

DEPARTMENT OF CONSUMER & BUSINESS SERVICES
Oregon Occupational Safety & Health Division

MEMORANDUM

Date: August 25, 1997

To: All OR-OSHA Staff

From: Mike Mitchell, Occupational Safety Specialist
Standards and Technical Resources

Subject: Construction Hazard Alert - Electrical Panel Box Guarding

The attached memo is from Jerry Murray, Program Manager, Utility Safety Section, Public Utility Commission. It addresses a hazardous work practice that is commonly found on construction sites of removing the electrical panel box cover after the building inspector has approved the installation, and prior to service connection by the utility. This usually is done in order to allow subs, such as drywallers, to complete their work. The hazard is created when the utility company arrives to connect the service and energize the system. If there is a fault in the box or in the system an electrical explosion can occur, injuring workers who may be in the area of the inadequately guarded box. Cardboard, which sometimes is placed over the opening, does not offer adequate protection against such an electrical explosion. The approved panel cover does.

If someone in the field observes an unguarded panel box prior to service connection and after the building inspector has approved the installation, it is recommended that they explain the hazard to the general contractor and recommend reinstallation of the panel cover. They then should notify the local utility of the condition so that they will be aware of the situation at the time of service connection. If the service has already been connected and the system is energized, then the electrical panel must be effectively guarded either by the approved cover that came with the panel box, or by temporary covers, such as double thickness cardboard or something as effective (refer to letter to Tice Electric dated 5/24/93, and memo to Norma Cross dated 5/8/92).

August 8, 1997

TO: ALL OREGON ELECTRIC UTILITIES

RE: New Service Connection Precautions

Recently a complaint was made to the PUC regarding an electric utility's practice relative to new service connections to residences. We are sharing the information surrounding this issue in the interest of preventing electrical accidents and clarifying existing safety regulations. We hope this information encourages utilities to carefully evaluate their current new service connection practices.

Two months ago a number of general and electrical contractors challenged the authority of a major electric utility to perform inspections on customer premises and to deny service because of an unsafe condition. The electric utility was refusing to connect a new residence because the main breaker and its panel enclosure (service equipment) was not adequately covered. The panel opening was apparently covered with a cardboard material. The electrician asserted that the manufacturer's panel cover would be installed after the sheetrock and painting work was completed.

In this case PUC staff supported the electric utility's position that it was right and prudent to perform verification checks of the customer's "service equipment" before the customer's facility was energized. Also, PUC staff affirmed that the utility had a clear safety obligation to refuse service until the service equipment was fully enclosed or guarded per National Electrical Code (NEC) and National Electrical Safety Code (NESC) requirements. The PUC also cautioned the utility to make sure that this practice is uniformly applied to all new customers.

Rationale: New customer electrical installations must comply with Oregon Building Code Division regulations (OAR Chapter 913, Division 305). These regulations adopt the NEC as the minimum standards for all building electrical wiring and equipment. PUC regulations and utilities tariffs also emphasize NEC compliance (see Attachment B, items D, E, and F.) and give the right to the utility to refuse if safe service cannot be given. Specifically, the NEC sets very clear standards that energized parts shall be enclosed or guarded. These standards are covered in NEC sections 230-62, 110-17, and 110-12a (see Attachment A).

Moreover, the electric utility has duties under NESC Rules 214; 420 and 441 (see Attachment B) to make sure that it is not knowingly creating or leaving an electrical hazard. Therefore, the utility has obligations to take safety precautions including inspections and tests before it energizes a new service installation and before leaving the customer's premises. Although the specific precautions are not prescribed, checking service equipment ratings, verifying that the main breaker(s) is turned "OFF" and the service equipment is fully enclosed and grounded are reasonable and prudent measures by the utility.

Per NEMA national standards indoor electrical equipment enclosures and covers must be designed to: (1) prevent personnel and public contact against accidental contact with enclosed electrical energized parts; and, (2) protect internal devices from external conditions. Cardboard, a combustible material of questionable strength, is not a suitable material that meets either of these two conditions, especially on a construction site where unqualified workers, children or other members of the public may be present.

The process of energizing a new service is an especially critical time when there is a higher probability for electrical faults. Such short-circuits can result from faulty equipment, human errors in wiring, vandalism, or the presence of small animals or foreign materials, etc. Consequently, before the service is connected by the utility, the service equipment must be fully enclosed or guarded to prevent accidental contact and to contain and limit any fault, should it occur. In all probability a manufacturer of the panel will not guarantee its equipment against personal injury or property damage if an unauthorized cover (i.e. cardboard) is used. The guarantee would only apply if the panel is completely assembled with the cover that was designed and tested by the manufacturer, and approved by UL or another authorized testing laboratory.

PUC safety staff agrees that utilities should promote "metermains" in new installations to reduce utility involvement inside of buildings and to improve safety. Safety is improved by providing an outside main disconnect that can be used when the meter is initially installed or when later reconnected. It also provides a outside disconnecting means that can be used in case of fire or when the house wiring needs to be deenergized. Moreover, the metermain provides for better overload and short-circuit protection for the customer's wiring. Although a metermain may cost more than a standard meter socket, it offers benefits that oftentimes offsets the extra cost. For example, it allows the circuit panel to be more centrally located within a home or small business, reducing branch circuit wiring costs, and improving power quality and energy efficiency for the customer's equipment.

In issuing this letter the PUC is in no way implying that it is the duty of electrical utilities to approve or to assume NEC inspection responsibility for the customer electrical service equipment. That responsibility must remain with the customer, the customer's electrician and the local building codes organization having enforcement jurisdiction. However, PUC staff believes that it is a good practice that the company's service personnel perform a safety check of customer equipment that they will be energizing before any new service connection is made. One of those checks should be to make sure that the service equipment covers are fastened in place and no energized part is exposed. If this type of safety violation or other NEC violations are found that threaten life or property the connection should be denied and the customer notified of the hazards involved.

I hope this information is of help to your company in affirming or revising your new customer

connection practices. Please forward this letter to the appropriate operations and engineering personnel for review in your company. If you have any questions or comments about this letter, please do not hesitate to call Bob Sipler at (503) 373-7451 or me.

Jerome A. Murray
Program Manager
Utility Safety Section
(503) 378-6626

Attachments

cc: Junior Owings, Oregon Building Codes Division
Mike L. Mitchell, OR-OSHA

Reference	Regulation, Code, or Standards Language
(a) NEC Article 100	<p data-bbox="493 401 922 436"><u>Definition Of Service Equipment:</u></p> <p data-bbox="493 438 1127 695">The necessary equipment, usually consisting of a circuit breaker or switch or fuses, and their accessories, located near the point of entrance of supply conductors to a building or other structure, or an otherwise defined area, and intended to constitute the main control and means of cutoff of the supply.</p>
(b) NEC Section 230-62	<p data-bbox="493 814 1024 850"><u>Service Equipment) Enclosed or Guarded</u></p> <p data-bbox="493 852 1068 926">Energized parts of service equipment shall be enclosed as specified in</p> <p data-bbox="493 928 1094 963">(a) below, or guarded as specified in (b) below.</p> <p data-bbox="493 966 1024 1115">(a) Enclosed. Energized parts shall be enclosed so that they will not be exposed to accidental contact or guarded as specified in (b) below.</p> <p data-bbox="493 1157 1029 1562">(b) Guarded. Energized parts that are not enclosed shall be installed on a switchboard, panelboard, or control board and guarded in accordance with Sections 110-17 and 110-18. Where energized parts are guarded as provide in Sections 110-17(a)(1) and (a)(2), a means for locking or sealing doors to energized parts shall be provided.</p>
(c) NEC Section 110-17 (a)	<p data-bbox="493 1640 1162 1675"><u>Guarding of Live Parts (600Volts, Nominal,or Less)</u></p> <p data-bbox="493 1677 1019 1934">(a) Live Parts Guarded Against Accidental Contact. Except as elsewhere required or permitted by this Code, live parts of electric equipment operating at 50 Volts or more shall be guarded against accidental contact by approved</p>

enclosures or by the following:

- (1) By location in a room, vault, or similar enclosure that is accessible only to qualified persons.
 - (2) By suitable permanent, substantial partitions or screens so arranged that only qualified persons will have access to the space within reach of the live parts. Any openings in such partitions or screens shall be so sized and located that persons are not likely to come into accidental contact with the live parts or to bring conducting objects into contact with them.
 - (3) By location on a suitable balcony, gallery, or platform so elevated and, arranged as to exclude unqualified persons.
 - (4) By elevation of 8 feet or more above the floor or other working space.
- (b) Prevent Physical Damage. In locations where electric equipment is likely to be exposed to physical damage, enclosures or guards shall be so arranged and of such strength as to prevent such

damage.

- (c) **Warning Signs.** Entrances to rooms and other guarded locations containing exposed live parts shall be marked with conspicuous warning signs forbidding unqualified persons to enter.

(d) NEC Section 110-3(b)

Installation and Use.

Listed or labeled equipment shall be installed, used, or both, in accordance with any instructions included in the listing or labeling.

(e) NEC Section 110-9

Interrupting Rating.

Equipment intended to break current at fault levels shall have an interrupting rating sufficient for the nominal circuit voltage and the current that is available at the line terminals of the equipment.

(f) NEC Section 110-12
(partial)

Mechanical Execution of Work.

Electric equipment shall be installed in a neat and workmanlike manner. (a) **Unused Openings.** Unused openings in boxes, raceways, auxiliary gutters, cabinets, equipment cases or housings shall be effectively closed to afford protection substantially equivalent to the wall of the equipment.

Reference**Regulation, Code, or Standards Language**

National Electrical Safety Code (NESC) - minimum prescribed standard for the construction, maintenance of electrical supply and signal lines (authorized by ORS 757.035 and OAR 860-24-00 & enforced by OPUC (note 1)

- A. NESC Rule 214 A.1. & Rule 31 3.A.1. (Note 1) Initial Compliance with NESC Rules
Lines and equipment shall comply with these safety rules when placed in service.
- B. NESC Rule 420.C.4. (Note 1) Safeguarding Oneself (Lineman) and Others
Employees who work on or in the vicinity of energized lines shall consider all of the effects of their actions, taking into account their own safety as well as the safety of other employees on the job site, or on some other part of the affected electric system, the property of others, and the public in general.
- C. NESC Rule 441 (first sentence) (Note 1) Energized Conductors or Parts
Employees shall not approach, or knowingly permit others to approach, any exposed ungrounded part normally energized except as permitted by this rule.

Oregon Administrative Rules - Grounds for Refusal of Service

- D. OAR 860-24-0335 (Note 2) (6) Any utility shall refuse to provide service if a customer or applicant has not complied with state and municipal codes and regulations governing service and with the rules and regulations of the utility.
(7) A utility shall not accept an application for service or materially change service to a customer, if, in the best judgment of the utility, it does not have adequate facilities to render the service applied for, or if the desired service is of a character that is likely to unfavorably affect service to other customers.
(8) A utility shall refuse to serve a customer or applicant, if, in the best judgment of the utility, the

facilities of the customer or applicant are of such a character that safe and satisfactory service cannot be given.

Utility Tariffs and Standards

E. Typical Utility Tariff for POE, PP&L and IPC

Condition for Receiving Service

The applicant's wiring and equipment must conform with applicable municipal,(Note 3) county and state requirements, and to accepted standards of the NESC, NEC, practices before the Company will provide service. As required by law, a certificate of electrical inspection must be obtained by the Applicant before the Company will provide service.

F. PGE/PP&L Electric Service Requirements ... Book (Section 1.6) (Note 3)

Customer's Responsibility for Safety

The customer shall comply with all laws and regulations to protect themselves, their family, their employees, the Power Company and its employees, contractors, and all third parties from injury, loss, or damage.

Notes

1. Applies to all electrical utilities and supply lines within the State of Oregon.
2. Applies to investor-owned electric utilities regulated by the Oregon PUC.
3. Applies to only those utilities listed with this note.

INTEROFFICE MEMORANWM

Department of Insurance and Finance

May 8, 1992

TO: Norma Cross, Consultants

FROM: Marilyn Schuster, Manager
Standards and Technical Resources

SUBJECT: Protective Barriers and Covers for Energized Electrical Panels During
Construction Process

QUESTION 1:

What regulations apply to safe work practices and guarding requirements to protect against contact with energized electrical panels while in the construction process?

ANSWER:

During the construction process 1926.416 would apply. When electrical panels are energized and the panel is not covered with its finish cover plate, then the open space around the panel where the work is being done must be guarded by being barricaded off and warning-signs posted (1926.416(a)(3) and 1926.416(b)(1)).

If the area where the energized panel is located is a passageway, the area must be barricaded and employees restricted from the area around the panel.

QUESTION 2:

Do guidelines of the NECA apply on construction sites if the issue is not addressed in our code?

ANSWER:

No, electrical equipment must be listed by a testing lab, such as UL, and used in accordance with its listing and manufacturer's specifications (1926.403(a) and (b)).

QUESTION 3:

Under what circumstances, if any, may cardboard be used as a protective cover?

ANSWER:

The electrical panel must be effectively guarded (1926.416(a)(1)).

Guarded means covered, shielded, enclosed, or otherwise protected by means of suitable covers to remove the likelihood of approach to a point of danger or contact by persons or objects (1926.449).

Norma Cross
May 8, 1992
Page 2

The cover material must be firmly affixed to the panel and be strong enough that a bar or pipe, upon accidentally hitting the cover will not knock it out of place or allow the bar to penetrate it.

A thin piece of cardboard stuck in the front of the panel would not be an effective guard, however, a piece of cardboard to cover the breaker openings and the panel cover in place would be an effective cover.

Two thicknesses of heavy cardboard covering the panel and held in place with duct tape around the edges could also be an effective barrier with a sign warning of the electrical hazard.

QUESTION 4:

What is considered an approved cover? Can plywood be used if it is not considered an approved cover?

ANSWER:

All electrical equipment must be installed in accordance with its listing. The only approved cover would be the panel box cover that came with the electrical panel box (1926.403(i)(2)).

Temporary panel covers may be any material that will effectively isolate the live electrical parts and protect workers from electrical shock (1926.416(a)(1)). Plywood could be used as a temporary cover if installed so as to effectively protect workers from accidental contact with live electrical parts.

QUESTION 5:

If a temporary barrier or non-approved cover is used, how long of a time period could this be allowed? For example, if an electrician covered a panel with a non-approved cover for 5 minutes to obtain tools or left panels with a temporary cover overnight or for days.

ANSWER:

While work is being performed on the panel the open space around the panel must be barricaded or the panel covered with a temporary cover plate when the electrician is not working at the panel (1926.416(b)(1)).

There is no time limit on barriers or temporary covers. As long as the panel needs to be open to feed conductors into it or to hook up the breakers, a temporary cover could be used. When there is no need to have the live parts exposed, the approved cover that came with the panel must be in place. The panel must be used in accordance with its approval which calls for the cover plate, therefore, the plate must be in place.

1064-ORTECH/peb

Oregon Occupational Safety and Health Division (OR-OSHA)
160 Labor and Industries Building, Salem, OR 97310
(503) 378-3272 · FAX: (503) 378-5729

May 24, 1993

Tice Electric
2139 SE Belmont St
Portland OR 97214

Dear Mr. Yeager:

In response to your request to have your temporary electrical panel cover approved, there would appear to be no problem with its use. The panel cover is to be constructed out of "Coroplast," corrugated plastic material, have full length magnetic strips along two sides to hold the cover in place and have a warning sign on its face warning of live electrical conductors and other hazards.

To be an effective guard, the panel cover must be firmly attached to the panel and be strong enough so that objects will not penetrate it. Your cover appears to meet the requirements of 1926.416(a)(1).

It is OR-OSHA's policy not to approve or endorse any product or procedures. Varying working conditions and misapplication or use of your cover could create hazards beyond those anticipated in this review.

If I can be of further assistance to you, please call me at 378-3272.

Sincerely,

Matilyn K. Schuster, Manager
Standards and Technical Resources Section
Oregon Occupational Safety & Health Division
378-3272

2087-ORTECH/JH:peb