ELECTRICAL WIRING HANDOUT

Inspection Procedures and Information for Homeowners

1. Determine whether you can do the work, or if you must hire an electrical contractor.
   a. Read sections 81-2121 and 81-2124 on page 3 of the homeowner handout.
   b. Decide if you know enough about electrical work to make a safe installation. State Electrical Inspectors are inspectors, not instructors. As the installer, you are responsible for knowing National Electrical Code and State Electrical Act requirements, which apply to your project and as such you will sign a verification so stating prior to a wiring permit being issued to you.

2. Completely read this handout before you start, and think through your project: Figure out what is to be done; whether you have time to complete it; how many boxes, fixtures, appliances, etc., there will be so you will know how to calculate the permit fee. Make a plan and follow through with it to completion.

3. Then, take out the permit by submitting a completed "Request for State Electrical Inspection with Homeowner Verification" form "State Electrical Permit" Form to the Nebraska State Electrical Division, PO Box 95066, Lincoln, NE 68509-5066. Or online at: https://www.nebraska.gov/sed/permits/

4. Once approved, then do the work.

5. Then, call for inspection. The various types of inspections are:

   Temporary Service: This inspection is for a temporary construction service installed and used to provide power to remodel an existing home if the main service has to be moved to a new location. It is your responsibility to provide the proper wires, pole, and equipment. Temporary services **WILL NOT** be energized by the power company until they receive authorization to do so from the State Electrical Inspector. Temporary services require a separate permit from the permanent service permit.

   New Service: This inspection is for the replacement of an existing panel in an existing house. When new service equipment is installed, all equipment including the meter loop, meter socket, panel, branch circuit wires, feeder wires, ground wires, service entrance wires, etc., require inspection. When a permit is issued for the new service, the State Electrical Division office will forward a copy to the power supplier along with authorization to energize the service at the request of the homeowner. Therefore, when you have the new service installed to the minimum standards of the Code, contact the power company, give them your permit number, and they will stop by and energize the permanent new service. They will not energize the service unless a permit has been issued and a copy forwarded to them.

Rough-In Inspection: This term applies to inspection of wires and boxes, which will be covered by building finish. For instance, a "rough-in" must be approved by the inspector before fiberglass insulation or drywall is installed. This inspection is done while the wiring is still visible, and must be approved before the wiring is covered.

Final Inspection: This inspection is the last to be done. It is to be scheduled after all electrical work is complete. The final inspection is done after all devices and fixtures have been installed. The term also applies to the last electrical inspection for new services, room additions, basement finishes, and "fished in" work, and should be scheduled when the electrical work is complete.

Re-Inspection: If a Correction Order is written when the Final Inspection is made, you will have approximately seventeen working days to make the corrections before another inspection is made. The re-inspection is made after you have corrected the Code violations listed on the Correction Order.

6. If the equipment you requested inspection for passes, proceed with construction. If it fails, make the necessary changes so it complies with Code, pay any re-inspection fees required, then contact the inspector to make a re-inspection.

Don't proceed with the next phase of construction until the present installation passes inspection, unless the inspector specifically allows it. This is good advice. For example, if the rough-in inspection did not pass, and drywall is installed without re-inspection, the inspector may require all of the drywall to be removed to allow for inspection of the wiring.

ELECTRICAL WIRING HANDOUT
FOR HOMEOWNERS
An Overview Of Wiring Requirements For Single-Family Dwellings

This handout describes some of the requirements for wiring a single-family dwelling. It is intended to inform homeowners doing electrical work in their homes of some of the most prevalent causes of failure to pass inspection. However, all Code requirements are not included in this information.

Electrical safety is our common goal. The National Electrical Code must be complied with to ensure electrical safety, and it is your responsibility to make a Code complying installation, which will pass inspection. Using this handout as a guideline should help you complete your installation and pass inspection. State Electrical Inspectors are not your instructors. They will not draw or design your job. They will only inspect your work and advise you if the installation meets Code requirements.

Sections of the National Electrical Code (NEC) and the Nebraska State Electrical Act are referred in this handout. The National Electrical Code is available at bookstores and the State Electrical Act can be downloaded from https://electrical.nebraska.gov/statutes-rules.

All State Electrical Inspectors have a 24-hour Inspection Line

Excerpt from State Electrical Act: Section 81-2121:
Nothing in the State Electrical Act shall be construed to: (5) Prohibit an owner of property from performing work on his or her principal residence or farm property, excluding commercial or industrial installations or installations in public-use buildings or facilities, or require such owner to be licensed under the act;

Excerpt from State Electrical Act: Section 81-2124:
Electrical Installations Subject to Inspection: (3) All new electrical installations for residential applications requiring new electrical service equipment shall be subject to the inspection and enforcement provisions of the act;

Excerpt from State Electrical Act: Section 81-2126:
Request for Inspection; when required: At or before commencement of any installation required to be inspected by the board, the licensee or owner making such installation shall submit to the board a request for inspection, on a form prescribed by the board..... Any person filing a late request for inspection shall pay a delinquent fee of fifty dollars.

If you, as the property owner, meet the requirements of Section 81-2121.5, and the work you are doing falls within the scope of Section 81-2124.3, then submit the completed Homeowner Verification Form along with the Request For State Electrical Inspection and correct fees to the State Electrical Division.
Provide all information on the forms, or they will be returned to you with instructions to provide the information. You can speed up the process by submitting the form with all information the first time.

Inspection Fees

Fees are based on the Main Service size and each branch circuit installed. The Request For State Electrical Inspection form explains how to calculate the fees. An example follows: Let's say you install a new 200-amp service panel and use only 30 circuit breakers. The fee for a 200-amp service is $35.00 and each branch circuit (circuit-breaker) is $5.00. Take the number of branch circuits times $5.00 and add the service fee: $5.00 x 30 (branch circuits) = $150.00 + $35.00 (200-amp service) = $185.00 inspection fee. Submit this amount with the applications. See the applicable fee schedule on the application for exact fee.

Inspection

When the application is received and processed the permit will be issued and sent to you. The permit is in the form of a yellow job-site card, which you must post in plain view so the inspector can see it when he is on the project. When he makes inspections he will sign and date the card indicating the type of inspection he made.

To request inspection call the telephone number listed under the Inspector's name on the wiring permit. You can leave a message on their voice mail 24-hours a day. State your name, your telephone number, your permit number, and whether you're are requesting a rough-in, final inspection, or re-inspection. After you leave your message on the inspectors voice mail, the inspector will contact you to schedule an inspection.

Wiring Standards

Receptacle Outlets

Receptacle outlets must be installed in every habitable room of the residence so that no point on any wall is over 6' from an outlet in the unbroken wall space of the room. In other words, you need an outlet within 6' of a doorway or fireplace, but in the rest of the room the outlets may be 12' apart if there is no break in the wall between them. It is permissible to measure around corners. Any wall space 2' wide or greater requires a receptacle outlet. Receptacle outlets in the ends of permanently installed baseboard heaters may be counted to meet the above requirements. Such receptacle outlets shall not be connected to the heater circuit. An outlet over 5'6" above the floor cannot be counted as an outlet in that space. Outlets in floor boxes within 18" of the wall may be counted as an outlet in that space. See NEC Section 220.14(I). It is recommended that no more than 10 receptacles be installed on a 15-ampere circuit, and no more than 13 on a 20-ampere circuit for general use. The two (minimum) 20-ampere circuits for small appliances in the kitchen/dining area shall not supply other loads such as lights, exhaust hoods, etc. (210.52(b)(2))

Every hallway 10' or longer must have at least one receptacle outlet. Section 210.52(h). Every bathroom must have a receptacle outlet located on an adjacent wall and within "36 of the outside edge of each basin. Section 210.52(d). The bathroom receptacles must be on a dedicated 20-ampere circuit with no other receptacles or lights on it. Section 210.11(c)(3). An exception to this rule is if a 20-ampere circuit is run to each individual bathroom, then you are allowed to have the bathroom lights on the circuit also. Section 210.11(c)(3)(Exception). However, if one 20-ampere circuit feeds more than one bathroom, no other receptacles or lights shall be on it.

You must install at least one receptacle outlet for laundry facilities. Section 210.11(c)(2). The laundry receptacle outlets must be a 20-amp circuit and this circuit shall have no other receptacle

outlets or lights. The laundry outlet must be within 6' of the intended location of the laundry equipment. Section 210.50(c).

You must install at least one receptacle outlet outside at grade level both at the front and back of the dwelling. Section 210.52(e)(1).

You must install at least one receptacle outlet in addition to any provided for laundry equipment in each basement. 210.52(g)(3).

You must install at least one receptacle outlet in each attached garage, and in each detached garage with electric power. Section 210.52(g)(1).

In kitchens and dining areas, a receptacle outlet must be installed at each counter space 12" or wider. Receptacle outlets shall be installed so no point along the counter wall is over 24" from a receptacle. Each wall space behind each counter top space broken by a sink, appliance or other equipment must be counted as new wall space. Receptacle outlets behind refrigerators, freezers, or other fixed or stationary equipment shall not count as an outlet in that wall space. Section 210.52(c).

Circuits

Wire sizes given are for copper conductors only. Non-metallic sheathed cable, NMB, (romex) may be used in dwellings.

Kitchen: The counter top area must have receptacle outlets supplied by at least two 20-ampere circuits, (12 gauge wire, 20-ampere overcurrent protection). Those in the dining area must also be fed from a 20-ampere circuit, which may extend from the kitchen circuits. These 20-ampere circuits shall supply no other loads. Section 210.52(b)(2).

Dishwasher: If installed, a separate circuit of the proper ampere rating must be installed for the dishwasher.

Garbage Grinder or Compactor: A separate circuit of the proper ampere rating must be installed for each. Permanently installed appliances cannot be cord and plug connected. Install a length of flexible conduit over the romex cable to the unit for mechanical protection of the cable.

Range: For New Construction: A circuit suitable for the load (40-amperes) is required for a range of 8 3/4 kW or more, either free standing or drop-in type. Three insulated #8 wires are required in the cable, plus a #10 separate equipment ground wire. The receptacle must be a 3-pole with ground (4-wire) 50-ampere device, and the neutral at the range must be disconnected from the frame. The separate equipment ground wire of the range connection must be attached to the frame of the range. Section 210.19(a)(3).

Clothes Dryer: For New Construction: A 30-ampere circuit is required for the clothes dryer. Three insulated 10 gauge wires, plus one 10-gauge equipment ground wire are required in the cable. The receptacle must be a 3-pole with ground (4-wire) 30-ampere device, and the neutral at the dryer must be disconnected from the frame. The separate equipment ground wire of the dryer connection must be attached to the frame of the dryer.

For Replacement Of Existing Ranges And Dryers: For replacements, the existing 3-wire circuit can be re-used. However, any time new wire is installed, for instance to extend a range or dryer circuit to a new location, the whole circuit, including the receptacle and pigtail for the appliance, must be changed to 4-wire.

<u>Important:</u> Remember, if the circuit is 3-wire, make sure the bonding strap between the appliance frame and the neutral is installed. If the circuit is 4-wire, make sure the bonding strap is removed.

Water Heater: A circuit sized 125% of the nameplate rating is required for the electric water heater. This is usually a 30-ampere circuit. If the water heater is not within sight and within 50' of the panel, a disconnect switch is required at the water heater. The disconnect switch must be rated 125% of the full-load current of the water heater. Section 422.11(f)(3).

Furnace: A separate circuit is required for the furnace. If the furnace is not within sight and within 50' of the panel, a disconnect switch (a single-pole switch for a gas furnace, a safety switch for an electric furnace) is required at the furnace. The disconnect switch must be rated 125% of the full-load current of the furnace.

Ground-Fault Circuit-Interrupter (GFCI)

Ground-fault circuit-interrupter (GFCI) protection must be provided for the following 15- & 20-ampere, 125 volt receptacles at dwelling units. See Section 210.8.

1. All bathroom receptacles.
2. All garage, storage or accessory building receptacles; except those that are not readily accessible such as outlets for garage door openers, and a single receptacle (not duplex) for one appliance or a duplex receptacle for two appliances occupying dedicated space and which are not easily moved from one location to another, such as a refrigerator or freezer.
3. All outdoor receptacles.
4. All receptacles in crawl spaces at or below finished grade.
5. All receptacles in unfinished basements accept a single receptacle (not duplex) on a dedicated circuit for an appliance such as a refrigerator, freezer, washing machine or sump pump. For the purposes of this section only, GFCI protection is required unless the walls and ceiling are covered with finish material at the time of inspection.
6. All receptacles within 6' of a wet-bar sink.
7. All receptacles servicing kitchen counter tops.
8. All power supplied to hydro massage tubs, hot tubs, and swimming pools. See NEC Article 680 for more information.

Wiring

Holes drilled through framing members shall be centered. Where closer than 1 1/4" from either edge, a steel nail plate shall be installed to protect the wire. Romex shall be stapled a minimum of every 4 ½' , within 8" of single gang plastic boxes, and within 12" of multiple gang boxes. All multiple gang boxes require cable clamps for the cable. Each wire entering the box must not be cut shorter than 6" to allow connection. Either drill floor or ceiling joists to run the Romex through them or staple it to a running board. Exposed Romex must be protected from physical damage. You may use conduit as a sleeve to protect it. All splices must be made in a junction box, and all junction boxes must be accessible. Review Section 300.15 and 314.16 for number of conductors allowed in a box. Install only one wire under a screw. All metal boxes must be bonded with the equipment ground wire, using an approved screw or clip. Sheet metal screws, mounting screws, or cover screws are not approved to bond the box.

Lighting

A wall switched lighting outlet must be installed at each outdoor entrance or exit. A wall switched lighting outlet must be installed in every habitable room, in bathrooms, hallways, stairways, attached garages and detached garages with electric power. In habitable rooms other than kitchens and

bathrooms a wall switched receptacle outlet shall be permitted in lieu of a lighting outlet. Where lighting is installed according to the above in interior stairways, there shall be a wall switch at each floor level to control the lighting where the difference in floor levels is six steps or more. Section 210.70(a)(2). When wiring with Romex, three-wire cable shall be used in 3-way and 4-way switch circuits. A lighting outlet shall be installed in each basement. There shall also be one installed in any attic, crawl space, or utility room that contains equipment that could require servicing, or if the space is used for storage. Locate the lights at or near the equipment and the switches near the point of entry to the spaces mentioned above. Section 210.70.

Recessed: All recessed lights shall be listed for the intended use. All recessed lighting shall be thermally protected. All recessed lights in direct contact with thermal insulation shall be IC Rated. Section 410.116(a)(2).

Clothes Closet: Incandescent surface light fixtures are not allowed in any clothes closet unless they meet Section 410.8 requirements.

Service Equipment

FIRST, always consult the serving utility with your intentions. The service disconnecting means shall be installed at a readily accessible location nearest the point of entrance of the service conductors in or on the house. Locate it on an outside wall to minimize the length of unfused service wires entering the house. The service entrance equipment must be grounded and bonded as required by Article 250. The grounding electrode conductor is sized per Article 250.66. This conductor shall be run in one continuous length from the neutral bar of the service disconnecting means to the metal water line. The connection shall be made within 5' of the point the metal water line enters the house. A ground rod must also be installed as a supplement to the metal water line ground. If no metal water line is available on premises, then only a ground rod needs to be installed. The #6 copper ground wire connected to the ground rod must be protected from physical damage. If metal conduit is used to protect it, the conduit must be bonded to the wire. Therefore, it is better to use PVC to protect it. Metallic conduits for service entrance conductors shall be adequately bonded to service equipment enclosures (i.e., bonding bushings for concentric knock outs, reducing washers, or locknuts). Insulating bushings shall be installed where required on fittings to protect service conductors. All conductors exposed to earth must be listed for direct burial.