

VILLAGE OF GODFREY
ELECTRICAL REQUIREMENTS



2017 NATIONAL ELECTRICAL CODE

The Village of Godfrey has adopted the **2017 National Electrical Code (NEC)**.

This handout is meant to be a brief guide for the most common questions about the 2017 NEC and is not meant to be all-encompassing. Contractors are encouraged to reference the 2017 NEC as published by the National Fire Protection Association for all electrical work done in the Village of Godfrey.

Twenty-four (24) hour notice is required for all electrical inspections. Failed inspections will require an additional permit and fee. Electrical panel cover should be off and labeled for inspection. A cover that is not removed may be cause for failure of inspection. If consultation is desired for electrical work, an additional permit fee will be charged.

- A. **Disconnecting Means and Branch-Circuit Protective Equipment.** The minimum size service is 100 Amps.
- B. **Ground Electrode Conductor.** Ground wire shall be copper wire in PVC conduit from meter socket to ground rod or rigid metal conduit bonded at each end.
- C. **Feeder of Service Neutral Load.** Entrance conductors and neutral must be of the same size and rating (Article 200-61 NEC 2017).
- D. **Maximum Number of Disconnects.** All dwelling units' service panels shall have a single main disconnect. On new construction, all service panels shall have **three (3)** additional spaces for future circuits. **No one-half (1/2) size circuit breakers are permitted in any new construction.** Workspace shall be maintained and center of main breaker shall be no higher than six feet six inches (6'-6") from the floor.
- E. **Ground Blocks.** All new services, service upgrade or service panel changes require ground blocks (Article 250-94 NEC 2017).
- F. **Conductor Material.** Aluminum wire is permitted for dwelling units. Minimum size shall be 4 AWG. *Exception: See "Services" on following pages.*
- G. **Conductors – Minimum Ampacity and Size.** All power wire 110 volts or higher shall be 12 AWG or larger. *Exception: 14 AWG wire can be used for smoke detector circuits.*
- H. **Non-Metallic Sheathed "NM" (Romex).** Permitted only in residential dwellings.
- I. **Smoke Detectors & Carbon Monoxide Detectors.** All residential dwellings shall have smoke detectors and carbon monoxide detectors installed. Detectors shall be hard-wired (110 volts) with battery backup and interconnected. Smoke detectors shall be located in every bedroom, in hallways within fifteen feet (15') of bedrooms doors and on each level of the home. Carbon monoxide detectors shall be located within fifteen feet (15') of bedroom doors. Smoke detectors and carbon monoxide detectors integrated into security systems are not permitted.
- J. **Arc Fault Circuit Interrupter (AFCI) Protection.** All 120-volt, single-phase, 15- and 20-Amp 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 AFCI protected.

ROUGH-IN AND CIRCUITS

1. All work shall be done in a workman-like manner.
2. All wiring shall be 12 AWG copper or larger excluding phone, sound, security, data, and smoke detector circuits.
3. All wiring conductors shall be copper unless provided for in the code.
4. Smoke detector circuits only: 14/3 Romex for 120 volt smoke detectors installed on 15 Amp AFCI breaker. All residential dwellings shall have smoke detectors and carbon monoxide detectors installed. Detectors shall be hard-wired (110 volts) with battery backup and interconnected. Smoke detectors shall be located in every bedroom, in hallways within fifteen feet (15') of bedroom doors and on each level of the home. Carbon monoxide detectors shall be located within fifteen feet (15') of bedroom doors. Smoke detectors and carbon monoxide detectors integrated into security systems are not permitted.
5. All conduits installed shall use proper electrical fittings. Plumbing fittings are not permitted.
6. All rough-in wiring shall be completed and made up. All wiring (including ground wire) shall be spliced and tailed out with at least six inches (6") or wire extending outside of the box. All receptacles shall be tailed. Feed through on receptacles is permitted.
7. All wiring in a basements 8/3 or smaller shall be installed in a chase or in drilled holes in joists. Holes shall be drilled so as to not damage the integrity of the joists. Wire larger than 8/3 may run along the bottom of the joists, but not through the center of the room.
8. Dryers, ranges, and ovens shall be wired with three conductors and a ground. They shall be wired with a four-wire receptacle and shall not have the frame tied to the neutral.
9. All outlets in garages and accessory buildings that have floors at, or below, grade level which are not intended as habitable rooms such as storage areas, work areas, unfinished areas of basements, etc. shall be GFCI protected.
10. GFCI receptacles are required in crawl spaces (including lighting), wet bars, all kitchen countertops, bathrooms, garages, outdoor receptacles, above ground pools and all receptacles within six feet (6') of the edge of a sink or standing water.
11. All 120 volt, 15 and 20 Amp circuits supplying receptacles in any occupied space shall be arc fault protected (i.e. living rooms, family rooms, bedrooms, kitchens, rec rooms, libraries, sun rooms, dining rooms, closets, hallways, laundry areas, etc.).
12. It is recommended that grounds on receptacles be installed on top.
13. All "Disconnecting Means" shall be legibly marked to indicate its purpose.
14. "Working Space" requirements at all electrical equipment (meters, panels, AC units, etc. will be enforced).
15. Illumination is required for all working spaces for service equipment, switch boards, and panel boards that are installed indoors.
16. The white conductors in NM cable (Romex) shall be identified with a continuous black tape when used as an ungrounded conductor.
17. On multiple branch circuits where two or more branch circuits supply devices or equipment, a means of simultaneously disconnecting power shall be provided.

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18. Balconies, decks, and porches that are accessible from inside the dwelling shall have at least one receptacle within the perimeter of the balcony, deck, or porch.
19. Where a raceway enters a building or structure it shall be sealed with sealants that are identified for use with cable insulation. It shall be sealed in the conduit and around the exterior of the conduit.
20. Grounding and bonding is required on metal pipes, metal equipment, support beams, and concrete-encased electrodes stubbed up or turned out (rebar as grounds) in basements.
21. New homes or those being remodeled require and spare switched conductor for ceiling fans and support for ceiling fans.
22. Neutrals are required in "switch boxes" for the purpose of automatic room lighting.
23. GFCI protection shall be provided for cables installed in electrically heated floors in bathrooms, kitchens, and hydro-massage bathtubs.
24. All closet lights shall be covered (no bare bulbs). A minimum of twelve inches (12") is required between fixture and any stored material.
25. All outdoor receptacles are required to have "in-use" covers.
26. Upon final inspection, all plates, devices, and electrical components shall be installed and operational. All fixtures are to be installed, have lamps, and be working. All electrical work shall be complete.
27. All electric panels require circuit identification and a legible panel directory.

SERVICES

1. Minimum service for dwellings is 100 Amps.
 - a. 100 Amp service: 3 AWG copper or larger; or 1 AWG aluminum or copper clad aluminum or larger.
 - b. 200 Amp service: 2/0 copper or larger; or 4/0 aluminum or copper clad aluminum or larger.
 - c. Services require 6 AWG copper ground wire for 100 Amp or 4 AWG copper ground wire for 200 Amp.
2. Entrance conductors and neutrals must be the same size and rating.
3. Neutrals shall be identified with white tape or white insulation and unbroken from the weather head through the meter to the panel. *CONTACT THE UTILITY FOR METER CAN TYPE* Ameren approved meter cans do not require unbroken neutrals.
4. All service entrance conductors shall be installed in conduit from the meter to the panel. When using PVC conduit, it shall be schedule 80.
5. Ground wire from the meter to the ground rod shall be in PVC conduit.
6. All PVC conduit shall have the proper size ground wire within it.
7. All service panels must have a single main disconnect. On new construction, panels shall have at least three (3) spaces for future circuits.
8. Panel boxes shall be mounted with a maximum height of six feet six inches (6'-6") to the center of the main breaker.
9. Panel boxes are not permitted in closets or bathrooms.
10. Panel boxes require working space of thirty-six inches (36") wide, thirty-six inches (36") deep, and floor to ceiling unobstructed height. No objects shall be located within the working space, including sump pumps.
11. Meters shall be five feet six inches (5'-6") above final grade to the center of the meter.
12. Weather heads shall be thirteen feet (13') above finished grade.
13. Conduit trenches shall remain open until inspection.
14. Service conductors shall extend twenty-four inches to thirty inches (24" – 30") out of the weather head and be marked within twelve inches (12") of the weather head.
15. Service conductors are required to be a minimum of ten feet (10') above yards, decks, and patios; twelve feet (12') above driveways; and eighteen feet (18') above roadways.
16. All new services and upgrades will require an outdoor disconnect located next to the meter. Panel replacements do not require an outdoor disconnect provided the meter can is not replaced but a ground rod and intersystem ground block will be required anytime the meter has been removed.
17. A concrete encased electrode (Ufer) will be required on all new construction.

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SERVICES: Utility portion (installed by customer) overhead services shall have a rigid heavy wall galvanized threaded conduit. The top of the meter can shall have a rain-tight hub. Metal conduits require “bonding bushings” or “grounding bushings” with lugs and bond wires. The meter can must be the correct or acceptable can for the utility company servicing the customer. Bypass ears or horns where necessary. The meter can shall have the correct “continuous load rating” for the breaker in the service. Dry wall screws are not allowed as fasteners mounting electrical equipment.

SIZE REQUIREMENTS FOR SERVICES:

100 Amp – 3 AWG copper – 100 Amp Breaker – 1-1/4” Conduit

125 Amp – 2 AWG copper – 125 Amp Breaker – 1-1/4” Conduit

200 Amp – 2/0 copper – 200 Amp Breaker – 2” Conduit

2” conduit is required on all services where the utility connects onto the service mast and on roof penetrating services.

SERVICE CONDUCTOR INSULATION REQUIREMENTS: RHW, RHW-2, THHW, THW, THW-2, THWN, THWN-2, XHHN, XHHN-2, USE, and USE-2. No other insulation permitted.

*Note: Underground services vary from the above information.

CUSTOMER SIDE OF SERVICE: Conduit is required from meter can to service panel or first disconnecting means. Conduit can be rigid heavy wall galvanized threaded conduit, rigid threaded aluminum conduit, or rigid PVC conduit schedule 80. PVC conduit requires a ground wire of proper size within the conduit. All new services or service upgrades require and intersystem ground block UL Listed for the purpose.

GROUND WIRE REQUIREMENTS:

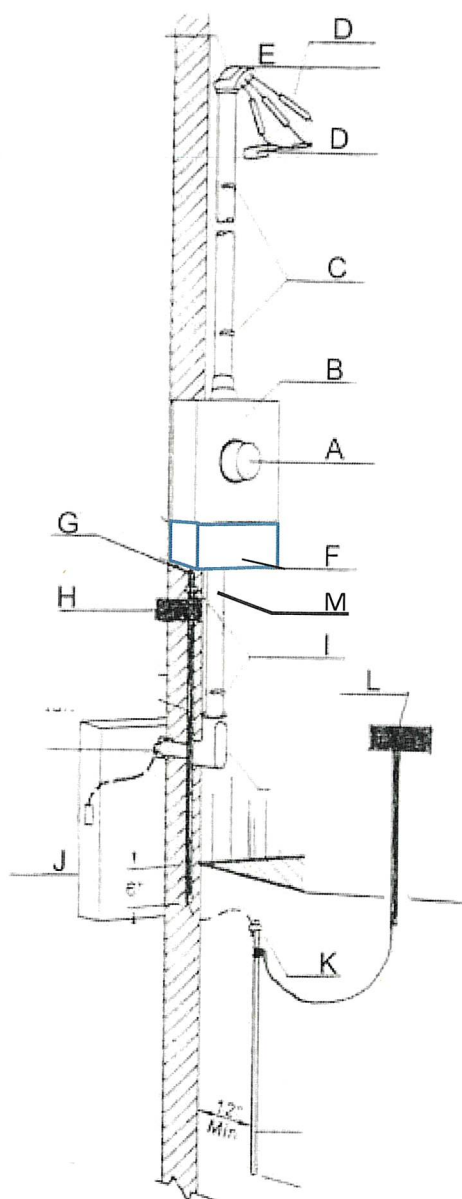
100 Amp service – 6 AWG copper (solid or stranded), insulated or bare; marked with green tape if insulated

200 Amp service – 4 AWG copper

320 Amp service – 2 AWG copper

Two (2) ground rods, six feet (6') apart may be required to meet twenty-five (25) OHMs or less as stated in NEC 2017. *Exception: Where Ufer ground connection is made, the largest required conductor to the ground rod is 6 AWG copper.*

100 AMP AND 200 AMP RESIDENTIAL OVERHEAD SERVICE



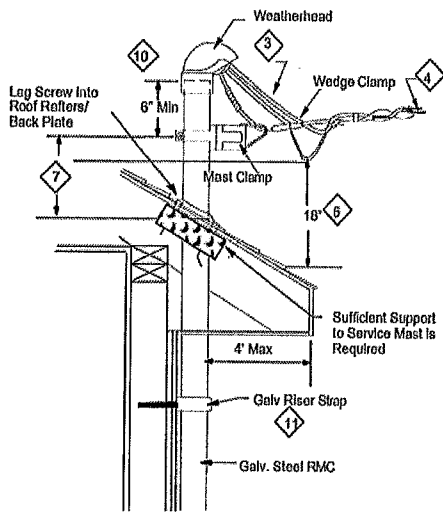
- A. **METER.** Five feet six inches (5'-6") above grade to center.
- B. **METER CAN.** Ameren requires bypass lever and Ameren approved label. Contact Ameren for details.
- C. **CONDUIT RISER.** Heavy wall rigid and threaded conduit with supports and straps.
- D. **SERVICE CONDUCTORS.** Ten feet six inches (10'-6") minimum above finished grade. Neutral identified with white phase tape in meter and within twelve inches (12") of weather head.
- E. **WEATHER HEAD.** Twelve feet six inches to thirteen feet (12'-6" – 13') above finished grade. In yard area: Minimum ten feet six inches (10'-6") above grade. In driveway area: Minimum twelve feet (12') above grade. In roadways: Minimum eighteen feet (18') above grade.
- F. **DISCONNECTING MEANS.** Required by Ameren.
- G. **GROUND CONDUIT.** One-half inch (1/2") electrical conduit (PVC) attached to meter can and minimum six inches (6") into earth.
- H. **GROUND BLOCK.** With one-half inch (1/2") PVC hubs.
- I. **STRAPS OR SUPPORTS FOR CONDUIT.** UL Listed.
- J. **CUSTOMER PANEL.** Located in accessible location either by meter or inside of building nearest to service entrance.
- K. **GROUND ROD AND CLAMP.** Five-eighths inch (5/8") diameter copper and minimum eight feet (8') in length. Top of rod to be four to six inches (4"-6") below grade. Where ground rod does not meet 25 OHM or less requirement, a second rod is required and must be six feet (6') away from first ground rod.
For 100 Amp: 6 AWG wire (copper)
For 200 Amp: 4 AWG wire (copper)
Exception: For new construction with Ufer ground connection, 6 AWG wire (copper) will be largest required.

L. ALTERNATIVE INSTALLATION OF GROUND BLOCK

- M. **CUSTOMER SIDE OF SERVICE.** Rigid or threaded heavy wall conduit, rigid threaded aluminum conduit, or rigid PVC (Schedule 80).

100 AMP AND 200 AMP RESIDENTIAL THROUGH-ROOF SERVICE

- A. All standard height requirements for services apply to Through-Roof services.
- B. All service equipment and supports to be furnished by customer unless noted by Ameren.
- C. Customer installed house knob shall be imbedded at least two inches (2") into vertical stud of house. Through bolt and backing plate may also be acceptable.
- D. Rigid threaded galvanized heavy wall conduit required for riser and may not be coupled if less than ten feet (10') long. If more than ten feet (10'), coupling should be close to meter can.
- E. Ameren may require guy wire.



3. Approx. thirty-six inches (36") of customer's conductor will extend from weather head.

4. Max. service drop lengths: 2 AWG Triplex – 125'; 1/0 Triplex and Quadplex – 100'; 4/0 Triplex and Quadplex – 75'

5. Where the service riser mast is not more than four feet (4') from the edge of the roof and the service is terminated on the service riser mast, with voltage between conductors not exceeding 300 volts, the service drop(s) and drip loop(s) are permitted to be not less than eighteen inches (18") above the roof line when within six feet (6') of the service mast.

7. Heights greater than shown in below table are possible provided that adequate guying and support are provided and approved by Ameren.

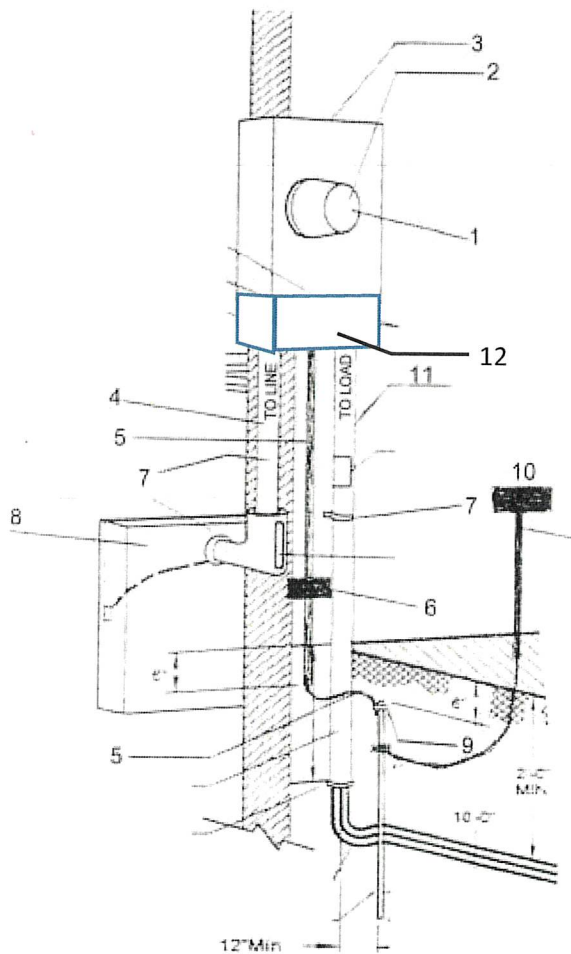
10. Service drop is not permitted to be secured to the mast between the weather head and a coupling that is installed above the roof penetration or the last point where the conduit attaches to the building.

11. Riser straps must be placed at:

- a. One no more than twelve inches (12") above the meter socket hub.
- b. Subsequent straps at no greater than thirty inches (30") spacing all the way to the roof decking.

Maximum Attachment Height Above Roof					
Amps	Phase	Utility Supplied Service Drop	2" Galvanized Steel RMC	2-1/2" Galvanized Steel RMC	3" Galvanized Steel RMC
100	1	2 AWG A1, Triplex	2' – 2"	4' – 1"	-
200	1	2 AWG A1, Triplex	2' – 2"	4' – 1"	-
200	1	1/0 A1, Triplex	2' – 2"	4'	-
200	3	1/0 A1, Quadplex	-	4'	-
400	1	4/0 A1, Triplex	-	-	4'
400	3	4/0 A1, Quadplex	-	-	4'

100 AMP AND 200 AMP RESIDENTIAL UNDERGROUND SERVICE



1. **METER.** Five feet six inches (5'-6") above grade to center.
2. **WORK AREA.** Three feet by three feet (3' x 3') area in front of meter with no obstructions.
3. **METER CAN.** Use 200 Amp can. Ameren requires bypass lever and Ameren approved label.
4. **CUSTOMER SIDE OF SERVICE.** Conduit required from meter can to service panel. Rigid or threaded heavy wall conduit, rigid threaded aluminum conduit, or rigid PVC (Schedule 80).
5. **GROUND CONDUIT.** One-half inch (1/2") electrical conduit (PVC) attached to meter can and minimum six inches (6") into earth.
6. **GROUND BLOCK.** With one-half inch (1/2") PVC with UL listed hubs for intersystem grounding.
7. **STRAPS OR SUPPORTS FOR CONDUIT.** UL Listed.
8. **CUSTOMER PANEL.** Located in accessible location either by meter or inside of building nearest to service entrance.
9. **GROUND ROD AND CLAMP.** Five-eighths inch (5/8") diameter copper and minimum eight feet (8') in length. Top of rod to be four to six inches (4"-6") below grade. Where ground rod does not meet 25 OHM or less requirement, a second rod is required and must be six feet (6') away from first ground rod.

For 100 Amp: 6 AWG wire (copper)

For 200 Amp: 4 AWG wire (copper)

10. ALTERNATIVE INSTALLATION OF GROUND BLOCK

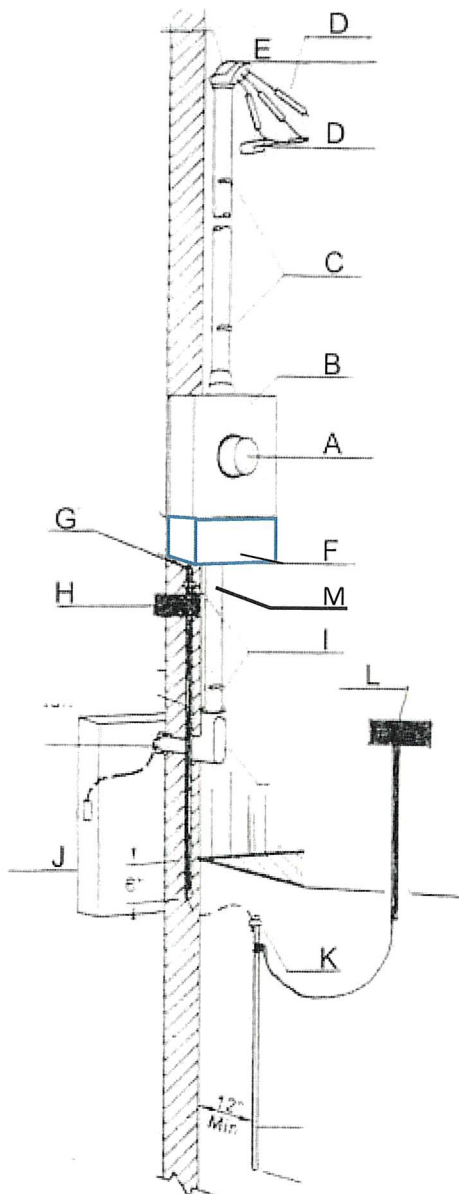
11. SLIP FITTING. Ameren requires "Slip Fitting" or "Expansion Fitting" directly below meter can.

12. DISCONNECTING MEANS. Required by Ameren.

Note: Customer wire attaches to bottom of meter. Customer may be required to supply utility side of conduit (contact Ameren for confirmation). Some manufacturers manufacture meter can with three inch (3") knockouts.

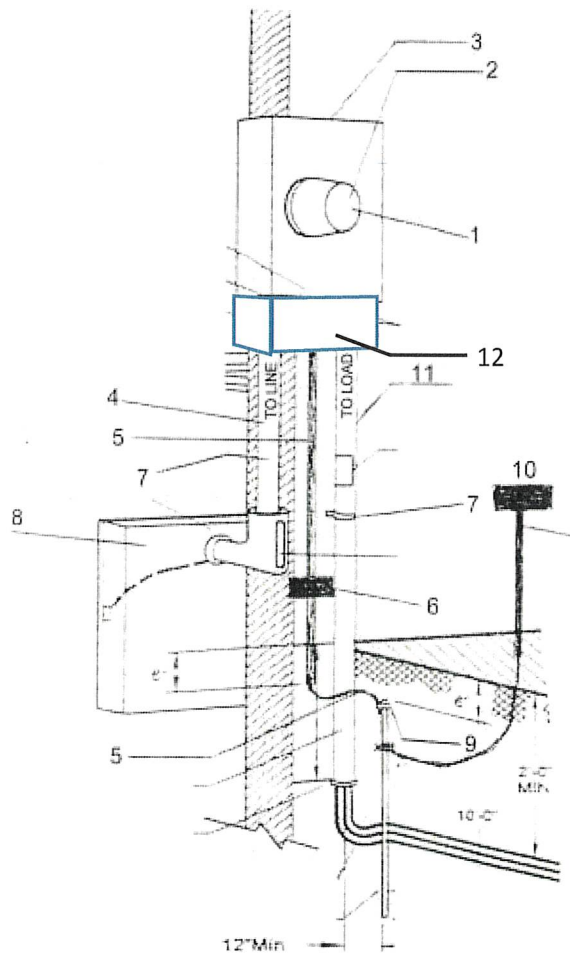
320 AMP RESIDENTIAL OVERHEAD SERVICE

Conductors for 320 Amp services may be 350 cir. Mil. Copper or parallel 2/0 copper (4 hots and 2 neutrals) – Confirm with Ameren



- A. **METER.** Five feet six inches (5'-6") above grade to center.
- B. **METER CAN.** Ameren requires bypass lever and Ameren approved label. Contact Ameren for details.
- C. **CONDUIT RISER.** Heavy wall rigid and threaded conduit with supports and straps.
- D. **SERVICE CONDUCTORS.** Ten feet six inches (10'-6") minimum above finished grade. Neutral identified with white phase tape in meter and within twelve inches (12") of weather head.
- E. **WEATHER HEAD.** Twelve feet six inches to thirteen feet (12'-6" – 13') above finished grade. In yard area: Minimum ten feet six inches (10'-6") above grade. In driveway area: Minimum twelve feet (12') above grade. In roadways: Minimum eighteen feet (18') above grade.
- F. **DISCONNECTING MEANS.** Required by Ameren.
- G. **GROUND CONDUIT.** One-half inch (1/2") electrical conduit (PVC) attached to meter can and minimum six inches (6") into earth.
- H. **GROUND BLOCK.** With one-half inch (1/2") PVC hubs.
- I. **STRAPS OR SUPPORTS FOR CONDUIT.** UL Listed.
- J. **CUSTOMER PANEL.** Located in accessible location either by meter or inside of building nearest to service entrance.
- K. **GROUND ROD AND CLAMP.** Two (2) rods required at least six feet (6') apart. Five-eighths inch (5/8") diameter copper and minimum eight feet (8') in length. Top of rod to be four to six inches (4"-6") below grade. Ground wire shall be 2 AWG copper.
- L. **ALTERNATIVE INSTALLATION OF GROUND BLOCK**
- M. **CUSTOMER SIDE OF SERVICE.** Rigid or threaded heavy wall conduit, rigid threaded aluminum conduit, or rigid PVC (Schedule 80).

320 AMP RESIDENTIAL UNDERGROUND SERVICE



1. **METER.** Five feet six inches (5'-6") above grade to center.
2. **WORK AREA.** Three feet by three feet (3' x 3') area in front of meter with no obstructions.
3. **METER CAN.** Use 320 Amp can. Ameren requires bypass lever and Ameren approved label.
4. **CUSTOMER SIDE OF SERVICE.** Conduit required from meter can to service panel. Rigid or threaded heavy wall conduit, rigid threaded aluminum conduit, or rigid PVC (Schedule 80).
5. **GROUND CONDUIT.** One-half inch (1/2") electrical conduit (PVC) attached to meter can and minimum six inches (6") into earth.
6. **GROUND BLOCK.** With one-half inch (1/2") PVC with UL listed hubs for intersystem grounding.
7. **STRAPS OR SUPPORTS FOR CONDUIT.** UL Listed.
8. **CUSTOMER PANEL.** Located in accessible location either by meter or inside of building nearest to service entrance.
9. **GROUND ROD AND CLAMP.** Five-eighths inch (5/8") diameter copper and minimum eight feet (8') in length. Top of rod to be four to six inches (4"-6") below grade.

10. ALTERNATIVE INSTALLATION OF GROUND BLOCK

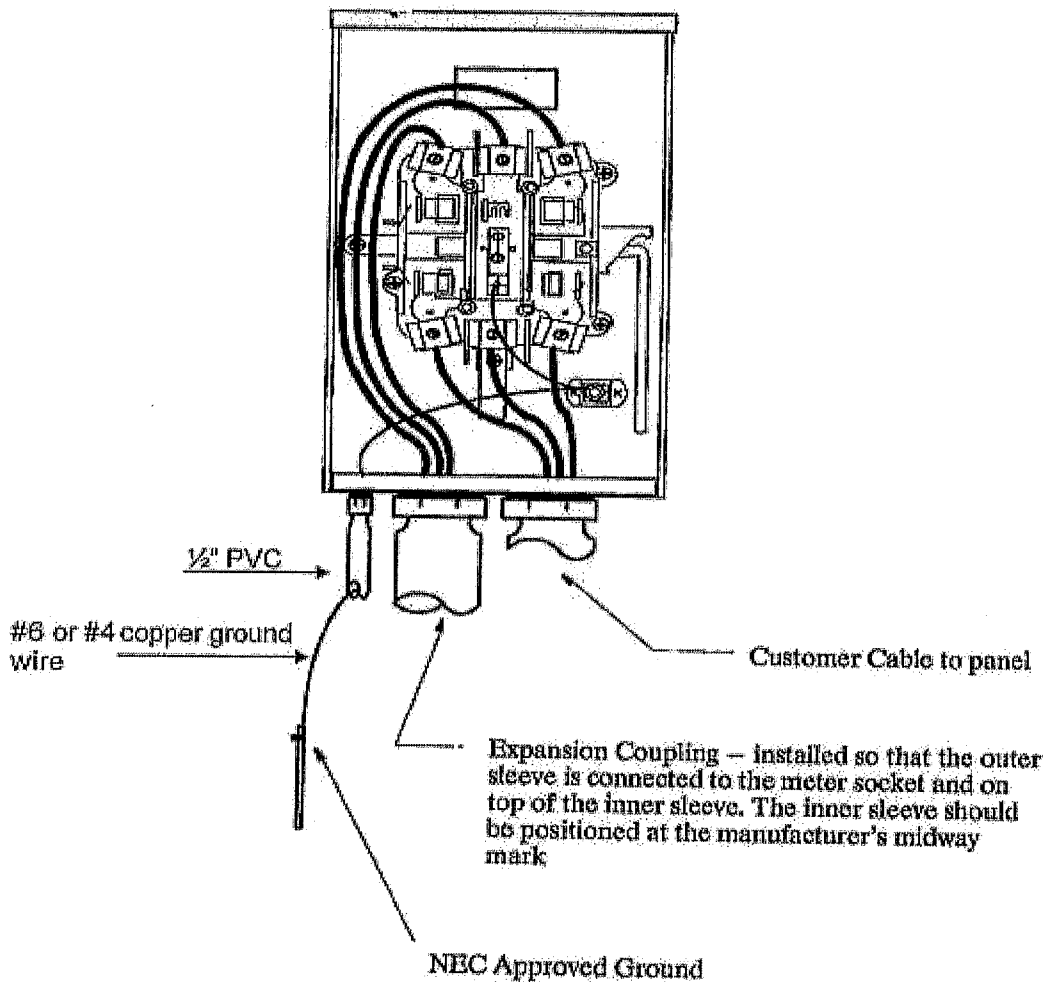
11. **SLIP FITTING.** Ameren requires "Slip Fitting" or "Expansion Fitting" directly below meter can.
12. **DISCONNECTING MEANS.** Required by Ameren.

Conductors for 320 Amp service may be:

- A. 1 - 200 Amp and 1 - 100 Amp panel: 2/0 and 3 AWG copper, respectively
- B. 2 - 200 Amp panels parallel: 2/0 copper
- C. 350 cir. Mil feed meter can (copper)
- D. 500 cir. Mil. Feed meter can (aluminum)

Note: Customer wire attaches to bottom of meter. Customer may be required to supply utility side of conduit (contact Ameren for confirmation). Some manufacturers manufacture meter can with three inch (3") knockouts.

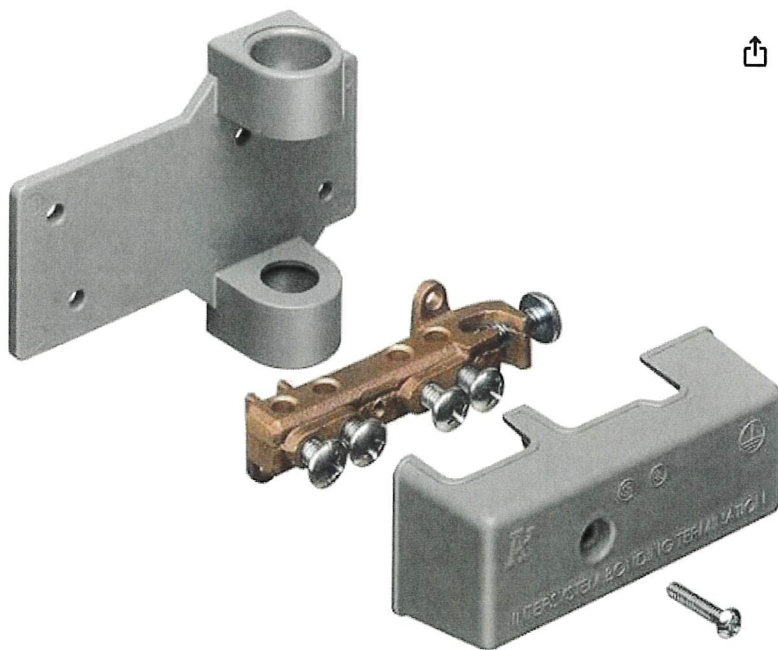
SELF-CONTAINED 100/200 AMP SOCKET CRITERIA



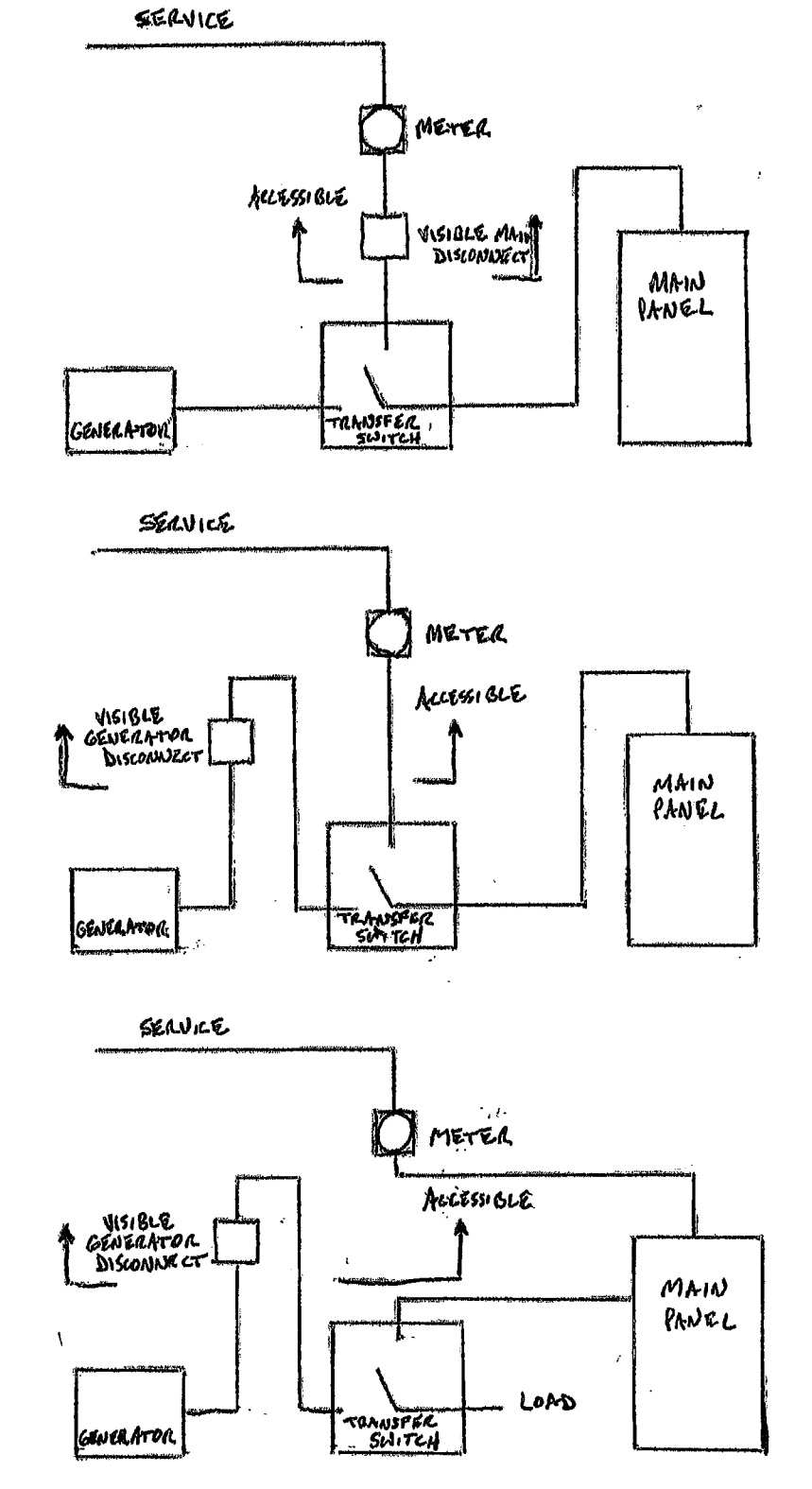
Notes:

1. Ameren approved lever bypass socket shown. Contact Ameren to verify correct socket type and configuration.
2. Socket must have UL sticker and have a NEMA 3, 3S, or 3R enclosure rating.
3. Socket must be rated for continuous duty. For 200 Amp service, the meter socket needs to be marked, usually inside, 200 Amp CONTINUOUS as opposed to 200 Amp maximum.
4. Multiple meter sockets are to comply with the same criteria as above.

GROUND BLOCK



BACK UP GENERATORS



Journeyman or Residential Electrician Testing Procedures
The Journeyman Test is for commercial and residential
The Residential is only for residential, multi-family up to a 4-plex
(no commercial work can be done with the residential)

- **To take the exam online, an International Code Council (ICC) account will be required.**
- **To take the exam in person, a Pearson VUE account will be required.**

To take the exam online or to purchase an exam voucher (Go to step #1 to create an ICC account. If you already have an account, skip to step #2).

1. Click the following link or, in your internet browser, go to www.shop.iccsafe.org. Use the "Sign In" dropdown at the top right of the screen and follow the instructions.
2. Once you are logged into your account, click the following link or go to www.iccsafe.org.
3. At the top of the page, use the dropdown entitled "Professional Development" "Credentialing" Click on "Exam Catalog"
4. Scroll down to the Catalog Search window and, using the Search box, Type "G17" for the **Journeyman Electrician Test** or "G18" for the **Residential Electrician Test** and click "Search"
5. The result should appear entitled **Journeyman Electrician or Residential Electrician**. Make sure the Code Year dropdown shows **2017**. Then click "Register".
6. In the new window, be sure the Code Cycle shows **2017** and the Exam Format shows **PRONTO**. Select the applicable option for who will be taking the exam.
 - a. *If you select "Myself", read the disclaimers, check the box, then click "Add to Cart".*
 - b. *If you select "Someone else", click on "Purchase Voucher".*
7. Once you have completed adding items to your cart, proceed to the checkout and follow the instructions for payment information to complete the purchase.
8. You will then receive additional information about the exam.

To take the exam in person:

1. Click on the following link or, in your internet browser, go to www.home.pearsonvue.com/icc.
2. Scroll down to the "Contractor/Trades" box and click on "View exams that do NOT require pre-authorization".
3. In the search bar at the top of the screen type "G17" or "G18" and click "Go".
4. The result should appear for "Journeyman Electrician or Residential Electrician". Click "Next".
5. Use the appropriate box to Log in to your Pearson VUE account or create an account.
6. Click on "View Exams".
7. In the search bar at the top of the screen type "G17" or "G18" and click "Go".
8. In the dropdown for what local jurisdiction is being applied for select "National" and click "Next".
9. Confirm that the exam is for Journeyman Electrician or Residential Electrician and click "Next".
10. Read through the policies and click "Agree".
11. In the search bar type in your address or ZIP code and click "Search". Check the box of the preferred testing center and then click "Next".
12. Follow the instructions on selecting a date and time for the exam and then book your appointment.
13. You will then receive additional information about the exam.