Board of Building Standards

ELECTRICAL SAFETY INSPECTOR ADVISORY COMMITTEE MEETING AGENDA

DATE: OCTOBER 15, 2021
TIME: 10:00 AM
LOCATION: NO MEETING THIS MONTH

Call to Order

Personnel Certification Applications

P-1 Hickman, James - ESI
Cert ID: 8687
Current Certifications: None
Staff Notes: Appears to meet requirements for certification.
ESIAC Recommendations:
Committee Recommendation:

Continuing Education Applications for Review

ER-1 NEC 2017 of Ohio (HalfMoon Education)
All certifications except PI, PPE, NRIUI, and RIUI
Staff Notes: Omission of ESI on the application was an oversight.
ESIAC Recommendation:
Committee Recommendation:

Old Business

New Business

Adjourn

File Attachments for Item:

P-1 Hickman, James - ESI

Cert ID: 8687

Current Certifications: None

Staff Notes: Appears to meet requirements for certification.

ESIAC Recommendations:

Committee Recommendation:

Board of Building Standards Application for Interim Certification, Building Department Personnel

Hickman — *Last Name*

James — *First Name*

BBS Certification ID

SECTION 1: CHECK INTERIM CERTIFICATION(S) BEING REQUESTED

☐ Building Official	☐ Master Plans Examiner	☐ Building Inspector	☒ Electrical Safety Inspector	☐ Fire Protection Inspector
☐ Building Plans Examiner	☐ Plumbing Plans Examiner	☐ Mechanical Plans Examiner	☐ Electrical Plans Examiner	☐ Fire Protection Plans Examiner
	☐ Plumbing Inspector	☐ Mechanical Inspector	☐ Non-Residential Industrial Unit Inspector	

SECTION 2: LIST ANY OHIO LICENSE, CERTIFICATE, OR REGISTRATION HELD

(Mark "T" If Trainee)

Description			Certificate Number	Date Received
Architectural Registration				
P.E. Registration				
Res	Non-Res			
☐	☐	Building Official Certification		
☐	☐	Plans Examiner Certification		
☐	☐	Building Inspector Certification		
☐	☐	Mechanical Inspector Certification		
Building Plans Examiner Certification				
Mechanical Plans Examiner Certification				
Fire Protection Plans Examiner Certification				
Electrical Plans Examiner Certification				
Plumbing Plans Examiner Certification				
Fire Protection Inspector Certification				
Electrical Safety Inspector Certification				
Plumbing Inspector Certification				
Fire Safety Inspector Certification				
Fire Protection System Designer Certification				
Medical Gas Piping Inspector Certification				

Hickman
Last Name

James
First Name

BBS Certification ID

SECTION 3: EMPLOYMENT/EDUCATION

Formal Education	Date Graduated
Midview High School	06/07/1986
Related Vocational or Technical Training	**Years' Experience**
A.B.C School Annapolis MD	1
J.A.T.C. Local 26 Washington DC	1
U.S. Military construction experience (MOS or other designation):	**Years' Experience**
Place of Employment:	**Years' Employed**
Valid Electric CO. 7731 Airpark Rd. Gaithersburg MD 20879	31

SECTION 4: APPLICANTS REQUESTING MEDICAL GAS INSPECTOR CERTIFICATION

Attach proof *of certification by an ASSE recognized third-party certifier in accordance with ASSE standard 6020.*

SECTION 5: OBC BUILDING INSPECTION EXPERIENCE PERFORMED FOR A BBS CERTIFIED BUILDING DEPARTMENT

BBS Certified Building Department	BBS Certified Position/Title	Duties	Date of Service, Length of Time (MM/DD/YY)

Hickman
Last Name

James Hickman
First Name

BBS Certification ID

SECTION 6: ELECTRICAL SAFETY INSPECTOR (ESI) - SPECIFIC EXPERIENCE QUALIFICATIONS

Applicants for Electrical Safety Inspector Only Must Complete This Item

Section 3783 of the Ohio Revised Code specifies that an applicant for a Certificate of Competency as an Electrical Safety Inspector must meet on of the following to qualify to take required examination. Please check the qualification that applies:

1. ☐ Have been a journeyman electrician or equivalent for four years, two of which were as an electrician foreman, and have had two years' experience as a building department electrical inspector trainee;
2. ☐ Have been a journeyman electrician or equivalent for four years and have had three years' experience as a building department electrical inspector trainee;
3. ☐ Have had for four years' experience as a building department electrical inspector trainee;
4. ☒ Have been a journeyman electrician or equivalent for six years;
5. ☐ Am a graduate electrical engineer and registered in the State of Ohio. Registration number: _____
6. ☐ Applicant authorizes all testing organizations including ICC to provide test results to the BBS.

SECTION 7: EXPERIENCE *(DO NOT SUBSTITUTE WITH OTHER RESUMES)*.

Refer to Experience Requirements Listed in O.A.C. 4101:7-3-01 and O.R.C. 3783

Below, list the specific projects you worked on, and the specific work you performed, your typical duties for each project, and dates of this work. You **must** demonstrate that you have the required number of months (years) of actual, practical experience for the certification requested (see matrix).

Provide letters from certified inspectors, employers, or contractors verifying your experience. Submit copies of any certificates, diplomas, or licenses. Remove all personal information.

SECTION 7 CONT.: EXPERIENCE

List Each Construction Project AND Specific Type of Work Performed	Name of Employer, Contact, Address, Telephone Number	Project Time: From_ To _ (MM/YY)
Example: *Children's Hospital, Toledo* *Structural steel work on addition*	*Homer Steel and Trade* *125 Anytown Street* *My City, OH, 45454* *(419)555-1212*	*July 2013-May 2014* *(10 months)*
Norwegian embassy Washington DC. Remoided/addition Electrical	Valid Electric co. 7731 Airpark Rd. Gaithersburg MD 20879	9/1/2020 4/30/2021
VA Clinic Charlotte Hall MD New construction Electrical	Valid Electric CO 7731 Airpark Rd. Gaithersburg MD 20879	12/2/2019 08/28/2020
Total Experience on This Page (In Months):		16 months

Hickman
Last Name

James
First Name

BBS Certification ID

List Each Construction Project AND Specific Type of Work Performed	Name of Employer, Contact, Address, Telephone Number	Project Time: From_ To _ (MM/YY)
Maloney Hall Catholic University Washington DC. Remodeled classrooms/offices	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD 20879	08/04/2017 11/29/2019
McDowell Hall St. John's College Annapolis MD Remolded classrooms	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD 20879	1/04/2017 7/28/2017
St. John Paul Shrine Washington DC. Courtyard/site lighting	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD 20879	12/23/2016 2/01/2016
AB Pav. Vinson Hall Mclean Virginia Renovation Nursing Home	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD 20879	2/01/2016 11/28/2016
Montgomery College Rockville MD Fire alarm Install	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD 20879	1/09/2015 1/29/2016
Fair Oaks Mall Fairfax Virginia Interior mall Renovation	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD 20879	9/2/2013 12/26/2014
Washington Canal Park Washington DC. Park/Pavilion New Installation	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD 20879	8/05/2013 7/02/2012
	Total Experience on This Page (In Months):	98

Hickman | James | _____
Last Name | First Name | BBS Certification ID

SECTION 6: ELECTRICAL SAFETY INSPECTOR (ESI) - SPECIFIC EXPERIENCE QUALIFICATIONS
Applicants for Electrical Safety Inspector Only Must Complete This Item
Section 3783 of the Ohio Revised Code specifies that an applicant for a Certificate of Competency as an Electrical Safety Inspector must meet on of the following to qualify to take required examination. Please check the qualification that applies:

1. ☐ Have been a journeyman electrician or equivalent for four years, two of which were as an electrician foreman, and have had two years' experience as a building department electrical inspector trainee;
2. ☐ Have been a journeyman electrician or equivalent for four years and have had three years' experience as a building department electrical inspector trainee;
3. ☐ Have had for four years' experience as a building department electrical inspector trainee;
4. ☒ Have been a journeyman electrician or equivalent for six years;
5. ☐ Am a graduate electrical engineer and registered in the State of Ohio. Registration number: _____
6. ☐ Applicant authorizes all testing organizations including ICC to provide test results to the BBS.

SECTION 7: EXPERIENCE *(DO NOT SUBSTITUTE WITH OTHER RESUMES).*
Refer to Experience Requirements Listed in O.A.C. 4101:7-3-01 and O.R.C. 3783
Below, list the specific projects you worked on, and the specific work you performed, your typical duties for each project, and dates of this work. You **must** demonstrate that you have the required number of months (years) of actual, practical experience for the certification requested (see matrix).
Provide letters from certified inspectors, employers, or contractors verifying your experience. Submit copies of any certificates, diplomas, or licenses. Remove all personal information.

SECTION 7 CONT.: EXPERIENCE

List Each Construction Project AND Specific Type of Work Performed	Name of Employer, Contact, Address, Telephone Number	Project Time: From_ To _ (MM/YY)
Example: *Children's Hospital, Toledo* *Structural steel work on addition*	*Homer Steel and Trade* *125 Anytown Street* *My City, OH, 45454* *(419)555-1212*	*July 2013-May 2014* *(10 months)*
Norwgian embassy Washington D.C. Addition, Demo electric in old building, new service, Branch circuits, Lighting, Fire alarm, conduit, underground conduit, court yard lighting.	Valid Electric Co. 11731 Air Park Rd. Gaithersburg MD. 20879	9/1/2020 4/30/2021
VA Clinic Charlotte Hall MD. New construction, electrical service, fire alarm, branch circuits, Lighting, Security conduits, Parking Lot lighting, IT conduits and grounding	Valid Electric Co. 11731 Air Park Rd. Gaithersburg MD. 20879	12/2/2019 08/28/2020
Total Experience on This Page (In Months):		16 months

Hickman — *Last Name*
James — *First Name*
BBS Certification ID

List Each Construction Project AND Specific Type of Work Performed	Name of Employer, Contact, Address, Telephone Number	Project Time: From_ To _ (MM/YY)
Maloney Hall Catholic University Washington D.C. Demo electric, Install new service, Branch circuits, lighting, lighting controls, Fire alarm, IT conduits, elevator Power, Court yard lighting.	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD. 20879	08/04/2017 11/29/2019
McDowell Hall St. John's college Annapolis MD. Remolded building, Demo electric, installed Branch circuits, lighting, new fire alarm systems, elevator Power, IT conduits	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD. 20879	01/04/2017 07/28/2017
St. John Paul Shrine Washington D.C. Courtyard/site lighting, underground conduits, Branch lighting circuits, Lighting controls, Install light fixtures.	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD. 20879	12/23/2016 2/01/2016
A.B. Pav. Vinson Hall Mclean Virginia Renovation nursing home, Demo electric, install branch circuits, lighting, add fire alarm devices, wire kitchen appliances.	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD. 20879	2/01/2016 11/28/2016
Montgomery College Rockville MD. fire alarm upgrade in (6) buildings. Installed fire alarm conduits, wiring, fire alarm Panels, devices, testing, Inspection	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD. 20879	1/09/2015 1/29/2016
Fair oaks mall Fairfax Virginia Interior/exterior renovation. Demo electric, install underground conduits, Branch circuits, Light fixtures, floor boxes, electric Panels, electric devices, escalator Power, IT conduits	Valid Electric Co. 7731 AirPark Rd. Gaithersburg MD. 20879	9/2/2013 12/26/2014
	Total Experience on This Page (In Months):	85

Board of Building Standards Application for Interim Certification, Building Department Personnel

Hickman — *Last Name*

James — *First Name*

BBS Certification ID

List Each Construction Project AND Specific Type of Work Performed	Name of Employer, Contact, Address, Telephone Number	Project Time: From_ To _ (MM/YY)
Washington Canal Park Washington D.C. New Park/Pavilion installation. New Service, Switchboard, motor control center, underground conduits, Branch circuits, light fixtures, Parking lot Lighting, fire alarm system, motor connections, electrical devices.	Valid Electric co. 7731 Air Park Rd. Gaithersburg MD. 20879	8/05/2013 7/02/2012
	Total Experience on This Page (In Months):	13

Hickman
Last Name

James
First Name

BBS Certification ID

SECTION 8: PERSONAL HISTORY

1. Have you ever been convicted of any felony, or any crime involving moral turpitude? ☐ Yes ☒ No

   If you answered "Yes" please explain below:

2. Have you served in the U.S. armed services? (If No, skip question 3) ☐ Yes ☒ No
3. If YES, were you discharged under honorable conditions? ☐ Yes ☐ No

   If you answered "No" please explain below:

SECTION 9: CERTIFICATION

I certify the information contained in this application is true and complete, and I understand that providing false information may be grounds for not granting certification or for immediate termination of certification at any point in the future, if granted. I authorize the investigation of all statements contained herein and release all parties from all liability for any damage that may result from furnishing the same to Ohio Board of Building Standards. Falsification is a violation of section 2921.13 of the Ohio Revised Code and is punishable as a misdemeanor of the first degree.

Signature of Applicant: [signature]

Subscribed and duly sworn before me according to law, by the above named applicant this day 17 of September in the year 2021 at Columbia Station, County of Lorain and State of Ohio

Notary Public: [signature]

NOTARY PUBLIC STATE OF OHIO

KIMBERLY KUSHEN
Notary Public, State of Ohio
My Comm. Expires September 24 2025

INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS
Local 26
UNION CRAFTSMANSHIP WITH PRIDE!

C.E. GRAHAM
Business Manager

R. G. RAMOS
President

M.R. SHOEMAKER
Financial Secretary

F.E. LADDBUSH, JR.
Recording Secretary

GENERAL OFFICE
4371 Parliament Place
Lanham, MD 20706
301-459-2900
Fax: 301-459-2100

WASHINGTON DC OFFICE
7059 Blair Road, N.W.
Washington, DC 20012
202-291-2405
Fax: 202-829-0134

SOUTHERN MD OFFICE
101 Skipjack Road #4
Prince Frederick, MD 20678
301-494-0981
Fax: 410-535-0221

CHARLOTTESVILLE OFFICE
386-D Greenbrier Drive
Charlottesville, VA 22901
434-975-4239
Fax: 434-975-4249

MANASSAS OFFICE
8731 Plantation Lane #6
Manassas, VA 20110-4506
703-690-6126
Fax: 703-361-7862

WINCHESTER OFFICE
166-4 Garber Lane
Winchester, VA 22602
540-722-4421
Fax: 540-722-3731

ROANOKE OFFICE
6306 Peters Creek Rd., NW
Roanoke, VA 24019
540-563-0336
Fax: 540-563-0337

May 18, 2011

To Whom It May Concern:

The applicant, James A. Hickman, social security number [redacted] in accordance with our records, is a competent and qualified journeyman electrician and has had the following electrical work experience out of Local Union No. 26, IBEW:

WORKED AS A RESIDENTIAL TRAINEE FOR:

CONSTRUCTION MANAGEMENT	From 05/01/87 to 09/01/88.
MAC ELECTRICAL CONST.	From 08/03/89 to 10/04/90.
VALID ELECTRIC	From 10/15/90 to 05/31/92.

WORKED AS A RESIDENTIAL WIREMAN FOR:

VALID ELECTRIC	From 06/01/92 to 05/12/99.

WORKED AS A JOURNEYMAN ELECTRICIAN FOR:

VALID ELECTRIC	From 05/13/99 to present.

Very truly yours,

Charles E. Graham
Business Manager

CEG/njg
opeiu #2

INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS
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Fax: 540-722-3731

ROANOKE OFFICE
6306 Peters Creek Rd., NW
Roanoke, VA 24019
540-563-0336
Fax: 540-563-0337

February 24, 2011

James Hickman
[redacted]

Dear Brother:

On behalf of the officers and members of I.B.E.W. Local Union No. 26, I congratulate you on achieving 20 years of membership in our proud organization. I am pleased to present you with a 20 year service award in recognition of your dedication to a professional career in the electrical industry.

The faithful service to this brotherhood by members like you, has contributed to building our reputation as a strong and honorable Local Union. Please accept our sincere appreciation and gratitude.

The award presentation will be made at the monthly local union meeting Friday, March 11, 2011 at 4371 Parliament Place, Lanham, MD 20706. The meeting begins at 8 p.m. When you check-in at the meeting, please advise the doorman that you are receiving your service award. Failure to check-in will result in your name being omitted from the Award Roster and you may not be called to receive your award.

Please advise the Financial Secretary's office by March 9, 2011 regarding your attendance at this meeting. Call the Finance Office at (301) 459-2900 between 8 a.m. and 3:00 p.m., Monday through Friday.

I look forward to seeing you there.

Fraternally,

Michael R. Shoemaker

Michael R. Shoemaker
Financial Secretary

MRS:ll/opeiu2,afl-cio

NECA
NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION

LOCAL 26 IBEW

CERTIFICATE OF COMPLETION

This certificate is awarded to

James Hickman

For Successfully Completing **10** Contact Hours of Related Material
in **2014 NEC Significant Changes**

NECA/IBEW LOCAL UNION #26
JOINT APPRENTICESHIP AND TRAINING COMMITTEE

CHAIRMAN — Date 3/21/15

SECRETARY — Date 3-21-15

INSTRUCTOR — Date 3-21-15

The Trustees
of the

ELECTRICAL TRAINING ALLIANCE

for the

INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS®

and the

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION

do hereby present this certificate to

JAMES HICKMAN

indicating they have satisfactorily completed the course

2015 NEC SIGNIFICANT CHANGES

which is herewith acknowledged by the following signatures

President, IBEW®

CEO, NECA

Executive Director,
Electrical Training ALLIANCE

Instructor

International Brotherhood of Electrical Workers

GENERAL OFFICE: 6220 KANSAS AVE., N.E., WASHINGTON, D.C. 20011 • TELEPHONE 829-2900 • FINANCIAL OFFICE: TELEPHONE 829-1114

LOCAL 26 IBEW
CHARTERED 1892
AFL-CIO

July 1, 1998

Mr. James A. Hickman
[redacted]

Dear Brother Hickman:

Congratulations! You have been accepted into the Residential Upgrade Program for the September 1998 session. You will be required to attend one year of up grade school.

You will be notified by the Apprenticeship Program Director of the time, date and place where you must attend school this fall.

All registrants must present to the Examining Board a current dues receipt for admittance to the upgrade school on the first night of class.

If you have any questions please call me at 202-829-2900 ext. 36.

Fraternally,

Charles E. "Chuck" Graham
Chairman, Examining Board

CEG/tmk
opeiu #2

The Trustees
of
The National Joint Apprenticeship and Training Committee

for the

INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS

and the

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION

upon the Recommendation of the

LU 26 IBEW Electrical

JOINT APPRENTICESHIP AND TRAINING COMMITTEE

do hereby present this certificate to

James Hickman

indicating they have satisfactorily completed a Training Program in

Fire Alarm Systems I

which is herewith acknowledged by the signatures of the Trustees

on this seventh day of May in the year 1998

J.J. Barry

President, IBEW

Lee M. Gross

Executive Vice President, NECA

IBEW – NECA ATTITUDE + SKILL + KNOWLEDGE FOR THE ELECTRICAL INDUSTRY NJATC APPRENTICESHIP & TRAINING

E.H. Satterfield Jr.

JATC Chairman

David L. McCall

JATC Secretary

INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS
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Fax: 540-722-3731

ROANOKE OFFICE
6306 Peters Creek Rd., NW
Roanoke, VA 24019
540-563-0336
Fax: 540-563-0337

December 28, 2015

James Hickman
[redacted]

Dear Brother Hickman:

On behalf of the officers and members of I.B.E.W. Local Union No. 26, I congratulate you on achieving 25 years of membership in our proud organization. I am pleased to present you with a 25-year service award in recognition of your dedication to a professional career in the electrical industry.

Faithful service to this brotherhood by members like you, James, has contributed to building our reputation as a strong and respected Local Union. Please accept our sincere appreciation and gratitude.

The award presentation will be made at the monthly local union meeting, Friday, January 8, 2016 at 4371 Parliament Place, Lanham, MD 20706. The meeting begins at 8 p.m. When you check-in at the meeting, please advise the doorman that you are receiving your service award. Failure to check-in will result in your name being omitted from the Award Roster and you may not be called to receive your award.

Please advise the Finance office prior to the meeting date if you will attend. Email Linda Lawrence at llawrence@ibewlocal26.org or call (301) 918-8832, from 8 a.m. to 3:00 p.m., Monday through Friday. You may leave a voice mail message.

I look forward to seeing you there.

Fraternally,

Joseph F. Dabbs

Joseph F. Dabbs
Financial Secretary

JFD:ll/opeiu2,afl-cio

File Attachments for Item:

ER-1 NEC 2017 of Ohio (HalfMoon Education)

All certifications except PI, PPE, NRIUI, and RIUI

Staff Notes: Omission of ESI on the application was an oversight.

ESIAC Recommendation:

Committee Recommendation:

National Electrical Code 2017 of Ohio

Live, Interactive Webinar – December 15, 2021

8:00-8:45 **Overview of Major Changes in the 2017 Code and Preview of Expected Changes in Future Codes**

Article 425: Fixed Industrial Process Heating

Article 691: Large-Scale PV Electric Power Production

Article 706: Energy Storage Systems

Article 710: Stand-Alone Systems

Article 712: Direct-Current Microgrids

Ohio amendments

8:45-9:30 **Chapter 1: National Electrical Code**

Requirements for electrical installations, including

Clearances and free space requirements about equipment

New reconditioned equipment, identification and traceability;

New limited access working space requirement

New short-circuit current documentation

9:30-10:15 **Chapter 2: Wiring and Protection**

Grounded conductors

Voltage drop calculations

Branch circuit, feeder and services calculations

GFCI receptacle outlet requirements

Service requirements

Transformer protection

New GFCI protection for non-dwelling units

10:15-10:30 **Break**

10:30-11:15 **Grounding and Bonding**

Grounding of service entrances

Grounding of separately-derived systems

Grounding electrodes

Sizing of grounding electrode and grounding conductor

Bonding of services

11:15-12:00 **Chapter 3: Wiring Methods and Materials**

Wiring methods—underground installation requirements

Conductors for general wiring

	Conductor ampacity correction and adjustments	
	Number of conductors in a raceway	Pull and junction box fill calculation
	New Single-phase dwelling services and feeders	
12:00-1:00	**Lunch**	
1:00-1:45	**Chapter 4: Equipment for General Use**	
	Flexible cords and cables	Receptacle requirements
	Switchboards and panel boards	Short circuit rating
	Luminaires, appliances, transformers and motors	
1:45-2:15	**Chapter 5: Special Occupancies**	
	Hazardous locations	Commercial garages
	Health care facility requirements	Recreational vehicle parks
2:15-2:45	**Chapter 6: Special Equipment**	
	Signs, outline lighting, elevators	Hybrid vehicle plug in requirements
	Data center requirements	Pools and spas
	Solar photovoltaic systems	Small wind turbine systems
2:45-3:00	**Break**	
3:00-3:30	**Chapter 7: Special Conditions**	
	Emergency systems	Class 1, 2, and 3 power-limited circuits
	Fire alarm circuits	
3:30-4:00	**Chapter 8: Communications Circuits**	
	Premises-powered broadband communication systems	
	Network-powered broadband communication systems	
4:00-4:30	**Chapter 9: Tables**	

APPLICATION

FOR

Continuing Education Course Approval

Continuing education programs approved for education credit by the Ohio Board of Building Standards may be used for compliance with certification requirements related to code enforcement, plan review, and inspection responsibilities. The credit is to be used to renew the certifications issued by the Ohio Board of Building Standards pursuant to section 3781.10(E) ORC.

Board of Building Standards
6606 Tussing Road, P.O. Box 4009
Reynoldsburg, Ohio 43068-9009
(614) 644-2613 Fax: (614) 644-3147
dic.bbs@com.state.oh.us
www.com.state.oh.us/dic/dicbbs.htm

COURSE SUBMITTER:

Course Submitter: Tim Case, CE Coordinator
(Contact Name)

Organization: HalfMoon Education, Inc.
(Organization/Company)

Address: PO Box 278
(Include Room Number, Suite, etc.)

City: Altoona State: WI Zip: 54720

E-Mail: halfmoonce@halfmoonseminars.org

Telephone: 715-835-5900 x2035 Fax: 715-835-6066

Course Sponsor: HalfMoon Education, Inc.

COURSE INFORMATION:

Course Title: National Electrical Code 2017 of Ohio

New Course Submittal: ■ Update Course: ☐ Prior Approval Number: _____

Purpose and Objective: The objective of this program is to educate learners on the NEC 2017 as adopted in Ohio. Topics will an overview of major changes in the 2017 code, and a chapter-by-chapter examination of requirements for wiring and protection, grounding and bonding, wiring methods and materials, equipment for general use, special occupancies, equipment, and conditions, and communications circuits.

Number of Instructional Contact Hours that can be obtained upon completion: 7.0 (420 minutes)

If Multi-Session, Number of Instructional Contact Hours Per Session: _____

Program Applicable for the Following Participants:

Building Official	■	Master Plans Examiner	■	Building Inspector	■	Fire Protection Inspector	■
		Building Plans Exam.	✔				
		Plumbing Plans Exam.	☐				
		Electrical Plans Exam.	■				
		Mechanical Plans Exam.	■				
		Fire Protect. Plans Exam.	✔				

Mechanical Inspector	■	Plumbing Inspector	☐	Non-Res IU Inspector	☐				
Res Building Official	■	Res Plans Examiner	■	Res Building Inspector	■	Res Mechanical Inspector	■	Res IU Inspector	☐

Electrical Safety Inspectors ☐

Location of ESI Course: _____ Date(s) of ESI Course(s): _____

SUBMITTAL CHECKLIST: **Make Sure** all of the Following Information is **Submitted**:		Check Off
Course Submitter:	Name of contact person and their certification numbers, organization, address, fax, phone	x
	Organization sponsoring or requesting the program (if any)	x
Course Title:	Name of course (related to content)	x
Purpose/Objective:	Describe purpose and how course will improve competency of certification(s) listed	x
Contact Hours:	Indicate instructional time and credit requested in hours (e.g.: 0.5 hr, 1 hr, 3.5 hrs)	x
Participants:	Check off each certification for which credit is requested (for which course relates to certification)	x
Content of Program:	Include collated agenda, time schedule, course outline; list specific sections of code, references, and topics covered	x
Course Materials:	Collated workbooks, handouts, hard copy or electronic versions of program is available	x
Instructor(s) Info.:	Resume of professional/educational qualifications & teaching/training experience/BBS certifications	x
Test Materials:		
Completed Application:		x

NOTE: The Board does NOT grant retroactive approval for courses presented prior to approval date.

Instructor Contact Info

Speaker 1
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Instructor Biography

***JD White**, Consultant at Freelance Electrical System Design and Drafting*

Mr. White's past ten years with Columbus State Community College in Columbus, Ohio, as its Skilled Trades Program coordinator, has provided him with insights beyond teaching, including migration to semesters, and providing oversight of 144 apprenticeship courses and 28 open enrollment courses covering construction, carpentry, electrical, plumbing, and welding. Mr. White helped craft 15 plans for study for various certificates, AAS majors, and ATS majors. He has been an active part of articulation agreements, with various vocational career programs and apprenticeship programs. He started a new open enrollment program in June of 2007, which had over 200 active students, and filled 28 course sections per term, prior to him handing it over to a new faculty member. Mr. White is presently working with 10 apprenticeship partnerships with annual enrollment of 1,500 students. He has oversight of five labs, equipment, materials, and lab personnel.

NEC 2017 REVIEW OF CHANGES CHAP. 1-9

Presented by JD White
jwhite02@cscc.edu

Overview of 2017 Changes

- 4,102 Suggestion Submitted
- 1,233 Given Consideration
- 1,513 Public Inputs on Considerations
- 559 Changes, Many are Grammatical
- 226 Considered Note Worthy
- 138 Covered in this presentation
- 9 New Articles Proposed
- 5 New Articles Accepted

- Article 90 = 11
- Chapter 1 = 13
- Chapter 2 = 37
- Chapter 3 = 18
- Chapter 4 = 37
- Chapter 5 = 34
- Chapter 6 = 47
- Chapter 7 = 21
- Chapter 8 = 4
- Chapter 9 = 4

Article 90

90.3 Arrangement

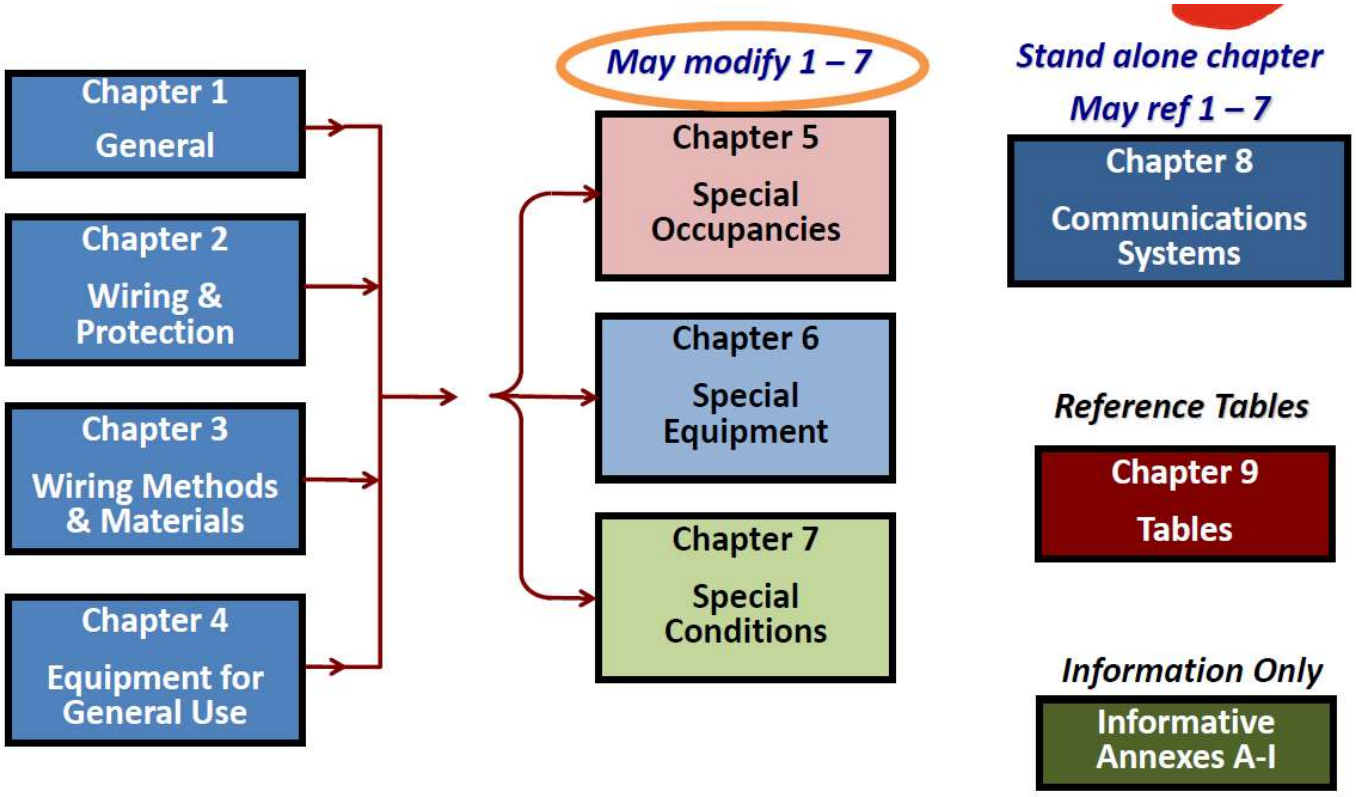
Chapters 1-4 General requirements of NEC

Clarified that Chapters 5-7 May modify chapters 1-7

Chapter 8 is not subject to 1-7 except where noted in 8

Chapter 9 is Tables and Apply as Noted

Annexes are Informational Only



Code Wide Changes

- New Articles
- 425 Fixed Resistance and Electrode Industrial Process Heating Equipment
- 691 Large-Scale Photovoltaic (PV) Electric Supply Stations
- 706 Energy Storage Systems
- 710 Stand-Alone Systems
- 712 Direct-Current Microgrids

Code Wide Changes

- Definitions were added to Article 100, and there were definitions found within other articles relocated to Article 100
- Work Space in Article 110, will now be prescriptive, acknowledging full compliance not always feasible
- Continued migration of changing 600V to 1,000V through out Code. The 600V Threshold is still valid
- Documentation of Available Short-Circuit Current, added in 9 Articles

Definitions Relocated to Article 100

Limited Access Working Space

600 Volts Threshold to 1000 Volts

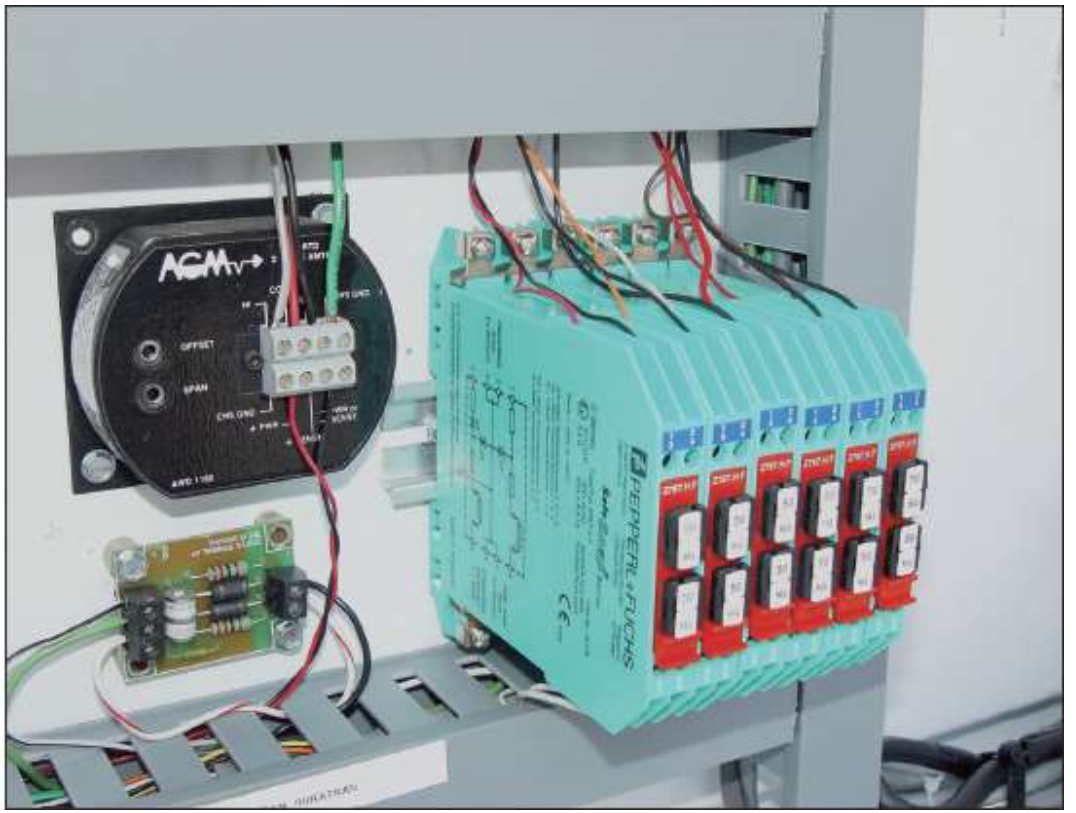
Available Short-Circuit Current

Accessible, Readily

- The use of a key is not considered taking an action such as the use of a “Tool” to gain ready access.
- Whereas Crawling under something or climbing over something is not considered readily accessible

Associated Apparatus

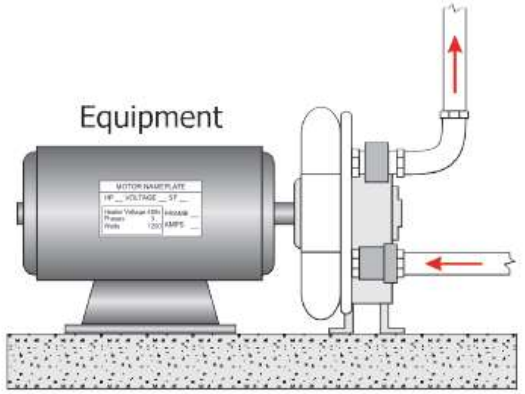
- Definition was relocated Article 100
- Relocated here to allow application across all hazardous locations
- These are devices which may not be Intrinsically Safe Systems, but connect with Intrinsically Safe Systems



Building, Structure

- Terms revision aligns with current Building Code terms.
- These terms were revised to eliminate Building Code provisions and to clarify that a structure is something other than equipment

Building



Structure

Building - A structure that stands alone or that is ~~cut off~~ separated from adjoining structures by fire walls ~~with all openings therein protected by approved fire doors~~.

Structure - That which is built or constructed, other than equipment.

Coaxial Cable

- This term was relocated
- This will allow an application to other articles

Field Evaluation Body(FEB) and Field Labeled

- New Term
- Field evaluations of electrical products are a recognized process.
- For the NEC to use terms related to a field evaluation, these terms need to be defined.

Field Evaluation Body (FEB). An organization or part of an organization that performs field evaluations of electrical or other equipment. [NFPA 790, 2012]

Field Labeled (as applied to evaluated products). Equipment or materials to which has been attached a label, symbol, or other identifying mark of an FEB indicating the equipment or materials were evaluated and found to comply with requirements as described in an accompanying field evaluation report.

Receptacle

- This is a Revision
- The definition of a receptacle has been revised to recognize mating devices used to install luminaires and ceiling-suspended (paddle) fans.
- This accommodates electrical equipment employing means, other than traditional attachment plug caps, and connecting directly to corresponding contact devices.

Listed locking support and mounting receptacle with compatible attachment fitting

Courtesy of Safety Quick Lighting and Fans Corp

Receptacle. A contact device installed at the outlet for the connection of an attachment plug, or for the direct connection of listed and labeled electrical utilization equipment designed to mate with the corresponding contact device. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is two or more contact devices on the same yoke.

SAFETY QUICK LIGHT

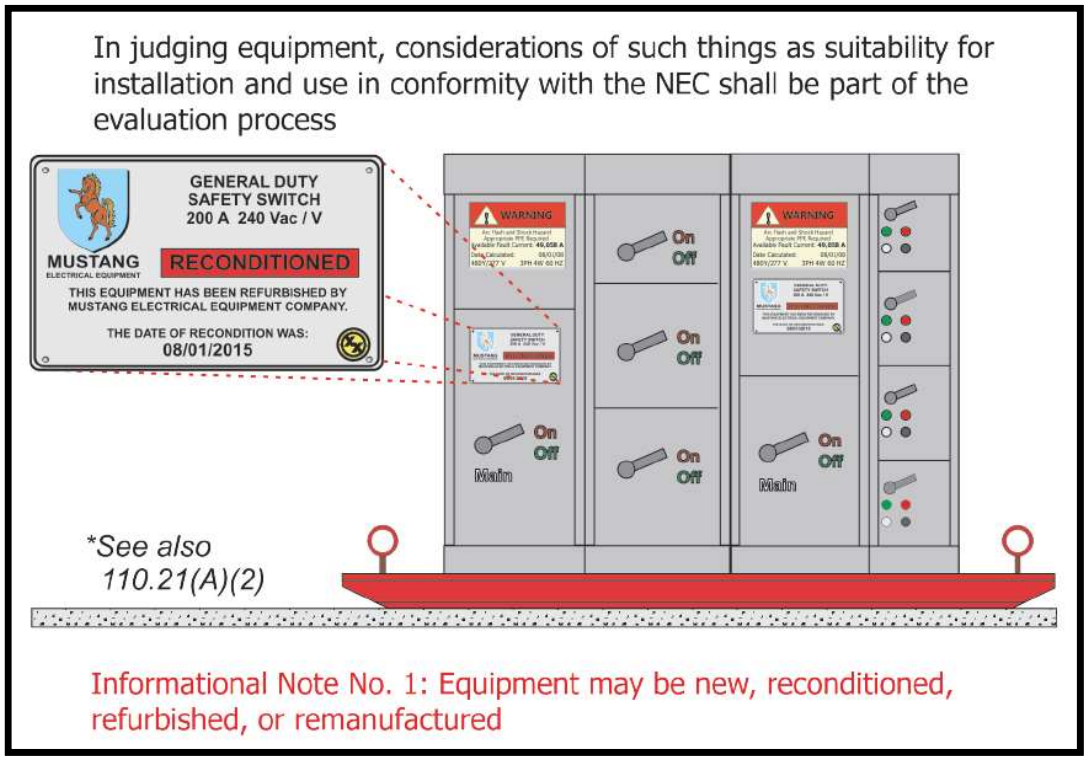
Plug-In Lighting & Fans

- **Female Receptacle**
- Wire are secured into the holes on the side of the receptacle.
- Receptacle is fastened to the junction box in the ceiling or wall with two screws
- Male plug is pre-installed on fixture and wires attached during manufacturing
- Male plug is inserted into receptacle and locked into position with ball-bearing push button system
- **Holds 50 lbs,** tested to 200 lbs

CHAPTER 01
GENERAL REQUIREMENTS

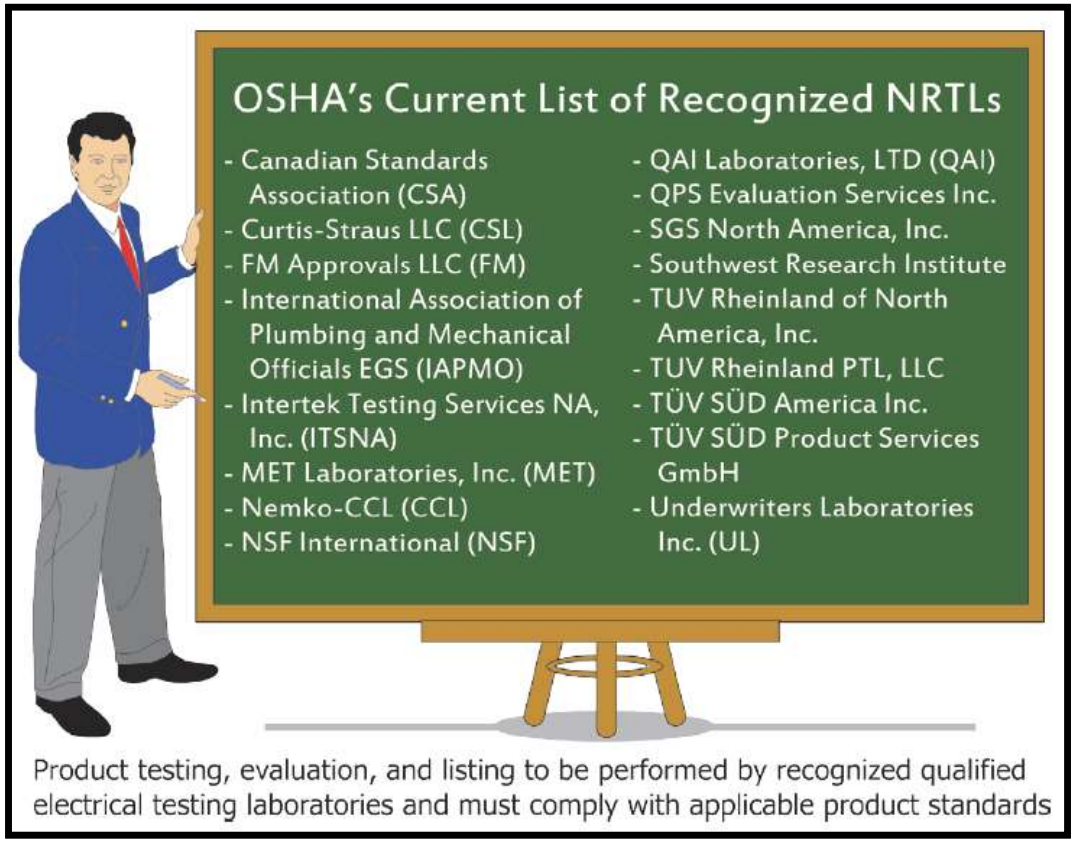
Article 110.3(A)(1) Info Note 1

- New I-Note was added indicating equipment may be new, reconditioned, refurbished or remanufactured.
- When it is Installed, Inspected, and Examined.



Article 110.3(C)

- Examination, Identification, Installation, Use, and Listing (Product Certification) of Equipment
- Testing must be by a Qualified third-party electrical testing laboratory.



Article 110.14(D)

- Electrical Connection Torque Tools
- 2014 NEC, made electricians aware of necessity to torque per manufactures specification
- Otherwise up to 75% are wrong
- 2017 Requires Torque tools be used on all equipment where a specification is listed on equipment and/or installation instructions, provided by the manufacture.
- These tools are required to be calibrated.

Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool is generally required to be used to achieve the indicated torque value

Article 110.16(B)

- Arc-Flash Hazard Warning, Service Equipment
- Now Non-Dwelling service equipment rated **1200 Amperes** or more be labeled with the Normal System Voltage, Available Fault Current, Clearing Times, and Date the label was applied

In other than dwelling units, in addition to the requirements in 110.16(A), a permanent label shall be field or factory applied to service equipment rated 1200 amperes or more

WARNING

Arc Flash and Shock Hazard
Failure to comply can result in death or serious injury.
Refer to NFPA 70E. Appropriate PPE Required.

Nominal System Voltage: 480 VAC
Available Fault Current: 23.3 kA
Clearing Time of Service OCPD: 0.03 sec (2 cycles)
Date Label Applied: 08/01/16

Equipment ID: Panel XYZ
Sidewinder Electrical Contractors Celina, TX 800-444-1212

Exception: Label not required if arc flash label is applied in accordance with "acceptable industry practice" (NFPA 70E)

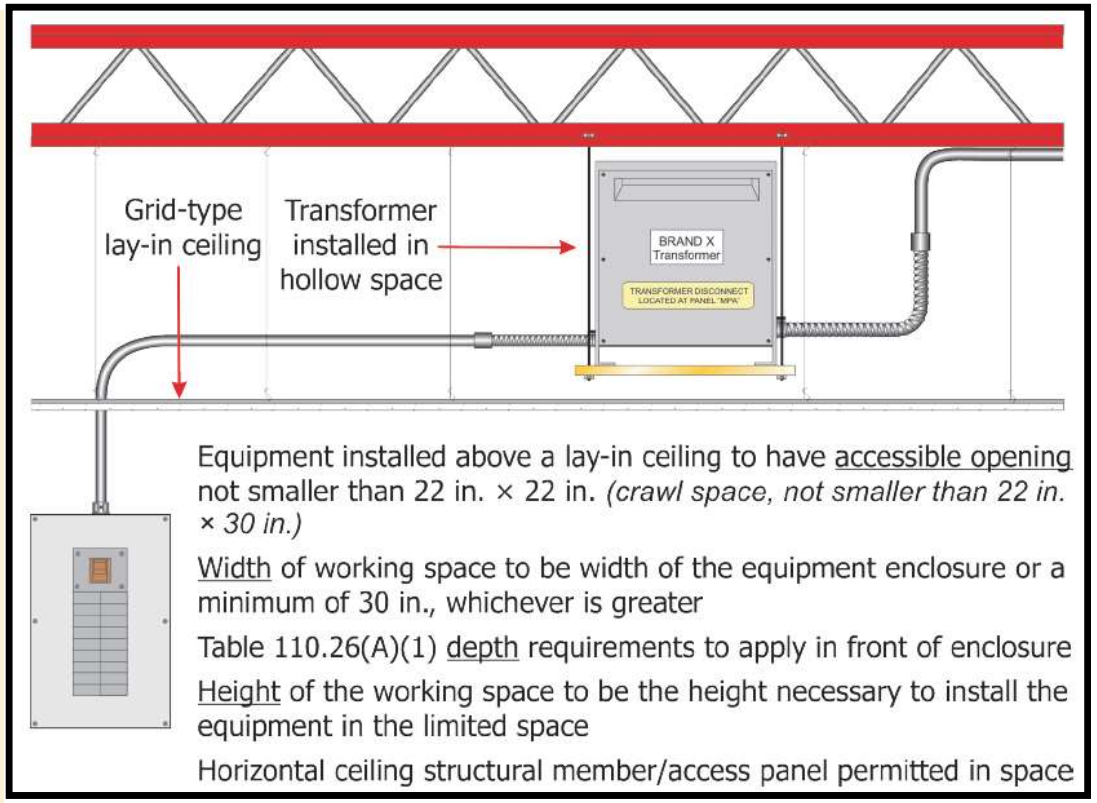
Article 110.21(A)(2)

- Marking, Reconditioned Equipment
- New Rule, Requires all refurbished, reconditioned, or remanufactured equipment to be marked with Name, Trademark, or other markings noted the organization who is responsible.
- The date of reconditioning is also required
- Shall not be bases solely on equipment's original listing

Typical marking requirements for reconditioned electrical equipment in accordance with 110.21(A)(2)

Article 110.26(A)(4)

- Spaces about Electrical Equip-ment, Working Space ≤ 1,000V
- The space requirements of 426.66(B) were relocated here to broaden requirement to more than duct heaters.
- Provisions for limited access to crawl spaces were also added to this requirement.
- Ceilings 22"x22", Crawl 22"x30"
- Width 30" or width of equipment
- Doors must open to 90 degrees



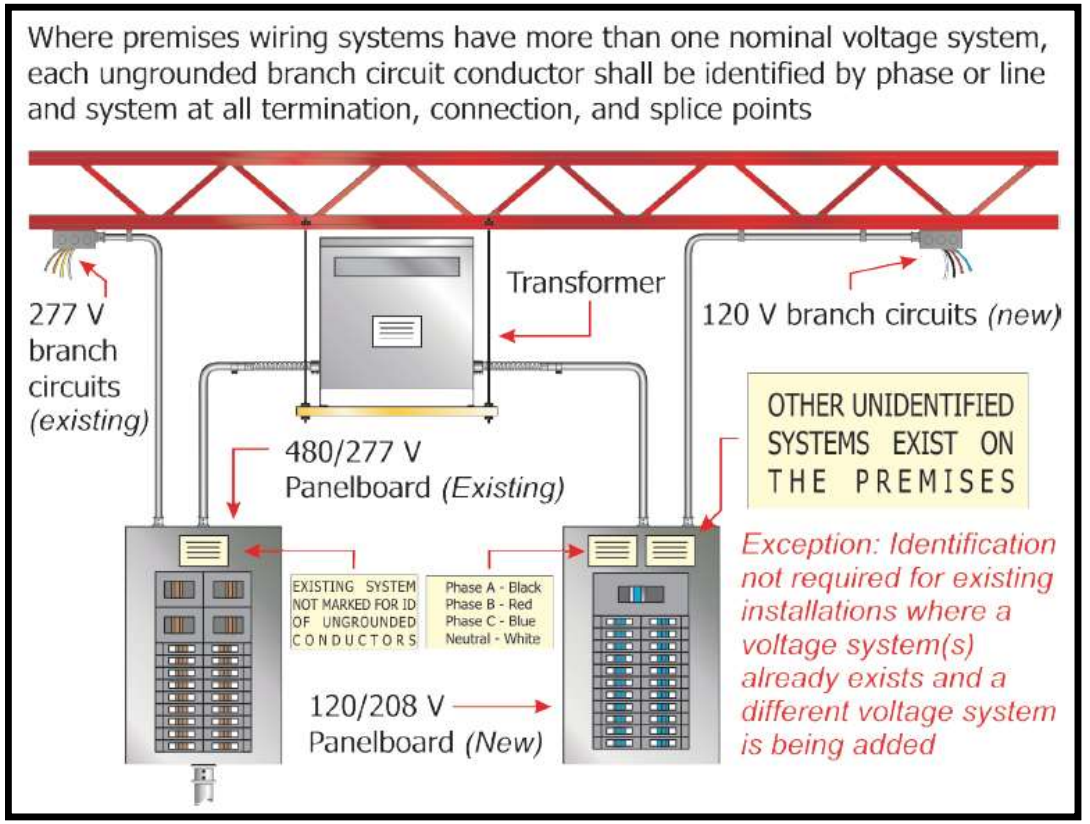
Article 110.41(A)and(B)

- Inspections and Test
- This is in **Part III,** 110.30, Over 1,000V Nominal
- Equipment installed shall be tested after first installed
- A test report covering results shall be available to AHJ, prior to energization, where required.
- Indoor or Outdoor Equipment

CHAPTER 02
WIRING AND PROTECTION

Article 210.5(C)(1), Exception

- New Exception for Identification of Ungrounded Conductors
- When an Electrical System is Existing and a New one is Added of a Different Voltage System
- The Existing will NOT be required to be properly identified per 210.5(C)(1)(a)&(b).
- The new system labels shall include the words **"Other Unidentified Systems exit on Premises"**
- Existing Label "Not Identified"



Article 210.8

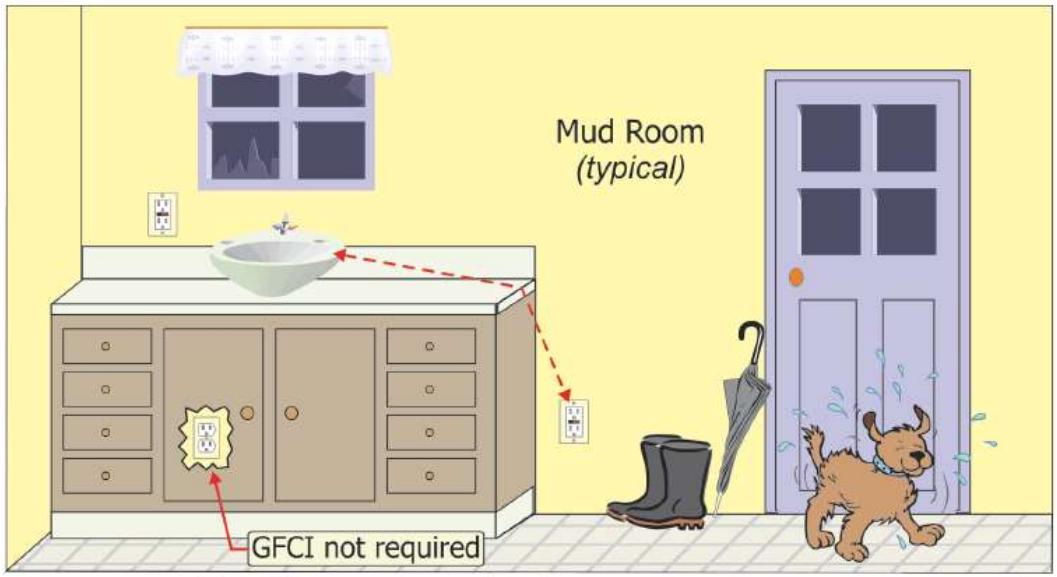
- Measurements for GFCI Protection
- New language added to clarify how distance from sink is measured for GFCI compliance.
- To measure the "Shortest Path" of a cord without piercing a floor, wall, ceiling, fixed barrier, or passing through a door, doorway, or window.
- Dwelling and Non-Dwelling
- Appliances under the cabinet will now Not be required to have GFCI

GFCI protection shall be provided as required in 210.8(A) through (E) and installed in a readily accessible location

When determining distance from receptacles, distance shall be measured as the "shortest path" the cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or passing through a door, doorway, or window

Article 210.8(A)(7)

- GFCI Protection at Sinks
- As with Kitchen Sinks all other Sink locations will allow for receptacles below the counter to be standard non-GFCI type.
- Otherwise, all 125V 15A & 20A receptacles within 6' of the "top inside edge of the bowl" shall have GFCI protection



GFCI required for all 125-volt, single-phase, 15- and 20-ampere receptacles installed within 1.8 m (6 ft) from the top inside edge of a dwelling unit sink *(laundry, utility, mud room, kitchen, wet bar, etc.)* without the measurement piercing a floor, wall, ceiling, or fixed barrier, or passing through a door, doorway, or window

Note: Same requirement at 210.8(B)(5) for non-dwelling unit sinks

Article 210.8(B)

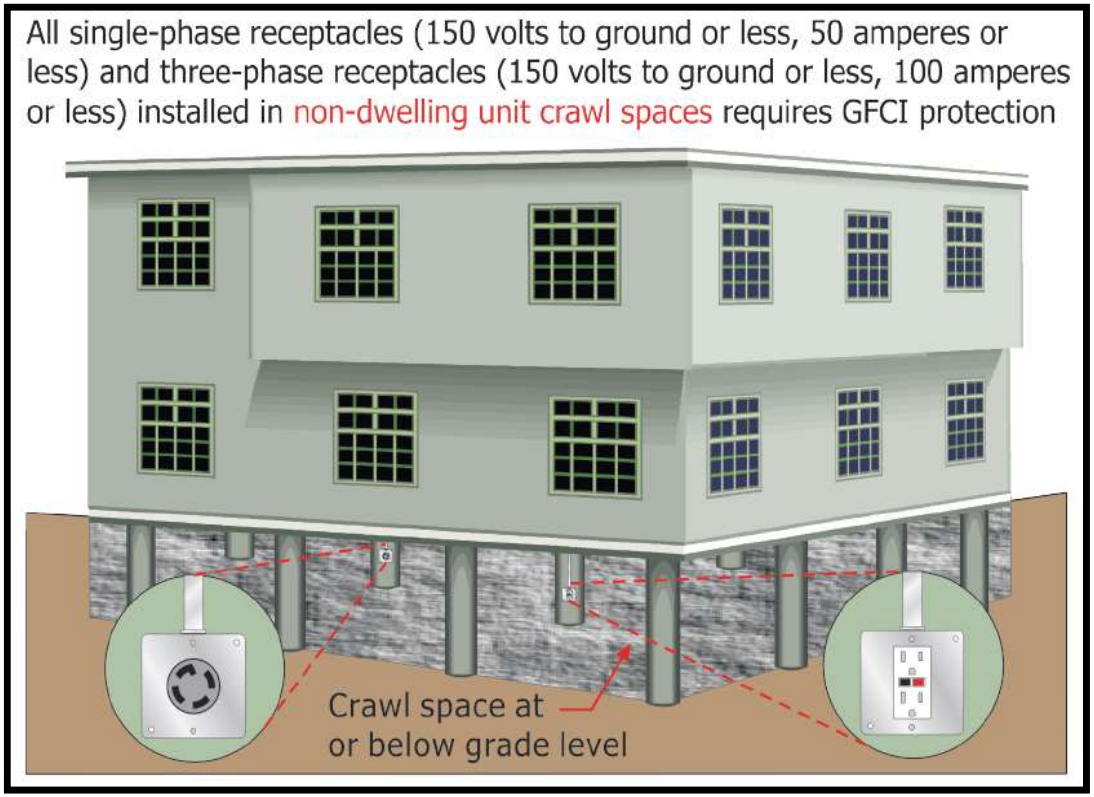
- Three-Phase GFCI Protection
- Other than Dwelling Units
- Single Phase 150V or less to Ground, 50 Amperes or less
- Three Phase 150V or less to Ground, 100 Amperes or less
- Shall have GFCI for Personnel as specified in 210.8(B)(1)-(10)
- List was expanded from 8 – 10 Locations
- GFCI for Personnel is 4-6 mA

(Photo Courtesy of Littlefuse)

(Other Than Dwelling Units) All single-phase receptacles rated 150 volts to ground or less, 50 amperes or less; and three-phase receptacles rated 150 volts to ground or less, 100 amperes or less, installed in specified locations shall have ground-fault circuit-interrupter protection for personnel

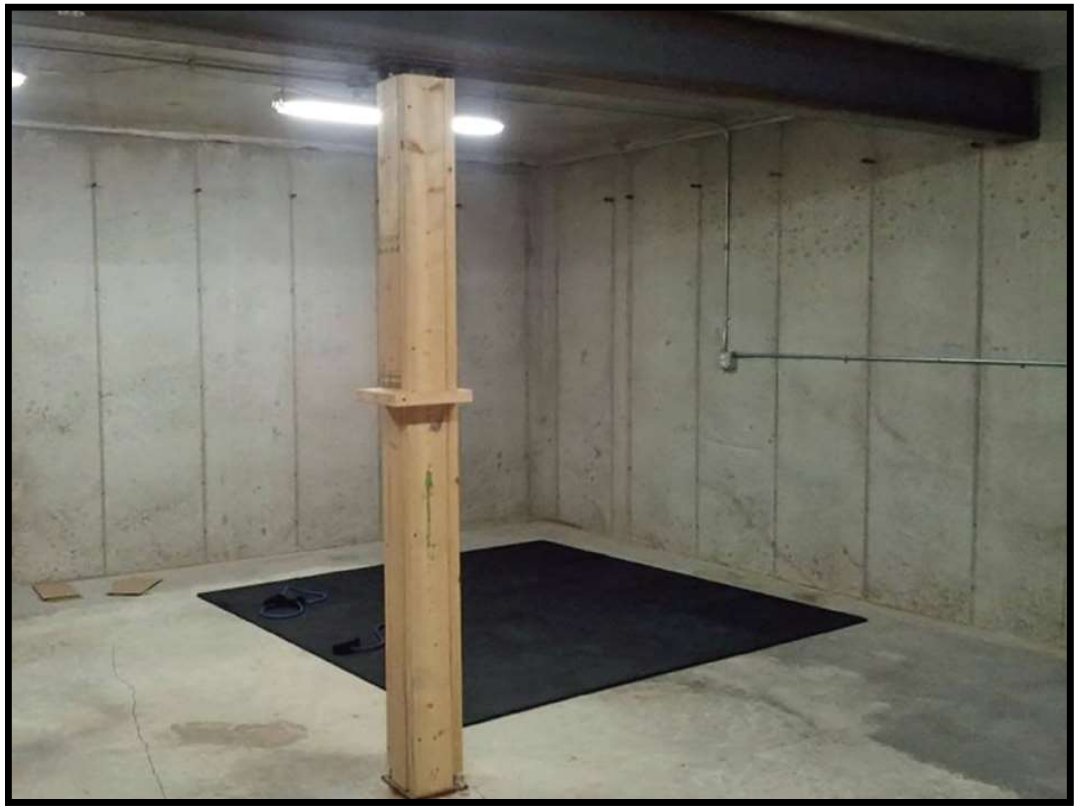
Article 210.8(B)(9)

- Non-Dwelling Unit Crawl Space
- New space added for GFCI protection in Non-Dwelling Units



Article 210.8(B)(10)

- Non-Dwelling Unit Receptacles in Unfinished Basements
- New space added for GFCI protection in Non-Dwelling Units

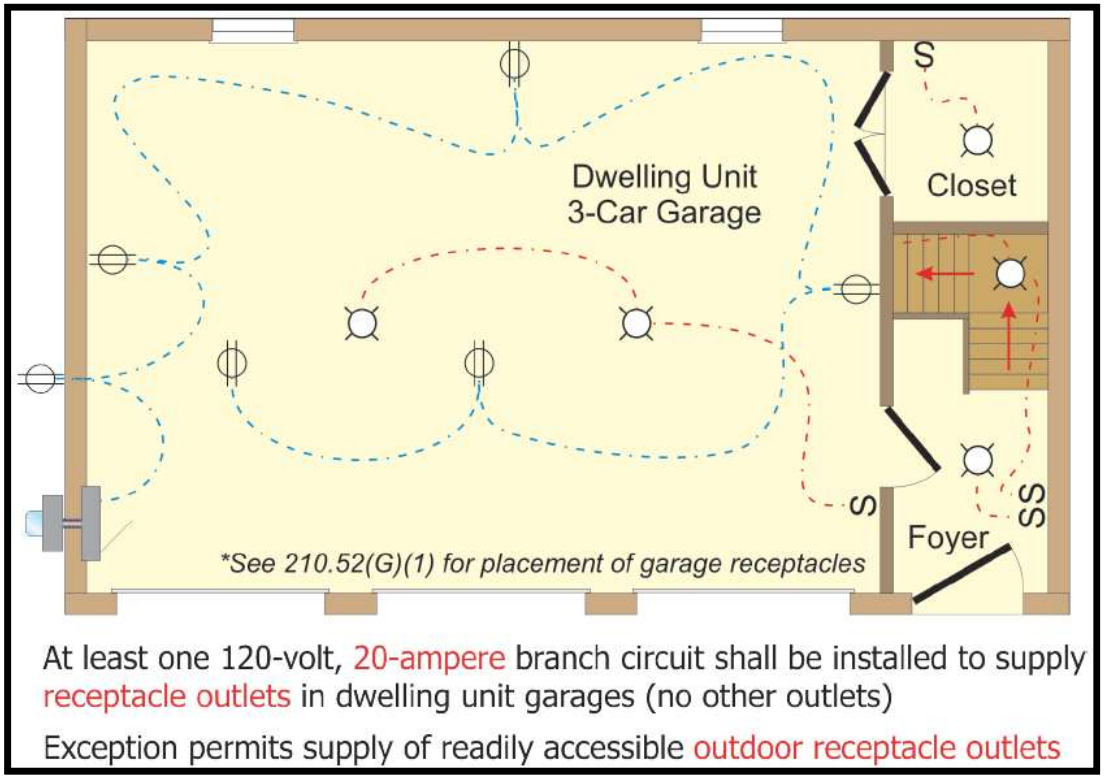


Article 210.8(E)

- GFCI Protection for Lighting Outlets in Crawl Spaces
- New Requirement
- Light Outlets, in Crawl Spaces Not Exceeding 120V, where space is at or below grade.
- This applies to Dwelling and Non-Dwelling Locations.

Article 210.11(C)(4)

- Garage Branch Circuits
- New, At least one 120V 20A branch circuit to supply Dwelling unit Garage outlets.
- No other outlets other than an exception for Readily Accessible
- I think the Exception are for outlets installed on the exterior of the garage.



Article 210.12(C)

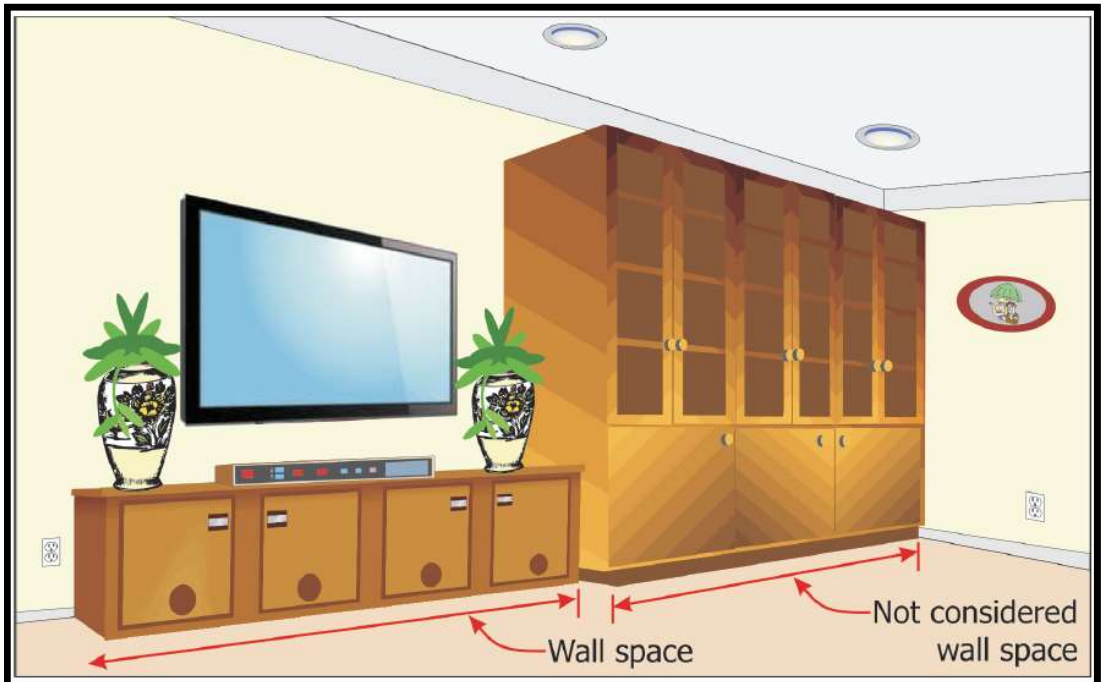
- AFCI Protection in Guest Rooms and Guest Suites
- Expanded Protection
- All 120V single-phase 15A & 20A branch circuits supplying outlets and devices installed in guest rooms and guest suites of hotel and motels, regardless of “permanent provisions for cooking” or not.

Removed Article 210.17

- Electric Vehicle Branch Circuit
- Deletion from 210.17
- Relocation to 625.40
- As per prior, the outlet is to be dedicated not being shared with any other outlets
- New location is better suited for this special use receptacle

Article 210.52(A)(2)(1)

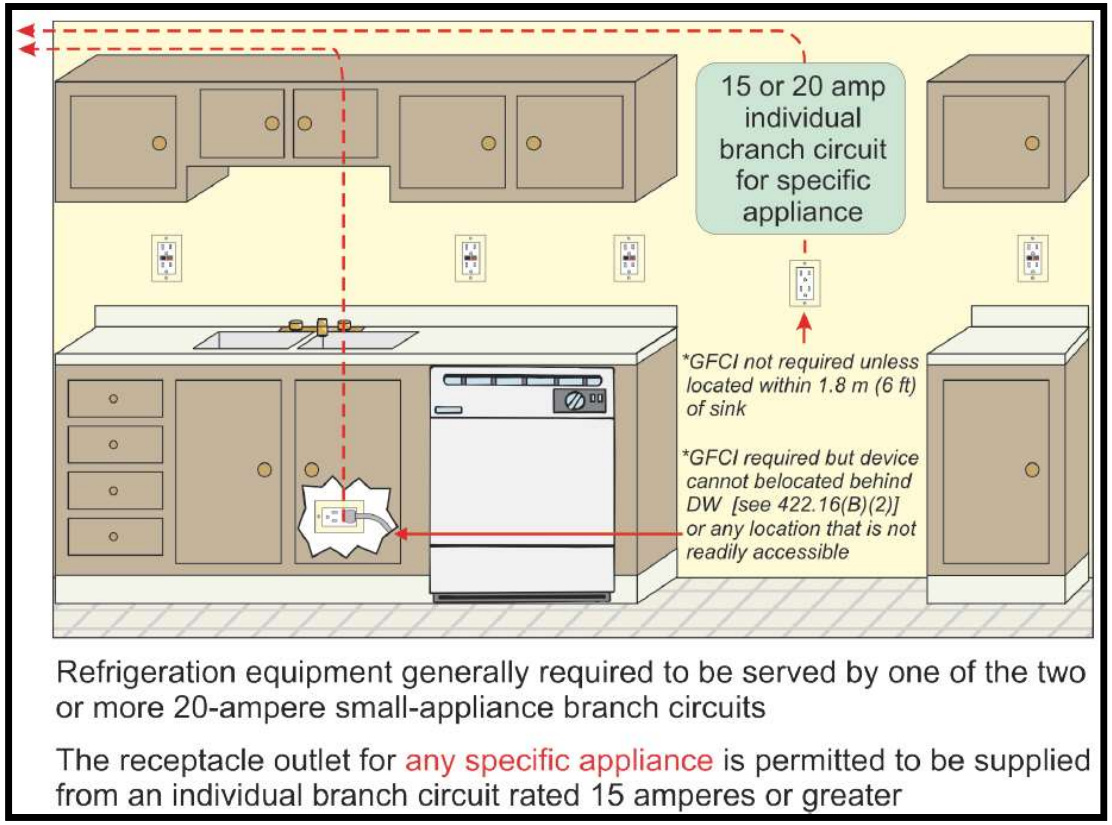
- Receptacle Wall Space
- Revision
- Only "Fixed Cabinets that do not have countertops or similar work surfaces" are now considered as an item (doorways & fireplaces) that would not be counted as "Wall Space" concerning receptacle spacing.
- A Floor outlet is not required, this is **NOT** considered a wall space.



Any space 600 mm (2 ft) or more in width and unbroken along the floor line by doorways and similar openings, fireplaces, and fixed cabinets that do not have countertops or similar work surfaces

Article 210.52(B)(1), Ex. #2

- Appliance Branch Circuit
- Any specific dwelling unit kitchen appliance is permitted to be supplied by an individual 15A or 20A circuit, when not connected to the required 20A branch circuits.

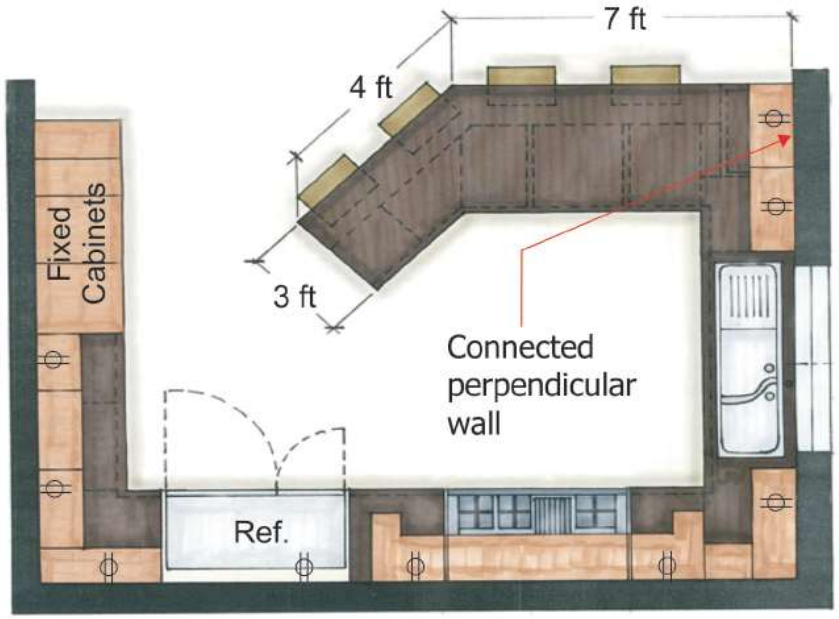


Refrigeration equipment generally required to be served by one of the two or more 20-ampere small-appliance branch circuits

The receptacle outlet for any specific appliance is permitted to be supplied from an individual branch circuit rated 15 amperes or greater

Article 210.52(C)(3)

- Peninsular Countertop Spaces
- The measurement point has been changed from the "connecting edge" to the "connected perpendicular wall"

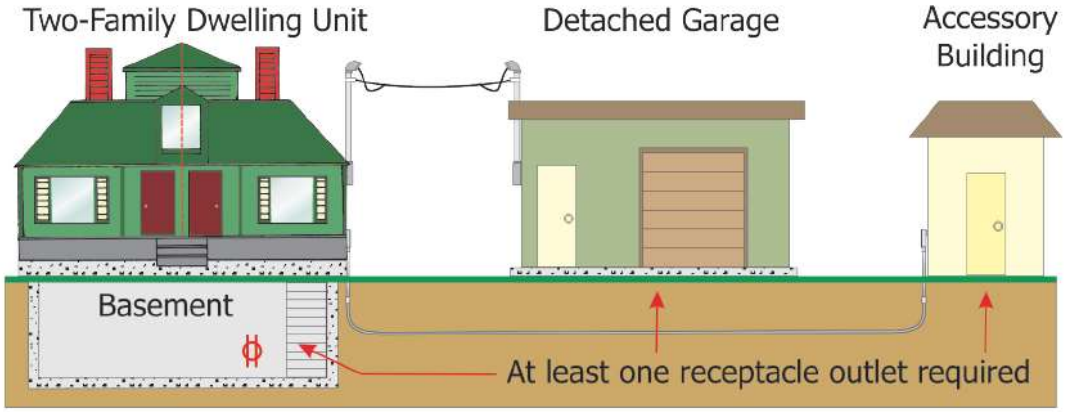


At least one receptacle outlet to be installed at each peninsular countertop with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater

Measurements to be measured from the "connected perpendicular wall"

Article 210.52(G)

- Receptacle for Basements, Garages, and Accessory Buildings
- One and Two-family Dwellings
- This change expands what was before restricted to only One Family Dwellings.
- Key parts are Unfinished Parts of Basements
- Garages and accessory buildings, only if power is provided

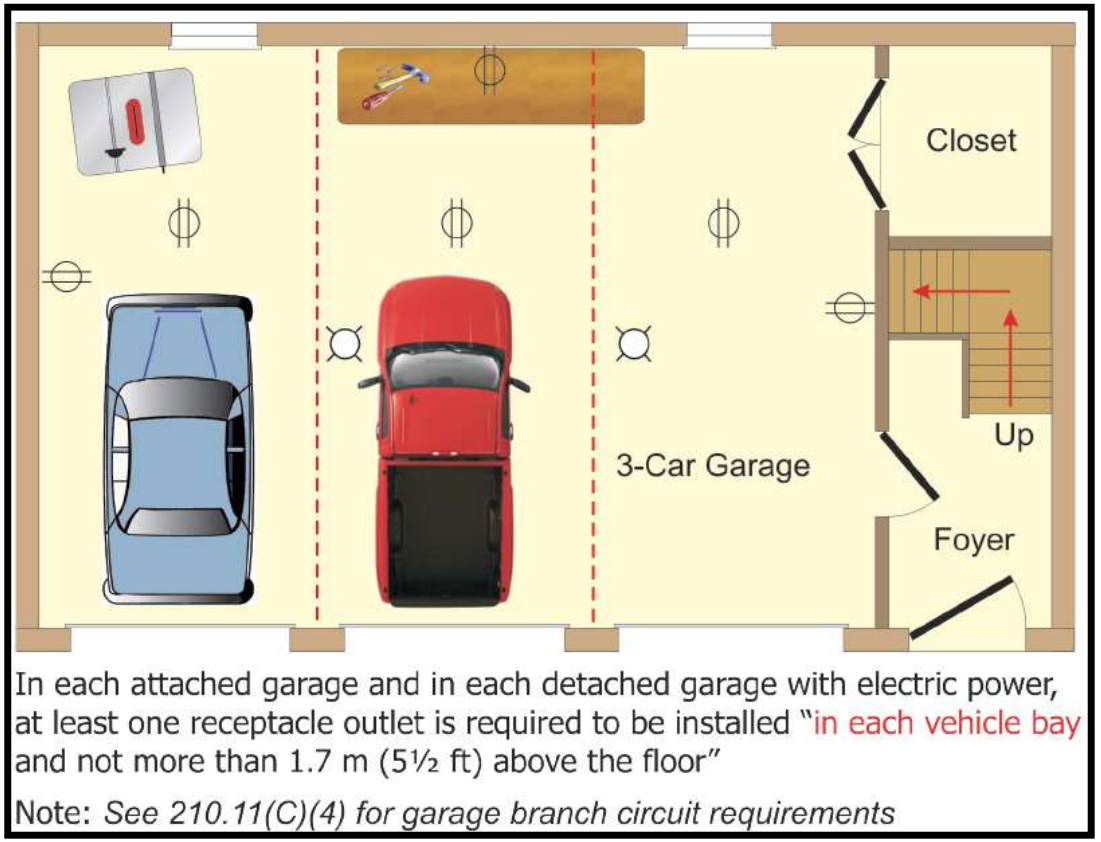


At one- and two-family dwellings, at least one 125-volt, 15- or 20-ampere receptacle outlet, in addition to those for specific equipment, shall be installed in areas specified below:

- Attached garages and in each detached garage with electric power
- Accessory buildings with electric power
- Unfinished basements - each seperate portion of the basement

Article 210.52(G)(1)

- Dwelling Unit Garages
- A Receptacle shall be installed in each vehicle bay, not more than 5.5' above the floor.
- The receptacle for the GDO, do not count as meeting this requirement.



In each attached garage and in each detached garage with electric power, at least one receptacle outlet is required to be installed "in each vehicle bay and not more than 1.7 m (5½ ft) above the floor"

Note: *See 210.11(C)(4) for garage branch circuit requirements*

Article 210.64

- Receptacle at Electrical Service Areas
- Must be within 25' and limited to indoor service equipment.
- It must also be within the same room as the service equipment.

- Exception #2 If service system is greater than 120V to ground, not required for articals 675, or 682 types.

At least one 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed in an accessible location within 7.5 m (25 ft) of all indoor electrical service equipment and located within the same room or area as the service equipment *(other than one- and two-family dwellings)*

Exception added for service areas covered in Articles 675 and 682

Article 210.70(C)

- Lighting Outlets All Occupancies
- Lighting outlet requirements for storage and equipment spaces added for Non-dwelling unit utility rooms and basements.

At non-dwelling unit attics, underfloor spaces, utility rooms, and basements, at least one lighting outlet containing a switch or controlled by a wall switch must be installed where these spaces are used for storage or contain equipment requiring servicing *[See 210.70(A)(3) for dwelling units]*

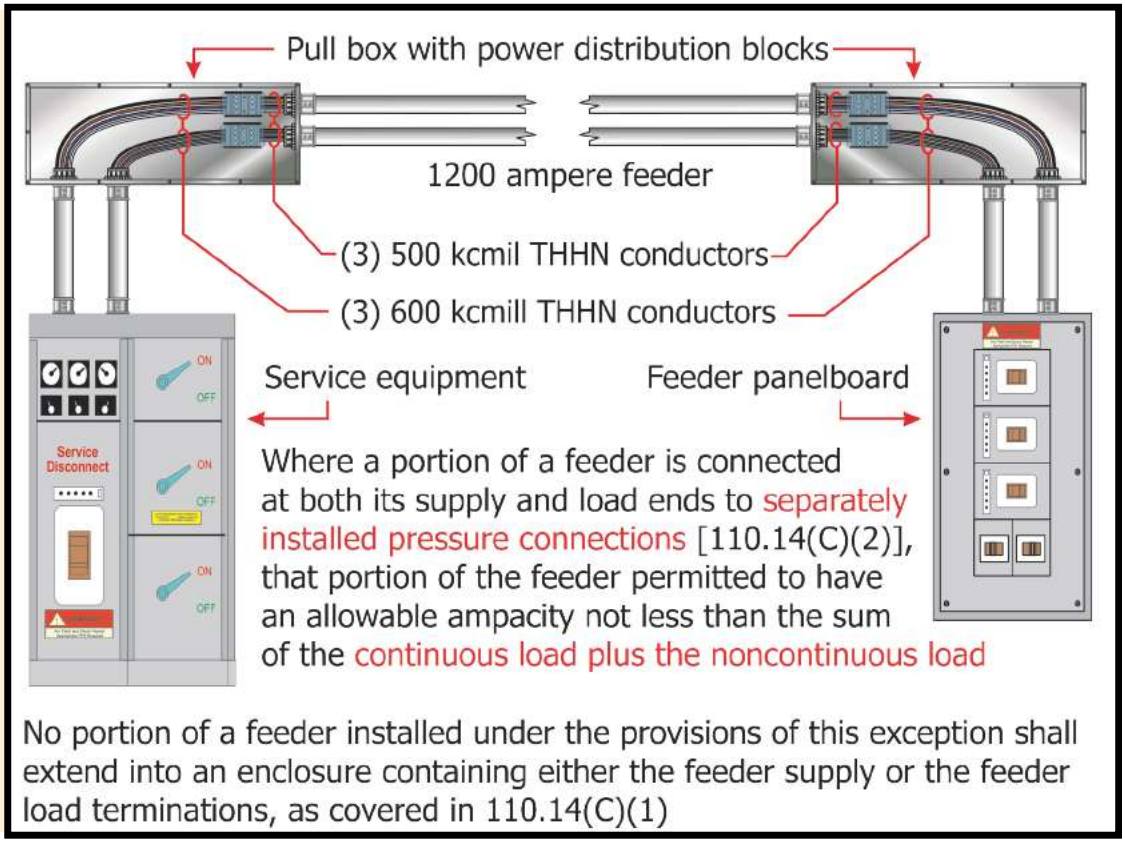
At least one switch to be located at the "usual point of entry" to space with lighting outlet(s) located "at or near the equipment requiring servicing"

Article 210.71

- Receptacles Outlets in Meeting Rooms
- Non-dwelling meeting rooms, Less than 1000 Sq.'
- Same spacing as dwelling rooms 2-6-12 requirements.
- Larger areas not able to be split into 1000 Sq.' areas or less will be exempt

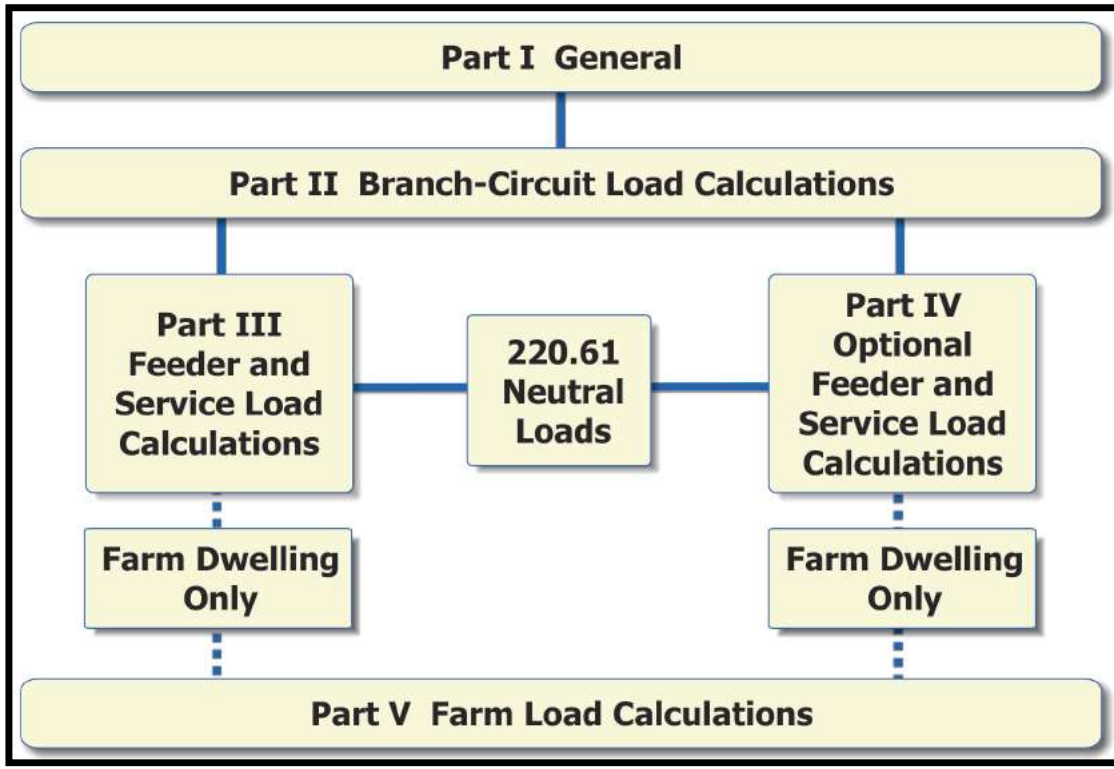
Article 215.2(A)(1)(a) Ex#2

- Feeder Rating and Size
- Allows for a part of a feeder to be reduced in size to align with 100% of the continuous rather than being required to be sized at 125% of the non-continuous.
- Rationale is based on terminations being a factor is sizing. This allocation is for the middle portion of a conductor and not it's termination.
- Blocks must be Pressure Connections



Article 220 & 220.1

- Branch-Circuit, Feeder, and Service Load Calculations
- Only the Title and Scope were revised for enhanced clarity
- Feeders changed to Feeder
- Services changed to Service
- Farms changed to Farm Loads



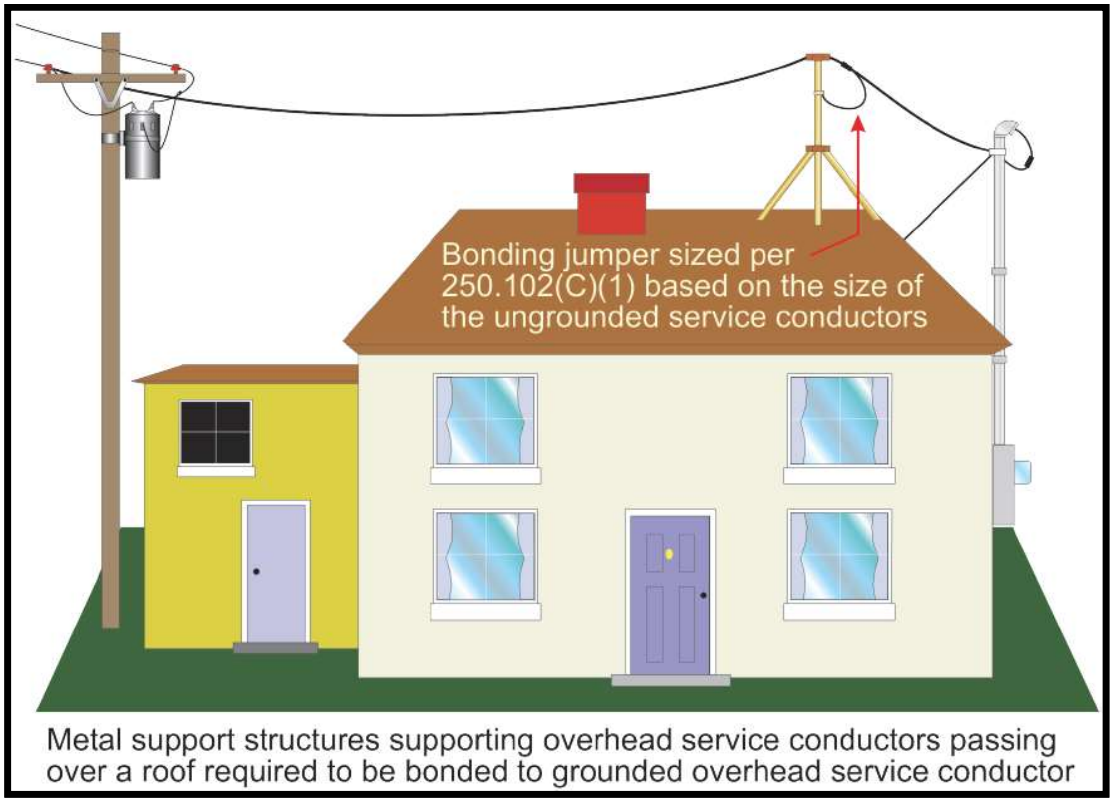
Article 230.24(B)(5)

- Clearance for Overhead Service Conductors
- Clearance over Railroad Tracks must be 24.5’ or greater
- Other clearance values are unchanged for this Article

Overhead service conductors (not over 600 volts) shall have a minimum clearance from track rails of a railroad of not less than 7.5 m (24.5 ft)

Article 230.29

- Supports over Buildings
- Must install a Bonding Jumper from the Grounded Phase to the metal support structure based on 250.102(C)(1)
- This support item was not addressed in 2014 NEC



Metal support structures supporting overhead service conductors passing over a roof required to be bonded to grounded overhead service conductor

Article 240.6(A)

- Standard Ampere Ratings for Fuses and Inverse Time Circuit Breakers
- This is the same list as prior, but now is in a table format for easier reading
- Note, Additional sizes were supposed to be listed as a footnote, however that action did not occur.
- You have to look at 240.6(A) to read the additional standard sizes

The standard ampere ratings for fuses and inverse time circuit breakers shall be considered as shown in Table 240.6(A)

15	20	25	30	35
40	45	50	60	70
80	90	100	110	125
150	175	200	225	250
300	350	400	450	500
600	700	800	1000	1200
1600	2000	2500	3000	4000
5000	6000			

Additional standard ampere ratings for fuses shall be 1, 3, 6, 10, and 601

The use of fuses and inverse time circuit breakers with nonstandard ampere ratings shall be permitted

Article 240.67

- Arc Energy Reduction
- This will occur January 1, 2020, even if the 2020NEC is NOT adopted.
- Energy Reducing allows for a temporary reduction during maintenance
- The goal is to reduce Arc-Flash while servicing energized gear for any gear 1200A or greater.
- Like reducing the speed limit in a construction zone

Where fuses rated 1200 amperes or higher are installed, 240.67(A) and (B) shall apply

This requirement shall become effective January 1, 2020

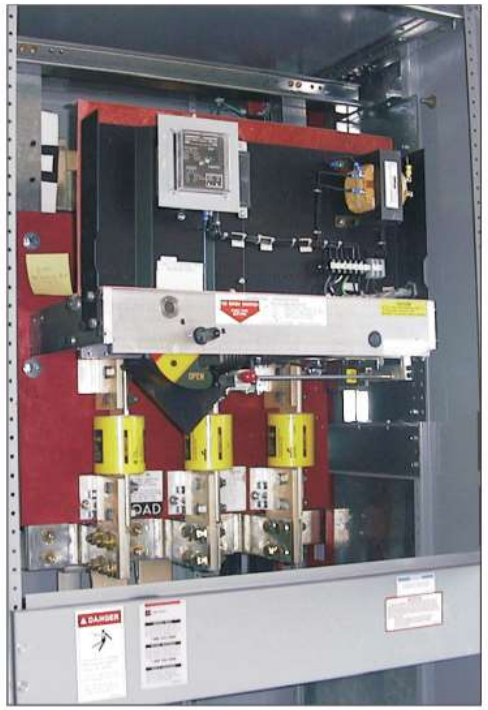
A fuse shall have a clearing time of 0.07 seconds or less at the available arcing current, or one of the following shall be provided:

(1) Differential relaying

(2) Energy-reducing maintenance switching with local status indicator

(3) Energy-reducing active arc flash mitigation system

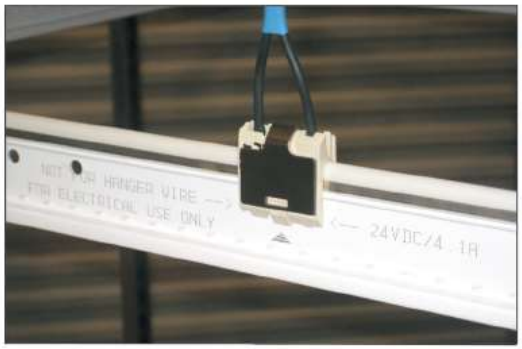
(4) An approved equivalent means



Courtesy of Eaton Corporation

Article 250.22(6)

- Circuits Not to Be Grounded
- This list in 250.22, was 5 in the 2014, is expanded to 6 in the 2017
- Class 2 circuits used for suspended ceiling LV power distribution allowed for in 393.60(B)



The following circuits shall not be grounded:

(1) Circuits for electric cranes operating over combustible fibers in Class III locations, as provided in 503.155

(2) Circuits in health care facilities as provided in 517.61 and 517.160

(3) Circuits for equipment within electrolytic cell working zone as provided in Article 668

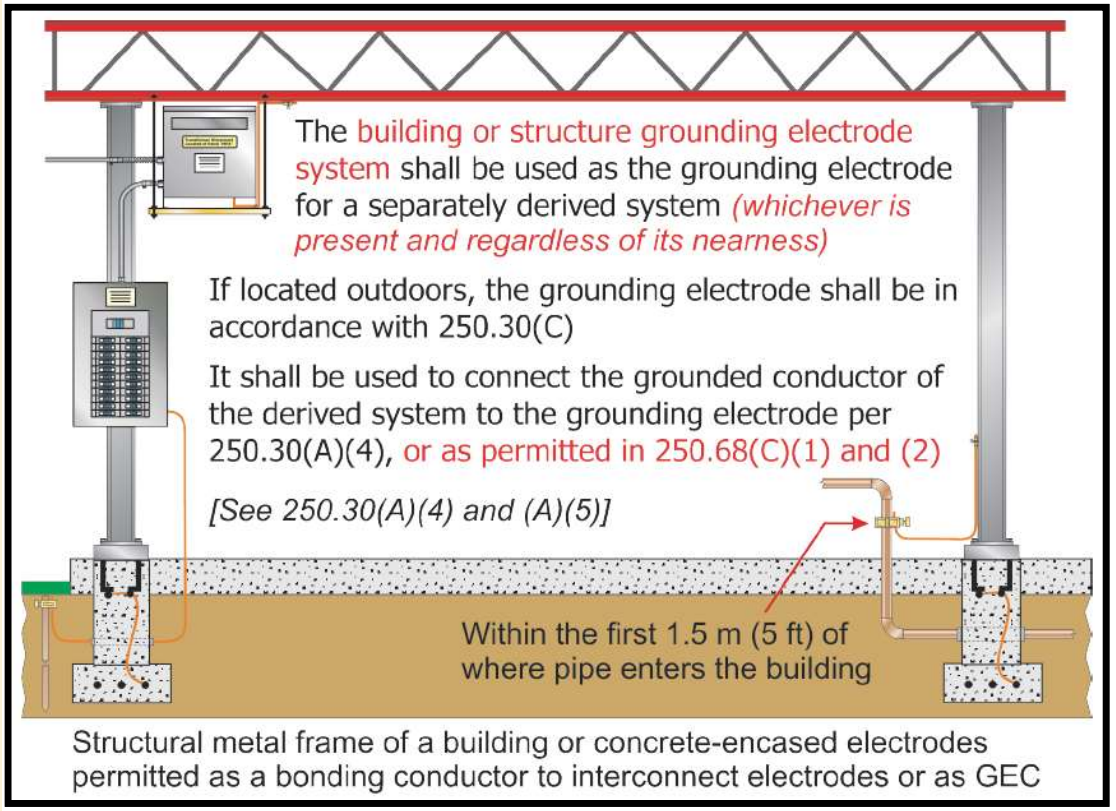
(4) Secondary circuits of lighting systems as provided in 411.6(A)

(5) Secondary circuits of lighting systems as provided in 680.23(A)(2)

(6) Class 2 load side circuits for suspended ceiling low-voltage power grid distribution systems as provided in 393.60(B)

Article 250.30(A)(4) & (A)(5)

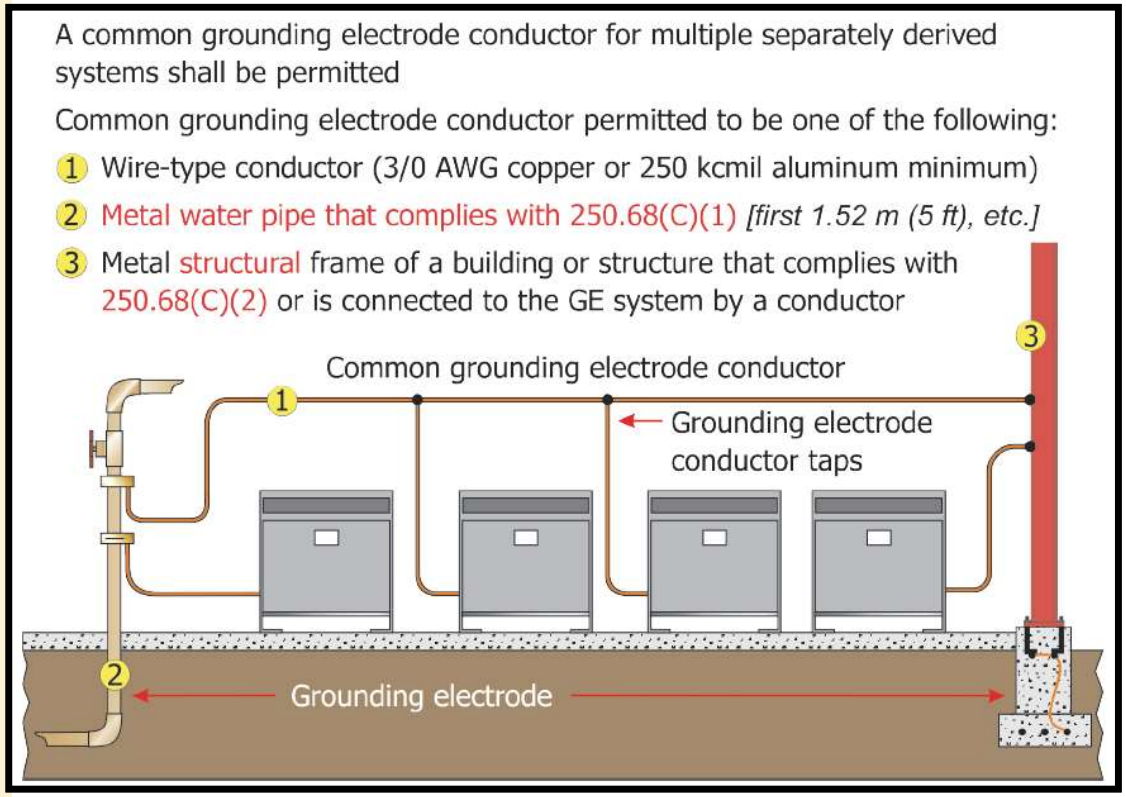
- Grounding **Separately Derived** Systems
- **Allows and Restricts** bonding to either the Building or Structure grounding electrode system.
- Building steel or Metallic Water pipes. Other electrode conductors are not full size, such as the conductors to a Grounding Electrode, or concrete encased, or the ground ring.



Structural metal frame of a building or concrete-encased electrodes permitted as a bonding conductor to interconnect electrodes or as GEC

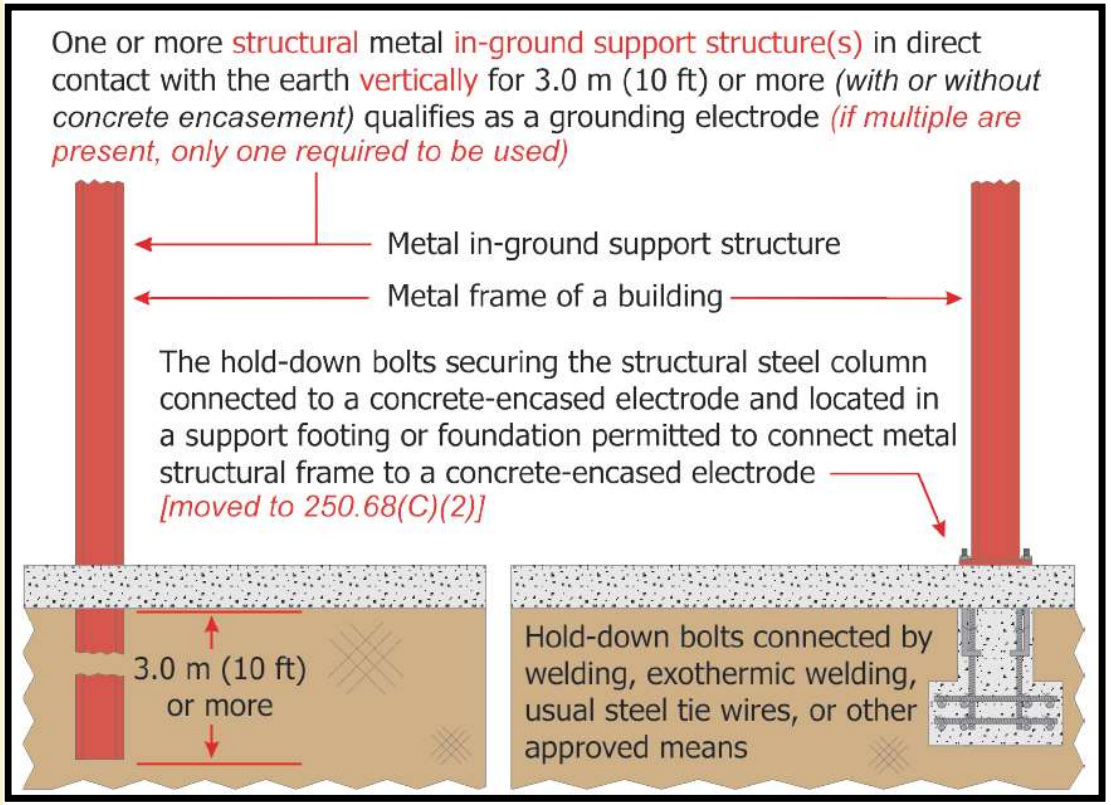
Article 250.30(A)(6)(a)

- Common Grounding Electrode Conductor
- Metal Water Pipe was added tot he Methods of achieving a common Grounding Electrode conductor for Multiple Separately Derived Systems.
- This can be Horizontal or Vertical
- Not smaller than 3/0 CU or 250 kcmil AL with taps sized per 250.102(C)(1) to each Transformer



Article 250.52(A)(2)

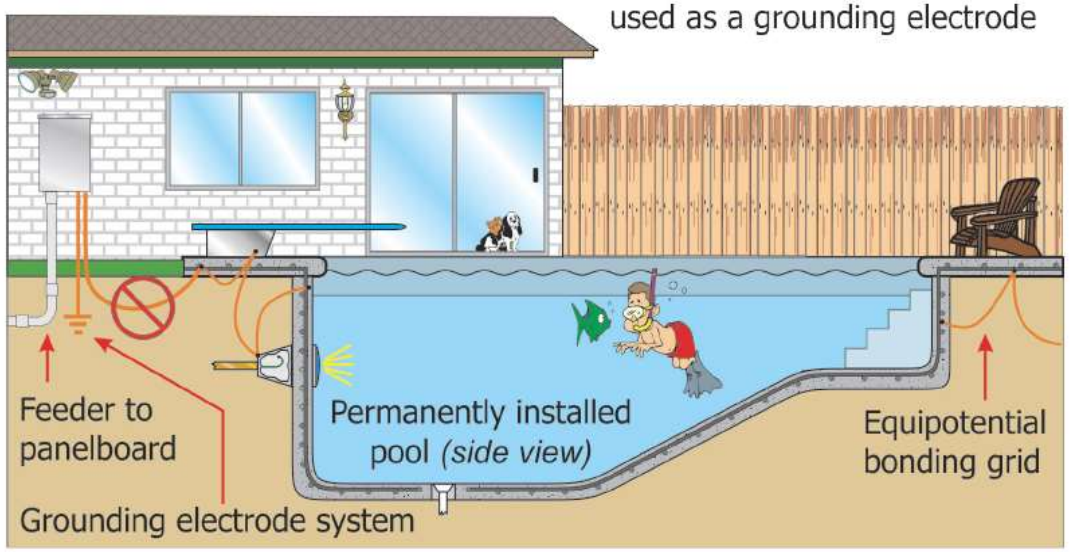
- Metal In-Ground Support Structures, now allowed to be used as a grounding electrode
- Clarifies that only one of the steel beams must driven to 10' or directly connected to the rebar system.
- Column bolts can be wet set provided on set is hard wired or welded into position prior to the concrete pour.



Article 250.52(B)(3)

- Not Permitted for Use as a Grounding Electrode
- New In-ground swimming pool structures are not permitted to be used as a grounding electrode.
- This is added to the existing list of Gas piping system and Aluminum electrodes.
- If not prohibited, you would have to use, due to requirement of "If present"

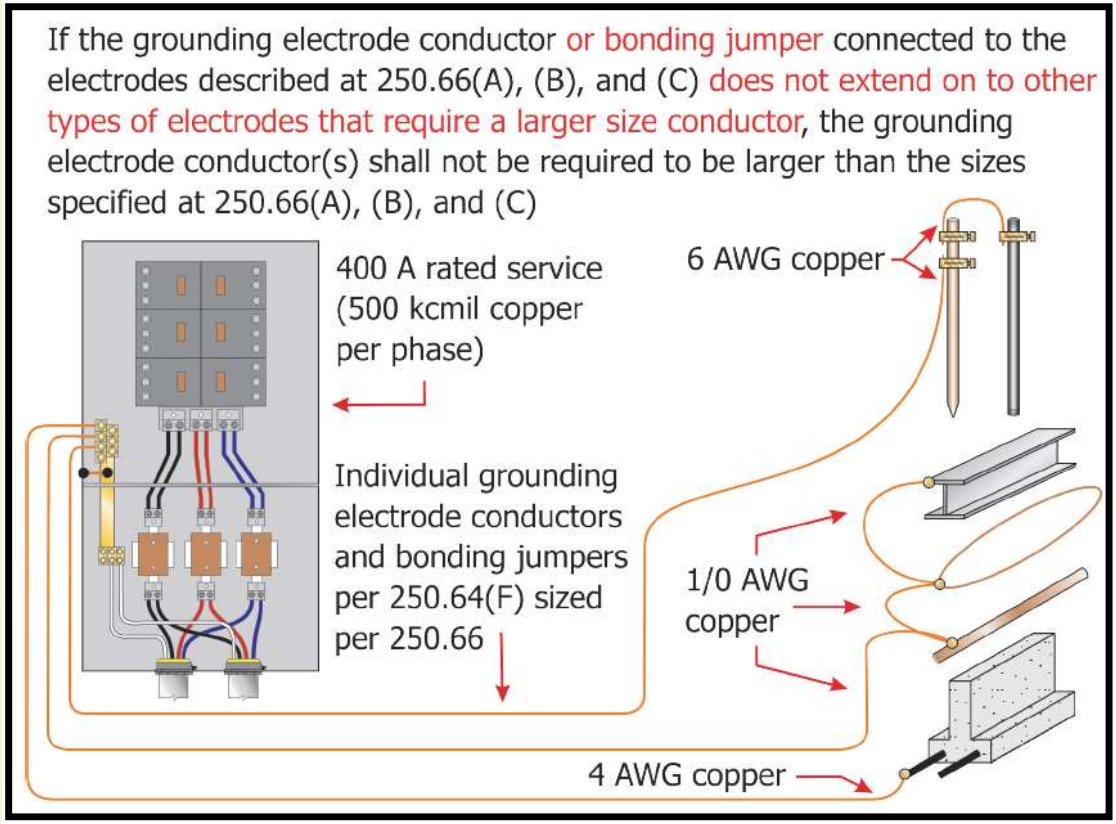
The structures and structural reinforcing steel of an in-ground swimming pool as described in 680.26(B)(1) and (B)(2) are prohibited from being used as a grounding electrode



The provisions of 680.26 for equipotential bonding are to reduce voltage gradients *(difference of voltage potential between two conducting objects)*, not to establish a grounding electrode system for a building or structure

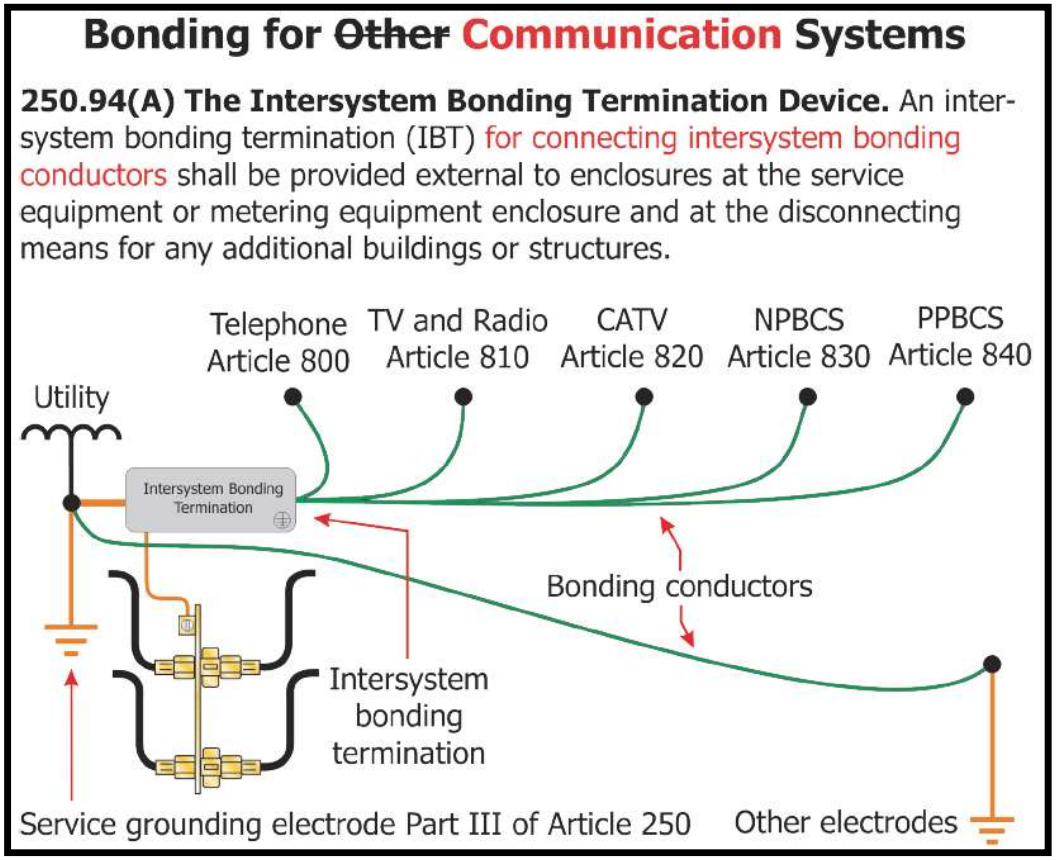
Article 250.66(A),(B),&(C)

- Size of Grounding Electrode Conductors
- If the allowed size of a type of GEC is smaller than other types and do not connect to them but directly to the Service Disconnect, they do not have to be the size of the larger.
- This is considered a Sole Connection



Article 250.94(A)

- Intersystem Bonding Terminations
- Revised to state Communication rather than Other

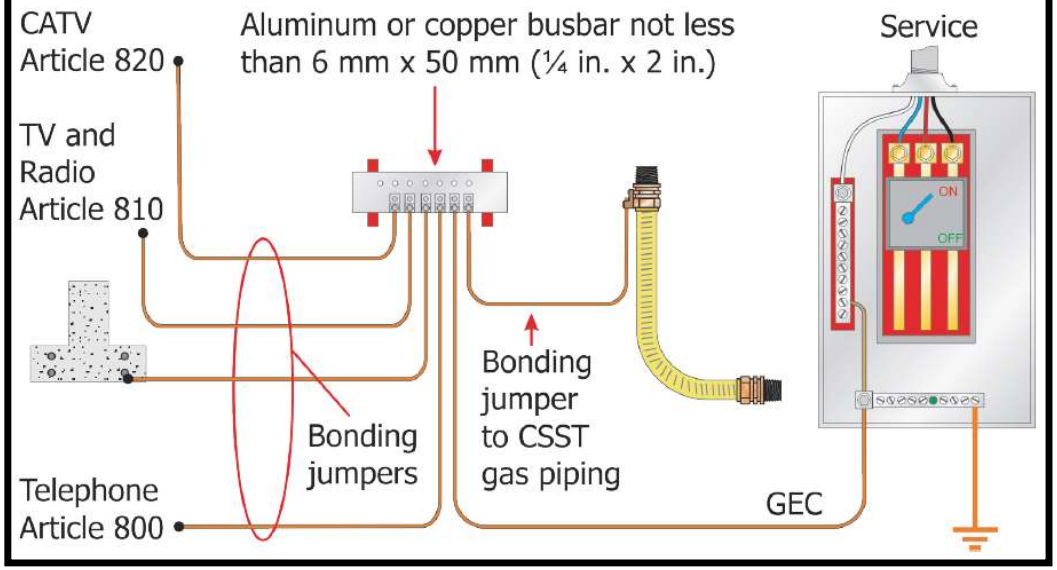


Article 250.94(B)

- Intersystem Bonding Terminations
- In addition to Other Connections
- Bonding jumper to CSST shall be #6 CU or larger

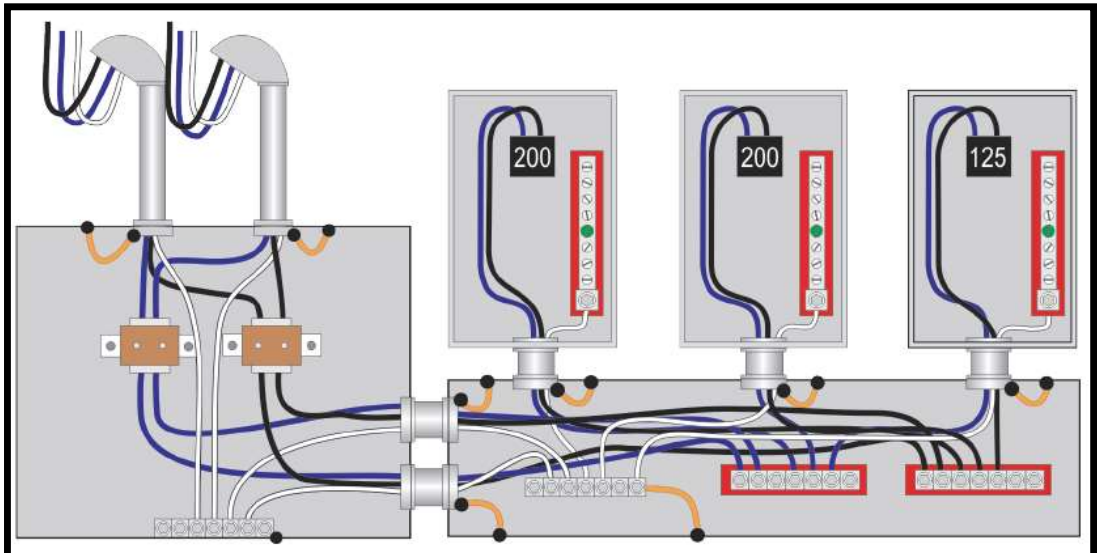
Bonding for ~~Other~~ Communication Systems

250.94(B) Other Means. Connections to an aluminum or copper busbar not less than 6 mm thick × 50 mm wide (¼ in. thick × 2 in. wide) and of sufficient length to accommodate at least three terminations for communication systems in addition to other connections.



Article 250.102

- Grounded Conductors, Bonding Conductors, and Jumpers
- Revision of Title change for clarity
- All bonding jumpers are sized using chart 250.102(C)(1)



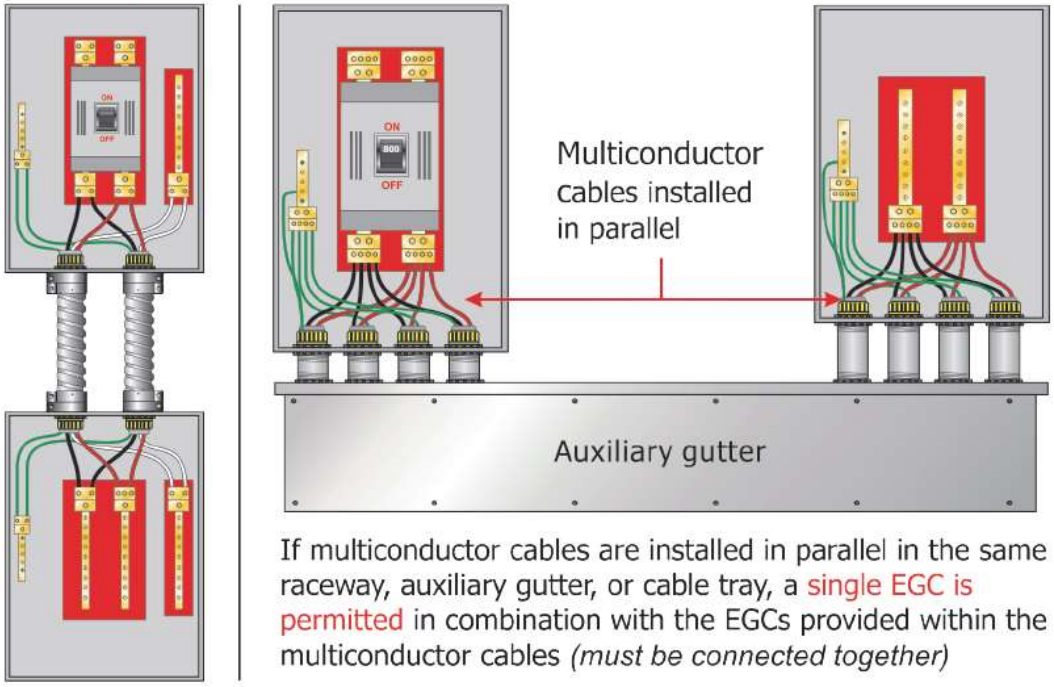
Grounded conductors, bonding conductors, and bonding jumpers of copper, aluminum, copper-clad aluminum, or other corrosion-resistant material are to be sized in accordance with 250.102 and Table 250.102(C)(1)

Supply-side bonding jumpers installed in parallel in two or more raceways or cables to comply with 250.102(C)(2)

Article 250.122(F)

- Equipment Grounding Conductor
- Rule #1 regarding EGC, they must all come together
- If Installed in raceway or cable tray, each must be sized per the total OCP per 250.122
- If all runs are in a single raceway than a single ECG is allowed
- In installed in a multiconductor cable, they can be sized per the cable with a single sized per OCD and bonded together.

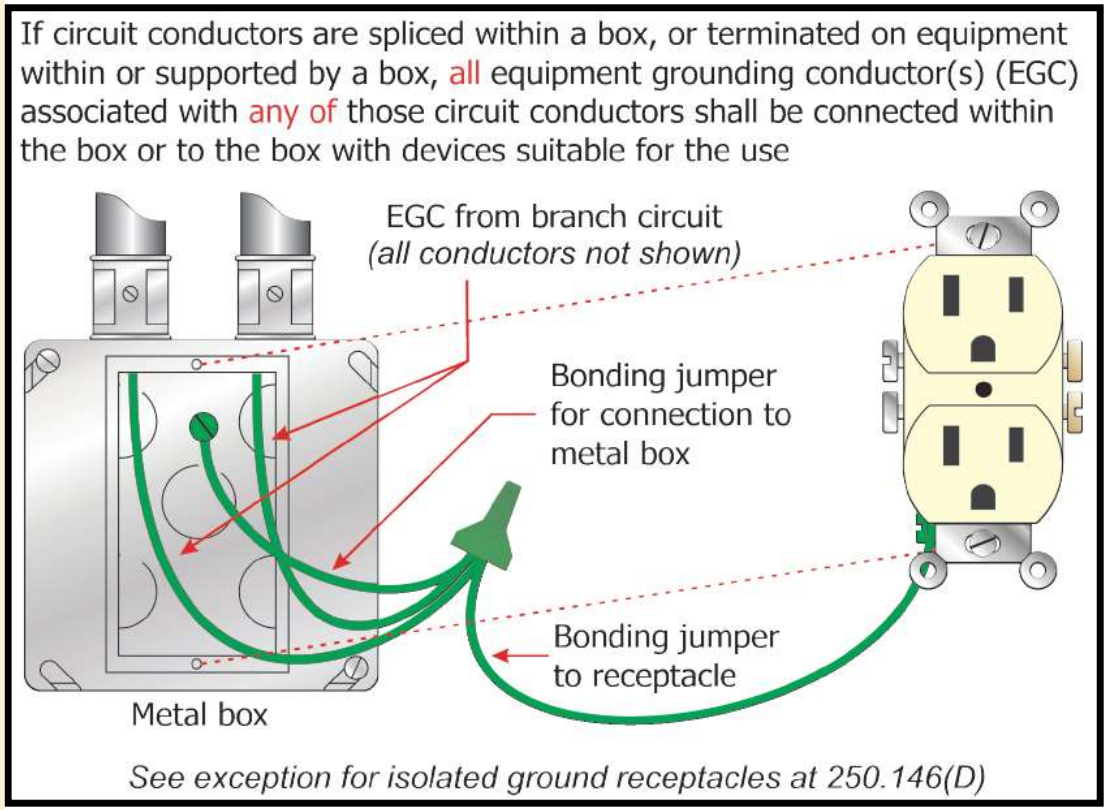
Rules for equipment grounding conductors installed in parallel in single or multiple raceways or cables and in cable tray, have been expanded to cover EGCs installed in auxiliary gutters and as part of a multiconductor cable



If multiconductor cables are installed in parallel in the same raceway, auxiliary gutter, or cable tray, a single EGC is permitted in combination with the EGCs provided within the multiconductor cables *(must be connected together)*

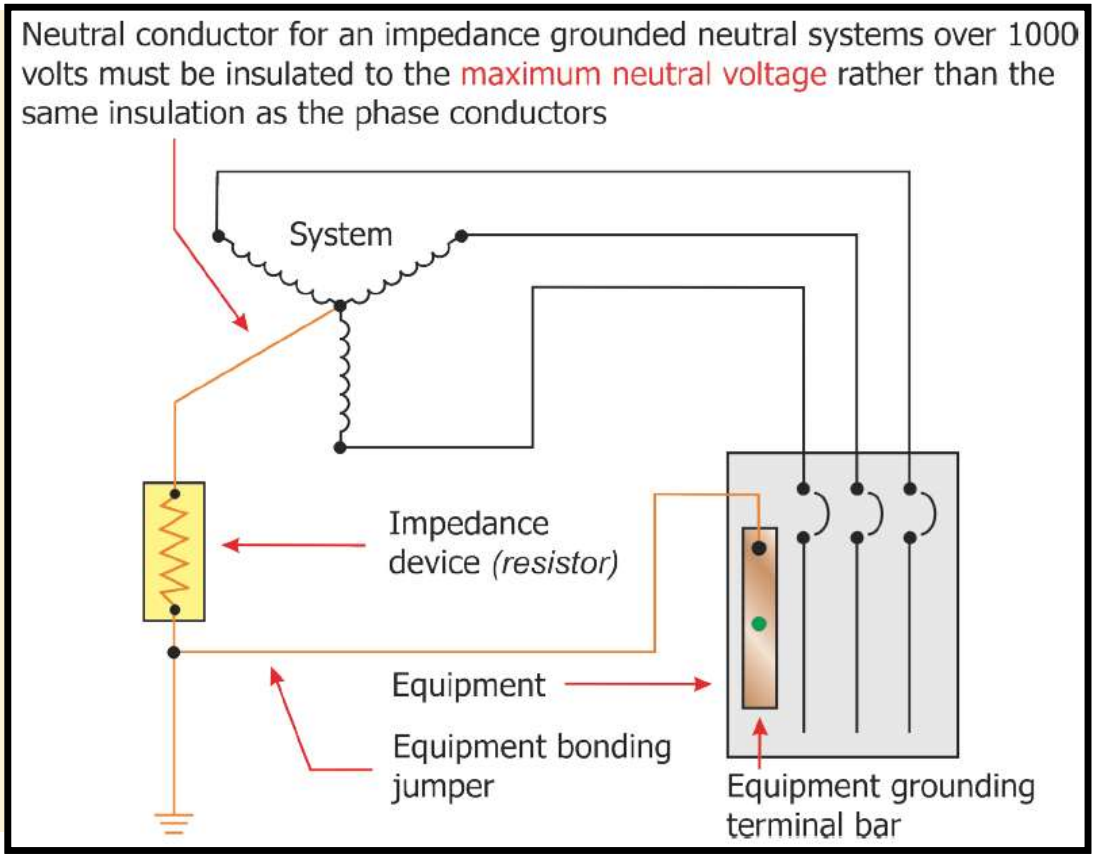
Article 250.148

- Continuity of attachment of EGC to Boxes
- Clarification all EGC within any box, shall be connected together either directly or by individual connection to the box.
- Exception being an Isolated Ground Conductor, is allowed to be unconnected to the other EGC in a box.



Article 250.187(B)

- Impedance Grounded Neutral Systems
- Neutral Conductor shall be Identified
- Shall be insulated for the **maximum** neutral voltage
- Information Note: Maximum Neural voltage in a three-phase Wye system is 57.7 percent of the phase to phase voltage.



CHAPTER 03
WIRING METHODS & MATERIALS

Article Table 300.5 Footnotes a&b

- Minimum Cover Requirements
- Two New Footnotes were added

1. A Lesser Depth shall be permitted where specified in the installation instructions of a listed low-voltage lighting system
2. A depth of 6" shall be permitted for pool, spa, and fountain lighting, installed in a nonmetallic raceway, limited to not more than 30 volts where part of a listed low-voltage lighting system

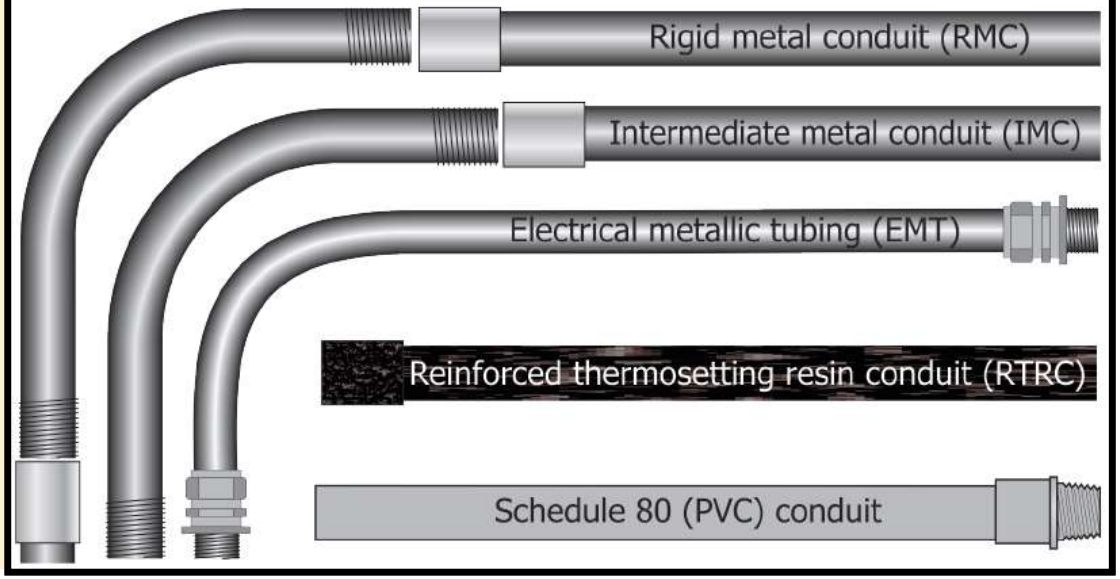
Minimum Cover Requirements, 0 to 1000 Volts, Nominal, Burial to Millimeters (Inches)

	Type of Wiring Method or Circuit									
	Column (1) Direct-Buried Cables or Conductors		Column (2) Rigid Metal Conduit or Intermediate Metal Conduit		Column (3) Nonmetallic Raceways Listed for Direct Burial (No Concrete Encasement)		Column (4) Residential BC (120 Volts or Less, GFCI, Max. OCPD of 20 Amperes)		Column (5) Irrigation and Landscape Ltg (30 Volts Max., Type UF or Other Identified Cable or Raceway	
Location of Wiring Method or Circuit	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
All locations not specified below	600	24	150	6	450	18	300	12	150[a,b]	6[a,b]
In trench below 50 mm (2 in.) thick concrete or equivalent	450	18	150	6	300	12	150	6	150	6
Under a building *(see NEC text)*	0	0	0	0	0	0	0	0	0	0
Under min.102 mm (4 in.) thick concrete exterior slab with no vehicular traffic [slab extending not less than 152 mm (6 in.)]	450	18	100	4	100	4	150 *(direct burial)* 100 *(in raceway)*	6 4	150 *(direct burial)* 100 *(in raceway)*	6 4
Under streets, highways, roads, alleys, driveways, parking lots	600	24	600	24	600	24	600	24	600	24
One- and two-family dwelling driveways/parking areas, (dwelling-related purposes only)	450	18	450	18	450	18	300	12	450	18
In or under airport runways	450	18	450	18	450	18	450	18	450	18

Article 300.5(D)(4)

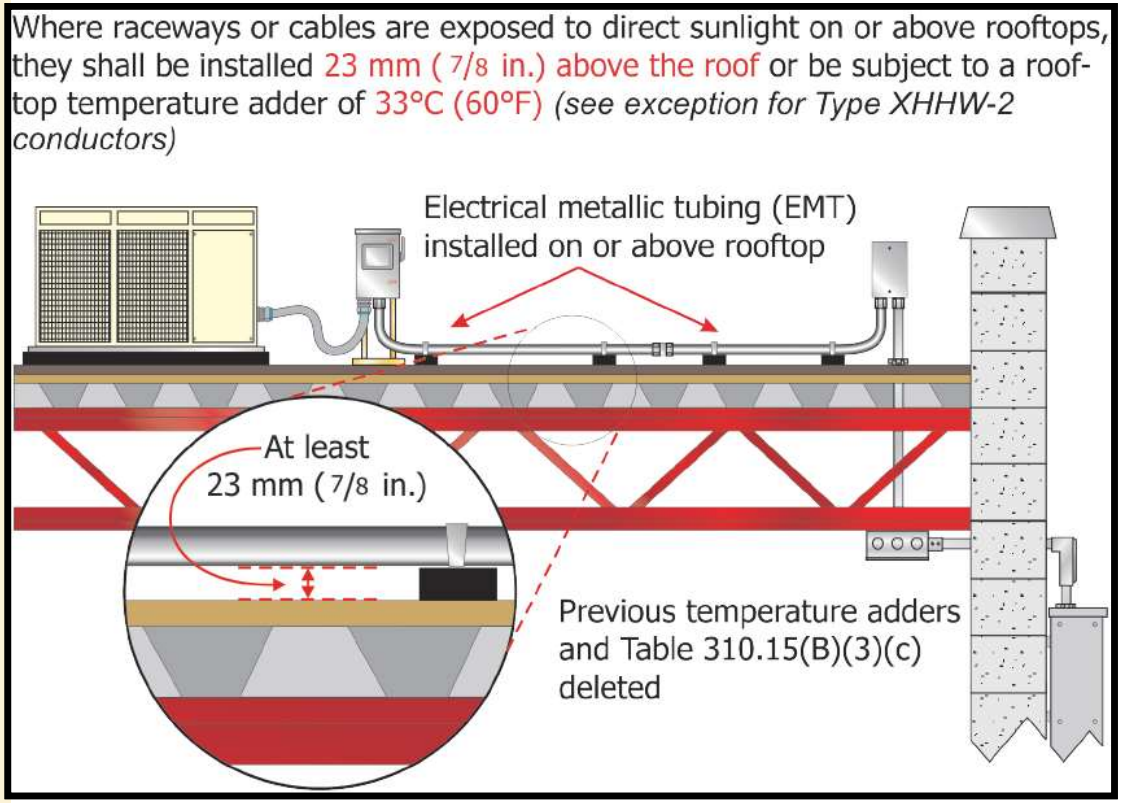
- Protection from Physical Damage
- EMT has been added as an approved method to provide protection from Physical Damage
- It is also allowed to be in concrete and direct buried now. This is due to the Zinc coating it has.
- Note, in areas of severe corrosive influences, it will require a coating to provide extra protection 300.6

Where direct-buried conductors and cables are installed in enclosures or raceways and are subject to physical damage, electrical metallic tubing (EMT), rigid metal conduit (RMC), intermediate metal conduit (IMC), reinforced thermosetting resin conduit (RTRC) (Type RTRC-XW), Schedule 80 rigid polyvinyl chloride (PVC) conduit, or equivalent is allowed to be used to provide protection from physical damage



Article 310.15(B)(3)(C)

- Raceways and Cable on Rooftops
- Raceways must be installed with a clearance of not less than 7/8".
- Otherwise an adder of 60°F must be applied to the conductors.
- Table 310.15(B)(3)(c) has been deleted.
- If adder is needed XHHW-2 is still exempt of this adder.
- Evidence has shown the concern over ambient roof temps were unfounded.



Article Table 310.15(B)(7)

- 120/240V or 208Y/120V Single-Phase Dwelling Service and Feeders
- The 83% rule for Dwellings is back, and expanded, to include single-phase tapped from a Wye.
- The table is removed at the code reference, however is in Annex D as an example, Pg. 70-800.

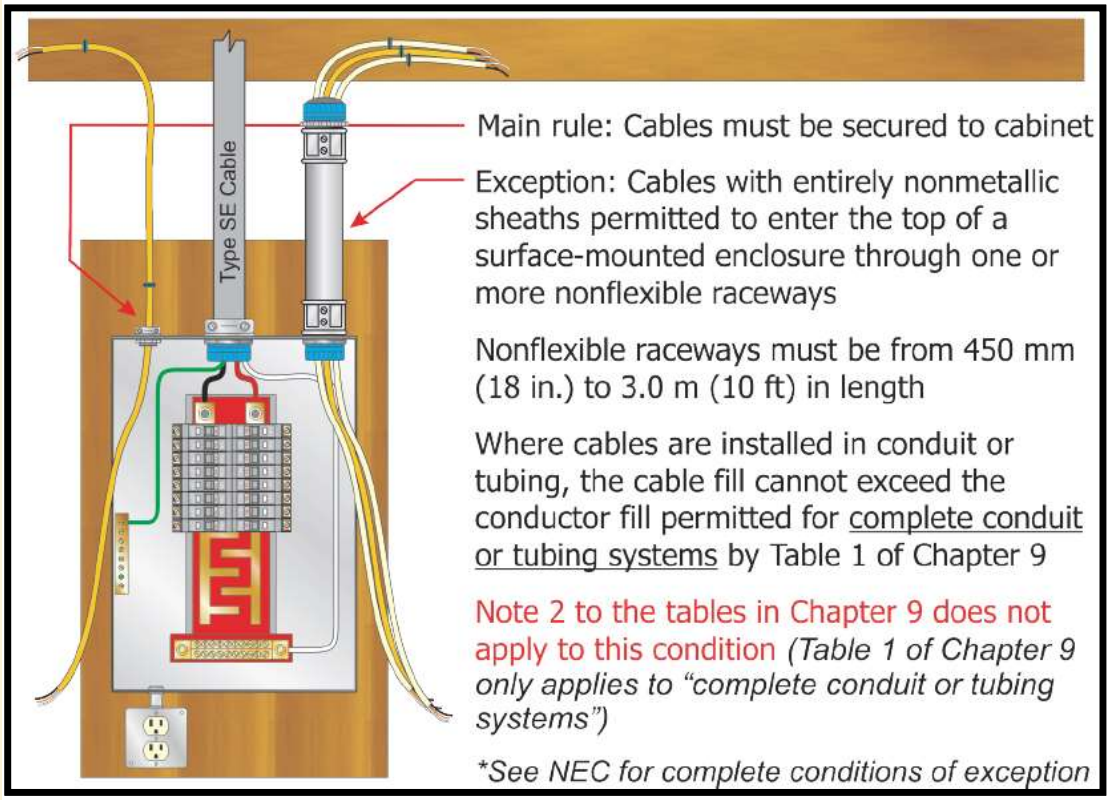
Single-phase, 120/240-volt services or feeders (100 - 400 ampere) and single-phase, 208Y/120-volt feeders (100 - 400 ampere), supplying the entire dwelling unit load permitted to have an ampacity not less than 83% of the service or feeder rating

Correction or adjustment factors required by 310.15(B)(2) or (3) permitted to be applied to the ampacity associated with the temperature rating of these conductors

Service/feeder ratings addressed by this section are based on the standard ampacity ratings from 240.6(A)

Article 312.5(C), Ex Item (7)

- Cable Raceway
- Cables with entirely Nonmetallic sheaths permitted to enter enclosure through one of more nonflexible raceways not less than 18" and not more than 10'
- Cables must be fastened within 12" of entry into raceway +6 other rules
- Chapter 9 Note #2 does not apply to this application
- 40% fill capacity πr^2 to figure the area 3/8" = 0.1145 Or Table 5



Article Table 312.6(A)

- Minimum Wire-Bending Space at Terminals and Minimum Width of Wiring Gutters
- Added a Column for Compact Stranded Aluminum Conductors
- Before Copper and Aluminum were treated as the same regarding bending radius

Wire Size (AWG or kcmil)		Wires per Terminal									
		1		2		3		4		5	
All Other Conductors	Compact Stranded AA-8000 Aluminum Alloy Conductors (see Note 2)	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
14-10	12-8	Not Specified		—	—	—	—	—	—	—	—
8-6	6-4	38.1	1½	—	—	—	—	—	—	—	—
4-3	2-1	50.8	2	—	—	—	—	—	—	—	—
2	1/0	63.5	2½	—	—	—	—	—	—	—	—
1	2/0	76.2	3	—	—	—	—	—	—	—	—
1/0-2/0	3/0-4/0	88.9	3½	127	5	178	7	—	—	—	—
3/0-4/0	250-300	102	4	152	6	203	8	—	—	—	—
250	350	114	4½	152	6	230	8	254	10	—	—
300-350	400-500	127	5	203	8	254	10	305	12	—	—
400-500	600-750	152	6	203	8	254	10	305	12	356	14
600-700	800-1000	203	8	254	10	305	12	356	14	406	16
750-900	—	203	8	305	12	356	14	406	16	457	18
1000-1250	—	254	10	—	—	—	—	—	—	—	—
1500-2000	—	305	12	—	—	—	—	—	—	—	—

Note 1: Bending space at terminals shall be measured in a straight line from the end of the lug or wire connector *(in the direction that the wire leaves the terminal)* to the wall, barrier, or obstruction.

Note 2: This column shall be permitted to be used to determine the minimum wire-bending space for compact stranded aluminum conductors in sizes up to 1000 kcmil and manufactured using AA-8000 series electrical grade aluminum alloy conductor material in accordance with 310.106(B). The minimum width of the wire gutter space shall be determined using the all other conductors value in this table.

Article 312.8(B)

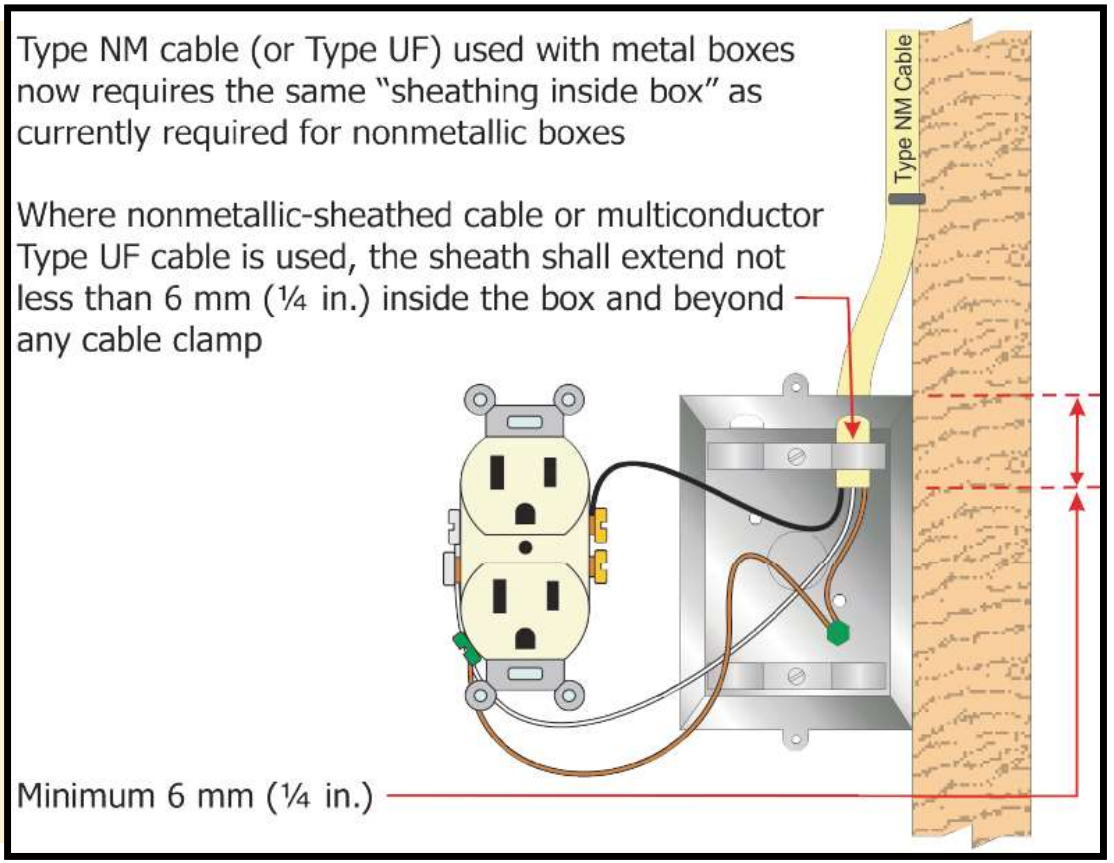
- Switch and Overcurrent Device Enclosures
- Power Monitoring equipment is now required to be listed for the application when installed in free spaces of cabinets and cutout boxes.
- Cannot exceed 75% of the cross-sectional area of space

Article 314.16(A) & (B)

- Number of Conductors in Outlet, Devise, and Junction Boxes, and Conduit Bodies
- Text was added to accommodate boxes with internal barriers for box volume and box fill calculations.
- Volume of box, apportioned to each resulting space
- 1/2 cubic" for Steel barriers
- 1 cubic" for Nonmetallic barriers
- Unless Barrier volume is indicated

Article 314.17(B)

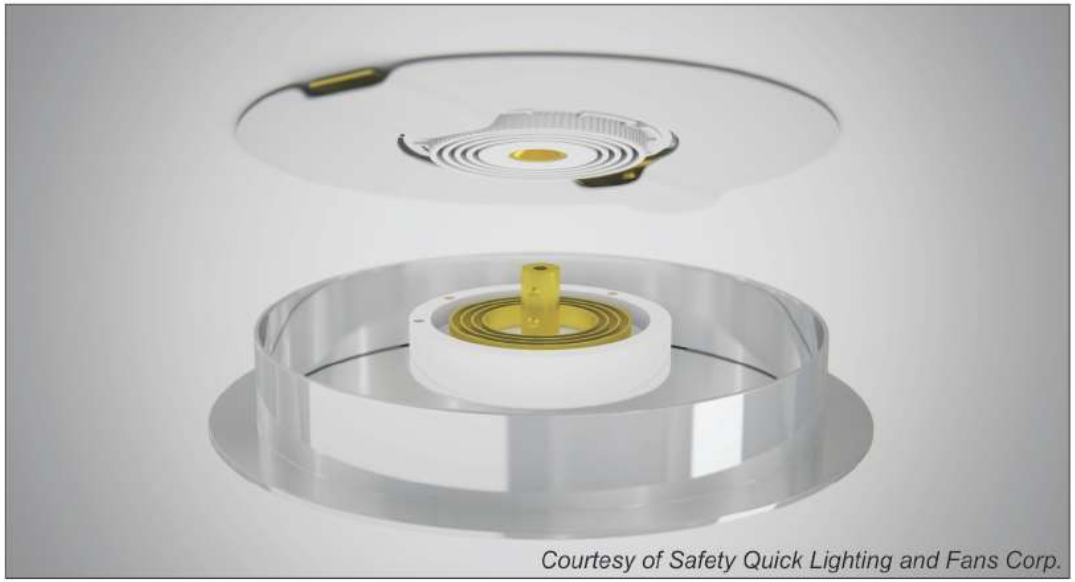
- Type NM Cable Entering Metal Boxes
- 1/4" of sheath inside box, **Beyond** clamp, as is the case with Nonmetallic boxes.



Article 314.27(E)

- Separable Attachment Fittings
- New Outlet boxes are permitted to support listed locking support and mounting receptacles used in combination with compatible attachment fittings.
- Fixtures will be able to be changed, without doing any wiring.
- Non-electricians could do changes, without serious exposure to energized components

Outlet boxes permitted to support listed locking support and mounting receptacles used in combination with compatible attachment fittings



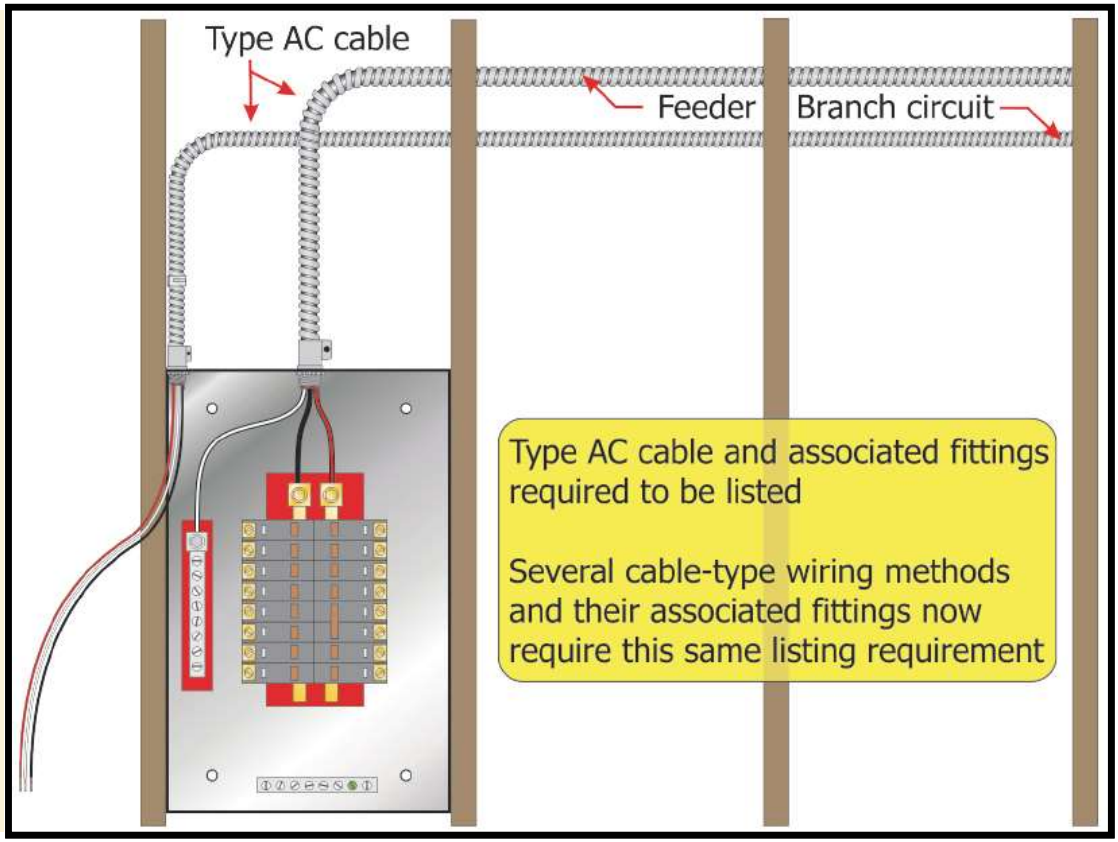
Courtesy of Safety Quick Lighting and Fans Corp.

Separable attachment fittings must be identified for the support of equipment within the weight and mounting orientation limits of the listing

Supporting receptacle installed within a box must be included in box fill calculation

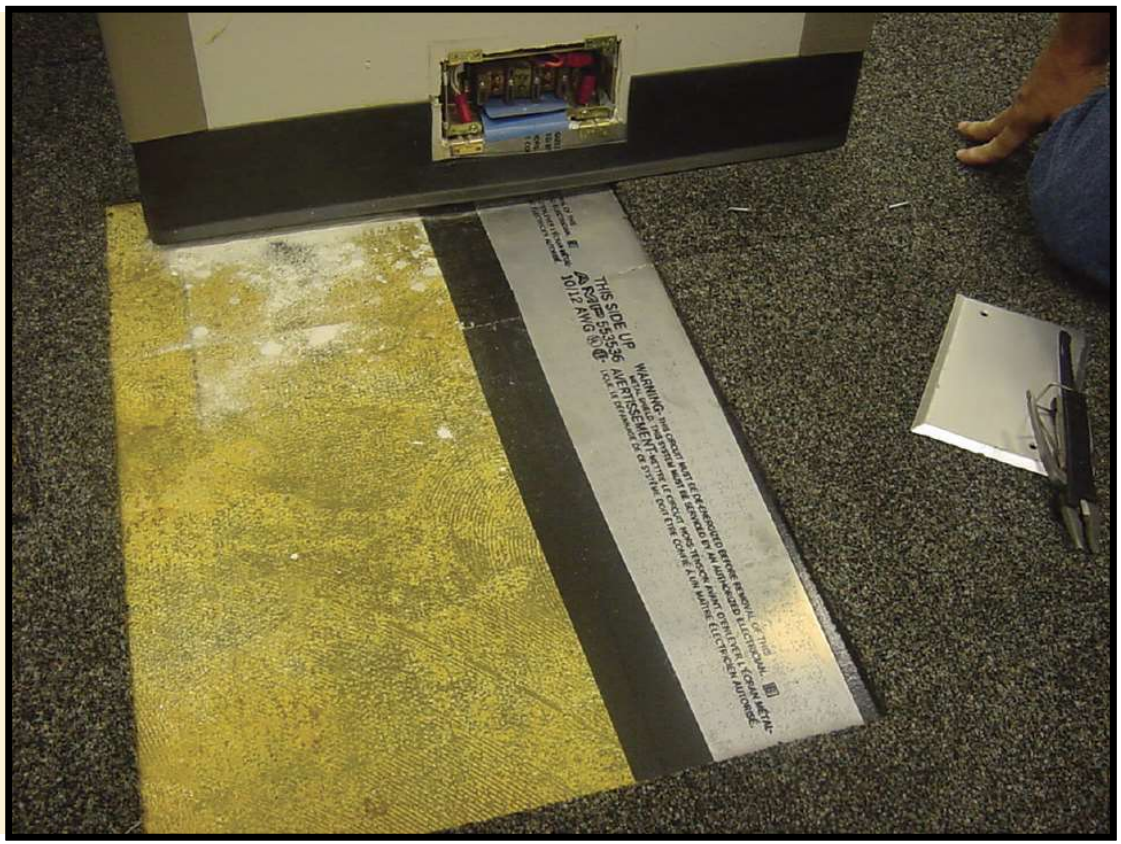
Article 320.6

- Listing Requirements (Armored Cable: Type AC
- The associated fitting shall be listed for use with type AC cable
- This xxx.6 wording was added to 11 different cable types in chapter 3
- 320 Type AC cable is the first in this list of both metallic and nonmetallic sheathed cable types.



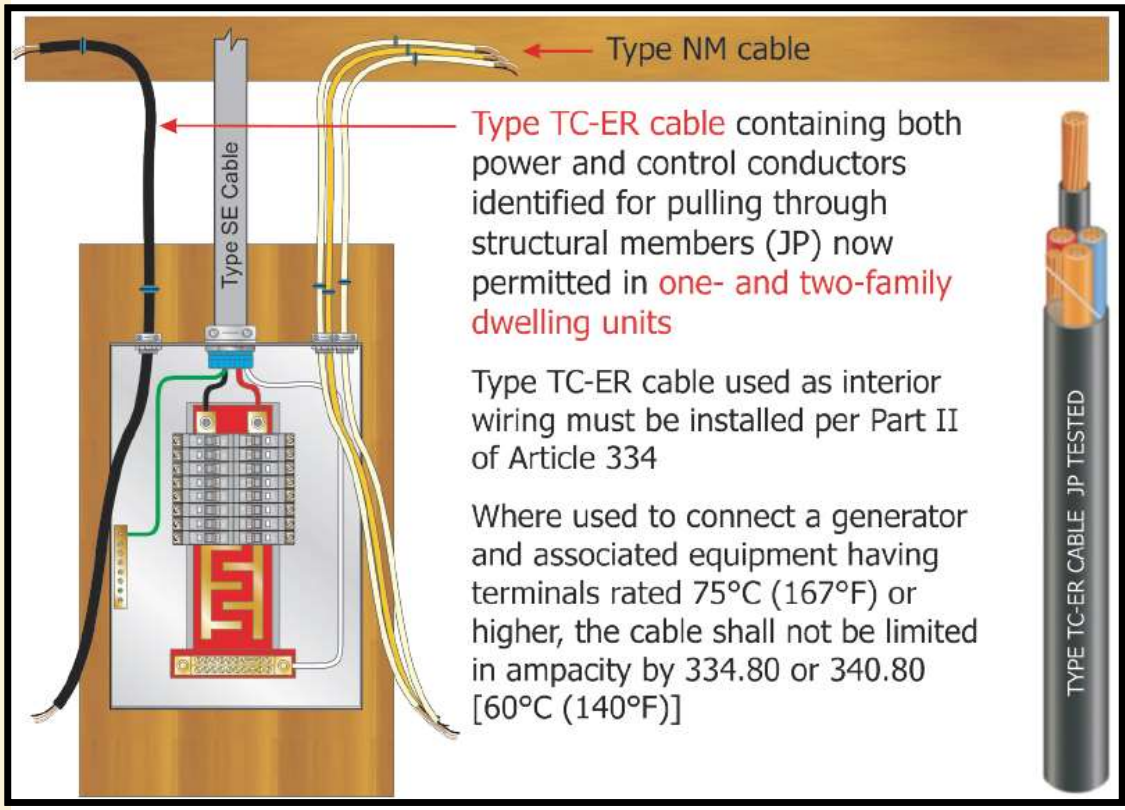
Article324.12(5)

- Uses Not Permitted (Flat Conductor Cable) Type FCC
- 324.12 Item #5 Still prohibited in Schools and Hospital, with the **Exception** of Administrative Office Area



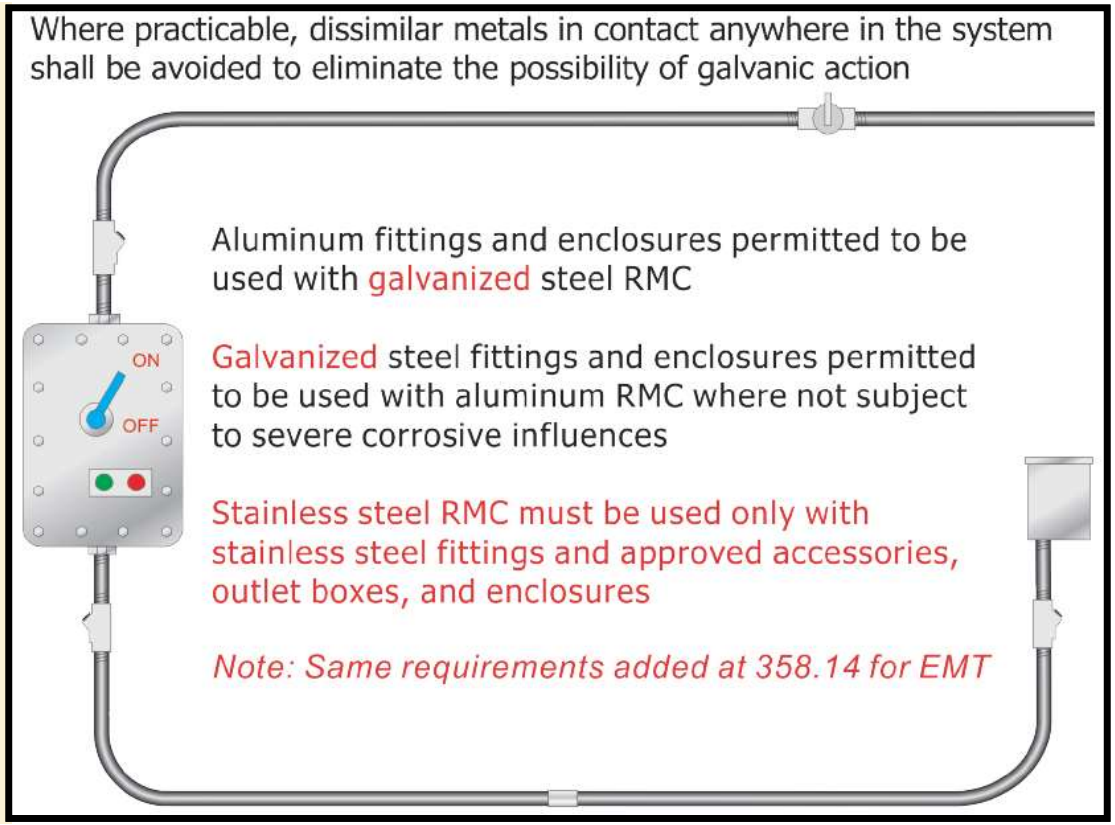
Article 336.10(9)

- Uses Permitted for Type TC Cable with a designator of "JP"
- Now approved for one and two-family Dwelling Units
- Now the cable to a Generator can be in one cable with power and control conductors
- Mitsubishi AC Units could use it
- The sheath is twice the thickness of an SER sheath



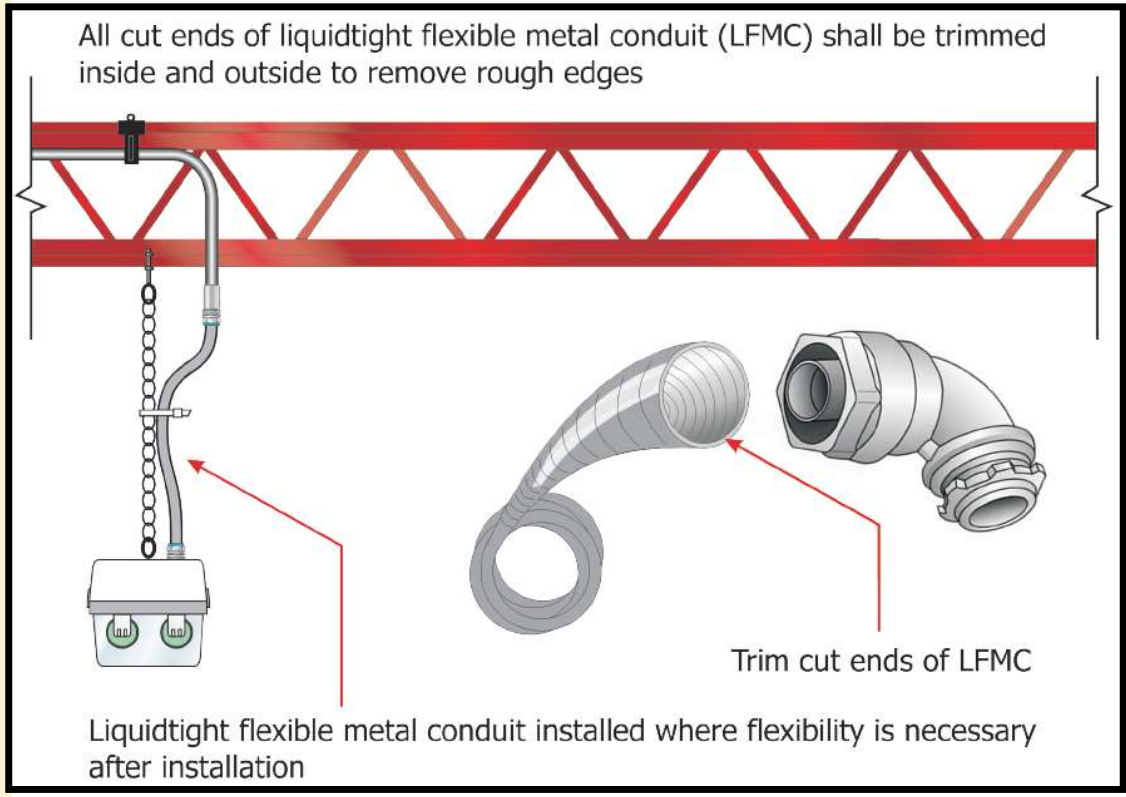
Article 344.14

- Dissimilar Metals: Type RMC
- Stainless Steel RMC Must be used only with stainless steel fittings, approved accessories, outlet boxes and enclosures.
- Galvanized RMC is ok to use with Aluminum fittings without severe corrosive effects.



Article 350.28

- Trimming of LFMC
- Must trim both the inside metal jacket and the outside nonmetallic jacket prior to installing fittings.
- Removing rough edges both protects conductors and ensures a better fitting connection.

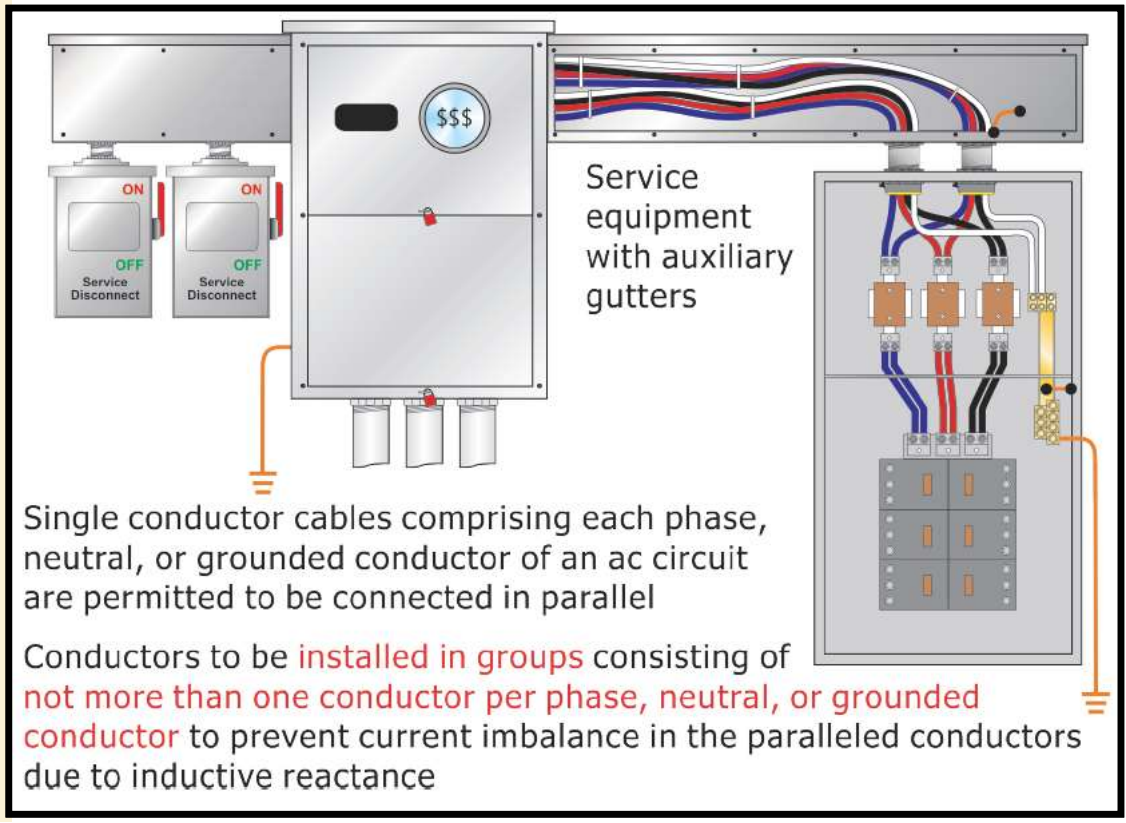


Article 358.10

- Uses Permitted: Type EMT
- For both concealed and Exposed work:
- In concrete, direct contact with earth, in dry, damp, and wet locations.
- Not sure about this one. I have unearthed a lot of EMT over the years, and it not being allowed in direct bury applications was a good thing.
- Take into account cost to wrap when needed.

Article 366.20

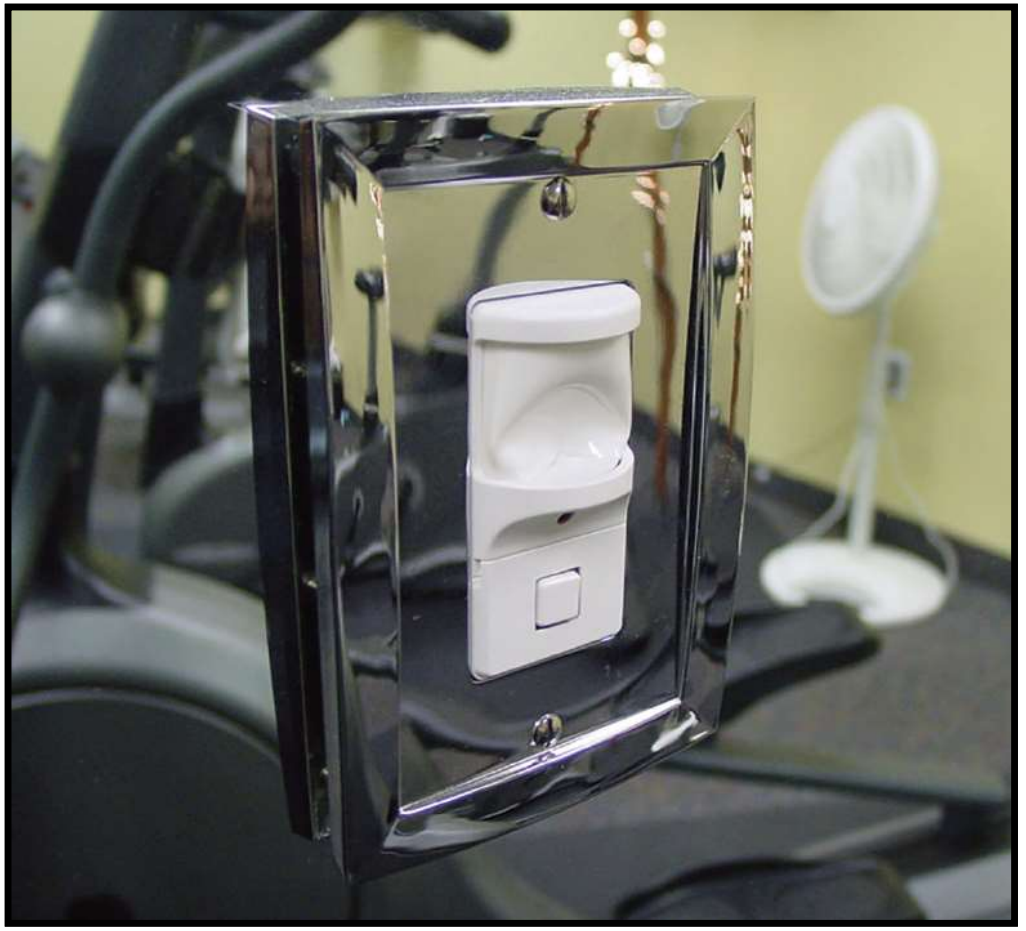
- Parallel Conductor in Auxiliary Gutters
- Parallel runs in open wireways, must be kept grouped in bundles, where there is not more than a single conductor per phase
- This will ensure phase cancellation and the prevention of imbalance due to inductive reactance
- The tendency is to group phase conductors, which creates heat



CHAPTER 04
EQUIPMENT FOR GENERAL USE

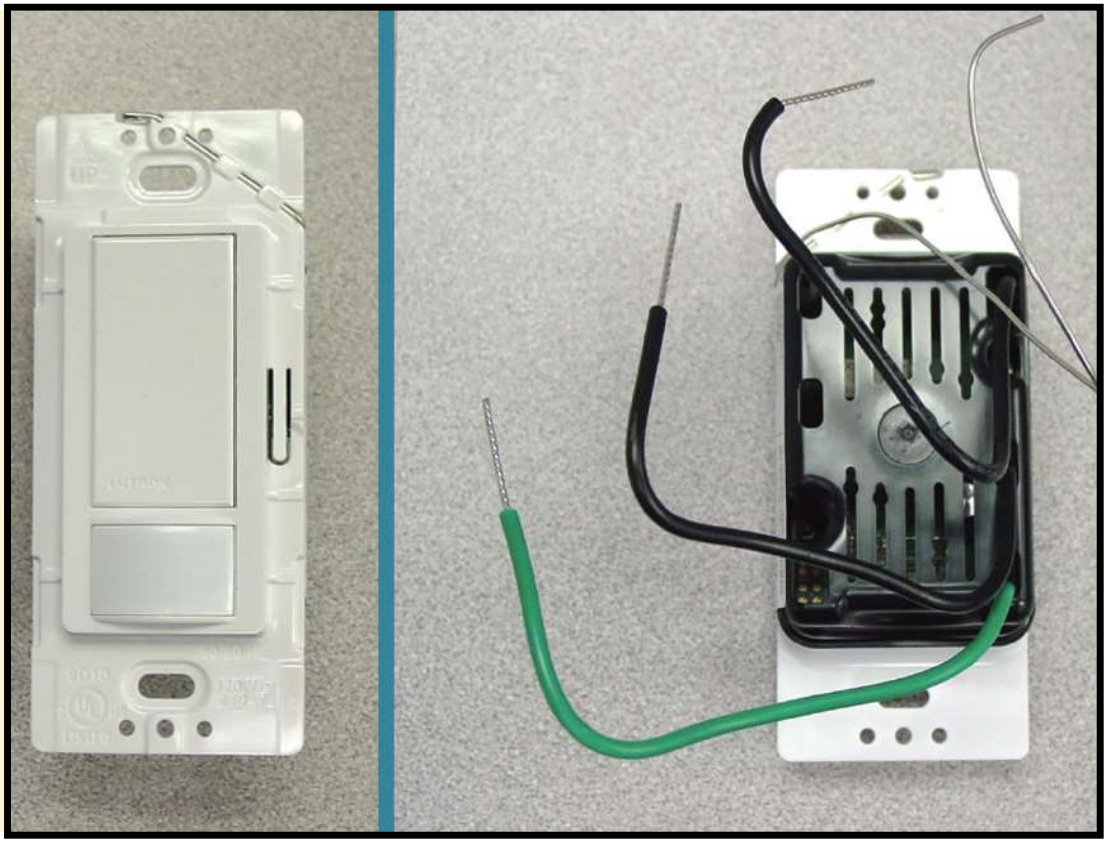
Article404.2(C)

- Switch Connections
- Clarifies that a grounded conductor of the lighting circuit at switch locations shall be connected to the electronic device.



Article 404.22

- Branch-Circuit Voltage Limitations
- New provision added to Electronic Lighting Controlled Switches, Prohibiting current on the equipment grounding conductor with a future effective date
- January 1, 2020
- Presently some manufactures are directing installers to use and equipment ground if no Neutral is available in the switch box



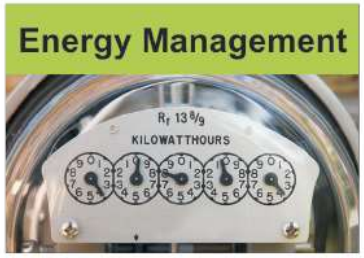
Article 406.2

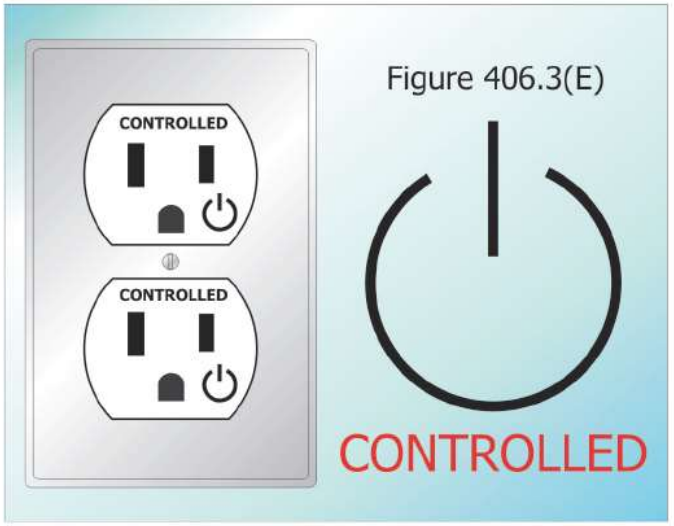
- Receptacles, Cord Connectors, and Attachment Plugs (Caps)
- New definition for "Outlet Box Hood" was added

Article 406.3(E)

- Controlled Receptacle Marking
- Receptacles controlled by automatic control devices must be permanently marked with a symbol and the word Controlled
- One the Face, not the cover plate

All nonlocking-type, 125-volt, 15- and 20-ampere receptacles controlled by an automatic control device, energy management, or building automation shall be marked with the "Controlled Receptacle Marking Symbol" from Figure 406.3(E) and the word "CONTROLLED"

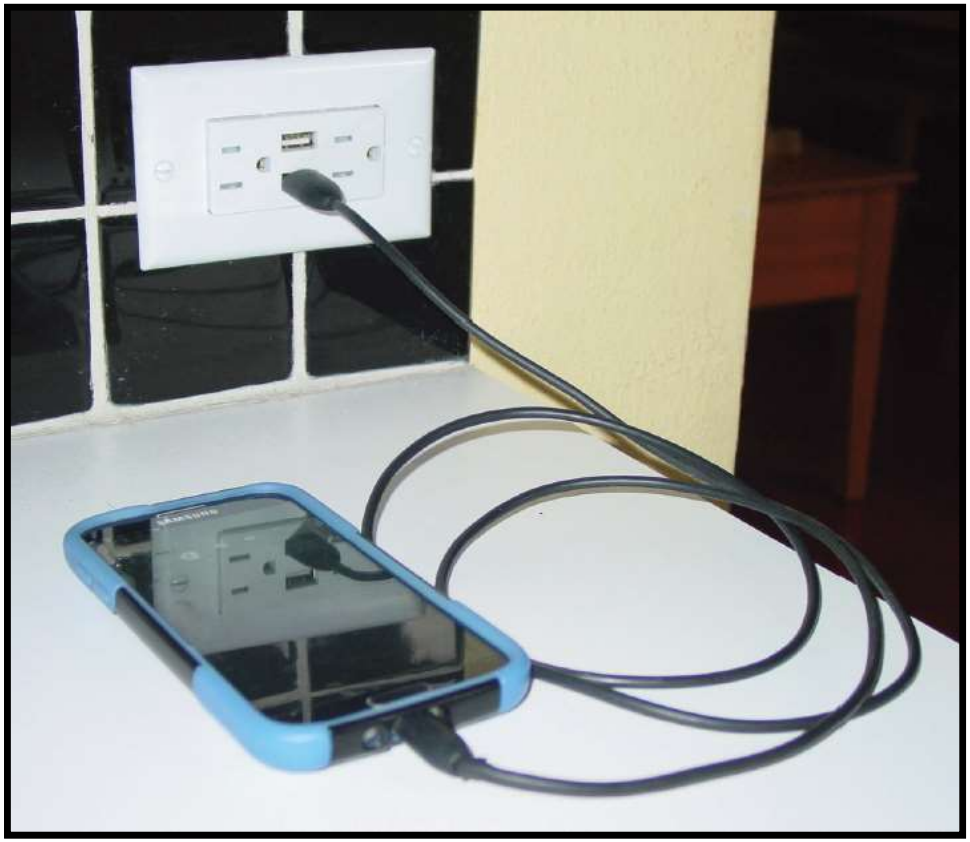




For receptacles controlled by an automatic control device, the marking shall be located on the receptacle face and visible after installation

Article 406.3(F)

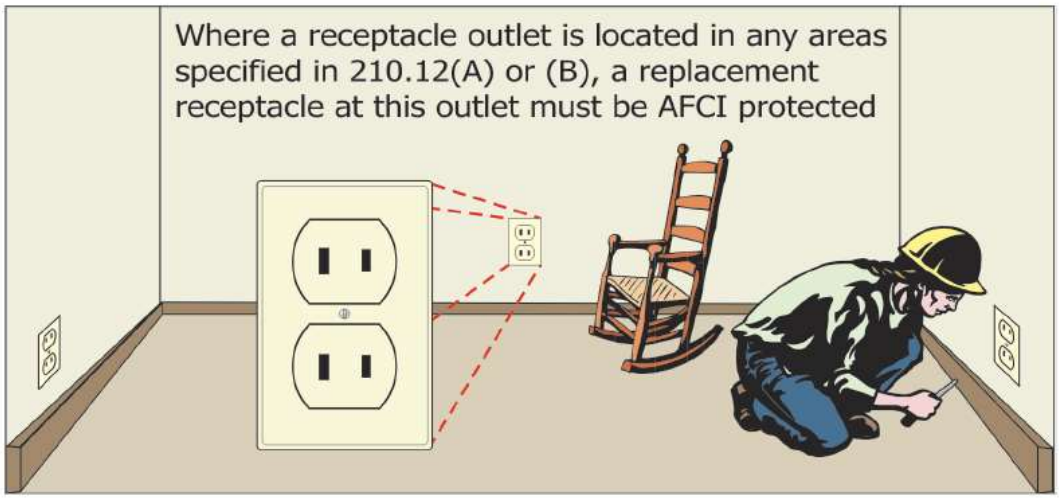
- Receptacle Rating and Type
- New requirements were added for receptacles outlets with USB chargers
- At present the Class 2 circuit cannot be created elsewhere and wired to these outlets, but are an integral part of the device
- Limited to 125V 15A & 20A Receptacle devices



Article 406.4(D)(4) Ex. #1 & 2

- Replacement Receptacles AFCI
- Two new Exceptions were added for AFCI requirements

1. Existing Two Wire receptacle is replaced and no equipment ground is available
2. The exemption of AFCI requirement for circuits extended less than 6' does not apply to the requirement to replace a standard receptacle with an AFCI when one would be required, if new.



Ex. No. 1: AFCI protection not required where all of the following apply:

(1) Replacement complies with 406.4(D)(2)(b) *(two-wire system-GFCI)*

(2) Impracticable to provide an EGC as provided by 250.130(C)

(3) Listed combination type AFCI circuit breaker not commercially available

(4) GFCI/AFCI dual function receptacles not commercially available

Ex. No. 2: Exception at 210.12(B) shall not apply to replacement of receptacles

Article 406.4(D)(5)

- Receptacle Replacement Tamper-Resistant
- Tamper-resistant receptacles are required for replacement of receptacles except where a non-grounding receptacle is replaced.

Listed tamper-resistant receptacles are required for replacement receptacles where a receptacle outlet is required to be tamper-resistant elsewhere in the *Code* "except where a non-grounding receptacle is replaced with another non-grounding receptacle"

Article 406.6(D)

- Receptacle Faceplates with Integral Night Light and/or USB Charger
- New Item "D" requirements were added for receptacle faceplates with integral night lights
- Shall be listed and constructed such that the night light and/or Class 2 circuitry is integral with the flush device cover plate

Receptacle faceplates shall be installed so as to completely cover the opening and seat against the mounting surface

Courtesy of SnapPower

A flush device cover plate that additionally provides a night light and/or Class 2 output connector(s) shall be listed

The night light and/or Class 2 circuitry must be integral with the flush device cover plate

Article 406.9(B)(1)

- Extra-Duty Outlet Box Hoods
- New provision allowing "other listed products" enclosures, or assemblies providing weatherproof protection that do not utilize an outlet box hood, need not be marked "extra duty"
- They still have to be an "In Use" type allowing a lid to shut with an attachment cord plugged in.

An outlet box hood installed at an enclosure for 15 and 20 amperes, 125 and 250 volt receptacles in a wet location to provide weatherproof protection whether or not an attachment plug cap is inserted or not must be listed and identified as "extra duty"

Must be Marked "Extra Duty"

"Extra Duty" Not Required

Other listed products, enclosures, or assemblies providing weatherproof protection that do not utilize an outlet box hood need not be marked "extra duty"

Article 406.12

- Tamper-Resistant Receptacles
- Requirements expanded to:
- Preschools, and elementary education facilities
- As well as other locations where small children are likely to congregate (anywhere the Duggar family visits)

All 15- and 20-ampere, 125- and 250-volt nonlocking-type receptacles in areas specified in 406.12(1) through (7) must be listed tamper-resistant receptacles: (1) Dwelling units in all areas specified in 210.52 and 550.13; (2) Guest rooms and guest suites of hotels and motels; (3) Child care facilities

(4) Preschools/elementary educational facilities; (5) Waiting rooms, etc. in medical/dental offices; (6) Places of waiting-transportation, gymnasiums, etc.; (7) Dormitories

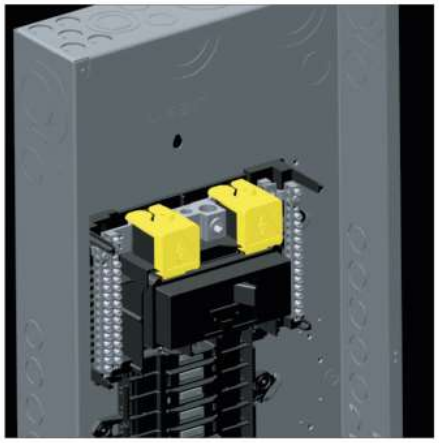
Article 406.15

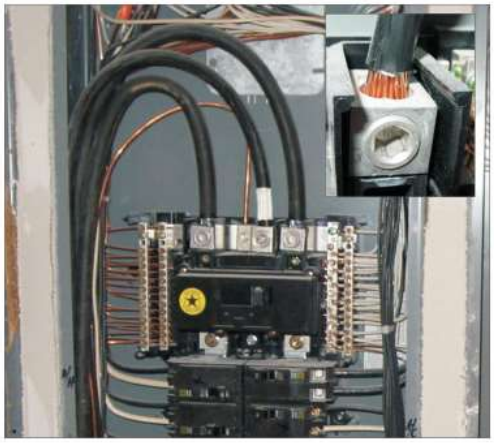
- Dimmer-Controlled Receptacles
- Article **Deleted**
- This was limited to specially configured receptacles, that would not allow standard cord connection.

Article 408.3(A)(2)

- Barriers at Service Panelboards
- New requirements for barriers to be placed in all service panelboards so that no uninsulated, ungrounded service busbar or service terminal will be exposed to inadvertent contact by persons.
- At present the focus is on Line-Side terminals.
- Split-bus panels are exempt for the present
- This will be the responsibility of the installer, due to the varying types of configurations.

Barriers required in all service panelboards, switchboards, and switchgear such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations





Courtesy of Schneider Electric

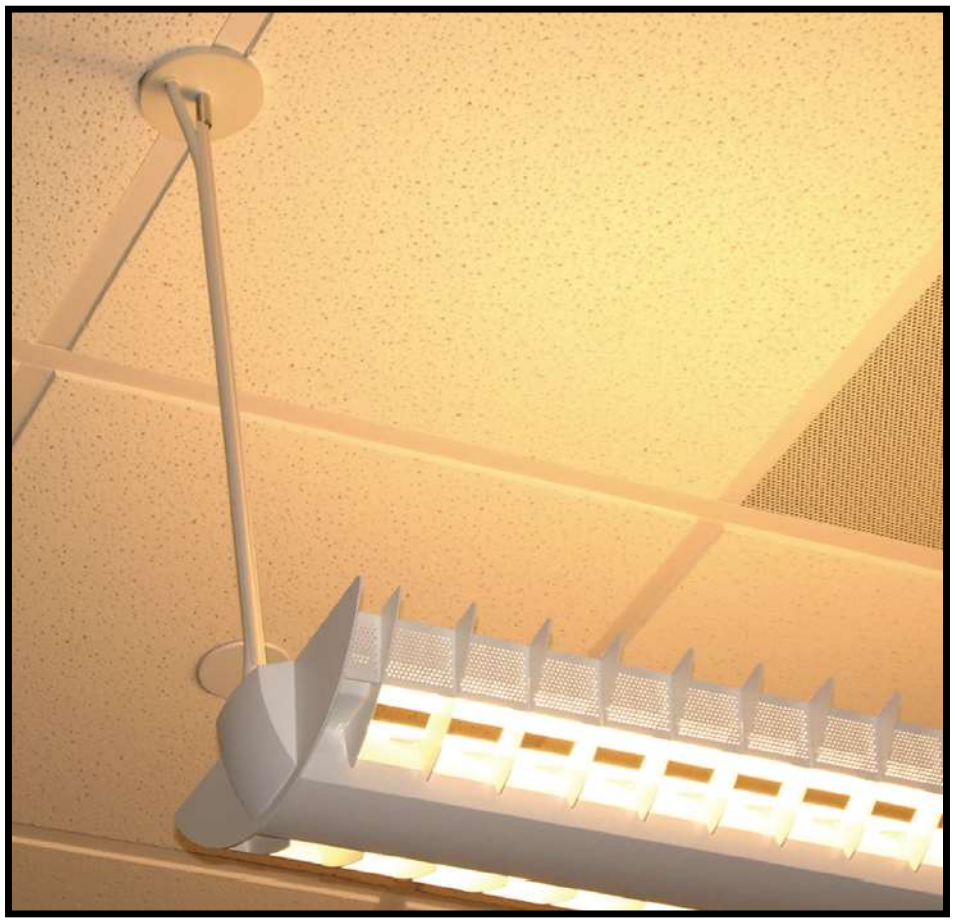
Exception: *This requirement shall not apply to service panelboards with provisions for more than one service disconnect within a single enclosure as permitted in 408.36, Exceptions No. 1, 2, and 3*

Article 409.22(B)

- Short-Circuit Current Rating
- New requirements added for documentation of available short-circuit current at industrial control panels.
- Must be dated for when the short-circuit current calculation was performed.

Article 410.62(C)(1)

- Cord-Connected Lampholders and Luminaires
- Reorganization to the requirements for cord-connected lampholders and luminaires of electric-discharge and LED types of fixtures.
- The reorganization is an attempt to make easier to understand



Article 411

- Low-Voltage Lighting
- Revision
- Reorganized and renamed
- Changed from sole focus of a voltage limitation (30V)
- Now a 25 amperes for the output circuits of the power supply under all load conditions.

Article 422.2

- Definition (Appliances)
- Term "Vending Machine" has been deleted.
- They are still required to be GFCI protected but now that requirement is now in 422.5(A)(5)
- To focus on Vending machine might miss the mark, by the general classification of an **"Appliance"**, they are more clearly included in the requirement for GFCI protection.

Article 422.5

- GFCI Protection for Appliances
- GFCI for the five specific types of appliances were grouped together and relocated to one location in 422.5(A) and new 422.5(B)

GFCI requirements for Appliances *(250 volts or less and 60 amperes or less, single- or 3-phase)* have been moved to one location in Article 422

(Multiple GFCI devices are permitted but not required)

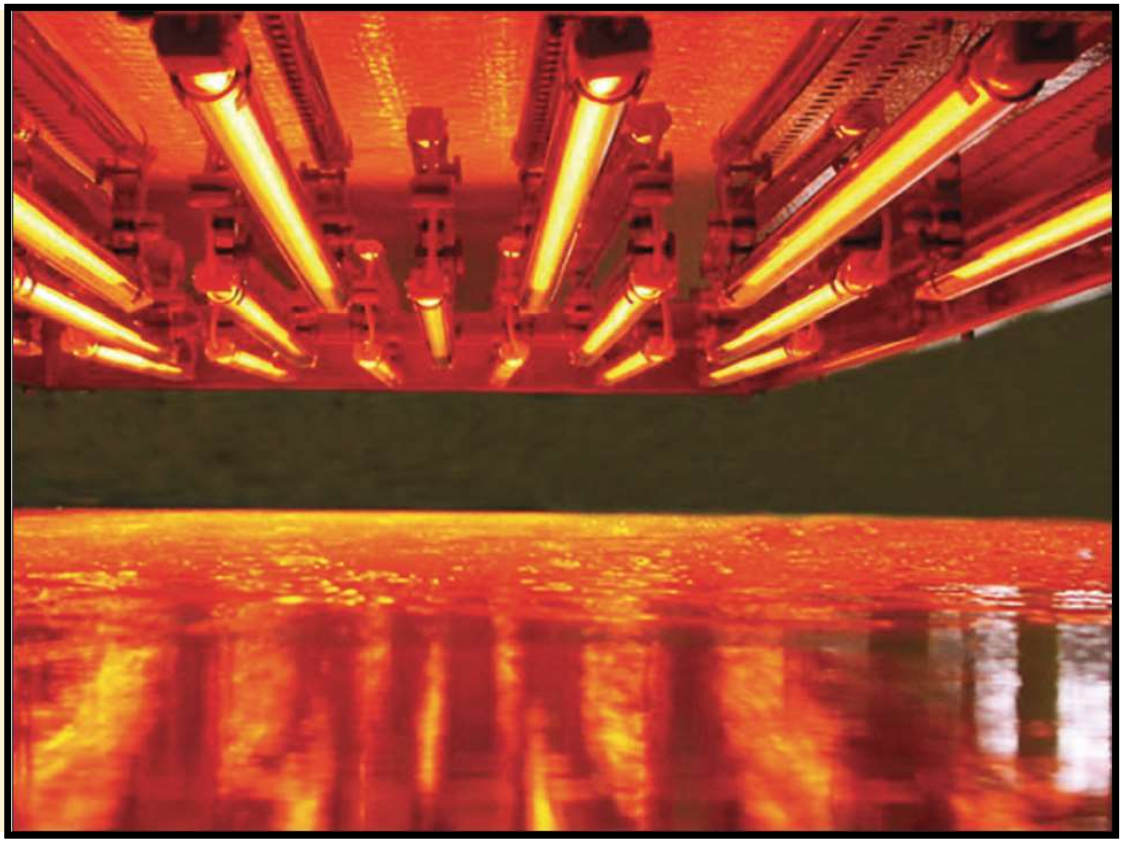
(1) Automotive vacuum machines; (2) Drinking water coolers; (3) High-pressure spray washing machines *(cord-and-plug-connected)*; (4) Tire inflation machines; (5) Vending machines

Article 422.6

- Listing Required (Appliances)
- New listing requirement enforced for all appliances operating at 50V or more.
- This is a move to protect consumers, exposed to various appliances. A measure beyond GFCI protection.

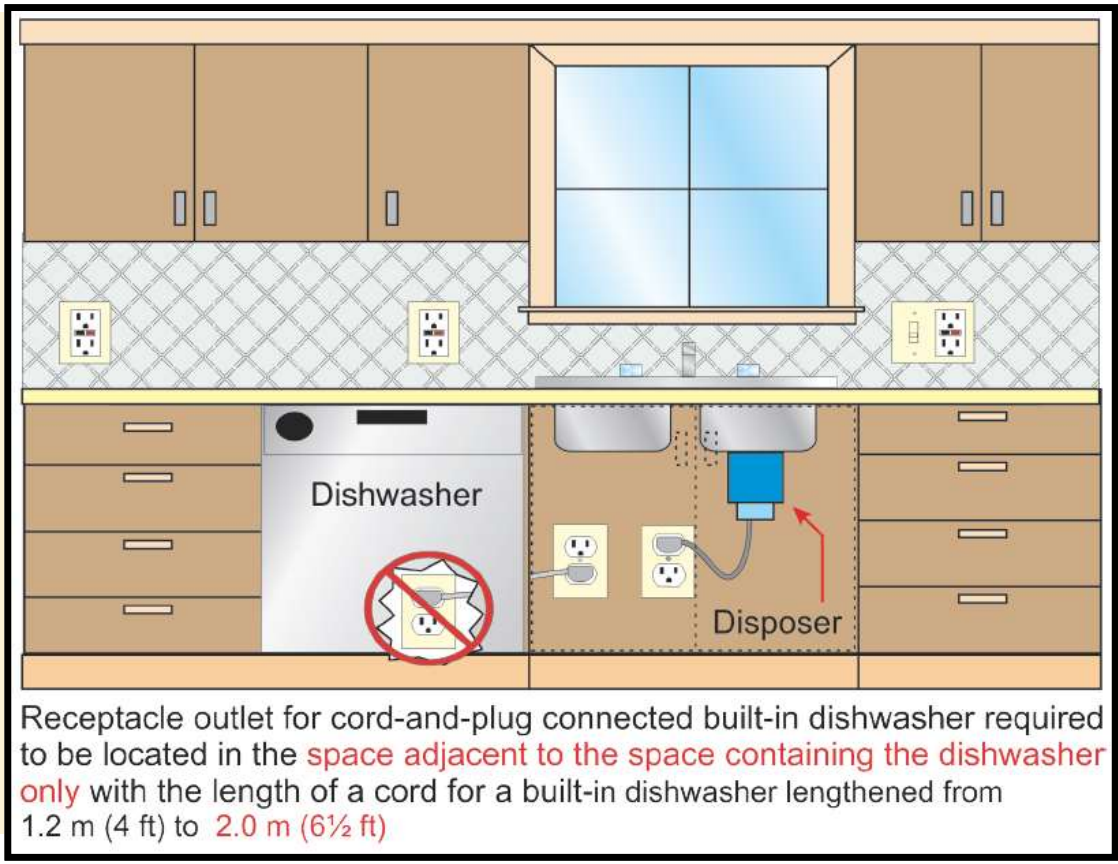
Article 422.14

- Infrared Lamp Industrial Heating Appliances
- Deletion of 422.14 and relocated to New Article 425.14
- This will put it with other types of industrial heating appliance into one location.



Article 422.16(B)(2)

- Built-In Dishwashers
- Maximum length of flexible cord for built-in dishwashers increased from 4’ to 6.5’
- Outlet for dishwashers can only be located in a space adjacent to the dishwasher and not behind or within the same installation space.
- Trash compactor may have an outlet in the same space or adjacent.

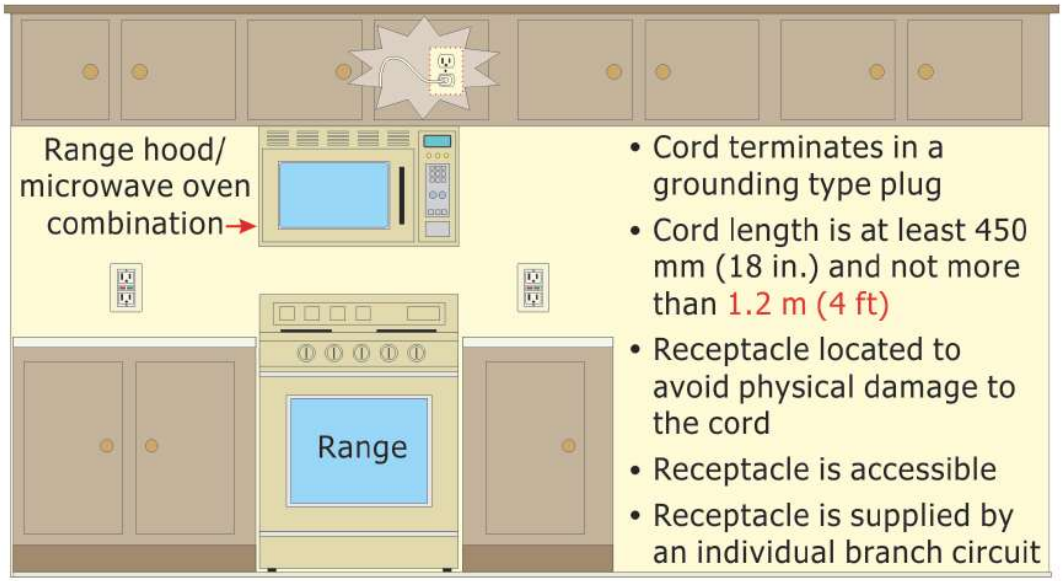


Receptacle outlet for cord-and-plug connected built-in dishwasher required to be located in the space adjacent to the space containing the dishwasher only with the length of a cord for a built-in dishwasher lengthened from 1.2 m (4 ft) to 2.0 m (6½ ft)

Article 422.16(B)(4)

- Range Hoods
- Revision maximum length of flexible cord for a cord and plug-connected range hood has been increased from 36" to 4'
- Built in Range hoods may be cord and plug-connected
- This allows for a dedicated outlet for a future Microwave to be installed, where a cheaper range hood is installed for the present.

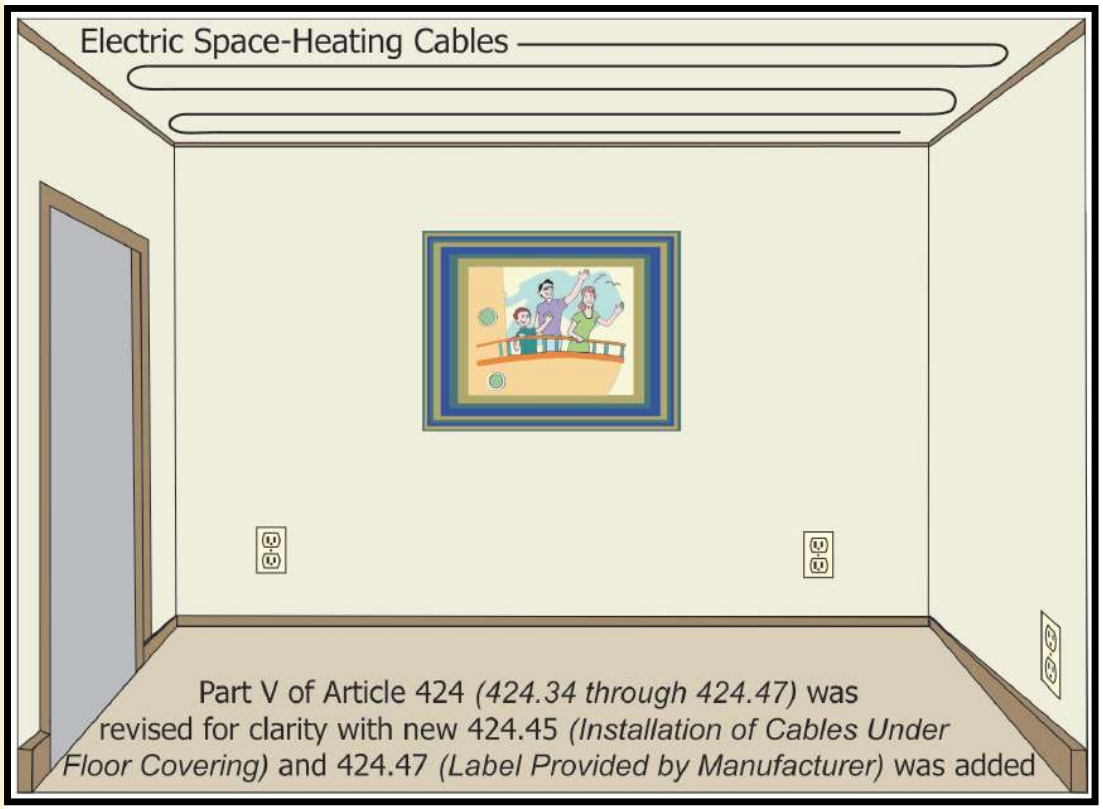
Range hoods are permitted to be cord-and-plug connected where identified on installation instructions by manufacturer and meets the following:



Length of cord for cord-and-plug connected range hoods increased from 900 mm (36 in.) to 1.2 m (4 ft)

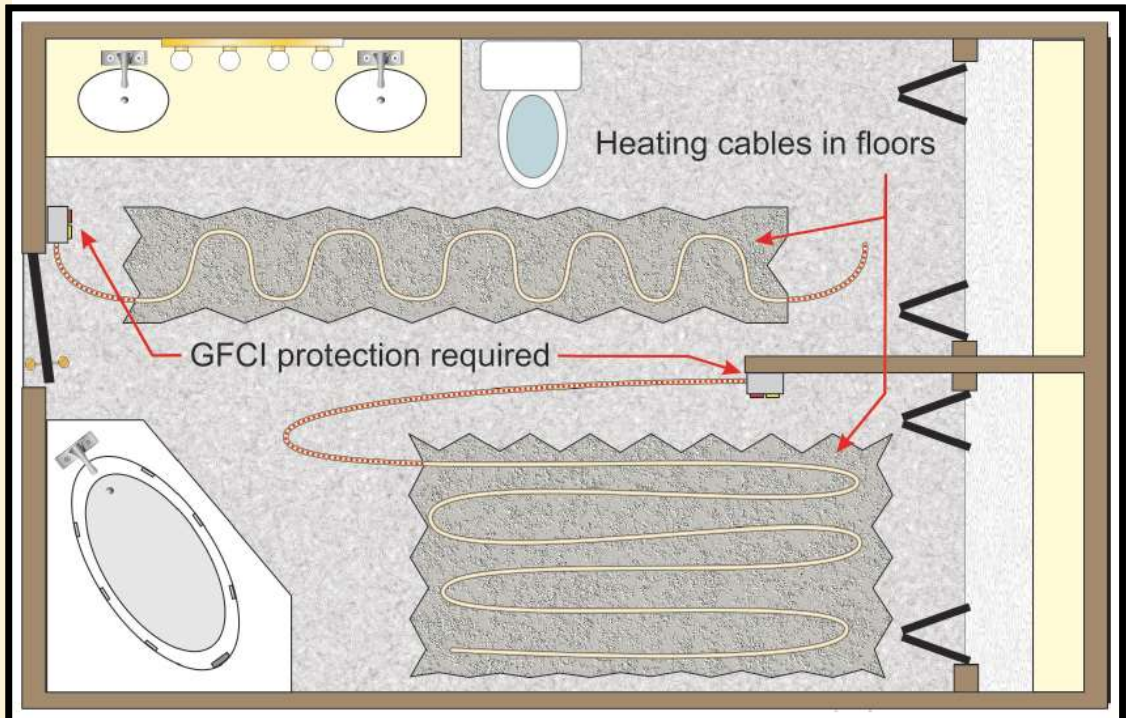
Article 424 Part V

- Electric Space-Heating Cables
- Revision, Part V (424.34 through 424.47) revised for clarity.
- Two new sections were added to address proper installation of under floor coverings and labels provided by the manufactures.



Article 424.45

- Heating Cables Under Floor Coverings
- New added for the installation of heating cables installed under floor coverings
- These instructions are in addition to any provided by the manufacture, which are typically lacking



New requirements added in Part V of Article 424 giving specific instruction for the installation of heating cables installed under floor coverings

Article 424.47

- Label Provided by Manufacturer
- New provisions were added for manufacturers of electric space-heating cables to provide marking labels to be affixed to panelboards to identify which branch circuits supply circuits to those space-heating installations.
- Installing these labels will be the electricians responsibility, and you will have to chase this down from the installer.

Manufacturers of electric space-heating cables are to provide marking labels that indicate electric space-heating cables present and instructions that the labels be affixed to panelboards identifying branch circuits supply heating cables

⚠ CAUTION

RISK OF ELECTRICAL SHOCK-ELECTRICAL WIRING AND HEATING CABLES CONTAINED BELOW THE FLOOR. DO NOT PENETRATE FLOOR WITH NAILS, SCREWS, ETC.

Electric space-heating cables installed in this area. Avoid actions which may result in mechanical damage to these heating cables.

Room Name	Circuit Breaker	Volt Rating	Total Output	No. of Units
Master Bathroom	*14*	*120 volts*	*2.55 A / Unit*	*3*

If the electric space-heating cable installations are visible and distinguishable after installation, labels are not required to be provided and affixed to panelboards

Article 424 Part X

- Fixed Electric Space-Heating Equipment
- New, Part X 424.100 was added for low-voltage fixed electric space-heating equipment

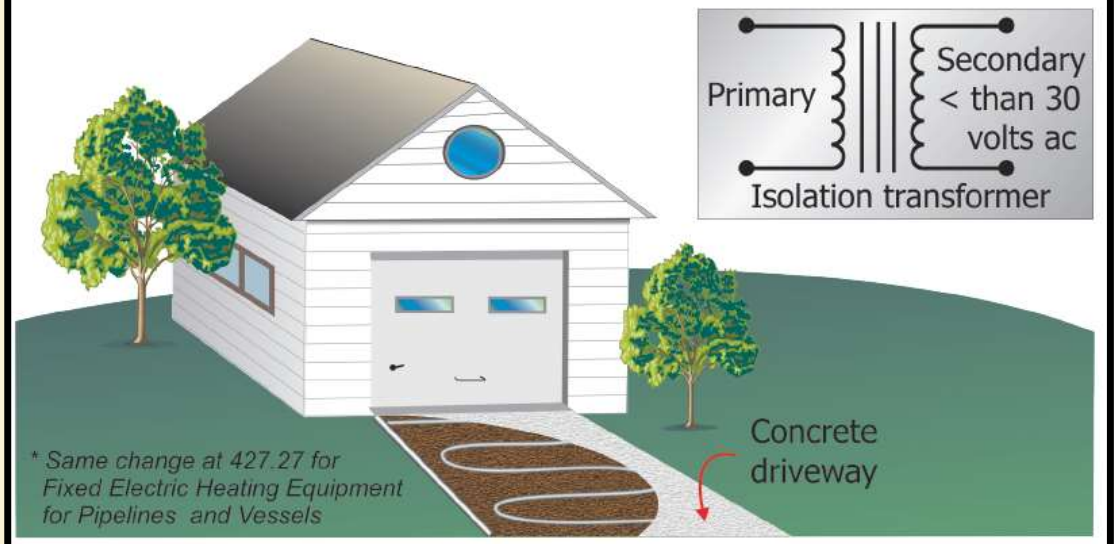
New Article 425

- Fixed Resistance and Electrode Industrial Process Heating Equipment
- Designed specifically for Industrial locations and applications.

Article 426.32

- Impedance Heating Voltage Limitation Fixed Outdoor Electric Deicing and Snow Melting Equipment
- Revision, Secondary winding of an isolation transformer connected to an impedance heating element cannot have an output voltage greater than 30V AC
- The allowance of a voltage output greater than 30V AC, if the system is provided with a Class A GFCI, has been deleted.

Secondary winding of an isolation transformer connected to the impedance heating elements shall not have an output voltage greater than 30 volts ac

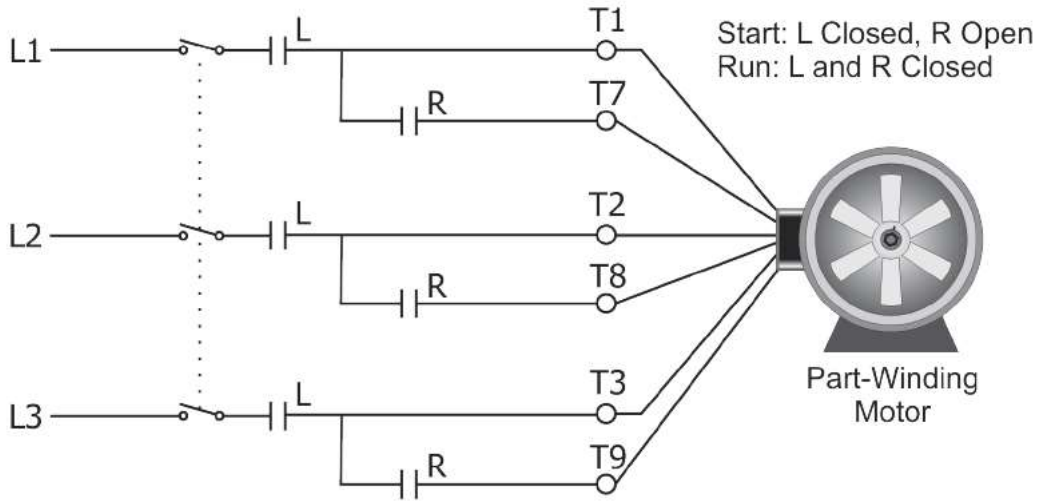


The allowance for voltage output greater than 30 volts ac if an impedance heating system for fixed outdoor electric deicing and snow-melting equipment is provided with Class A GFCI protection has been deleted

Article 430.2 & 430.4

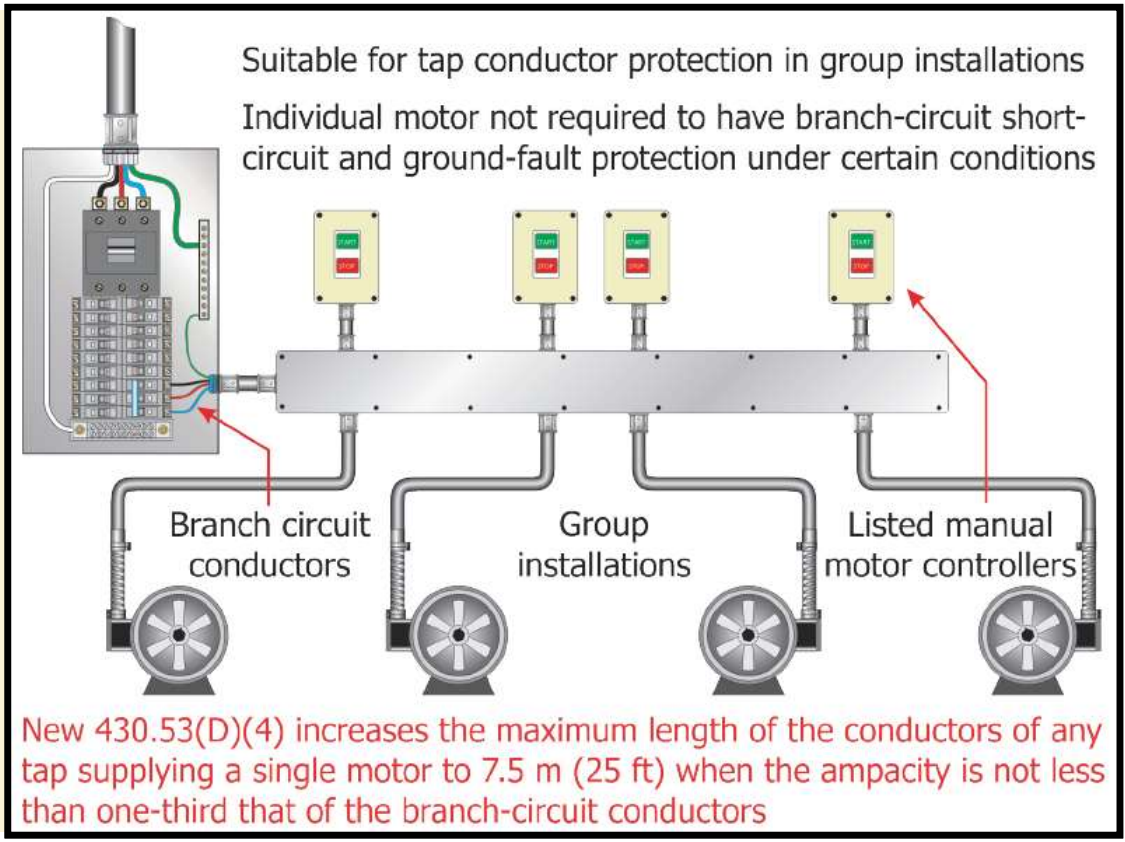
- Definitions: Part-Winding Motors
- Text was deleted from 430.4, and located in 430.2
- The new location is deemed a better fit. Due to needing to be defined before requisite information is provided for connection and operation.
- Hermetically sealed units are not permitted to have Part-Winding Motors.

Part-Winding Motors. A part-winding start induction or synchronous motor is one that is arranged for starting by first energizing part of its primary (armature) winding and, subsequently, energizing the remainder of this winding in one or more steps. A standard part-winding start induction motor is arranged so that one-half of its primary winding can be energized initially, and, subsequently, the remaining half can be energized, both halves then carrying equal current. A hermetic refrigerant compressor motor shall not be considered a standard part-winding start induction motor.



Article 430.53(D)(4)

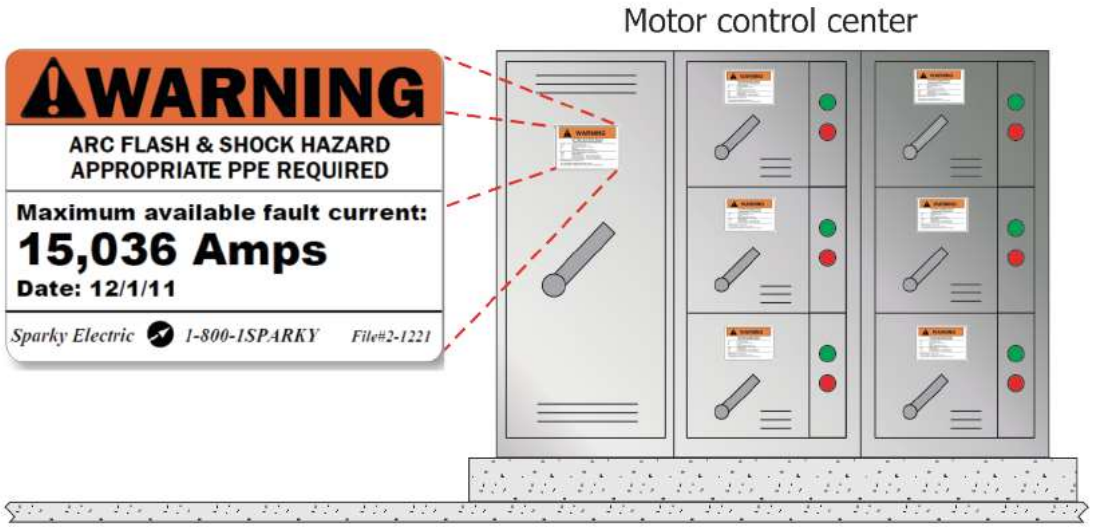
- Single Motor Taps on One Branch Circuit
- New tap rule for a single motor allows 25' taps with the same condition as is allowed in other areas of the NEC
- Ampacity of the conductor must not be less than 1/3 that of the branch circuit ampacity



Article 430.99

- Available Fault Current for Motor Control Centers
- New, Requirements added for available short-circuit current at the motor control center and the date the short-circuit current calculation was performed
- Remember to add the Motor contribution onto the short-circuit calculations can be 4xFLA of utility transformer output

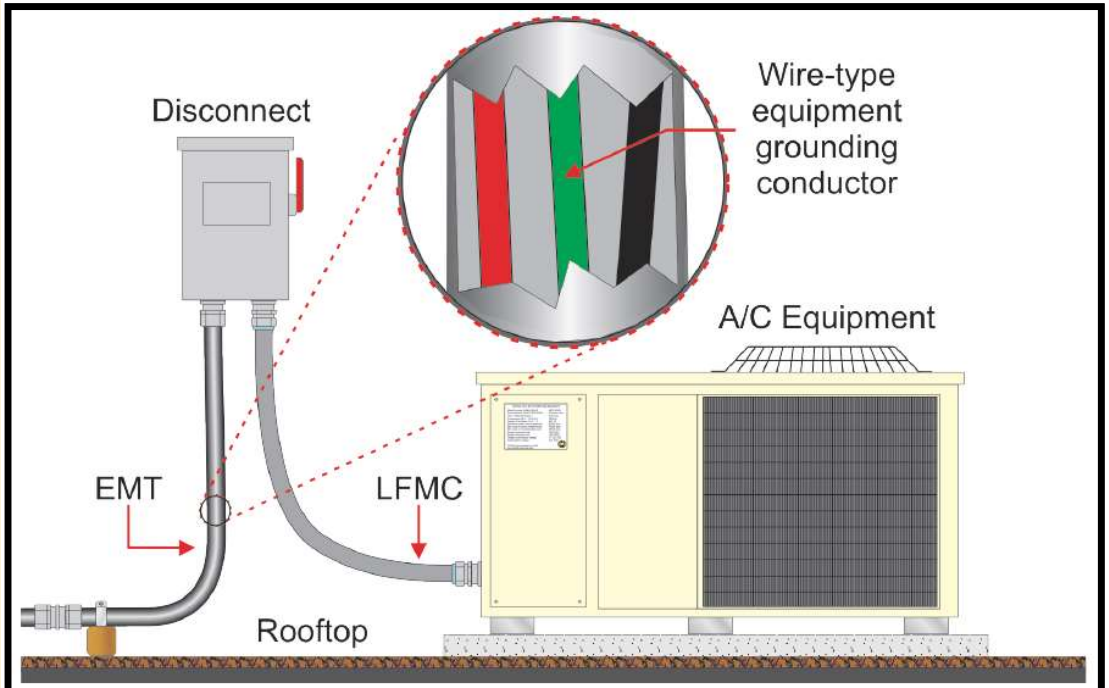
The available short circuit current at the motor control center and the date the short circuit current calculation was performed shall be documented and made available to those authorized to inspect the installation



New requirements added for available short circuit current at motor control centers and the date the short circuit current calculation was performed

Article 440.9

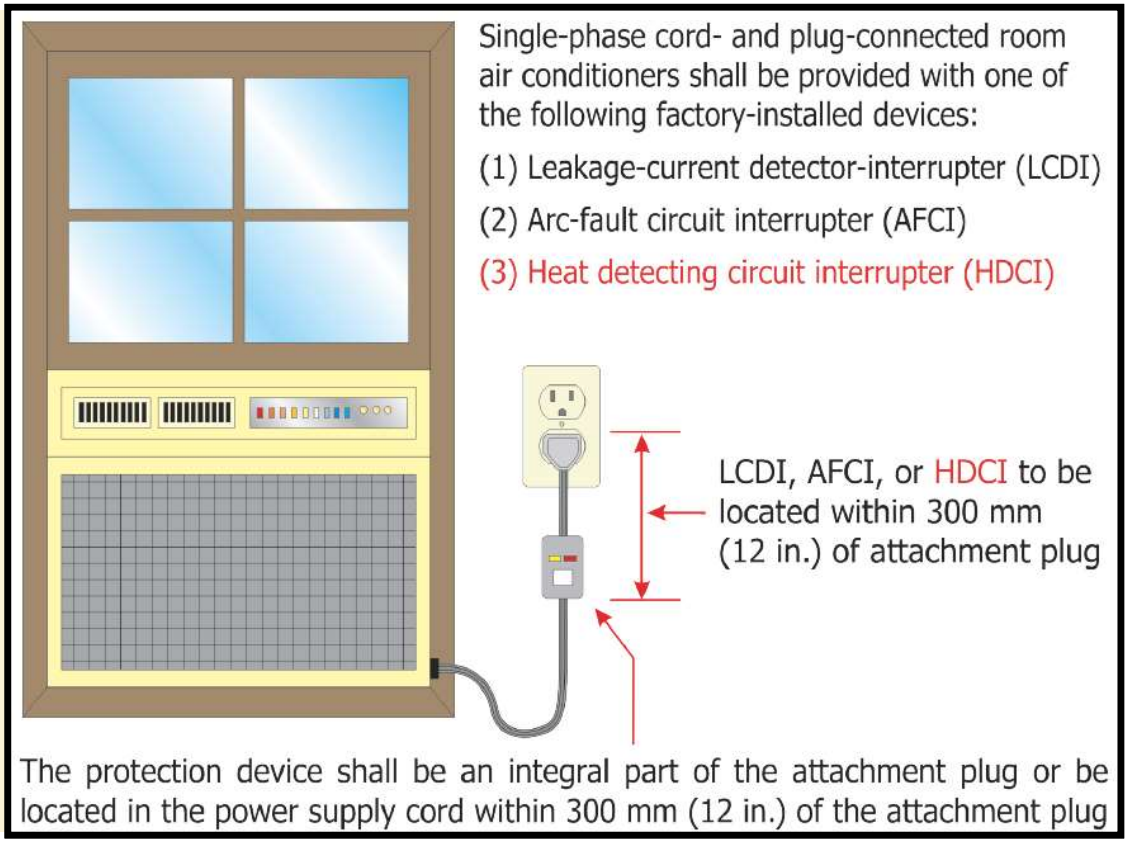
- Grounding & Bonding – Rooftop Equipment
- New, Requirement of a wire type equipment grounding conductor for non-threaded conduit systems on rooftops supplying such things as HVAC equipment.
- More and more sections of the code are requiring a wire type EGC in addition to qualified raceway EGC conditions
- Raceways can be broken/kicked apart



Where multimotor and combination-load equipment are installed outdoors on a roof, an equipment grounding conductor of the wire type shall be installed in outdoor portions of metallic raceway systems that use non-threaded fittings

Article 440.65

- Protection Devices for Room AC Units
- Heat detecting circuit interrupter (HDCI) was add
- There are now a list of three different types of interrupting items, one of which must be part of the attachment cord of a window type AC unit.
- LCDI Leakage-Current Detector
- AFCI Arc-Fault Current
- HDCI Heat Detecting Circuit



Article 445.11

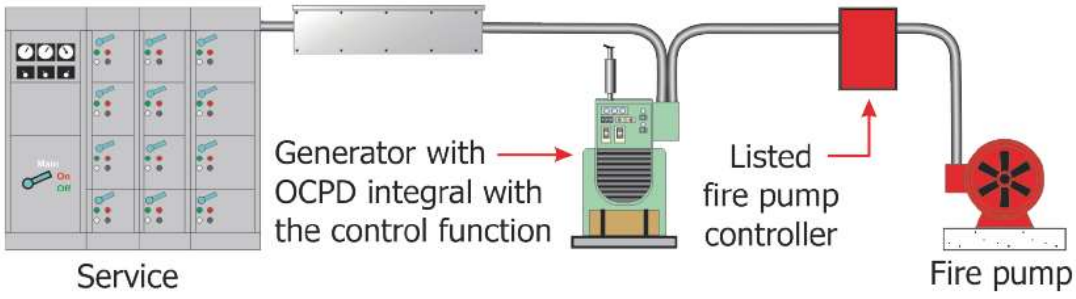
- Marking (Generators)
- Revised to now be in a list format
- All stationary generators and portable generators rated more than 15KW
- 5 Items required by the manufacture

Article 445.13(B)

- Generator OCPD Provided
- New, requirement clarifies that feeder taps can be used if the generator is equipped with an overcurrent relay or other overcurrent protective device.

Ampacity of conductors between a generator and the first overcurrent protection device cannot be less than 115% of the nameplate current rating on the generator nameplate

An exception permits these conductors to have an ampacity of not less than 100% of the generators nameplate current rating if the generator is designed to operate to prevent overloading *[see 445.13(A) and exception]*



Feeder tap rules of 240.21(B) can be used if the generator or generator set is equipped with an overcurrent relay or other overcurrent device

Tapped conductors are not allowed for portable generators rated 15 kW or less where field wiring connection terminals are not accessible

Article 445.18

- Disconnecting Means and Shutdown of Prime Mover
- Generator disconnecting means have been reorganized.
- Provisions for disconnecting means, shut down of the prime mover, and provisions for generators installed in parallel have been added

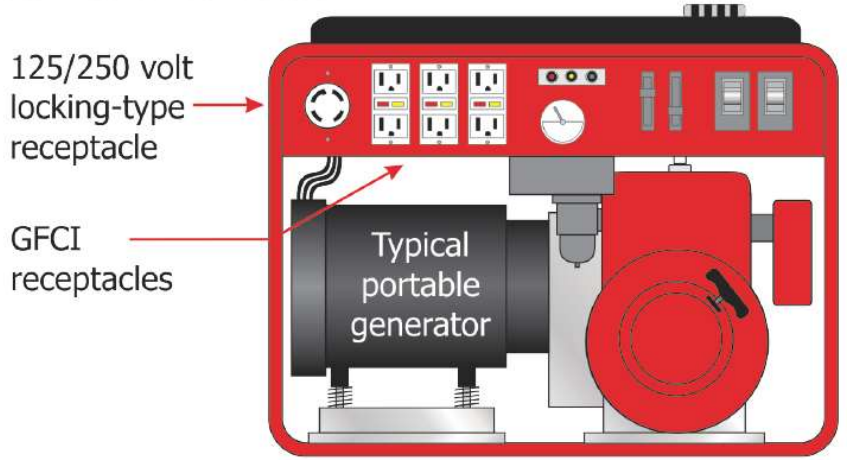
Article 445.20

- GFCI Protection for Receptacles on 15KW or Smaller Portable Generators
- If manufactured prior to January 1, 2015 a listed attachment cord with GFCI protection is allowed, if the GFCI protection is not integral
- I think you might be better off to change out the outlets to GFCI, rather than depending on everybody using a GFCI attachment cord.
- OSHA is gunning for these violations

Receptacle outlets that are a part of a 15-kW or smaller portable generator shall have listed GFCI for personnel integral to the generator or receptacle

(A) Unbonded (Floating Neutral) Generators

(B) Bonded Neutral Generators



If the generator was manufactured or remanufactured prior to January 1, 2015, listed cord sets or devices incorporating listed GFCI protection for personnel identified for portable use shall be permitted

Article 480.3

- Equipment (Storage Batteries)
- New, storage batteries and battery management equipment are now required to be listed (other than lead-acid batteries)

CHAPTER 05
SPECIAL OCCUPANCIES

Article 500.5(A)

- Title was changed to General
- This chart provides a bird's eye view

The title of 500.5(A) was changed to "General" as it applies to all of 500.5

Refrigerant machinery rooms containing ammonia refrigeration may be classified as "unclassified" locations based on the use of gas detection and adequate ventilation *(concentration not exceeding 150 ppm)*

Class I, II, and III Locations and Groups

Substance	Gas	Dust	Fibers/Flyings
Class	Class I [500.5(B)]	Class II [500.5(C)]	Class III [500.5(D)]
Division 1 (Normally Hazardous)	Flammable or combustible concentrations exist under normal operating conditions	Group E, Groups F & G Normally in air in ignitible concentrations	Where they are manufactured
Division 2 (Normally Hazardous)	Confined within closed systems and closed containers	Groups F & G Not normally in air in ignitible quantities	Where they are stored
Groups	A, B, C, and D *NEC* 500.6(A)	E, F, and G *NEC* 500.6(B)	No Groups
NEC Article	501	502	503

Table 500.8(D)(2)

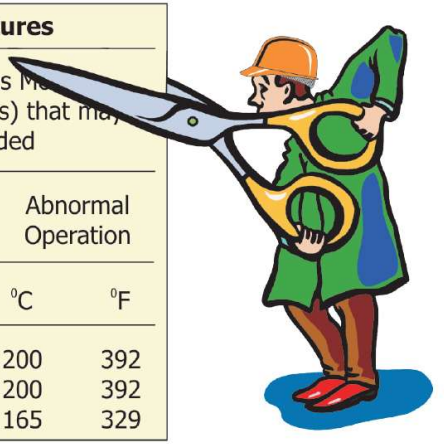
- This table has been deleted.
- Other existing articles cover the information found on this table.

Previous Table 500.8(D)(2) has been deleted as the table is no longer applicable

Fixed ignition temperature limits referenced in the table are no longer used to evaluate Class II temperature limitations on equipment

Table 500.8(D)(2) - Class II Temperatures

Class II Group	Equipment Not Subject to Overloading		Equipment (Such as Power Transformers) that may be overloaded			
			Normal Operation		Abnormal Operation	
	°C	°F	°C	°F	°C	°F
E	200	392	200	392	200	392
F	200	392	150	302	200	392
G	165	329	120	248	165	329



Article501.10(B)(1)

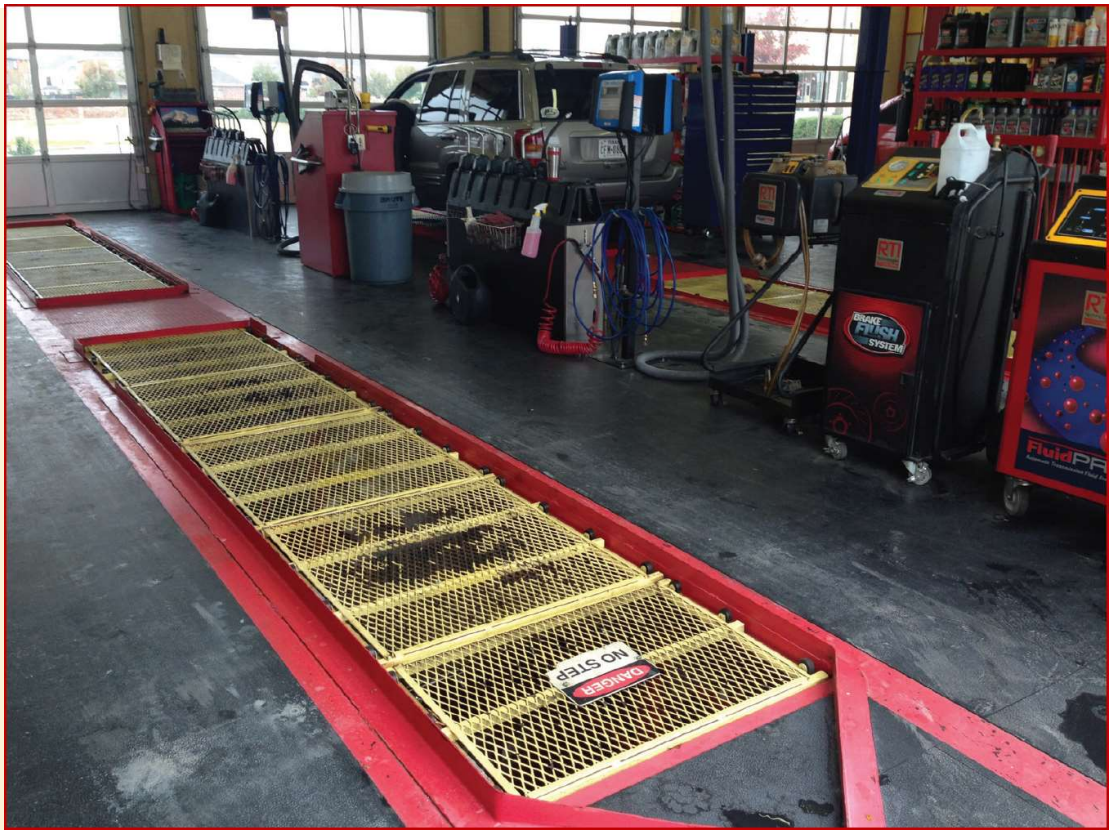
- Class I, Division 2 Locations
- Wiring Methods Expanded
- RMC & IMC have been added as approved raceways
- Cablebus also added

Rigid metal conduit (RMC) and intermediate metal conduit (IMC) with listed threadless fittings have been added to the allowable wiring methods in a Class I, Division 2 location

Cablebus also added to permitted wiring methods in a Class I, Division 2 location

Article 511.3 (C)
Table 511.3(C)

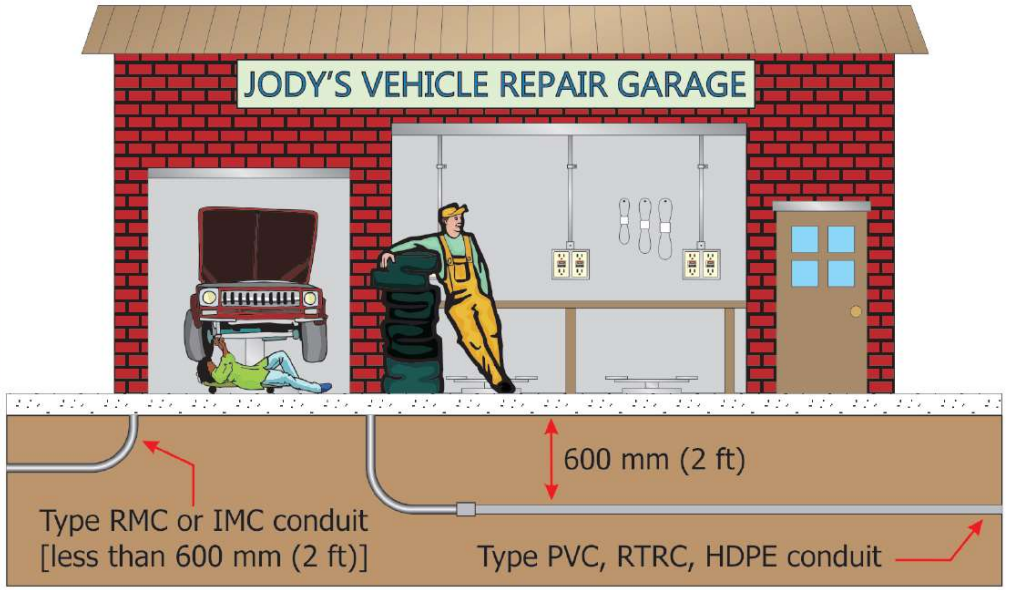
- New tables for clarification
- Title changed to be more inclusive, Major and Minor
- Both types of garages are defined, and their requirements better definded



Article 511.8

- New article with clarification regarding Underground Wiring for Repair Garages.
- In the past AHJ, would default to same requirements of Class I, Division 1 location

Underground wiring method for a commercial repair garage to be installed in threaded RMC conduit or threaded steel IMC conduit



Type PVC, RTRC, and HDPE conduit are permitted to be used where buried under not less than 600 mm (2 ft) of cover

Article 514.8 Ex. #2

- Motor Fuel Dispensing Facilities
- Now allowed is HDPE raceways, where installed with 2' of cover, and using RMC or IMC to emerge from below grade
- PVC and RTRC were already permitted raceways

Article 516

- Article was extensively revised for clarity, and better alignment with NFPA 33, and NFPA 34.
- New section on Enclosure Types
- Outdoor Spray Area
- Part II, Open Containers
- Several new Diagrams/Figures for illustration

Article 516 was extensively revised for clarity and to align with NFPA 33 *Standard for Spray Application Using Flammable and Combustible Materials* and NFPA 34 *Standard for Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids*

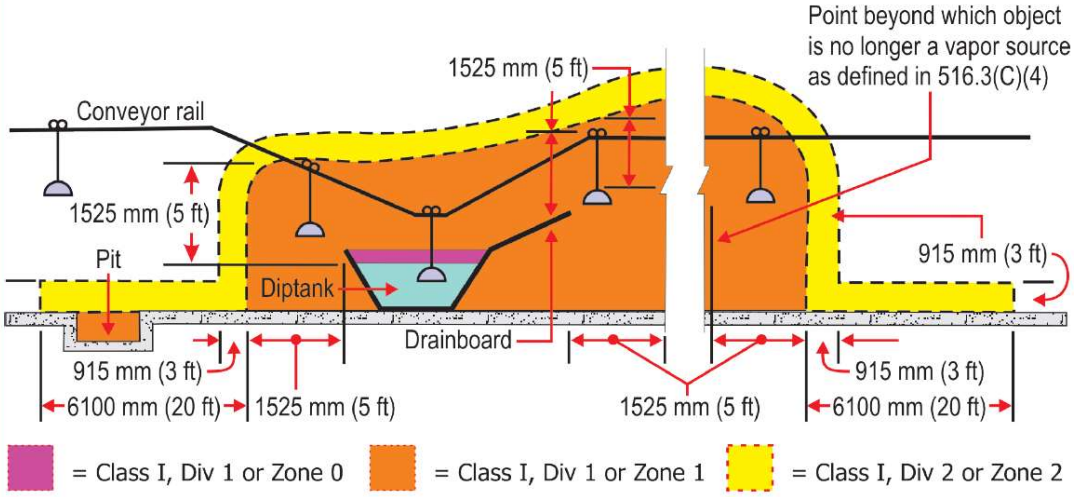
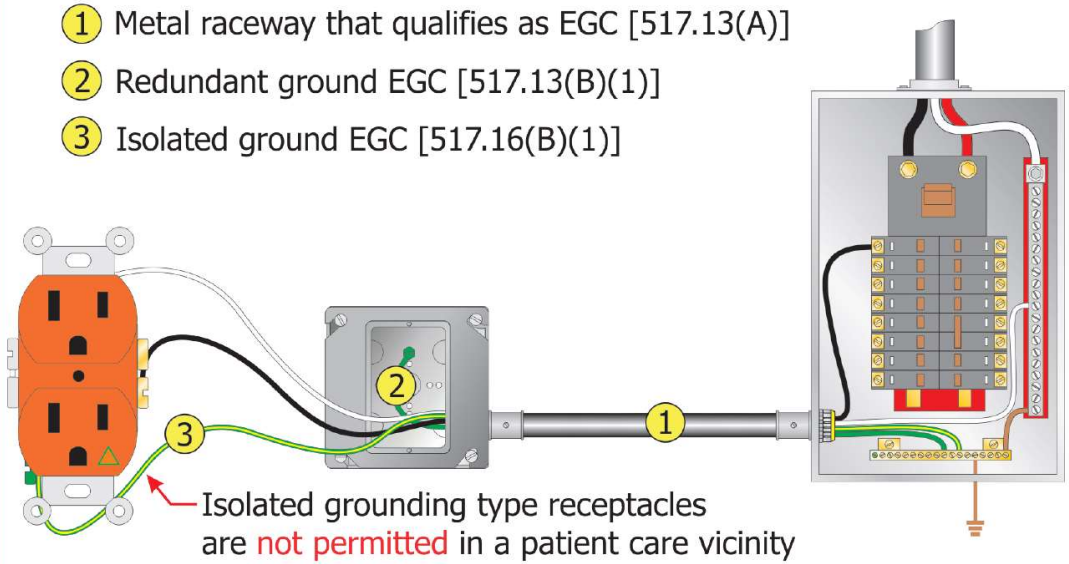


Figure 516.29(a) Electrical Area Classification for Open Dipping and Coating Processes Without Vapor Containment or Ventilation

Article 517.16

- Health Care Facilities have had several term clarification to be aware of in 517.2
- Isolated Ground receptacles are not permitted in a patient care vicinity
- 517.16(B) clarifies the requirement of Three grounding Paths, for Isolated Ground Receptacles
- Raceway/Cable, Green wire Redundant, Green with Yellow Stipe for the Isolated Ground

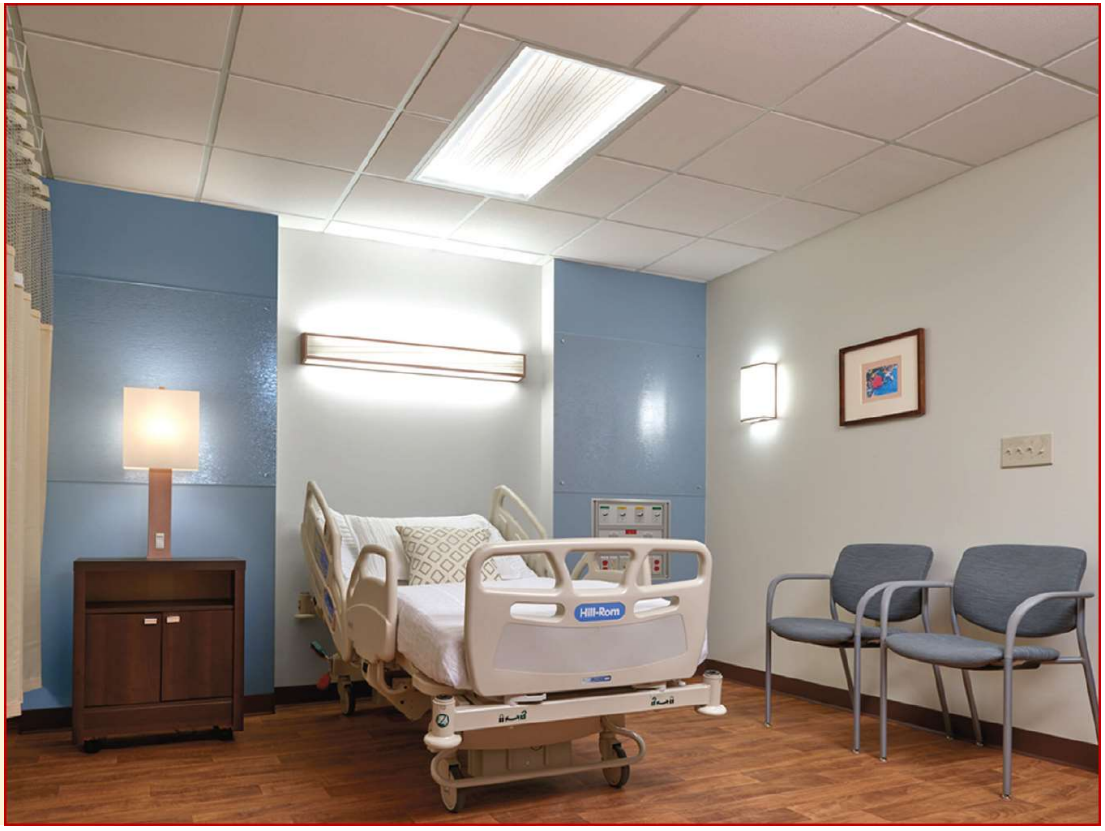
New provisions were added to 517.16 pertaining to the proper installation of isolated ground receptacles located outside of a patient care vicinity



The probation of isolated ground receptacle inside a patient care vicinity are addressed at 517.16(A) and isolated ground receptacles installed outside a patient care vicinity are addressed at 517.16(B)

Article 517.34(B)

- 2017 clarifies that Task illumination is allowed to be switched when on a critical branch circuit
- 2014 wording was vague, and some AHJ, required task illumination on critical branch as non-switched



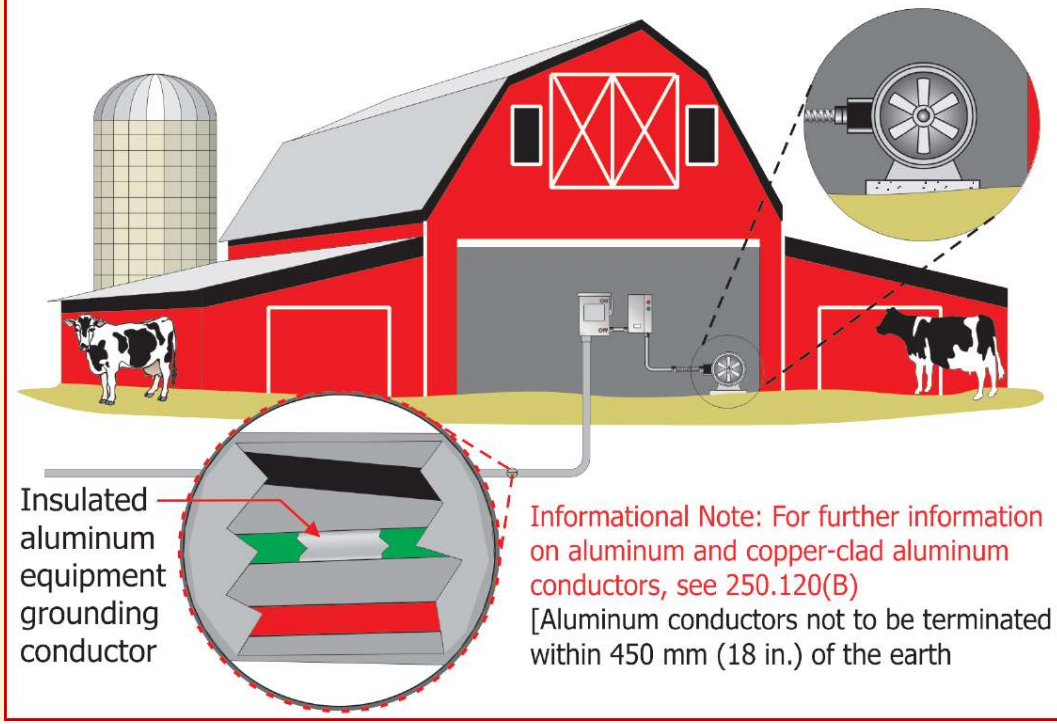
Article 525.23(D)

- GFCI protection now must be Listed, Labeled, and Identified for Portable use; when said GFCI protection is provided via flexible cords
- All 125V 15-20A Non-Locking outlets, readily accessible to the public

Article 547.5(F)

- A conductor which is covered, could be covered by most anything, whereas a conductor which is insulated is clearly a conductor having a covering which is protective and with dielectric value
- Agricultural buildings should have always been required to have an insulated equipment ground which is separate from a grounded conductor

An insulated ~~or covered~~ aluminum or copper equipment grounding conductor is now permitted for underground agricultural building installations



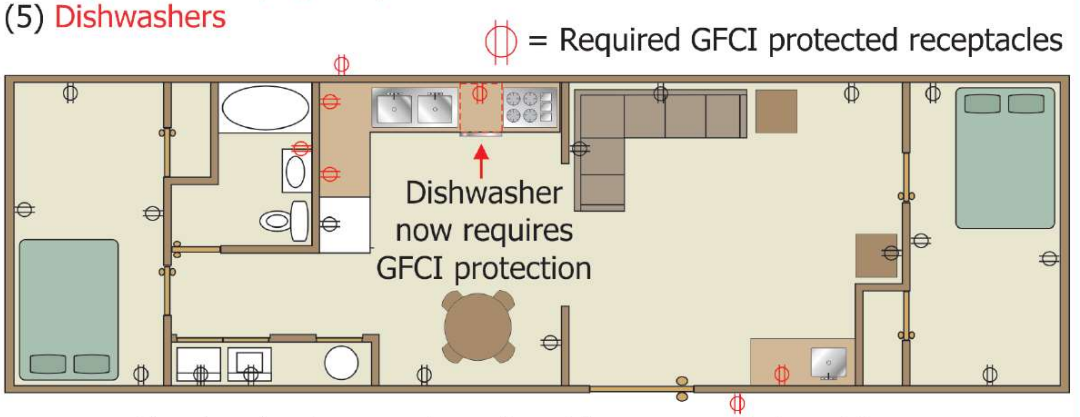
Informational Note: For further information on aluminum and copper-clad aluminum conductors, see 250.120(B)
[Aluminum conductors not to be terminated within 450 mm (18 in.) of the earth

Article 550.13(B)

- GFCI requirements were put into a list format for clarity and organization
- GFCI for Dishwashers which are consistent with traditional stick built
- All outside receptacles without limitation to ones behind access panels
- This helps to get Mobile homes updated with other GFCI changes

All 125-volt, single-phase, 15- and 20-ampere receptacle outlets installed in the following locations shall be provided with GFCI protection:

(1) Outdoors, including compartments accessible from outside the unit
(2) Bathrooms (including receptacles in luminaires)
(3) Kitchens, where receptacles are installed to serve countertop surfaces
(4) Sinks, where receptacle are installed within 1.8 m (6 ft) of the outside edge of a sink *(any sink)*
(5) Dishwashers



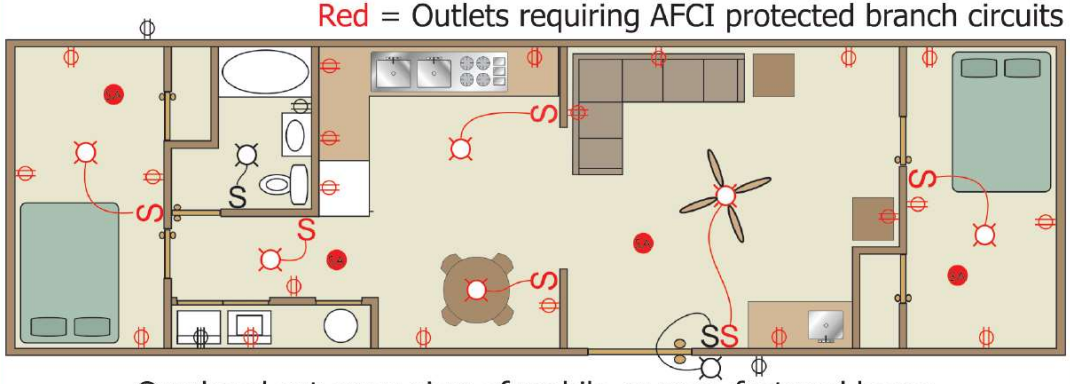
Overhead cut-away view of mobile or manufactured home

Article550.25(B)

- Rather than a laundry list of location, they have also expanded the list required for Mobile homes to have the same AFCI protection as found in 210.12

AFCI protection at mobile and manufactured homes was revised by eliminating the specific "laundry list" of rooms and areas requiring AFCI protection at mobile and manufactured homes and simply requiring compliance with 210.12

Red = Outlets requiring AFCI protected branch circuits



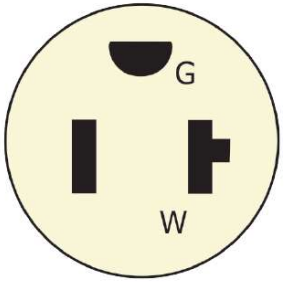
Overhead cut-away view of mobile or manufactured home

All 120-volt branch circuits that supply 15- and 20-ampere outlets shall comply with 210.12

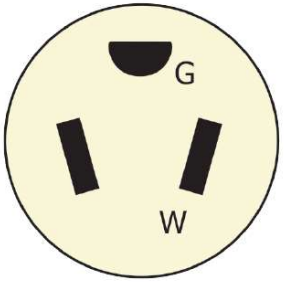
Article 551.71

- RV Parks Outlet Voltage/Amperes
- Every Site with Electric 120V, 20A
- 70% of Electric Sites 120V, 30A
- 40% of Electric Sites 125/250V, 50A
- Dedicated Tent sites excluded
- GFCI All 120V, 15&20A Receptacles

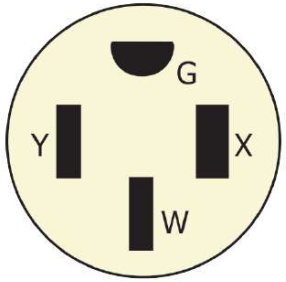
Every RV site (with electrical power provided) must be equipped with a certain number and type of receptacles *[see 551.71(A) through (F)]*



20-A, 125-V, 2-pole, 3-wire, grounding type



30-A, 125-V, 2-pole, 3-wire, grounding type



50-A, 125/250-V, 3-pole, 4-wire, grounding type

551.71 has been broken into six separate first level subdivisions with titles

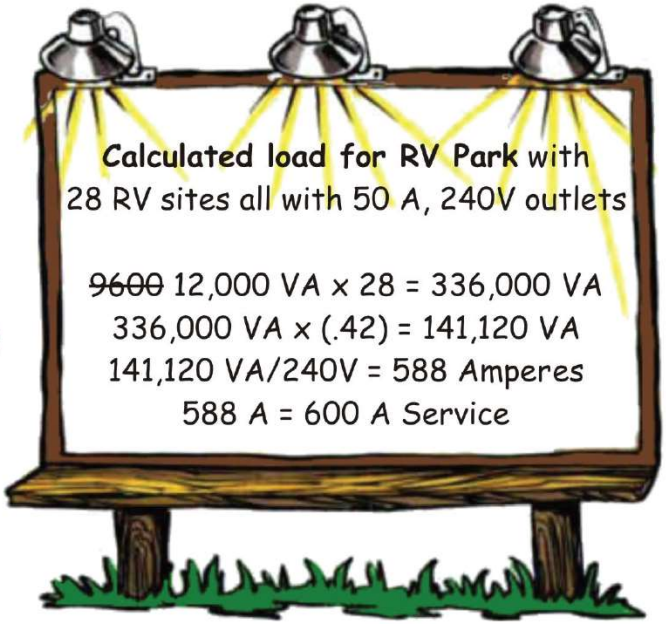
The number of RV sites required to be equipped with 50-ampere, 125/250-volt receptacles has increased from 20 percent to 40 percent for all new RV sites

GFCI devices used in RV site electrical equipment not required to be weather or tamper resistant in accordance with 406.9 and 406.12

Article 551.73(A)

- 50A sites must now be calculated at 12,000 VA rather than 9,600.
- This is for sizing the feeders, service, and branch circuits.
- This falls in line with how VA for the other two site types are calculated
- 3,600 for 20/30A sites is the same
- 2,400 for 20A only sites is the same
- Personal note, if RV's are increasing in size, then a 60A or even a 100A outlet is needed

The calculated load for electrical services and feeders at RV parks shall be calculated on the basis of not less than 12,000 volt-amperes per RV site equipped with 50-ampere, 208Y/120 or 120/240-volt supply facilities.



Article 555.3

- Ground Fault Protection
- Required on all/each OCPD
- Reduced from 100mA to 30mA
- GFCI for all 125V 15/20A receptacles still in place

The ~~main~~ overcurrent protective devices that supply the marina, boatyards, and commercial and noncommercial docking facilities shall have ground fault protection not exceeding 30 mA

GFP protection required for OCPDs for marinas, and now boatyards, and commercial and noncommercial docking facilities as well was reduced to a maximum of 30 mA rather than 100 mA

This GFP protection is required on all supply OCPDs *(not necessarily the main OCPD)*

Article 555.19(B)(1)

- Removed text, limiting the requirement for GFCI protection
- Now, any 125V, 15 or 20A Shall be GFCI protected

GFCI protection required for all 125-volt, single-phase, 15- and 20-ampere receptacles installed outdoors, in boathouses, and in buildings or structures used for storage, maintenance, or repair regardless of the intended use

The term, "where portable electrical hand tools, electrical diagnostic equipment, or portable lighting equipment are to be used" was deleted

The removal of this portable electrical hand tool, etc. conditional language will aid the AHJ in enforcement of the GFCI requirements at these locations

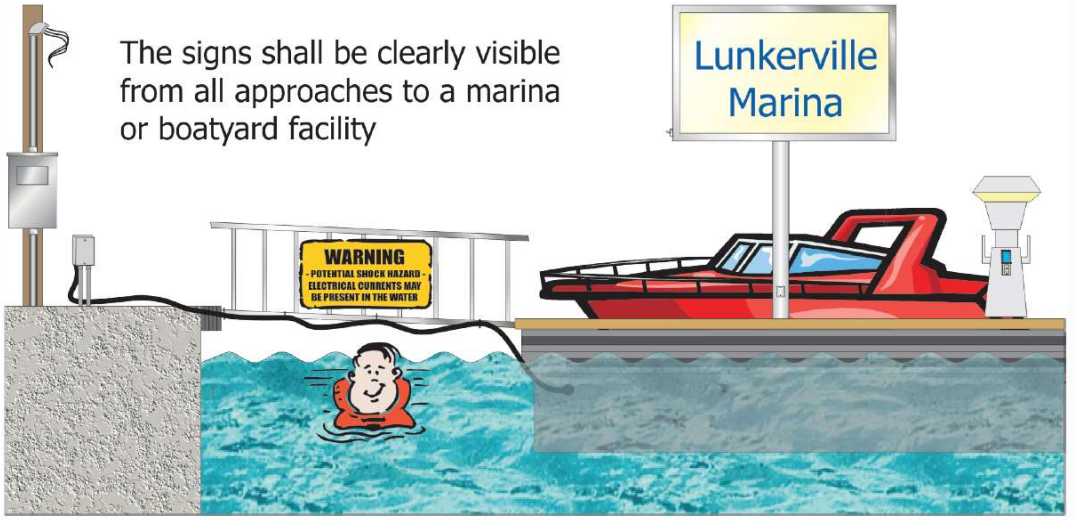
Article 555.24

- Warning Signs now required at all marinas with power available
- Electric Shock Drowning ESD, is the "Invisible Killer"
- 6 or more are killed every year around fresh water marinas
- Often the culprit are boats (with wiring errors) connected to shore power

New requirements added for permanent safety signs to be installed to give notice of electrical shock hazard risks to persons using or swimming near a boat dock or marina

WARNING - POTENTIAL SHOCK HAZARD - ELECTRICAL CURRENTS MAY BE PRESENT IN THE WATER

The signs shall be clearly visible from all approaches to a marina or boatyard facility

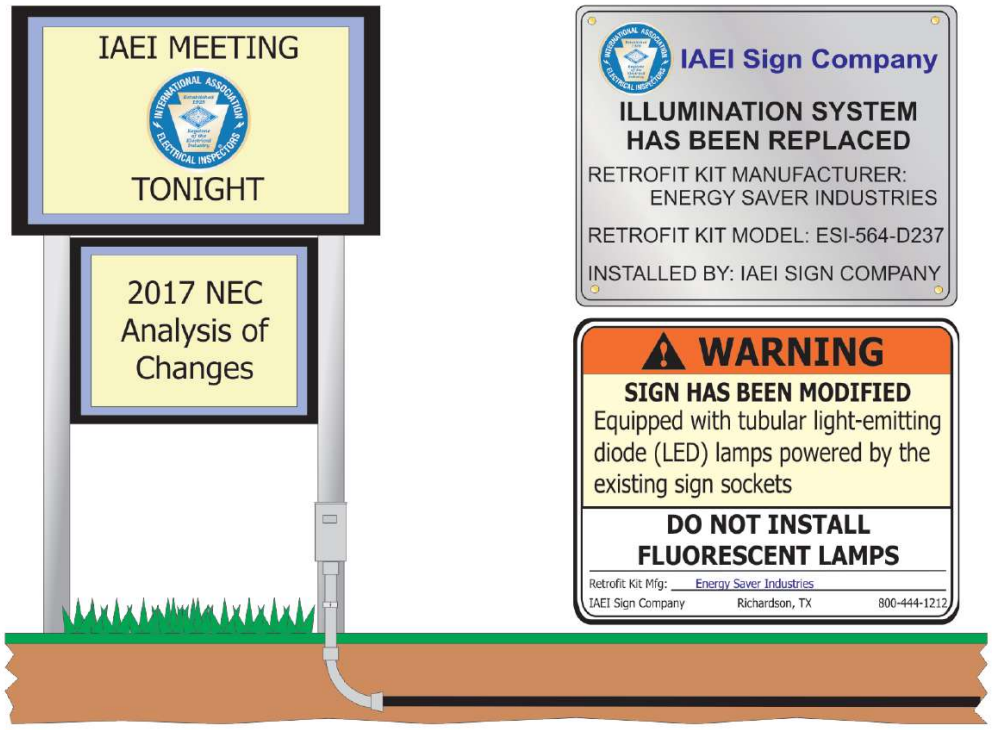


CHAPTER 06
SPECIAL EQUIPMENT

Article 600.4(B)

- New Article, requires signs that have been retrofitted
- If tubular LED are used, an additional warning sign is required

Retrofitted sign shall be marked that the illumination system has been replaced



Article 600.34

- Off Grid, or On Grid PV powered signs now have an article
- Regarding Equipment, Wiring, Cords/Cables, Grounding, Disconnecting Means, and Battery Compartments

Article 620.16

- Short Circuit Current Rating
- The equipment must be able to clear a fault
- You must know the available fault current at the panel
- The Interrupting rating of the equipment must be equal to or greater than the available fault current

Elevator control panel required to be marked with its short-circuit current rating and shall not be installed where the available short-circuit current exceeds its short-circuit current rating

Short-circuit current rating to be based on listing of assembly or established utilizing an approved method *(such as UL 508A)*

Article 645.18

- Surge Protection
- Required for Critical Operations Data Systems
- IT systems required for Public Safety, Emergency Management, Business Continuity, National Security…

Surge protection is now required to be provided for critical operations data systems

Surge arresters

Surge protective devices (SPD)

Article 660.5

- Disconnecting means must be within sight of the X-Ray Controls and Readily Accessible
- Before, it only needed to be Readily Accessible

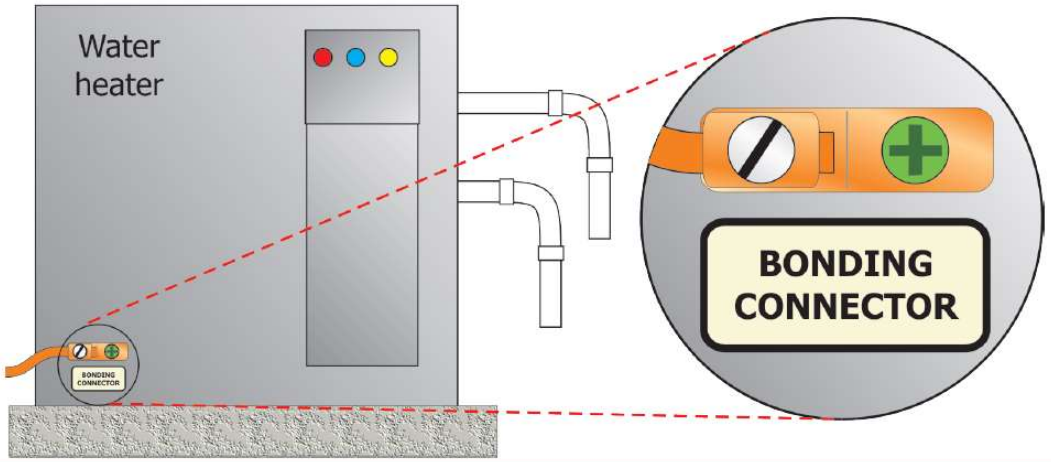
New Article 680.7

- Grounding and Bonding in Wet Locations
- Terminals must be Copper, Copper Alloy, or Stainless Steel
- Must also be rated for Direct Burial

Grounding and bonding terminals shall be identified for use in wet and corrosive environments

Field-installed grounding and bonding connections in a damp, wet, or corrosive environment shall be composed of copper, copper alloy, or stainless steel

Grounding and bonding terminals shall be listed for direct burial use



Article 680.11

- Underground Wiring was renumbered to 680.11
- Former 680.10 was removed
- Now we are pointed to 300.5 for burial depths for pools and such

Previous 680.10 (Underground Wiring Location) moved to 680.11 and previous Table 680.10 Minimum Cover Depths was deleted

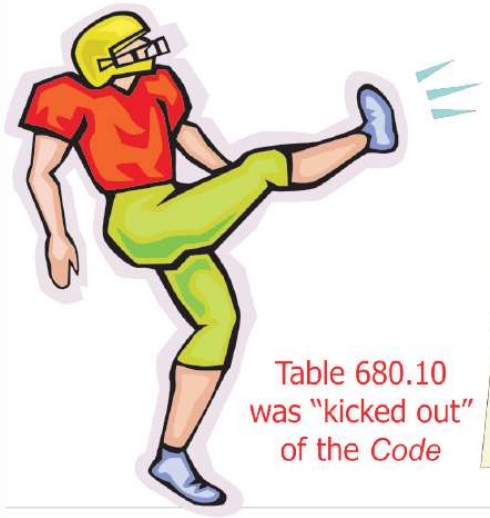


Table 680.10 was "kicked out" of the *Code*

Table 680.10 Minimum Cover Depths

Wiring Method	Minimum Burial mm	Minimum Burial in.
Rigid metal conduit	150	6
Intermediate metal conduit	150	6
Nonmetallic raceways listed for direct burial under minimum of 102 mm (4 in.) thick concrete exterior slab and extending not less than 162 mm (6 in.) beyond the underground installation	150	6
Nonmetallic raceways listed for direct burial without concrete encasement	450	18
Other approved raceways*	450	18

*Raceways approved for burial only where concrete encased shall require a concrete envelope not less than 50 mm (2 in.) thick

Table 300.5 burial depth requirements will now apply around swimming pools, spas, hot tubs, fountains, and similar installations

Article 680.12 & 680.14

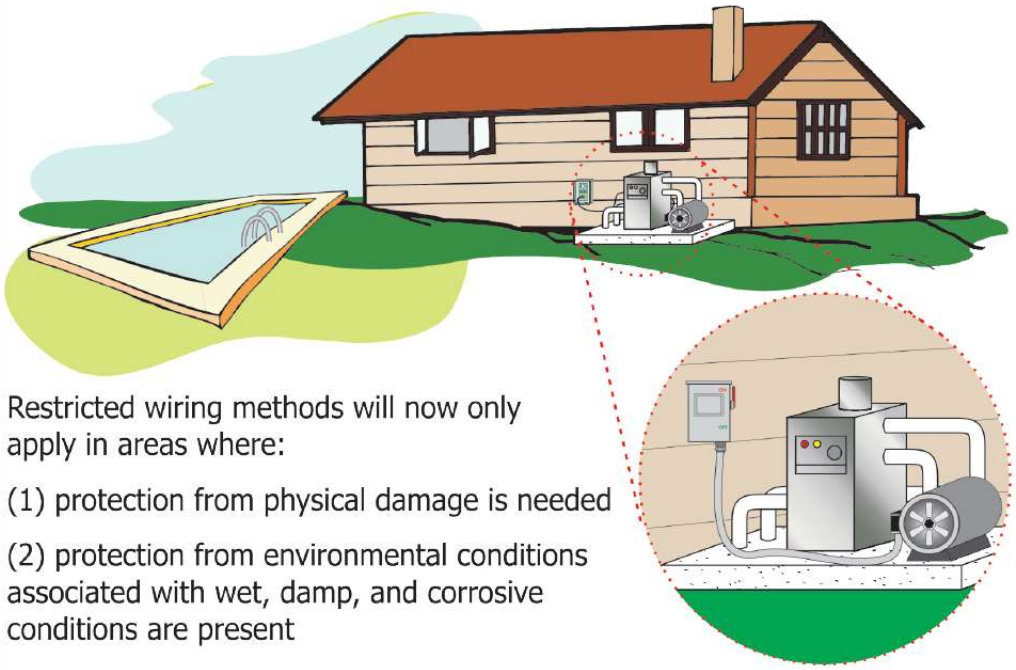
- Equipment must be suitable for the situation.
- Pool area and locations with chlorine storage distribution are highly corrosive
- Wiring method shall be listed and labeled for such areas.
- RMC, IMC, PVC, & RTRC are listed as in 680.14 as resistant


Photo courtesy of David Williams, Michigan

Article 680.21(A)

- The wiring method has been restricted to MC cable approved for the location.
- PVC coated MC Cable with approved fittings.

Where installed in noncorrosive environments, branch circuits wiring methods for permanently installed swimming pool pump motors are to comply with the general requirements of *NEC* Chapter 3 wiring methods



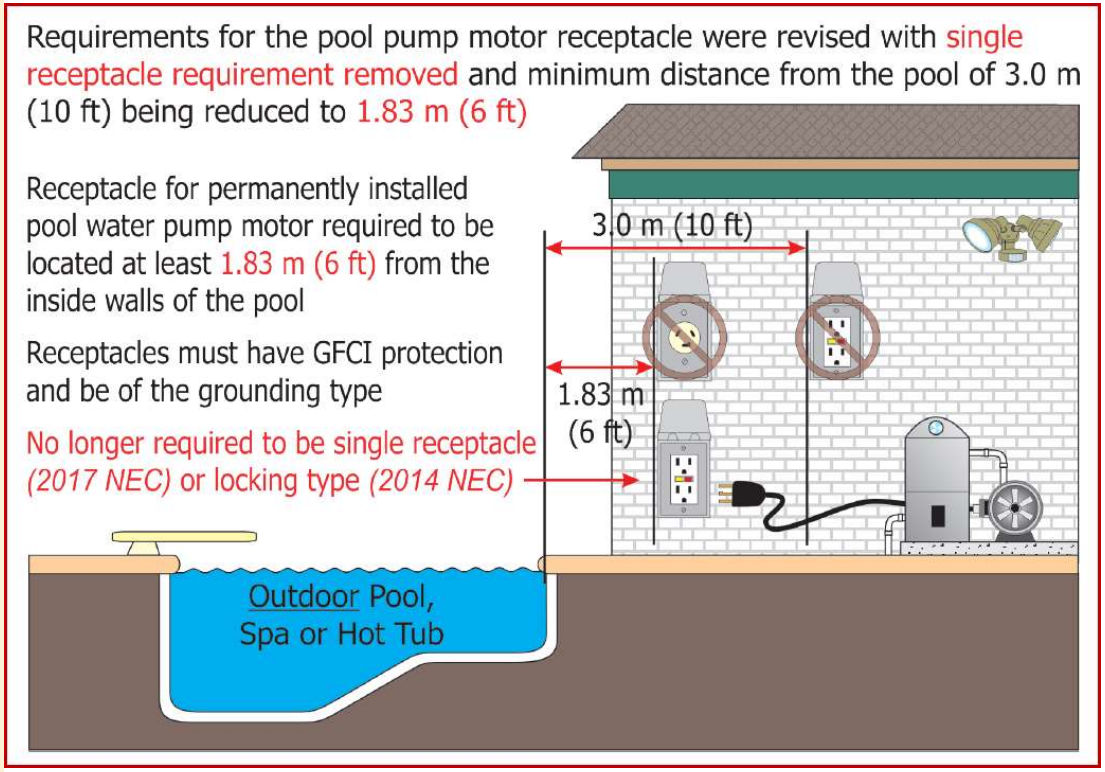
Restricted wiring methods will now only apply in areas where:

(1) protection from physical damage is needed

(2) protection from environmental conditions associated with wet, damp, and corrosive conditions are present

Article 680.22(A)(2)

- Minimum Distance for pool pump motor receptacle has been reduced from 10’ to 6’ from inside edge of pool.
- No longer required to be twist lock, or a Singleplex
- Shall be GFCI and a Grounding Type Receptacle



New Article 680.22(B)(7)

- 2014 allowed for low voltage luminaries 5' from inside pool edge, but did not address these type of fixtures specifically
- These are not like the spark gap ignitors used with grills. These are more like glow plugs

New requirements added for low-voltage gas-fired luminaires, decorative fireplaces, fire pits, and similar equipment

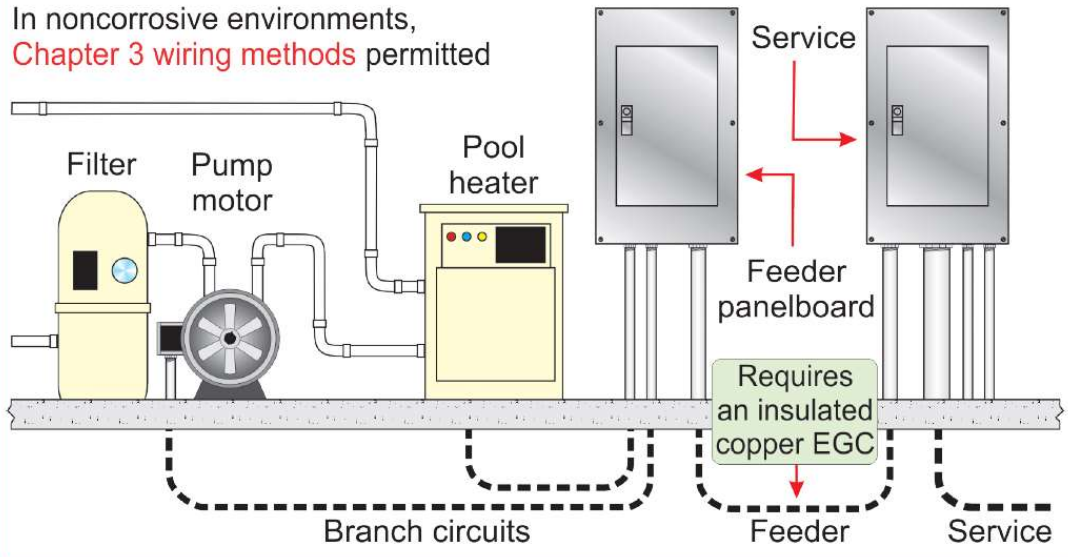
Listed low-voltage gas-fired luminaires, decorative fireplaces, fire pits, and similar equipment using low-voltage ignitors with outputs that do not exceed the low-voltage contact limit shall be permitted to be located less than 1.5 m (5 ft) from the inside walls of a permanently installed pool

Article 680.25

- The final feeder to a panel in a corrosive environment shall have an equipment ground that is copper
- From the service to an area that is noncorrosive any Chapter 3 wiring method is permitted

Previous 680.25(B) for grounding of swimming pool panelboard feeders was deleted as grounding provisions for swimming pool panelboard feeders have been incorporated into the revised text at 680.25(A)

The revised text at 680.25(A) requires restricted wiring methods only in areas where harsh conditions *(physical damage, environmental conditions, corrosive conditions, etc.)* are present

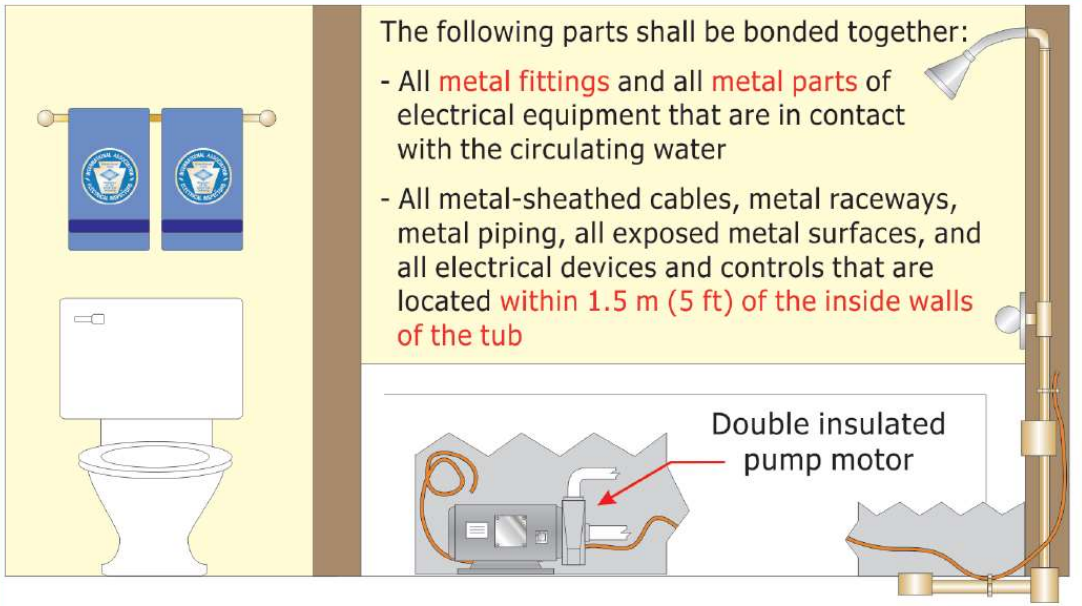


New Article 680.28

- Previously there were no articles specific to Gas Fired pool heaters
- It was an expectation they would be GFCI, primarily because they are typically outdoors
- This clarifies the requirement to be connected via a GFCI when they are operated at voltages about the low volt contact voltage limit

Article 680.74

- They did not change much, other than, rather than being in a paragraph format, it is now in a list format
- There were may code updates, that were format changes to a list
- List are easier to check off, and easier to understand when a violation occurs



Bonding requirements for hydromassage bathtubs was reformatted into a list format

New exception was added to exempt "small conductive surfaces not likely to become energized" from hydromassage bathtub bonding requirements

Article 680.2 & 680.80

- A new Definition and a new Part VIII was added to provide directions for Protection, Bonding, Switching Devices, and Nameplate Marking requirements
- 2014 was void of any information regarding this type of equipment though it has been in use for several years

Electrically Powered Pool Lift. An electrically powered lift that provides accessibility to and from a pool or spa for people with disabilities.

Article 695.6(G)

- The language was changed to emphasize the prohibition of using GFPE for Fire Pump Power Circuits.
- Prior language was used by some to think it is an option.
- The wiring to and fire pump equipment are sacrificial in nature
- Thus No Overload protection, and OCPD set at the Locked Rotor Value with conductors sized at 125% of the motor's FLC

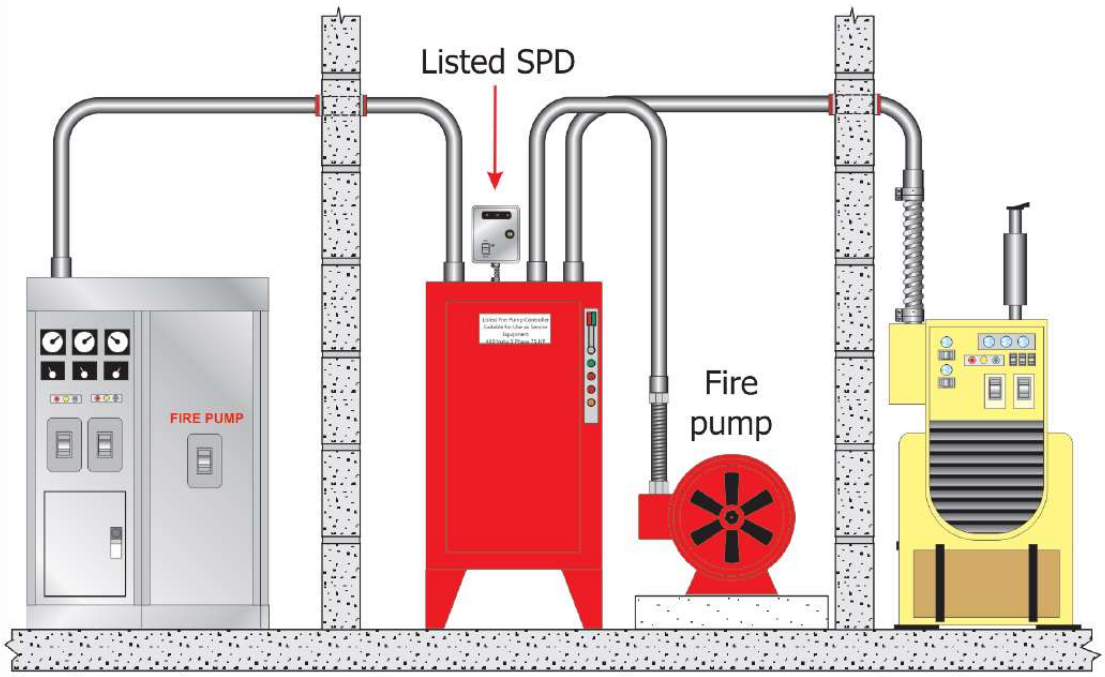
Ground-fault protection of equipment shall not be installed in any fire pump power circuit

Revision changed 695.6(G) from "ground-fault protection of equipment shall not be permitted for fire pumps" to "ground-fault protection of equipment shall not be installed in any fire pump power circuit"

Article695.15

- Fire Pump Controllers
- New Installations Shall have a Surge Protective Device installed in them or on them.

A listed surge protection device (SPD) shall be installed in or on the fire pump controller

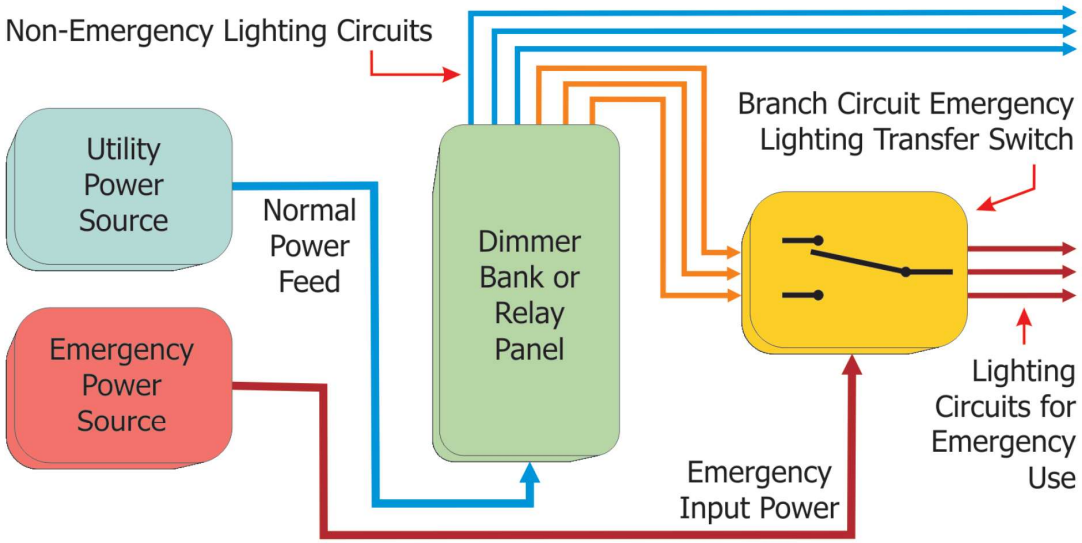


CHAPTER 07
SPECIAL CONDITIONS

700.2 & 700.25

- A new definition for Branch Circuit Emergency Lighting Transfer Switch, with provision for the same in 700.25
- Allows devices to be used to transfer emergency lighting loads supplied by branch circuits rated not great than 20 amps.

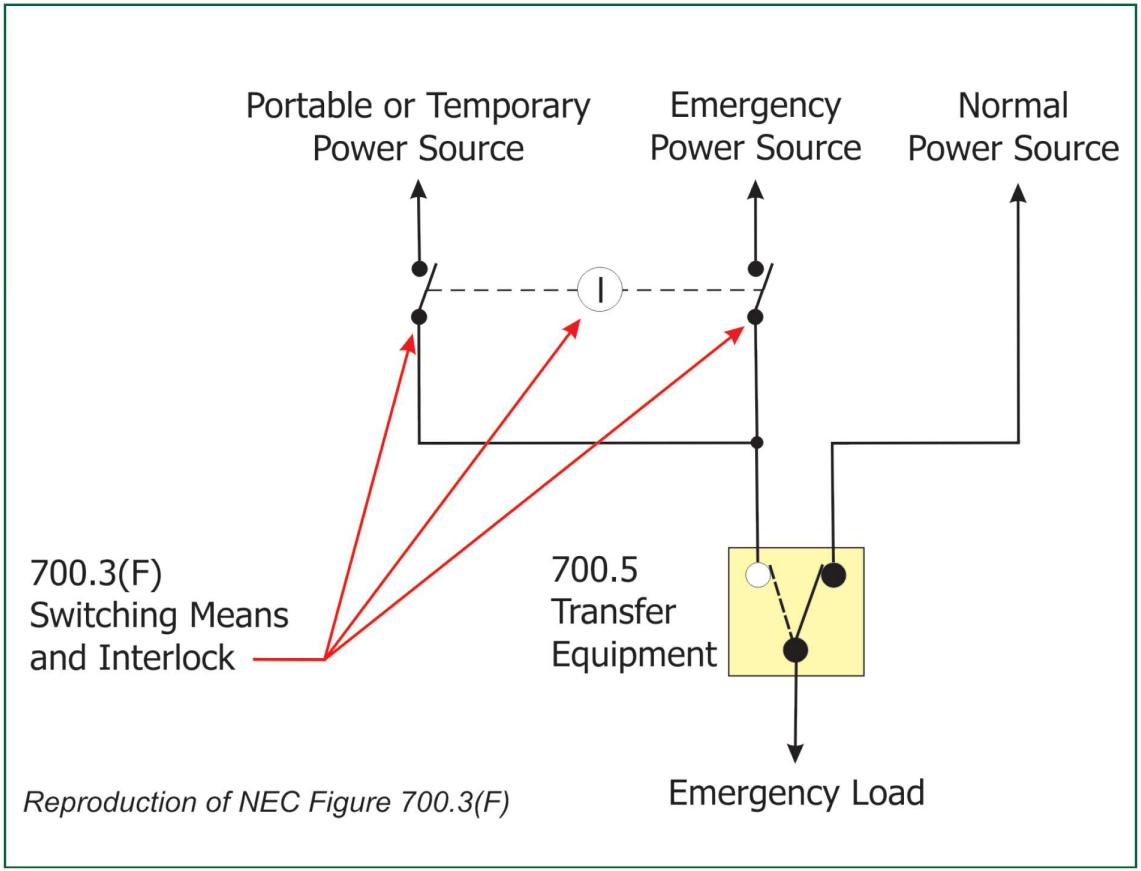
Branch Circuit Emergency Lighting Transfer Switch is allowed to be used to transfer emergency lighting loads supplied by branch circuits rated at 20 amperes or less from the normal branch circuit to an emergency branch circuit



Branch Circuit Emergency Lighting Transfer Switch. A device connected on the load side of a branch circuit overcurrent protective device that transfers only emergency lighting loads from the normal supply to an emergency supply.

700.3(F)

- Temporary source of power for maintenance or repair of the alternate source of power
- 5 key points of the new article
- Permissible to use manual switching to switch from the permanent source of power to a portable or temporary alternate source of power

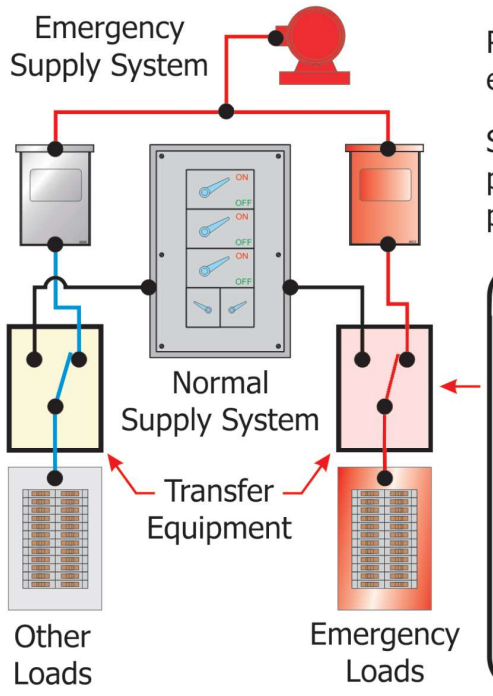


Reproduction of NEC Figure 700.3(F)

700.5(E)

- Short-Circuit Current rating marked on Transfer Equipment of Emergency Systems
- New requirement: Short Circuit current rating shall be field marked on the exterior of the transfer equipment.
- This same new requirement, is found in:
  - 701.5(D) Legally Required Standby
  - 702.5 Optional Standby
  - 708.25(E) Critical Operations

New requirements added for available short-circuit current rating documentation and field-marking at emergency system transfer equipment



Required to be field marked on the exterior of the transfer equipment

SCCR based on the specific overcurrent protective device type and settings protecting the transfer equipment

WARNING

Maximum Available Fault Current at Transfer Equipment: **35.4 kA**

Voltage: **480**

SCCR: **50 kA**

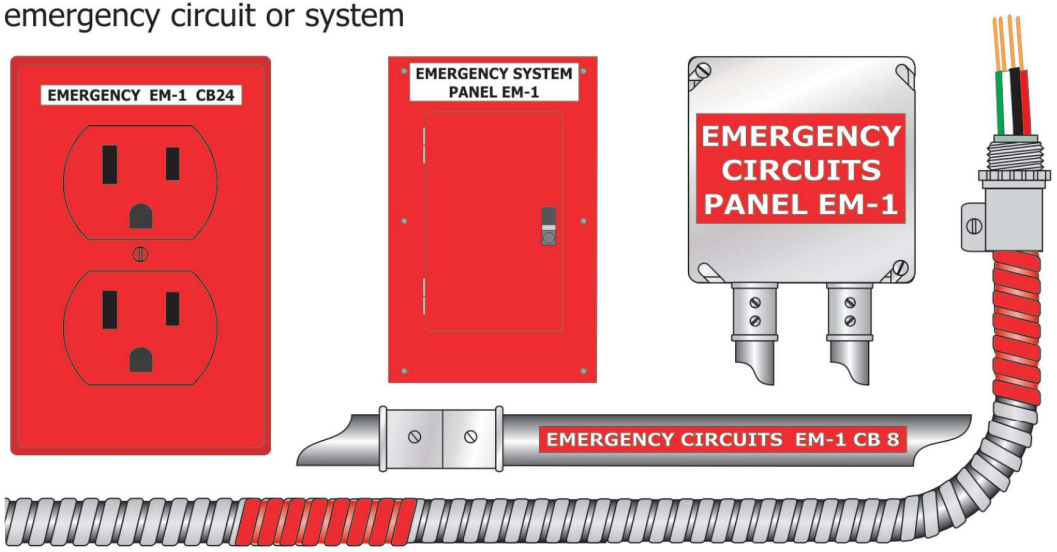
Date: **Oct 2014**

XYZ Electrical Contractors Richardson, TX 800-444-1212

700.10(A)

- Marking of Boxes and Enclosures for Emergency Circuits and/or Systems
- Emergency circuits shall be permanently marked so they will be readily identified as a component of an emergency circuit or system by 2 methods
- The primary reason for this identification is for individuals working on these systems and/or circuits in the future, to minimize outages, and the time needed for repairs

In addition to boxes and enclosures, exposed emergency system cables and raceway systems not associated with boxes or enclosures required to be permanently marked to be readily identified as a component of an emergency circuit or system

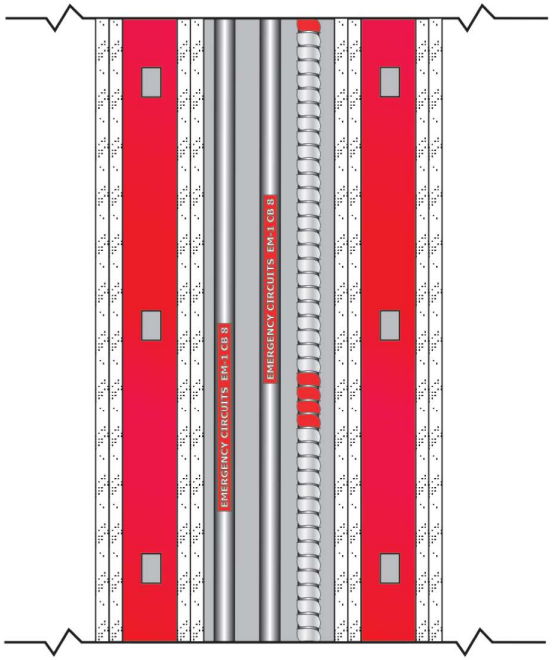


Receptacles supplied from the emergency system are now required to be identified by a "distinctive color or marking" on the receptacle cover plates or the receptacle

700.10(D)

- Fire Protection of Emergency System Feeder in Health Care Occupancies
- Changed the format of requirements for application of this requirement
- 4 clear directives are provided regarding
  - Feeder – Circuit Wiring
  - Feeder-Circuit Equipment
  - Generator Control Wiring

Occupancy areas requiring fire protection requirements for emergency system feeders was expanded for the 2017 *NEC*



Fire protection provisions for emergency system feeders required for the following occupancies:

(1) Assembly occupancies for not less than 1000 persons

(2) Buildings above 23 m (75 ft) in height

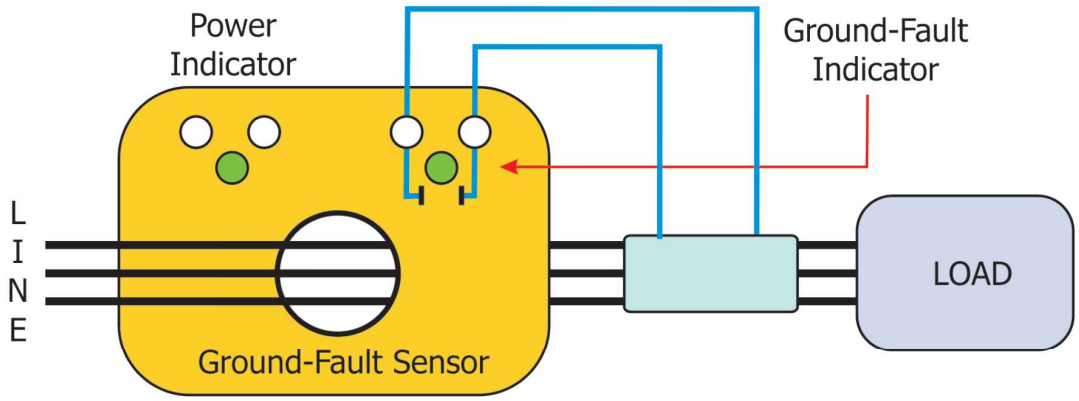
(3) Health care occupancies where persons are not capable of self preservation

(4) Educational occupancies with more than 300 occupants

701.6(D)

- Ground-Fault Sensors at Alternate Locations in Standby Systems
- For systems with multiple emergency sources connected to a paralleling bus, the ground-fault sensor shall be permitted at an alternate location
- Prior to this change an alternate location was not permitted.
- This is related to GFP of Equipment
-

The sensor for ground-fault signal devices is generally required to be located at, or ahead of, the main system disconnecting means for the legally required standby source of a legally required standby system



Code language was added at 701.6(D) to allow the ground fault sensor to be located at an alternate location for systems with multiple emergency sources connected to a paralleling bus

702.12(C)

- Power Inlets used with Optional Standby Generators
- Rated 100 Amps or Greater
- Two new Exceptions

706

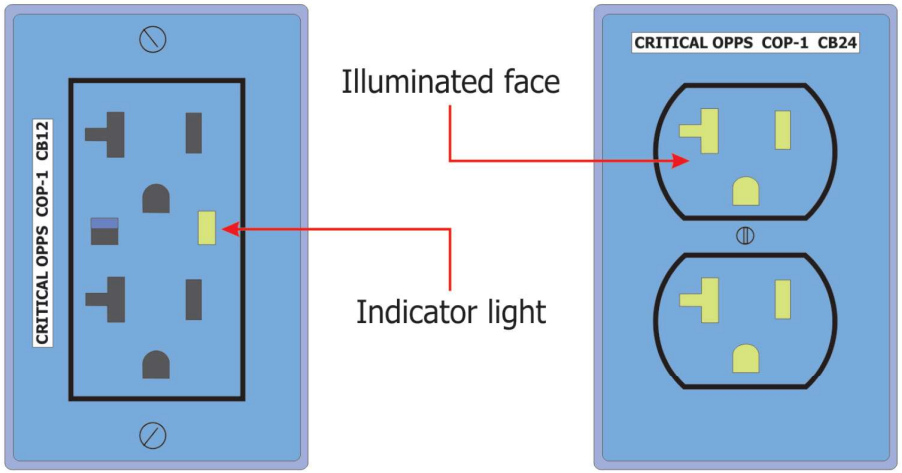
- Energy Storage Systems
- Pertains to Energy Storage to all permanently installed ESS operating at over 50 Volts AC or 60 Volts DC
- May be stand-alone or interactive with other electric power production sources

708.10(A)(2)

- Illuminated Faces or Indicator Lights on COPS Receptacles
- Critical Operations Power Systems

In a building in which COPS are present with other types of power systems:

The receptacle cover plates or the receptacles themselves supplied from the COPS shall have a distinctive color or marking so as to be readily identifiable

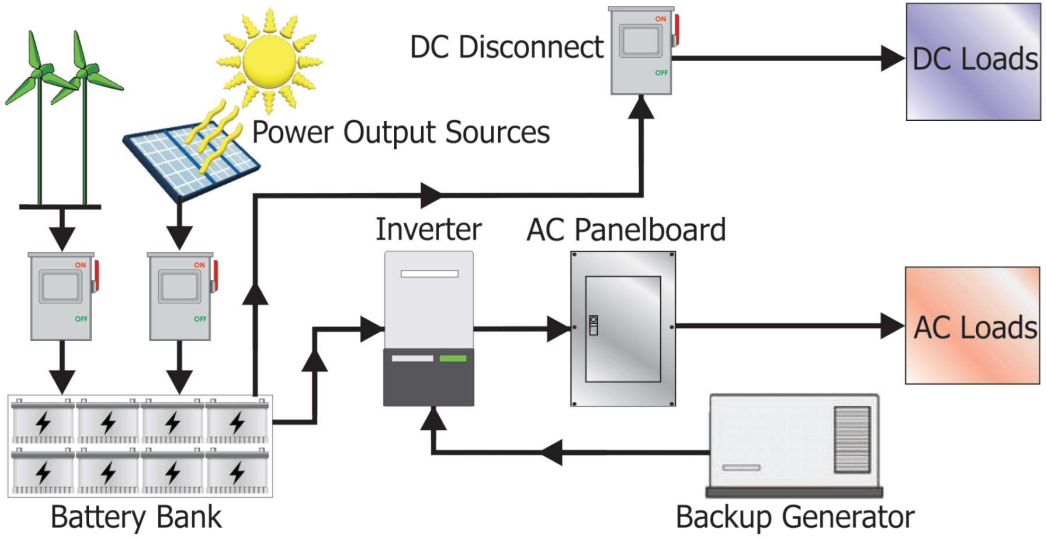


Nonlocking-type, 125-volt, 15- and 20-ampere receptacles supplied from the COPS must have an illuminated face or an indicator light to indicate that there is power to the receptacle

710

- Stand-Alone Systems

A new article for "Stand-Alone Systems" was added to address the operating parameters for electric power production sources in a stand-alone mode

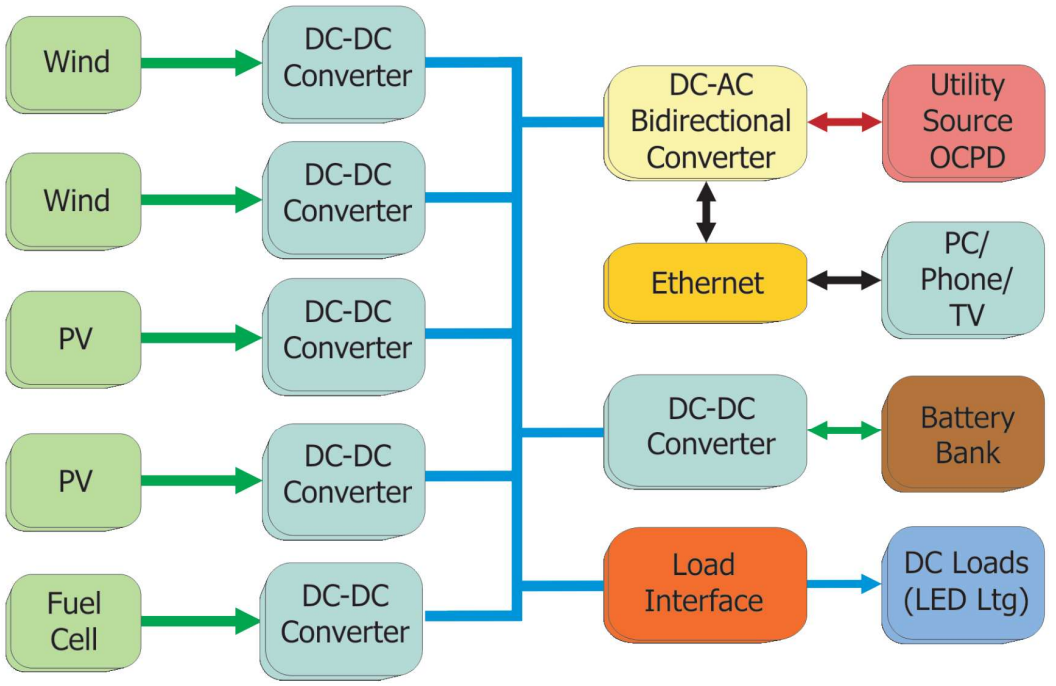


Stand-alone power systems typically include one or more methods of electricity generation, energy storage, and regulation

712

- Direct Current Microgrids
- DC systems consisting of more than one interconnected DC power sources, supplying DC – DC converters, DC loads, or AC loads powered by AC Inverters

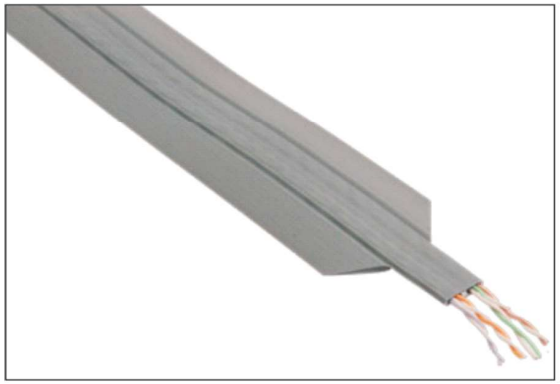
DC Microgrid - A power distribution system consisting of more than one inter-connected dc power sources, supplying dc-dc converters(s), dc loads(s), and/or ac loads(s) powered by dc-ac inverters(s).

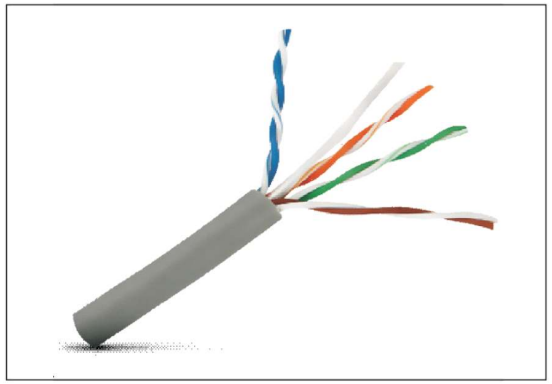


725.135(K)(6)

- Type CMUC Under-carpet Communication Wiring and Cables under Modular Flooring and Planks
- Installation of Class 2, Class 3, and PLTC Cables
- Clarifies where and how these installations are now permitted

Type CMUC undercarpet communication wiring and cables is permitted to be installed under modular flooring and planks as well as under carpet



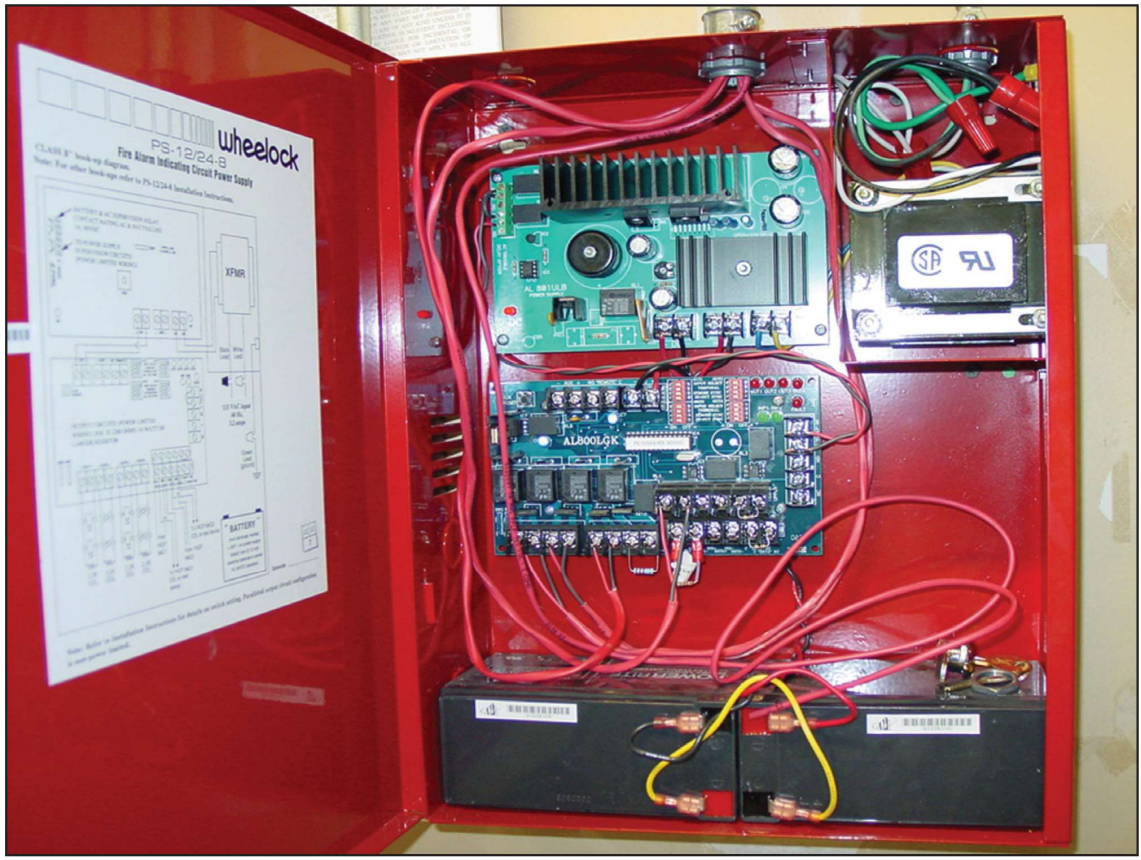


Wiring methods for the installation of Class 2, Class 3, and power-limited tray cables (PLTC) at one- and two-family dwellings, multifamily dwellings, and other building locations is described at 725.135(K), (L), and (M)

This would include CL2P, CL3P, CL2R, CL3R, CL2, CL3, and PLTC cables as well as Type CMUC undercarpet communications wires and cables

760.176(G) & 760.179(I)

- Temperature Ratings and Conductor Size Markings on NPLFA and PLFA Cables
- Temperature rating shall be marked on the jacket of NPLFA cables that have a rating exceeding 60C
- The jacket of NPLFA cable shall be marked with the conductor size
- These two rules also apply to PLFA cables.



770.44

- Overhead (Aerial) Optical Fiber Cables
- New section contains needed information for the installation of overhead optical fiber cables to buildings

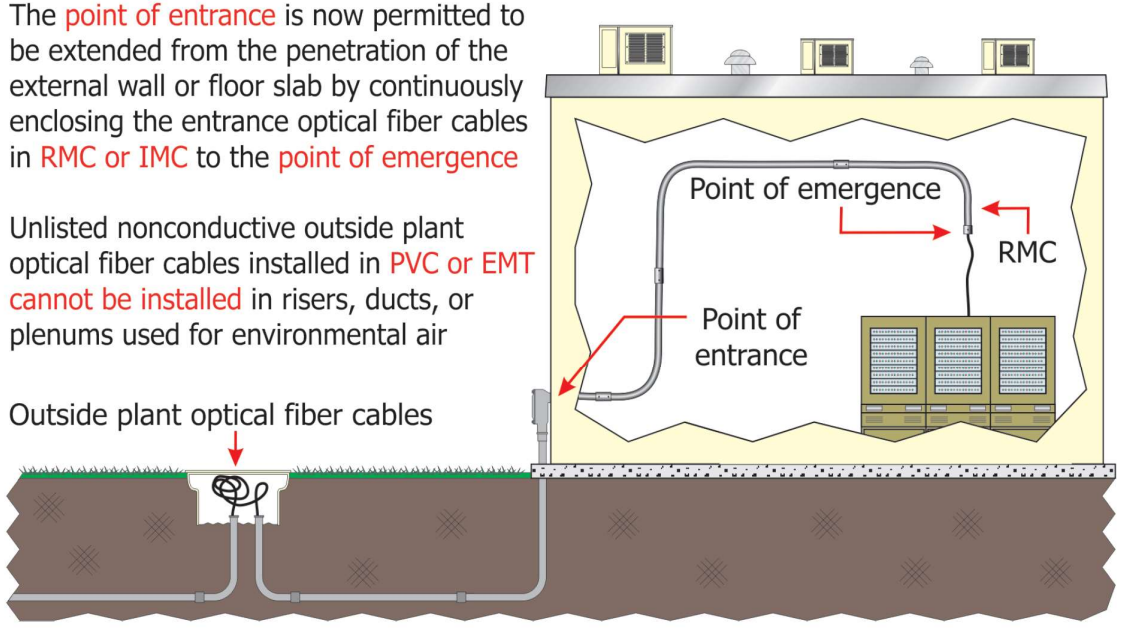
770.48(A) & (B)

- Optical Fiber Cables Entering Building

Unlisted conductive and nonconductive outside plant optical fiber cables are generally permitted to be installed in building spaces where the length of the cable within the building *(measured from its point of entrance)* does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure

The point of entrance is now permitted to be extended from the penetration of the external wall or floor slab by continuously enclosing the entrance optical fiber cables in RMC or IMC to the point of emergence

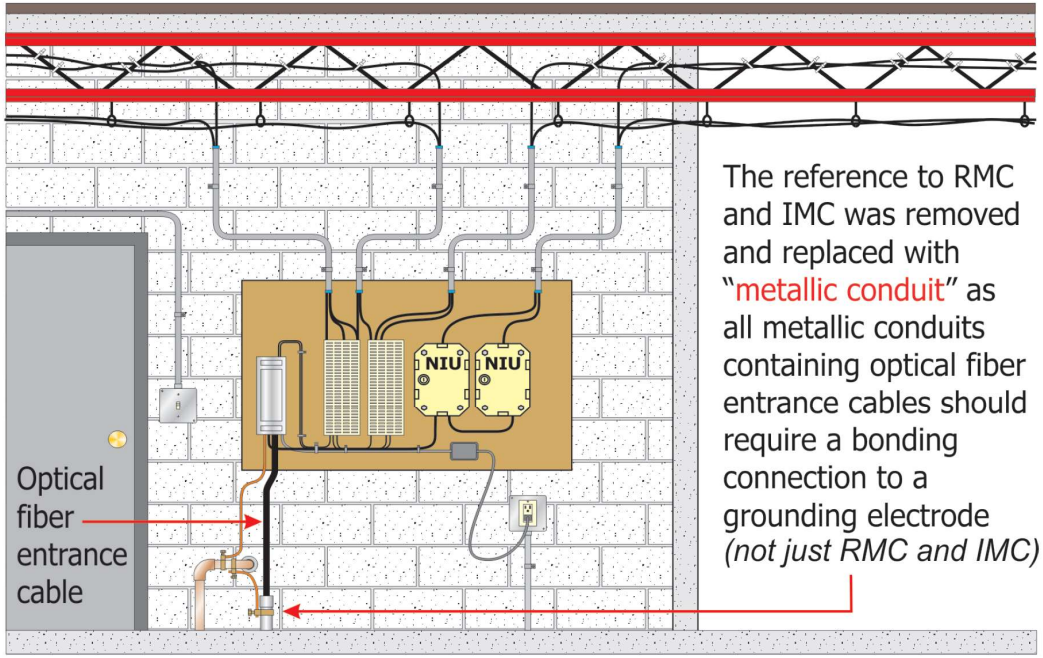
Unlisted nonconductive outside plant optical fiber cables installed in PVC or EMT cannot be installed in risers, ducts, or plenums used for environmental air



770.49

- Metallic Entrance Conduit Grounding
- Changed wording to included Any Metallic Raceway, not solely IMC and/or RMC as it was prior.

Metallic conduit containing optical fiber entrance cable shall be connected by a bonding conductor or grounding electrode conductor to a grounding electrode in accordance with 770.100(B)

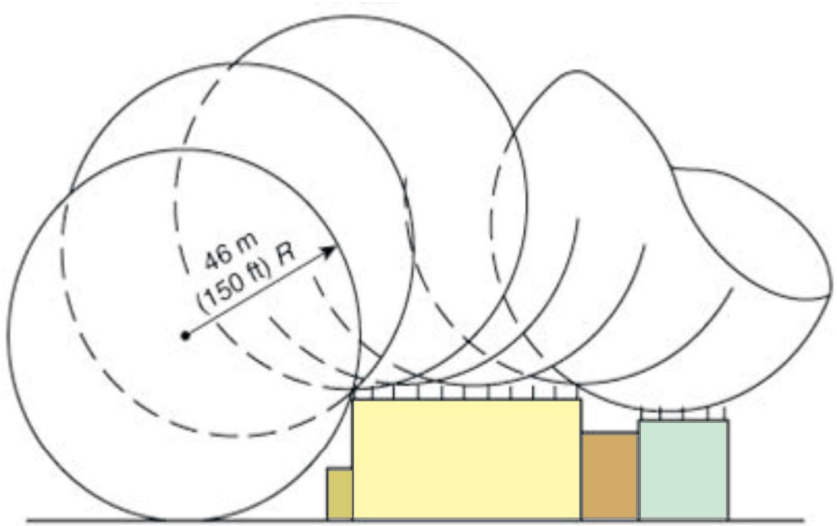


CHAPTER 08
COMMUNICATION SYSTEMS

810.15

- Grounding of Radio and TV Equipment
- Grounding of Mast and metal supporting structures for radio and TV antennas can be eliminated when the antenna and related supporting mast are with a zone of protection defined as a 150' rolling sphere.

Masts and metal structures supporting antennas shall be grounded in accordance with 810.21 unless...



Zone of protection as determined by the "Rolling Sphere" method

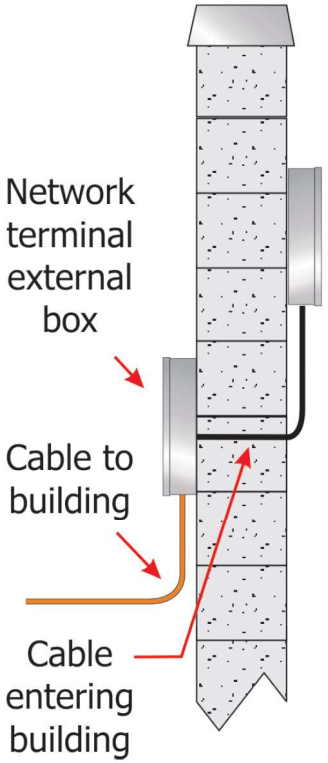
the antenna and its related supporting mast or structure are within a zone of protection defined by a 46 m (150 ft) radius "rolling sphere"

840.2

- Network Terminals
- The definition of Optical Nework Terminal (ONT) was revised to Network Terminal

840.48

- Unlisted Wires and Cables Entering Building
- Three new first-level subdivisions which outline specific requirements for unlisted
  - optical fiber cables,
  - communication wires/cables,
  - coaxial cables were added



Installations of unlisted premises-powered broadband communication wires and cables entering buildings shall comply with 840.48(A), (B), or (C), as applicable

(A) Optical Fiber Cables - Installations of unlisted optical fiber cables entering buildings shall comply with 770.48

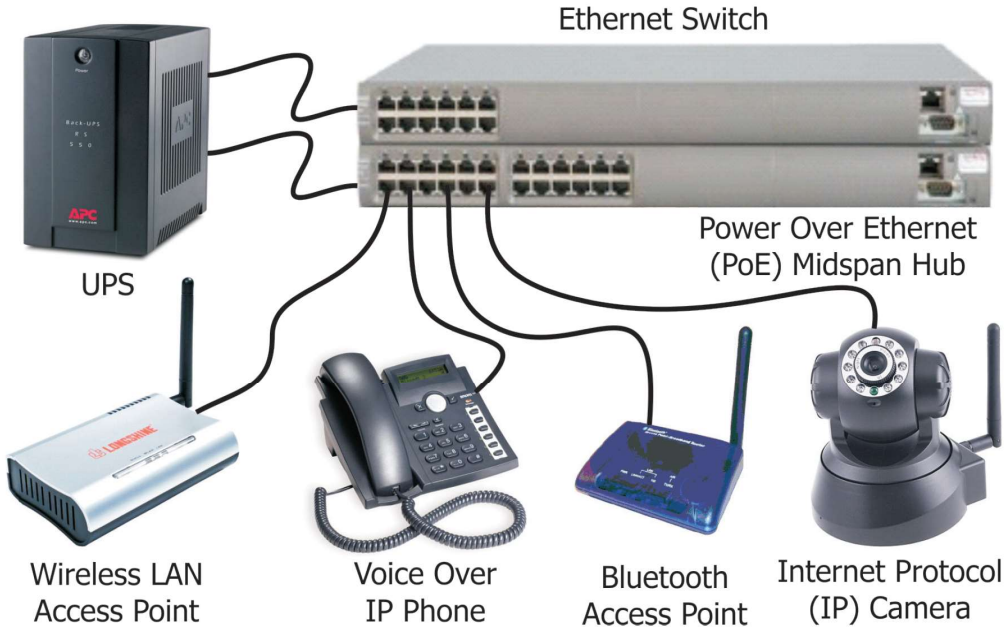
(B) Communications Wires and Cables - Installations of unlisted communications wires and unlisted multipair communications cables entering buildings shall comply with 800.48

(C) Coaxial Cables - Installations of unlisted coaxial cables entering buildings shall comply with 820.48

840.160

- Powering Circuits
- Gives direction to comply with the new 725.144, and permission regarding power delivery circuits that exceed 60 watts on communications cables
- Provided to help keep up with PoE being widely used

New 840.160 (Powering Circuits) was added under new Part VI (Premises Powering of Communication Equipment over Communication Cables) with direction to new 725.144 for power delivery circuits that exceed 60 watts on communications cables



CHAPTER 09
TABLES & ANNEX D

Chapter 9

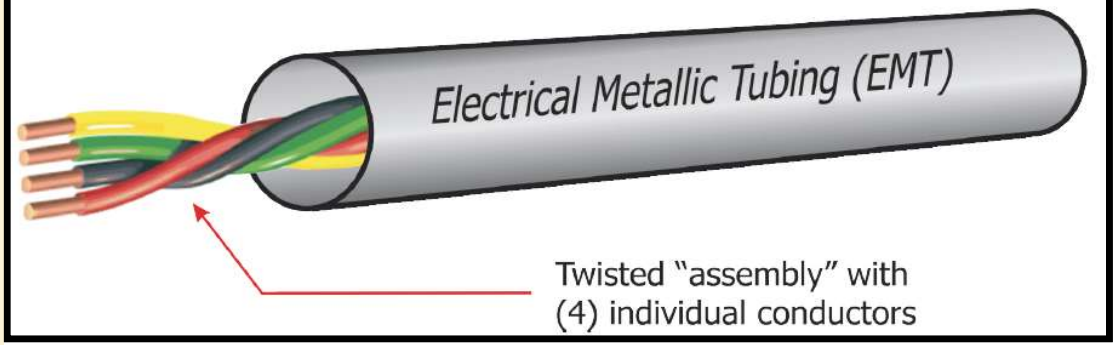
- Notes to Tables, Note 9
- For a cable to be considered as a single conductor, it must have an exterior sheath, like NM Cable.
- Otherwise, even if it is a preassembled twisted wire product, each cable part of the twisted unit will count as a conductor.

A multiconductor cable, optical fiber cable, or flexible cord of two or more conductors shall be treated as a single conductor for calculating percentage conduit or tubing fill area

For cables that have elliptical cross sections, the cross-sectional area calculation shall be based on using the major diameter of the ellipse as a circle diameter

Assemblies of single insulated conductors without an overall covering shall not be considered a cable when determining conduit or tubing fill area

The conduit or tubing fill for the assemblies shall be calculated based upon the individual conductors



Annex D, Example D3

- Example D3 Store Building
- Revision, a correction to this example due to which is greater the actual connected lighting load or the minimum load required. Which ever is greater.
- Also, factoring a continuous connected lighting load at 125% is not appropriate in the Calculated Load section of the example. There is not such factor required in the provision of 220.12.

A store 50 ft by 60 ft, or 3000 ft2, has 30 ft of show window. There are a total of 80 duplex receptacles. The service is 120/240 V, single phase 3-wire service. Actual connected lighting load is 8500 VA.

Calculated Load *(see 220.40)*

Noncontinuous Loads

Receptacle Load *(see 220.44)*	80 receptacles at 180 VA	14,400 VA
10,000 VA at 100%		10,000 VA
14,400 VA − 10,000 VA = 4400 at 50%		2,200 VA
	Subtotal	12,200 VA

Continuous Loads

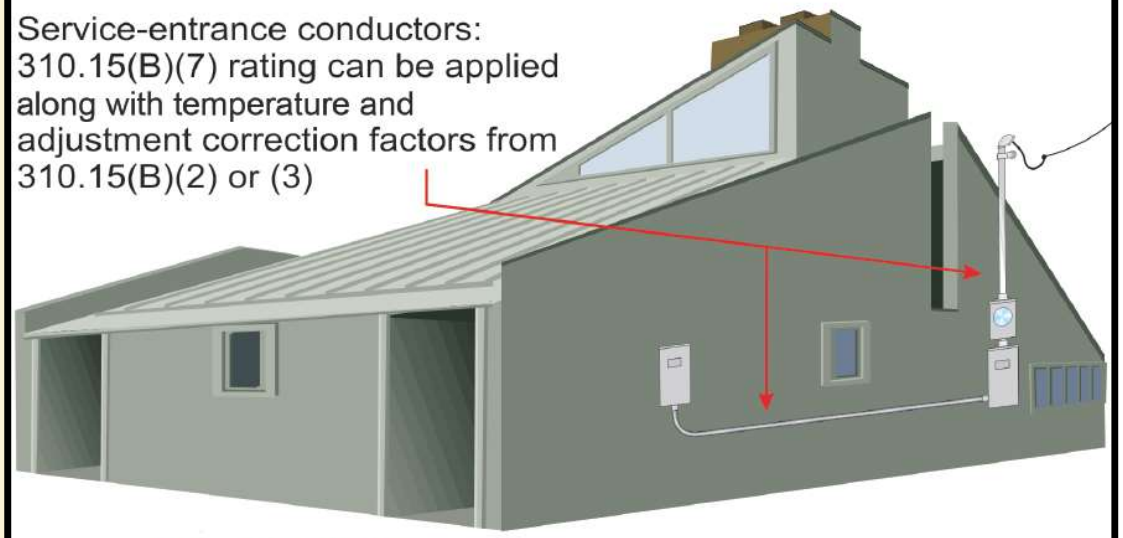
General Lighting*	3000 ft^2 at 3 VA/ft^2	9,000 VA
Show Window Lighting Load	30 ft at 200 VA/ft *[see 220.14(G)]*	6,000 VA
Outside Sign Circuit *[see 220.14(F)]*		1,200 VA
	Subtotal	16,200 VA
	Subtotal from noncontinuous	12,200 VA
	Total noncontinuous loads + continuous loads =	28,400 VA

*In the example, ~~125% of~~ the actual connected lighting load (8500 VA ~~× 1.25 = 10,625 VA~~) is less than ~~125% of~~ the load from Table 220.12, so the minimum lighting load from Table 220.12 is used in the calculation. Had the actual lighting load been greater than the value calculated from Table 220.12, ~~125% of~~ the actual connected lighting load would have been used.

Annex D, Example D7

- Sizing of Service Conductors for Dwellings
- Revision, clarification that When there is No required adjustment or correction factors, the 83% rule can be applied directly.
- Example: 175A x 83% = 145.25A, per 310.15(B)(7)
- Then per 310.15(B)(16) a 1/0 CU or a 3/0 AL meets this rating at 75°C

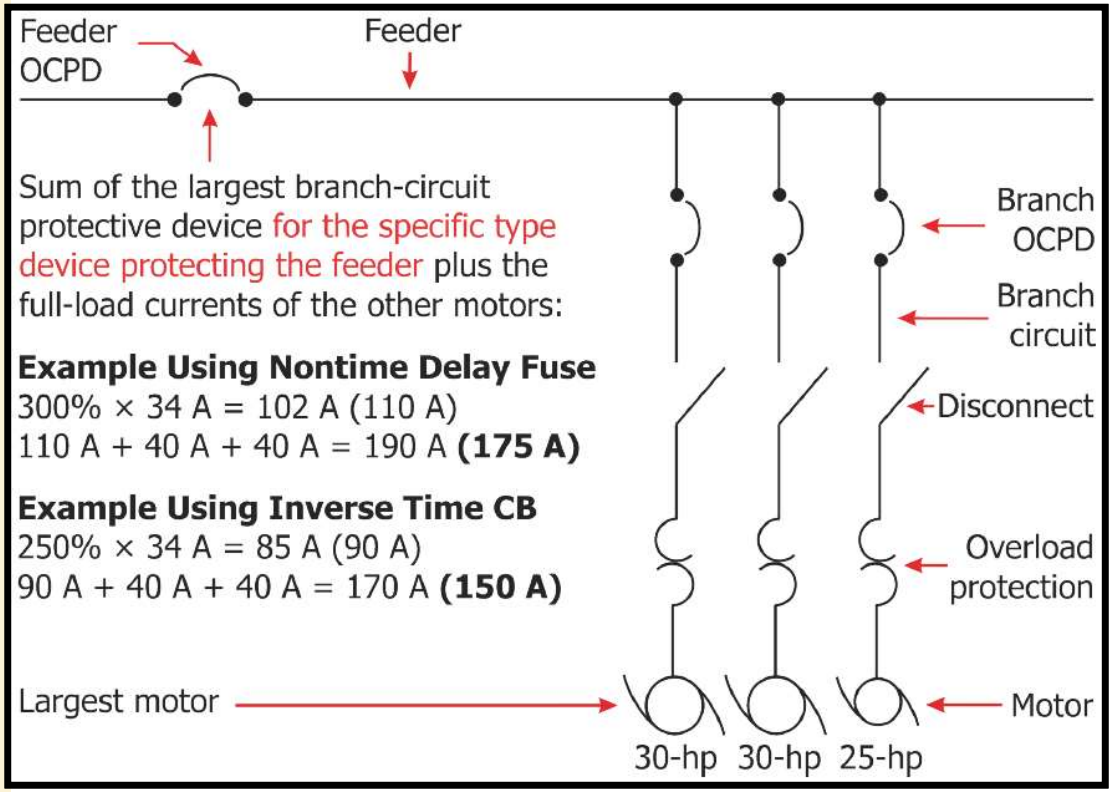
Example D7 for "Sizing of Service Conductors for Dwelling(s)" has been revised clarifying the use of temperature corrections and adjustment factors along with the 83% adjustment from 310.15(B)(7)



Previous Table 310.15(B)(7) was inserted after Example D7 for reference and use with sizing of dwelling unit service and main feeder conductors

Annex D, Example D8

- Feeder Short-Circuit and Ground-Fault Protection
- Example D8, was revised to provide an additional example using different types of protective devices for feeder short-circuit and ground-fault protection



NEW CODE ARTICLES TABLES & ANNEX D

New Code Articles

691 Large Scale PV
5,000 kW =
50 Megawatts

1,210 Megawatts =
1.21 Gigawatts
24.2 Large Scale PV
Production Facilities
to equal:
The Flux Capacitor

Article 425 Fixed Resistance and Electrode Industrial Process Heating Equipment. This article covers fixed industrial process heating employing electric resistance or electrode heating technology (boilers, electrode boilers, duct heaters, strip heaters, immersion heaters, process air heaters, or other approved fixed electric equipment used for industrial process heating).

Article 691 Large-Scale Photovoltaic (PV) Electric Power Production Facility. This article covers the installation of large-scale PV electric power production facilities operated for the sole purpose of providing electric supply to a system operated by a regulated utility for the transfer of electrical energy with a generating capacity of no less than 5,000 kW (generating stations, substations, associated generator, storage battery, transformer, and switchgear areas).

Article 706 Energy Storage Systems . This article applies to all permanently installed energy storage systems (ESS) operating at over 50 volts ac or 60 volts dc that may be stand-alone or interactive with other electric power production sources.

Article 710 Stand-Alone Systems. This article covers electric power production sources operating in stand-alone mode.

Article 712 Direct Current Microgrids (DC Microgrids). This article applies to direct current microgrids, which is a power distribution system consisting of more than one interconnected dc power sources, supplying dc-dc converters(s), dc loads(s), and/or ac loads(s) powered by dc-ac inverters(s).

NEC 2017 REVIEW OF CHANGES CHAP. 1-9

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