

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

Date: November 17, 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 Lebowksi (Board Counsel, DLI)
Brittany Wysokinski (Bd. Counsel, DLI) – via phone
Lyndy Logan (DLI)
Marty Kumm (DLI)
Amanda Spuckler (DLI)
Jeff Bird (MNESTA) – via phone
Barb Conti (Commerce) – via phone
Nick Erickson (Housing First)
David Fisch (MNESTA)
Sarah Gudmunson (BOE member)
Duane Hendricks (Chair, BOE)
Don Iverson (SQD)
Pete Lindahl (Vice-Chair, BOE)
Tim McClintock (NEMA)
Darren Reaman (CEDIA)
Andy Snope (IBEW 292)
Gary Thaden (NECA)

1. Call to Order – Committee Chair Hunter

- A. **Roll call:** Committee Chair Hunter called the meeting to order at 9:01 a.m. Roll call was taken by Secretary Weigel and a quorum was declared with 5 of 6 voting committee members present in person.
- 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 Haiby, seconded by Heimerl, to approve the agenda as presented. The 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 Heimerl, seconded by Weigel, to approve the Oct. 20, 2022, minutes as presented. The vote was unanimous with 5 votes in favor of the motion; 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 continued 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 and public participation is welcomed and encouraged.
- Additional questions and comments will be accepted until Dec. 2, 2022 – please send to DLI.Electricity@State.MN.US. These will be compiled and reviewed at the next Committee meeting on Dec. 6, 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 rulemaking docket for MN Rules 1315 can be found here: <https://www.dli.mn.gov/about-department/rulemaking/rulemaking-docket-minnesota-rules-1315>
- Hunter presented 2023 NEC Comments and Cost Analysis – see **Attachment A** and addressed Erickson’s previously submitted proposed amendments – see **Attachment B**.
- Housing First’s **Proposed Amendment 4: 210.8 (a)(6) – Kitchens in Dwelling**. *Housing First Minnesota requests that the proliferation of GFCIs in kitchens be amended to match the 2020 NEC (i.e., only outlets within six feet of a sink).*

The subcommittee discussed the proposed changes regarding the expansion of the GFCI protection to the entire kitchen area. In the 2023 NEC the language only says “kitchens.” The requirement will include all receptacles located in the kitchen, not just the countertop surface, but in the wall surface receptacles as well. The cost is negligible compared to the safety benefits of whole kitchen protection. The Consumer Product Safety Commission’s database revealed that there were 104 electrocutions from 2011 to 2020, and 81% of them were working on an appliance or other type of equipment. Hunter asked if anyone would like to comment or ask questions and there were none.

- Housing First’s **Proposed Amendment 1: TIA for 210.8 (f) (2020 NEC)**. *Housing First Minnesota respectfully requests the Board of Electricity 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.

- Hunter mentioned that TIA 20-17 was currently not being enforced in Minnesota. This TIA added new language to the 2020 NEC in section 210.8(F) exception 2, which exempts HVAC equipment. The 2020 NEC was revised to state that “*Ground-fault circuit-interrupter protection shall not be required for listed HVAC equipment. This exception shall expire September 1, 2026.*” Hunter said, if we look to adopt the NEC 2023, the same language is already contained in the published document. The Committee elected not to amend the language out because it's already covered in what would be the adopted language of the 2023 NEC. Hunter asked for any other comments or questions regarding this topic? Comment by Lebowski.
- Lebowski stated that at the time that we put the Committee together, the Board wasn't aware of the fact, at least I wasn't aware of the fact, and other people weren't either, that the language made the published edition. So as a result, it was a fair question, and it was reasonable at that time to question whether we should be doing a delete all, or a deletion for that section. However, now that we see that it made the publication, the legal analysis would go, is it reasonable and is it needed? And it certainly may be reasonable, arguably it is reasonable to put it in the Minnesota Code as an amendment. However, the second portion of that test is not met, which is, is it needed? Is it necessary? It isn't because it's already in the code. So, we apologize for that. I certainly wasn't aware of the fact that it made the printed edition, but apparently it did. So, if anyone has any other questions on it, I'm happy to address it otherwise we can move on.
- 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 this Housing First proposed amendment was to amend out AFCI protection in the NEC and mentioned that AFCI protection has been in the code for quite some time, since 1999 NEC edition. In addition, it was discussed that since the 2008 NEC, the code contained a list of rooms within a dwelling that required AFCI protection. In the 2020 NEC edition, there were a couple additional rooms added, however, for this code cycle there are no changes to the dwelling areas. As a result, removing or severely limiting existing AFCI protection would be a step backward for safety. The only change for the 2023 NEC regarding AFCI protection is the additional language to include bunkhouse type rooms for firefighters/first responders. Hunter asked if there were any additional comments or questions regarding 210.12, and there were none.

- 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.
 - Hunter said the comment was brought up to revert to the 2017 NEC regarding the emergency disconnect to eliminate the requirement. The change in the 2023 NEC would require the disconnect to be located within 50 feet of the dwelling. Its purpose is to readily identify the placement of the disconnect so that emergency responders can quickly and efficiently locate the same. There is also a requirement for the disconnect to be added when the electrical service or feeder panel is replaced.
 - Marty Kumm said, the requirement only applies to a replacement service or feeder panel. If it's maintenance or repair, then the language wouldn't apply.
 - Hunter followed up by saying that an exception was added to clarify that an installer could forgo the emergency disconnect requirement if the work involved storm damages. Hunter then asked for any other questions or comments regarding the topic. There was no further discussion.
- Hunter said as far as the Committee goes, unless someone wants to discuss further, the Committee will stand on the initial Summary of Significant 2023 NEC Changes document which resulted in no amendments thus far – see **Attachment C**.
- Hunter said Housing First, and Central Minnesota Builders Association provided Cost Analyses – see **Attachment D**. Hunter noted that both analyses were similar.
- Hunter referred to Housing First’s 2023 NEC Cost Analysis – see below:
 - Housing First Minnesota respectfully submits the follow cost analysis of major changes impacting residential construction in the 2023 NEC.

210.8(A)(6): Dwelling Units – Kitchens	+\$175
210.52(C): Dwelling Units- Island and Peninsular	
Option1: Future wire and cap off	+ \$75 / Each future wire/cap
Option 2: Pop-Up Countertop Receptacles	+ \$250 / Each receptacle
210.70: Lighting Outlets Required	+ \$60
TIA Re 210.8(F)	- \$125

Notes: These costs do not include builder overhead or interconnected work done by other trade partners related to these changes (cutting of countertops). The change of 210.70 will be largely impact multifamily construction, single-family attached and villa-style single-family detached.

 - Hunter asked if anyone had any comments regarding the cost analysis for 210.8(A)(6), Dwelling Units – Kitchens +\$175, and whether \$175 was reasonable.
 - Haiby said that this was discussed at the last meeting, and it was just the addition of the ground fault to an arc fault breaker already required and in

existence. So, instead of an arc fault breaker, we could do it with an arc fault combo GFCI breaker.

- Hanson said he might be misunderstanding, but depending upon how someone circuits their kitchen, these receptacles could easily be added to the existing arc fault, dual function, ground fault, circuit breaker, so you wouldn't even need an additional breaker. If it's a huge kitchen and there are many receptacles, you might want a third circuit as opposed to standard two small appliance branch circuits. With regards to affordable housing, he assumes that it's going to be a typical or smaller kitchen without an abundance of receptacles – they could easily be put on those two required circuits with minimal costs. Does that sound reasonable?
- Hunter agreed that it would not be a code violation to extend the small appliance branch circuit to the other kitchen receptacles.
- Hanson said I don't have a limitation on the number of receptacles that I can have on that circuit, correct? Hunter said correct, you do not.
- Hanson said so if I'm particularly thinking about being affordable, I would do it without even adding that extra circuit breaker or changing an arc fault to a dual function. At that point, I don't see that I have any cost for that.
- Hunter agreed with Hanson's comments and said he went in Haiby's direction because his thinking was that if they did have an additional circuit, the GFCI protection is already provided and that an additional cost, going from AFCI to a dual function breaker, would be considered a cost increase.
- Lebowski asked how Housing First came up with the \$175? If in fact, there is the ability to just simply change out the breaker, how was the \$175 arrived at?
- Erickson said when Housing First did their cost analysis they worked with their builders and trade partners directly; they didn't just go to a store and purchase. It's how their builders do it for their homes. They don't use high-end home builders, they're not custom builders. They work with production builders to do this work, production homes built to the bottom part of the market. Every builder has designs, their subs and trade partners that design differently, but we work with them to do the design. They reached out to a few builders that completed a review at the individual level and this was the range that was provided. This is when the builder is going to their subcontractor and asking them when we must renegotiate our rating for the new code, what is it going to cost for these items – this is how Housing First arrived at their cost analysis numbers. It's what the builder is going to get charged by the trade partner and as they noted, it doesn't always include everything, particularly items that are not going to be included by the trades. We're talking about cutting into a stone countertop or some of these different components, it's not something that that trade is doing, not capturing that cost, but it's what the trade partner is charging the builder for that specific component based on the current design of their cost.
- Lebowski said so it's fair to say then that's not in every single instance, that's just for an instance where they don't have the dual breakers installed, for example? Erickson said correct. Because that builder or trade partner are not doing that today.

- Lebowski asked if Erickson’s comment provided clarity to the Committee.
- Hanson said if they aren't doing it today, then they're not building in accordance with the current code, because the current code would require that arc fault breaker for those receptacles.
- Erickson said he isn’t an electrician and he’s not familiar with the designs. He doesn’t know specifically, he’s speaking in general for this or any provision, it’s what it costs above and beyond today for that. So, as they're going through and saying what's it going to be next year, I don't know specifically what any builder is doing today.
- Lebowski said one of the difficulties of cost analysis is that there's cost savings and then there's costs. There's also instances like this where that \$175 is not going to apply to every single instance and it’s important that the Committee understands or anyone reviewing the sonar or the cost analysis at the point when it's completed. It's almost impossible to say in every single instance this is what it's going to cost to implement the new code.
- Erickson said they noted the largest fee would be on the single-family townhomes or affordable housing where the laundry area is essentially located in a closet, also this could be very common in a slab on grade single family home. 210.70 would not be a cost increase on every installation but could add a significant cost depending on how the home is constructed.
- Weigel asked if Housing First’s cost analysis is for Minnesota or another state. She knows other states have different codes that have been adopted.
- Erickson said their cost analysis is for Minnesota specifically.
- Hunter referred to Housing First’s cost analysis of 210.52(C): Dwelling Units- Island and Peninsular

Option1: Future wire and cap off	+ \$75 / Each future wire/cap
Option 2: Pop-Up Countertop Receptacles	+ \$250 / Each receptacle
- Hunter said in the current NEC, we’ve always had to put several receptacles on an island, peninsula, or countertop surface based on the square footage of the surface area. The 2023 NEC will now remove that requirement based on the square footage. However, the installer still needs to provide provisions for a receptacle to be installed at a later date. It was noted that the reason for the change mainly was because there's been a lot of documented accidents where individuals were inadvertently pulling electrical appliances off the countertop when an appliance cord was being draped over the edge. The accidents involved small children that received some pretty significant burns. In addition, there was a comment received by the department from Beth Mason of Kate Roos Design asking us to reconsider the language and allow receptacles to be located below the countertop surface simply for convenience purposes as it is a popular request by homeowners. Yesterday, Hunter received an email that the National Homebuilders are going to appeal the requirement to allow the receptacles for handicap accessible facilities based on the ADA requirements. It appears the appeal will be heard at the NFPA Standards Council, but the language wouldn't currently be in the adopted document.
- Hunter said Housing First’s 210.52(C): Dwelling Units-Island and Peninsular option 1 and 2 would be as follows and he asked if anyone had any comments.

Option 1: Future wire and cap off + \$75 / Each future wire/cap
Option 2: Pop-Up Countertop Receptacles + \$250 / Each receptacle

- Hanson said, again, current code would require us to have a minimum of one receptacle in that island. So, with the change saying, depending upon how I'm wiring it, I'm going to run a piece of Romex or Nm cable out there and put it in a box and cap it potentially, again, depending upon the construction, if I've got an unfinished basement, is it enough for me just to stub a piece of conduit from the island down into that unfinished ceiling space and this could be considered future provision?
- Hunter said his group got together a couple of weeks ago because they're building the 2023 NEC FAQ just in case we adopt the 2023 NEC, and what we've determined is we need to provide the provisions at the island peninsula so an installer would need to run a wiring method directly to the island.
- Hanson said, okay, so you would then again, assuming you're going to redo an NM cable, you would then extend the wiring out to the island and terminate it in a box.
- Hunter replied yes, correct, it would have to be in the bottom of a cabinet.
- Hanson said current code would require running that NM cable and run into a receptacle that would be mounted somewhere in that cabinet. Hunter replied correct.
- Hanson said he doesn't see a big cost difference, but he certainly doesn't see an increase because he's not buying a receptacle, not cutting it in, it can just sit in the base of the cabinet where it's accessible. Again, option one, I don't see any additional cost. If anything, you might have a small cost savings. Hunter replied correct.
- Hunter said let's look at option 2: Pop-Up Countertop Receptacles +\$250/each receptacle – we've already discussed the fact that you can no longer put it down on the side of the cabinet, it must go in the top of the countertop. If in fact the homeowner chooses to have that device, the receptacle needs to use a listed pop-up receptacle approved for the area. This is where the \$250 comes in, however, in my opinion, this is an option. Because we all understand that you don't need it. It would be if someone is requesting it, then it would be an incurred cost.
- Hanson said there is no question that the pop up receptacle would be an additional cost over the current code. It is a more expensive device. They're not in general use, it's not a popular thing. Currently most people are putting their island receptacles somewhere on the side, which is no longer going to be allowed. So, it's possible, although you can't predict the future, that to the extent they become more common, the price may come down, but I haven't gone out and priced it myself. Whether it's \$250, there's probably a little more labor involved in that. Their point about cutting the countertop, depending upon whether it's plastic, laminate or granite, there is going to be some costs there so we can't dispute that there'll be additional costs. We can't say whether the \$250 is correct or not.

- Lebowski asked Hunter what he came up with for price cost on the pop ups? Hunter replied \$126 – he searched online because his cost analysis is based on what a homeowner would use and purchase locally in Minnesota.
 - Haiby said regarding option one he doesn't see that there's going to be an additional cost with that, he agrees with Hanson's comments. There will be additional cost on the countertop receptacle, but we must remember that this is optional, it's not going to be a requirement for every single home.
- Hunter referred to 210.70 and said current language mandates that there must be an overhead light in both the bathroom and kitchen area. What is being added for the 2023 NEC is that you must have a light in a "laundry area" now as well. So, this would be an additional \$60. Typically, a light is always installed in a laundry room; however, on a base model home this would now be required.
- Hanson said the language says laundry area, not room, but their comment references if you've got a stacked washer/dryer in a closet, I don't even know physically where you'd install the lighting outlet. It wouldn't provide any benefit; it would probably be inaccessible to the homeowner. So, he isn't sure how to apply this rule in that circumstance. If it's an actual room, I can walk in and stand in, then with common sense, I've done many of these and I'm always putting a lighting outlet in a laundry room, typically an inexpensive drum fixture; however, it is a room I walk in. It has a switch by the door, it's not this application we're talking about here that would affect multifamily or the townhome type. He can see an issue and as an installer he isn't even sure how he would address it.
- Kumm clarified that the language says "area", it does not say "room". So, if you added a small closet like this, we would look at the light being placed outside of it so you could see the laundry equipment, but not necessarily in that small area as it would be impracticable.
- Hanson said then I'm trying to imagine then what's that space I'm standing in and am I already required to put in a lighting outlet in the adjacent area. Is this code requirement going to say then I've got to get one of those flat panel LEDs and put it up on the wall like you might do to light a closet? It's probably going to be nonfunctional, there could be a legitimate concern. From an enforcement standpoint, how is the state and then how are other municipalities, whoever's inspecting, going to interpret these? Because it could get interpreted in a manner that really isn't the way it's intended.
- Hunter replied, right, we will address that in our FAQ because as far as enforcement, this could be an interpretation because if you had a 4x4 room with a slide-in washer and dryer, what would be the reason to have an additional light fixture
- Lebowski said that from an enforcement point of view, he believes that Legal/DLI is asked fairly frequently about these types of interpretations and the word "area" is very different from the word "room." It would be a different story if it said room. No question about that. From a legal point of view, it does say area, it could be more specific but the beauty of it is that it is flexible as far as what is in the area. This could be something that the Committee wants to delete but whether it's necessary to delete it out is arguable. It could probably go anywhere when you're using the word area, it could be anywhere within the vicinity of that laundry space.
- Hanson said when Hunter does his FAQ's he could provide guidance for the authority having jurisdiction to lead them down the right path. Would this be sufficient or are we

required to do an amendment? He believes that what he is hearing is that this would be sufficient.

- Lebowski said correct, it would not be a requirement for you from a legal point of view, but it is within the Committee's discretion to do so if it wishes.
- Hunter said this is how they've done it in the past, they've posted an FAQ. This is to keep DLI, which roughly does 178,000 electrical inspections a year, in step with municipalities to ensure everyone is on the same playing field.
- Hunter said Housing First's last item is TIA Re 210.8(f) for negative \$125. He assumes this is a reasonable cost because we're talking about the cost of the GFCI breaker to a regular breaker.
- Hanson said we weren't currently enforcing that provision under the 2020 codes.
- Hunter said based on the Housing First cost analysis, if you deduct the \$125, the cost increase for the proposed 2023 NEC adoption would be roughly \$500
- Hunter said the cost analysis submitted by the Central Minnesota Building Group is very similar to Housing First's. Hunter then referred to his Cost Analysis documents – see **Attachment E**. He has eight items where the other cost analysis had three. If the Committee thinks another should be added, let's discuss. He reached out to Dan Buuke from the National Home Builders because he wanted this to be a collaborative effort and to ensure he was going down the right road. Hunter reviewed items 1 through 8 aloud.
- Hanson said he just wants to reiterate that Hunter's cost analysis are just costs and do not include any kind of overhead or markup that's going to vary. To reiterate Lebowski's point, these costs aren't going to apply in every situation, this is a worst case scenario.
- Lebowski asked if Hunter knew when National Home Builders would finish their cost analysis and Hunter replied early December.
- Hunter asked if there were any comments on cost analysis – there was no further discussion.
- Hunter said regarding Hanson's earlier point, if wired differently, there would be zero cost – he just added the dual function breaker in because the GFCI protection already must be there, according to the current code.
- The presentation will be revised to include a missing slide and posted on the NEC 2023's website – see link on page 1.
- Hunter provided a draft copy of the SONAR and asked the committee members to review and comment on the two relevant sections that would require the member's input. The committee reviewed a section of the SONAR that addressed the Regulatory Analysis which included eight factors. See **Attachment F**.
- Lebowski commented that it's very important for everyone to recognize this is a rough draft right now. This is nowhere close to being final. We thought that we'd give the committee a heads-up as to this portion of the sonar that needs to be completed. The draft document responses included are what Dean and I discussed and came up with. However, they're not set in stone. We recognize the fact that you may wish to go back to your stakeholder groups and discuss this, which is perfectly fine.
- **“(1) a description of the classes of persons who probably will be affected by the proposed rule, including classes that will bear the costs of the proposed rule and classes that will benefit from the proposed rule”**

- Those who will be affected by the proposed rule, who will bear the costs of the proposed rule, and who will benefit from the proposed rule include: Building owners; equipment suppliers; contractors; and code enforcement authorities. Although provisions in the NEC have greater impact on electrical contractors, they also impact technology system contactors and general contractors.
 - Hanson commented on the possibility of adding homeowners to the list. Lebowski added that the last SONAR contained the same language, and it was stated that homeowners were technically “building owners” and the proposed language would be inclusive of all types of building owners.
- **“(2) the probable costs to the agency and to any other agency of the implementation and enforcement of the proposed rule and any anticipated effect on state revenues”**
 - Because the Board only adopts the NEC and does not administer it, the Board will not incur any costs associated with the adoption of the 2023 NEC. The Department provides administrative support to the Board and administers and enforces rules adopted by the Board.
 - Costs to the Department include the costs of purchasing code books for state employees who enforce and interpretate the electrical code. In addition, the Department will be required to revise the license examinations to reflect the updated code. Adoption of an updated version of the NEC will not affect state revenues because the Department currently enforces the existing Minnesota Electrical Code using electrical licensing and permit fees set by statute that go into a dedicated fund to cover administrative and enforcement costs.
- **“(3) a determination of whether there are less costly methods or less intrusive methods for achieving the purpose of the proposed rule”**
 - The Board has determined that there are no less costly or intrusive methods for achieving the purpose of the proposed rule. The NEC is recognized throughout the United States and many other countries as the prevailing model electrical code. Incorporating the 2023 NEC by reference is the least costly method for adopting a national model code and is in accordance with Minnesota Statutes, section 326B.32, subdivision 2 (a)(3) (2018) which directs that adoption. Historically, the state of Minnesota has adopted the NEC by reference without any state amendments. After review of the significant changes in the 2023 NEC, the Board of Electricity is proposing adoption of the 2023 NEC without amendment in this rulemaking. Unlike other building codes that may need to be amended at the local level due to specific conditions such as earthquakes, snow loads, wind loads, prevalence of hurricanes, extreme temperatures and so on, the NEC is universally applicable in all jurisdictions.
- **“(4) a description of any alternative methods for achieving the purpose of the proposed rule that were seriously considered by the agency and the reasons why they were rejected in favor of the proposed rule”**
 - No other methods were considered for achieving the purpose of the proposed rule. The purpose of the rule is to establish the Minnesota Electrical Code consistent with statutory requirements. The NEC is the only electrical code that is accepted and in use throughout the United States. Most importantly, the Board is required by the Legislature to adopt the “most current edition of the National Electrical

Code” in accordance with Minnesota Statutes, section 326B.32, subdivision 2 (a)(3) (2018).

- **“(5) the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals”**
 - The probable costs of complying with the proposed rule are generally anticipated to be minimal because there is already a current electrical code in place in Minnesota that has adopted the 2020 version of the NEC. The cost difference between the 2020 NEC and the 2023 NEC are not anticipated to result in a significant change in costs for any electrical stakeholders. Any change in costs for any given project will vary from project to project because the type of work being done, the size of the project, and the condition of any existing electrical work may affect any cost differential between complying with the existing electrical code and the 2023 NEC. There are many revisions, updates and clarifications reflected in the 2023 NEC can result in lower costs in some instances or higher costs in others. Of course, costs for any particular project may also remain the same under either the 2020 NEC or the 2023 NEC.
 - Nevertheless, the Board has identified eight notable changes in the 2023 NEC related to dwellings which may result in increased costs for some new building projects:
 1. 210.8(A)6) In addition to the GFCI protection for the countertop receptacles, GFCI protection is required for all kitchen receptacles.
 2. 210.8(A)7) Additional GFCI protection required for receptacle(s) located in areas with a sink and food preparation that is outside of the 6' measurement.
 3. 210.8(D) GFCI protection is required for appliances that are either hardwired or have a cord and plug connection. Previous code language only required GFCI protection for receptacles located within 6' of a sink.
 4. 210.8(F) GFCI protection has been expanded to outdoor outlets at: garages, dwelling accessory structures and boathouses.
 5. 210.52(C)2) The receptacles are no longer required; however, provisions are needed for a future installation to add a receptacle at the peninsular or island.
 6. 210.52(C)3) Receptacles installed on the peninsular or island countertop must be listed and mounted in the surface of the countertop or work surface.
 7. 220.11 Added garage and unfinished areas which could be used for habitable space when calculating service or feeder loads for a dwelling unit.
 8. 230.67(A) Prior surge protection devices were not required to have a minimum discharge current rating.
 - The cost analysis review recognizes that the cost difference from the 2020 NEC for these same requirements versus the 2023 NEC would be approximately \$115. Understanding that the cost estimates will vary greatly depending on factors such as the type of work being done, the size of the project, the condition of any existing electrical work, and other factors. For example, a new home may be built with all gas appliances. In that situation, the estimated costs for materials and labor would be substantially less.

- In the 2023 NEC another note-worthy cost savings would be the new exception added in 210.8(F). The new exception eliminates the need for GFCI protection for Heating, Ventilation, and Air Conditioning Equipment until Sept. 1, 2026.
 - Finally, affected parties include contractors, inspection departments and designers, who will need to purchase copies of the 2023 NEC. Training curriculum will also need to be updated to incorporate any new or changed provisions in the code. However, it should be noted that continuing education is a requirement for all licensed electricians in Minnesota, so training is necessary regardless of which code version is adopted. Finally, training providers will incur minimal expenses including purchasing of the 2023 NEC code book and updating their existing training materials.
- **“(6) the probable costs or consequences of not adopting the proposed rule, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals”**
 - If the new edition of the NEC is not adopted, the state of Minnesota would continue to rely on the **2020** NEC. This would cause the industry in Minnesota to use an electrical code that does not incorporate all the latest methods and technologies, which is the purpose of updating the national model codes. Minnesota would therefore fall behind in electrical standards to the detriment of all stakeholders. Failure to adopt the proposed rule would also have a negative effect on electrical licensing reciprocity with other states. Minnesota has electrical licensing reciprocity agreements with Alaska, Arkansas, Colorado, Iowa, Montana, Nebraska, North Dakota, South Dakota, and Wyoming, most of which are in the process of reviewing and considering adopting the 2023 NEC as well. Finally, failure to adopt the proposed rule could be considered a statutory violation since Minnesota Statutes, section 326B.32, subdivision 2(a)(3) (2018), requires the incorporation of the most recently published edition of the NEC into Minnesota’s electrical code.
 - Lebowski commented on the need to verify which states were in the process of the 2023 NEC adoption.
- **“(7) an assessment of any differences between the proposed rule and existing federal regulations and a specific analysis of the need for and reasonableness of each difference”**
 - There are no applicable federal regulations that address electrical code issues in the construction of non-federally owned buildings.
- **“(8) an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule”**
 - There are no applicable federal regulations that address electrical code issues in the construction of non-federally owned buildings, so there is no federal impact or cumulative effect. There are no other state regulations related to the specific purpose of this rule.
- **After review of the Regulatory Analysis, Hunter asked the committee members for comment, and none were made. Hunter then reviewed the second relevant portion of the SONAR that was related to the cost of complying for small business or city.**

COST OF COMPLYING FOR SMALL BUSINESS OR CITY

Agency Determination of Cost

As required by Minnesota Statutes, section 14.127, the Board has considered whether the cost of complying with the proposed rules in the first year after the rules take effect will exceed \$25,000 for any small business or small city.⁸ In development of this rule and at its January, 2023 board meeting, the Board discussed compliance costs and determined that the cost of complying with the proposed rules in the first year after the rules take effect will not exceed \$25,000 for any small business or small city. Some small cities or small businesses in the industry might purchase new code books, but the cost would be approximately a few hundred dollars, depending on how many books were purchased. The difference between complying with the current electrical code, the 2020 NEC, and the proposed rule, the 2023 NEC, is not anticipated to cost more than \$25,000. Some small businesses in the industry might also spend several hundred dollars on training, but this training is otherwise required in statute and Minnesota Rules, chapter 3800, for licensees. Based on discussion contributions from business owners and board members who work for or with small cities or businesses, the Board determined that no small business or small city will spend \$25,000 in the first year after the rules take effect to comply with the proposed rule.

Costs to small cities that have adopted a local electrical inspection ordinance include the costs of purchasing code books for city employees who work with electrical code inspections. The 2023 edition of the NEC is available from a wide range of outlets at a cost of \$155. An analysis of changes between code versions is also available for approximately \$53. Municipal electrical inspectors are required to be licensed. Conditions of license renewal include 16 hours of continuing education every two years for every license renewal. Although there will be a cost to train to the new code, the training is already required as a condition of licensure. Therefore, the proposed rule does not add any additional costs for training of municipal staff.

- After the brief review, the committee members had no comments, and it was discussed that committee members could review the document further and submit comments or suggestions by Dec. 2, 2022. The comments will be heard at the next meeting scheduled for Dec. 6th.
- David Fisch commented that he agreed with all of Hunter's comments.

5. **Announcements**

Next special meeting will be Dec. 6, 2022 @ 9:00 a.m., Minnesota Room, DLI with call-in option

6. **Adjournment**

A motion was made by Weigel, seconded by Haiby, to adjourn the meeting at 10:53 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

Cost Analysis



2023 NEC Comments and Cost Analysis

2023 National Electric Code Presentation Objectives

- Only meant to cover the significant 2023 NEC Changes
- Informational Handout Book (Analysis of Changes, 2023 NEC)
(<https://www.iaei.org/store/>)
- *Free access to the 2023 NEC maybe found at:*
(<https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70>)

2023 National Electric Code Committee Updates

- The Request for Comments for the adoption of the 2023 NEC was published in the State Register:
https://mn.gov/admin/assets/SR47_19%20-%20Accessible_tcm36-546665.pdf
- The link to the rulemaking docket is located on the BOE webpage with information regarding the 2023 NEC adoption:
<https://www.dli.mn.gov/about-department/rulemaking/rulemaking-docket-minnesota-rules-1315>

2023 National Electric Code

****Goals for the meeting****

Review subcommittee work up to this point:

- **Review the subcommittee documents and address the comments and cost analysis from CMBA, Housing First and others**
- **Review Department's cost analysis**
- **Review SONAR language: Review/discuss/comment on each of the Regulatory Analysis and the Small Business Analysis**



2023 NEC Code Explanation

210.8(A)(6) 2020 vs. 2023 NEC Text

2020 NEC

- (6) Kitchens — where the receptacles are installed to serve the countertop surfaces

2023 NEC

- (6) Kitchens

210.8(A)(6) Thought behind Change

- GFCI protection was expanded to apply to any cord and plug appliance in the kitchen, (regardless of whether the receptacle serves the countertop).
- The Consumer Product Safety Commission database reveals 104 electrocutions from 2011-2020
 - 81% were working on an appliance or other type of equipment.
- GFCI protection can be provided for those who are working on cord-and-plug appliances and/or cord-and-plug-connected equipment. Electrical hazards are not just due to the proximity of the appliance to water.
- These appliances and equipment have both the power supply and the grounded frame to complete the current path, creating the hazard to the individual.

210.8(F) 2020 vs. 2023 NEC Text

2020 NEC

Outdoor Outlets.

All outdoor outlets for dwellings, other than those covered in 210.8(A)(3), Exception to (3), that are supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, shall have ground-fault circuit-interrupter protection for personnel.

Exception No. 1: Ground-fault circuit-interrupter protection shall not be required on lighting outlets other than those covered in 210.8(C).

Exception No. 2: Ground-fault circuit-interrupter protection shall not be required for listed HVAC equipment. This exception shall expire September 1, 2026.

2023 NEC

Outdoor Outlets.

For dwellings, all outdoor outlets, other than those covered in 210.8(A), Exception No. 1, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

- (1) Garages that have floors located at or below grade level
- (2) Accessory buildings
- (3) Boathouses

If equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection. ...

Exception No. 2: GFCI protection shall not be required for listed HVAC equipment. This exception shall expire September 1, 2026.(A) Dwelling Units.

210.12 2020 vs. 2023 NEC Text

(A) Dwelling Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in [210.12\(A\)\(1\)](#) through (6):

- All 120-volt, single-phase, 10-, 15-, and 20-ampere branch circuits supplying outlets or devices installed in the following locations shall be protected by any of the means described in [210.12\(A\)\(1\)](#) through (A)(6):

- | | |
|------------------|-----------------------|
| (1) Kitchens | (8) Bedrooms |
| (2) Family rooms | (9) Sunrooms |
| (3) Dining rooms | (10) Recreation rooms |
| (4) Living rooms | (11) Closets |
| (5) Parlors | (12) Hallways |
| (6) Libraries | (13) Laundry areas |
| (7) Dens | (14) Similar area |

210.12 Thought behind the change.

- The areas in dwellings that have sinks and serve many of the functions of kitchens, but do not have permanent provisions for both food preparation and cooking are used similarly.
- These spaces generally have countertops, cabinets, and may have refrigeration equipment, dishwashers, toasters, blenders, coffee makers, ovens, and present similar demands to the electrical system.
- Activities performed in areas with permanent provisions for food preparation or permanent provisions for cooking are similar (i.e., washing dishes, cooking/heating food, cutting and washing food).



210.12 Thought behind the requirement.

- This info comes from <https://www.afcisafety.org/afci-nec-considerations/fast-facts/> .
- According to [NFPA](#), in 1980, residential electrical fires peaked at around 75,000
- AFCIs were first introduced in the 1999 NEC and were first required to be installed in January 2002
- The 2014 NEC[®] expands the AFCI requirement from bedrooms and other areas of the home into laundry areas and kitchens to provide additional electrical fire protection
- According to [the U.S. Fire Administration](#), electrical residential fires caused nearly 25,000 fires each year between 2017-2019, resulting in hundreds of deaths, thousands of injuries and more than \$1 billion in property loss.
- Additional branch-circuit protection (AFCIs), better construction materials and other fire prevention technologies has shown a significant decrease in the overall number of electrical residential fires that occur each year with related deaths falling by 15 percent, and injuries by 20 percent during that same time.

230.85 Emergency Disconnects.

For one- and two-family dwelling units, all service conductors shall terminate in disconnecting means having a short-circuit current rating equal to or greater than the available fault current, installed in a readily accessible outdoor location. If more than one disconnect is provided, they shall be grouped. Each disconnect shall be one of the following:

(1) Service disconnects marked as follows:

EMERGENCY DISCONNECT, SERVICE DISCONNECT

(2) Meter disconnects installed per [230.82](#)(3) and marked as follows: EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT

(3) Other listed disconnect switches or circuit breakers on the supply side of each service disconnect that are suitable for use as service equipment and marked as follows: EMERGENCY DISCONNECT, NOT SERVICE EQUIPMENT

Markings shall comply with [110.21\(B\)](#).

- Is too long to display:
- This section was reformatted for better useability with 4 technical changes
 - The disconnect must be installed on or within sight of the dwelling unit.
 - Must not be marked (listed) as suitable only for use as service equipment
 - For replacement of service equipment, all the requirements of this section apply.
 - The marking must be located on the outside front of the enclosure with red background and white text. The letters shall be at least 1/2 in. high.

230.85 Thought behind the change.

- Changes were made to help emergency responders more easily find the emergency disconnect. The revised language requires the emergency disconnect to be installed in a readily accessible outdoor location on or within sight of the dwelling unit.
- Revision provides clarity on the use of equipment marked “suitable for use as service equipment” and “suitable only for use as service equipment”, installed on the supply side of the service disconnect. Equipment on the line side of service disconnect cannot be marked as “suitable only for use as service equipment”. Additionally, this revision provides clarity in stating that conductors on the load side of these disconnects (found in (B)(2) and (B)(3)) are service conductors.
- Another revision clarifies the intent of this section by specifically identifying requirements for “replacements.” Maintenance or repair such as replacing storm damaged service entrance conductors or raceways, or fittings should not trigger the requirement for the addition of an emergency disconnect.
- Additional marking requirements are added for location, color and font for better identification the emergency disconnect.



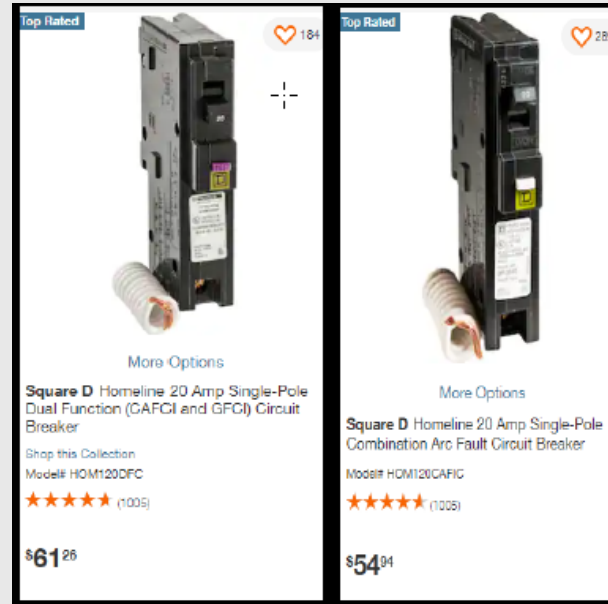
Cost Analysis

Firstname Lastname (if multiple people are presenting)

1. (210.8(A)(6))

GFCI Protection for all Kitchen Receptacle Outlets.

- 2020 NEC: Only required the kitchen receptacle outlets serving the countertop to be GFCI protected.
- 2023 NEC: Will require all kitchen receptacle outlets to be GFCI protected.



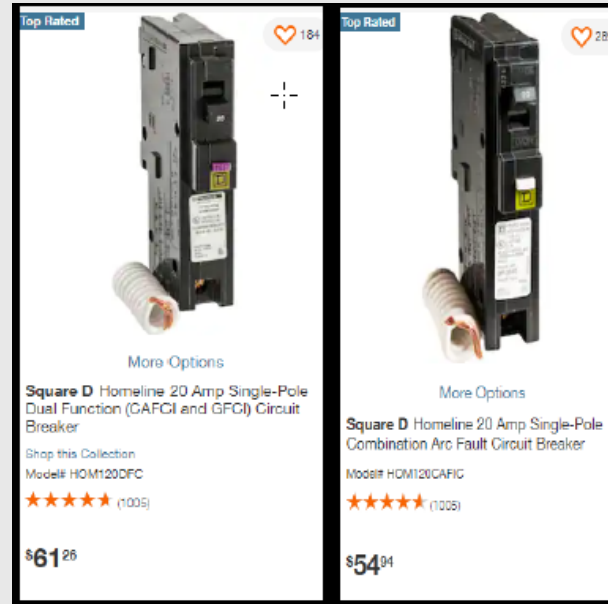
2020 NEC Section	2020 Cost	2023 NEC Section	2023 Cost	Mandatory Items Cost Difference	Optional Items Cost Difference	Added Labor Cost	Notes
210.8(A)6)	\$55	210.8(A)(6)	\$61	\$6		Nominal	Cost comparison based on a Square D Homeline circuit breaker.

<https://www.homedepot.com/b/Electrical-Power-Distribution-Electrical-Panels-Protective-Devices-Circuit-Breakers/N-5yc1vZbm16>

2. (210.8(A)(7))

GFCI protection for areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking..

- 2020 NEC: Was not addressed in 2020
- 2023 NEC: Additional GFCI protection required in areas with a sink and food, beverage preparation, or cooking that is outside of the 6' measurement.



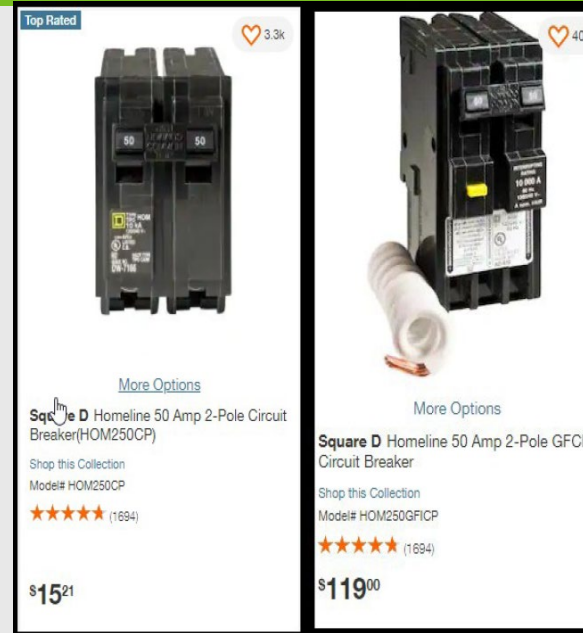
2020 NEC Section	2020 Cost	2023 NEC Section	2023 Cost	Mandatory Items Cost Difference	Optional Items Cost Difference	Added Labor Cost	Notes
N/A	\$55	210.8(A)(7)	\$61	\$6		Nominal	Cost comparison based on a Square D Homeline circuit breaker.

<https://www.homedepot.com/b/Electrical-Power-Distribution-Electrical-Panels-Protective-Devices-Circuit-Breakers/N-5yc1vZbm16>

3. (210.8(D))

GFCI protection is required for appliances such as the microwave, counter-mounted cooking units and range.

- 2020 NEC: Refer you to 422.5 for appliances that require GFCI Protection
- 2023 NEC: Removed the reference to 422.5 and add five appliances the require GFCI protection: Electric ranges, Wall-mounted ovens, Counter-mounted cooking units, Clothes dryers and Microwave ovens



2020 NEC Section	2020 Cost	2023 NEC Section	2023 Cost	Mandatory Items Cost Difference	Optional Items Cost Difference	Added Labor Cost	Notes
210.8(D)	\$15	210.8(D)	\$119	\$104		Nominal	Cost comparison based on a Square D Homeline circuit breaker.

[https://www.homedepot.com/b/Electrical-Power-Distribution-Electrical-Panels-Protective- Devices-Circuit-Breakers/N-5yc1vZbm16](https://www.homedepot.com/b/Electrical-Power-Distribution-Electrical-Panels-Protective-Devices-Circuit-Breakers/N-5yc1vZbm16)

4. (210.8(F))

Expanded GFCI protection to additional outdoor locations at dwellings.

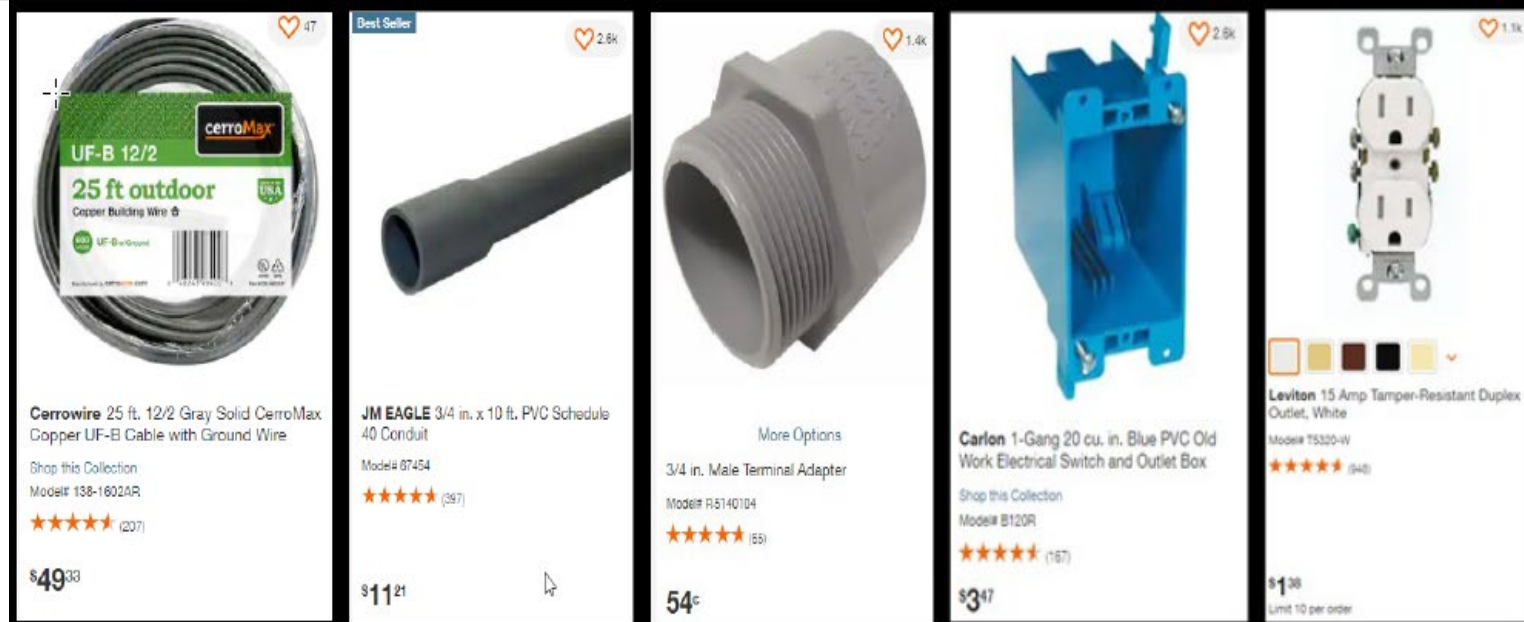
- 2020 NEC: GFCI protection was only required for Dwelling Unit Outdoor Outlets. There was confusion about associated dwelling buildings.
- 2023 NEC: Clarification was made that the outdoor outlets at dwelling associate structures also require GFCI protection.

2020 NEC Section	2020 Cost	2023 NEC Section	2023 Cost	Mandatory Items Cost Difference	Optional Items Cost Difference	Added Labor Cost	Notes
210.8(F)	N/A	210.8(F)	N/A	\$0		Nominal	

5. (210.52(C)(2))

Kitchen Island and Peninsular Countertop and Work Surface Receptacle Outlets

- 2020 NEC: One receptacle outlet was to be provided for the first 9 ft², or fraction thereof. An additional receptacle outlet was to be provided for every additional 18 ft², or fraction thereof.
- 2023 NEC: A receptacle outlet is now optional, however, if not provided, provisions shall be provided at the island or peninsula for future addition of a receptacle outlet.



2020 NEC Section	2020 Cost	2023 NEC Section	2023 Cost	Mandatory Items Cost Difference	Optional Items Cost Difference	Added Labor Cost	Notes
210.52(C)(2)	\$70	210.52(C)(2)	\$69	-\$1		Nominal	

<https://www.homedepot.com>

6. (210.52(C)(3))

Countertop and Work Surface Receptacle Outlet Locations

- 2020 NEC: Allowed the receptacle outlets to be below countertop or works surfaces.
- 2023 NEC: Receptacle outlets are no longer allowed below Counter or worksurface. Also, receptacle outlet assemblies must be appropriately listed.



2020 NEC Section	2020 Cost	2023 NEC Section	2023 Cost	Mandatory Items Cost Difference	Optional Items Cost Difference	Added Labor Cost	Notes
210.52(C)(3)	N/A	210.52(C)(3)	\$128	\$0	\$128	Nominal	

<https://www.amazon.com>

7. (220.5)

Additional Space Cost (per Square Footage) Calculations

- 2020 NEC: Did not require a garages and unfinished areas to be included in the floor area for load calculations.
- 2023 NEC: Requires garages and unfinished areas adaptable for future use as a habitable room or occupiable space to be included in the floor area for load calculations.

2020 NEC Section	2020 Cost	2023 NEC Section	2023 Cost	Mandatory Items Cost Difference	Optional Items Cost Difference	Added Labor Cost	Notes
220.11	N/A	220.5(C)	N/A	\$0		Nominal	No price change due to minimal impact (see cost analysis sheet)

7. (220.5) Option 1

Additional Space Cost (per Square Footage) Calculations

1,500 square foot single-family dwelling with a full unfinished basement and a 24' x 24' two car attached garage.

2023 NEC:

$$1,500 \times 2 \text{ (main floor and basement)} = 3,000 + 576 \text{ (garage)} = 3,576 \times 3 \text{ VA} = 10,728 \text{ VA}$$

$$10,728 \text{ VA} - 3,000 \text{ VA} = 7,728 \text{ VA} \times 35\% = 2,705 \text{ VA}$$

$$3,000 @100\% + 2,705 = \mathbf{5,705 - total VA load calculation}$$

2020 NEC:

$$1,500 \times 3 \text{ VA} = 4,500 \text{ VA}$$

$$4,500 - 3,000 = 1,500 \text{ VA} \times 35\% = 525 \text{ VA}$$

$$3,000 @100\% + 525 = \mathbf{3,525 - total VA load calculation}$$

$$5,705 \text{ VA (2023 NEC)} - 3,525 \text{ VA (2020 NEC)} = 2,180 \text{ VA} / 240 \text{ volts} = 9 \text{ amps load added}$$

7. (220.5) Option 2

Additional Space Cost (per Square Footage) Calculations

2,500 square foot single-family dwelling with a full finished basement and 24' x 40' three car attached garage.

2023 NEC:

$2,500 \times 2$ (main floor and basement) = 5000 + 960 (garage) = 5,960 X 3 VA = 17,880 VA

$17,880 \text{ VA} - 3,000 \text{ VA} = 14,880 \text{ VA} \times 35\% = 5,208 \text{ VA}$

$3,000 @100\% + 5,208 = 8,208$ - total VA load calculation

2020 NEC:

$2,500 \times 2 = 5,000 \times 3 \text{ VA} = 15,000 \text{ VA}$

$15,000 - 3,000 = 12,000 \text{ VA} \times 35\% = 4,200 \text{ VA}$

$3,000 @100\% + 4,200 = 7,200$ - total VA load calculation

$8,208 \text{ VA (2023 NEC)} - 7,200 \text{ VA (2020 NEC)} = 1,008 \text{ VA} / 240 \text{ volts} = 4.2 \text{ amps load added}$

7. (220.5) Option 3

Additional Space Cost (per Square Footage) Calculations

4,500 square foot single-family dwelling with an unfinished full basement and 24' x 40' three car attached garage.

2023 NEC:

$$4,500 \times 2 \text{ (main floor and basement)} = 9,000 + 960 \text{ (garage)} = 9,960 \times 3 \text{ VA} = 29,880 \text{ VA}$$

$$29,880 \text{ VA} - 3,000 \text{ VA} = 26,880 \text{ VA} \times 35\% = 9,480 \text{ VA}$$

$$3,000 @100\% + 9,480 = 12,408 - \text{total VA load calculation}$$

2020 NEC:

$$4,500 \times 3 \text{ VA} = 13,500 \text{ VA}$$

$$13,500 - 3,000 = 10,500 \text{ VA} \times 35\% = 3,675 \text{ VA}$$

$$3,000 @100\% + 3,675 = 6,675 - \text{total VA load calculation}$$

$$12,408 \text{ VA (2023 NEC)} - 6,675 \text{ VA (2020 NEC)} = 5,733 \text{ VA} / 240 \text{ volts} = 24 \text{ amps load added}$$

8. (230.67(E)) Surge Protecting Rating

- 2020 NEC: Required that service supplying power to dwelling units be provided with a surge-protective device (SPD).
- 2023 NEC: Requires the listed occupancies to be provided with an SPD that has a nominal discharge current rating (In) of not less than 10kA.

Intermatic AG3000 120/240 VAC Universal HVAC Surge Protective Device, Color

Visit the Intermatic Store
★★★★★ 666 ratings

\$76⁰⁴

FREE Returns

Get \$100 off instantly: Pay \$0.00 \$76.04 upon approval for the Amazon Prime Store Card. No annual fee.

- Three modes of protection: L-G, L-L, L-N
- TPMOV surge protection technology, Green LED indicator provides status of protection
- Type 4X watertight and UV resistant plastic enclosure
- 3-year product warranty, \$7,500 connected equipment warranty for 3 years
- UL Listed to ANSI/UL 1449 4th edition

See more product details

Customer ratings by feature

Easy to install	★★★★★	4.8
Comfort	★★★★★	4.7
Value for money	★★★★★	4.6

See all reviews

Prior surge protection devices were not required to have a minimum discharge current rating.

2020 NEC Section	2020 Cost	2023 NEC Section	2023 Cost	Mandatory Items Cost Difference	Optional Items Cost Difference	Added Labor Cost	Notes
230.67(A)	\$76	230.67(E)	\$76	\$0		Nominal	

https://www.amazon.com/Intermatic-AG3000-Surge-protector/dp/B008VM6MXI?source=ps-sl-shoppingads-lpcontext&ref_=fplfs&pvc=1&smid=A1KILHQU7780Z0

Thank you!

Questions or Comments

DLI.Electricity@state.mn.us

October 14, 2022

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

Re: 2023 National Electric Code Review

Via Electronic Delivery

Members of the 2023 NEC Adoption Committee,

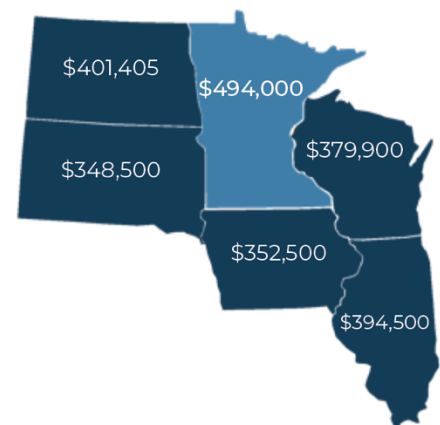
This letter contains comments and proposed amendments on the adoption of the 2023 National Electrical Code (NEC) as published by the National Fire Protection Association (NFPA). By way of background, Housing First Minnesota is the state's leading voice for the housing industry, representing member firms 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).

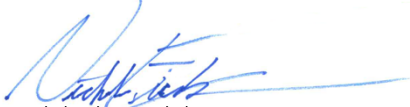
CONCLUSION

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:

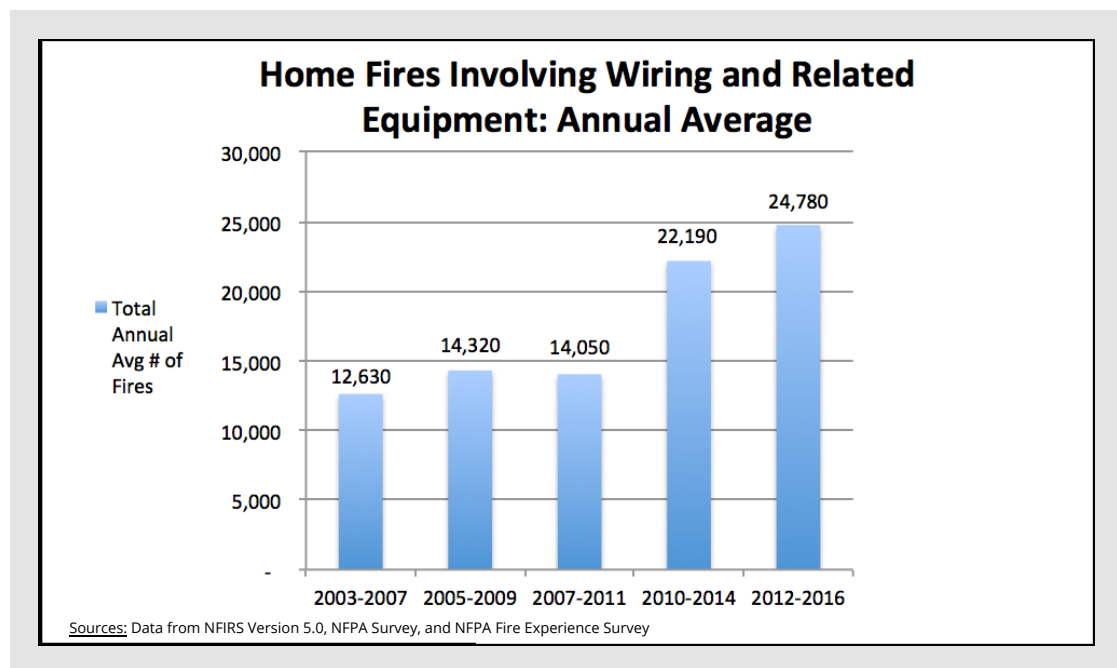
July 2020 AFCI Fact Sheet

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.

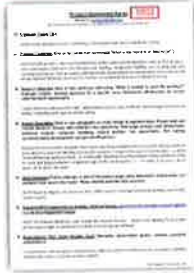
Due to discussions throughout the summit around the importance of data standardization and exchange, another FPRF project called the ITM Data Exchange Model, was briefly presented to the attendees. In this project, a novel approach, called knowledge graphs, are being utilized to standardize and consolidate 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



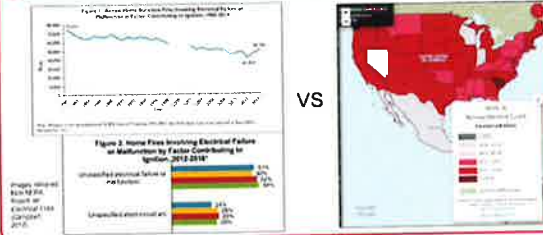
Background

- 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)



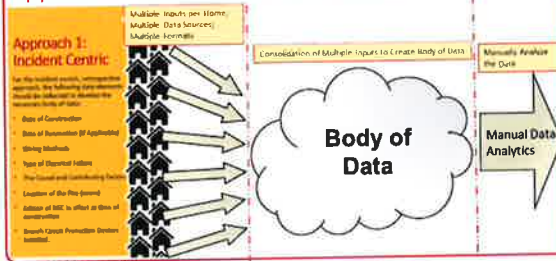
- To be useful, the data collected must be of **good quality**:
 - Is the data relevant (recent)?
 - Is the data in a format that can be used for data analytics?
 - Is the data accurate, true, and free of errors?
 - Is the needed information available?
- To be useful, the data collected must be in **sufficient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



- Challenges**
- We have little/no insight into what was going on in the electrical system prior to the fire.
 - The fire often burns away a lot of the causal evidence

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

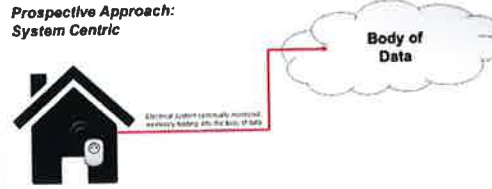


Approach 2: Prospective Analysis



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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
FIRE	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

- 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?



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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. It is the most common way to state when an event took place. There are subproperties of HasInstant to represent time intervals and/or time intervals. 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 it is, i.e. a DeliveryAddress and it is uniquely determined an object.
State	String	Since the Postal Service provided ZIP codes and their accompanying state postal codes in 1963 the two-letter abbreviations have steadily gained 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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 Phone: +1-617-984-7741 Email: vhutchison@nfpa.org
 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.

Summary of Significant 2023 NEC® Section Changes - Attachment C

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	

Line No.	NEC Code Section	Change Title	Change Summary	Date reviewed by NEC 2023 Committee	Committee Response	
					Accept	Amend
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	

Line No.	NEC Code Section	Change Title	Change Summary	Date reviewed by NEC 2023 Committee	Committee Response	
					Accept	Amend
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	

Line No.	NEC Code Section	Change Title	Change Summary	Date reviewed by NEC 2023 Committee	Committee Response	
					Accept	Amend
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	

Line No.	NEC Code Section	Change Title	Change Summary	Date reviewed by NEC 2023 Committee	Committee Response	
					Accept	Amend
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	

Line No.	NEC Code Section	Change Title	Change Summary	Date reviewed by NEC 2023 Committee	Committee Response	
					Accept	Amend
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	

November 10, 2022

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

Re: 2023 National Electric Code Cost Analysis

Via Electronic Delivery

Members of the 2023 NEC Adoption Committee,

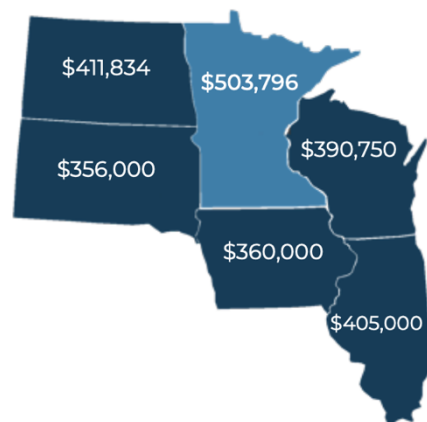
Thank you for the opportunity to address the Committee at its previous meeting. As noted, Housing First Minnesota was in the final stages of assembling its cost analysis on the new electrical code. We've completed that analysis and shared the top-line results below.

As we've stated throughout this process, our organization's mission is to increase housing affordability and access for all Minnesotans. Any changes in housing policies must account for the fact that our state's housing market is entering a challenging time as interest rates reach a 20-year high and significant affordability and access challenges remain a challenge for Minnesotans.

MINNESOTA'S HOUSING RECORD

As the Board of Electricity nears adoption of the 2023 NEC, Housing First Minnesota presents a refreshed view of the state of Minnesota's housing market.

- 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 [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 (October 2022). Graphic from Minnesota Housing Dashboard, Housing First Minnesota (October 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).

- At 6.95%, [interest rates have more than doubled](#) since the adoption of the 2020 National Electric Code, underscoring the need for balancing safety durability and affordability. ⁶

2023 NEC COST ANALYSIS

Housing First Minnesota respectfully submits the follow cost analysis of major changes impacting residential construction in the 2023 NEC.

210.8(A)(6): Dwelling Units – Kitchens	+ \$175
210.52(C): Dwelling Units- Island and Peninsular	
• Option1: Future wire and cap off	+ \$75 / Each future wire/cap
• Option 2: Pop-Up Countertop Receptacles	+ \$250 / Each receptacle
210.7: Lighting Outlets Required	+ \$60
TIA Re 210.8(F)	- \$125

Notes: These costs do not include builder overhead or interconnected work done by other trade partners related to these changes (cutting of countertops). The change of 210.7 will be largely impact multifamily construction, single-family attached and villa-style single-family detached.


By comparison, the 2020 NEC included a cost increase of [\\$1,300](#).

CONCLUSION

Housing First Minnesota recognizes and applauds the Board of Electricity for overseeing a more transparent and rigorous technical review. As stated throughout this process by Housing First Minnesota, this is the time to lower housing costs, not raise them.

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

⁶ 30-Year Fixed Rate Mortgage Average In The United States” Freddie Mac via Federal Reserve Bank of St. Louis (Nov. 3, 2022).



November 10, 2022

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

Re: 2023 National Electric Code Feedback

Via Electronic Delivery

Members of the 2023 NEC Adoption Committee,

On behalf of the Central Minnesota Builders Association (CMBA) and our more than 300 member builders, contractors and associates, we appreciate the opportunity to provide feedback for your consideration regarding the 2023 NEC and Minnesota’s Residential Electrical Code.

In Minnesota, we have a serious crisis in housing availability and affordability. Labor and materials costs and shortages, skyrocketing interest rates and limited housing stock are all contributing to this crisis. Adding to the difficulties by adopting Residential Electrical Code changes that add costs while doing little to improve safety and efficiency is reprehensible to us and our members.

In collaboration with our colleagues at Housing First Minnesota, we have analyzed the projected major cost impacts of what is being proposed in adopting the 2023 NEC.

210.8(A)(6): Dwelling Units – Kitchens	+ \$175
210.52(C): Dwelling Units- Island and Peninsular	
• Option1: Future wire and cap off	+ \$75 / Each future wire/cap
• Option 2: Pop-Up Countertop Receptacles	+ \$250 / Each receptacle
210.7: Lighting Outlets Required	+ \$60
TIA Re 210.8(F)	- \$125

Notes: These costs do not include builder overhead or interconnected work done by other trade partners related to these changes (cutting of countertops). The change of 210.7 will be largely impact multifamily construction, single-family attached and villa-style single-family detached.

By comparison, the 2020 NEC included a cost increase of \$1,300.

While CMBA appreciates some of the process improvements, we oppose adding these costs to what is a crisis in housing access and affordability. Please contact me with any questions or concerns. Thank you!

Sincerely,

Wanda Schroeder
Executive Director

2848 2nd Street South Suite 145, St. Cloud MN 56301
Office: 320.251.4382 / info@cmbaonline.org



November 10, 2022

NEC 2023 Adoption Review Committee-Board of Electricity
dli.electricity@state.mn.us

Committee Members:

The Minnesota Electronic Security and Technology Association (MNESTA) represent technology system contractors engaged in the design, sale, installation, service and monitoring of security, fire, video and technology based systems.

Our members are well trained, highly skilled professionals operating in the power limited area of the electrical industry. Virtually all technology systems whether they be Class 2, Class 3, or the emerging Class 4 (POE ++) are within the purview of our membership.

Everyday our members install and service Life Safety Systems in schools, senior living facilities, hospitals, hotels/motels, multiple dwellings, industrial facilities, retail locations, manufacturing facilities, government facilities and many more.

Life safety systems are inspected upon completion and must meet the standards laid out in the NEC.

As such, our members are well positioned, trained and experienced in handling the Technological System discipline as it continues to grow and expand. Our continuing training and education program is directed into that emerging and expanding area of the power-limited world we have entered.

We ask the committee to recognize as they consider and suggest any modifications to the Class 4 section of NEC 2023 that the technology systems contractors are more than qualified to handle the expanding area of power limited technology work.

Thank you...

David Fisch License # PL-002260
MNESTA Government Relations Chair 612-619-7870

161 St. Anthony Avenue • Suite 820 • St. Paul, MN 55103
(651) 287-6400 • fax (651) 291-0846 •

2020 National Electrical Code
Cost Comparison of the 2017 NEC and the 2020 NEC

Hunter Cost Analysis - Attachment E

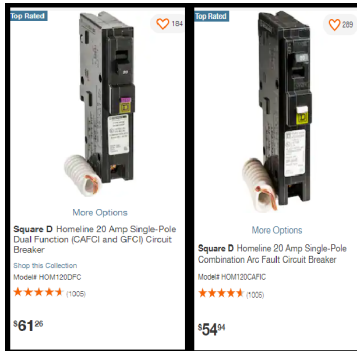
Sort	Topic	Change	Effect	2020 NEC Section	2020 Cost	2023 NEC Section	2023 Cost	Mandatory Items Cost Difference	Optional Items Cost Difference	Added Labor Cost	Notes
1	GFCI protection for all kitchen receptacles.	Revision	In addition to the GFCI protection for the countertop receptacles, GFCI protection is required for all kitchen receptacles.	210.8(A)6	\$55	210.8(A)6	\$61	\$6		Nominal	Cost comparison based on a Square D Homeline circuit breaker.
2	GFCI protection for areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking.	New	Additional GFCI protection is required in areas with a sink and food preparation that is located outside of the 6' measurement.	N/A	\$55	210.8(A)7	\$61	\$6		Nominal	Cost comparison based on a Square D Homeline circuit breaker.
3	GFCI protection is required for appliances (outlets) such as the microwave, counter-mounted cooking units and range.	Revision	GFCI protection is required for appliances that are either hardwired or have a cord and plug connection. Previous code language only required the protection for receptacles within 6' of the sink.	210.8(D)	\$15	210.8(D)	\$119	\$104		Nominal	Cost comparison based on a Square D Homeline circuit breaker.
4	Expanded GFCI protection to additional outdoor locations at dwellings.	Revision	GFCI protection has been expanded to outdoor outlets at: garages, dwelling accessory structures and boathouses.	210.8(F)	N/A	210.8(F)	N/A	\$0		Nominal	
5	Kitchen island and peninsular countertop and work surface receptacles	Revision	The receptacles are no longer required, however, provisions are needed for a future installation to add a receptacle at the peninsular or island.	210.52(C)2	\$70	210.52(C)2	\$69	-\$1		Nominal	
6	Kitchen island and peninsular countertop work surface receptacles	Revision	Receptacles installed on the peninsular or island countertop must be listed and mounted in the surface of the countertop or work surface.	210.52(C)3	N/A	210.52(C)3	\$128	\$0	\$128	Nominal	
7	Additional areas added for determining the calculated branch circuit load at a dwelling unit	Revision	Added garage and unfinished basement areas which could be used for habitable space when calculating service or feeder loads for a dwelling unit.	220.11	N/A	220.5(C)	N/A	\$0		Nominal	No price change due to minimal impact (see cost analysis sheet)
8	Surge Protection rating must have a discharge current rating of 10 kA.	New	Prior surge protection devices were not required to have a minimum discharge current rating.	230.67(A)	\$76	230.67(E)	\$76	\$0		Nominal	
Totals					\$271		\$514	\$115	\$128		

The cost estimates will vary greatly depending on factors such as the type of work being done, the size of the project, the condition of any existing electrical work, and other factors.

For example, a new home may be built with all gas appliances. In that situation, the estimated costs for materials and labor would be substantially less.

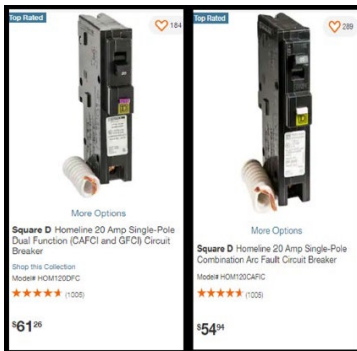
1. The cost increase is based on the existing breaker already being required to be AFCI protected, and the circuit breaker would now be required to be a dual function to provide both AFCI and GFCI protection.

<https://www.homedepot.com/b/Electrical-Power-Distribution-Electrical-Panels-Protective-Devices-Circuit-Breakers/N-5yc1vZbm16>



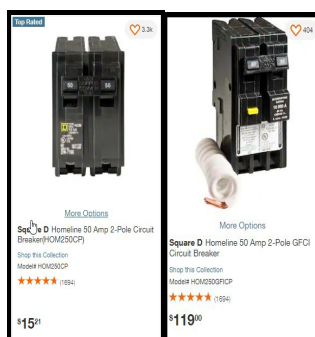
2. The cost increase is based on the existing breaker already being required to be AFCI protected, and the circuit breaker would now be required to be a dual function to provide both AFCI and GFCI protection.

<https://www.homedepot.com/b/Electrical-Power-Distribution-Electrical-Panels-Protective-Devices-Circuit-Breakers/N-5yc1vZbm16>



3. The cost increase is based on the assumption that the range receptacle is located more than 6' from a sink. If you recall, if the device was a receptacle (versus an outlet) within 6' of the edge of a sink GFCI protection was already required in the 2020 NEC. If this connection was hardwired in the 2020 NEC, it was not required to be GFCI protected.

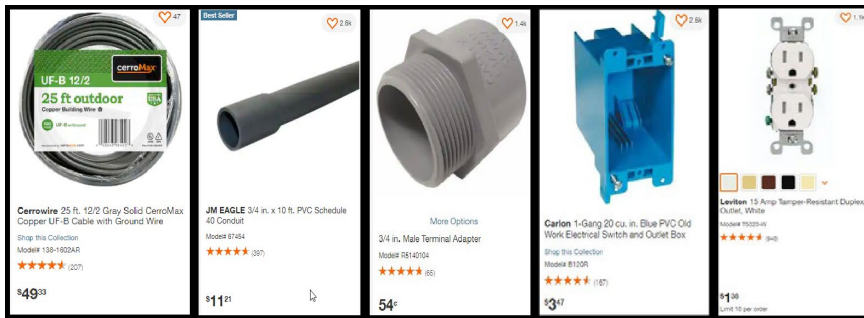
<https://www.homedepot.com/b/Electrical-Power-Distribution-Electrical-Panels-Protective-Devices-Circuit-Breakers/N-5yc1vZbm16>



4. The increased cost would be based on the expanded requirement for GFCI protection to additional outdoor locations at dwellings. With the new exception eliminating the GFCI protection on outdoor HVAC equipment, we are not aware of other “outlets” that might be a concern that are not already covered by the NEC.

5. The 2020 NEC cost takes into account a 25’ of 12/2 UF cable, installed in 15’ of ¾” PVC conduit sleeve and the cable is extended to a single gang box in a cabinet with a receptacle and plate. The 2023 cost is based on the removal of the device. <https://www.homedepot.com>

25’ of 12/2 UF = \$49, 15’ of ¾” PVC = \$16, PVC Fittings = \$1, Cut-in box = \$3 and Receptacle = \$1
 Total cost of materials = \$70



6. If an installer or owner **elects to install** a receptacle on the peninsular or island countertop surface, it must be listed for the application. The allowance to have the receptacle within 12” below the countertop or worksurface is not permitted in the 2023 NEC.

https://www.amazon.com/Bryant-Electric-RCT200NI-Countertop-Receptacle/dp/B07FKFS71Z/ref=sr_1_omk_4?gclid=EAlaIQobChMiz5fZmKfb-gIVlgbnChOnwgBxEAAyAiAAEgJai_D_BwE&hvadid=381073138965&hvdev=c&hvlocphy=9019539&hvnetw=g&hvqmt=e&hvrnd=952213702805721960&hvtargid=kwd-814885163222&hydacr=13109_9718132&keywords=counter%2Btop%2Bpop%2Bup%2Boutlet&qid=1665598972&qu=eyJxc2MiOi0LjI4IiwicXNhIjojMy4xNiIsInFzcCI6IjluNTIifQ%3D%3D&sr=8-4&th=1



7. The cost increase would be for sizing the of service or feeder to a dwelling unit by including the garage and unfinished areas as a part of the load calculation. This load is being added to eliminate panelboard loading concerns when spaces are renovated into a habitable space.

The calculation is based on 3 VA per square foot. For our cost analysis, we will consider 3 different options.

1. 1,500 square foot single-family dwelling with a full unfinished basement and a 24' x 24' two car attached garage.

2023 NEC:

$$1,500 \times 2 \text{ (main floor and basement)} = 3,000 + 576 \text{ (garage)} = 3,576 \times 3 \text{ VA} = 10,728 \text{ VA}$$

$$10,728 \text{ VA} - 3,000 \text{ VA} = 7,728 \text{ VA} \times 35\% = 2,705 \text{ VA}$$

$$3,000 @100\% + 2,705 = 5,705 - \text{total VA load calculation}$$

2020 NEC:

$$1,500 \times 3 \text{ VA} = 4,500 \text{ VA}$$

$$4,500 - 3,000 = 1,500 \text{ VA} \times 35\% = 525 \text{ VA}$$

$$3,000 @100\% + 525 = 3,525 - \text{total VA load calculation}$$

$$5,705 \text{ VA (2023 NEC)} - 3,525 \text{ VA (2020 NEC)} = 2,180 \text{ VA/240 volts} = 9 \text{ amps load added}$$

2. 2,500 square foot single-family dwelling with a full finished basement and 24' x 40' three car attached garage.

2023 NEC:

$$2,500 \times 2 \text{ (main floor and basement)} = 5000 + 960 \text{ (garage)} = 5,960 \times 3 \text{ VA} = 17,880 \text{ VA}$$

$$17,880 \text{ VA} - 3,000 \text{ VA} = 14,880 \text{ VA} \times 35\% = 5,208 \text{ VA}$$

$$3,000 @100\% + 5,208 = 8,208 - \text{total VA load calculation}$$

2020 NEC:

$$2,500 \times 2 = 5,000 \times 3 \text{ VA} = 15,000 \text{ VA}$$

$$15,000 - 3,000 = 12,000 \text{ VA} \times 35\% = 4,200 \text{ VA}$$

$$3,000 @100\% + 4,200 = 7,200 - \text{total VA load calculation}$$

$$8,208 \text{ VA (2023 NEC)} - 7,200 \text{ VA (2020 NEC)} = 1,008 \text{ VA/240 volts} = 4.2 \text{ amps load added}$$

3. 4,500 square foot single-family dwelling with an unfinished full basement and 24' x 40' three car attached garage.

2023 NEC:

$$4,500 \times 2 \text{ (main floor and basement)} = 9,000 + 960 \text{ (garage)} = 9,960 \times 3 \text{ VA} = 29,880 \text{ VA}$$

$$29,880 \text{ VA} - 3,000 \text{ VA} = 26,880 \text{ VA} \times 35\% = 9,480 \text{ VA}$$

$$3,000 @100\% + 9,480 = 12,480 - \text{total VA load calculation}$$

2020 NEC:

$$4,500 \times 3 \text{ VA} = 13,500 \text{ VA}$$

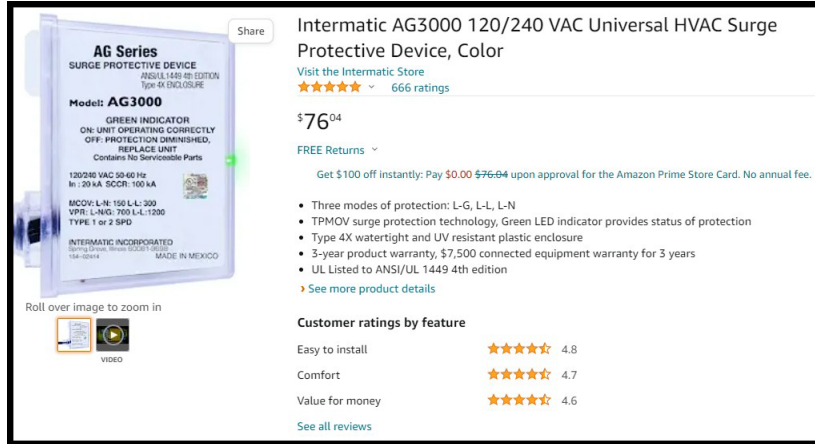
$$13,500 - 3,000 = 10,500 \text{ VA} \times 35\% = 3,675 \text{ VA}$$

$$3,000 @100\% + 3,675 = 6,675 - \text{total VA load calculation}$$

$$12,480 \text{ VA (2023 NEC)} - 6,675 \text{ VA (2020 NEC)} = 5,733 \text{ VA/240 volts} = 24 \text{ amps load added}$$

8. Surge Protection rating must have a discharge current rating of 10 kA.

https://www.amazon.com/Intermatic-AG3000-Surge-protector/dp/B008VM6MXI?source=ps-sl-shoppingads-lpcontext&ref=fp_lfs&p_sc=1&smid=A1KILHQU7780Z0



AG Series
SURGE PROTECTIVE DEVICE
ANSI/UL 1449 4th EDITION
Type 4X ENCLOSURE

Model: **AG3000**

GREEN INDICATOR
ON: UNIT OPERATING CORRECTLY
OFF: PROTECTION DIMINISHED,
REPLACE UNIT
Contains No Serviceable Parts

120/240 VAC 50-60 Hz
In: 20 kA SCCR: 100 kA

MCOV: L-N: 150 L-L: 300
VPIE: L-NG: 750 L-L: 1200
TYPE 1 or 2 SPD

INTERMATIC INCORPORATED
Spring Grove, Illinois 60077-1000
MADE IN MEXICO

Share

Intermatic AG3000 120/240 VAC Universal HVAC Surge Protective Device, Color

Visit the Intermatic Store
★★★★★ 666 ratings

\$76⁰⁴

FREE Returns

Get \$100 off instantly: Pay \$0.00 ~~\$76.04~~ upon approval for the Amazon Prime Store Card. No annual fee.

- Three modes of protection: L-G, L-L, L-N
- TPMOV surge protection technology, Green LED indicator provides status of protection
- Type 4X watertight and UV resistant plastic enclosure
- 3-year product warranty, \$7,500 connected equipment warranty for 3 years
- UL Listed to ANSI/UL 1449 4th edition

See more product details

Customer ratings by feature

Easy to install	★★★★★	4.8
Comfort	★★★★★	4.7
Value for money	★★★★★	4.6

See all reviews

REGULATORY ANALYSIS

Minnesota Statutes, section 14.131, sets out eight factors for a regulatory analysis that must be included in the SONAR. Paragraphs (1) through (8) below quote these factors and then give the agency's response.

“(1) a description of the classes of persons who probably will be affected by the proposed rule, including classes that will bear the costs of the proposed rule and classes that will benefit from the proposed rule”

Those who will be affected by the proposed rule, who will bear the costs of the proposed rule, and who will benefit from the proposed rule includes: Building owners; equipment suppliers; contractors; and code enforcement authorities. Although provisions in the NEC have greater impact on electrical contractors, they also impact technology system contactors and general contractors.

“(2) the probable costs to the agency and to any other agency of the implementation and enforcement of the proposed rule and any anticipated effect on state revenues”

Because the Board only adopts the NEC and does not administer it, the Board will not incur any costs associated with the adoption of the 2023 NEC. The Department provides administrative support to the Board and administers and enforces rules adopted by the Board.

Costs to the Department include the costs of purchasing code books for state employees who enforce and interpretate the electrical code. In addition, the Department will be required to revise the license examinations to reflect the updated code. Adoption of an updated version of the NEC will not affect state revenues because the Department currently enforces the existing Minnesota Electrical Code using electrical licensing and permit fees set by statute that go into a dedicated fund to cover administrative and enforcement costs.

“(3) a determination of whether there are less costly methods or less intrusive methods for achieving the purpose of the proposed rule”

The Board has determined that there are no less costly or intrusive methods for achieving the purpose of the proposed rule. The NEC is recognized throughout the United States and many other countries as the prevailing model electrical code. Incorporating the 2023 NEC by reference is the least costly method for adopting a national model code and is in accordance with Minnesota Statutes, section 326B.32, subdivision 2 (a)(3) (2018) which directs that adoption. Historically, the state of Minnesota has adopted the NEC by reference without any state amendments. After review of the significant changes in the 2023 NEC, the Board of Electricity is proposing adoption of the 2023 NEC without amendment in this rulemaking. Unlike other building codes that may need to be amended at the local level due to specific conditions such as earthquakes, snow loads, wind loads, prevalence of hurricanes, extreme temperatures and so on, the NEC is universally applicable in all jurisdictions.

“(4) a description of any alternative methods for achieving the purpose of the proposed rule that were seriously considered by the agency and the reasons why they were rejected in favor of the proposed rule”

No other methods were considered for achieving the purpose of the proposed rule. The purpose of the rule is to establish the Minnesota Electrical Code consistent with statutory requirements. The NEC is the

only electrical code that is accepted and in use throughout the United States. Most importantly, the Board is required by the Legislature to adopt the “most current edition of the National Electrical Code” in accordance with Minnesota Statutes, section 326B.32, subdivision 2 (a)(3) (2018).

“(5) the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals”

The probable costs of complying with the proposed rule are generally anticipated to be minimal because there is already a current electrical code in place in Minnesota that has adopted the 2020 version of the NEC. The cost difference between the 2020 NEC and the 2023 NEC are not anticipated to result in a significant change in costs for any electrical stakeholders. Any change in costs for any given project will vary from project to project because the type of work being done, the size of the project, and the condition of any existing electrical work may affect any cost differential between complying with the existing electrical code and the 2023 NEC. There are many revisions, updates and clarifications reflected in the 2023 NEC can result in lower costs in some instances or higher costs in others. Of course, costs for any particular project may also remain the same under either the 2020 NEC or the 2023 NEC.

Nevertheless, the Board has identified eight notable changes in the 2023 NEC related to dwellings which may result in increased costs for some new building projects:

1. 210.8(A)6 In addition to the GFCI protection for the countertop receptacles, GFCI protection is required for all kitchen receptacles.
2. 210.8(A)7 Additional GFCI protection required for receptacle(s) located in areas with a sink and food preparation that is outside of the 6' measurement.
3. 210.8(D) GFCI protection is required for appliances that are either hardwired or have a cord and plug connection. Previous code language only required GFCI protection for receptacles located within 6' of a sink.
4. 210.8(F) GFCI protection has been expanded to outdoor outlets at: garages, dwelling accessory structures and boathouses.
5. 210.52(C)2 The receptacles are no longer required; however, provisions are needed for a future installation to add a receptacle at the peninsular or island.
6. 210.52(C)3 Receptacles installed on the peninsular or island countertop must be listed and mounted in the surface of the countertop or work surface.
7. 220.11 Added garage and unfinished areas which could be used for habitable space when calculating service or feeder loads for a dwelling unit.
8. 230.67(A) Prior surge protection devices were not required to have a minimum discharge current rating.

The cost analysis review recognizes that the cost difference from the 2020 NEC for these same requirements versus the 2023 NEC would be approximately \$115. Understanding that the cost estimates will vary greatly depending on factors such as the type of work being done, the size of the project, the condition of any existing electrical work, and other factors. For example, a new home may be built with all gas appliances. In that situation, the estimated costs for materials and labor would be substantially less.

In the 2023 NEC another note-worthy cost savings would be the new exception added in 210.8(F). The new exception eliminates the need for GFCI protection for Heating, Ventilation, and Air Conditioning Equipment until September 1, 2026.

Finally, affected parties include contractors, inspection departments and designers, who will need to purchase copies of the 2023 NEC. Training curriculum will also need to be updated to incorporate any new or changed provisions in the code. However, it should be noted that continuing education is a requirement for all licensed electricians in Minnesota, so training is necessary regardless of which code version is adopted. Finally, training providers will incur minimal expenses including purchasing of the 2023 NEC code book and updating their existing training materials.

“(6) the probable costs or consequences of not adopting the proposed rule, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals”

If the new edition of the NEC is not adopted, the state of Minnesota would continue to rely on the 2017 NEC. This would cause the industry in Minnesota to use an electrical code that does not incorporate all the latest methods and technologies, which is the purpose of updating the national model codes. Minnesota would therefore fall behind in electrical standards to the detriment of all stakeholders. Failure to adopt the proposed rule would also have a negative effect on electrical licensing reciprocity with other states. Minnesota has electrical licensing reciprocity agreements with Alaska, Arkansas, Colorado, Iowa, Montana, Nebraska, North Dakota, South Dakota and Wyoming, most of which are in the process of reviewing and considering adopting the 2023 NEC as well. Finally, failure to adopt the proposed rule could be considered a statutory violation since Minnesota Statutes, section 326B.32, subdivision 2(a)(3) (2018), requires the incorporation of the most recently published edition of the NEC into Minnesota’s electrical code.

“(7) an assessment of any differences between the proposed rule and existing federal regulations and a specific analysis of the need for and reasonableness of each difference”

There are no applicable federal regulations that address electrical code issues in the construction of non-federally owned buildings.

“(8) an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule”

There are no applicable federal regulations that address electrical code issues in the construction of non-federally owned buildings, so there is no federal impact or cumulative effect. There are no other state regulations related to the specific purpose of this rule.

COST OF COMPLYING FOR SMALL BUSINESS OR CITY

Agency Determination of Cost

As required by Minnesota Statutes, section 14.127, the Board has considered whether the cost of complying with the proposed rules in the first year after the rules take effect will exceed \$25,000 for any small business or small city.⁸ In development of this rule and at its January, 2023 board meeting, the

Board discussed compliance costs and determined that the cost of complying with the proposed rules in the first year after the rules take effect will not exceed \$25,000 for any small business or small city. Some small cities or small businesses in the industry might purchase new code books, but the cost would be approximately a few hundred dollars, depending on how many books were purchased. The difference between complying with the current electrical code, the 2020 NEC, and the proposed rule, the 2023 NEC, is not anticipated to cost more than \$25,000. Some small businesses in the industry might also spend several hundred dollars on training, but this training is otherwise required in statute and Minnesota Rules, chapter 3800, for licensees. Based on discussion contributions from business owners and board members who work for or with small cities or businesses, the Board determined that no small business or small city will spend \$25,000 in the first year after the rules take effect to comply with the proposed rule.

Costs to small cities that have adopted a local electrical inspection ordinance include the costs of purchasing code books for city employees who work with electrical code inspections. The 2023 edition of the NEC is available from a wide range of outlets at a cost of \$155. An analysis of changes between code versions is also available for approximately \$53. Municipal electrical inspectors are required to be licensed. Conditions of license renewal include 16 hours of continuing education every two years for every license renewal. Although there will be a cost to train to the new code, the training is already required as a condition of licensure. Therefore, the proposed rule does not add any additional costs for training of municipal staff.