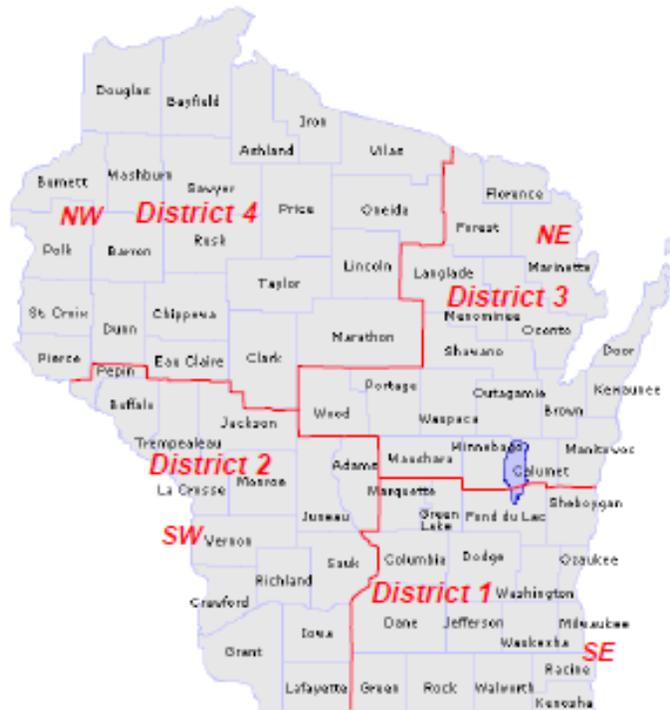




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Rev 12/14

Today's program will start with an overview of the electrical and lighting program. The technical program will consist of our code panel answering Code questions submitted by our customers. There will be a short overview of alternate power systems such as wind, solar, and generators. We will also cover using the UL White Book. We will provide links to the complete power point for both short programs and a short summary of all answers to the Code questions from our webpage. There is space in this handout for you to take notes.

2015 Winter Electrical Code Update

Link to the Electrical and Lighting Webpage:

<http://dsps.wi.gov/Programs/Industry-Services/Industry-Services-Programs/Electrical-Lighting/>

Notes:

Residential Electrical Questions

1. We wired a new home. One-half of the lower level is finished and used as habitable rooms. The other one-half is unfinished. The exterior walls are insulated and covered with drywall. The builder had us install two receptacles in the walls in the unfinished space. The building inspector is holding up occupancy because he says more receptacles are required. Does the drywall make it finished?

Answer: No.  
NEC 210.52(A)

The use of the space governs applicable requirements.

Your question asks us to define a finished basement. Dry walling the exterior walls of a basement does not in itself make the basement “finished”.

Some questions that need to be asked on a case by case basis are:

- \* What does the plans/prints specify the space to be?
- \* What does the owner of the premises deem the space as?
- \* What is the intended use of the space?

If the print/plans specify the space as a recreation or other habitable room, and the owner intends to use the space as such, then NEC 210.52 applies regardless of the wall surface material.

Additional receptacles in the unfinished spaces can and will be required to be installed once the owner decides to finish the rest of the space

2. We installed two receptacles in the 2<sup>nd</sup> floor laundry room on the same 20-ampere circuit. The lights are on the same circuit as the bathroom. We provided GFCI protection for the receptacles since they are within 6-feet of the laundry tub. Is arc-fault protection also required for branch circuits supplying the lighting and receptacle outlets in this laundry room?

Answer: Yes.  
NEC 210.12

NEC 210.12 contains a non-exclusive list of rooms and similar areas. Branch-Circuits supplying such rooms or similar areas require AFCI protection. A laundry room that is “finished” is similar to a hallway or closet. Those areas are specifically identified in 210.12 and requires AFCI protection.

NEC 210.12 does not apply to unfinished portions of basements.

3. I try to warn deck builders and home owners of all applicable Code requirements when I issue deck permits. A new deck on an existing house will require at least one receptacle accessible from the deck, correct? What about replacement of an existing porch or deck?

Answer: Yes. No. NEC 210.52(E)(3)

4. Can you review the code requirements for smoke and CO detector locations in a new home? We installed a combination smoke/CO detector in the basement and another on the main floor. The building inspector told us an additional smoke/CO detector is needed near the bedrooms on the main floor. Is this correct?

Answer: Yes.  
SPS 321.097

The UDC requires a CO detector within 21 feet of the door to each bedroom. The detector must also be on the exit path from the bedroom. If the detector you installed on the main floor does not meet both criteria, additional detector(s) are required.

5. We are bidding a new service installation for an existing 2-family residence. Only the lower tenant has access to the basement. Does the Code permit me to install the service equipment for the lower tenant in the basement and the SE for the upper unit on the outside of the house near the meters?

Answer: No.  
NEC 230.40 Exception No. 1

The panel for the upper unit will need to be installed in or on that unit. NEC 230.40 requires each service to supply only one set of service-entrance conductors. Exc. 1 allows a building with more than one occupancy to have one set of service entrance conductors to be run to each occupancy.

6. I have a question and need clarification on 680.10. A hot tub is proposed to be located within 1 foot of the underground service conductors. Does the exception to 680.10 apply? There is plenty of room in the yard but the owner's son wants it close to the back door.

Answer: No.  
NEC 680.10

NEC 680.10 prohibits underground wiring within 5' of the pool or spa. The allowance/exception is for the wiring necessary to supply the pool equipment permitted by Article 680. Even if we were to allow the utility wiring within 5' it would need to be installed in a complete raceway system of RMC, IMC or PVC in accordance to another provision in NEC 680.10 for installations where space limitations do not permit a five foot separation. This would not be typical for underground utility wiring supplying a dwelling.

7. I have a question on the area around a shower. In the case of the project I am wiring, the whole room is essentially the shower. And the shower head is on a wand that can be held in your hand. Is the entire room a “wet location”? Could the shower curtain be considered the edge of the shower?

Answer: Yes. Yes.  
NEC 410.10(D)

NEC 410.10(D) gives us some guidance as to the scope of a bathroom or shower area in relation to Luminaire locations. Per the section the top of the bathtub rim or "shower stall threshold" is used to identify the restrictive zone.

It is reasonable to consider the shower curtain as the line of measurement for the shower stall threshold. The shower curtain will prevent shower spray and alleviate the need for wet location fixtures if located outside of the threshold.

8. We have a question regarding arc fault protection. We are wiring a 24 unit apartment building. The room layout is small and tight. There is a small dinette area off the kitchen. The receptacle in the dinette area is fed from one of the 20 amp small appliance branch circuits. Does this one 20 amp receptacle have to be protected from an arc fault circuit breaker?

Answer: Yes.  
NEC 210.12(A)

The receptacle is located with the dining area room or dinette therefore the answer is "yes" per NEC 210.12(A). AFCI protection is required for dining rooms, dinette, and similar spaces for eating. The requirement applies to branch circuits supplying receptacle, lighting, and other 15- or 20-ampere, 125-volt outlets in these or similar areas. So the lighting outlet in this area also must be connected to an AFCI-protected circuit.

9. I have a question on a new service for a two family side-by- side dwelling. The electrical contractor proposes to put a 200 ampere service on each dwelling unit. I think this violates the “one-building-one service” rule. Are there any other sections that would prohibit this installation?

Answer: Yes.  
NEC 230.2

You are correct in your assessment of this installation. NEC 230.2 limits building to one service of the same class. Perhaps proposed installation could be modified to meet the conditions in the second sentence of 230.2.

This section allows more than one set of underground conductors running to the same location to be considered one service. The modification would be to locate service equipment to fit this

condition by grouping the service disconnecting means at one location on the outside of the building.

Another alternative is given by SPS 316.230 (1)(c)

10. A PV system is interconnected to the utility through a “back-fed” breaker. Am I always required to install hold down devices on back-fed breakers?

Answer: Yes-stand-alone; No-Utility interactive.

NEC 408.36(D) & 690.9(E)

11. I wired a detached garage. The local inspector told me the overhead door wouldn't need a light on the exterior but the service door does. Is this true?

Answer: Yes.

NEC 210.70(A)(2)(b).

NEC 210.70(A)(2)(b) requires for dwelling units, attached or detached garages with electric power, at least one wall switch controlled lighting outlet be installed to provide illumination on the exterior side of outdoor entrances or exits with grade level access. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.

12. I am installing a new electrical service on an existing two-family dwelling. Both tenants have access to the basement. The existing service is two meters and two panels. The landlord wants the new service to have only two meters and two panels. One panelboard will continue to supply the common basement and Unit 1. The second panelboard will supply Unit 2. Is this arrangement permitted if the landlord pays the electrical bill?

Answer: No.

Code Reference: PSC 113.802 & PSC 113.803

In almost all instances this is prohibited by PSC rules.

13. I have installed a 50-ampere feeder to a detached garage. I used 8-3 Type NM-B from the service panel in the house to a junction box on the outside wall. I then switched over to 8 AWG THWN-2 copper in PVC conduit from the J-box to the garage. The local inspector says I cannot install a 50 ampere breaker on this feeder. Is this correct?

Answer: Yes.

NEC 334.80 & NEC Table 310.15(b)(16)

NEC 334.80 requires the ampacity of Type NM cable not exceed that of a 60 degree C rated conductor.

A # AWG copper conductor in the 60 degree C col. of NEC table 310.15(b)(16) has allowable ampacity of 40 amps maximum.

14. We just purchased an older home. The service has been disconnected for some time. Can the Electrical Utility require inspection of the service prior to reconnection? Sometime in the 1980's a wall was built in front of the service panel. There is only about two feet of space between the front of the panel and the wall. Is this installation "grandfathered" in?

Answer: Yes. No.  
SPS 316.003

The working clearance requirements of a 36" depth in front of the electrical panel per NEC 110.26 were in effect in the 1980's. The panel working clearances of a 2' depth are non conformant. The inspector can and should require this wall to be relocated /removed, or the panel to be relocated.

15. Can I order two 200-ampere breakers within a meter pedestal? The meter pedestal is rated 400-amperes. One utility say yes. Another limits the total rating of the breakers to 300-Amperes. maximum. Is this a Code issue or Utility Policy?

Answer: Utility Policy.  
NEC 220 & 230.42(A),

The NEC requires conductors have sufficient ampacity to carry the current for the load as calculated in accordance with Article 220. The minimum ampere rating of the pedestal must be at least the sum of the non-continuous loads plus 125% of the continuous loads. If this calculation is 400-amperes or less, the pedestal selected is permitted by SPS 316 and the NEC. The Utility may require the sum of the breakers be less than 400-amperes in order to maintain the actual load to less than the rating of their meter.

16. Can a dishwasher or trash compactor be connected with flexible cord?

Answer: Yes  
NEC 422.16(B)(2)

The cord must have a grounding type attachment plug. The cord length must be at least 3 feet in length and not greater than 4 feet measured from the face of the plug to the rear plane of the appliance. The receptacle needs to be located to avoid physical damage to the cord. The receptacle must be located in the space occupied by the appliance or in a space immediately adjacent to the appliance. In all cases, the receptacle must be in an accessible location.

17. The bathroom in a dwelling unit has a countertop with 2 basins. Can we install one duplex receptacle for both basins?

Answer: Yes.  
NEC 210.52(D)

NEC 210.52(D) requires at least one receptacle to be installed within 3 feet of the outside edge of each basin. The receptacle outlet shall be located on a wall or partition that is adjacent to the basin or basin countertop, or installed on the side or face of the basin cabinet not more than 12 inches below the countertop.

Receptacle outlet assemblies listed for the application shall be permitted to be installed in the countertop.

One receptacle in the middle would meet the code requirement if it is within 3 feet of each basin.

Article 210.8 (A)(1) requires GFCI protection.

18. Is the terminal bar used for intersystem bonding required to be listed? Is a terminal bar required for new services on existing dwellings?

Answer: Yes. No.

NEC 250.94 & 250.94 Exception.

NEC 250.94 requires the installation for intersystem bonding in the following locations.

- 1) At the service or metering equipment of the building
- 2) At the disconnecting means of each additional building or structure.

The terminal must be accessible but does not have to be located on the outside of the house. The device must have at least 3 terminals for conductors and be connected to the grounding electrode system by a minimum 6 AWG copper conductor. The terminal shall be listed for grounding and bonding.

19. How many receptacles are required on the outside of a one- family dwelling? What about a side-by-side two-family dwelling?

Answer: Two. Four.

NEC 210.52(E) (1)

NEC 210.52(E)(1) lists the requirements. At least one on the front and one on the back of a one family dwelling and each unit of a two family dwelling that is at grade level. The receptacle outlets must be accessible while standing at grade level and located not more than 6 ½ feet above grade.

20. We installed recessed can lights in the second floor ceiling. The attic directly above the ceiling is well insulated so we built a box around the housing to keep insulation at least 3-inches away. The inspector said we have to change the can to an IC rated. Is this ruling correct?

Answer: Yes.

SPS 316.110 & NEC 410.116(B)

This is primarily a product listing issue.

NEC 410.116(B) requires thermal insulation not be installed above a recessed luminaire or within 3" of the recessed luminaire enclosure, wiring compartment, or ballast unless it is identified for contact with insulation, Type IC.

SPS 316.110 requires listed equipment be installed, used or both in accordance with any instructions included in the listing or labeling, provided they do not conflict with the code. A box installed around the Non-IC rated fixture entraps heat and prevents heat displacement. Typical non-IC housing are not tested or listed inside a box and the entrapped heat will affect the proper operation of the internal thermal overload.

You could provide details of your installation to the manufacture of the recessed cans. They might assist you with a possible engineering judgment to give to the local inspector.

The judgment would have to specifically address the installation. It would have to give a specific installation detail for installation and inspection.

For example, in addition to spacing the manufacture may specify the minimum size and location of a vent and the size of the box.

21. How much copper piping constitutes an interior metal water piping system? I am referring to a typical new home where PEX tubing is used for most of the house but there are short sections of copper for connecting to plumbing appliances such as water heaters, softeners, and individual faucets. I think the old requirement was 10 feet of pipe before bonding was required.

Answer: No specific length.

NEC 250.104(B)

A single run of pipe is not a piping system.

The NEC requires bonding "metal water piping system(s) installed in or attached to a building or structure".

Some general guidelines for inspectors and electricians to use are: System = piping, valves, fitting, and plumbing equipment.

22. Does the pressure switch for a submersible well pump require a locking-type disconnect within sight of the pressure switch? If so can a locking cover plate over a switch serve as the lock out?

Answer: Yes. No.

NEC 430.102(B)(2)

The pressure switch is the controller for the pump motor. The controller must always have an "in-sight" disconnect. This disconnect may also be the motor disconnect since it is not normally possible to install a disconnecting means within sight of a typical submersible pump motor. In this case, the disconnecting means for the controller must also be capable of being locked in the off position. The provisions for locking off must be permanently installed.

23. EMT is used as the wiring method for an overhead service. The contractor bonded the ground rods to the EMT with a 4 AWG copper. I usually see it connected to the service panel. The conductor is connected to the two ground rods. A listed clamp was used. Was the code changed to allow this?

Answer: Yes. NEC 250.53(A)(2).

Wisconsin Electrical Code no longer limits the service equipment enclosure as the sole permitted location for bonding to a supplemental electrode. NEC 250.53(A)(2)(4) allows the supplemental electrode to be bonded to a nonflexible metallic service raceway. "EMT" qualifies as long as the EMT is properly bonded.

A suitable clamp that is also listed for bonding and grounding is required to be used to make the connection.

24. Our customer is building a hunting shack (log cabin style) up in the north woods. The county required a UDC permit as the shack will have permanent provisions for sleeping, living and cooking. It will not have indoor plumbing. The county has issued them a permit to use an outdoor privy. The electric power supply is PV with a generator back-up. Do we have to wire it to meet the Electrical Code requirements for dwellings? The owner says "do as little as possible".

Answer: Yes. NEC 100 Definition of Dwelling Unit

All applicable electrical code requirements for dwellings apply if the owner wants electrical power.

The UDC defines a "dwelling unit" as any structure, or that part of a structure, which is used or intended to be used as a home, residence, or sleeping place by one person or by 2 or more persons maintaining a common household, to the exclusion of all others. *In other words, a place used for sleeping.*

The NEC definition is similar. Article 100 defines a Dwelling Unit as a single unit providing independent living facilities for one or more persons and includes permanent provisions for living, sleeping, cooking, and sanitation.

So yes, per the definitions in both the NEC and UDC, it is a dwelling.

25. I used ground rods for a new service that I purchased from a big box store. The inspector measured the diameter of the rods. He wrote me up and said I need listed rods because the ones I used were only ½-inch. Is he correct?

Answer: Yes.

NEC 250.52(A)(5)(b)

NEC 250.52(A)(5)(b) indicates the rod type electrodes of stainless steel and copper or zinc coated steel shall be at least 5/8" in diameter. The NEC permits rods that are less than 5/8" in diameter as long as they are listed. The listing mark is located near the top of the rod.

26. How is the 30" wide working space measured? I was taught I needed to install the panel in the center so that there was 15" to each side.

Answer: Does not have to be centered.

NEC 110.26(A)(2)

The NEC does not specify how the 30" wide clearance should be measured. 15" on both sides is acceptable. 30" from the corner edge of the equipment is acceptable.

NEC 110.26(A)(2) reads: The width of the working space in front of the electrical equipment shall be the width of the equipment or 30", whichever is greater. In all cases, the work space shall permit at least a 90 degree opening of equipment doors or hinged panels.

27. A bath fan is a lot cheaper than a range hood. So I used one on the last "high-end" home that I wired. The inspector said "No way!" Is this a Code requirement?

Answer: Yes.

SPS 316.110

The instructions must be used to determine permitted uses of the fan. Many bath style exhaust fans are prohibited from being installed in a kitchen. Bath fans are not listed and tested for use in locations where high heat and grease are present.

Always check the manufacturers' installation and information on the product label before installation.

The instructions generally require that a bath fan located above a shower or bath tub be GFCI protected.

28. I installed an IC-rated can light. The inspector rejected it on final. He said I had the wrong trim. He showed me the label which indicated what trims could be used in order to maintain the IC rating. If you used other trims, then you were to peel off that sticker and expose the sticker saying it was only thermally protected. Is this a Code requirement?

Answer: Yes.

SPS 316.110 Listing Requirement.

(Always check the manufacturing listing and labeling instructions before installation.)

29. Can I install an interconnected smoke detector on the ceiling of an older house? The ceiling is on the first floor with a poorly insulated attic above it.

Answer: No.

SPS 316.110 and NFPA 29.8.3.4

NFPA 29 covers specific location requirements. The manufacturers include these requirements as part of the installation instructions.

30. Can the disconnecting means for residential spa be located under the wooden skirt?

Answer: Yes.

NEC 680.12 & Article 100 Def. of Readily Accessible

NEC 680.12 Requires the Maintenance Disconnecting Means to be readily accessible and within sight of its equipment and located at least 5' horizontally from the inside walls of the spa, unless separated from the open water by a permanently installed barrier that provides a (5') reach path or greater.

The disconnecting means would not be considered “readily accessible” if the service person has to use “tools” to open the skirt. A hinged panel or similar would give ready access to the disconnect and electrical equipment.

31. A stacked washer/dryer is cord and plug connected. The receptacle outlet was roughed in such that it will end up behind the unit. Is the attachment plug/receptacle required to be readily accessible? Rough-in would be the best time to resolve this.

Answer: No.

Code Reference: NEC 422.33(A), NEC Article 100 “Accessible (as applied to equipment)”.

32. Is working clearance required for a utility electric meter? Is enforcement up to the local inspector or the utility?

Answer : Yes. Both.

NEC 110.26(A)

Working clearance is required for equipment where access to live electrical parts is required. The electrical meter socket and meter will likely require examination, adjustment, servicing, and maintenance while energized and shall comply with the working space dimensions of NEC 110.26(A)(1), (A)(2), & (A)(3)

Most Utilities refer to the NEC working space minimums in their utility installation requirements.

33. I am inspecting an addition to a detached garage. The only access to the addition is a small overhead door that opens to the back yard. Do I need a light and a GFCI receptacle outlet? The owner only wants a light. The garage does have both a light and several GFCI receptacles.

Answer: No.

NEC 210.52(G), 210.70(A)(2)(a)

At least one switch controlled light would be required by code. The requirement may be met by the existing lights as long as it is controlled by a wall switch since the shed is essentially part of the detached garage. The requirement is found under the “Additional Location” requirements for lighting outlets in NEC 210.70(A)(2)

Essentially the same answer for the receptacle. At least one GFCI protected receptacle is required for the entire structure. No specific location is required. The requirement for at least one receptacle in an attached garage is 210.52(G) and the GFCI protection comes in through 210.8(A)(2).

34. Is it legal to install a light switch behind a door? The inspector says it is not a code violation. The owner said “I’d fire the guy that did a job like that”.

Answer: Not a code violation.

Code Reference: NEC 210.70

35. I was hired to wire a new hydro-tub installed in the bathroom of an existing house. I noted that the GFCI receptacle next to the electrical panel was on its own circuit. The panel is in the basement. So I used that as the GFCI-protected circuit for the hydro tub. The inspector interprets the Code as requiring a dedicated circuit. What gives? A GFCI receptacle is a lot cheaper than a GFCI circuit-breaker.

Answer: The Inspector is correct.  
Code Reference: NEC 680.71

NEC 680.71 requires hydro-massage bathtubs and their associated equipment to be on an individual branch circuit and protected by a readily accessible GFCI device. The GFCI receptacle installed next to the panel in the basement is "readily accessible". However it no longer is on an individual circuit where used to "feed-through" and supply the hydro-tub. A GFCI Breaker or a dead front GFCI next to the panel in the basement would be an acceptable alternative. If the receptacle is changed to a "dead-front" GFCI, you would still need to ensure that the unfinished part of the basement has at least one receptacle outlet. And that outlet must also be GFCI-protected.

36. Can I plug in LED under-cabinet lights to existing receptacles? The receptacles are located above the counter-tops in the kitchen. The new LED-strip lights will be permanently attached to the bottom of the wall cabinets.

Answer: No.  
Code Reference: NEC 210.52(B)(1)&(2)

NEC 210.52(B)(2) Reads: The (2) or more small appliance branch circuits specified in 210.52(B)(1) shall have no other outlets.

There are two exceptions:

(1) A receptacle installed solely for the electrical supply to and support of an electric clock. (2) Receptacles installed to provide power for supplemental equipment and lighting on gas-fired ranges ovens or counter mounted cooking units.

No exception exists for under-counter lights that are permanently attached.

A good rule of thumb: "If the kitchen equipment is fastened in place, it is not permitted on the small appliance branch circuits"

37. I did a kitchen remodel project. I added a j-box in the ceiling in order to splice onto the existing wiring. I mounted the box above the drywall and right next to a new recessed "can" light. Once the housing is removed, I can easily access both the j-box for the can light as well as the splice box. Is this considered accessible?

Answer: Yes.  
Article 100 Definition of Accessible.

The installation does meet the minimum NEC requirement that the box be accessible. The housing of the can light can be removed without damage to the building finish. This will permit

access to both the factory installed J-box for the recessed can and your new junction box. Both are within reach of the opening once the housing is removed.

There are acceptable alternatives to the junction box above the ceiling. Splicing devices as those permitted in NEC 300.15(H) & NEC 334.40(B) are listed for use where concealed. This type of device is permitted to be used without boxes for rewiring in existing buildings. They are intended to be used with Type NM cable in locations where the cable is concealed.

38. Is there a specified distance that a twist-lock outlet supplying a pump motor needs to be from the edge of a pool?

Answer: Yes. 6-foot minimum.

Code Reference: NEC 680.22(A)

39. I am wiring a new AC unit. The nameplate indicates 27-amperes is the branch-circuit current. It also says the maximum fuse or circuit breaker size is 40 amperes. I plan on using 10 AWG, Type-NM cable on the inside of the house. Is this acceptable?

Answer: Yes

Code Reference: NEC 440.4, 334.80, 240.4(D), Table 310.15(B)(16)

NEC 440.4 specifies the marking requirements for equipment containing hermetic refrigerant motor compressors. The minimum supply conductor ampacity and the maximum rating of the branch circuit fuse or circuit breaker are two of the required markings.

NEC 334.80 indicates NM cable is constructed using conductors with 90°C insulation. However the allowable ampacity is determined using conductors with a 60°C degree rating. NEC 240.4(D) limits 10 AWG conductors to be protected by a maximum 30 ampere overcurrent device unless permitted by 240.4(E) or (G). 240.4(G) covers motors, AC equipment and compressors.

The equipment nameplate indicated the minimum supply conductor ampacity is 27 amperes. The allowable ampacity of 10 AWG conductors is 30 amperes with 60°C insulation per Table 310.15(B)(16).

40. Can I install 2 equipment grounding conductors under the same terminal screw in a panel? What about grounded (neutral) conductors?

Answer: Yes. No.

Code Reference: NEC 408.41, SPS 316.110

Check the marking on the interior of the panel. Typical manufacturer instructions permit multiple equipment grounding conductors to be terminated under the same terminal screw. SPS 316.110 permits or requires the instructions be followed. Not the case for grounded or neutral conductors. NEC 408.41 prohibits more than one grounded conductor on an individual terminal.

41. We are bidding a new generator installation for a house with a 200-ampere service. The generator will be equipped with an automatic transfer switch. Does the output of the generator have to be 200-amperes?

Answer: It depends on the load to be supplied.

Code Reference: NEC 702.4(B)

NEC 702.4(B) indicates the generator needs to be sized for the calculated load to be supplied. One option is to use manual transfer equipment. In this case, the generator and transfer equipment can be sized for only the items to be selected by the owner. The second alternative is an ATS. In this case, the generator would have to automatically pick up all of the connected load at one time. So the Code tells us that for automatic transfer equipment the minimum size of the generator is the total load that will be transferred by the automatic transfer equipment. The Code does offer one other alternative. A load management system can be used to automatically shed non-essential loads. This allows for a smaller generator size. A typical residential transfer switch would not be equipped with this feature.

42. I would like clarification on the NEC requirements for dining room circuits. Are the branch circuits supplying receptacle outlets in the dining room required to be 20 Amp?

Answer: YES

Code Reference: NEC 210.52(E)(3) Exception to (3)

One or more of the 20-ampere small appliance circuits must supply all of the wall and floor receptacle outlets in the dining room. There are no exceptions such as there are for laundry areas.

43. I know about the work space in front of an electrical panel. But is there a minimum distance between the side of the panel and a sink on the same wall?

Answer: No

Code Reference: None

There is no required separation between a sink and an electrical panel. The sink may not intrude into or restrict the required working spaces for the panel. There is no minimum horizontal separation between the panel and a sink.

44. The nameplate current for a sump pump motor is 7.1 Amp. I was hoping to put a few lights on the same circuit as the pump. Will this meet Code?

Answer: Yes

Code Reference: NEC 210.23(A)(2)

The rule requires you consider the load. A permanently connected appliance can be connected to the same circuit as lights and receptacles as long as the appliance load is less than 50% of the rating of the circuit. A 20-ampere circuit may be required based on the duty cycle for the motor.

45. I read on one of the on-line blogs that SE cable was not allowed to be used inside a house. The code reference discussed was NEC 338.10 (B)4. I read this section to allow it. What did I miss?

Answer: Nothing.

Code Reference: 338.10(B)(4), 338.12(B)

Type USE (Underground Service Entrance) cable is not permitted for use inside buildings. Type SE and SER cables are permitted in any location where Type NM cable can be used. Only type SER has an insulated neutral and separate equipment grounding conductor. So you would need to use SER as the wiring method for a feeder as the neutral conductor cannot be used for equipment grounding on the load side of the service equipment. Type SE could be used as the branch circuit wiring method for 240-volt appliances such as water heaters or air-condition equipment.

46. I set up the service for a new house by mounting the pedestal on the outside of the garage. The service conductors leave the load side of the pedestal and are run back underground, through the foundation wall and under the garage slab until they enter the basement of the house. The wiring method is PVC conduit. The garage slab will be 4-inch thick. Is the area under the garage considered "outside" the building? Is there a burial depth under the slab?

Answer: Yes. No.

Code Reference: NEC 230.6, SPS 316.230-(3)(b), Table NEC 300.5

We assume the conductors emerge from the meter pedestal, are routed down the outside of the garage, through the foundation, and then under the slab. These service conductors are considered outside of the building until the point where they emerge in the basement.

NEC 230.6 permits service conductors to be considered "outside" of a building where 2-inches of concrete are between the conductors and the inside of the building.

Contrast that example with conductors that emerge through the back of the pedestal, down the inside wall of the garage, under the slab and into the basement. These conductors are considered inside the building at the point where they enter the garage. In this case, a service disconnect is required either outside or inside nearest to the point where the conductors enter the garage.

Table 300.5 requires "0-inches" of cover for underground conductors that are located "under a building".

47. The inspector is telling me that we need to install outlets at the 7-inch step into the sunken living room. I told him that it not considered wall space. Am I correct?

Answer: Yes.

Code Reference: NEC 210.52

We assume there is no railing dividing the living room from the adjacent room.

NEC 210.52(A)(2) describes wall spaces requiring receptacles as follows.

A wall space shall include the following:

- (1) Any space 600 mm (2 ft) or more in width (including space measured around corners) and unbroken along the floor line by doorways and similar openings, fireplaces, and fixed cabinets
- (2) The space occupied by fixed panels in exterior walls, excluding sliding panels
- (3) The space afforded by fixed room dividers such as freestanding bar-type counters or railings.

Stepping down into the living room is not any different from entering through doorway, hallway, or level floor from an adjacent room.

48. We have been red tagged by an inspector. We have located the AC disconnects between the two A/C units. The disconnects are the type that pull-out and have no fuses. Do we need "working space" for these disconnects? What about for the control panel on each unit.

Answer: No. Yes.

Code Reference: NEC 110.26(A)

110.26(A) applies to equipment containing overloads or overcurrent devices. Typical examples are fused switches or circuit breakers. We would not generally apply 110.26(A) to a disconnect switch or pull-out type disconnect for a typical AC compressor unit since these types of disconnects do not require servicing or maintenance. If the AC disconnect has a fused switch or circuit breaker, a 30" X 36" working clearance would apply.

A technician servicing the unit would have to energize it in order to perform many tasks. So yes, a minimum 30 inch wide by 36-inch deep clear working space is required in the direction of access to the control panel.

49. Is there a maximum height off the floor for a service panel?

Answer: Yes. 6'7"

Code Reference: NEC 404.8(A)

The maximum height applies to the top most circuit breaker and not to the panel enclosure.

NEC 404.8(A) indicates that "They be installed such that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 6' 7" above the floor or working platform."

50. Does the NEC permit metallic boxes allowed in stud or joist spaces used as cold-air returns?

Answer: Yes

Code Reference: NEC 300.22(C)(2). The NEC permits metal boxes in stud or joist spaces used as cold-air returns. The applicable requirement is 300.22(C). Please note that 300.22(C)(2) permits metal boxes in these spaces. "Nonmetallic enclosures listed for the use" are also permitted.

Building inspectors may limit the size and placement of electrical boxes due to restrictions in the air flow. They do recognize that sometimes there is no other space to put the box in order to meet code requirements for wall receptacles and switches.

51. My customer wants to install a 200 amp service on a detached garage and then feed the existing 100 amp panel in the house from the garage. Is this installation acceptable?

Answer: Yes.

Code Reference: NEC 225 II, SPS 316.225, NEC 220.32

The applicable rules for supplying the house from a service on a detached structure are in Part II of NEC 225. Grounding requirements are essentially the same as a service and are found in NEC 250.32(A). The only difference is there is no meter and the equipment grounding conductor(s) are bonded to the grounding electrode conductor(s) instead of the neutral.

52. A builder has requested that we correct the electrical aspects of electric water heater installation. The letter from the inspector says we need a disconnect within sight of the heater? Is this our only option?

Answer: No.

Code Reference: NEC 422.31(B)

A electrical water heater is typically 4500 watts or volt-amperes. NEC 422.31 (B) applies to appliances rated over 300 Volt-Amperes.

53. I have a friend that is building a new house. He pulled his own UDC permit. Can he use my state journeyman electrician license number do his own work? Or do I need a state master electrician license to help him out?

Answer: No. Yes.

Code Reference: SS 101.862(4)Exemption

The owner of a house under construction is not permitted to perform electrical work. The exemption is only for homes that are occupied by the homeowner at the time the work is performed.

A licensed ME will have to sign for the UDC permit and supervise the electrical work. And only licensed electricians may perform the electrical work. Your friend may obtain a registered electrician certificate without an exam. However, registered electricians still would have to work under the direct supervision of a ME or JE. Direct supervision means the JE or ME are on the job while the registered electrician is working.

54. We are bidding a service change and would like to reuse the breakers. Can we reuse the breakers to supply existing multi-wire branch circuits without adding handle ties?

Answer: Yes.

Code Reference: NEC 210.4(B) & SPS 316.003 (3)

The current code requirement in 210.5 (B) does not apply to existing circuit-breakers. It would apply to new circuit-breakers installed as part of a service upgrade or circuit-breakers supplying

new multi-wire branch circuits. The applicable Code section is SPS 316.003 (3). Some refer to this section as the "grandfather" clause.

55. Are tamper-resistant outlets required in new detached garages or accessory buildings?

Answer: Yes.

Code Reference: NEC 406.12, NEC 210.52(G)(1)

You are correct in requiring the installation of tamper-resistant receptacles in a detached dwelling or associated garage. NEC 406.12 requires tamper-resistant receptacles in all specified areas in NEC 210.52. Detached garages are listed in the section.

56. I am wiring the attached garage. The plan shows a receptacle outlet on the ceiling for the garage door opener and one duplex wall receptacle. Do both outlets require GFCI protection?

Answer: Yes.

Code Reference: NEC 210.8(A)(2)

All 125 volt 15 and 20 ampere receptacles in a garage need to have GFCI protection. The GFCI also needs to be in a readily accessible location according to NEC 210.8.

57. I was told I had to add a grade level WP receptacle to a new home. I have already placed one on the side of the home and about 2 feet from the front of the house. I installed a combination A/C disconnect with 125-volt WP receptacle outlet. That is located on the back of the house. Both are GFCI-protected. Is this an acceptable installation?

Answer: Yes.

Code Reference: NEC 210.52(E)

The front receptacle outlet can be located on the side of the house as long as it is close to the front of the house. Two or three feet is close.

The other exterior receptacle has to serve the rear of the house. It also could be on the side and close to the rear of the house. It also could be incorporated into the AC disconnect. As you noted, both receptacles have to be WP and GFCI protected.

58. Are we required to install arc fault breakers for bathroom lighting? Lighting in an unfinished portion of the basement (shown on plans as "future family room")?

Answer: No. No.

Code Reference: NEC 210.12

AFCI protection is not required for the lighting outlets in the areas you have listed. The condition is the branch circuits in question only serve those areas.

For example, a branch circuit serving lighting outlets in both finished and unfinished areas of the basement would require AFCI protection.

The areas requiring AFCI protection are listed in 210.12(A)

59. I am writing to you about an electrical issue in my detached garage. The panel in the garage has a 100-ampere main breaker. The feeder for the garage comes from the service panel in the basement of the house. The feeder is rated 60-amperes. The inspector wants the main breaker in the garage changed from a 100-amp breaker to 60 amp. Is this necessary?

Answer: No.

Code Reference: NEC 215.2(A)(1), 225.39

There are no code violations based on the information you provided. Feeder conductors are required to be protected at their allowable ampacity and by a fuse or circuit breaker placed at the origin of the circuit per NEC 215.2(A)(1). The circuit breaker at the origin of the circuit is rated 60-amperes. As long as the allowable ampacity of the wire is 60 amperes or greater, this requirement has been met. Having a higher rated device in the garage is permissible. NEC 225.39(D) requires the disconnect have a minimum rating of 60-amperes but does not prohibit a larger rated device.

60. We are remodeling the second floor bedrooms and hallway of an existing house. We would like to reuse the existing circuits. There would be less of a load on the circuits when we are done. We plan to extend these circuits to the new out locations. Do we need to AFCI protect all of the branch circuit? Just the portion we extended?

Answer: No. No.

Code Reference: SPS 316.003(3) & SPS 316.210(4)

The branch circuits are existing. Presumably they were installed to meet the code in effect at the time of installation. And also presumably, you have determined the existing insulation and wiring is still safe. You are proposing to extend or modify the circuits. Arc Fault protection would not be required. SPS 316.210 (4) deletes NEC 210.12(B) "Branch Circuit Extensions or Modifications.

61. I plan to install a meter pedestal on the house. One set of service entrance conductors will supply the panel in the basement. The second set I plan to run to a panel in a detached accessory building. Will this be acceptable?

Answer: No

Code reference: SPS 316.230(3)(a)

SPS 316.230(3)(a) requires a disconnecting means be provided to disconnect the utility wiring from the premises wiring at any point where the utility wiring terminates and the premises wiring extends overhead or underground to more than one building.

62. We are being challenged by a contractor. She maintains that Schedule 40 PVC can be used for an above ground service raceway. We are requiring Schedule 80 anywhere the PVC is exposed. Is Schedule 40 PVC permitted to be used where exposed? Exposed to damage?

Answer: Yes. No.

Code Reference: NEC 352.10(F)

NEC 352.10(F) Allows PVC to be exposed with conditions. PVC conduit used exposed in areas of physical damage shall be identified for the use. Type Schedule 80 is the only PVC identified for use in areas where physical damage is likely. If the anticipated use of the area exposes the PVC to potential physical damage either the Schedule 40 must be protected or Schedule 80 PVC used.

63. The supply conductors to house are fed from a center-yard service. The service consists of a meter pedestal and Service-rated distribution panel located at grade. A 200-ampere breaker protects the feeder conductors to the house. The house panel has a 200-ampere main breaker and is located near the center of the basement. Do we need a service rated disconnect on the outside of the house or within 8-feet of where the conductors enter the house? Do we still need to install two ground rods and bond to the metal water piping in the basement?

Answer: Yes. Yes.

Code Reference: SPS 316.225(3) NEC 250.52(A)(1)-(A)(7), 250.104(A)(3)

NEC 225.32 requires the disconnecting means at the building be located either inside or outside. It also requires the location be readily accessible and nearest to the point where the feeder conductors enter the building.

SPS 316.225(3) limits the length of the feeder conductors entering the building to not longer than 8 feet.

NEC 250.50 requires all grounding electrodes described in 250.52(A)(1)-(A)(7) that are present at each building or structure served shall be bonded together to form the grounding electrode system.

The interior metal water piping must be bonded to the building disconnecting means even if the piping to the building is nonmetallic. Unlike the equipment grounding conductor, the size of the bonding conductor is based upon the ungrounded feeder conductor size and by using Table 250.66.

For a 200-ampere feeder, the equipment grounding conductor run with the feeder conductors would be 6 AWG. The size of a bonding conductor to metal water piping is 4 AWG.

64. A homeowner would like to install a hot tub/spa on an existing concrete patio. Do the bonding requirements in the NEC apply to a concrete patio that was poured 20 years ago?

Answer: Yes but....

Code Reference: SPS 316.680 (1)

The proposed new installation must meet current Code requirements. However, SPS 316.680(1) exempts listed tub assemblies with non-metallic walls.

SPS 316.680(1) is a department exception to the NEC requirements for bonding pools that has helped many an electrician or owner. The bonding requirements for pools listed in NEC 680.26(B)(2) , would not apply to a listed self contained spa or hot tub constructed with nonmetallic walls.

If the tub has a conductive wall or is built in place, the bonding requirements would apply as listed in NEC 680.26(B)(1)-(7). This rule would apply to a new tub on an existing patio poured 20 years ago.

65. May we install 30 amp over current protection on 12 AWG wiring for construction receptacles. The power saws and air compressors keep tripping the 20-ampere breaker.

Answer: No.

Code reference: Article 590, NEC 240.4(D)

Article 590 does not modify the over current protection requirements of 240.4. The typical branch circuit supplying GFCI-protected 15- and 20- ampere, 125 volt receptacles used for construction power 240.4. Under these conditions, the OCP for a 12 AWG conductor is limited to 20-amperes.

Some other articles do modify article 240. (See tables 240.3 and 240.4(G) ). These articles are generally for specific equipment, or specific conductor applications.

66. The pump motor for a spa is located underneath the unit. The spa is enclosed with a vinyl skirting. The skirt is attached to the spa with snaps. The electrician has installed a GFCI protected receptacle under the unit. Can this type of cover be permitted if the GFCI has to be readily accessible?

Answer: Acceptable.

Code Reference: NEC Article 100 Definitions

The key is "ready-access" to the GFCI for testing. This is part of the manufacturer's instructions so SPS 316.110 applies. The key is the snap-in cover. If the cover can be easily removed without the use of tools it meets the definition of "readily accessible".

(Note to presenter: Add information on 6/29/15, "Self-test", UL listing requirements for GFCI?)

67. Can a concrete-encased electrode or UFER ground be used as the sole grounding electrode for a new house? Are the 2 ground rods still required?

Answer: Yes. No.

Code Reference: NEC 250.52(A)(3)

A UFER or concrete-encased electrode established per NEC 250.52(A)(3) does not have to be supplemented.

68. The inspectors are telling us we can have no more than two #14 or #12 NM cables per insulated hole. We interpret the NEC to require derating the conductors if more than two cables are installed in the hole. Who is correct?

Answer: You are.

Code Reference: NEC 334.80, SPS 316.310 (1)

We understand where the problem comes from. The inspectors are reading SPS 316.310 (1) or (2) and see

(Note to presenter: read from SPS 316.310(1) page 199 "Where more than two..".)

If they would read on they would note that more than two cables grouped together can be justified by derating.

NEC 334.80 permits the 90° C insulation temperature rating to be used to adjust the ampacity. For example:

- 1) Four 14/3 NM cables run in insulation or through a drilled hole that is draft-stopped.
- 2) The neutrals are not considered current carrying in a dwelling unit. So the number of conductors that has to be counted in applying Table 310.15(B)(3)(a) is  $4 \times 2 = 8$ .
- 3) The allowable ampacity of 14 AWG at 90°C = 25-amperes.
- 4) Using Table 310.15(B)(2) and 8 conductors from Step 2, the derating factor is 70%.
- 5) 70% of 25 Amperes = 17.5 Amperes. So even after derating it is still OK to protect the cables with a 15 ampere breaker.

69. My question is on the grounding electrode conductor for ground rods. Must it be continuous from the one rod through the other and all the way to the panel? Can it be *mechanically* spliced on the second ground rod with an approved clamp?

Answer: No. Yes.

Code Reference: NEC 250.64(C) & Article 100 definition of Grounding electrode conductor.

(Note to presenter: Read from Definition on page 29. NEC Article 100 defines the Grounding Electrode Conductor as a conductor used to connect the system grounded conductor or the equipment to a grounding electrode or a point on the grounding electrode system. )

In your example, the grounding electrode conductor is the wire that runs from the panel to the "first" rod. The connection from rod to rod is considered a bonding connection.

70. A radon mitigation fan is located on the exterior of a home. Does the disconnecting means have to be located on the outside of the home as well?

Answer: Yes.

Code Reference: NEC 430.102(B), & Article 100 Definition

A disconnect shall be provided for the radon mitigation fan. The disconnect for the motor must be within sight from the motor location.

A properly rated snap switch in a weather-tight enclosure is one option. NEC 430.109(C) permits a general use switch as the disconnect for motors 2 HP or less. The ampere-rating of the switch must be at least twice the full-load current rating of the motor.

An AC-only switch must have an ampere rating of at least 125% of the motor full load current. The branch-circuit circuit-breaker to serve as the required disconnect but only where the motor is rated 1/8 HP or less.

71. A contractor who wants to run a 20-amp 120/240-volt branch circuit to a heat pump. The nameplate ampacity of the heat pump is 16.7-amperes. He then wants to connect one hot leg and the neutral to supply the maintenance receptacle. Is this OK?

Answer: No.

Code Reference: NEC 210.23(A)(2).

The Code indicates that total rating of the heat pump could not exceed 50% of the branch circuit ampere rating. This limitation applies where cord & plug connected utilization equipment not fastened in place, or both are supplied from the same branch circuit. 50% of 20-amperes equals 10-amperes.

The installation instructions of many A/C or heat pump equipment specify that the unit be on a dedicated individual branch circuit. SPS 316.110 would apply if the install instructions had such a requirement.

72. A GFCI is now required for all 125 volt, single phase, 15- and 20- amp receptacles installed within 6 feet of the outside edge of a dwelling unit sink. That's pretty clear. But does that 6' range also go vertical? For example a receptacle mounted above a cabinet or shelf.

Answer: Yes.

Code requirement: NEC 210.8(A)(7)

NEC 210.8(A)(7) requires all 125-volt 15 and 20 Ampere receptacles within 6' of a sink to be GFCI protected. This section does not apply to sinks in kitchens. Article 100 defines a kitchen as an area with a sink and permanent provisions for food preparation and cooking.

Examples of where it would apply are sinks in laundry rooms or wet bars.

The 6' from the outside edge of sinks other than kitchens is all encompassing. It would include 125-volt receptacles on the counter, below the counter, above in a cabinet, on an adjacent wall. A good example on how to make the measurement is to picture a 6' string. Touch one end of the string to the closest edge of the sink. ALL receptacles that the other end touches would require GFCI protection.

GFCI protection requirements for dwelling kitchens are found in NEC 210.8(A)(6). The requirements differ from 210.8(A)(7).

In a dwelling kitchen the only receptacles requiring GFCI protection in the 2011 NEC are those receptacles serving the countertop surface.

We would not use the 6' string example in a dwelling kitchen. In a kitchen ALL countertop receptacles require GFCI protection. Not included are the waste disposal or receptacles above in a kitchen cabinet, or on adjacent wall in the kitchen.

73. I need some help answering a question about a two-family home we are working on. The detached garage is shared by both tenants. Each stall will have one receptacle and one switched lighting outlet fed from that tenant's panel.

My question is on the requirement for a disconnecting means. Must the snap switch for each circuit be grouped together?

Answer: Yes.

Code reference: SPS 316.225(2)(B)

Your memory is correct. SPS 316.225 2(B) permits a single branch circuit to be run from the tenant's panel to each tenants' respective space. The disconnect for each branch circuit may be a snap switch per NEC 225.36 Exception. The disconnect for the branch circuit may be in the space and shall be located per 225.32. The identification requirement of 225.37 applies. NEC 250.32 also comes into play. 250.32 requires an electrode, two rods minimum, since there are multiple branch circuits supplying the building. The ground rods may be connected to the equipment grounding conductor(s) at a common location such as a junction box at the point where the branch circuits arrive at the garage.

74. The service pedestal with meter and main breaker is 50 feet from house. A feeder supplies the house. Do I need an additional disconnect at the house? Are the feeder conductors limited to 8-feet maximum inside the house?

Answer: Yes. Yes.

Code reference: NEC 225.32 and SPS 316.225(3)

NEC 225.31 requires a disconnecting means for the feeder supplying a separate structure. The require location is inside or outside or where the conductors pass through the structure. None of the exceptions apply to a single family dwelling.

SPS 316.225(3) allows you to extend a maximum of 8' into a building. That would be the maximum distance the supply conductors could be considered "inside the building" and ahead of the building's disconnecting means.

75. Are frost sleeves at raceway risers always required? Do soil conditions matter?

We would appreciate any guidance you can provide.

Answer: Soil Conditions Matter.

Code Reference: NEC 300.5(J)

The requirement for protection of conductors and equipment due to settlement or frost is found in 300.5(J). This requirement does not specifically state that expansion fittings must be used. The use of a type of fill that drains easily, so that the raceways, cables, or equipment are not damaged by frost or settlement, would be an acceptable way of protection. The AHJ would make the determination if the amount and type of fill material would provide sufficient protection.

76. Does exposed NM cable that supplies under-cabinet lights require protection from damage? The cable runs horizontally within ½ inch of the underside of the cabinet. The cable is exposed for about 6 to 9 inches.

Answer: Generally No.

Code Reference: NEC 334.15(A)

Does the cable closely follow the bottom of the cabinet? Does the cabinet have a raised edge? If the answer to both is yes, the cable is not likely to be damaged and would comply with NEC 334.15(A).

77. Is a 125-volt receptacle required to be added when an existing AC unit is replaced in the same location?

Answer: No.

Code Reference: SPS 316.003 (3) and 316.003 (4)

SPS 316.003 (3) and 316.003 (4) address the issue. These sections do not require existing installations be brought up to the current code when the installation is repaired or replaced in kind. This assumption is based on the existing AC unit being installed at a time when 210.63 was not in effect.

Local ordinances may be more restrictive for dwellings only that were constructed prior to adoption of the Uniform Dwelling Code in November, 1979.

78. We are remodeling a house. We know AFCI protection is required for new branch circuits serving outlets in dining room, living area, bedrooms etc. What about replacement receptacles in those areas?

Answer: Not required.

Code Reference: SPS 316.210(4), SPS 316.003 (4)

While 210.12(B) does require branch circuit extensions or modifications to be AFCI protected, SPS 316.210(4) deletes this requirement.

Replacement receptacles, extensions or modifications to these branch circuits would not require AFCI protection.

Notes Page:



**STATE OF WISCONSIN**

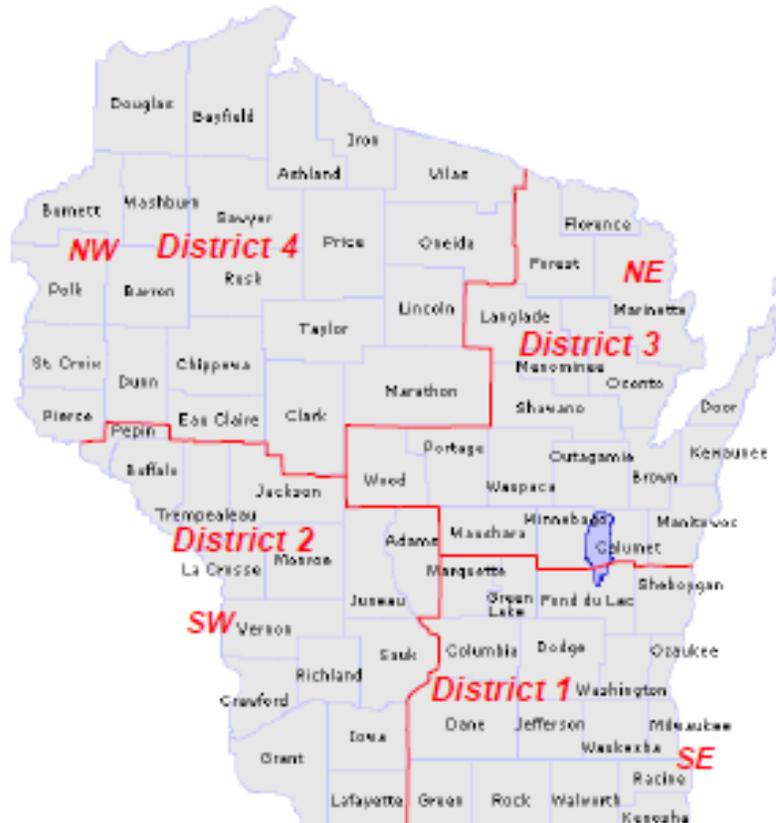
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