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Inspection Item

II. ELECTRICAL SYSTEMS

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A. Service Entrance and Panels

Comments:

Items noted during the visual inspection that require comment, are in need of repair, adjustment, restoration, continuation of the due diligence process and/or servicing or items noted for information include but are not limited to:

Electrical service was provided to the house by underground conductors. The conduit protecting the conductors was continuous and was not damaged, where visible. The meter was securely attached to the structure. The grounding conductor was visible and appeared to be securely fastened to the grounding electrode. Information.



The conduit between the meter can and the main breaker panel was PVC. PVC pipe does not conduct electricity. As PVC pipe was used, there was no bond established between the meter can and the main panel. A bond is required to equalize electrical potentials. A bonding conductor could be used from the interior of the meter can to the interior of the main panel. As shown in the photograph, no bonding conductor was installed. A proper bond should be created between the meter can and the main panel. The lack of a bond is an electrical shock/electrocution and fire hazard.

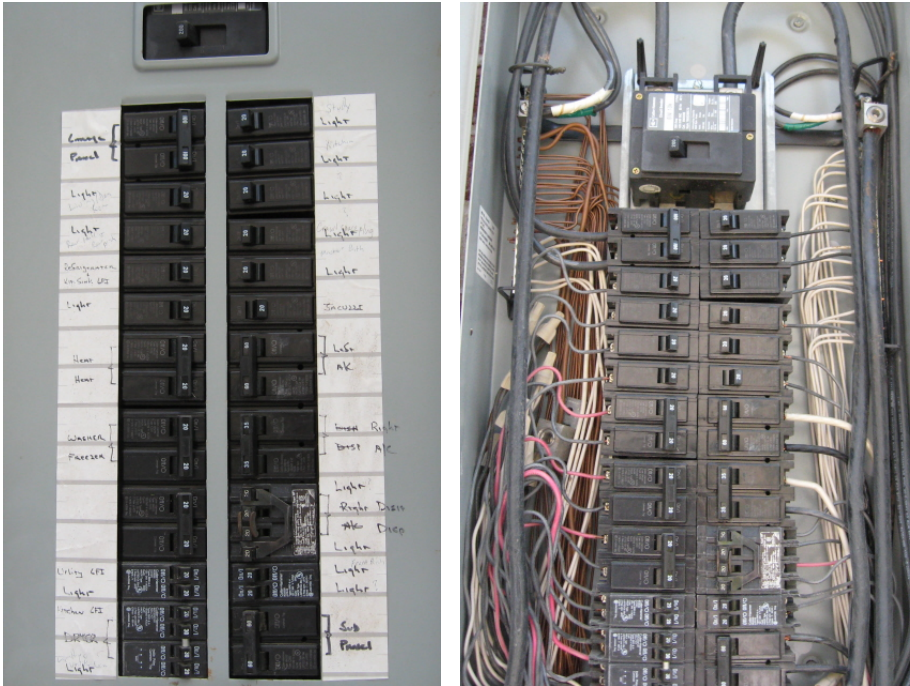
There was no earth grounding conductor between the meter can and the main panel. This indicates that the meter can was not bonded to the remainder of the electrical service equipment, as noted above, and that the meter can is not grounded to the earth. A proper grounding conductor should connect the meter can to the earth grounding system for safety.



MAIN PANEL: The breaker panel was an exterior 200 Amp Cutler Hammer box with 200 Amp main disconnects. The service entrance conductors were 2/0 copper conductors. The interior wiring to the house was copper. The branch circuits were rated as follows:

1 __ 100-240
2 __ 60-240
1 __ 35-240
1 __ 30-240
5 __ 20-240

4 __ 20-120
7 __ 15-120



The circuits were not properly labeled or identified in the breaker panel. As the circuits were not identified, it could not be determined if the circuits were properly sized for the listed appliances. Over sizing on any appliance is a recognized fire hazard. The National Electric Code, Section 408.4, states that identifying circuits as ‘bedrooms or wall outlets or light switches’ is not adequate. Labeling must be specific as to which appliances are to be protected by the over current device. The circuits should be rated and certified by a competent electrician according to the listings of the appliances.

The grounded conductors (neutrals) and equipment and branch circuit grounding conductors were not separated on different bus bars. The current installation causes electrical flow on the bonding bar. While the International Residential Code (IRC) allows this installation, the manufacturer of the panel does not. In all codes, the most restrictive covenants control. The manufacturer intended the bonding bar to equalize differing electrical potentials. The grounded conductors and the grounding conductors should be connected to their respective bus bars to allow the proper operation of the bonding bar.

The main disconnect and the house sub panel were not properly bonded or grounded. This condition can put electrical potential on the equipment grounding conductors which can result in an electrical shock or fire hazard. The neutrals and equipment grounding conductors must be completely separated, the neutrals must be solely attached to the neutral bus bars and neutral conductors, the equipment grounding conductors to the grounding bus bar and grounding electrode conductors and the grounding bus bar must be bonded to the sub panel housing. The main panel and house sub panel should be properly bonded for safety.

It is extremely important that no connection is made between the grounded conductors and the grounding conductors downstream of the main disconnect. Such a connection on the load side of the main disconnect could create a parallel path for fault-current and normal current. An exception to this rule is for the circuits to existing ranges and dryers. Another exception is where two or more buildings

are supplied from a common service and an equipment grounding conductor is not run with the supply conductors to the other building. Section 3507.2 of the IRC Commentary

The feeder neutral or grounded conductor of the supply must be insulated and is not bonded to the panelboard cabinet. It is kept separate from the grounding conductors and is not bonded to the separate building grounding electrode(s). The panelboard cabinet of the separate building has one terminal bus for the grounded conductors and another for the grounding conductors. The bonding screw supplied for the purpose of bonding the neutral terminal strip to the metal cabinet must not be installed, and this neutral terminal strip is insulated from the metal cabinet. The grounding electrode is connected to the equipment grounding terminal, which is bonded to the metal cabinet. If the neutral terminal bus and the equipment grounding conductor terminal bus were bonded together, the current intended to return via the neutral could also flow on the equipment grounding conductor. This is a fire and life safety hazard. From the IRC Commentary.

The panel appeared to be over-filled. Electrical components and conductors can fill an enclosure within strict limitations on the area used by the appliances. The flow of electricity generates heat and there must be ample air in which to diffuse the heat. The area limitations should be confirmed by an electrician or other areas created for splicing the conductors.

E3807.1 Enclosures for switches or overcurrent devices.

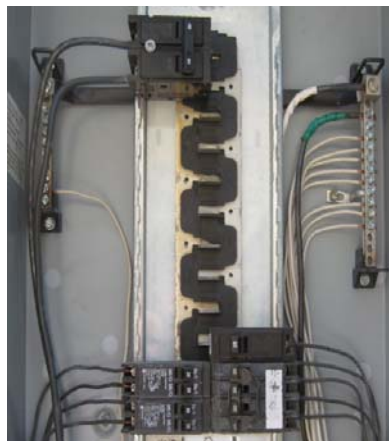
Enclosures for switches or overcurrent devices shall not be used as junction boxes, auxiliary gutters, or raceways for conductors feeding through or tapping off to other switches or overcurrent devices, except where adequate space for this purpose is provided. The conductors shall not fill the wiring space at any cross section to more than 40 percent of the cross-sectional area of the space, and the conductors, splices, and taps shall not fill the wiring space at any cross section to more than 75 percent of the cross-sectional area of that space.

Neutral conductors were used as hot conductors and were not identified. All hot conductors are required to be identified by the use of any color other than white, gray or green or bare copper per Section 3307.3 of the International Residential Code (IRC). The conductors should be properly identified for safety.

HOUSE SUB PANEL: The sub breaker panel was an exterior 125 Amp Cutler Hammer box with 60 Amp main disconnects. The service entrance conductors were #4 copper conductors. The interior wiring to the house was copper. The branch circuits were rated as follows:

2 __ 20-240

5 __ 20-120



The circuits were not properly labeled or identified in the breaker panel. As the circuits were not identified, it could not be determined if the circuits were properly sized for the listed appliances. Over sizing on any appliance is a recognized fire hazard. The National Electric Code, Section 408.4, states that identifying circuits as 'bedrooms or wall outlets or light switches' is not adequate. Labeling must be specific as to

which appliances are to be protected by the over current device. The circuits should be rated and certified by a competent electrician according to the listings of the appliances.

There were no equipment and branch circuit grounding conductors present in the panel box. There were not enough equipment and branch circuit grounding conductors in the main panel to indicate that the grounding conductors were terminated in the main panel. The locations of the termination of the grounding conductors should be determined. The terminations of the grounding conductors should be made in the sub panel for safety.

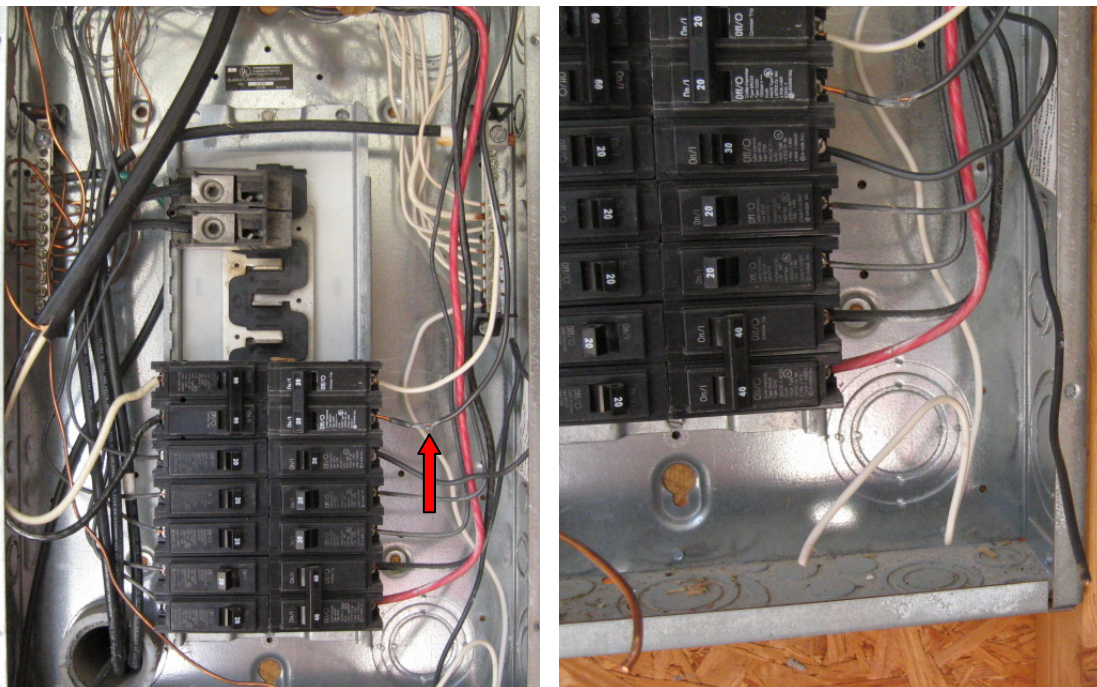
The grounded conductors (neutrals) and the service grounding conductor were not separated on different bus bars. The current installation causes electrical flow on the bonding bar. While the International Residential Code (IRC) allows this installation, the manufacturer of the panel does not. In all codes, the most restrictive covenants control. The manufacturer intended the bonding bar to equalize differing electrical potentials. The grounded conductors and the grounding conductors should be connected to their respective bus bars to allow the proper operation of the bonding bar.

As noted in the “Main Panel” section, the sub panel was not properly bonded to the electrical system or connected to the earth grounding electrode. This condition should be corrected for safety.

GARAGE SUB PANEL: The breaker panel was an interior 125 Amp Cutler Hammer box with 60 Amp main disconnects. The interior wiring to the structure was copper. The branch circuits were rated as follows:

1 __ 60-240
1 __ 40-240
1 __ 20-240

1 __ 20-120
7 __ 15-120



The conductors on the 30 Amp, 120 volt circuit had been cut and were terminated in the panel. The open ends of the ungrounded (hot) conductor and the grounded (neutral) conductor were in contact with the panel housing. The 30 Amp breaker had been turned off which relieved part of the hazard of live conductors being in contact with a metal housing however, grounded (neutral) conductors carry electrical current at all times. Had the 30 Amp breaker been operating, the panel box itself would have completed the electrical circuit. A fault or malfunction of the electrical equipment or conductors could also have caused a

circuit to have been created using the panel box. This was an extreme life/safety hazard. With your permission, I removed the conductors from the panel box. The photograph on the right above is of the terminations of the conductors after I had moved them out of the panel box.

The 30 Amp, 120 volt breaker was oversized for the #12 copper conductors attached to it. If the circuit is reestablished, either #10 copper conductors will need to be used in the circuit or the breaker will need to be replaced with a breaker rated for the size of the conductor.

The insulation was split on one of the ungrounded (hot) conductors in the panel. The uninsulated section of the conductor should be removed. A properly insulated conductor should be installed. Insulation is the inhibitor that keeps electrical current on its circuit. Failure of the insulation can allow a fault or short to occur.

COMMENTS FROM THE OTHER INSPECTOR

A. Service Entrance & Panels – Comments: This inspection covers the service entrance wiring, electrical panels and subpanels.

I NI NP R

☒ ☐ ☐ ☒

Wire Type(s) found in Main and Sub Panels:

Appropriate Connections:

☒ Copper

☒ Present

☐ Approved Copper / Aluminum Devices

☐ Pig Tailed Connections

☐ Other

☐ Aluminum

☐ Not Present

☐ Crimp Connections

☐ Other

☒ ☐ ☐ ☒ **B. Branch Circuits - Connected Devices and Fixtures** (Report as in need of repair the lack of ground fault circuit protection where required.):

Comments:

Items noted during the visual inspection that require comment, are in need of repair, adjustment, restoration, continuation of the due diligence process and/or servicing or items noted for information include but are not limited to:

The bonding cable on the water supply pipes was improperly installed. The bonding conductor was attached to the water pipes but the connection to the water pipe system was made on the tank side of the shutoff valve. Most valves are plastic lined or the pipe threads are treated when the unions are made. The linings and many of the treatments do not conduct electricity. The bonding conductor should be moved to the supply pipe to equalize electrical potentials in the piping systems.

The clamp material for the bonding conductor was not compatible with the water supply pipes. The differences in material cause electrolysis which will destroy the pipes. The clamps should be made of the same material as the pipes to prevent Galvanic action.



E3509.6 Metal water piping bonding.

The interior metal water piping system shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more

grounding electrodes used. The bonding jumper shall be sized in accordance with Table E3503.1. The points of attachment of the bonding jumper(s) shall be accessible.

E3509.7 Bonding other metal piping.

Where installed in or attached to a building or structure, metal piping systems, including gas piping, capable of becoming energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table E3808.12 using the rating of the circuit capable of energizing the piping. The equipment grounding conductor for the circuit that is capable of energizing the piping shall be permitted to serve as the bonding means. The points of attachment of the bonding jumper(s) shall be accessible.

There was inadequate clearance in front of the air conditioning mechanic's disconnects at the air conditioning condensing units. All energized electrical equipment and panelboards are required to have unobstructed access 36 inches deep in front of the equipment and 30 inches wide, at a minimum. Proper access for the disconnects should be provided according to Section E3305.2 of the IRC and Section 110.26(A) of the National Electric Code.

The intent of 110.26(A) is to provide enough space for personnel to perform any of the operations listed without jeopardizing worker safety. Examples of such equipment include panelboards, switches, circuit breakers, controllers and controls on heating and air conditioning equipment. It is important to understand that the word examination includes such tasks as checking for voltage with a portable voltmeter. 110.26(A) NEC



A cable clamp was missing from the garage air conditioning condensing units mechanics disconnect. Cable clamps protect the insulation on the conductors as they pass through the metal box. A cable clamp should be installed for safety.



The downstairs toggle switch on the staircase three way lighting circuit was a rheostat (dimmer). A rheostat should not be used as the purpose of the lighting fixture is to illuminate all treads and landings. The use of the rheostat could cause the treads and/or landings to be inadequately illuminated. This may create a trip hazard. The rheostat should be removed and replaced with a toggle switch.

Electrical appliance box extenders were not installed on electrical wall outlets and lighting switches installed through additional wall covering surfaces in the kitchen and bathrooms, etc. The electrical appliance boxes were fastened to the wall framing and there are spaces existing between the front of the appliance box and the cover plate. When electrical outlets and switches are installed through additional wall covering materials, such as tile or cultured marble, etc, an appliance box extender is required to be installed to seal the outlet box. See section E3806.5 of the International Residential Code.

E3806.5 In wall or ceiling.

In walls or ceilings of concrete, tile or other noncombustible material, boxes shall be installed so that the front edge of the box will not be set back from the finished surface more than 0.25 inch (6.4 mm). In walls and ceilings constructed of wood or other combustible material, outlet boxes shall be flush with the finished surface or project therefrom.



COMMENTS FROM THE OTHER INSPECTOR

I NI NP R
☒ ☐ ☐ ☒

B. Branch Circuits – (Report as in need of repair the lack of Ground Fault Circuit Protection where required.) Comments: This inspection covers electrical receptacles, switches and fixtures.

Branch circuit wiring	<input checked="" type="checkbox"/> Copper	<input type="checkbox"/> Aluminum
Branch circuit wiring is	<input checked="" type="checkbox"/> Grounded 3 wire	<input type="checkbox"/> Underground 2 wire
GFCI protection at	<input checked="" type="checkbox"/> Kitchen	<input checked="" type="checkbox"/> Bar <input checked="" type="checkbox"/> Bathroom <input type="checkbox"/> Laundry
	<input checked="" type="checkbox"/> Whirlpool	<input checked="" type="checkbox"/> Garage (note for freezer use)
	<input checked="" type="checkbox"/> Exterior outlets (below 5'6")	<input type="checkbox"/> Pool / Spa light

Comments: 1) Could not determine circuit feeding the extension cord to the sump pump in the crawl space. This should be a GFCI circuit.

I=Inspected NI=Not Inspected NP=Not Present R=Not Functioning or In Need of Repair
 I NI NP R Inspection Item

III. HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS

☒ ☐ ☐ ☒ **A. Heating Equipment**

Type and Energy Source: Central Forced, Natural Gas & Electricity

Comments:

Items noted during the visual inspection that require comment, are in need of repair, adjustment, restoration, continuation of the due diligence process and/or servicing or items noted for information include but are not limited to:

FIRST STORY UNIT: The work platform installed at the unit was inadequate. A work platform a minimum of 30 inches wide and 30 inches deep should be installed on each side of the unit for safe access to the unit as required by the manufacturer's installation instructions and by the model building codes.



GARAGE UNIT: The work platform installed at the unit was inadequate. A work platform a minimum of 30 inches wide and 30 inches deep should be installed on each side of the unit for safe access to the unit as required by the manufacturer's installation instructions and by the model building codes.

COMMENTS FROM THE OTHER INSPECTOR

I NI NP R
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A. Heating Equipment – (Type and Energy Source - **None**) Comments: This inspection covers gas and electrical heating systems.

Furnace(s)	<input type="checkbox"/>	Electric	<input checked="" type="checkbox"/>	Gas		
Gas Shut Off Valve	<input checked="" type="checkbox"/>	Present	<input type="checkbox"/>	Accessible	<input type="checkbox"/>	Not Present and/or Observable
Branch Line	<input checked="" type="checkbox"/>	Iron / Flex	<input type="checkbox"/>	Copper	<input type="checkbox"/>	

Comments: **Furnace operation good**