
EASTPENN
AMERICAN
POWERSYSTEMS
NEC® Updates That “Stick Out”
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Who Am I and What Qualifies Me to Speak on This?

- Curtis Ashton
  - American Power Systems LLC (APS)
    - A Subsidiary of East Penn Mfg (Deka lead-acid batteries & Navitas Li-ion)
    - Training Director
  - Electrical Engineer (BSEE)
  - Master Electrician (licensed in Colorado and New Mexico)
    - Former Engineering Technician and Electrician's Helper for SRP and DMTS Power Maintenance Engineer for LUMEN Predecessors
  - Past Chair of IEEE PES ESSB
    - Primary Author and WG Chair of IEEE 1657, IEEE 1635 / ASHRAE 21
      - And Several Other Power, Grounding, and Battery Standards
  - NFPA 855 Committee Member and Task Group Chair

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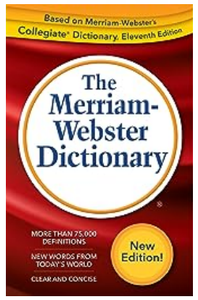
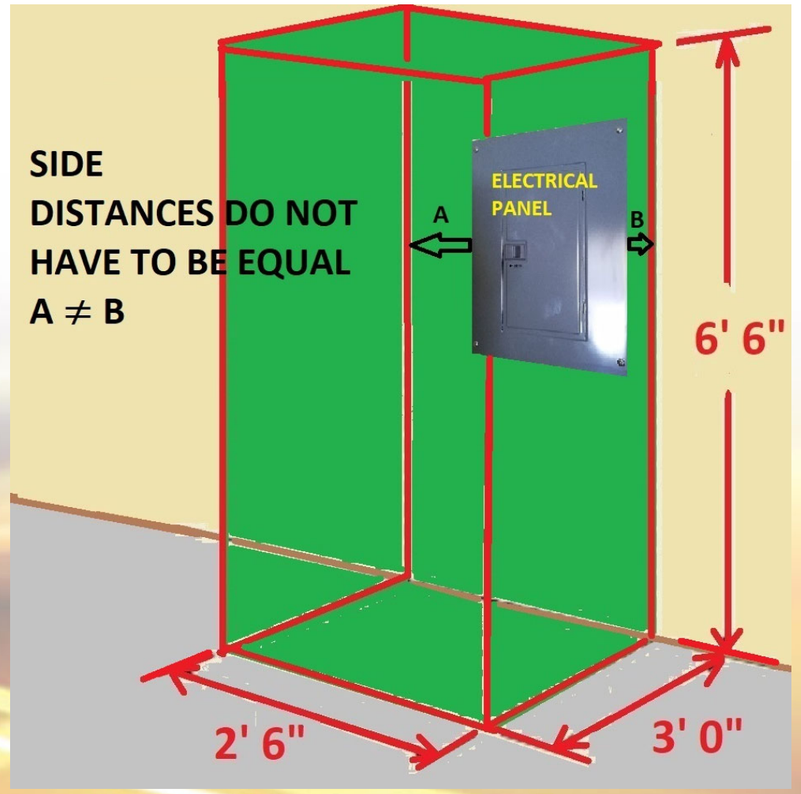
Global Changes

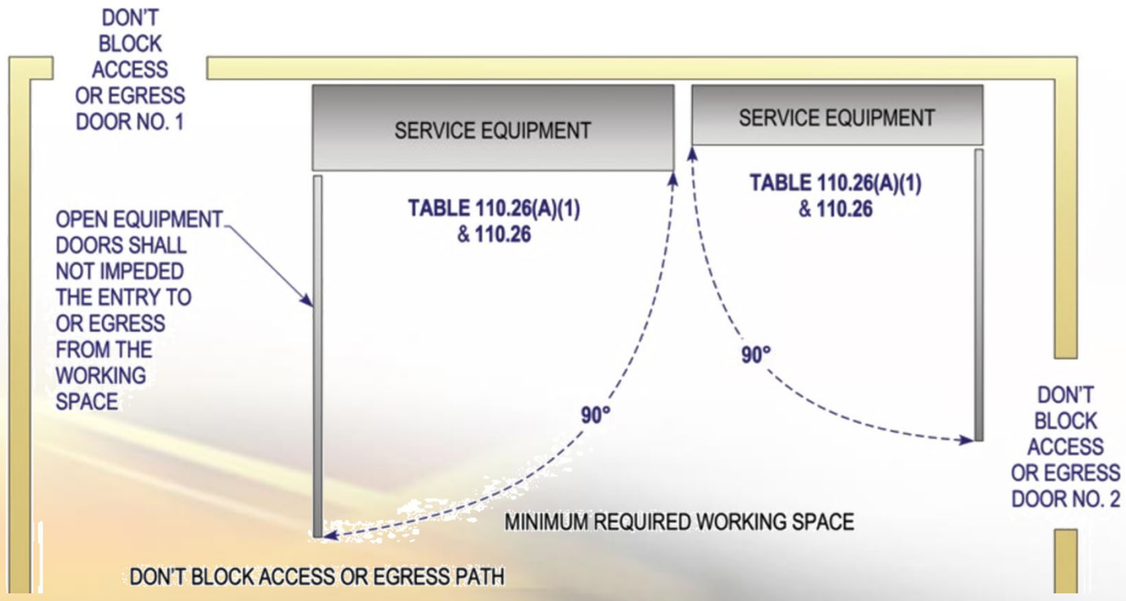
- All Definitions Moved from Individual Chapters to Article 100
- DC Low Voltage Max Moved Up to 1,500 V ⎓
- New Markings Required on Re-Conditioned Equipment



Clarification of Working Space with Doors Open

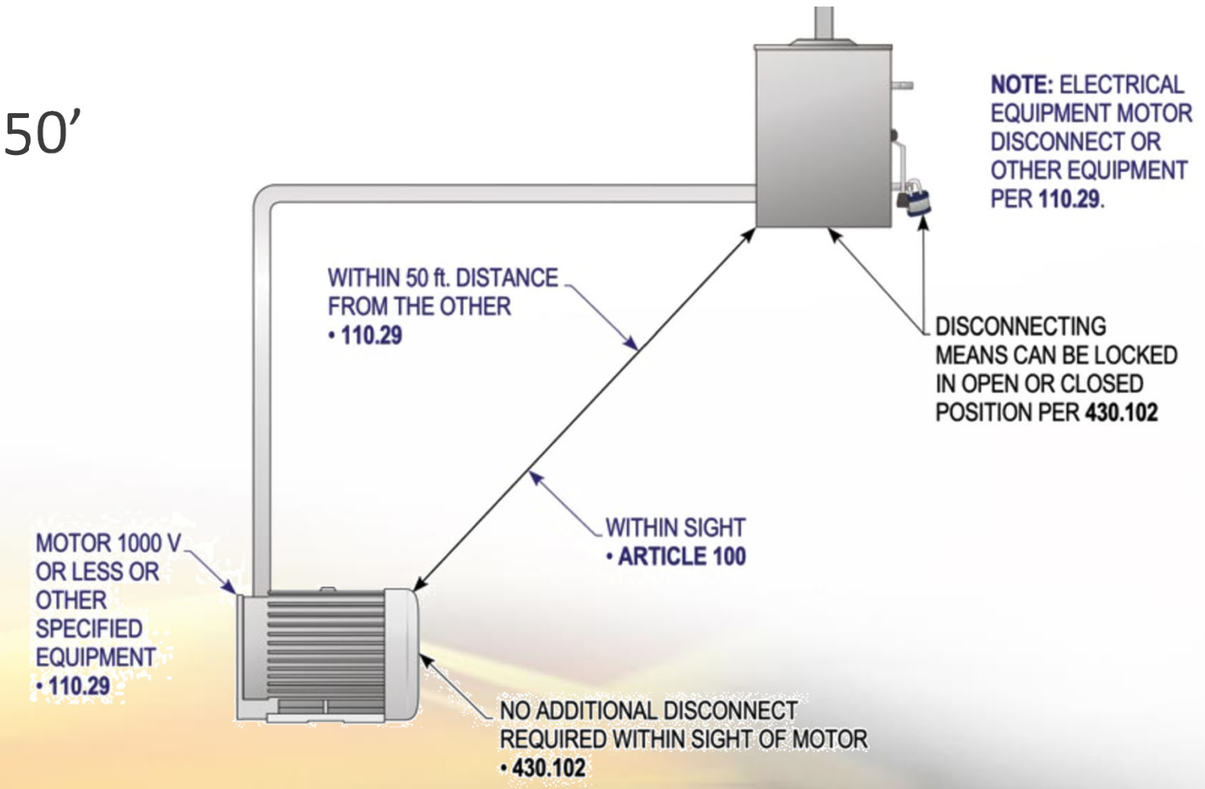
- Most are familiar with 110.26 Minimum 30” Working Space Width
  - with Doors Open was Clarified to 24” in 110.26 and 110.33(A)





In Sight From / Within Sight (of) Defined

- New 110.29
  - Visible and Within 50’



GrdFault/AFCI Changes (210.8/12/13, 410.184, 424.48, 630.8, 680.5/12/22)

- Additional Appliances Required to Have GFCI Feeds
  - Heating Cables in Walls and Floors (need AFCI too)
  - Clothes Dryers, Ranges, Wall-Mounted Ovens, and Microwaves
  - Kitchen Areas Not in Residences, and Pool Equipment Rooms
  - Outlets Intended for Hand Tools in Welding Areas
  - Growhouse Lighting Connected with Flexible Cords
    - 277 V Growhouse Lighting Can Have Trip Set at 20 mA Instead of Traditional 6
- SPGFCI (Higher Trip) Allowed Near Pool & GFCI-Exempt for Power Limited
- Additional AFCI Protection Requirements
  - Sleeping Quarters of Fire/Police/Ambulance/Ranger Stations
- Items That No Longer Have to Have GFCI
  - Outdoor HVAC Feeding Outlets (For 3 Years [temporary for now])
  - Lab Outlets < 6’ from Sinks Where Tripping Causes Greater Hazard
- Removed 480/277 > 1000 A Grd Fault Protection Exceptions for I_{sc} > 10k

10 A Branch Circuits for Lighting, Gas Fireplace Dedicated Circuit, and Stove/Laundry Fans on Lighting Circuits Finally Recognized

- 210.23(A) Insertion
  - 10 A Breakers Have Always Been in the Code, but 15 A Was the Smallest Permissible Branch Circuit Previously
    - This is Mostly Due to the Increased Efficiency of Lighting
- 10 A Breakers Specifically Prohibited to Feed:
  - Outlets
  - Appliances
  - Garage Door Openers
  - Laundry Equipment

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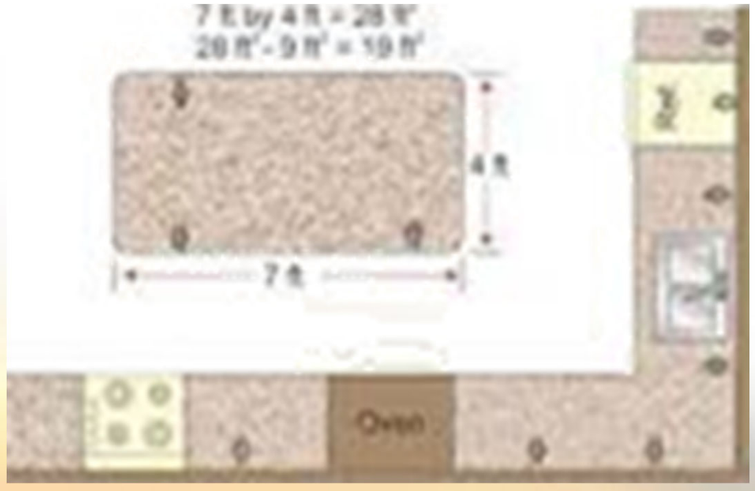
Outlet No Longer Required on Kitchen Island

- Article 210.52(C)(2) Changed
  - If Not Placed, Wiring/Conduit and Junction Box Must be Placed for Future Addition Though

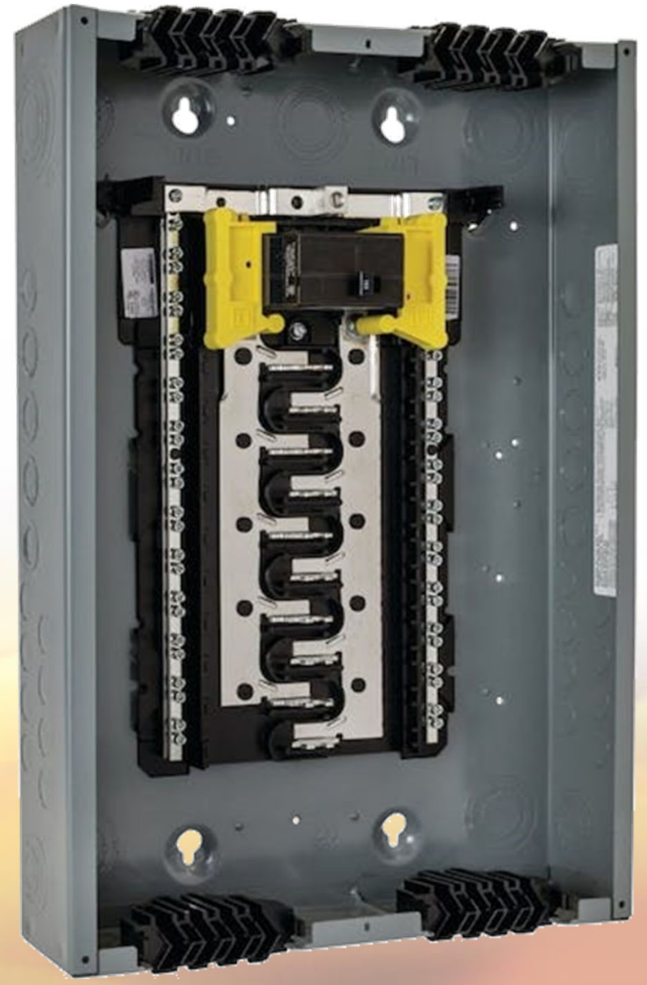


Laundry Areas Bigger than a Very Small Closet Need Lighting Controlled by Wall-Mount Switch

- Article 210.70(A)(1) Added

Line Side of PanelBoards Needs Contact Protection

- 215.15

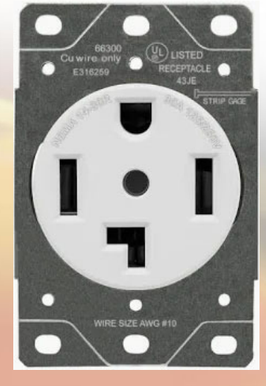


New SPD Requirements

- 215.18, 225.42, and 230.67 – at Service Entrances for Nursing Homes, and Hotels/Motels
  - Previously Only Required for New Residential
  - All Due to the Proliferation of More and More Electronics Whose Tiny Internal Spacings Make Them More Susceptible to OverVoltage
- 409.70 – For Safety Circuits in Industrial Control Panels
  - Right Next to Panel

Source of Ground When Converting 240 V 3-Prong to 4-Prong for Dryers and Ranges

- When Retrofitting Older 3-Prong 240/120 VAC Outlets for Dryers and Stoves to 4 Prong, 250.140(B)(5) Now Allows the ACEG (Green-Wire Ground) to be Derived from Other Sources (e.g., Nearby Cold Water Pipe) Rather than Run New from the Main House Service Panel



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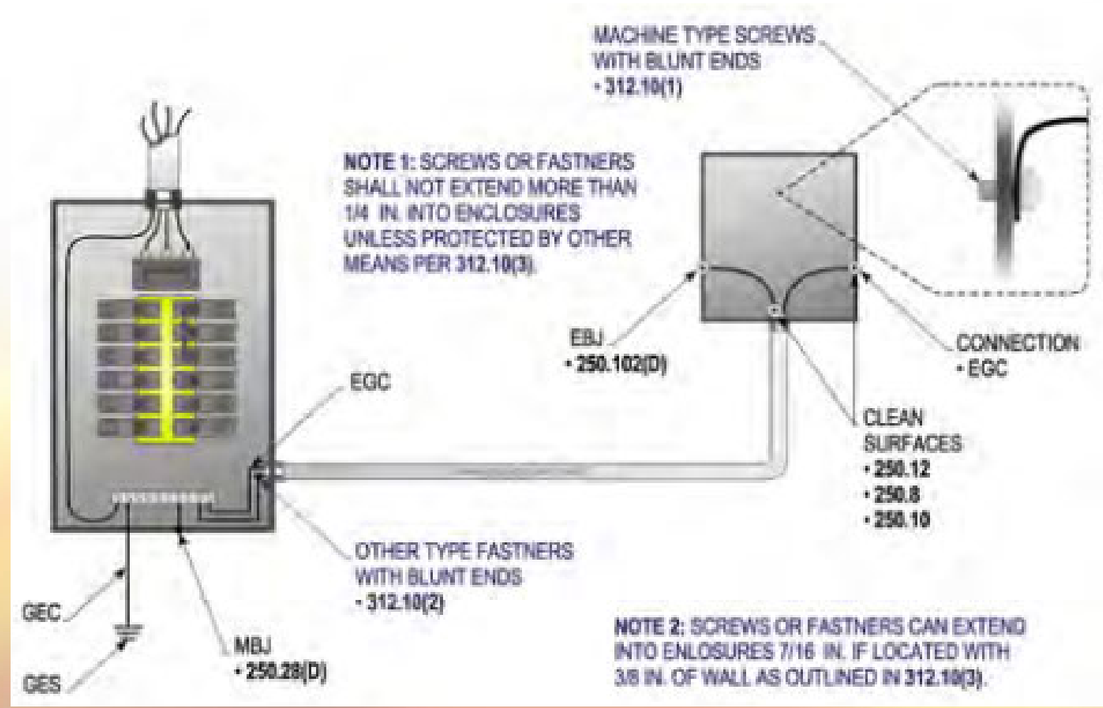
Limitations on Screws Protruding into Wiring Boxes

- New Additions to Article 312.10 and new Article 314.5 to Clarify Maximum Penetrations of Screws into Wiring Boxes and Permissible Screw Types; both to Limit Potential Damage to Conductor Insulation



Expansion Fittings for PVC Emerging from Earth

- 352.44(B) Added to Address Ground Settling/Movement for Complete PVC Runs Emerging from Earth

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Flexible BusBar (371)

- Historically, for Larger Power Transfer in Buildings, Bus Duct Has Often Been Used Rather than Cable
  - Unlike Cable BusDuct is Not Historically Flexible, and thus “Turns” Have to be Engineered (sometimes special “Purpose-Built”)
- Flexible BusDuct Finally Approved in new Article 371

versus

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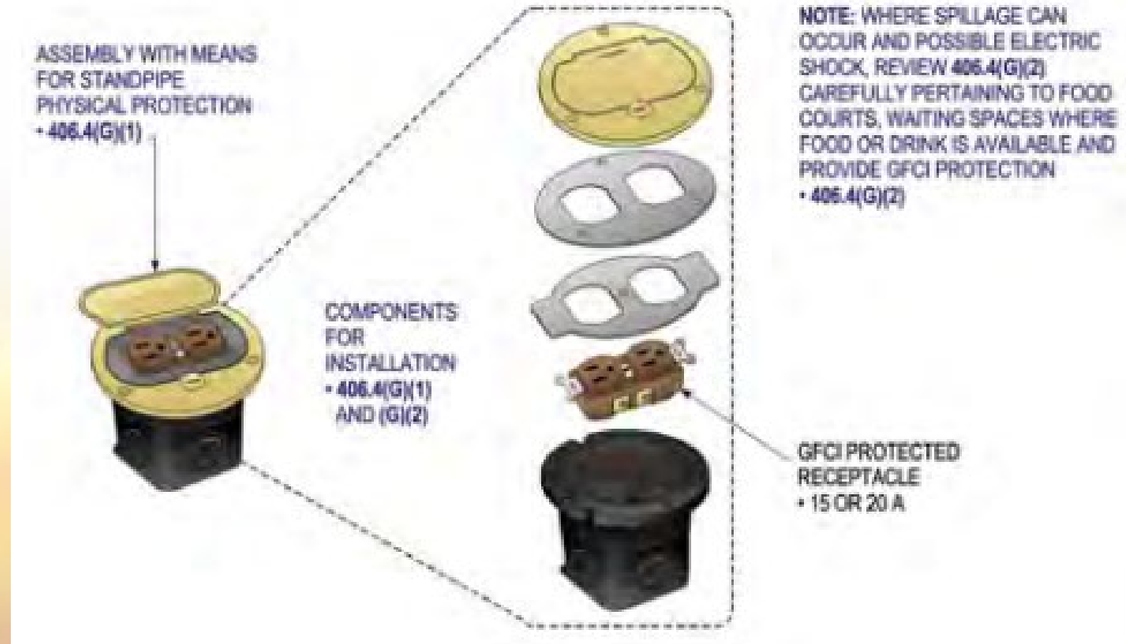
Protection of Floor Receptacles

- 406.4(G)(1) Requires All new Floor Receptacles to have Coverings so That Floor Cleaning Machines Won't Damage them
- 406.4(G)(2) Requires GFCI Protection on All Floor Receptacles in Kitchen Areas



Wider Opening Receptacle Covers

- For Non-Locking Receptacles in Damp or Wet Locations with Covers, they are now Required to Open to at Least 90° with Additions to Article 406.9(A) and (B)

Added Exemptions to Receptacle Prohibition Near Tubs

- 2 additional Exemptions added to 406.9(C)
  - For HydroMassage (e.g., Jacuzzi-like) Tubs in Compliance with 680.73
  - For Electronic Toilets and Bidet Seats (e.g., Japanese style toilets)

New Exception for Tamper-Resistant Receptacles

- 406.12 Had an Exemption Added to the Requirement for New Installations to Have Tamper-Resistance Receptacles in Many Areas
  - Not Required For An Outlet Built to Serve an Appliance that Will Not Be Readily Accessible (think refrigerator, etc.)

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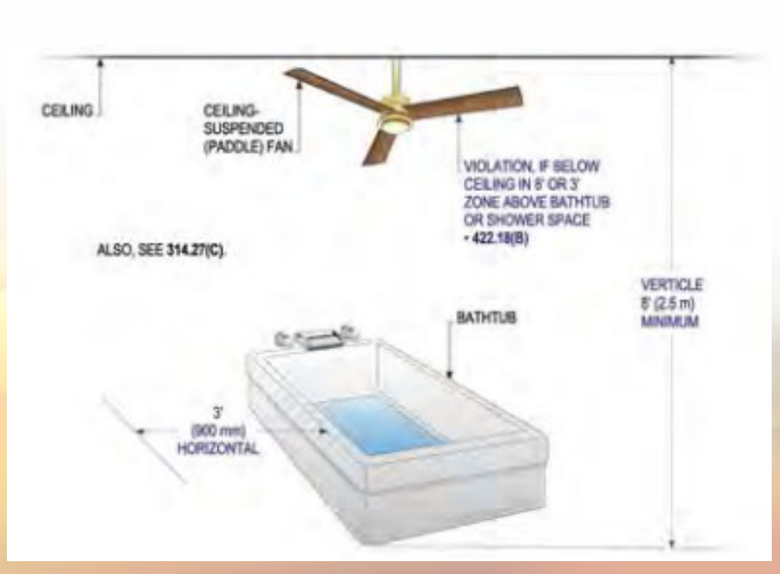
Distance Limitations for Paddle Fans from Tubs/Showers Added

- 422.18(B) was Added to Keep Paddle Fans at Least 3’ Horizontally and 8’ Vertically from Tubs and Showers



Minimum Distances for Dock Electrical Apparatus Placement (555.4)

- Previously, There Were No Requirements on Where to Place Electrical Outlets, etc., for Docks
  - This New Requirement Requires it to Be At Least 5’ Horizontally and 1’ Vertically From the Typical Water High Point
- In Addition, Disconnects Now Have to Be Marked as “Emergency Shutoff” [555.36(C)]

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New EV and Residential ESS Requirements / Allowances

- 220.53 Now Requires EV Chargers to Be Part of Service Load Calc
  - 220.70 Allows Limitations on the Load Based on an EMS
- A New Exception to 625.40 Allows 120 V Outlet Branch Circuits Where the EV (Typically a PHEV for These Smaller Loads) Draws 16 A or Less to Be Non-Dedicated (Shared)
- 625.49 Allows EVs to Feed Back to the Home or Local MicroGrid in an “Islanded” Mode

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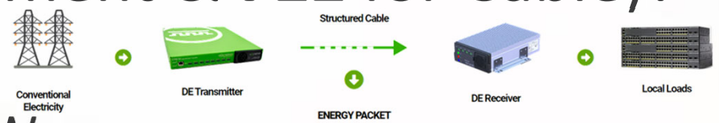
POE-Powered Emergency Egress Lighting Allowed/Rules

- New Rules in 700.11 for Class 2 Power Limited Powering of Emergency Egress Lighting

Class 4 Power Limited Circuits (aka “Fault-Managed” Power [FMP])

- Why Power Limited Circuits?
  - Less Expensive to Install (Without Conduit / Cable Tray, for Example)
- Examples of Existing Power Limited Circuits Classes 1-3
  - 24 VDC Lighting in Drop Ceilings
  - ±190 VDC Twisted Pair Line-Powering for Remote DSLAMs (miles)
    - 100 W/channel Max
- What is New Class 4 (**Articles 726** for Equipment & **722** for Cable)?
  - Up to 450 VDC or VACpeak Unlimited Power



    - Existing Products on the Market Up to 2000 W
  - Power is “Pulsed” with Signaling Between “Pulses”
    - If Fault Occurs(such as Person Touching the Circuit, or Wet cables, etc.) it will Interrupt Signalling, thus Cutting Power Delivery
      - A “form” of Ground Fault Detection
  - Listing: UL 1400-1 for Equipment and 1400-2 for Cable

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