

Meeting Minutes: NEC 2023 Adoption Review Committee (Board of Electricity)

Date: October 20, 2022

Time: 9:00 a.m.

Location: Minnesota Room, DLI, 443 Lafayette Road No., St. Paul, MN 55155

Committee Members Present

1. Steve Haiby
2. Mike Hanson
3. Jeff Heimerl
4. Dean Hunter – Cmt. Chair / CO’s Designee
5. Desiree Weigel – Secretary

Committee Members Absent

Alfreda Daniels

DLI Staff & Visitors

Jeff Lebowski (Board Counsel, DLI)
Brittany Wysokinski (Bd. Counsel, DLI) – via phone
Lyndy Logan (DLI)
Marty Kumm (DLI)
Amanda Spuckler (DLI)
Sarah Adams (Housing First)
Nick Erickson (Housing First)
Duane Hendricks (Chair, BOE)
Don Iverson (SQD)
Chad Kurdi (BKV Group)
Pete Lindahl (Vice-Chair, BOE)
Clara Albert (Electrical Assn.) – via phone
Tim McClintock (NEMA)
Gerald O’Connor (Eaton)
Andy Snope (IBEW 292)

1. **Call to Order – Committee Chair Hunter**

- A. **Roll call:** Committee Chair Hunter called the meeting to order at 9:03 a.m. Roll call was taken by Secretary Weigel and a quorum was declared with 5 of 6 voting committee members present in person or via phone.
- B. **Announcements/Introductions** – Committee Chair Hunter
 - Committee members:
 1. Alfreda Daniels – Public member
 2. Steve Haiby – Representative of Electrical Suppliers in rural areas
 3. Michael Hanson – Master Electrician – Contractor
 4. Jeff Heimerl – Journeyworker Electrician
 5. Dean Hunter (Chair) – Commissioner’s Designee
 6. Desiree Weigel – Electrical Inspector
 - All handouts discussed and meeting information are posted on the Committee’s website.
 - Everyone present in person and via phone can hear all discussions.
 - Public participation is welcome and encouraged.
 - All votes will be taken by roll call if any Committee member is attending via phone.

2. **Approval of Meeting Agenda**

A motion was made by Heimerl, seconded by Haiby, to approve the agenda as presented. The roll call vote was unanimous with 5 votes in favor of the motion; the motion carried.

3. **Approval of Previous Meeting Minutes**

A motion was made by Hanson, seconded by Weigel, to approve the Sept. 22, 2022, minutes as presented. The roll call vote was unanimous with 4 votes in favor of the motion and one abstention (Heimerl); the motion carried.

4. **Regular Business**

A. **Expense Approval** – No expenses

5. **Special Business**

A. **Summary of Significant 2023 NEC Section Changes – Dean Hunter**

- Hunter said he will be reviewing the information handout book *Analysis of Changes 2023 NEC*. Review the book here: <https://www.iaei.org/store/>
- Free access to the 2023 NEC: <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70>
- Hunter said his presentation is meant as informational only to cover significant 2023 changes.
- Questions and comments will be accepted until Nov. 10, 2022 – please send to: DLI.Electricity@State.MN.US.
- Questions/comments will be compiled and reviewed at the next Committee meeting on Nov. 17, 2022, at 9 a.m.
- Additional Committee meetings will be scheduled until Committee members are prepared to make a recommendation to the full Board of Electricity (BOE).
- The handout – NEC 2023 Adoption Review Committee Change Summary – was shared and Hunter said they would be reviewing ten changes in each segment, along with the corresponding slide(s) – see **Attachment A**.
- Nick Erickson, Housing First, said they're asking every housing regulator, not just the BOE, to rethink its process to take a considerable look at housing affordability. The last time this body [BOE] it was a much different housing environment. It was the early stages of the pandemic, homes were more affordable, less so today. The big points to hit are: homes are teetering on the edge of \$500,000 for a new median home in Minnesota. That is the highest in the Midwest by a country mile and the state is 60,000 homes short. We were 50,000 units behind in 2018 – the gap has grown by 20% in a few, short years and simply, we're just asking that everyone focus on affordability aspects of its rulemaking or policy making. The big thing that has changed in the last year has been interest rates. It is these persistent interest rate increases between 6% and 7% on mortgages which is more than double the last time the code was adopted. Purchasing power has fallen by roughly \$150,000 on a new home for the average Minnesotan since the last time the electrical code was considered. Before we get to the specific amendments, the TIA that was issued on GFCI related to HVAC equipment is something they're looking broadly at, it is not anything specific to the BOE; however, he thinks there needs to be a more comprehensive look at durability and interplay on codes not just specific to electricity but this rulemaking. Looking at how the proposed changes do play with available technology as well with the other codes. The TIA that was issued shows that something is needed – he isn't sure who is responsible for this.
- Erickson responded to a question about providing a breakdown of electrical/labor costs and said this was completed in 2019 using 2018 price data and he will provide a new

overall cost analysis – they will use builders who are building in multiple Minnesota cities using the same models. They try to use the same reference home because they are likely using the same subcontractors – this give us a little more consistency when we are doing an analysis.

- Erickson referred to Housing First’s comments and proposed amendments– see **Attachment B. Proposed Amendment 1: TIA for 210.8 (f) (2020 NEC):** *Housing First Minnesota respectfully requests the Board of Electrify specifically adopt an amendment which removes 210.8 (f) out of Minnesota’s electrical code. This action actively affirming the TIA would send a message to the NFPA that a more rigorous technical review of the provisions it adopts is long overdue.*
 - Erickson said they’ve spoken with other housing groups across the country, and he thinks there are a lot of issues, particularly in the South, related to 210.8 (f). He would like to see this provision amended or crossed out. Yes, there's a TIA that has been issued but it sends the message to NFPA that you must take a more rigorous review. They are saying the same thing to the ICC. We need to take a much more comprehensive approach to go through and make sure these model codes have had the proper analysis on durability and interplay.
 - Hunter said there is a TIA that was issued for 2020 NEC, and there was TIA 23-3 for the 2023 NEC edition issued prior to the publication. Remember, as we go through the code adoption process, if we elect to adopt the code without amendments, the exception language in 210.8(F) does push the date out to September 1, 2026.
 - Hunter shared an article from the most recent edition of the IAEI magazine that shows data related to GFCI protection and electrocutions. Since the 1970’s till now, the expansion of GFCI protection in the NEC has greatly reduced the number of appliance electrocutions in a home – in 1968 there were 1,048 electrocutions across the country and 481 were related to consumer safety products. These would be appliances a homeowner would touch. In 2019, with 73 million homes where ground fall protection has been built into, there were only 266 electrocutions across the country and only 43 related to consumer safety products. So, when you think about what the ground fault protection does for us in the electrical safety side of it, it makes sense. With the TIA in place, the HVAC issue has been delayed until September 1, 2026. With that delay, we will be well into the 2026 NEC adoption process and will have a better understanding as the electrical industry continues to consider and vet technical data.
 - Weigel asked Erickson if it is only air conditioners that he is concerned about regarding GFCI or is it everything?
 - Erickson said he just wants to codify the TIA in Minnesota’s code. He didn’t provide proposed language, just clarify this in the adopted language.

- **Housing First’s Proposed Amendment 2: 225.41 Emergency Disconnect / 230.85 Dwelling Disconnect:** *For the exterior electricity disconnect, Housing First Minnesota respectfully requests the Board of Electricity revert back to the 2017 NEC. In conversations with licensed electricians over the past two and a half years, not a single electrician outside the Board of Electricity has told us that this is necessary as workarounds are already used in the field where these devices are not in place. While we understand why the NFPA included this provision, thankfully, the number of residential fires in Minnesota, especially new homes, is extremely low.*

 - Erickson said he has had many conversations with electricians over the past 3 years since the 2020 process began and this is one where we’ve repeatedly had this innovation challenge within our organization. They’ve asked subject matter experts across all aspects of homebuilding what can be done to lower construction costs without sacrificing safety, durability, and efficiency and this is one where the electricians (residential only) consistently say this is simply not necessary – there are ways around it if someone’s neighbor is an electrician – it is just ridiculous. This is not needed. It is probably the most consistent thing they’ve heard from residential electricians – this is not necessary. Obviously, there are changes to the 2023, they are simply just proposing to revert to what it was prior to the adoption in 2020 so it wouldn’t be a requirement.
 - Haiby asked what's the reasoning behind calling it ridiculous?
 - Erickson said it’s to say that it is not necessarily, there are ways around it, alternative ways it could be done.
 - Haiby asked for an example.
 - Erickson said he’s not an electrician, he doesn’t have the specifics. It deals today with homes that were built prior to the 2020 NEC being implemented Minnesota. In the off chance there is a residential fire it's handled. Thankfully, it's rare in Minnesota. That's the comment that keeps getting made is that this is something that is not necessary.
 - Haiby said he has 20 years’ experience as a firefighter, and he disagreed with Erickson’s comments regarding emergency disconnects. It is a safety enhancement to be able to disconnect service to a residential building, or any building, when coming onsite. He doesn’t know how else you would do this safely.

- **Housing First’s Proposed Amendment 3: 210.12 (a) AFCI in Dwelling Units:** *As noted in our challenge to the 2020 NEC, Housing First Minnesota had significant concerns over AFCI proliferation and nuisance tripping. Housing First Minnesota has since been supplied with information stating that the NFPA has not been able to evaluate the effectiveness of AFCIs. A copy of the information we received have been attached. As this document notes, nuisance tripping is especially problematic for seniors. Housing First Minnesota respectfully request the Board of Electricity modify the AFCI requirement to a minimum inclusion until the effectiveness and durability of AFCI usage in dwelling units can be confirmed.*

 - Hunter said he has noticed that when they looked at the last code adoption cycle, the national homebuilder associations, along with Housing First, looked at taking AFCI protection out of the NEC or considerations for that. He said when they look at

the AFCI protection, it's been in the code since 1999 and this particular list format was in the 2008 NEC. For the last few code cycles, they haven't seen a whole lot of movement on the AFCI's other than for expanded types of buildings – although now we've seen the expansion obviously during this code cycle, looking at bunk houses for first responders. For the most part, the AFCI language has been in the code, the way it was written, for many years.

- Erickson apologized and said he may have gotten it wrong. This is something that came up frequently with their client groups and builders on warranty callbacks. It isn't a warranty callback, it's just that they were told that it's working as it should, but to the homeowner it doesn't appear that way. He is told it is costing homeowner's money – it's viewed as their issue.
- **Housing First's Proposed Amendment 4: 210.8 (a)(6) – Kitchens in Dwelling:** *Housing First Minnesota respects that the proliferation of GFCIs in kitchens be amended to match the 2020 NEC (only outlets within six feet of a sink).*
 - Erickson said in 3 to 10 years every outlet is going to be a GFCI – this is where the industry thinks it is going, it's just that slow march.
 - Hanson said that the expansion of these additional receptacles should not add any additional cost depending on how the electrical contractor wired the kitchen. In addition, a comment was made about the fact that because AFCI protection is already required for the kitchen receptacles, the additional cost for a dual function breaker that provides both AFCI and GFCI protection is minimal.
 - Erickson apologized.
- Hunter summarized comments received from Andy Snope, IBEW 292 (**Attachment C**) and said Andy has concerns about the calculation piece, that the 2023 NEC arguably falls short when we consider multiple EV chargers being located at any given site. It was noted that there is no demand factor table that's been considered for the 2023 NEC. If you're familiar with the 2020 NEC, section 625.42, states that you must take into account the ampere rating of the equipment. Now there are some adjustability allowances that you can consider depending on the particular charger. In the 2023 NEC, the new section 220.57 there is no provision for any demand factors when there are multiple chargers in a building. Hunter did some research and there was discussion about the proposed language in the first draft; however, the demand factor chart was removed during the technical review of the second draft. The calculated amount will be 7,200 VA in the 2023 code, or the rating of the charging equipment. There is still a debate on whether that value includes the 125% calculation for the continuous load. Hunter reviewed the code language with everyone.
- Hunter reviewed each change in the “Summary of Significant 2023 NEC Section Changes” – see **Attachment A**. After each group of ten items Hunter asked members and visitors if they had any comments or concerns – there were none.

- Hunter said that at the next meeting the Committee will add in and discuss comments provided by Nick Erickson and Andy Snope. These comments will be included in the cost analysis.
- Weigel asked Nick Erickson if their cost analysis would be ready; Erickson said yes. Weigel asked if they would have a breakdown of electrical; Erickson said yes.

5. Announcements

Next special meeting will be Nov. 17, 2022 @ 9:00 a.m., Minnesota Room, DLI with call-in option

6. Adjournment

A motion was made by Haiby, seconded by Weigel, to adjourn the meeting at 11:05 a.m. The roll call vote was unanimous with 5 votes in favor of the motion; the motion carried.

Respectfully Submitted,

Desiree Weigel

Desiree Weigel
Secretary

Summary of Significant 2023 NEC® Section Changes - Attachment A

Definition and New Code Articles were not included in this summary.

Line No.	NEC Code Section	Change Title	Change Summary	Date reviewed by NEC 2023 Committee	Committee Response	
					Accept	Amend
1	110.16(B)	Service Equipment/Feeder Supplied Equipment	Reduces labeling requirement from 1200 to 1000-Amps, adds "Feeder Supplied Equipment" and 4 previously listed items and exception deleted.	9/22/2022, 10/20/2022	X	
2	110.26	Spaces About Electrical Equipment	Concerns equipment doors and their interference with egress and access from working space.	9/22/2022, 10/20/2022	X	
3	210.8(A)(6)	Dwelling Units – Kitchens	GFCI protection has been expanded to include all receptacle outlets in the kitchen	9/22/2022, 10/20/2022	X	
4	210.8 (A) Exception 4	Dwelling Unit Bathroom(Except fan Receptacle)	Exception from GFCI for factory-installed exhaust fans receptacle.	9/22/2022, 10/20/2022	X	
5	210.8 (A) & (B) Exception 6	“Weight Supporting Ceiling Receptacle (WSCR)” and “Weight Supporting Attachment Fitting (WSAF)” Exception	Two new terms and acronyms have been introduced for WSCR and WSAF for consistency throughout the code. These two exceptions were relocated to the end of 210.8(A) and 210.8(B) as part of the reorganization of 210.8.	9/22/2022, 10/20/2022	X	
6	210.8(B)	Other Than Dwelling Locations (Location Item 4)	Addition of buffet serving areas to the list of locations requiring GFCI protection.	9/22/2022, 10/20/2022	X	
7	210.8(B)	Other Than Dwelling Locations (Location Item 7)	Has been modified to address cord-and-plug-connected fixed and stationary appliances at sinks locations as well as receptacle outlets.	9/22/2022, 10/20/2022	X	
8	210.8(B)	Other Than Dwelling Locations (Location Item 13)	Has added GFCI protection for receptacles installed within 6 ft. of aquariums, bait wells, and similar open aquatic vessels or containers.	9/22/2022, 10/20/2022	X	
9	210.8(D)	Specific Appliances	Provides a list appliances (cord-and-plug and hard-wired) requiring GFCI protection. The list was expanded to include: electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and microwave ovens.	9/22/2022, 10/20/2022	X	
10	210.8(F)	Outdoor Outlets	GFCI protection to be installed when the equipment supplied by an outlet covered under the requirements of this section is replaced. A new exception HVAC equipment from GFCI protection until September 1, 2026.	9/22/2022, 10/20/2022	X	
11	210.11(C)(4)	Dwelling Unit Garage Branch Circuits	Clarifies so that 15-ampere branch circuits are permitted to serve receptacle outlets installed in a dwelling unit garage. The receptacles required by 210.52(G) are required be a 20-amp branch circuit dedicated to garage receptacles and all other receptacles to may be served by either a 15-amp or 20-amp branch circuit.	9/22/2022, 10/20/2022	X	

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12	210.11(C)(4)	Dwelling Unit Garage Branch Circuits	A new exception (4) was added permitting the 20-ampere circuit supplying a single vehicle bay garage to supply other equipment in accordance with requirements in 210.23(A)(1) and (A)(2).	9/22/2022, 10/20/2022	X	
13	210.12	Arc-Fault Circuit-Interrupter Protection (AFCI)	This section was reformatted, 10-ampere branch circuit was added to the branch circuit sizes and AFCI protection for first responder living facilities was added.	9/22/2022, 10/20/2022	X	
14	210.17	Guest Rooms and Guest Suites	Assisted living facilities added to the existing list of locations requiring their branch circuits to be installed per the requirements for dwelling units if a permanent means for cooking exists.	9/22/2022, 10/20/2022	X	
15	210.23	Permissible Loads	Covers permitted and non-permitted use of a 10-ampere branch circuit. Installation requirements were necessary for the use of a 10-ampere branch circuit if the installer chose to do so	10/20/2022	X	
16	210.52(C)	Dwelling Units- Island and Peninsular	The requirement for receptacles serving the countertop or work surface of an island or peninsula has been made optional.	10/20/2022	X	
17	210.52(C)	Dwelling Units- Island and Peninsular	Receptacle assemblies must be listed for application.	10/20/2022	X	
18	210.52(C)	Dwelling Units- Island and Peninsular	Receptacle outlets must be installed on above the countertop. Receptacles outlet will no longer be allowed below the countertop.	10/20/2022	X	
19	210.52(C)	Dwelling Units- Island and Peninsular	If a receptacle outlet is not provided, provisions must be made to allow for a future installation.	10/20/2022	X	
20	210.52 (G)	Basements, Garages, and Accessory Buildings	The receptacle that provides the premises security systems does not meet the receptacle requirements of 210.52(G).	10/20/2022	X	
21	210.70	Lighting Outlets Required	Laundry areas has been added to the existing list of locations in 210.70(1).	10/20/2022	X	
22	210.70	Lighting Outlets Required	Prohibits the switch or wall-mounted control device to rely solely on a batteries unless provided with a means to energize lighting outlets upon failure	10/20/2022	X	
23	215.15	Barriers (Feeders)	When feeder taps or transformer secondary conductors supply panelboards, switchboards, switchgear, or motor control centers, there must be barriers installed.	10/20/2022	X	
24	215.18	Surge Protection (Feeders)	This new language requires Type 1 or 2 SPDs when a feeder supplies a dwelling unit, dormitory unit, guest rooms of hotels and motels, and sleeping rooms/areas of nursing homes and limited-care facilities.	10/20/2022	X	
25	220.5 (C)	Floor Areas	Areas such as garages, or unused or unfinished space(s) are no longer excluded from the calculated floor area of the building, dwelling unit or other area.	10/20/2022	X	
26	220.57	Electric Vehicle Supply Equipment (EVSE) Load	Section 220.57 has been added to specify load calculations for Electric Vehicle Supply Equipment (EVSE). Section 220.57 has been added to specify load calculations for Electric Vehicle Supply Equipment (EVSE).	10/20/2022	X	

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27	220.70	Energy Management Systems (EMSs)	A new section has been added to specify load calculations for Energy Management Systems (EMSs). Seeks to build upon specific allowances providing a new option for any load connected to a feeder or service conductor where these loads are controlled to a maximum limit that effectively restricts the total loads operated at one time. This will help property owners to pursue the use of EMS equipment without requiring extensive electrical system upgrades	10/20/2022	X	
28	220.120	Receptacle Loads	Marinas, Boatyards, Floating Buildings, and Commercial and Noncommercial Docking Facilities Requirements at Section 555.6 have been relocated to Part VII 220.120.	10/20/2022	X	
29	225.5 and 225.7	225.5, Size of Conductors 1000 Volts, Nominal, or Less, and 225.7, Lighting Equipment Installed Outdoors	Deleted sections	10/20/2022	X	
30	225.41	Emergency Disconnects	Requires an emergency disconnect at a readily accessible outdoor location for one-and two-family dwelling units that are served by feeders.	9/22/2022, 10/20/2022	X	
31	230.62(C)	Barriers	Installed in such a way that no uninsulated, ungrounded busbars or terminals are exposed to inadvertent contact while load terminations are being serviced when the service disconnect is in the open position.	9/22/2022, 10/20/2022	X	
32	230.67	Surge-Protective Devices	Additional occupancies have now been added that include: dormitory units, guest rooms and guest suites of hotels and motels, and areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms.	9/22/2022, 10/20/2022	X	
33	230.67	Surge-Protective Devices	SPDs shall have a nominal discharge current rating (In) of not less than 10kA	9/22/2022, 10/20/2022	X	
34	230.71(B)	Two to Six Service Disconnecting Means	Transfer switches were added to clarify that they must be listed for and used as service equipment. Each service disconnect is to be provided in a separate compartment	9/22/2022, 10/20/2022	X	
35	230.71(B) Ex.	Two to Six Service Disconnecting Means	An exception was added to clarify that existing service equipment is not required to comply with the provisions of 230.71(B) when existing equipment was installed in compliance with previous editions of the NEC allowing for up to six service disconnects in a single enclosure or compartment.	9/22/2022, 10/20/2022	X	
36	230.85	Emergency Disconnects	Section 230.85 was reorganized into sub-sections with titles to better align with the formatting requirements. listed disconnects used as the emergency disconnect cannot be marked as "suitable ONLY for use as service equipment."	9/22/2022, 10/20/2022	X	

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37	240.4(B)	Overcurrent Devices Rated 800 Amperes or Less	Adjustable trip overcurrent protective devices are permitted to have an ampacity value set that does not exceed the next higher standard overcurrent protection device ampacity value [per Table 240.6(A)] above the ampacity of the conductors being protected.	9/22/2022, 10/20/2022	X	
38	240.4(D)(3)	14 AWG Copper-Clad Aluminum	14 AWG copper-clad aluminum was added to the list of permitted small conductors. Has been added to align with other small conductors permitted per 240.4(D). Overcurrent protection device rating for the conductors cannot exceed 10 amperes, and the maximum continuous load on the circuit cannot exceed 8 amperes.	9/22/2022, 10/20/2022	X	
39	Table 240.6(A)	Standard Ampere Ratings	10 ampere was added to the list of standard ratings of overcurrent protection devices. 10 ampere rated fuses and circuit breakers are available and being used in the field.	9/22/2022, 10/20/2022	X	
40	240.6(D)	Remotely Accessible Adjustable-Trip Circuit Breakers	Allows for remote access to adjustable-trip circuit breakers through a direct local nonnetworked interface or a networked interface connection. Due to SMART devices, provisions were needed to address cybersecurity.	9/22/2022, 10/20/2022	X	
41	240.11	Selective Coordination	Clarifies that whenever the NEC requires a feeder overcurrent protective device to be selectively coordinated with a service overcurrent protective device, then ALL feeder overcurrent devices connected to such service must be selectively coordinated with the service overcurrent device. Closes any loopholes or gaps in the code.	9/22/2022, 10/20/2022	X	
42	250.130	Equipment Grounding Conductor Connections	Snap switches were added to the item (receptacle) that are allowed to use Section 250.130(C) for their equipment grounding conductor (EGC) connection.	9/22/2022, 10/20/2022	X	
43	250.140	Frames of Ranges and Clothes Dryers	Cases exist where an existing load center was the service equipment but is now being supplied by a feeder. In these situations, the grounded conductor was not permitted to be used as part of the effective ground-fault current pathway. In the 2023 NEC the grounded connector is to be insulated or field covered within the supply enclosure with a listed insulating material to prevent contact of an uninsulated conductor with any normally non-current carrying metal part of the equipment.	9/22/2022, 10/20/2022	X	
44	300.4(E)	Raceways/Metal-Corrugated Decking	A new Exception No. 2 has been added which recognizes poured concrete on top of the metal roof decking as a means of physical protection for wiring methods installed in or under metal-corrugated roof decking.	9/22/2022, 10/20/2022	X	

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45	Table 300.5	Minimum Cover Requirements	Electrical Metallic Tubing (EMT) has been added to Column 3 of the table to clearly indicate that it can be installed in an underground location.	9/22/2022, 10/20/2022	X	
46	300.25	Exit Enclosures (Stair Towers)	An exception was added addressing egress lighting on outside exterior doorways.	9/22/2022, 10/20/2022	X	
47	312.10	Screws and Other Fasteners	New section added to address field installed screws or other fasteners entering a cabinet, cutout box, or meter socket.	9/22/2022, 10/20/2022	X	
48	314.16(B)(6)	Terminal Block Fill	A new subsection was added to address volume allowance concerns when terminal blocks are installed in boxes.	9/22/2022, 10/20/2022	X	
49	314.24	Dimensions of Boxes	The existing language was modified by broadening the reach of this section to address side entries for outlet and device boxes.	9/22/2022, 10/20/2022	X	
50	352.44(B)	Earth Movement (Expansion Fittings)	Requirements were added for an expansion fitting to be installed for underground runs of direct buried PVC conduit that emerge from the ground.	9/22/2022, 10/20/2022	X	
51	404.1	Scope (Switches)	Article 404 does not cover equipment such as wireless control switches that do not connect to electrical branch circuit conductors. Informational note directs the user of the Code to Section 210.70, Lighting Outlets Required, for additional details.	9/22/2022, 10/20/2022	X	
52	406.4(D)(8)	Ground-Fault Protection of Equipment	Requires ground-fault protection of equipment (GFPE) to be provided for replacement receptacles that require GFPE protection by requirements found elsewhere in the NEC.	9/22/2022, 10/20/2022	X	
53	406.4(G)	Floor Receptacles Protection	Floor receptacles must permit floor-cleaning equipment to be operated without damage to the receptacles and in food courts and waiting spaces of passenger transportation facilities where food or drinks are allowed must be GFCI protected.	9/22/2022, 10/20/2022	X	
54	406.9(C)	Bathtub and Shower Space	This clarifies receptacle restrictions in and around bathtubs and showers.	9/22/2022, 10/20/2022	X	
55	406.12	Tamper-Resistant Receptacles	Additional areas and occupancies were added where tamper-resistant receptacles will now be required to help protect children.	9/22/2022, 10/20/2022	X	
56	408.4	Descriptions Required	Requirements for circuit directories and descriptions were placed into a list format for clarity. There was confusion with the previous text as written in paragraph form.	9/22/2022, 10/20/2022	X	
57	408.9	Replacement Panelboards	Clarifies the replacement requirements for panelboards.	9/22/2022, 10/20/2022	X	
58	408.38	Enclosure (Panelboards)	The panelboard and enclosure combination shall be evaluated for the application when a panelboard is installed in a cabinet, cutout box, or identified enclosure and having an available fault current greater than 10,000 amperes.	9/22/2022, 10/20/2022	X	

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59	408.43	Panelboard Orientation	Panelboards cannot be installed in the face-down position. Added due to working space concerns. Even with acceptable working space, it would be very difficult for a qualified worker to safely work due to the installer lying, kneeling, or standing on a floor surface looking up.	9/22/2022, 10/20/2022	X	
60	409.70	Surge Protection	New section has been added requiring surge protection for industrial control panels.	9/22/2022, 10/20/2022	X	
61	410.10(F)	Luminaires Installed in or Under Roof Decking	Requires a minimum of 38 mm (1 ½ in.) to luminaires under any roof system where physical damage can occur to the luminaire	9/22/2022, 10/20/2022	X	
62	410.71	Disconnecting Means for Fluorescent or LED Luminaires	Relocated the requirement for disconnects for luminaires to this location because LED drivers were added to this section.	9/22/2022, 10/20/2022	X	
63	Article 410 Part XVII	Germicidal Irradiation	Part XVII of Article 410 has been added to address the increasing use of germicidal luminaires for disinfecting purposes.	9/22/2022, 10/20/2022	X	
64	422.16(B)(2)	Built-in Dishwashers and Trash Compactors	Provisions were added for supply cords to trash compactors and dishwashers that pass through a wood cabinet to be provided with protection that incorporates “smoothed edges.”	9/22/2022, 10/20/2022	X	
65	424.48	Installation of Cables in Walls	New section will allow heating cable to be installed in walls with specific protection and limitations. Concerns existed for heating cable installed in walls, and the need for installation with proper protection was evident. Provision includes a January 1, 2026, future effective date.	9/22/2022, 10/20/2022	X	
66	440.8	Single Machine and Location	New language has been added indicating that mini-split unit heating and cooling systems are not to be installed in a tub or shower zone.	9/22/2022, 10/20/2022	X	
67	440.11	General	Added additional language requiring disconnects with covers exposing live parts to be locked. Requires air-conditioning and refrigerating equipment disconnects that have hinged covers, and when open, have exposed live parts, be locked to prevent children and unqualified people from accidental contact.	9/22/2022, 10/20/2022	X	
68	440.14	Location	Adds a reference to 110.26(A), which makes it clear that working space clearances are required for air-conditioning and refrigerating equipment.	9/22/2022, 10/20/2022	X	
69	445.18(A)	Disconnecting Means	New guidance has been added permitting the disconnecting means to be located within the generator behind a hinged cover, door, or enclosure panel. When the generator disconnecting means is located in the generator enclosure, a field-applied label to be provided indicating the location of the disconnecting means.	9/22/2022, 10/20/2022	X	

Line No.	NEC Code Section	Change Title	Change Summary	Date reviewed by NEC 2023 Committee	Committee Response	
					Accept	Amend
70	445.19	Emergency Shutdown of Prime Mover	A new Section 445.19 will separate the generator emergency shutdown requirements from the generator disconnect requirements. New language at (C) clarifies that the emergency shutdown device located at one- and two-family dwelling units installed on the exterior of the generator enclosure meets the requirements of this section. Makes it clear that the emergency disconnect for one-and two-family dwellings is to shut down the prime mover and not allow it to restart. At other than one- and two-family dwelling, generators with greater than 15 kW rating, units are to be equipped with a remote emergency stop switch that will shut down the prime move.	9/22/2022, 10/20/2022	X	
71	Article 517	Health Care Facilities	This edition of the NEC has completed the phased approach of changing the references from critical, general, basic, and support spaces to Category 1, 2, 3, and 4 Spaces. This “phased approach” of aligning with NFPA 99 (Health Care Facilities Code) was completed this cycle and the parenthetical references were deleted, leaving only the Category space references.	9/22/2022, 10/20/2022	X	
72	518.2	General Classification- (A)Examples	Casinos and gaming facilities are now included in the list of assembly occupancy examples.	9/22/2022, 10/20/2022	X	
73	547.26	Physical Protection (Agricultural Buildings)	Nonmetallic cables will be prohibited from being concealed within walls and above ceilings of buildings that are contiguous with or physically adjoin livestock confinement areas.	9/22/2022, 10/20/2022	X	
74	547.44	Equipotential Planes and Bonding of Equipotential Planes	Clarifies the indoor and outdoor locations requiring equipotential planes and specifies the bonding locations for these planes at agricultural buildings.	9/22/2022, 10/20/2022	X	
75	550.32(A)	Service Equipment	The electrical service disconnect can now be located “within sight from” the mobile home as opposed to the previously required 30 feet. Service equipment cannot be installed in or on mobile home.	9/22/2022, 10/20/2022	X	
76	551.3	Electrical Datum Plane Distances	Substantiation was submitted for the need to address recreational vehicle sites located next to natural bodies of water. This change was necessary to clarify some of the inconsistencies related to all electrical equipment installations around bodies of water.	9/22/2022, 10/20/2022	X	
77	551.40(D)	Loss of Ground Device	Substantiation was submitted to eliminate the need for a “reverse polarity device” in a recreational vehicle and in its place a “loss of ground device.”	9/22/2022, 10/20/2022	X	
78	555.4	Location of Service Equipment	Modified to state that services for a marina or docking facility must be located on land and no closer than 1.5 m (5 ft) horizontally from the structure served and elevated to a distance of 12 in. above the electrical datum plane.	9/22/2022, 10/20/2022	X	

Line No.	NEC Code Section	Change Title	Change Summary	Date reviewed by NEC 2023 Committee	Committee Response	
					Accept	Amend
79	555.14	Equipotential Planes and Bonding	Substantiations was submitted that enhanced safety could result from requiring an equipotential plane to equalize or eliminate step and touch voltages for electrical equipment located at or on docks.	9/22/2022, 10/20/2022	X	
80	555.15	Replacement of Equipment	The “replacement” of electrical equipment at docking facilities is to be installed to the current edition of the NEC. The new language will allow the authority having jurisdiction (AHJ) to inspect the existing electrical equipment for any damage. The damage found for existing equipment needs only to be repaired to the NEC edition for which it was originally installed.	9/22/2022, 10/20/2022	X	
81	555.35 E	Leakage Current Measurement Device	Language was added recognizing that the leakage current device is required to be listed by January 1, 2026. The required leakage current testing device had no specific standard in place to build, test, or construct this metering equipment specific for a marina environment.	9/22/2022, 10/20/2022	X	
82	555.36(C)	Emergency Electrical Disconnect	Language has been added at a new subsection 555.36(C) to mandate that an emergency disconnect be located within sight of a marina power outlet or enclosure that provides shore power to boats.	9/22/2022, 10/20/2022	X	
83	555.38	Luminaires	This new section should help both installers and AHJs address electrically safe installations of luminaires at docking facilities to help reduce the incidents of ESD.	9/22/2022, 10/20/2022	X	
84	620.22(A)	Car Light Receptacles, Auxiliary Lighting and Ventilation	Revised the requirements to specify permissible loads on the car light circuit.	9/22/2022, 10/20/2022	X	
85	620.36	Different Systems in One Raceway or Traveling Cable	Specifies which cable types may be installed in elevator raceway or traveling cable. The following cables are now specifically permitted are shielded pair, coaxial and other communication circuits.	9/22/2022, 10/20/2022	X	
86	620.51(A) Type Ex. No. 2	Stairway Chair Lift	Clarification for situations where cord-and-plug connection of a stairway chair lift utilizing batteries is permitted. This is in lieu of the previous requirement for a fused motor switch/lockable circuit breaker.	9/22/2022, 10/20/2022	X	
87	625.6	Listed (Electric Vehicle Power Transfer)	Clarifies equipment for electric vehicle power transfer (charging, power export, or bi-directional current flow) that is required to be listed.	9/22/2022, 10/20/2022	X	
88	625.49	Island Mode (Electric Vehicles)	Creates a new section stating that electric vehicle power export equipment (EVPE) and bidirectional electric vehicle supply equipment (EVSE) are permitted to be a part of interconnected power systems operating in an island mode condition.	9/22/2022, 10/20/2022	X	

Line No.	NEC Code Section	Change Title	Change Summary	Date reviewed by NEC 2023 Committee	Committee Response	
					Accept	Amend
89	630.8	GFCI Protection for Personnel (Electric Welders)	Creates a new section requiring ground-fault circuit-interrupter (GFCI) protection for personnel involved with electric welder applications. This change is not for the welder receptacle but rather for other receptacles within the area where the welder is being used, and other tools might be connected – these other receptacles are the 125-volt, 15- and 20-ampere receptacles supplied by single-phase branch circuits rated 150 volts or less to ground.	9/22/2022, 10/20/2022	X	
90	646.19	Entrance to and Egress from Working Space	Specifies requirements for egress doors in modular data centers. The Code did not clearly specify egress door opening requirements when the door was not of a “swing-type” – now will include requirements for situations where the egress opening may be a sliding or “barn-door” style.	9/22/2022, 10/20/2022	X	
91	680.5	GFCI and SPGFCI Protection	Text has been revised and subdivided to address ground-fault circuit-interrupter (GFCI) protection and introduce Special Purpose Ground-Fault Circuit-Interrupter (SPGFCI) protection in swimming pool locations. SPGFCI protection is a relatively new GFCI protection requirement for circuits above 150 volts to ground, but not more than 480 volts phase to phase, single or three phase.	9/22/2022, 10/20/2022	X	
92	680.9(A)	Power (Swimming Pools)	Clarifies that overhead wiring in raceways are not subject to the clearance requirements in Table 680.9(A) and Figure 680.9(A).	9/22/2022, 10/20/2022	X	
93	680.1	Electric Pool Water Heaters	Text has been revised by and subdivided to include provisions for pool water temperature conditioning equipment that incorporates technology other than resistance heating. Recently, installation of heat pump and chiller equipment has been used to heat or cool water temperature. Recognizes that this type of installation and provides requirements to size circuits and protective devices.	9/22/2022, 10/20/2022	X	
94	680.12	Equipment Rooms, Vaults, and Pits	Revised and subdivided to require equipment rooms, vaults, or pits with equipment to have drainage or be suitable for submersion and a receptacle for maintenance.	9/22/2022, 10/20/2022	X	
95	680.21(D)	Pool Pump Motor Replacement	Expands the requirement to provide GFCI protection for replaced pool pump motors and now includes those that are repaired. GFCI protection enhances safety for pool users and workers maintaining pool equipment.	9/22/2022, 10/20/2022	X	
96	680.54(C)	Equipotential Bonding of Splash Pads	Substantiation was submitted for the creation of 680.54(C) to address bonding requirements for splash pads.	9/22/2022, 10/20/2022	X	

Line No.	NEC Code Section	Change Title	Change Summary	Date reviewed by NEC 2023 Committee	Committee Response	
					Accept	Amend
97	Article 690	Solar Photovoltaic (PV) Systems	The use of the term PV Output has been removed throughout Article 690. Circuits and conductors will be considered PV Source whether individual or combined. The definitions of PV circuits also changed to properly align with these changes. "PV Source Circuit" and "PV String Circuit" are both subsets of "PV System DC Circuit."	9/22/2022, 10/20/2022	X	
98	690.12 Exc. No.2	Exception No.2 and Informational Note	New language to eliminate rapid shutdown requirements for structures where firefighters will not need to access the roof.	9/22/2022, 10/20/2022	X	
99	690.15	Disconnecting Means for Isolating PV Equipment	A requirement for an equipment disconnecting means to be within 10 feet of the equipment and also be within sight was modified. 690.15(A) now refers to 690.15(C) for an equipment disconnect – requires the disconnecting means to be within sight and within 10 feet of the equipment or capable of being lockable in accordance with 110.25.	9/22/2022, 10/20/2022	X	
100	700.3(F)	Temporary Source of Power- List Item (4)	The revised subsection (4) to require listing. The switching device should be listed, and the interlock should be listed for use with the specific switching device.	9/22/2022, 10/20/2022	X	
101	700.3(F)	Temporary Source of Power- List Item (6)	List item (6) is new and directs that the permanent connection point must be accessible at an exterior location for the temporary power source. Cables cannot be routed through exterior windows, doors, or similar openings.	9/22/2022, 10/20/2022	X	



October 14, 2022

Board of Electricity 2023 NEC Adoption Committee
443 Lafayette Road
St. Paul, MN 55155

Re: 2023 National Eclectic Code Review

Via Electronic Delivery

Members of the 20203 NEC Adoption Committee,

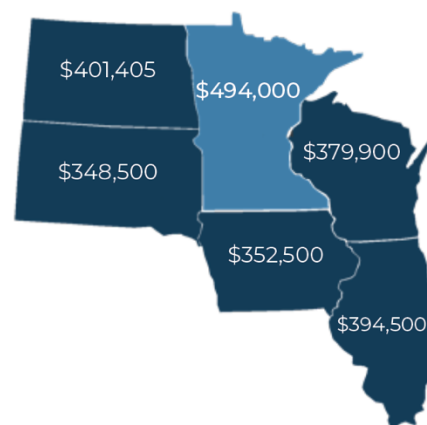
This letter contains comments and proposed amendments on the adoption of the 2023 National Electrical Code (NEC) as published by the National Fire Protection Association (NFPA). By way of background, Housing First Minnesota is the state's leading voice for the housing industry, representing member firms engaged in all aspects of housing, including new home construction, remodeling and the related trades impacted by the adoption of Minnesota's electrical code.

Our organization's mission is to increase housing affordability and access for all Minnesotans.

MINNESOTA'S HOUSING RECORD

As the Board of Electricity nears adoption of the 2023 NEC, Housing First Minnesota requests that the Board to consider housing affordability in concert with safety and durability, as state law requires. Adoption of a new electrical code must also consider the troubling record our state has when it comes to housing.

- Minnesota is home to the [highest median new home price in the Midwest](#) (right).¹
- The Twin Cities is home to [the lowest housing inventory in the nation](#).²
- The Twin Cities is home to the [widest homeownership equity gap in the nation](#).³
- Our state is nearly [60,000 housing units short](#), a figure that is increasing at an alarming rate. This is an increase of approximately 20% since the 2018 Minnesota Task Force on Housing called for a surge in new home production.⁴
- By nearly every measure, [it costs more to build a new home in Minnesota](#) than in nearby Midwest states.⁵



¹ Market data from Zonda (September 2022). Graphic from Minnesota Housing Dashboard, Housing First Minnesota (September 2022).

² Minnesota Population Center Review of United States Census Bureau Data (2021).

³ Urban Institute Review of United States Census Bureau American Community Survey (2021).

⁴ Minnesota Housing Dashboard, Housing First Minnesota (August 2022).

⁵ Priced Out: The True Cost of Minnesota's Broken Housing Market, Housing Affordability Institute (2019).

- **Interest rates have doubled** since the adoption of the 2020 National Electric Code, underscoring the need for balancing safety, durability and affordability.⁶

Given the depth of the state's housing crisis, Housing First Minnesota believes the Board of Electricity should use this regulatory process as an opportunity for mark a new era in Minnesota, one in which housing regulators better incorporate and contextualize homeowner cost and access impacts.

CONCERNS & CONSIDERATIONS

Housing First Minnesota is pleased with the recent TIA the NFPA published regarding 210.8 (F) of the 2020 NEC. This change, however, must also be viewed as what it is: an avoidable situation. The move by the NFPA to publish a TIA on this provision, delaying it until 2026, underscores a lack of technical review at either the NFPA or Minnesota level. Currently, model code publishers view each code chapter as separate and distinct from each other. The State of Minnesota as a whole, regrettably, lacks a single comprehensive technical review that analyses all codes in concert.

Homes, as with all structures, are the sum of its parts. Any and all changes must consider interplay with other codes, as well as the availability of the components of which the code is meant to interact. They must also reflect products that are available broadly to the industry. Following the adoption of the 2020 NEC, the State of Minnesota temporarily suspended enforcement of a provision due to the lack of available products.

Housing First Minnesota respectfully requests the Board of Electricity undertake a comprehensive durability analysis to better understand how the proposed version of the 2023 NEC Minnesota works in concert with the other building codes and products available at this time.

During the judicial hearing of the adoption of the 2020 National Electrical Code, Housing First Minnesota raised concerns over nuisance tripping. At the time, the Board responded and stated that this means that the code is working as it should whenever nuisance tripping occurs. The reversal by the NFPA has vindicated the concerns and illustrates the critical nature of industry and homeowner concerns and feedback. The Board must evolve its process to consider amendments and commit to a thorough and inclusive process that includes industry expertise.

Since the 2020 NEC adoption, Housing First Minnesota has learned more about the rationale and data previously used to support of the adoption of several changes. As illustrated below in our proposed amendments, some NFPA studies were not able to truly evaluate the effectiveness of certain provisions specific to residential construction.

Housing First Minnesota respectfully requests the Board of Electricity, going forward, identify both a demonstrated need for any new, additional cost coming from the 2023 NEC, and that the effectiveness of these provisions are demonstrated.

Finally, I want to reiterate Housing First Minnesota's concerns over the rapid pace of adoption following a new version of the NEC being published. The model 2023 NEC has just been completed and the State of Minnesota already begun the process for another code update.

⁶ "30-Year Fixed Rate Mortgage Average In The United States" Freddie Mac via Federal Reserve Bank of St. Louis.

PROPOSED AMENDMENTS

Our organization firmly believes that safety, durability and affordability must be balanced. The amendments submitted below reflect this essential balance. Housing First Minnesota also believes that the Board of Electricity must demonstrate a true need with data that shows each new provision in necessary.

Any proposed amendments, unless noted, reflect the 2023 NEC and do not include renumbering that these proposed changes would require.

Our comments are submitted in alignment with the legislative intent of the establishment of a state building code. Now in its 50th anniversary, the legislature's intent is as important today as it was in 1971:

It is the purpose of this act to prescribe and provide for the administration and amendment of a state code of building construction which will provide basic and uniform performance standards, establish reasonable safeguards for health, safety, welfare, comfort, and security of the residents of this state who are occupants and users of buildings, and provide for the use of modern methods, devices, materials, and techniques which will in part tend to lower construction costs.⁷ (emphasis added)

Proposed Amendment 1: *TIA for 210.8 (f) (2020 NEC)*

Housing First Minnesota respectfully requests the Board of Electrify specifically adopt an amendment which removes 210.8 (f) out of Minnesota's electrical code. This action actively affirming the TIA would send a message to the NFPA that a more rigorous technical review of the provisions it adopts is long overdue.

Proposed Amendment 2: *225.41 Emergency Disconnect / 230.85 Dwelling Disconnect*

For the exterior electricity disconnect, Housing First Minnesota respectfully requests the Board of Electricity revert back to the 2017 NEC. In conversations with licensed electricians over the past two and a half years, not a single electrician outside the Board of Electricity has told us that this is necessary as workarounds are already used in the field where these devices are not in place.. While we understand why the NFPA included this provision, thankfully, the number of residential fires in Minnesota, especially new homes, is extremely low.

Proposed Amendment 3: *210.12 (a) AFCI in Dwelling Units*

As noted in our challenge to the 2020 NEC, Housing First Minnesota had significant concerns over AFCI proliferation and nuisance tripping. Housing First Minnesota has since been supplied with information stating that the NFPA has not been able to evaluate the effectiveness of AFCIs. A copy of the information we received have been attached. As this document notes, nuisance tripping is especially problematic for seniors. Housing First Minnesota respectfully request the Board of Electricity modify the AFCI requirement to a minimum inclusion until the effectiveness and durability of AFCI usage in dwelling units can be confirmed.

Proposed Amendment 4: *210.8 (a)(6) – Kitchens in Dwelling*

Housing First Minnesota respects that the proliferation of GFCIs in kitchens be amended to match the 2020 NEC (only outlets within six feet of a sink).

⁷ Session Laws 1971, 16.83 (As published in the Guide to the Minnesota State Building Code).


CONCLUSION

The NFPA process must be reviewed scrutinized carefully, and the NEC is not a document without flaws. We respectfully request this body carefully consider any and all changes presented by the NPFA in the 2023 NEC and do its part to lower construction costs and increase homeowners affordability and access in Minnesota.

As I expressed to the Board of Electricity in my oral comments at its July meeting, it is duty of all housing regulators to examine ways it can increase housing affordability. The cause of the state's housing affordability and accesses challenges does not fall on any single body. Rather, it is a collective challenge that our state has failed to properly address. For decades, each housing regulatory body has prioritized its narrow issue area over housing affordability, and homeownership in our state has been negatively impacted.

Please contact me with any questions at nick@housingfirstmn.org or (651) 697-7586.

Sincerely,



Nicholas Erickson
Senior Director of Housing Policy
Housing First Minnesota

Enclosures:

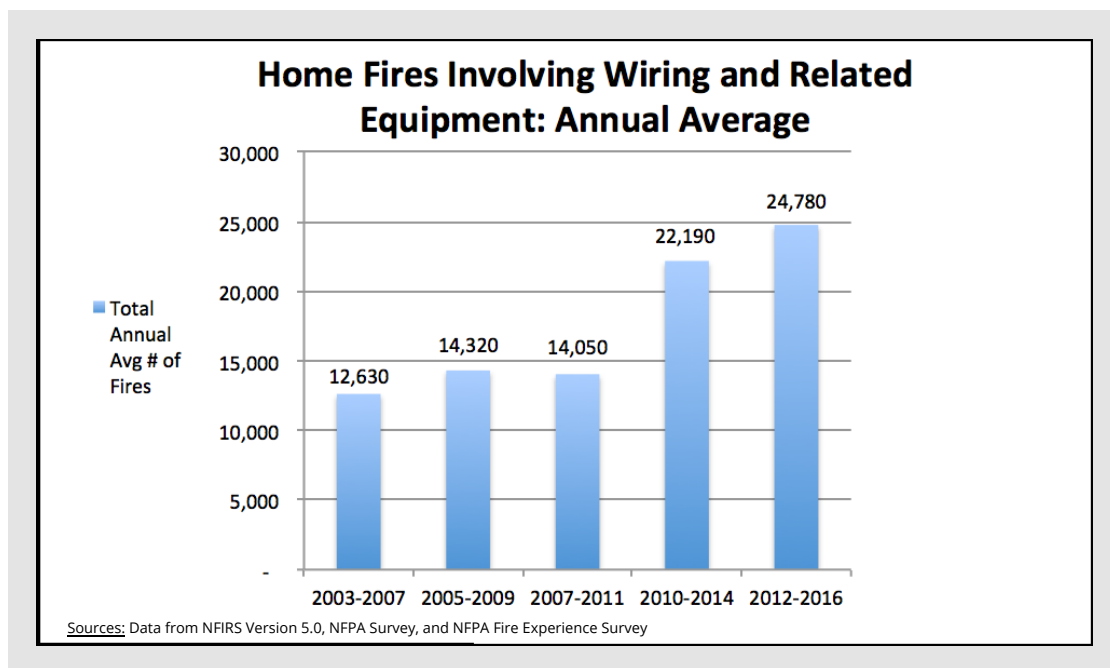
July 2020 AFCI Fact Sheet

No Data to Support AFCI Expansion

While GFCI receptacles have been pivotal in reducing residential electrocutions, there is no data to show that AFCIs have been effective in reducing electrical fires.

AFCIs are required in most residential outlets, beginning in 2002 with bedrooms, expanding throughout homes to living rooms and dining rooms, and finally to kitchens and laundry rooms in 2014. They are currently not required in bathrooms or garages. Since AFCIs have been in the codes, more than 125 million AFCIs have been installed in more than 12.9 million homes built during this period. This should have led to a decrease, or a leveling off, of home fires involving electrical wiring.

However, over a recent 13-year time period, NFPA reports revealed significant increases of average annual levels of residential electrical fires caused by wiring – from 12,630 to 24,780. The lack of data to support AFCI expansion caused the leadership of NEC Code-Making Panel (CMP) 2 to ask the NFPA Research Foundation to analyze existing fire data and make recommendations on next steps.



The report, “Residential Electrical Fire Problem: The Data Landscape”, found:

- “Data and data analytics is lacking to guide the optimum approaches to minimize residential electrical fires and related hazards.”
- The report summarized fire data to address the “problem and the impact of the NEC’s regulatory changes regarding AFCIs from being precisely defined.”
- The report observes that “while proving the effectiveness of preventative measures (e.g. AFCI’s) is a challenging task, the significant limitations associated with the existing traditional data sources presents serious concerns.”

It is not good code-making to *hope* that a device improves safety and then mandate it. The best and most responsible course of action is to allow the NFPA and the Foundation to address the lack of conclusive data on AFCI efficacy towards reduction of home fires.

AFCI Nuisance Tripping Should be Addressed Before Further Expansion

Expansion of AFCI mandates will lead to the greater use of dual function AFCI/GFCI breakers. Nuisance tripping is a significant problem with AFCI's – a problem that has only grown in the past several years as appliances have become more complex.

The National Electrical Manufacturers Association produced a white paper ("Recommendation on AFCI/Home Electrical Product Compatibility," National Electrical Manufacturers Association, March 2011) discussing the false signals many common home electrical products send to AFCIs.

In a September 2017 study conducted by The Farnsworth Group, more than 200 contractors surveyed expressed serious concerns with AFCIs and nuisance tripping:

- 60% say nuisance tripping is an issue with dual function AFCI/GFCI Breakers.
- 85% say that dual function Breaker nuisance tripping has resulted in call backs.
- 47% have received complaints from homeowners not wanting to go to a remote panel to reset power.

Nuisance tripping problems have increased with expanded AFCI usage. Review of ballot comments from CMP No.2 members showed direct knowledge and concern of nuisance trips in general. Discussions during Panel meetings were focused on issues found in kitchens and laundry areas as well as other locations.

The industry is fully aware of problems with AFCI nuisance tripping. In June 2018, NEMA created a joint Section committee on electromagnetic interference (EMI) related to generation and immunity in a panel where nuisance trips were specifically noted as a problem. At the first joint meeting, it was noted that UL previously raised two main concerns: unintended operation (nuisance tripping) and inability to respond (masking or blinding), due to the presence of intentional transmitters mounted in panels.

The impacts of the nuisance trips include, but are not limited to:

- Removal of AFCI and GFCI protection by replacing a dual function AFCI/GFCI circuit breaker with a standard thermal-magnetic circuit breaker.
- Untested workarounds such as EMI filters.
- Unsafe workarounds such as extension cords.
- Unpaid call-backs for contractors.
- Significant inconvenience for homeowners, plus real risks to senior citizens and those with disabilities.

As the country ages, more seniors will have to test or reset their breaker due to nuisance trips.

- On an annual basis, falls result in more than 2.8 million injuries treated in emergency departments, including over 800,000 hospitalizations and more than 27,700 deaths.
- Direct medical and other indirect costs of non-fatal stair injuries total as much as \$92 billion per year.
- 25% of Americans over 65 years old fall each year. Every 11 seconds, an older adult is treated in the emergency room for a fall. Every 19 minutes, an older adult dies from a fall.
- About half of all homes in the US contain stairs, and many homes' circuit breakers are only accessible via stairs.

AFCI Nuisance Tripping Testimonials

“Since the advent of the AFCI breaker and its introduction into the NEC, there have been numerous issues. These devices have not proven to be effective. They are costly and damage the reputation of the electrical contractor when they have constant nuisance tripping. The expansion of these breakers will not alleviate any safety hazard, but will in actuality, create a serious safety hazard. In my many years in this business as an installer I can attest to the cost, lost time, and frustration of chasing ghosts from nuisance tripping of AFCI breakers.” - Jane Allred; Chief Electrical Inspector for the State of Wyoming

“As CEO of the Northeast ARC, I am fully aware of the challenges posed every day to the members we serve. At the Northeast Arc our mission is to help people with disabilities become full participants in the community; choosing for themselves how to live, learn, work, socialize and play. For many people we serve, resetting a circuit on a circuit breaker may be overwhelming while simply pushing a button on an outlet is far easier. I fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently.” - Jo Ann Simons; CEO, Northeast Arc

“We have eaten countless hours, fuel and money going back out to warranty calls when AFCI breakers trip.” - Douglas Onion; VP of Canby Electric

“AFCI nuisance tripping happens all the time. We end up having to take back breakers that aren't bad because it's a device that hasn't been matched up to the arc fault breaker. When I sell a load center, I frequently sell a surge and noise suppression device with it. It's a mess. Therefore, it would be our position to halt the unnecessary expansion of AFCI requirements throughout the home.” - Greg Miller; Dahl Electric Supply

States are Removing AFCI Requirements Because Of Nuisance Tripping

Nuisance tripping is so widespread that to date, 21 out of 45 states with state wide electrical codes and many major municipalities have removed or reduced AFCI requirements when adopting the NEC. For example, South Carolina moved to remove AFCIs from kitchens and laundry rooms following pushback from electricians.

- Arkansas
- Connecticut
- Delaware
- Idaho
- Indiana
- Iowa
- Michigan
- Montana
- New Hampshire
- New Jersey
- North Carolina
- North Dakota
- Ohio
- Oregon
- South Dakota
- Tennessee
- Utah
- Vermont
- Virginia
- West Virginia
- Wyoming

Conclusion

We are committed to the development of electrical products aimed at making homes safer, namely by reducing incidents of both accidental electrocution with GFCIs as well as fires with AFCIs. However, AFCI requirements for dwellings in the NEC should not be expanded until:

- There is evidence through an independently verifiable measurement means that the proliferation of AFCI's up-to-now, has in fact, reduced the number of residential electrical fires.
- AFCI technology has been improved to reduce nuisance tripping.



G.3) Residential Electrical Data, Victoria Hutchison, Fire Protection Research Foundation

Victoria Hutchison, Research Project Manager at the Fire Protection Research Foundation, presented a case study analysis on the challenges of collecting and analyzing data on residential electrical fires. Based on a request from a NEC code-making panel, the Fire Protection Research Foundation initiated a project to try to better define the residential electrical fire problem by assessing the causal factors, identifying the demographics of homes having electrical fires, evaluating the effectiveness of the existing protection methods, and identifying the level of protection that homes having electrical fires contain (i.e. what edition of the NEC is the home in compliance with).

Through this analysis, several challenges were identified, however, the most prominent challenge was the lack of quality data available for assessment. The necessary data was inconsistent at best. All data elements were often in disparate data sources, largely incomplete, or nonexistent. To better define the residential electrical fire problem, the data needed to be available in an adequate quantity, have sufficient quality, be reliable, have sufficient detail, be accessible and relevant. Traditional datasets have significant shortcomings in this regard, but many emerging data collection approaches are showing promise (e.g. sensor data, open data sources, etc) for enabling residential electrical fires to be better understood in the future.

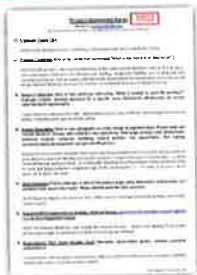
Due to discussions throughout the summit around the importance of data standardization and exchange, another FPRF project called the ITM Data Exchange Model, was briefly presented to the attendees. In this project, a novel approach, called knowledge graphs, are being utilized to standardize and consolidate inspection, testing and maintenance (ITM) data. This project was highlighted to show an approach that could potentially be applied to electrical data, in the future.

Figure 16: Panel G-03 Slides - Residential Electrical Data



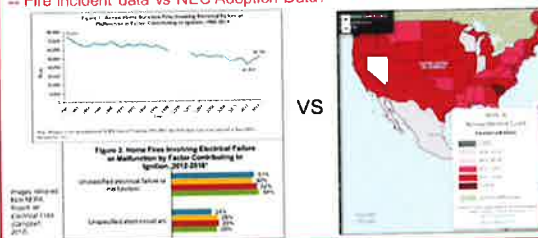
Background

- Research Request from NEC CMP2
- Research Objective:
 - Define the Residential Electrical Fire Problem through data analysis.
 - Determine the specific causes contributing to residential electrical fires.
 - Collect data that will assist NEC CMP 2 with determining the best methods of protecting branch circuit wiring in dwelling units against electrical arcing.



Simple?

— Fire incident data vs NEC Adoption Data?



What do we want to know about Residential Electrical Fires?

- What are the causal factors contributing to residential electrical fires?
- Are the existing protection methods effective?
 - Are the existing protection methods reducing electrical fires in homes?
 - Are they performing as expected?
- Where are these fires occurring (i.e. type/age of home)? What type/extent of protection do these homes have?
 - Which edition of the NEC are they in compliance with?
- What is the problem?
 - Lack of good quality data is hindering the analysis

Key Principles of Data Collection & Analytics

Core Principles of Data Collection & Analytics

- 1) **Collecting** the Data
- 2) **Processing** the Data (computation)
- 3) **Delivering** the Data (informed decision-making)



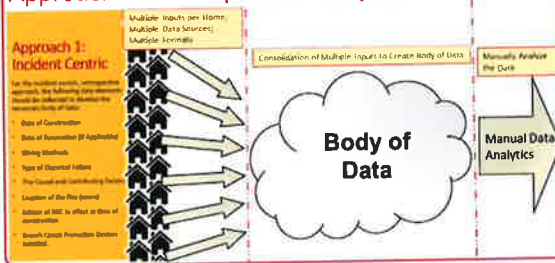
- To be useful, the data collected must be of **good quality**:
 - Is the data relevant (recent)?
 - Is the data in a format that can be used for data analytics?
 - Is the data accurate, true, and free of errors?
 - Is the needed information available?
- To be useful, the data collected must be in **sufficient quantity** to enable data analytics.

Retrospective vs Prospective Approach

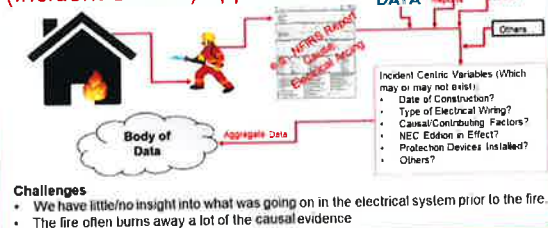


- Limited to what is available.
- Ability to guide the outcome (e.g. quality, quantity, targeted data elements, etc.)
- Goal oriented data collection

Approach 1: Retrospective Analysis



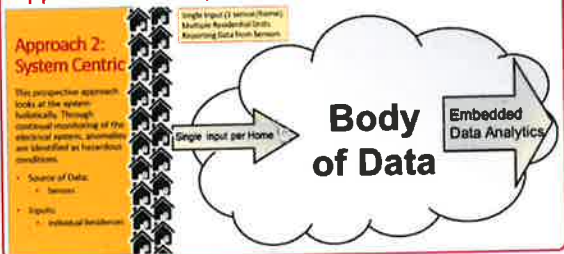
Summary: Data Collection for Retrospective (Incident Centric) Approach



Fire statistics do not measure the effectiveness of prevention devices in residential dwellings.

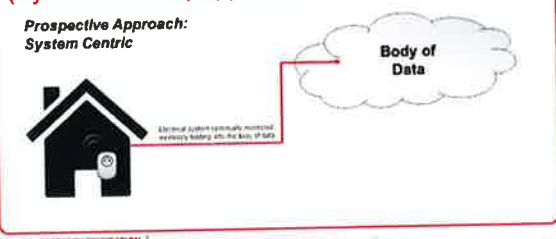


Approach 2: Prospective Analysis



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Summary: Data Collection for Prospective (System Centric) Approach



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Assessment of Existing Dataset Characteristics for Residential Electrical Fire Data

	Adequate Quality	Reliable Content	Granular Detail	Adequate Quantity	Accessible	Ideal Format	Relevant Data
Traditional Datasets							
NFIRS	Yes	Moderate	Yes	Yes	Yes	No	Moderate
FDIO	Yes	Yes	Yes	No	Moderate	No	Moderate
Fax Inv.	Yes	Yes	Yes	No	Moderate	No	Moderate
Emerging Datasets							
Open Data Portals	No	Yes	No	No	Yes	Yes	Moderate

Note: This illustration is entirely focused on the characteristics with respect to residential electrical fire data for the collection of retrospective data. Other categories of data entry (e.g. laboratory research) may have different characteristics.

- There are inherent challenges and barriers to the effective collection of the necessary residential electrical data
- Traditional data collection approaches have shortcomings
 - All existing datasets are not openly accessible
 - Important details are lacking in many cases
 - Insufficient quantity of data to evaluate effectiveness of protection devices
- Future data collection approaches show promise (e.g. IoT sensor data, open data sources, etc.)

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Trends and Future Data Landscape

Our World is Changing... and Becoming Increasingly Sensor Rich

How can we leverage technology and its data to address key fire safety questions?

Grid4C Predictive Home Advisor (Fault Detection)

Energy Monitor

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Trends and Future Data Landscape

Internet of Things & Artificial Intelligence are Driving Change...

- Due to the evolution of the **Internet of Things**, technologies that are collecting data can connect wirelessly to the internet
 - Enabling interconnection between sensors/data sources and communication
- The evolution of **Artificial Intelligence** is enabling automated processing and analysis of the data collected via sensors to provide meaning and context to the data.

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Examples of IoT and AI Enabled Technology

Case Study: One Sensor – Potential to Monitor Entire Home

- IoT Connected Device
- Monitors the dwelling's electrical network
- Measures electromagnetic data from home electrical network at a granular level (millions of readings/sec)
- Process the electromagnetic data, using AI based algorithms, to identify anomalies that represent arcing (e.g. arcs, sparks, etc.) in the electrical network

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Summary Observations

- To evaluate the residential electrical fire problem...
- **Good quality** data is needed.
- **A lot** of good data is needed.
- Data analytics **is extraordinarily challenging** to perform on the existing post-incident data.
- Data needs to be **compatible, unified, and scalable**.
- The greatest challenge lies with **non-technical issues**.
- **Credible, scientific validation** of future data sources is needed.

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Concept: ITM Data Exchange Model

Knowledge Graph Approach

Field	Data Type	Description
Identifier	Integer	An unambiguous reference to the resource within a given context.
Has Instant	DateTime	This property is used to put time indicators on any individual. If it is the most common way to state when an event took place. There are subproperties of HasInstant to represent time intervals and durations between events. If the exact moment is not known, but it is necessary to specify a certain time, use HasTime instead. All of these properties are also used to indicate the time at which a property under the Temporary Constraint is valid.
Delivery Address	String	where n:1:zip is a DeliveryAddress and n:zip uniquely determines an object.
State	String	Since the Postal Service provided ZIP codes and their accompanying state postal codes in 1963, the two-letter abbreviations have the only general popularity. Though it is usually preferable to write out the full name, state abbreviations often require use of an abbreviation.

Thank You!

Contact Information:

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Fire Protection Research Foundation

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FPRF Website: www.nfpa.org/Foundation

G.4) NEC Data Needs, Larry Ayer, NEC Technical Correlating Committee Chair

Larry Ayer, from Biz Com Electric, Inc. and the NEC® Technical Correlating Committee Chair, presented on the data needs of the NEC®, and the role data can have on future editions. A key point that was highlighted in this presentation and the entire summit was the need for the code making process to better adapt to the changing world. Today, there are continual advances in technology, such as LED lighting, power over ethernet (POE), wireless technology, HVAC systems, receptacle use, renewable energy, among others. As a result of this technological advancement, there are greater opportunities to leverage data to enhance and optimize the safety infrastructure.

It was noted that the goal was to leverage data to update the National Electric Code (NEC®) and make the code more usable. One gap within the code that was highlighted was the outdated demand factors. While a prominent difference between the actual demand and the calculated demand for receptacles, lighting, and others currently exists, this is seen as an area where data can be used to inform potential reductions. In the 2020 edition of the NEC®, significant changes were made to the lighting allowances to allow them to be closer aligned to actual demands. The NEC® is looking to update receptacle loading next based on the results of the FPRF Report on “Electric Circuit Data Collection”. Several different NEC® task groups on medium voltage, renewable energy, power over ethernet, digital electricity, and durable medical equipment have been created to address the future data needs in support of safety as technology continues to evolve.

From: [Hunter, Dean \(DLI\)](#)
To: [Logan, Lyndy \(DLI\)](#)
Subject: FW: Load Calcs for EV's
Date: Wednesday, October 19, 2022 2:29:59 PM
Attachments: [image002.png](#)
[image003.png](#)
[image004.png](#)
[image006.png](#)

Hello Lyndy,

Here was another question (email) that I received regarding the 2023 NEC, after our initial meeting. Please provide a copy for the subcommittee members.

Dean

From: Hunter, Dean (DLI)
Sent: Thursday, September 29, 2022 11:38 AM
To: Andrew Snope <aSnope@ibew292.org>
Subject: RE: Load Calcs for EV's

Hello Andy,

Great questions.... I do agree that this will add additional (unnecessary) load to existing and new multi-family dwellings. Basically, in the end, you have to calculate the EV charger at its nameplate rating. I'll explain.....

In the existing 2020 NEC, we only have the language found in section 625.42. It basically has to be sized to the product rating.

625.42 Rating.

The power transfer equipment shall have sufficient rating to supply the load served. Electric vehicle charging loads shall be considered to be continuous loads for the purposes of this article. Service and feeder shall be sized in accordance with the product ratings. Where an automatic load management system is used, the maximum equipment load on a service and feeder shall be the maximum load permitted by the automatic load management system.

Adjustable settings shall be permitted on fixed-in-place equipment only. If adjustments have an impact on the rating label, those changes shall be in accordance with manufacturer's instructions, and the adjusted rating shall appear with sufficient durability to withstand the environment involved on the rating label. Electric vehicle supply equipment with restricted access to an ampere adjusting means shall be permitted to have ampere ratings that are equal to the adjusted current setting. Sizing the service and feeder to match the adjusting means shall be permitted. Restricted access shall prevent the user from gaining access to the adjusting means. Restricted access shall be accomplished by at least one of the following:

- (1) A cover or door that requires the use of a tool to open*
- (2) Locked doors accessible only to qualified personnel*
- (3) Password protected commissioning software accessible only to qualified personnel*


In my opinion, the new 2023 NEC didn't go far enough. They have created the new section in 220.57 to address minimum feeder and branch circuit calculations; however, the recommended demand factors that were proposed (below), didn't make into the code because there was no substantiated data.

2023 NEC language:

220.57 Electric Vehicle Supply Equipment (EVSE) Load.

The EVSE load shall be calculated at either 7200 watts (volt-amperes) or the nameplate rating of the equipment, whichever is larger.

Here is the First Draft proposed demand factors and the committee statement.

 Public Input No. 4661-NFPA 70-2020 [New Section after 220.56]

New Section 220.57 Electric Vehicle Level 2 Charging Station Load
 Electric Vehicle Level 2 charging station outlet load calculations shall be permitted to be made subject to the demand factors given in Table 220.57

Table 220.57 Demand Factors for Level 2 Electric Vehicle Outlets

Number of Parking Spaces	Demand Factor (%)
First 3	100
Next 4 – 20	75
Next 21 – 30	50
31 and remainder over	25

Committee Statement

Resolution: [FR-9170-NFPA 70-2021](#)

Statement: A new section is added to address EVSE, and an informational note to refer to the applicable requirements in Section 625.42. The 7200 watt (volt-amperes) minimum requirement is based on a 30 ampere, 240 volt, single-phase circuit.

CMP 2 is not adding demand factors as proposed, as the values proposed were not substantiated, and the requirements for sizing EVSE loads are in Section 625.42.

The 2023 NEC text for section 625.42 may allow the value to be less - if the EV charger is adjustable. The settings and/or protection to allow access to qualified persons would need to meet 750.30. If adjusted, at least you could use the 7200 VA as the minimum.

625.42 Rating.

The EVSE shall have sufficient rating to supply the load served. Electric vehicle charging loads shall be considered to be continuous loads for the purposes of this article. Service and feeder shall be sized in accordance with the product ratings, unless the overall rating of the installation can be limited through controls as permitted by [625.42\(A\)](#) or (B).

625.42(A) Energy Management System (EMS).

Where an EMS in accordance with [750.30](#) provides load management of EVSE, the maximum equipment load on a service and feeder shall be the maximum load permitted by the EMS. The EMS shall be permitted to be integral to one piece of equipment or integral to a listed system consisting of more than one piece of equipment. When one or more pieces of equipment are provided with an integral load management control, the system shall be marked to indicate this control is provided.

625.42(B) EVSE with Adjustable Settings.

EVSE with restricted access to an ampere adjusting means complying with [750.30\(C\)](#) shall be permitted. If adjustments have an impact on the rating label, those changes shall be in accordance with manufacturer's instructions, and the adjusted rating shall appear on the rating label with sufficient durability to withstand the environment involved. EVSE as referenced shall be permitted to have ampere ratings that are equal to the adjusted current setting.

Hope this helps!

Dean

Dean Hunter

Chief Electrical Inspector

Minnesota Department of Labor and Industry

443 Lafayette Road N., St. Paul, MN 55155

Phone: Office (651) 284-5314 Cell (218) 770-1263 | Web: www.dli.mn.gov



Approval as a result of an inspection shall not be construed to be an approval of a hidden, concealed, undetected or other violation of the provisions of the code or of the laws and rules of the state. Electrical inspections only include readily accessible systems and components. Latent and concealed defects, deficiencies and violations are excluded from inspections.

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From: Andrew Snope <aSnope@ibew292.org>

Sent: Thursday, September 29, 2022 10:53 AM

To: Hunter, Dean (DLI) <dean.hunter@state.mn.us>

Cc: gthaden@gmail.com; dan@mplsbtcc.org; Derrick Atkins <datkins@mplsjatc.org>

Subject: Load Calcs for EV's

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Hi Dean,

In consideration of seeing Multi-Family units installing EV chargers; either 1 of them or several of them.

Is there anything in the new to be adopted, or existing, code that adds a consideration of EV chargers to a feeder or service sizing calculation?

If so, are there any demand factors used in the determination of load for several EV Chargers, much like there would be for several electric dryers in a multi-unit building?

Just thinking if additional impacts a requirement to install EV chargers in multi-unit buildings would have.

Thanks,

Andy

Andy Snope

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