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

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  – 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
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
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 Panel Boards 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
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
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
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.)
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)

• Previoulsy, 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)]
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
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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