

Wisconsin State Electrical Code

SUPPLEMENT

In this supplement are included the amendments to the 1930 Electrical Code. These were adopted June 9, 1933, and become effective July 15, 1933.

It is suggested that immediately upon receipt of this supplement you mark the affected portions of your copy of the code. This will eliminate possibility of using obsolete orders.

Order 1031 F-3

Page 27

In installations such as farms where there is more than one building wired and there is no extended water system the conduit and neutral wire shall be grounded to an artificial ground at the service entrance. At each of the other buildings the conduit or raceway (if grounding is required by Order 1309.04-a) shall be grounded with the neutral wire to an artificial ground.

Order 1036. Separate Grounds and Ground Conductors.

Page 33

(A) *Grounding Conductors.* Grounding conductors from equipment and circuits of each of the following classes, when required by these rules, shall be run separately to the grounding electrode (or to a sufficiently heavy station grounding bus or system ground cable which is well connected to ground at more than one place and has a ground resistance less than 3 ohms.)

- (1) Lightning arresters.
- (2) Secondaries connected to low voltage lighting or power circuits.
- (3) Secondaries of current and potential instrument transformers and cases of instruments on these secondaries.
- (4) Frames of direct-current railway equipment and of equipment operating in excess of 750 volts.
- (5) Frames of utilization equipment or wire raceways other than covered by item (4), except that if a secondary distribution system has multiple grounds, service conduits may utilize the same grounding conductors.
- (6) Lightning rods. (See Order 1031 f, 4 and Part 6.)

Exception No. 1: Acceptable lightning protective devices having valve characteristics may be connected directly to the secondary neutral where extended metallic water systems are available and used provided that:

1. The lightning protective devices are protected by the transformer fuses.
2. The neutral or protective device is connected to ground at the transformer and the utility connects the neutral to an extended underground metallic water system at least 20 feet from the transformer.

The second ground may be omitted if the neutral is connected to an extended water system at at least two customers' entrances.

Exception No. 2: Where extended underground metallic water systems are not available, acceptable lightning protective devices having valve characteristics may have their ground leads connected to the secondary neutral through a gap having a break down of not less than 15 K.V. r.m.s. 60 cycle provided that:

1. The lightning protective devices are protected by the transformer fuses.

2. The protective devices' ground lead is run directly to ground and the utility places a ground on the secondary neutral at least 20 feet from the protective device ground.

Order 1304.04-c Page 206

Overhead wires shall enter buildings only in rigid steel conduit or as separate individual wires or through multiple-conductor service entrance cable approved for the purpose. Where open wires are used, drip loops shall be formed on the individual wires which shall then pass upward and inward through slanting, non-combustible, non-absorptive insulating tubes, directly into the service cabinet. Where rigid steel conduit is used it shall have weatherproof threaded or threadless joints and be equipped with approved service-head.

Order 1304.05-c-1 Page 207

Where the switch, fuses, and meter are combined in an approved device or compact combination of such devices having no live parts or wiring exposed, and capable of being sealed or locked, the switch may be so connected that it will not disconnect the meter from the supply line.

Order 1304.05-c-6 Page 208

In a single family residence having not more than six branch circuits not exceeding 150 volts to ground, approved type of circuit-breakers may be used in each branch circuit in place of fuses when these are grouped in a single readily accessible cabinet, provided the circuit-breaker may be operated and reset without opening the cabinet, that there is placed on the line side of the branch circuit-breakers a circuit-breaker or switch and fuses that will protect and open all ungrounded conductors supplying the branch circuit-breakers, and that approved means are available within cabinet for opening the grounded conductor.

Note: The branch circuit circuit-breakers do not substitute for the main service fuse or circuit-breaker called for in paragraph f of the following.

Order 1304.05-c-7 Page 208

Where the meter is installed in conjunction with sealable equipment with no live parts or wiring exposed, on alternating current circuits not exceeding 300 volts between conductors and 150 volts to ground, the meter may be placed on the supply side of the switch and fuses provided the capacity of the latter does not exceed 100 amperes.

Order 1304.05-f Page 208

Each ungrounded service conductor shall be protected by a fuse or automatic overload circuit-breaker arranged to cut off the current from all circuits fed through it, and from all devices, in such circuits other than the service switch, and under the conditions specified in paragraphs (c) 1 and (c) 7, of this section, the meter. Fuses, where used, shall be controlled by the service switch except where they are located at the outer end of the service conduit. A circuit-breaker, where used, shall be controlled by the service switch unless it is manually operable.

Order 1305.07-a Page 229

Cable shall not be used for circuits exceeding 300 volts between conductors nor where the cable is subject to a temperature exceeding 120 degrees F. (49 degrees C.).

Order 1305.07-b Repeal. Page 229

Order 1305.08-e Page 232

Metallic tubing and fittings shall be of the following electrical trade sizes, as determined by the internal diameter of the tubing: No tubing smaller than 1/2", electrical trade size, shall be used except as provided for under plaster extensions in Order 1305.10 and for enclosing the leads of fractional horsepower motors.

Nominal Electrical Trade Size	Approximate Actual Internal Diameter of Tubing
3/8 inch	0.493 inch
1/2	0.622
3/4	0.824
1	1.049
1 1/4	1.38
1 1/2	1.61
2	2.06

Order 1305.08-h Page 232

Electrical metallic tubing shall not be used for interior wiring systems of more than 300 volts, unless wires and cables are of lead covered type, nor for conductors larger than No. 6.

Order 1305.08-i Page 232

Electrical metallic tubing may be used for open or concealed work in locations where during installation or afterwards it will not be subject to severe mechanical injury nor to corrosive vapors. It may be buried in concrete, other than cinder concrete, or in masonry walls, if provided with water-tight fittings. It shall not be used in permanently wet locations.

Order 1305.08-n Page 233

Wires shall not be drawn into raceways of electrical metallic tubing until all mechanical work on the building

which is liable to injure the wires has been completed, as far as possible.

Order 1305.11 Repeal old order 1305.11 and add as new order. Page 235

Wireways and Busways

a. Approved types of wireways and busways and fittings may be used if installed in exposed dry locations in industrial premises for circuits of not more than 600 volts. They shall not be placed in hoistways nor where they will be subject to severe mechanical injury, nor where corrosive vapors are present, nor in hazardous locations. Busways may also be used as risers and feeders in office buildings of fire-resistant construction.

b. Wireways and busways shall be of substantial construction and all surfaces, both interior and exterior, shall be suitably protected from corrosion.

c. Wireways, busways and their fittings shall be of such designs and so installed that adequate electrical and mechanical continuity throughout the systems will be secured. Wireways and their fittings shall be designed so as to protect the contained wires from abrasion.

d. Runs of wireways shall be continuous throughout their entire lengths and shall be installed as complete systems without wires. Wires shall not be laid in until all the mechanical work on the building liable to injure the wires has been completed as far as possible. Wireways and busways may extend transversely through dry walls or partitions if in unbroken lengths where passing through. Wireways and busways shall be securely supported at least every five feet. Dead ends shall be closed by approved fittings.

e. Conductors used in wireways shall be approved rubber-covered wires, Type R, or shall have varnished-cloth insulation, Type VC wire, except that slow-burning wire, Type SB or asbestos-covered wire, Type A, shall be used where the wire when installed is subject to a temperature exceeding 120° F. (49° C.). On lighting circuits, joints or taps made and insulated by approved methods may be located within wireways when they are accessible by means of hinged covers or at pull boxes. In wireways, joints or taps on power circuits may be made only when special permission has been obtained.

f. Wireways shall not contain more than 30 conductors, unless special permission is obtained for the use of a larger number, or unless all conductors in excess of 30 are for signaling circuits or are control wires between a motor and its starter and used only for starting duty. In any case, the following provisions shall be observed:

1. No conductor larger than 500,000 C.M. shall be used.

2. The sum of the cross-sectional areas of all contained conductors shall not exceed 20 per cent of the interior cross-sectional area of the wireway.

3. The temperature of rubber-covered wires in a wireway shall at no time exceed 120° F. (49° C.).

g. Rigid or flexible conduits, electrical metallic tubing, surface metal raceways or armored cable shall be used in extensions from wireways or from busways and shall be connected to the wireway or busway in a manner that is approved for the material employed as specified in other sections of this article.

h. Wires of different systems shall not occupy the same wireway unless separated from each other by barriers in accordance with the provisions of paragraph n of Order 1305.03.

i. When alternating current is to be employed, all conductors of a circuit shall be placed within the same wireway in accordance with the provisions of paragraph o of Order 1305.03.

j. Busways shall be marked with the current rating for which they are designed. Wireways and busways shall be marked so that their manufacturer's name or trade name can be determined after the installation is made.

k. Plug-in connections or other devices for tapping off branch lines from busways shall be of approved types containing the necessary automatic overload protective devices required for the branch circuit.

l. Wireways and busways shall be grounded as prescribed in Section 130.9 of this code, and when grounded shall have bonding jumpers at expansion joints or telescoping sections.

Order 1305.16 *Non-Metallic Surface Extensions.* Page 236

a. Two-wire assemblies approved for the purpose may be used as extensions to existing convenience outlets on lighting and/or appliance branch circuits only in exposed dry locations in residence or office occupancies.

b. Attachment of such extensions to existing convenience outlets shall be by plug connectors approved for the purpose.

c. Such extensions shall be attached only to the surface of interior woodwork or plaster finish and shall not be installed as concealed wiring or run through floors or partitions or be installed where subject to moisture or corrosive vapors; nor be installed in contact with any piping, metal work, or other conductive material.

d. Such extensions shall not be made on circuits of over 150 volts.

e. Individual extensions shall not run more than 20 feet horizontally in either direction from the existing outlet, and may contain a maximum of three receptacles provided that the total outlets on the branch circuit including those on the extension are not over 12.

f. Such assemblies shall be secured between outlets to the surface wired over by tacks, screws, small nails or other approved means at intervals of not more than 6 inches, except that the assembly shall not be secured within 6 inches of a connector. The heads of such nails or screws shall not exceed in width one-half the space between the conductors in the assembly.

g. Receptacles and other fittings shall be of approved type and be secured to the surface wired over by suitable screws. The end of the assembly on such an extension shall terminate in an approved receptacle which covers the ends of the wires in the assembly. All angle bends which reduce the space between conductors shall be covered by an approved cap securely attached to the surface wired over.

h. Such extensions shall be made in continuous lengths without joint, splice, or tap, or exposed bare conductors.

Order 1305.17 Auxiliary Gutters. Page 235

a. Auxiliary-gutters, used to supplement wiring spaces at meter centers, distribution centers, switchboards and similar points of interior wiring systems may enclose wires and cables or bus-bars, but shall not be used to enclose switches, overload protective devices or other appliances or apparatus. An auxiliary-gutter shall not extend a greater distance than 10 feet beyond the equipment which it supplements except when an approved wireway or busway is used for the purpose.

b. Gutters shall be used only in exposed dry locations and for circuits which operate at not more than 600 volts. They shall not be used where they will be subject to severe mechanical injury nor where corrosive vapors are present, nor in Class I or Class II hazardous locations.

c. Gutters shall be constructed of sheet metal of thicknesses not less than in the following table:

Maximum Width of the Widest Surface of Gutters	Thickness (U. S. Standard Sheet Metal Gauge)
Up to and including 4 inches.....	No. 16—.062 inch
Over 4 inches and not over 18 inches.....	No. 14—.078 "
Over 18 inches and not over 30 inches.....	No. 12—.109 "
Over 30 inches	No. 10—.140 "

d. Covers shall be securely fastened to the gutter in an approved manner; and the gutter shall be supported at intervals not exceeding five feet throughout its entire length.

e. Gutters shall be of substantial construction and shall provide a complete enclosure for the contained conductors. All surfaces, both interior and exterior, shall be suitably protected from corrosion. Corner joints shall be made tight and where the assembly is held together by rivets or bolts, these shall be spaced not more than 12 inches apart.

f. Gutters shall be so designed and installed that adequate electrical and mechanical continuity of the complete raceway system will be secured.

g. Suitable bushings, shields or fittings having smooth rounded edges shall be provided where conductors pass between gutters, through partitions, around bends, between gutters and cabinets or junction boxes and at other locations where necessary to prevent abrasion of the insulation of the conductors.

h. Wires shall be approved rubber-covered wires, Type R, or shall have varnished-cloth insulation, Type VC, except that slow-burning wire, Type SB, or asbestos-covered wire, Type A, shall be used where the wire when installed is subject to a temperature exceeding 120° F. (49° C.). Where rubber-covered or varnished-cloth insulated wires are used, their outer braids shall be treated in an approved manner with a flame and moisture-proof compound. Joints or taps, made and insulated by approved methods, may be located within gutters if they are accessible by means of removable covers or doors.

i. The sum of the cross-sectional areas of all wires, including joints and taps, at any cross-section of a gutter, shall not exceed 20 per cent of the cross-sectional area of the gutter at that point, and no single compartment of a gutter shall contain more than 30 wires at any cross-section.

j. Busbars shall be securely and rigidly supported so that the minimum clearance between bare current-carrying metal parts of opposite polarities mounted on the same surface shall not be less than two inches, nor less than one inch when the parts are held free in air. A minimum spacing of one inch shall be secured between bare current-carrying metal parts and any metal surface. Adequate provision shall be made for expansion and contraction of busbars.

k. Taps from busbars shall leave the gutter opposite their terminal connections and conductors shall not be brought in contact with uninsulated current-carrying parts of opposite polarity.

l. Bare copper busbars in auxiliary gutters shall not be permitted to carry continuously currents greater than 1,000 amperes per square inch cross-section of the busbars.

m. Unfused tap connections from cables or busses shall comply with the provisions of Order 1308.05 of this code.

n. Wires of different systems shall not occupy the same gutter unless separated by barriers in accordance with the provisions of paragraph n of Order 1305.03 of this code.

o. When alternating current is employed, all conductors of a circuit shall be placed within the same gutter-compartment in accordance with the provisions of paragraph o of Order 1305.03 of this code.

p. All taps shall be suitably identified at the gutter as to the circuit or equipment which they supply.

q. Gutters shall be grounded as prescribed in Section 130.9 of this code.

Order 1309.04-d

Pages 287-288

Interior conduit and other interior wiring system raceways of metal, exposed metal of fixed current using equipment and control apparatus that are required to be grounded, the service conduit, service-cable sheath and service equipment may use the interior wiring system grounding conductor and its electrode for grounding when the connection is made on the supply side of the service switch and provided that the supply system is grounded at two or more additional locations not in the same building to a continuous metallic underground piping system, or to effective artificial grounds. The same procedure shall be followed at each individual building wired with a raceway system required to be grounded by Order 1309.04-a.

Note: Where ground resistance below 3 ohms cannot be obtained, attention should be paid to the selection of a suitable wiring method. In such a case metallic raceway systems should not be used.

Order 1350.02-a

Page 351

a. The tube shall be substantially supported and so installed as to be free from contact with flammable material, or for voltages exceeding 7500 volts, grounded metal objects. It shall not be unduly exposed to mechanical injury. Tube terminals shall comply with one of the following provisions:

1. They shall project within the sign enclosure; or
2. They shall be isolated from combustible material and inaccessible to unauthorized persons; or
3. For exposed signs in show windows they shall be entirely surrounded by glass or porcelain and the high-tension leads shall be approved for the purpose or shall be enclosed in a substantial glass tube or equivalent insulation so that no part of such lead or the metal terminal is exposed to contact; or
4. They shall be installed in separate enclosure approved for the purpose which shall consist of non-combustible, non-absorptive insulating material or of metal of thickness not less than No. 24 U. S. sheet-metal gauge. Such sheet metal shall be galvanized, treated with at least three coats of anti-corrosive paint, or otherwise suitably protected from corrosion. Connections at electrodes shall be mechanically and electrically secured and, unless a solderless connector approved for the purpose is used, shall be soldered.

Note: Rubber tape alone surrounding high-tension leads is not considered sufficient insulation.