		Basic	Preliminary Design																
		Basic	Alignment Selection																
		Basic	Control Valve and Meter Selection																2
		Basic	Field Review																
		Basic	Prepare cost analysis																
		Basic	Alignment selection Meeting																
		Basic	QA/QC																
		Basic	Final Design																
		Basic	60% Plans																
		Basic	Coordinate Subs																
		Basic	P/P Drawings																
		Basic	Valve Vault Drawings						8	12			8	12					
		Basic	Electrical & Instrumentation Drawings																
		Basic	General Detail Sheets													4	12		
		Basic	Specification Prep																
		Basic	60% submittal																
		Basic	OPCC																
		Basic	Review Meeting																
		Basic	TxDOT Coordination																
		Basic	QA/QC									2	2						
		Basic	Prepare alternative meter site options																
		Basic	90% Plans																
		Basic	P/P Drawings																
		Basic	Valve Vault Drawings																
		Basic	Connection Details																
		Basic	Electrical & Instrumentation Drawings																
		Basic	Structural Vault Drawings and Details																
		Basic	Mechanical Drawings and Details						8	20			8	20					
		Basic	Architectural Drawings and Details										8	20					
		Basic	General Detail Sheets													8	24		
		Basic	Specification Prep																
		Basic	State Agency Coordination (TCEQ)																
		Basic	90% Submittals						4	20			4	20					
		Basic	OPCC																
		Basic	Review Meeting																
		Basic	Revise Documents							8				8		2	4		
		Basic	SUE preparation																
		Basic	QA/QC									2	2						
		Basic	Constructability Review													24			
		Basic	Issue Bid Docs						2	4			2	4		2	2		
		Basic	Bid Phase																
		Basic	Bid Invitation																
		Basic	Advertisement																
		Basic	Bidders List																
		Basic	Bid Questions																
		Basic	Addendum							2			2						
		Basic	Bid Opening																
		Basic	Review Bid																
		Basic	Bid Tab																
		Basic	Issue Construction Docs							2				2					
		Basic	Construction Phase																
		Basic	Project Admin																
		Basic	Review insurance																
		Basic	Pre-Con																

Town of Prosper
 Custer Rd Meter Vault Relocation
 5/9/2018
 Detailed Cost Breakdown

Item 12.

Tasks				Labor															
Phase	Task	Basic or Special	Task Description	Erin Kelly	Melissa Kinzer	Mike Shiflett	Micah Hargrave	Holly Saez	Van Cashen	Ryan Edwards	Vimal Nair	Parris Jones	Chelsea Thorn	Stephen Bundy	Jerry Taylor	Brett Bristow	Christie Ubando	Scott Cole	
				ES	ES GIS	Geo QC	Geo Lead	Geo DE	Mech Lead	Mech DE	Mech QC	Arch QC	Arch Lead	Arch CAD	CS	Civil Lead	Civil CAD	Model QC	
				\$101	\$101	\$313	\$199	\$165	\$188	\$155	\$320	\$270	\$129	\$128	\$259	\$211	\$147	\$331	
		Basic	Review Schedule																
		Basic	Review Sequence																
		Basic	Review Pay Aps (12)																
		Basic	Site Visits																
		Basic	Submittals							2			4						
		Basic	Warranty Review							1									
		Basic	RFI						2	4			2						
		Basic	CO						2	4			2						
		Basic	Substantial Completion Inspection																
		Basic	Final Inspection																
		Basic	Record Drawings																
		Special	Topographical Survey																
		Special	B&C Survey																
		Special	Easement Documents																
		Special	B&C Easement Documents																
		Special	Subsurface Utility Engineering																
		Special	Survwest Level A SUE																
		Special	Environmental Services																
		Special	Compile info and site visit	12															
		Special	Prepare tech memo	12	6														
		Special	THC letter	8	6														
		Special	Project Team Coordination	2															
		Special	Geotechnical																
		Special	Project Setup/Kickoff																
		Special	Field Exploration																
		Special	Boring Layout/Site Reconnaissance/Stake Borings				2	2											
		Special	Coordination with Utilities and Subconsultant					4											
		Special	Laboratory Testing																
		Special	Assign/Review Lab Testing				2	4											
		Special	Draft/Review Boring Logs					6											
		Special	Engineering Analysis and Reporting																
		Special	Analysis/Calculations for PL				2	4											
		Special	Technical Memorandum for PS			4	4	8											
Total Hours / Quantity				34	12	4	12	28	26	81	4	4	34	66	24	18	42	2	
Total Effort				\$ 3,438	\$ 1,213	\$ 1,253	\$ 2,393	\$ 4,616	\$ 4,901	\$ 12,527	\$ 1,280	\$ 1,080	\$ 4,372	\$ 8,437	\$ 6,207	\$ 3,795	\$ 6,156	\$ 662	

**Town of Prosper
Custer Rd Meter Vault Relocation
5/9/2018
Detailed Cost Breakdown**

Item 12.

		Tasks				
Phase	Task	Basic or Special	Task Description	Melissa Brunger	Total Hours	Total Labor Effort
				Model Lead		
				\$226		
		Basic	General Requirements			\$ -
		Basic	Internal Kickoff	2	28	\$ 5,416
		Basic	Client Kickoff		4	\$ 770
		Basic	Existing Data Collection		6	\$ 899
		Basic	ES Desktop		2	\$ 221
		Basic	Review Front ends		2	\$ 550
		Basic	TxDOT Meetings		8	\$ 2,200
		Basic	NTMWD Coordination Meetings		8	\$ 2,200
		Basic	Utility Coordination		8	\$ 2,200
						\$ -
		Basic	Preliminary Design			\$ -
		Basic	Alignment Selection		13	\$ 2,073
		Basic	Control Valve and Meter Selection	12	20	\$ 4,367
		Basic	Field Review		8	\$ 1,537
		Basic	Prepare cost analysis		6	\$ 991
		Basic	Alignment selection Meeting		10	\$ 1,762
		Basic	QA/QC		10	\$ 2,724
						\$ -
		Basic	Final Design			\$ -
		Basic	60% Plans			\$ -
		Basic	Coordinate Subs		16	\$ 4,399
		Basic	P/P Drawings		34	\$ 5,502
		Basic	Valve Vault Drawings		154	\$ 21,378
		Basic	Electrical & Instrumentation Drawings		96	\$ 14,458
		Basic	General Detail Sheets		24	\$ 3,722
		Basic	Specification Prep		34	\$ 5,380
		Basic	60% submittal		12	\$ 1,798
		Basic	OPCC		6	\$ 991
		Basic	Review Meeting		6	\$ 991
		Basic	TxDOT Coordination		124	\$ 21,685
		Basic	QA/QC		14	\$ 3,943
		Basic	Prepare alternative meter site options		56	\$ 9,391
						\$ -
		Basic	90% Plans			\$ -
		Basic	P/P Drawings		36	\$ 6,100
		Basic	Valve Vault Drawings		38	\$ 6,089
		Basic	Connection Details		20	\$ 3,128
		Basic	Electrical & Instrumentation Drawings		108	\$ 16,040
		Basic	Structural Vault Drawings and Details		136	\$ 15,980
		Basic	Mechanical Drawings and Details		28	\$ 4,601
		Basic	Architectural Drawings and Details		28	\$ 3,585
		Basic	General Detail Sheets		36	\$ 5,764
		Basic	Specification Prep		22	\$ 3,727
		Basic	State Agency Coordination (TCEQ)		8	\$ 1,711
		Basic	90% Submittals		88	\$ 12,509
		Basic	OPCC		10	\$ 1,595
		Basic	Review Meeting		6	\$ 991
		Basic	Revise Documents		98	\$ 14,852
		Basic	SUE preparation		14	\$ 2,348
		Basic	QA/QC		14	\$ 3,943
		Basic	Constructability Review		26	\$ 6,757
		Basic	Issue Bid Docs		44	\$ 6,676
						\$ -
		Basic	Bid Phase			\$ -
		Basic	Bid Invitation		6	\$ 751
		Basic	Advertisement		4	\$ 486
		Basic	Bidders List		2	\$ 265
		Basic	Bid Questions		16	\$ 2,881
		Basic	Addendum		18	\$ 3,264
		Basic	Bid Opening		6	\$ 991
		Basic	Review Bid		2	\$ 221
		Basic	Bid Tab		4	\$ 441
		Basic	Issue Construction Docs		28	\$ 4,428
						\$ -
		Basic	Construction Phase			\$ -
		Basic	Project Admin		18	\$ 2,960
		Basic	Review insurance		2	\$ 550
		Basic	Pre-Con		6	\$ 991

**Town of Prosper
Custer Rd Meter Vault Relocation
5/9/2018
Detailed Cost Breakdown**

Item 12.

Tasks						
Phase	Task	Basic or Special	Task Description	Melissa Brunger	Total Hours	Total Labor Effort
				Model Lead		
				\$226		
		Basic	Review Schedule		2	\$ 221
		Basic	Review Sequence		2	\$ 221
		Basic	Review Pay Aps (12)		6	\$ 662
		Basic	Site Visits		32	\$ 5,837
		Basic	Submittals		80	\$ 13,482
		Basic	Warrantee Review		3	\$ 457
		Basic	RFI		36	\$ 6,006
		Basic	CO		42	\$ 6,905
		Basic	Substantial Completion Inspection		10	\$ 1,757
		Basic	Final Inspection		10	\$ 1,757
		Basic	Record Drawings		49	\$ 6,954
						\$ -
		Special	Topographical Survey			\$ -
		Special	B&C Survey			\$ -
						\$ -
		Special	Easement Documents			\$ -
		Special	B&C Easement Documents			\$ -
						\$ -
		Special	Subsurface Utility Engineering			\$ -
		Special	Survwest Level A SUE			\$ -
						\$ -
		Special	Environmental Services			\$ -
		Special	Compile info and site visit		16	\$ 1,978
		Special	Prepare tech memo		24	\$ 3,184
		Special	THC letter		20	\$ 2,779
		Special	Project Team Coordination		4	\$ 585
						\$ -
		Special	Geotechnical			\$ -
		Special	Project Setup/Kickoff			\$ -
		Special	Field Exploration			\$ -
		Special	Boring Layout/Site Reconnaissance/Stake Borings		4	\$ 729
		Special	Coordination with Utilities and Subconsultant		4	\$ 659
		Special	Laboratory Testing			\$ -
		Special	Assign/Review Lab Testing		6	\$ 1,058
		Special	Draft/Review Boring Logs		6	\$ 989
		Special	Engineering Analysis and Reporting			\$ -
		Special	Analysis/Calculations for PL		6	\$ 1,058
		Special	Technical Memorandum for PS		16	\$ 3,370
						\$ -
Total Hours / Quantity				14	1,959	
Total Effort				\$ 3,167		\$ 316,822

Town of Prosper Custer Rd Meter Vault Relocation 5/9/2018 Detailed Cost Breakdown		Project Fee Summary	
		Basic Services	318,225
		Special Services	41,000
		Total Project	359,225

Item 12.

Tasks				Expenses										
Phase	Task	Basic or Special	Task Description	Tech Charge	Miles	Meals	Hotel	B&W (sheet)	Color (sheet)	Binding (each)	Lg Format - Bond - B&W (sq. ft.)	Lg Format - Glossy/Mylar - B&W (sq. ft.)	Other	Total Expense Effort
		Basic	General Requirements											\$ -
		Basic	Internal Kickoff	28										\$ 238
		Basic	Client Kickoff	4										\$ 34
		Basic	Existing Data Collection	6										\$ 51
		Basic	ES Desktop	2										\$ 17
		Basic	Review Front ends	2										\$ 17
		Basic	TxDOT Meetings	8	100									\$ 126
		Basic	NTMWD Coordination Meetings	8	100								139	\$ 285
		Basic	Utility Coordination	8	50									\$ 97
														\$ -
		Basic	Preliminary Design											\$ -
		Basic	Alignment Selection	13										\$ 111
		Basic	Control Valve and Meter Selection	20										\$ 170
		Basic	Field Review	8	50									\$ 97
		Basic	Prepare cost analysis	6										\$ 51
		Basic	Alignment selection Meeting	10	50			100					100	\$ 239
		Basic	QA/QC	10										\$ 85
														\$ -
		Basic	Final Design											\$ -
		Basic	60% Plans											\$ -
		Basic	Coordinate Subs	16										\$ 136
		Basic	P/P Drawings	34										\$ 289
		Basic	Valve Vault Drawings	154										\$ 1,309
		Basic	Electrical & Instrumentation Drawings	96										\$ 816
		Basic	General Detail Sheets	24										\$ 204
		Basic	Specification Prep	34										\$ 289
		Basic	60% submittal	12				200						\$ 122
		Basic	OPCC	6										\$ 51
		Basic	Review Meeting	6	100									\$ 109
		Basic	TxDOT Coordination	124										\$ 1,054
		Basic	QA/QC	14										\$ 119
		Basic	Prepare alternative meter site options	56										\$ 476
														\$ -
		Basic	90% Plans											\$ -
		Basic	P/P Drawings	36										\$ 306
		Basic	Valve Vault Drawings	38										\$ 323
		Basic	Connection Details	20										\$ 170
		Basic	Electrical & Instrumentation Drawings	108										\$ 918
		Basic	Structural Vault Drawings and Details	136										\$ 1,156
		Basic	Mechanical Drawings and Details	28										\$ 238
		Basic	Architectural Drawings and Details	28										\$ 238
		Basic	General Detail Sheets	36										\$ 306
		Basic	Specification Prep	22										\$ 187
		Basic	State Agency Coordination (TCEQ)	8										\$ 68
		Basic	90% Submittals	88				200					9	\$ 778
		Basic	OPCC	10										\$ 85
		Basic	Review Meeting	6	100									\$ 109
		Basic	Revise Documents	98										\$ 833
		Basic	SUE preparation	14										\$ 119
		Basic	QA/QC	14										\$ 119
		Basic	Constructability Review	26										\$ 221
		Basic	Issue Bid Docs	44										\$ 374
														\$ -
		Basic	Bid Phase											\$ -
		Basic	Bid Invitation	6										\$ 51
		Basic	Advertisement	4										\$ 34
		Basic	Bidders List	2										\$ 17
		Basic	Bid Questions	16										\$ 136
		Basic	Addendum	18										\$ 153
		Basic	Bid Opening	6	50									\$ 80
		Basic	Review Bid	2										\$ 17
		Basic	Bid Tab	4										\$ 34
		Basic	Issue Construction Docs	28				500					570	\$ 944
														\$ -
		Basic	Construction Phase											\$ -
		Basic	Project Admin	18										\$ 153
		Basic	Review insurance	2										\$ 17
		Basic	Pre-Con	6	100									\$ 109

Town of Prosper Custer Rd Meter Vault Relocation 5/9/2018 Detailed Cost Breakdown	Project Fee Summary	
	Basic Services	318,225
	Special Services	41,000
	Total Project	359,225

Item 12.

Tasks				Expenses										
Phase	Task	Basic or Special	Task Description	Tech Charge	Miles	Meals	Hotel	B&W (sheet)	Color (sheet)	Binding (each)	Lg Format - Bond - B&W (sq. ft.)	Lg Format - Glossy/Mylar - B&W (sq. ft.)	Other	Total Expense Effort
		Basic	Review Schedule	2										\$ 17
		Basic	Review Sequence	2										\$ 17
		Basic	Review Pay Aps (12)	6										\$ 51
		Basic	Site Visits	32	500								253	\$ 850
		Basic	Submittals	80										\$ 680
		Basic	Warrantee Review	3										\$ 26
		Basic	RFI	36										\$ 306
		Basic	CO	42										\$ 357
		Basic	Substantial Completion Inspection	10										\$ 85
		Basic	Final Inspection	10										\$ 85
		Basic	Record Drawings	49				200						\$ 437
		Special	Topographical Survey											\$ -
		Special	B&C Survey										22	\$ 25
		Special	Easement Documents											\$ -
		Special	B&C Easement Documents										9	\$ 10
		Special	Subsurface Utility Engineering											\$ -
		Special	Survwest Level A SUE										41	\$ 47
		Special	Environmental Services											\$ -
		Special	Compile info and site visit	16	200									\$ 251
		Special	Prepare tech memo	24				100					134.5	\$ 369
		Special	THC letter	20										\$ 170
		Special	Project Team Coordination	4										\$ 34
		Special	Geotechnical											\$ -
		Special	Project Setup/Kickoff											\$ -
		Special	Field Exploration											\$ -
		Special	Boring Layout/Site Reconnaissance/Stake Borings	4	200								407	\$ 617
		Special	Coordination with Utilities and Subconsultant	4										\$ 34
		Special	Laboratory Testing											\$ -
		Special	Assign/Review Lab Testing	6										\$ 51
		Special	Draft/Review Boring Logs	6										\$ 51
		Special	Engineering Analysis and Reporting											\$ -
		Special	Analysis/Calculations for PL	6										\$ 51
		Special	Technical Memorandum for PS	16										\$ 136
														\$ -
Total Hours / Quantity				1,959	1,600	-	-	1,300	-	-	-	-	1,685	
Total Effort				\$ 16,652	\$ 920	\$ -	\$ -	\$ 130	\$ -	\$ -	\$ -	\$ -	\$ 1,937	\$ 19,639

Town of Prosper Custer Rd Meter Vault Relocation 5/9/2018 Detailed Cost Breakdown	Project Fee Summary	
	Basic Services	318,225
	Special Services	41,000
	Total Project	359,225

Item 12.

Phase	Task	Basic or Special	Tasks Task Description	Subconsultants					Total Sub Effort	Total Effort
				Brittain and Crawford	Brittain and Crawford	Survwest	GAI	Texplor		
		Basic	General Requirements						\$ -	\$ -
		Basic	Internal Kickoff						\$ -	\$ 5,654
		Basic	Client Kickoff						\$ -	\$ 804
		Basic	Existing Data Collection						\$ -	\$ 950
		Basic	ES Desktop						\$ -	\$ 238
		Basic	Review Front ends						\$ -	\$ 567
		Basic	TxDOT Meetings						\$ -	\$ 2,325
		Basic	NTMWD Coordination Meetings						\$ -	\$ 2,485
		Basic	Utility Coordination						\$ -	\$ 2,296
									\$ -	\$ -
		Basic	Preliminary Design						\$ -	\$ -
		Basic	Alignment Selection						\$ -	\$ 2,183
		Basic	Control Valve and Meter Selection						\$ -	\$ 4,537
		Basic	Field Review						\$ -	\$ 1,634
		Basic	Prepare cost analysis						\$ -	\$ 1,042
		Basic	Alignment selection Meeting						\$ -	\$ 2,000
		Basic	QA/QC						\$ -	\$ 2,809
									\$ -	\$ -
		Basic	Final Design						\$ -	\$ -
		Basic	60% Plans						\$ -	\$ -
		Basic	Coordinate Subs						\$ -	\$ 4,535
		Basic	P/P Drawings						\$ -	\$ 5,791
		Basic	Valve Vault Drawings						\$ -	\$ 22,687
		Basic	Electrical & Instrumentation Drawings						\$ -	\$ 15,274
		Basic	General Detail Sheets						\$ -	\$ 3,926
		Basic	Specification Prep						\$ -	\$ 5,669
		Basic	60% submittal						\$ -	\$ 1,920
		Basic	OPCC						\$ -	\$ 1,042
		Basic	Review Meeting						\$ -	\$ 1,100
		Basic	TxDOT Coordination						\$ -	\$ 22,739
		Basic	QA/QC						\$ -	\$ 4,062
		Basic	Prepare alternative meter site options						\$ -	\$ 9,867
									\$ -	\$ -
		Basic	90% Plans						\$ -	\$ -
		Basic	P/P Drawings						\$ -	\$ 6,406
		Basic	Valve Vault Drawings						\$ -	\$ 6,412
		Basic	Connection Details						\$ -	\$ 3,298
		Basic	Electrical & Instrumentation Drawings						\$ -	\$ 16,958
		Basic	Structural Vault Drawings and Details						\$ -	\$ 17,136
		Basic	Mechanical Drawings and Details						\$ -	\$ 4,839
		Basic	Architectural Drawings and Details						\$ -	\$ 3,823
		Basic	General Detail Sheets						\$ -	\$ 6,070
		Basic	Specification Prep						\$ -	\$ 3,914
		Basic	State Agency Coordination (TCEQ)						\$ -	\$ 1,779
		Basic	90% Submittals						\$ -	\$ 13,288
		Basic	OPCC						\$ -	\$ 1,680
		Basic	Review Meeting						\$ -	\$ 1,100
		Basic	Revise Documents						\$ -	\$ 15,685
		Basic	SUE preparation						\$ -	\$ 2,467
		Basic	QA/QC						\$ -	\$ 4,062
		Basic	Constructability Review						\$ -	\$ 6,978
		Basic	Issue Bid Docs						\$ -	\$ 7,050
									\$ -	\$ -
		Basic	Bid Phase						\$ -	\$ -
		Basic	Bid Invitation						\$ -	\$ 802
		Basic	Advertisement						\$ -	\$ 520
		Basic	Bidders List						\$ -	\$ 282
		Basic	Bid Questions						\$ -	\$ 3,017
		Basic	Addendum						\$ -	\$ 3,417
		Basic	Bid Opening						\$ -	\$ 1,071
		Basic	Review Bid						\$ -	\$ 238
		Basic	Bid Tab						\$ -	\$ 475
		Basic	Issue Construction Docs						\$ -	\$ 5,372
									\$ -	\$ -
		Basic	Construction Phase						\$ -	\$ -
		Basic	Project Admin						\$ -	\$ 3,113
		Basic	Review insurance						\$ -	\$ 567
		Basic	Pre-Con						\$ -	\$ 1,100

Town of Prosper Custer Rd Meter Vault Relocation 5/9/2018 Detailed Cost Breakdown	Project Fee Summary	
	Basic Services	318,225
	Special Services	41,000
	Total Project	359,225

Item 12.

Tasks			Subconsultants						Total		
Phase	Task	Basic or Special	Task Description	Brittain and Crawford	Brittain and Crawford	Survwest	GAI	Texplor	Geoscience	Total Sub Effort	Total Effort
		Basic	Review Schedule							\$ -	\$ 238
		Basic	Review Sequence							\$ -	\$ 238
		Basic	Review Pay Aps (12)							\$ -	\$ 713
		Basic	Site Visits							\$ -	\$ 6,688
		Basic	Submittals							\$ -	\$ 14,162
		Basic	Warranty Review							\$ -	\$ 482
		Basic	RFI							\$ -	\$ 6,312
		Basic	CO							\$ -	\$ 7,262
		Basic	Substantial Completion Inspection							\$ -	\$ 1,842
		Basic	Final Inspection							\$ -	\$ 1,842
		Basic	Record Drawings							\$ -	\$ 7,391
										\$ -	\$ -
		Special	Topographical Survey							\$ -	\$ -
		Special	B&C Survey	7,500						\$ 8,625	\$ 8,650
										\$ -	\$ -
		Special	Easement Documents							\$ -	\$ -
		Special	B&C Easement Documents		4,600					\$ 5,290	\$ 5,300
										\$ -	\$ -
		Special	Subsurface Utility Engineering							\$ -	\$ -
		Special	Survwest Level A SUE			4,350				\$ 5,003	\$ 5,050
										\$ -	\$ -
		Special	Environmental Services							\$ -	\$ -
		Special	Compile info and site visit							\$ -	\$ 2,229
		Special	Prepare tech memo							\$ -	\$ 3,552
		Special	THC letter							\$ -	\$ 2,949
		Special	Project Team Coordination							\$ -	\$ 619
										\$ -	\$ -
		Special	Geotechnical							\$ -	\$ -
		Special	Project Setup/Kickoff							\$ -	\$ -
		Special	Field Exploration					1,680		\$ 1,932	\$ 1,932
		Special	Boring Layout/Site Reconnaissance/Stake Borings							\$ -	\$ 1,346
		Special	Coordination with Utilities and Subconsultant							\$ -	\$ 693
		Special	Laboratory Testing							\$ 920	\$ 920
		Special	Assign/Review Lab Testing							\$ -	\$ 1,109
		Special	Draft/Review Boring Logs							\$ -	\$ 1,040
		Special	Engineering Analysis and Reporting						865	\$ 995	\$ 995
		Special	Analysis/Calculations for PL							\$ -	\$ 1,109
		Special	Technical Memorandum for PS							\$ -	\$ 3,506
										\$ -	\$ -
Total Hours / Quantity				\$ 7,500	\$ 4,600	\$ 4,350	\$ 800	\$ 1,680	\$ 865		
Total Effort				\$ 8,625	\$ 5,290	\$ 5,003	\$ 920	\$ 1,932	\$ 995	\$ 22,764	\$ 359,225

COMPENSATION

Compensation to FNI for Basic Services in Attachment SC shall be the lump sum of Three Hundred Eighteen Thousand Two Hundred Twenty Five Dollars (\$318,225).

Compensation to FNI for Special Services in Attachment SC shall be computed on the basis of the following Schedule of Charges, but shall not exceed Forty One Thousand Dollars (\$41,000).

If FNI sees the Scope of Services changing so that Additional Services are needed, including but not limited to those services described as Additional Services in Attachment SC, FNI will notify OWNER for OWNER's approval before proceeding. Additional Services shall be computed based on the following Schedule of Charges.

Position	Hourly Rate	
	Min	Max
Professional 1	85	153
Professional 2	99	162
Professional 3	120	231
Professional 4	158	249
Professional 5	197	367
Professional 6	207	410
Construction Manager 1	97	181
Construction Manager 2	114	194
Construction Manager 3	159	228
Construction Manager 4	216	294
CAD Technician/Designer 1	70	154
CAD Technician/Designer 2	103	160
CAD Technician/Designer 3	137	211
Corporate Project Support 1	53	128
Corporate Project Support 2	74	176
Corporate Project Support 3	103	271
Intern / Coop	45	89

Rates for In-House Services and Equipment

<u>Mileage</u>	<u>Bulk Printing and Reproduction</u>		<u>Equipment</u>	
Standard IRS Rates		<u>B&W</u>	<u>Color</u>	Valve Crew Vehicle (hour) \$75
	Small Format (per copy)	\$0.10		Pressure Data Logger (each) \$100
<u>Technology Charge</u>	Large Format (per sq. ft.)			Water Quality Meter (per day) \$100
\$8.50 per hour	Bond	\$0.25	\$0.75	Microscope (each) \$150
	Glossy / Mylar	\$0.75	\$1.25	Pressure Recorder (per day) \$200
	Vinyl / Adhesive	\$1.50	\$2.00	Ultrasonic Thickness Gauge (per day) \$275
				Coating Inspection Kit (per day) \$275
	Mounting (per sq. ft.)	\$2.00		Flushing / Cfactor (each) \$500
	Binding (per binding)	\$0.25		Backpack Electrofisher (each) \$1,000
				<u>Survey Grade</u> <u>Standard</u>
				Drone (per day) \$200 \$100
				GPS (per day) \$150 \$50

OTHER DIRECT EXPENSES:

Other direct expenses are reimbursed at actual cost times a multiplier of 1.15. They include outside printing and reproduction expense, communication expense, travel, transportation and subsistence away from the FNI office. For other miscellaneous expenses directly related to the work, including costs of laboratory analysis, test, and other work required to be done by independent persons other than staff members, these services will be billed at a cost times a multiplier of 1.15. For Resident Representative services performed by non-FNI employees and CAD services performed in-house by non-FNI employees where FNI provides workspace and equipment to perform such services, these services will be billed at cost times a multiplier of 2.0. This markup approximates the cost to FNI if an FNI employee was performing the same or similar services.

These ranges and/or rates will be adjusted annually in February. Last updated February 2020.

Prosper Custer Pipeline Relocation Effort				
Employee	Unit	Quantity	Rate	Costs
Engineering Costs				
CIP Manager	Hrs			
Project Manager	Hrs			
Transportation	Miles	100	\$ 0.58	\$ 58.00
Engineering Total				\$ 58.00
Administration Costs				
	Hrs			
Administraion Total				
Inspection Costs				
Senior Inspector	Hrs	500	\$ 90.00	\$ 45,000.00
Transportation	Miles	200	\$ 0.58	\$ 116.00
Insepction Total				\$ 45,116.00
Prosper Total				\$ 45,174.00

Custer Road Pump Station Meter Vault Relocation In Kind Qty Per Sheet

Line Item	Line Item Description	Sheet	G-6	G-8	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	S-8 and S-9	Total
		UNIT														
A-1	Meter Vault	EA			1											1
A-2	24" Magnetic Flow Meter	EA						1								1
A-3	36" Flow Conditioner	EA			1											1
A-4	24" Butterfly Valve (1-Interior)	EA						1								1
A-5	42" Butterfly Valve (2-Exterior)	EA			2											2
A-6	3" Combination Air Valve	EA			1											1
A-7	72"x72" Valve Vault (For 2-BFY's outside meter vault)	EA			2											2
A-8	Electrical, SCADA, Controls, and Instrumentation	EA														1
A-9	Pipeline Removal	LF	490													490
A-10	Vault Demolition	EA		1												1
A-11	Connect to NTMWD 48" Waterline	EA			1											1
A-12	Flowable Fill	CY														0
A-13	Testing of Pipeline	EA														0
A-14	Seeding	AC			0.333	0.333	0.333									1
A-15	Site Preparation	EA														1
A-16	Storm Water Pollution Prevention Plan	EA														1
A-17	Pipeline Disinfection	EA														1
A-18	South Access Road	SY									1635					1635
A-19	42" AWWA C303 Bar Wrapped Concrete Cylinder Pipe By Open Cut	LF			339	500	69.17									908.17
A-20	42" AWWA C303 Bar Wrapped Concrete Cylinder Pipe By Other than Open Cut	LF			161											161
A-21	60" Steel Casing By Other than Open Cut	LF			161											161
A-22	Relocation of Existing 16" Sleeve Valve	EA		1												1
A-23	Retaining Wall Extension	CY													275	275
A-24	Retaining Wall Excavation	CY												500		500
A-25	Structural Backfill	CY												1100		1100
A-26	Retaining Wall Flexible Base (Crushed Limestone)	CY												500		500
A-27	Removal of Existing Concrete Roadway	SY	265													265
A-28	CoServ Allowance	EA														20000
A-29	NTMWD Insepection Allowance	HR														45

The betterment on this project will be from the increase of pipeline size from 36" to 42" as well as the encasement of the 42" pipeline as shown on C-1 through C-3

Attachment "H" Proof of Property Interest

Supporting documentation of compensable property interest that establishes reimbursement eligibility as referenced in Texas Transportation Code §203.092.

Property interest documented through applicable affidavits and required attachments.

ROW-U-1A **and**

ROW-U-1B

Or

ROW-U-1C

The roadway improvement project is designated as an Interstate Highway project; therefore, no supporting documentation of compensable interest is required.

Initial Date
TxDOT

Initial Date
Utility

Existing Easement Documents

Existing Town of Prosper Deed

TxDOT Highway Project Number
CCSJ: 2351-01-017
ROW CSJ: 2351-01-022, -02-015

TxDOT Parcel
Parcel #10

TxDOT ROW Station Number(s)
358+66.28 – 359+21.28

Easement Instrument Number
Deed, Document # 2005-0144358

Easement Volume and Page Number
Volume 4189, Pg. 1138

Easement for Property Owner
Town of Prosper

Easement Grantor
D.R.C.C.T

~~Attn: Patrick~~
Landplan Development Corp.
5400 Dallas Pkwy.
Frisco, TX 75034

Return to: SJ2
Republic Title of Texas, Inc.
2626 Howell Street, 10th Floor
Dallas, TX 75204

06022 04349

2005-0144358

NOTICE OF CONFIDENTIALITY RIGHTS: IF YOU ARE A NATURAL PERSON, YOU MAY REMOVE OR STRIKE ANY OF THE FOLLOWING INFORMATION FROM THIS INSTRUMENT BEFORE IT IS FILED FOR RECORD IN THE PUBLIC RECORDS: YOUR SOCIAL SECURITY NUMBER OR YOUR DRIVER'S LICENSE NUMBER.

SPECIAL WARRANTY DEED

Effective Date: October 3rd, 2005

Grantor: 104 Proper, L.P., a Texas limited partnership and 310 Proper, L.P., a Texas limited partnership

Grantor's Mailing Address (including county): c/o Landplan Development Corporation
Attn: Jim Williams, Jr.
5400 Dallas Parkway
Frisco, Texas 75034
Collin County

Grantee: City of Prosper

Grantee's Mailing Address (including county): Attn: Town Administrator
City of Prosper
113 W. Broadway
Prosper, Texas 75078
Collin County

Consideration: For and in consideration of the sum of TEN AND NO/100 DOLLARS (\$10.00) and other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged.

Property: BEING all more particularly described in Exhibit A attached hereto and made a part hereof for all purposes.

Reservations from and Exceptions to Conveyance and Warranty:

This deed is executed and delivered subject to all matters of record but only to the extent such exceptions are valid and existing as of the date hereof, and standby fees, taxes and

06022 04350

assessments by any taxing authority for the year of 2005, and subsequent years.

“AS IS”:

IT IS UNDERSTOOD AND AGREED THAT GRANTOR IS NOT MAKING ANY WARRANTIES OR REPRESENTATIONS OF ANY KIND OR CHARACTER, EXPRESS OR IMPLIED, WITH RESPECT TO THE PROPERTY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OR REPRESENTATIONS AS TO MATTERS OF TITLE, ZONING, TAX CONSEQUENCES, PHYSICAL OR ENVIRONMENTAL CONDITION, OPERATING HISTORY OR PROJECTIONS VALUATION GOVERNMENTAL APPROVALS GOVERNMENTAL REGULATIONS OR ANY OTHER MATTER OR THING RELATING TO OR AFFECTING THE PROPERTY. GRANTEE AGREES THAT WITH RESPECT TO THE PROPERTY, GRANTEE HAS NOT RELIED UPON AND WILL NOT RELY UPON, EITHER DIRECTLY OR INDIRECTLY, AND REPRESENTATION OR WARRANTY OF GRANTOR EXCEPT FOR GRANTOR'S EXPRESS WARRANTIES. GRANTEE HAS CONDUCTED SUCH INSPECTIONS AND INVESTIGATIONS OF THE PROPERTY, INCLUDING, BUT NOT LIMITED TO, THE PHYSICAL AND ENVIRONMENTAL CONDITIONS THEREOF, AND IS RELYING UPON SAME, AND ASSUMES THE RISK THAT ADVERSE MATTERS, INCLUDING, BUT NOT LIMITED TO, ADVERSE PHYSICAL AND ENVIRONMENTAL CONDITIONS, MAY NOT HAVE BEEN REVEALED BY GRANTEE'S INSPECTIONS AND INVESTIGATIONS. GRANTEE, HEREBY ACKNOWLEDGES AND AGREES TO WAIVE, RELINQUISH AND RELEASE GRANTOR FROM AND AGAINST ANY AND ALL CLAIMS, DEMAND, CAUSES OF ACTION, LOSS, DAMAGE, LIABILITIES, COSTS AND EXPENSES (INCLUDING ATTORNEYS' FEES AND COURT COSTS) OF ANY AND EVERY KIND OR CHARACTER, KNOWN OR UNKNOWN, FIXED OR CONTINGENT, WHICH GRANTEE MIGHT HAVE ASSERTED OR ALLEGED AGAINST GRANTOR AT ANY TIME AND FROM TIME TO TIME BY REASON OR ARISING OUT OF THE VIOLATION OF ANY APPLICABLE LAWS (INCLUDING ANY APPLICABLE ENVIRONMENTAL LAWS HEREINAFTER DEFINED) AND ANY AND ALL MATTERS ARISING OUT OF ANY ACT, OMISSION, EVENT OR CIRCUMSTANCE, REGARDLESS OR WHETHER THE ACT, OMISSION, EVENT OR CIRCUMSTANCE CONSTITUTED A VIOLATION OF ANY SUCH APPLICABLE LAWS AT THE TIME OF ITS EXISTENCE OR OCCURRENCE. GRANTEE HAS TAKEN WHATEVER ACTION AND PERFORMED WHATEVER INVESTIGATIONS AND STUDIES GRANTEE DEEMED NECESSARY TO SATISFY ITSELF AS TO THE CONDITION OF THE PROPERTY AND THE EXISTENCE OR NONEXISTENCE OF, OR CURATIVE ACTION TO BE TAKEN WITH RESPECT TO, ANY HAZARDOUS AND/OR TOXIC SUBSTANCES ON OR DISCHARGED FROM THE PROPERTY. SHOULD ANY CLEAN UP OF THE PROPERTY BE REQUIRED AFTER THE DATE STATED ABOVE, IT IS HEREBY UNDERSTOOD AND AGREED THAT SUCH CLEAN UP SHALL BE THE RESPONSIBILITY OF, AND SHALL BE PERFORMED AT THE SOLE COST AND EXPENSE OF GRANTEE. GRANTEE ACKNOWLEDGES AND AGREES THAT UPON CLOSING, FUNDING AND DELIVERY OF THIS DEED, GRANTOR IS SELLING AND CONVEYING TO GRANTEE AND GRANTEE SHALL IS ACCEPTING THE PROPERTY "AS IS, WHERE IS", WITH ALL FAULTS AND THERE ARE NO ORAL AGREEMENTS WARRANTIES OR REPRESENTATIONS,

06022 04351

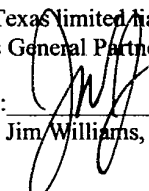
COLLATERAL TO OR AFFECTING THE PROPERTY BY GRANTOR OR ANY THIRD PARTY.

Grantor, for the consideration and subject to the reservations from and exceptions to conveyance and warranty, grants, sells, and conveys to Grantee the property, together with all and singular the rights and appurtenances thereto in any wise belonging, to have and hold it to Grantee, Grantee's heirs, executors, administrators, successors, or assigns forever. Grantor binds Grantor and Grantor's heirs, executors, administrators, and successors to warrant and forever defend all and singular the property to Grantee and Grantee's heirs, executors, administrators, successors, and assigns against every person whomsoever lawfully claiming or to claim the same or any part thereof, except as to the reservations from and exceptions to conveyance and warranty, by, through, or under Grantor but not otherwise.

When the context requires, singular nouns and pronouns include the plural.

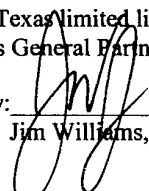
310 Prosper, L.P. a Texas limited partnership

By: Texas Land Management, L.L.C.,
a Texas limited liability company,
its General Partner

By: 
Jim Williams, Jr., President

104 Prosper, L.P. a Texas limited partnership

By: Texas Land Management, L.L.C.,
a Texas limited liability company,
its General Partner

By: 
Jim Williams, Jr., President

UNOFFICIAL

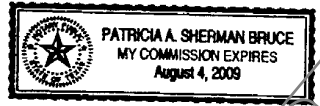
06022 04352

ACKNOWLEDGMENT

THE STATE OF TEXAS §
COUNTY OF COLLIN §

THIS INSTRUMENT was acknowledged before me on the 3rd day of October, 2005, by Jim Williams, Jr., President of Texas Land Management, L.L.C., a Texas limited liability company, the general partner of 310 Prosper, L.P., a Texas limited partnership on behalf of said partnership for the purpose set forth therein.

[NOTARIAL SEAL]



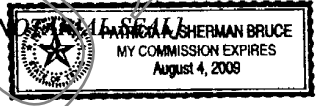
Patricia A. Sherman
Notary Public, State of Texas

ACKNOWLEDGMENT

THE STATE OF TEXAS §
COUNTY OF COLLIN §

THIS INSTRUMENT was acknowledged before me on the 3rd day of October, 2005, by Jim Williams, Jr., President of Texas Land Management, L.L.C., a Texas limited liability company, the general partner of 104 Prosper, L.P., a Texas limited partnership on behalf of said partnership for the purpose set forth therein.

[NOTARIAL SEAL]



Patricia A. Sherman
Notary Public, State of Texas

AFTER RECORDING RETURN TO:

[Redacted] Administrator
City of Prosper
1 [Redacted] Highway
Prosper, Texas 75078

06022 04353

Exhibit A

BEING a 12.344 acre tract of land situated in the Jeremiah Horn Survey, Abstract Number 411, Collin County, Texas and being a portion of a 104.483 acre tract of land described by deed recorded in Volume 5316, Page 5314 of the Deed Records of Collin County Texas (DRCCT) and being a portion of a 65.593 acre tract of land described by deed recorded in Volume 4189, Page 1138 (DRCCT) and being more particularly described as follows:

BEGINNING at a 5/8 inch iron rod set for the southeast corner of the herein described tract of land and being located in the west line of said 65.593 acre tract of land same being the east line of said 104.483 acre tract of land and being located North 00°51'05" West a distance of 918.49 feet and North 01°08'56" West a distance of 234.93 feet from the southeast and southwest corners thereof and also being the north right-of-way line of U.S. Highway 380 (variable width);

THENCE departing said common deed lines, SOUTH 89°10'00" WEST a distance of 403.92 feet to a point for corner located in the center of a drainage ditch running north/south;

THENCE along the meanderings of said drainage ditch running north/south as follows:

NORTH 07°39'59" EAST a distance of 96.29 feet to a point for corner;

NORTH 01°35'59" EAST a distance of 192.92 feet to a point for corner;

NORTH 16°33'14" WEST a distance of 275.59 feet to a point for corner;

NORTH 05°41'02" EAST a distance of 165.13 feet to a point for corner;

NORTH 18°58'26" EAST a distance of 236.78 feet to a point for corner;

THENCE departing the center of said drainage ditch running north/south, NORTH 89°10'00" EAST a passing distance of 352.02 feet to the east line of said 104.483 acre tract of land same being the west line of said 65.593 acre tract of land, in all a total distance of 702.91 feet to a 5/8 inch iron rod set for corner;

THENCE SOUTH 10°06'09" EAST a distance of 273.57 feet to a 5/8 inch iron rod set for corner;

THENCE NORTH 89°10'00" EAST a distance of 599.99 feet to a 5/8 inch iron rod set in the west right-of-way line of F.M. Highway 2478 (Custer Road);

THENCE along the west right-of-way line of said F.M. Highway 2478 (Custer Road), SOUTH 00°50'00" EAST a distance of 55.00 feet to a 5/8 inch iron rod set for corner;

THENCE departing the west right-of-way line of said F.M. Highway 2478 (Custer Road), SOUTH 89°10'00" WEST a distance of 993.16 feet to a 5/8 inch iron rod set in the east line of said 104.483

06022 04354

acre tract of land same being the west line of said 65.593 acre tract of land;

THENCE along said common line, **SOUTH 01°08'56" EAST** a distance of **615.10** feet to the **POINT OF BEGINNING**;

CONTAINING within these metes and bounds **12.344** acres or **537,717** square feet of land more or less.

Att. Patricia
LandPlan Development Corp.
5400 Dallas Pkwy.
Frisco, TX 75034

UNOFFICIAL

ANY PROVISION HEREIN WHICH RESTRICTS THE SALE, RENTAL, OR USE OF THE DESCRIBED REAL PROPERTY BECAUSE OF COLOR OR RACE IS INVALID AND UNENFORCEABLE UNDER FEDERAL LAW (THE STATE OF TEXAS) (COUNTY OF COLLIN) I hereby certify that this instrument was FILED in the File Number Sequence on this date and the time stamped hereon by me; and was duly RECORDED. In the Official Public Records of Real Property of Collin County, Texas on

OCT 12 2005

Brenda Taylor



Filed for Record in:
Collin County, McKinney TX
Honorable Brenda Taylor
Collin County Clerk

On Oct 12 2005
At 2:05pm

Doc/Num : 2005- 0144358

Recording/Type:D1 36.00
Receipt #: 41123

Existing Water Line Easement

TxDOT Highway Project Number

CCSJ: 2351-01-017

ROW CSJ: 2351-01-022, -02-015

TxDOT Parcel

Parcel #7

TxDOT ROW Station Number(s)

355+65.79 – 358+66.28

Easement Instrument Number

Deed, Document # 2005-0144358

Easement Volume and Page Number

Volume 4189, Pg. 1138

Easement for Property Owner

Town of Prosper

Easement Grantor

D.R.C.C.T



"Notice of Confidentiality rights: If you are a Natural Person, you may remove or strike any or all of the following information from this instrument before it is filed for record in the Public Records: Your Social Security Number or your Drivers' License Number."

AFTER RECORDING, PLEASE RETURN TO:

Town of Prosper
Attn: Douglas C. Mousel
121 W. Broadway Street
P. O. Box 307
Prosper, TX 75078

WATER LINE EASEMENT AND TEMPORARY CONSTRUCTION EASEMENT

**THE STATE OF TEXAS §
 §
COUNTY OF COLLIN §**

KNOW ALL MEN BY THESE PRESENTS:

THAT, FF 14th FAIRWAY LIMITED PARTNERSHIP, a Texas limited partnership, whether one or more, hereinafter called "Grantor," for and in consideration of the sum of **ONE DOLLAR (\$1.00)** and other good and valuable consideration to Grantor in hand paid by the **TOWN OF PROSPER, TEXAS**, a General Law Municipality, hereinafter called "Grantee", the receipt and sufficiency of which are hereby acknowledged, and the further agreements of Grantee set forth herein, does GRANT, DEDICATE, SELL and CONVEY to the Grantee, the non-exclusive easement and right to construct, reconstruct, operate, alter, relocate and perpetually maintain underground water line(s), together with all incidental improvements which shall be at ground level, and all necessary laterals (collectively, the "Facilities") in, and under certain real property located in the Town of Prosper, Collin County, Texas, as more particularly described in Exhibit "A", which is attached hereto and made a part hereof by reference as if fully set forth herein (the "Easement Property"). This conveyance also includes a temporary construction easement as described on Exhibit "A" attached hereto for the purpose of excavation, construction and laying of the Facilities within the Easement Property described herein (the "Temporary Construction Easement"). The Temporary Construction Easement granted herein will terminate and cease upon the earlier to occur of: (a) the expiration of twelve (12) months following the date of execution of this instrument by Grantor; or (b) completion of the construction and testing of the Facilities by the Town of Prosper. As part of the grant hereby made, it is agreed between the parties hereto that any stone, earth, gravel or caliche which may be excavated in the opening,

construction or maintenance of said easement may be removed from said premises by Grantee, provided, that Grantee shall back fill any area disturbed with clean fill dirt.

TO HAVE AND TO HOLD the same perpetually unto the Grantee, its successors and assigns, together with the right and privilege at all times to enter the Easement Property and/or, prior to termination of the Temporary Construction Easement, the Temporary Construction Easement, or any part thereof, for the purpose of constructing, reconstructing, altering, operating, relocating and maintaining the Facilities, and all incidental improvements which shall be at or below ground level and for making connections therewith.

Grantee will at all times after doing any work in connection with the construction, operation or repair of the Facilities, restore the surface of the Easement Property and/or Temporary Construction Easement as close to the condition in which it was found before such work was undertaken as is reasonably practicable, including landscaping, sprinkler systems, and paving within the Easement Property and/or Temporary Construction Easement that were removed as a result of such work.

Grantor does hereby bind itself and its successors to **WARRANT AND FOREVER DEFEND** all and singular the Easement Property and Temporary Construction Easement unto Grantee, its successors and assigns, against every person whomsoever lawfully claiming or to claim the same or any part thereof, by, through or under Grantor, but not otherwise subject to all existing easements and other matters validly existing and affecting the Easement Property.

There are no liens, attachments or other encumbrances which will affect the title or right of the Grantor to convey this easement to the Grantee for the purposes as described herein other than as set forth above. This instrument shall not be considered as a deed to the Easement Property or any part thereof and is non-exclusive, and the right is hereby reserved to Grantor, its successors and assigns, to grant other easements and rights of use with respect to the Easement Property which are not inconsistent with the terms of this easement. Grantor and subsequent owners of the Easement Property shall have the right fully to use and enjoy the said premises covered by said above described easement for purposes which do not unreasonably interfere with the use of the Easement

Property by Grantee for the purposes set forth herein, including the right to lay out and construct streets, alleys, parking lots, landscaping, fences, signs, including subdivision and/or project monument type signs and utilities along and across said Easement Property. Notwithstanding, any such streets and utilities shall: (i) not be constructed unless approved in advance by Grantee; (ii) not unreasonably endanger or interfere with the normal operation of the Facilities and (iii) not cross the water line installed pursuant to the provisions hereof at not less than 45 degree angles. Grantor may not erect buildings or walls over said Easement Property without the approval of Grantee. Grantee will not create a nuisance or do any act that will be detrimental to the Easement Property or any portion property owned by Grantor adjacent to the Easement Area ("Grantor's Property") in the use of the rights and privileges herein granted. Grantee also agrees to install temporary fencing during periods of construction to ensure that livestock and animals will not escape. Grantee shall bury the water line to a minimum depth of at least four (4) feet from existing grade. Grantee shall not change the grade of the Easement Property. Grantee shall pay all costs and expenses incurred in connection with the Facilities and shall not permit any liens to attach to the Easement Property or any other property of Grantor in connection therewith. Grantee shall pay all claims, liabilities, costs and expenses incurred by Grantor as a result of or in connection with Grantee's use of the easements described in this instrument.

This instrument shall constitute a covenant running with the land and shall benefit and burden the applicable real properties described herein and shall inure to the benefit of, and be binding upon, Grantee and Grantor, and their respective successors or assigns.

This instrument may be executed in a number of identical counterparts, each of which shall be deemed an original for all purposes.

The individual executing this instrument on behalf of the Grantor represents that all appropriate and necessary actions have been taken to authorize the individual who is executing this instrument to do so for and on behalf of the Grantor, that there are no other parties or entities required to execute this instrument in order for the same to be an authorized and binding agreement on the Grantor and that the individual affixing his or her signature hereto is authorized to do so, and

such authorization is valid and effective on the date hereof, but such individual shall not have any personal or individual liability hereunder.

SIGNED my hand this 06 day of June, 2006.

FF 14th FAIRWAY LIMITED PARTNERSHIP, a Texas limited partnership

By: PHH GP, Inc., a Texas corporation, its General Partner

By: *Glenn D. Jones*
Name: Glenn D. Jones
Title: Vice President

ACKNOWLEDGMENT

THE STATE OF TEXAS §
 §
COUNTY OF TARRANT §

This instrument was acknowledged before me on the 06 day of June, 2006, by Glenn D. Jones, Vice President of PHH GP, Inc., a Texas corporation, General Partner of FF 14th Fairway Limited Partnership, a Texas limited partnership, on behalf of said corporation and limited partnership.

Debra A. Duran
Notary Public in and for the State of Texas

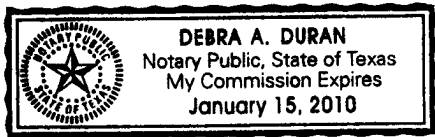


EXHIBIT "A"
TOWN OF PROSPER
PROSPER PUMP STATION, STORAGE TANK & WATERLINE PROJECT

PARCEL NO. 1
OWNER: FF 14TH FAIRWAY LIMITED PARTNERSHIP
PERMANENT WATERLINE EASEMENT
J. HORN SURVEY, ABSTRACT No. 411
COLLIN COUNTY, TEXAS

Being a permanent waterline easement situated in the J. Horn Survey, Abstract No. 411, Collin County, Texas and being a portion of the remainder of a 65.593 acre tract of land (by deed) being deeded to FF 14TH Fairway Limited Partnership as recorded in Volume 4189, Page 1138 of the Deed Records of Collin County, Texas, said permanent waterline easement being more particularly described by metes and bounds as follows:

COMMENCING at a 3/4 inch iron rod found for the most easterly southeast corner of a 12.344 acre tract of land (by deed) deeded to the City of Prosper as recorded in Volume 6022, Page 4349 of said Deed Records of Collin County, Texas, said 3/4 inch iron rod being in the west right-of-way line of F. M. 2478 (Custer Road, a variable width right-of-way), from which a 3/4 inch iron rod found for the most easterly northeast corner of said 12.344 acre tract of land bears North 00 degrees 33 minutes 50 seconds West, a distance of 55.04 feet, said 3/4 inch iron rod being in the west right-of-way line of said F. M. 2478; **THENCE** South 89 degrees 26 minutes 35 seconds West, with the most northerly south line of said 12.344 acre tract of land, a distance of 10.75 feet to the **POINT OF BEGINNING** of the herein described permanent waterline easement;

- THENCE** South 00 degrees 29 minutes 50 seconds East, a distance of 372.50 feet to a point for corner;
- THENCE** South 89 degrees 30 minutes 10 seconds West, a distance of 40.00 feet to a point for corner;
- THENCE** North 00 degrees 29 minutes 50 seconds West, a distance of 70.00 feet to a point for corner;
- THENCE** North 89 degrees 30 minutes 10 seconds East, a distance of 5.00 feet to a point for corner;
- THENCE** North 00 degrees 29 minutes 50 seconds West, a distance of 302.47 feet to a point for corner in the most northerly south line of said 12.344 acre tract of land, from which a 3/4 inch iron rod found for an interior ell corner in the south line of said 12.344 acre tract of land bears South 39 degrees 26 minutes 35 seconds West, a distance of 947.22 feet;

(Exhibit "A") Page 1 of 3

THENCE North 89 degrees 26 minutes 35 seconds East, with the most northerly south line of said 12.344 acre tract of land, a distance of 35.00 feet to the **POINT OF BEGINNING**, and containing 13,387 square feet or 0.307 acres of land, more or less.

TEMPORARY CONSTRUCTION EASEMENT

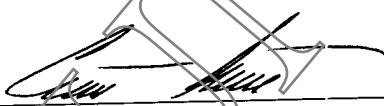
Being a variable width temporary construction easement parallel with and contiguous to the west line of said permanent waterline easement as shown on "Plat of Exhibit A", said variable width temporary construction easement shall expire upon completion of the waterline project.

NOTE: All bearings and coordinates are referenced to the Texas Coordinate System, NAD-83, The North Central Zone, based on TxDOT Control Monuments #R0430026, #R0430038 and #R0430019, with a TxDOT Surface Factor for this project of 1.000152710, distances and areas shown are surface.

*** SURVEYOR'S CERTIFICATE ***

TO ALL PARTIES INTERESTED IN TITLE TO THE PREMISES SURVEYED, I DO HEREBY CERTIFY THAT THE ABOVE LEGAL DESCRIPTION WAS PREPARED FROM PUBLIC RECORDS AND FROM AN ACTUAL AND ACCURATE SURVEY UPON THE GROUND AND THAT SAME IS TRUE AND CORRECT.

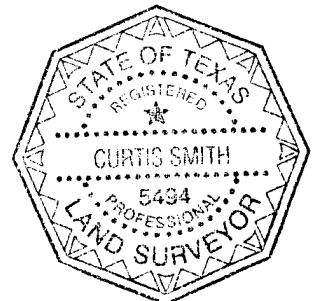
Company Name: **Gorronдона & Associates, Inc.**

By: 

Surveyor's Name: Curtis Smith
Registered Professional Land Surveyor,
Texas No. 5494

Date of survey: November 14, 2005

(Exhibit "A") Page 2 of 3



PLAT OF EXHIBIT "A"

REMAINDER OF
65.593 ACRE TRACT (BY DEED)
FF 14TH FAIRWAY LIMITED PARTNERSHIP
VOLUME 4189, PAGE 1138
D.R.C.C.T.

P.O.B.
PERMANENT WATERLINE
EASEMENT

12.344 ACRE TRACT (BY DEED)
CITY OF PROSPER
VOLUME 6022, PAGE 4349
D.R.C.C.T.

P.O.C.
FND 3/4"IR

20' ELECTRIC EASEMENT
DENTON COUNTY ELECTRIC
COOPERATIVE, INC.
VOLUME 830, PAGE 777
VOLUME 467, PAGE 373
D.R.C.C.T.

LINE TABLE		
LINE	BEARING	DISTANCE
L-1	S 89°30'10"W	40.00
L-2	N 00°29'50"W	70.00
L-3	N 89°30'10"E	5.00
L-4	N 89°26'35"E	35.00
L-5	S 89°26'35"W	10.75
L-6	N 89°26'35"E	65.00
L-7	S 89°30'10"W	60.00
L-8	N 00°33'50"W	55.04

J. HORN SURVEY
ABSTRACT No. 411

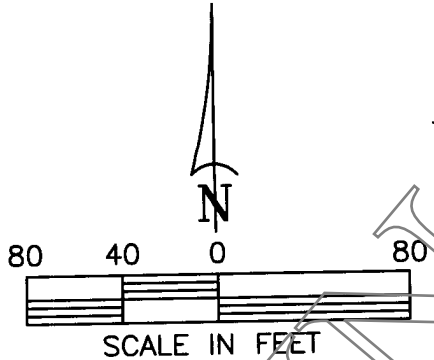
REMAINDER OF
65.593 ACRE TRACT (BY DEED)
FF 14TH FAIRWAY LIMITED PARTNERSHIP
VOLUME 4189, PAGE 1138
D.R.C.C.T.

PERMANENT WATERLINE EASEMENT
(13,387 SQ. FT. OR 0.307 AC.)

TEMPORARY CONSTRUCTION EASEMENT
(23,858 SQ. FT. OR 0.548 AC.)

20.0' PERMANENT WATERLINE EASEMENT
NORTH TEXAS MUNICIPAL WATER DISTRICT
VOLUME 5741, PAGE 37
D.R.C.C.T.

F.M. No. 2478 (CUSTER ROAD)
(VARIABLE WIDTH RIGHT-OF-WAY)



NOTE: ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, NAD-83, THE NORTH CENTRAL ZONE, BASED ON TxDOT CONTROL MONUMENTS #R0430026, #R0430038 AND #R0430019, WITH A TxDOT SURFACE FACTOR FOR THIS PROJECT OF 1.000152710. DISTANCES AND AREAS SHOWN ARE SURFACE.

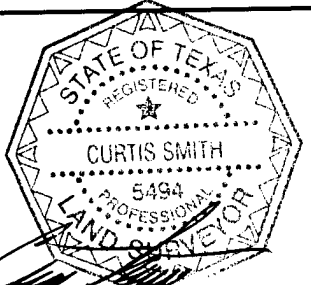


Town of Prosper

TOWN OF PROSPER

P.O. BOX 307 PROSPER, TEXAS 75078

PROJECT: PROSPER PUMP STATION, STORAGE TANK & WATERLINE		
PARCEL NO. 1	PROJECT No. PRP05200	
SURVEY: J. HORN SURVEY, ABSTRACT NO. 411, COLLIN COUNTY, TEXAS		
EASEMENT ACQUISITION AREA 13,387 SQUARE FEET OR 0.307 ACRES		
JOB NO. 0509-1672	DRAWN BY: RCS	CADD FILE: 1672ESMT.DWG
DATE: JANUARY 20, 2006	PAGE 3 OF 3	SCALE: 1" = 80'



CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494

UNOFFICIAL

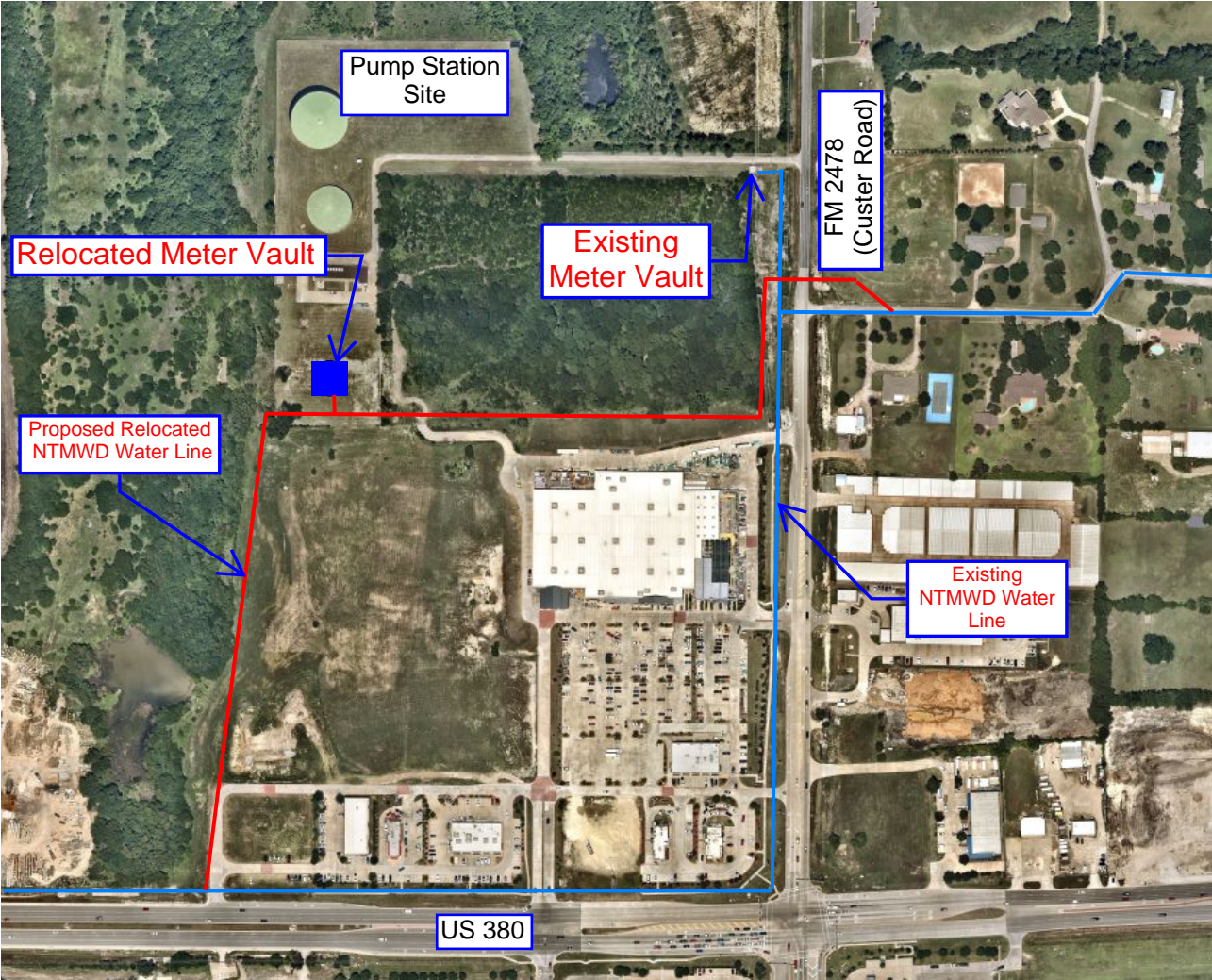
Filed and Recorded
Official Public Records
Brenda Taylor, County Clerk
Collin County, TEXAS
06/22/2006 09:10:12 AM
\$44.00 DLARD
20060622000859250



Brenda Taylor

LOCATION MAP

CUSTER ROAD PUMP STATION METER VAULT RELOCATION



TxDOT Standard Utility Agreement (Based on Estimate)

Estimated Construction Costs	\$	3,551,352
24' Fire Utility Access Easement	\$	53,244
Estimated Town of Prosper Engineer, Admin, & Inspection Costs	\$	45,174
Freese and Nichols Professional Service Costs	\$	359,225
Total In Kind Cost	\$	3,726,245
Total Betterment Cost (A)	\$	282,750
Total Cost (In Kind + Betterment) (B)	\$	4,008,995
Betterment Credit Percentage (A/B)		7.05%
Total Cost x Betterment Credit Percentage	\$	282,750
Composite Eligibility Ratio (CER)		100%
Total TxDOT Reimbursement B-(B x (A/B))	\$	3,726,245
Total Cost to Town of Prosper	\$	282,750

FINANCE DEPARTMENT



To: Mayor and Town Council

From: Chuck Springer, Executive Director of Administrative Services

Through: Harlan Jefferson, Town Manager

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Discussion and Presentation on the Continuous Process Improvement (CPI) Program. **(CS)**

Description of Agenda Item:

The Town staff began an implementation of a lean/six sigma based program with Town staff in early 2019. This was termed the Town's Continuous Process Improvement (CPI) Program. A presentation of implementation of the program, accomplishments and on-going efforts will be presented.

Town Staff Recommendation:

This item is for information purposes and no Town Council action is necessary.

FINANCE

To: Mayor and Town Council

From: Betty Pamplin, Finance Director

**Through: Harlan Jefferson, Town Manager
Chuck Springer, Executive Director of Administrative Services**

Re: Town Council Meeting – July 28, 2020

Agenda Item:

Budget Work Session Follow-Up Discussion. **(BP)**

Description of Agenda Item:

On Friday, July 17th staff provided to Town Council a VERF fund analysis, a five-year review of CIP funding sources and a multi-year professional services summary as a follow up to discussions from the budget work session held on June 18, 2020.

Attached Documents:

1. VERF fund analysis
2. CIP funding sources
3. Professional Services Summary

Town Staff Recommendation:

Town staff recommends that the Town Council discuss the provided documents for staff to provide any needed feedback or clarification.

Vehicle and Equipment Replacement Fund

Initial Establishment of Fund

The Town established the Vehicle Equipment and Replacement Fund (VERF) in Fiscal Year 2013-2014 to accumulate sufficient resources to replace existing vehicles and equipment when they reach or exceed their useful life. A significant factor in the creation of the VERF was to reduce the General Fund fund balance which was at a level of approximately 80% of General Fund expenditures at the end of fiscal year 2012/13. The internal program was designed for departments to contribute annual payments to the fund based on the number, type, average life expectancy, and the projected replacement cost of the vehicles/equipment. The intent was for funds to be managed to purchase Town vehicles and equipment in a manner that would not create a burden on the Town budget.

Initial deposits of \$800,000 and \$772,480 were made at fiscal yearend 13/14 and 14/15 respectively. Annual contributions are determined by amortizing the replacement cost for the life expectancy of the vehicle/equipment and are allocated as transfers from each department. Balances at the department level are calculated each year and adjustments are made to replacement values as needed. In addition to budgeted annual contributions, each department is credited for proceeds of auctioned vehicles/equipment, as well as interest earned for the year. These proceeds are considered when determining contribution needs for the following fiscal year. The attached spreadsheets give a history of the VERF Fund and current status.

Town's Agreement with Enterprise

The Town entered into a Master Equity Lease Agreement with Enterprise FM Trust on September 25, 2018, to implement a fleet management program. Enterprise performs three major functions for the Town (vehicle maintenance, vehicle purchases and vehicle sales). The Enterprise program does not cover heavy equipment vehicles such as, fire trucks, ambulances, dump trucks, or mobile equipment (trailers, mowers, backhoes and tractors). The Enterprise program is separate from the Town's VERF Fund. The Town pays for vehicle purchases made through Enterprise from the VERF Fund. All Town vehicles are owned by the Town. The VERF Fund is totally funded and controlled by the Town. Some of the benefits of the Enterprise program have been the consolidation and tracking of vehicle maintenance and timing of vehicle purchases to reduce Town costs. Enterprise recommended to the Town in June of 2019 that the Town order the current year model (prior to a price increase for next year's model) and take delivery after October 1st. This reduced the Town costs by approximately 3-5% per vehicle by avoiding the new model price increases. The Town continued this practice in the current fiscal year and will take delivery again in October with similar associated savings.

Town VERF Financials and History

There are three tables attached to this report. The first table gives audited financials and projections for the current year of the VERF Fund since inception. The fund balance includes some assets less depreciation, so the actual cash balance is shown on this table as well. The second table gives a breakdown of the cash balance in the VERF by fund and type of equipment (vehicles, mobile equipment and IT equipment). This balance is compared to the estimated current replacement value based on expected life. At fiscal year-end 18/19 the funding ratio was 72.16% and is estimated to be 91.43% at fiscal year-end 19/20.

A significant change in VERF funding was approved in May 2018. Prior to this date the replacement cost for all vehicles was based on the initial purchase cost. The replacement cost of some larger vehicles (ex. fire trucks and ambulances) was significantly above the initial purchase cost. The change in 2018 was to annually set replacement costs based on current market costs of vehicles. The budgets for fiscal year 18/19 and 19/20 increased the transfer to the VERF to catch up for the change in replacement costs. The contributions to the VERF in the upcoming budget will be below the prior two years as these catch up costs have been completed. The last table presents the contributions to the VERF by fund over the last four years.

Vehicle Equipment and Replacement Fund Summary

FUND BALANCE

FUND	ACCOUNT TYPE	ACTUAL 2013-2014	ACTUAL 2014-2015	ACTUAL 2015-2016	ACTUAL 2016-2017	ACTUAL 2017-2018	ACTUAL 2018-2019	ESTIMATED 2019-2020
REVENUES	Other	-	19,429	90,206	36,217	-	149,418	307,388
	Interest Income	-	-	-	15,460	34,485	79,060	47,000
	Transfers In	800,000	1,306,502	500,781	514,060	1,078,827	1,626,037	2,022,682
	TOTAL REVENUES	\$ 800,000	\$ 1,325,931	\$ 590,987	\$ 565,737	\$ 1,113,312	\$ 1,854,515	\$ 2,377,070
EXPENDITURES	Technology Expenses	-	51,152	12,023	27,800	84,887	72,290	92,814
	Equipment Expenses	-	-	9,995	-	90,828	292,910	26,000
	Vehicle Expenses	-	226,241	947,571	297,336	310,354	932,051	1,313,082
	TOTAL EXPENDITURES	\$ -	\$ 277,393	\$ 969,589	\$ 325,136	\$ 486,069	\$ 1,297,251	\$ 1,431,896
	<i>Period Excess / (Deficit)</i>	\$ 800,000	\$ 1,048,538	\$ (378,602)	\$ 240,601	\$ 627,243	\$ 557,264	\$ 945,174
NET CHANGE IN FUND BALANCE		\$ 800,000	\$ 1,048,538	\$ (378,602)	\$ 240,601	\$ 627,243	\$ 557,264	\$ 945,174
BEGINNING FUND BALANCE		\$ -	\$ 800,000	\$ 1,848,538	\$ 1,469,936	\$ 1,710,537	\$ 2,337,780	\$ 2,895,044
ENDING FUND BALANCE		\$ 800,000	\$ 1,848,538	\$ 1,469,936	\$ 1,710,537	\$ 2,337,780	\$ 2,895,044	\$ 3,840,218
ENDING CASH BALANCE*		\$ 800,000	\$ 1,763,248	\$ 1,401,305	\$ 1,621,937	\$ 2,276,372	\$ 2,790,597	** \$ 3,751,115

*Ending Fund Balance less assets, accumulated depreciation and accounts payable equals ending cash balance.

**Deposit of \$322,243 was made for replacement engine. Excluding this deposit cash balance equals \$3,112,840.

VERF VIRTUAL BALANCES

Department	Category	Total Asset Replacement Value at 9.30.2019	Fund Cash Balance at 9.30.19	Fund Cash Balance Should Be at 9.30.19	% Funded at 9.30.19
General Fund	Vehicles	8,386,493.37	1,809,428.15	2,772,240.71	65.27%
	Mobile Equipment	1,013,223.81	119,870.01	319,078.72	37.57%
	IT Equipment	421,925.00	198,291.51	208,000.00	95.33%
General Fund Total		\$ 9,821,642.18	\$ 2,127,589.67	\$ 3,299,319.43	64.49%
Water/Sewer Fund	Vehicles	1,457,157.82	493,462.52	529,151.66	93.26%
	Mobile Equipment	844,604.82	445,804.59	437,596.30	101.88%
	IT Equipment	50,000.00	26,610.48	25,840.00	102.98%
Water/Sewer Fund Total		\$ 2,351,762.64	\$ 965,877.60	\$ 992,587.97	97.31%
Storm Water Fund	Vehicles	28,243.85	17,009.24	17,652.41	96.36%
	Mobile Equipment	8,465.00	1,347.71	2,821.67	47.76%
	IT Equipment	3,100.00	1,015.78	1,420.00	71.53%
Storm Water Fund Total		\$ 39,808.85	\$ 19,372.73	\$ 21,894.07	88.48%
Grand Total		\$ 12,213,213.67	\$ 3,112,840.00	\$ 4,313,801.47	72.16%

Department	Category	Total Asset Replacement Value at 9.30.2020	Estimated Fund Cash Balance at 9.30.20	Estimated Fund Cash Balance Should Be at 9.30.20	Estimated % Funded at 9.30.20
General Fund	Vehicles	10,363,445.00	2,122,047.31	2,277,904.97	93.16%
	Mobile Equipment	1,016,824.00	281,104.64	382,275.80	73.53%
	IT Equipment	458,995.00	184,639.29	296,919.00	62.19%
General Fund Total		\$ 11,839,264.00	\$ 2,587,791.24	\$ 2,957,099.77	87.51%
Water/Sewer Fund	Vehicles	1,872,417.00	573,459.30	548,470.71	104.56%
	Mobile Equipment	882,490.00	545,348.27	534,060.38	102.11%
	IT Equipment	52,837.00	21,184.80	36,407.40	58.19%
Water/Sewer Fund Total		\$ 2,807,744.00	\$ 1,139,992.37	\$ 1,118,938.48	101.88%
Storm Water Fund	Vehicles	28,244.00	19,541.27	21,183.00	92.25%
	Mobile Equipment	8,465.00	2,234.27	3,527.08	63.35%
	IT Equipment	3,100.00	1,555.66	2,040.00	76.26%
Storm Water Fund Total		\$ 39,809.00	\$ 23,331.20	\$ 26,750.08	87.22%
Grand Total		\$ 14,686,817.00	\$ 3,751,114.81	\$ 4,102,788.33	91.43%

CONTRIBUTIONS BY FUND

FUND	ACTUAL 2017-2018	ACTUAL 2018-2019	ESTIMATED 2019-2020	ESTIMATED 2020-2021
General Fund	817,229	1,296,109	1,706,490	1,191,031
Water/Sewer Fund	252,560	324,000	312,229	281,391
Storm Water Fund	9,038	5,928	3,963	6,083
Total Contributions	\$ 1,078,827	\$ 1,626,037	\$ 2,022,682	\$ 1,478,505

The following tables display the Town's adopted Capital Budgets for the last five fiscal years with projects broken down between debt funding and other funding of capital projects. This information was requested at the Town Council Budget Work Session meeting on June 18, 2020. The other funding sources are displayed at the end of this report. Capital projects can cover multiple fiscal years and may be delayed and budgeted again the following fiscal year. I have attempted to adjust projects to avoid duplication, but some overlap may be reflected in these budgeted projects. The final table at the end of this report displays the cash contributions from the General Fund to the Capital Budget for the same five fiscal years.

FY 2019-2020			
Project Type	Debt Funded	Other Funding	Total Funding
Streets	\$ 17,740,000	\$ 7,114,489	\$ 24,854,489
Traffic	\$ -	\$ 1,200,000	\$ 1,200,000
Parks	\$ 347,000	\$ 1,383,951	\$ 1,730,951
Facility	\$ -	\$ -	\$ -
Water and Sewer	\$ -	\$ 3,151,275	\$ 3,151,275
Drainage	\$ 1,082,765	\$ 100,000	\$ 1,182,765
Totals	\$ 19,169,765	\$ 12,949,715	\$ 32,119,480

FY 2018-2019			
Project Type	Debt Funded	Other Funding	Total Funding
Streets	\$ 7,205,897	\$ 8,585,639	\$ 15,791,536
Traffic	\$ -	\$ 1,535,000	\$ 1,535,000
Parks	\$ 500,000	\$ 3,656,524	\$ 4,156,524
Facility	\$ 12,000,000	\$ 3,150,000	\$ 15,150,000
Water and Sewer	\$ 8,542,198	\$ 9,794,756	\$ 18,336,954
Drainage	\$ 1,700,979	\$ -	\$ 1,700,979
Totals	\$ 29,949,074	\$ 26,721,919	\$ 56,670,993

FY 2017-2018			
Project Type	Debt Funded	Other Funding	Total Funding
Streets	\$ 6,130,000	\$ 47,138,015	\$ 53,268,015
Traffic	\$ -	\$ 1,380,000	\$ 1,380,000
Parks	\$ -	\$ 2,088,524	\$ 2,088,524
Facility	\$ 1,900,000	\$ 3,100,000	\$ 5,000,000
Water and Sewer	\$ 18,300,980	\$ 4,781,635	\$ 23,082,615
Drainage	\$ 400,000	\$ -	\$ 400,000
Totals	\$ 26,730,980	\$ 58,488,174	\$ 85,219,154

FY 2016-2017			
Project Type	Debt Funded	Other Funding	Total Funding
Streets	\$ 3,103,816	\$ 6,566,184	\$ 9,670,000
Traffic	\$ -	\$ 475,000	\$ 475,000
Parks	\$ -	\$ 90,000	\$ 90,000
Facility	\$ 19,236,500	\$ 1,250,000	\$ 20,486,500
Water and Sewer	\$ -	\$ 408,275	\$ 408,275
Drainage	\$ 2,017,500	\$ -	\$ 2,017,500
Totals	\$ 24,357,816	\$ 8,789,459	\$ 33,147,275

FY 2015-2016			
Project Type	Debt Funded	Other Funding	Total Funding
Streets	\$ 7,209,004	\$ 14,838,903	\$ 22,047,907
Traffic	\$ -	\$ -	\$ -
Parks	\$ 8,686,225	\$ 1,990,000	\$ 10,676,225
Facility	\$ 1,450,000	\$ 815,000	\$ 2,265,000
Water and Sewer	\$ 1,157,519	\$ 9,197,981	\$ 10,355,500
Drainage	\$ 2,592,000	\$ 57,500	\$ 2,649,500
Totals	\$ 21,094,748	\$ 26,899,384	\$ 47,994,132

Other Funding Sources Include:

- Cash Contributions from General Fund or Utility Funds
- Developer Contributions
- TIRZ Funding
- Impact Fees
- Park Dedication and Development Funds
- Escrow Funds
- Federal, State Or County Funding
- Grants

General Fund Cash Contributions to CIP Program

FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
\$1,265,000	\$ 4,165,000	\$ 2,160,000	\$ 6,573,000	\$ 1,398,000

SUMMARY	FY 2018		FY 2019		FY 2020	
	PO Value	% Spend	PO Value	% Spend	PO Value	% Spend
Architectural	\$ 1,197,530.94	31.12%	\$ 197,814.79	4.72%	\$ 103,865.00	2.41%
Engineering	\$ 1,791,995.59	46.56%	\$ 2,838,265.55	67.72%	\$ 2,956,036.00	68.67%
Financial	\$ 52,930.00	1.38%	\$ 52,500.00	1.25%	\$ 77,380.00	1.80%
Grant Services	\$ -	0.00%	\$ 19,985.00	0.48%	\$ 18,285.00	0.42%
Human Resources	\$ 20,000.00	0.52%	\$ 64,000.00	1.53%	\$ 35,352.50	0.82%
Inspection	\$ 290,000.00	7.54%	\$ 251,097.50	5.99%	\$ 533,397.00	12.39%
Lobbyist	\$ 39,000.00	1.01%	\$ 72,000.00	1.72%	\$ 72,000.00	1.67%
Miscellaneous	\$ 164,840.70	4.28%	\$ 394,828.36	9.42%	\$ 183,588.00	4.26%
Town Manager	\$ 292,313.00	7.60%	\$ 300,780.00	7.18%	\$ 324,754.44	7.54%
TOTAL	\$ 3,848,610.23		\$ 4,191,271.20		\$ 4,304,657.94	

Type of Service	Vendor Name	Project	FY	PO #	PO Value
Architectural	Randall Scott Architects, Inc.	Design Services for Town Hall/Multi-Purpose Facility	2018	15124	22,325.94
Architectural	GSO Architects, Inc.	Architectural Services Consultant (As Needed Only)	2018	18093	5,000.00
Architectural	Brown Reynolds Watford Arch.	Needs Assessment for Public Safety Complex Phase 1 Police Station and Dispatch Facility	2018	18170	24,900.00
Architectural	Brown Reynolds Watford Arch.	Design Services for Phase 1 Police Station Concept Design Project 1713-FC	2018	18213	24,900.00
Architectural	Brown Reynolds Watford Arch.	Design, Construction Documents, and Construction Phase Services for Public Safety Facility Phase 1 Police Station and Dispatch Facility	2018	18260	1,120,405.00
Engineering	Teague Nail & Perkins, Inc.	Design Services for Town Hall Infrastructure Improvements Project	2018	15170	9,200.00
Engineering	Wier & Associates, Inc.	Construction Documents for Downtown Enhancements Project	2018	16256	8,000.00
Engineering	D&S Engineering Labs	Construction Materials Testing for Town Hall/Multi-Purpose Facility	2018	17067	2,363.00
Engineering	Cobb, Fendley & Assoc., Inc.	Design Services for Paving & Drainage Improvements for Coit Road from E. First St. to Frontier Pkwy Project 1710-ST	2018	17088	400,000.00
Engineering	Freese & Nichols	Design Services for Lower Pressure Plane Water Supply - Pipeline Project 1716-WA (Phase 1)	2018	17144	131,750.00
Engineering	Kimley-Horn and Associates	Design Construction Documents, and Construction Phase Services for Old Town Streets 2015 (Fifth, McKinley) Project 1513-ST	2018	18062	155,000.00
Engineering	Todd Property Advisors, Inc.	Preparation of Seven Appraisals for 9 tracts	2018	18071	12,250.00
Engineering	Pipeline Analysis LLC	CMOM Plan Update	2018	18083	5,500.00
Engineering	DHS Automation	Design and Build Services for Frontier Park Lift Station Scada	2018	18091	13,400.00
Engineering	Garver, LLC	Design Services for Cook Lane and E-W Collector Project	2018	18105	249,686.00
Engineering	BW2 Engineers, Inc.	Design, Construction Documents, and Construction Phase Services for Whitley Place Trail Extension Project	2018	18106	67,750.00
Engineering	D&S Engineering Labs	Geotechnical Services for US Hwy 289 Entryway Monument Design Project	2018	18109	4,800.00
Engineering	Birkhoff, Hendricks & Carter	Drainage Analysis for Prosper Sports Complex	2018	18114	4,940.00
Engineering	JLL Valuation & Advisory	Land Appraisal Services for First Street (DNT - Coleman) Project, W Prosper Road Section D & E Projects, and Parks/Public Works Facility Project	2018	18129	24,900.00
Engineering	Cardinal Strategies	Reclamation Study for Doe Branch Project 1808-PK	2018	18151	24,250.00
Engineering	Half Associates	Construction Documents and Construction Phase Services for US 380 Green Ribbon Landscape Design Project	2018	18152	59,250.00
Engineering	Garver, LLC	Hydrology and Hydraulics Services for Doe Branch Tributary	2018	18184	34,900.00
Engineering	Wier & Associates, Inc.	Design, Construction Documents, and Construction Phase Services for Old Town Drainage - Broadway & Church Retention Pond Improvements Project	2018	18201	114,500.00
Engineering	Stantec Consulting Services	Signal Warrant Analysis	2018	18204	14,950.00
Engineering	Petitt Barraza, LLC	Survey Services for West Prosper Road Improvements, Segment D	2018	18206	4,000.00
Engineering	Freese & Nichols	Wastewater System Analysis	2018	18208	9,960.00
Engineering	Alliance Geotechnical Group	Geotechnical Services for Prosper Police Station Project 1713-FC	2018	18209	7,000.00
Engineering	Burgess & Niple, Inc.	Sanitary Sewer Evaluation Survey	2018	18217	21,046.59
Engineering	Half Associates	Construction Documents for Fishtrap/First Street Intersection Improvements at Dallas North Tollway Project 1820-ST	2018	18240	60,000.00
Engineering	BGE, Inc.	Construction Documents and Construction Phase Services for Victory Way (N. Coleman to Frontier Parkway) Project 1823-ST	2018	18248	247,600.00
Engineering	Lee Engineering	Preston Road Signal Timing Project 1825-TR	2018	18258	47,000.00
Engineering	Spars Engineering, Inc.	Construction Documents and Construction Phase Services for Fishtrap Rd and Teel Pkwy Intersection Improvements Project 1824-ST	2018	18270	50,000.00
Engineering	D&S Engineering Labs	Town of Prosper Draft Pavement Design Manual	2018	18277	8,000.00
Financial	McConnell & Jones LLP	Annual Financial Audit	2018	18002	39,650.00
Financial	First Southwest Asset Mgmt LLC	Arbitrage Rebate Compliance Services	2018	18138	5,780.00
Financial	Willdan Financial Services	Water and Wastewater Rate Study	2018	18200	7,500.00
Human Resources	McGriff, Seibels & Williams	Employee Benefits Consultant	2018		20,000.00
Inspections	Bureau Veritas North America	Third Party Plan Review and Inspection Services	2018	18013	250,000.00
Inspections	Bureau Veritas North America	Health Related Inspection Services	2018	18014	40,000.00
Lobbyist	HillCo Partners, LLC	Legislative Advocacy and Consultation Services	2018	18043	39,000.00
Miscellaneous	City of Frisco	GIS Services	2018	18028	75,182.00
Miscellaneous	Municipal Voice	Public Information Services	2018	18072	36,000.00
Miscellaneous	Terra-Solve, Inc.	Asbestos Survey	2018	18167	5,550.00
Miscellaneous	Randall Scott Architects, Inc.	Town Hall Interior Design	2018	18197	14,750.00
Miscellaneous	Terra-Solve, Inc.	Air Monitoring During ACM Abatement	2018	18211	4,860.00
Miscellaneous	Gary Glen Warren Jr	Fire Department Study Project	2018	18214	12,000.00
Miscellaneous	Kimley-Horn and Associates	Phase 2 Prosper Old Town Area Assessment Project MD18-0005	2018	18285	16,498.70
Town Manager	Public Administrators Inc.	Town Manager Services	2018	18016	292,313.00
					3,848,610.23

*Amounts highlighted in grey represent a change order to a prior year PO that was processed in FY 2018.

FY 2018 Purchase Order Value		% Spend
Architectural	\$ 1,197,530.94	31.12%
Engineering	\$ 1,791,995.59	46.56%
Financial	\$ 52,930.00	1.38%
Grant Services	\$ -	0.00%
Human Resources	\$ 20,000.00	0.52%
Inspection	\$ 290,000.00	7.54%
Lobbyist	\$ 39,000.00	1.01%
Miscellaneous	\$ 164,840.70	4.28%
Town Manager	\$ 292,313.00	7.60%
\$	3,848,610.23	100.00%

Type of Service	Vendor Name	Project	FY	PO #	PO Value
Architectural	Brown Reynolds Watford Arch.	Design, Construction Documents and Construction Phase Services for Public Safety Facility Phase 1 Police Station and Dispatch Facility	2019	18260	173,314.79
Architectural	Parkhill, Smith & Cooper, Inc.	Landscape Architectural Services for Hays Park Project 1802-PK	2019	19026	24,500.00
Engineering	Wier & Associates	Design Services for Old Town Drainage - Church & Parvin Drainage Improvements Project 1613-DR	2019	16105	21,000.00
Engineering	Haff Associates	Construction Documents for Prosper Trail from East of Coit Road to West of Custer Road Project 1709-ST	2019	17122	122,000.00
Engineering	Garver, LLC	Design Services for Cook Lane and E-W Collector Project	2019	18105	16,766.00
Engineering	BW2 Engineers, Inc.	Design, Construction Documents, and Construction Phase Services for Whitley Place Trail Extension Project	2019	18106	9,250.00
Engineering	Freese & Nichols	Design, Construction Documents and Construction Phase Services for Custer Road Pipeline and Meter Vault Relocations Project	2019	19093	290,325.00
Engineering	Teague Hall and Perkins Inc	Town Hall Infrastructure Improvements Project (Close-out for PO 15170)	2019	19107	1,861.05
Engineering	Peak Program Value, LLC	Consultant to Review Public Safety Complex Phase 1 Police & Dispatch Facility - CMAR Process	2019	19108	24,310.00
Engineering	Haff Associates	Construction Documents for Prosper Trail/DNT Intersection Improvements Project 1803-ST	2019	19121	88,000.00
Engineering	Haff Associates	Design Services for Broadway St. Downtown Monument Sign Project 1922-PK	2019	19168	16,000.00
Engineering	Kimley-Horn and Associates	Study for Town Hall Open Space Enhancements Phase 2 Project 1921-PK	2019	19179	36,451.00
Engineering	Freese & Nichols	Analysis of Water Use and Contract Minimums	2019	19182	16,400.00
Engineering	Harris Kocher Smith	Construction Documents for Cook Lane Extension Project	2019	19204	24,740.00
Engineering	Lee Engineering	Prosper Quiet Zone & Railroad Grade Separation Preliminary Design Project 1925-TR	2019	19216	78,000.00
Engineering	Hayden Consultants, Inc	Design of Coleman Street from Gorgeous to Prosper Trail - Interim Improvements	2019	19225	24,995.00
Engineering	Lee Engineering	Operational Improvements Analysis for Intersections on Preston Road	2019	19242	10,600.00
Engineering	Hayden Consultants, Inc	Design Services for Coleman Street from Gorgeous to Prosper Trail - Interim Improvements Phase 2	2019	19243	24,990.00
Engineering	Teague Hall and Perkins Inc	Prosper Town Hall Site Plan and Plat Amendment	2019	19247	5,800.00
Engineering	Reed Engineering Group, Ltd.	Geotechnical Study for Teel-Fishtrap Intersection Improvements	2019	19253	3,300.00
Engineering	Stantec Consulting Services	Traffic Signal Design at Teel Parkway and Fishtrap Road Project 1928-TR	2019	19256	34,100.00
Engineering	Alliance Geotechnical Group	Construction Materials Testing for Town of Prosper Police Station & Dispatch Project	2019	19257	114,177.50
Engineering	Teague Hall and Perkins Inc	Design, Construction Documents and Construction Phase Services for Improvements to Fishtrap Road (Segments 1 & 4) and Schematic Design of Fishtrap Road (Elementary to DNT)	2019	19268	345,000.00
Engineering	Haff Associates	Citywide Trails Master Plan Project 1910-PK	2019	19301	64,000.00
Engineering	RLK Engineering, Inc.	Design Services for Coit Road at US 380 Turn Lane Project	2019	19302	6,300.00
Engineering	Freese & Nichols	Design, Construction Documents and Construction Phase Services for Lower Pressure Plane Pump Station and Pipeline Phase 2 Project 1501-WA	2019	19303	1,434,400.00
Engineering	Stantec Consulting Services	Traffic Signal Warrant Studies Project 1924-TR	2019	19333	20,000.00
Engineering	JLL Valuation & Advisory	Land Surveying Services for Whitley Place Trail Extension Appraisal	2019	19318	3,300.00
Financial	Pattilo, Brown & Hill LLP	Annual Financial Audit	2019	19013	47,500.00
Financial	Ricker I Cunningham, LLC	Financial Advisory Services	2019	19324	5,000.00
Grant Services	Blais & Associates, Inc.	Department of Homeland Security SAFER Grant	2019	19173	6,765.00
Grant Services	Blais & Associates, Inc.	Collin County Parks & Open Space Project Funding Assistance Program	2019	18236	4,460.00
Grant Services	Blais & Associates, Inc.	Texas Parks and Wildlife Department Non-Urban Outdoor Recreation Grant - Whitley Place Park Trail Extension and Amenities	2019	18293	8,760.00
Human Resources	McGriff, Seibels & Williams	Employee Benefits Consultant	2019	19042	20,000.00
Human Resources	Public Sector Personnel Cons.	Compensation and Classification Study	2019	19086	25,000.00
Human Resources	BMI Audit Services	Health Care Claims Audit	2019	19221	19,000.00
Inspection	Bureau Veritas North America	Third Party Plan Review and Inspection Services	2019	19041	249,500.00
Inspection	Johnson-Kelley Associates, Inc	Texas Accessibility Preliminary Inspection for Town Hall - Post Construction Inspection	2019	19127	1,055.00
Inspection	Randall Scott Architects, Inc.	Reimbursement for Texas Accessibility Preliminary Inspection for Town Hall	2019	19125	542.50
Lobbyist	HillCo Partners, LLC	Legislative Advocacy and Consultation Services	2019	19035	72,000.00
Miscellaneous	Terra-Solve, Inc.	Asbestos Survey	2019	19023	8,820.00
Miscellaneous	NCTCOG	Digital Orthophotography	2019	19045	22,333.86
Public Safety	A. Mack Borchardt	Evaluation of Current Practice Specific to Deployment and Operations of the Fire Department Resources	2019	19048	4,750.00
Miscellaneous	Cline Advisors & Consultants	Infrastructure and Transportation	2019	19049	24,900.00
Miscellaneous	City of Frisco	GIS Services	2019	19050	61,000.00
Miscellaneous	Municipal Voice	Public Information Services	2019	19066	36,000.00
Miscellaneous	Southwest Leadership Resources	Promotional Assessment for CID/Admin Sergeant	2019	19080	4,195.00
Miscellaneous	David McCaskill Design Group	3rd Party Landscape Plan Review Services	2019	19092	24,000.00
Miscellaneous	Mike Pietsch, PE Consult Serv	Prepare ISO Pre-Survey Packets and Assist with ISO Information Transfer for Areas Afforded Fire Hydrant Protection	2019	19105	19,000.00
Miscellaneous	Petty & Associates, Inc.	Economic Development Consulting Services	2019	19136	25,000.00
Miscellaneous	Connected Nation, Inc.	Broadband Access Assessment Project Consulting Services	2019	19138	25,000.00
Miscellaneous	Terra-Solve, Inc.	Asbestos Survey	2019	19157	5,810.00
Miscellaneous	Promoter Line, Inc.	Promoter/Producer for Downtown Celebration Event	2019	19192	87,950.00
Miscellaneous	RNDI Companies, Inc	Asbestos Abatement	2019	19207	18,350.00
Miscellaneous	Medical City Plano	Medical Control and Continuing Education for Fire Department	2019	19290	11,017.50
Miscellaneous	Delaney's Design	Interior Design Services for Town Hall Christmas Décor	2019	19316	9,895.00
Miscellaneous	Delaney's Design	Interior Design Services for Town Hall Art	2019	19327	6,800.00
Town Manager Services	Public Administrators, Inc.	Town Manager Services	2019	19001	300,780.00
					4,191,271.20

*Amounts highlighted in grey represent a change order to a prior year PO that was processed in FY 2019.

	FY 2019 Purchase Order Value	% Spend
Architectural	\$ 197,814.79	4.72%
Engineering	\$ 2,838,265.55	67.72%
Financial	\$ 52,500.00	1.25%
Grant Services	\$ 19,985.00	0.48%
Human Resources	\$ 64,000.00	1.53%
Inspection	\$ 251,097.50	5.99%
Lobbyist	\$ 72,000.00	1.72%
Miscellaneous	\$ 394,828.36	9.42%
Town Manager	\$ 300,780.00	7.18%
	\$ 4,191,271.20	100.00%

Type of Service	Vendor Name	Project	FY	PO #	PO Value
Architectural	Kimley-Horn and Associates	Amendment 1 Community Engagement related to Town Hall Open Space Enhancements Project Phase 2 Project 1921-PK	2020	19179	5,975.00
Architectural	Brown Reynolds Watford Arch.	Feasibility Study for Fire Station No. 3	2020	20207	22,000.00
Architectural	Kimley-Horn and Associates	Landscape Architecture for West Prosper Roads, Segment A Gee Road from US 380 to Fishtrap Rd Project 2020-ST	2020	20259	24,950.00
Architectural	Dunaway Associates, LP	Design Services for Pecan Grove Park Phase 2 Project 2015-PK	2020	20281	50,940.00
Engineering	Half Associates	Amendment 1 Modify Construction Documents for Prosper Trail from East of Coit Road to West of Custer Road Project 1709-ST	2020	17122	122,000.00
Engineering	Engineered Air Balance Co, Inc	Commissioning Services for HVAC, Hot Water, and Lighting Control Systems for Police Station and Dispatch Facility	2020	20090	24,900.00
Engineering	Gaylen Howard Laing Architect	Design Services for Frontier Park Storage Buildings Project 2016-PK	2020	20144	13,800.00
Engineering	Stantec Consulting Services	Traffic Signal Design at Coit Rd and Richland Blvd	2020	20172	39,000.00
Engineering	Studio 13 Design Group, PLLC	Construction Documents and Construction Phase Services for Whitley Place Trail Powerline Easement Project 1926-PK	2020	20174	15,725.00
Engineering	Teague Nail and Perkins Inc	Surveying and Civil Engineering Services for Improvements to Fishtrap Road from Stuber Elementary to DNT Project 2012-ST	2020	20191	900,000.00
Engineering	Teague Nail and Perkins Inc	Surveying and Civil Engineering Services for Improvements to First St. from Coit Road to Custer Road Project 2014-ST	2020	20192	1,000,000.00
Engineering	City of Frisco	Design Services for Median Improvements on US Hwy 380 from Lovers Lane to Custer Road	2020	20202	53,725.00
Engineering	Maldonado-Burkett, LLP	Design Services for Traffic Signal at Fishtrap Road and Gee Road Project 2004-TR	2020	20205	34,685.00
Engineering	Freese & Nichols	Evaluation of Interceptor Sizing in the Doe Branch Area of Prosper	2020	20245	5,577.00
Engineering	Schricket, Rollins and	Construction Documents and Construction Phase Services for Hays Park Project 1802-PK	2020	20246	24,990.00
Engineering	Kimley-Horn and Associates	Easement Documents for Gates of Prosper Phase 1	2020	20252	1,678.00
Engineering	Hayden Consultants, Inc	Design Services for Teel (US 380 Intersection Improvements) Project 2013-St	2020	20264	95,985.00
Engineering	Garver, LLC	Design Services for First Street from DNT to Coleman Street Project 1512-St	2020	20272	599,971.00
Engineering	Lee Engineering, LLC	On Call Traffic Engineering Services	2020	20278	24,000.00
Financial	Ricker I Cunningham, LLC	Financial Advisory Services	2020	20068	5,000.00
Financial	Pattillo, Brown & Hill, LLP	Annual Financial Audit	2020	20124	47,500.00
Financial	NewGen Strategies and Solution	Water and Wastewater Rate Study	2020	20173	24,880.00
Grant Services	Blais & Associates, Inc.	JAG Application	2020	20213	7,035.00
Grant Services	Blais & Associates, Inc.	Assistance to Firefighters	2020	20214	6,635.00
Grant Services	Blais & Associates, Inc.	Hays Park Construction	2020	20250	4,615.00
Human Resources	The Benefit Company, Inc	ACA Employer Reporting Fulfillment	2020	20005	3,602.50
Human Resources	McGriff, Seibels & Williams	Employee Benefits Consultant	2020	20045	20,000.00
Human Resources	McGriff, Seibels & Williams	Employee Benefits Consultant	2020	20260	11,750.00
Inspection	Bureau Veritas North America	Third Party Plan Review and Inspection Services	2020	20063	533,397.00
Lobbyist	HillCo Partners, LLC	Legislative Advocacy and Consultation Services	2020	20024	72,000.00
Miscellaneous	Municipal Voice	Public Information Services	2020	20023	36,000.00
Miscellaneous	City of Frisco	GIS Services	2020	20116	80,000.00
Miscellaneous	Medical City Plano	Medical Control and Continuing Education for Fire Department	2020	20026	45,645.00
Miscellaneous	Southwest Leadership Resources	Promotional Assessment for Assistant Chief/Lieutenant/Corporal	2020	20057	11,207.25
Miscellaneous	LeaderSelect, LLC	Promotional Examinations for Lieutenant/Corporal	2020	20058	7,000.00
Miscellaneous	Southwest Leadership Resources	Promotional Assessment for Corporal	2020	20235	3,735.75
Town Manager	Public Administrators Inc.	Town Manager Services	2020	20027	324,754.44
					4,304,657.94

**Amounts highlighted in grey represent a change order to a prior year PO that was processed in FY 2020.*

	FY 2020 Purchase Order Value	% Spend
Architectural	\$ 103,865.00	2.41%
Engineering	\$ 2,956,036.00	68.67%
Financial	\$ 77,380.00	1.80%
Grant Services	\$ 18,285.00	0.42%
Human Resources	\$ 35,352.50	0.82%
Inspection	\$ 533,397.00	12.39%
Lobbyist	\$ 72,000.00	1.67%
Miscellaneous	\$ 183,588.00	4.26%
Town Manager	\$ 324,754.44	7.54%
	\$ 4,304,657.94	100.00%