

Revisions In
**Wisconsin State
Electrical Code**

Effective August 27, 1924

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Pursuant to Sections 101.01 to 101.31 inclusive of the statutes, the Industrial Commission on July 14, 1924, repealed the following general orders of the Wisconsin State Electrical Code, which have been in effect since September 13, 1922: 1020-3, 1031-b, 1034-a, 1035-a, 1036-a, 1101, 1121, 1142-b, 1142-c, 1217-e, 1218-c, 1220-a, 1228-c, 1228d, 1228-f, 1295-a, 1295-c, 1295-d, 1295-e, 1295-f, 1295-h, 1295-j, 1296-a, 1297-a, 1297-b, 1297-c, 1297-d, 1299, 1301, 1310-a, 1310-b, 1312, 1313-b, 1313-c, 1314, 1320, 1321-b, 1324, 1330-d, 1331-a, 1331-b, 1340-a, 1341-a, 1341-f, 1343-h, 1343-k, 1346-b, 1346-c, 1346-d, 1346-f, 1346-k, 1350-a, 1350-b, 1350-d, 1350-f, 1350-k, 1351-a, 1351-d, 1351-f, 1351-g, 1352-b, 1353, 1354-b, 1355-d, 1356-a, 1357-g, 1357-h, 1358-b-1, 1360, 1361, 1362, 1378-c, 1378-e, 1378-f, 1378-g, 1382, 1391-b, 1391-e, 1391-i. On the same day the Industrial Commission adopted the following general orders to take the place of those repealed:

Order 1020-3. **Circuit.** (a) In general means a conductor, or system of conductors and connected equipment, designed to carry an electric current.

(b) Branch circuit means that portion of a wiring system for utilization equipment extending beyond the final set of fuses or circuit-breakers protecting it. The term outlet, when used in connection with orders prescribing the protection of branch circuits, means points on such circuits at which current is taken to supply fixtures, lamps, heaters, motors and current consuming devices generally.

Order 1031-b. Alternating Current Distribution Systems.

- (1) In alternating-current distribution systems the ground connection shall be made at the building service or near the transformer (or transformers) either by direct ground connection through water-piping system or artificial ground (see order 1033) or by the use of a system ground wire to which are connected the ground conductors of many secondary mains, and which is itself effectually grounded at intervals that will fulfill the resistance and current-carrying requirements of Order 1035.
- (2) In single-phase, three-wire systems the ground connection shall be on the neutral conductor.
- (3) In single-phase, two-wire systems the ground connection shall be on the neutral point or on either conductor.
- (4) In two phase, three-wire systems, the ground connection shall be made to the conductor common to both phases. In two phase, four-wire systems, a ground connection shall be made to the neutral point of each phase.
- (5) In three phase, three-wire, delta systems, the ground connection shall be made on one phase conductor or on the neutral point of one phase.
- (6) In three phase, three-wire, or four-wire, star connected systems, the ground connection shall be made at the point common to all the phases.
- (7) In the absence of a direct ground connection at all building services, ground connections shall be made to the grounded neutral or other grounded conductor of a secondary system supplying more than one utilization equipment, at intervals that will fulfill the resistance and current-carrying requirements of Order 1035.
- (8) When the secondaries of transformers are supplying a common set of mains, fuses if installed shall be located only at such points as not to cause the loss of the ground connections after any fuses in the transformer circuits or mains have been blown.
- (9) Alternating-current secondary circuits shall not be grounded inside buildings, except at service entrance.

Note: In all cases, multiple grounds are preferable for alternating-current distribution systems, because of the assurance provided against loss of protection by the chance of disconnection of one ground connection.

Order 1034-a. **Water-Piping Connections.** Ground connections to metallic piping systems shall be made (except as permitted below) on the street side of water meters, but connections may be made immediately inside building walls to secure accessibility for inspection and test.

Exceptions: (1) When water meters are located outside of buildings or in concrete pits within buildings where piping connections are imbedded in concrete flooring, or other flooring reasonably insuring against the disturbance of water pipe, the ground connections may be made on the building side of the meters, if meters are suitably shunted.

(2) When the making of a ground to a piping system outside meter or other device would involve a long run, connection for equipment or conduit (but not for circuits) may be made to the water-piping system at a point near the part to be protected, provided there are no insulating joints in the pipe to prevent a good ground. In such cases, care should be taken to electrically connect all parts of the piping system liable to create a hazard (if they become alive) and to shunt the pipe system where necessary around meters, etc., in order to keep the connection with the underground piping system continuous.

Order 1035-a. **Limits.** The combined resistance of the ground wires and connection of any grounded circuit, equipment or lightning arrester shall not exceed the values given below:

Amperes	Water Pipe Grounds Ohms	Artificial Grounds Ohms
Less than 10	15	25
10 to 25	6	25
25 and above	3 or less	25

Exception: Where because of dry or other high-resistance soils it is impracticable with artificial grounds (other than those protecting low voltage alternating current distribution circuits) to obtain resistance as low as the values given above, two grounds as defined in Order 1034-c shall be installed except as in Order 1033-d-2, and no requirements will be made as to resistance.

Note: The current stated opposite the different resistances in the table is either the current-carrying capacity of a circuit from which leakage can occur to the grounded circuit or the continuous current-carrying capacity to which the grounded equipment conduit or lightning arrester is limited by design or by automatic cut-outs.

The product of the corresponding numbers in the first and second columns is never greater than 150—that is, the potential difference due to the stated current is never greater than 150 volts—where connections are made to water pipes.

Where more than one ground is made on the same circuit, equipment, conduit or arrester in the same vicinity, all such grounds are considered collectively in respect to meeting the requirements of this order.

Where a secondary is exposed only through transformer windings, this current-carrying capacity will be that of the primary fuse of the transformer. Where the secondary is exposed to the conductors of conflicting or crossing high voltage circuits, the current-carrying capacities will be those of the automatic cut-outs in such circuits.

Order 1036-a. **Ground Conductor.** Ground conductors shall be run separately to the ground (or to a sufficiently heavy grounding bus or system ground cable which is well connected to ground at more than one place) from equipment and circuits of each of the following classes:

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, conduit systems, etc., other than covered by Item 4.

6. Lightning rods.

Exception: A common ground conductor for secondary distribution circuits and service conduit at the service entrance will be permitted provided the utility supplying the service has placed on such secondary circuits one or more permanent and effective grounds as required by Order 1313 (b) which meet the resistance requirements of Order 1035.

Note: Lightning-arrester ground connections should be spaced as far as practicable from other artificial grounds. A space of at least 20 feet should be secured where possible.

Order 1101. **Electrical Supply Equipment in Factories.** Orders 1100 to 1199 inclusive also apply to electrical supply equipment, including generators, motors, storage batteries, transformers and lightning arresters installed in factories, mercantile establishments, or elsewhere, provided the equipment is in separate rooms or similar inclosed areas, in charge of a qualified person and accessible only to such person.

Order 1121. **Where Explosives and Inflammables Exist.** Where explosives and inflammables exist in dangerous quantities, the equipment shall be installed as called for in Order 1312, Section 113 of Part 3.

Order 1142-b. **Location.** (1) Switchboards shall be so placed that the operator will not be endangered by any live or moving parts of machinery or equipment located near the board and so as to reduce to a minimum the danger of communicating fire to adjacent combustible material.

(2) There shall be a space of three feet between top of switchboard and combustible material, unless switchboard is otherwise properly guarded to prevent igniting combustible material.

(3) Switchboards shall be accessible from front and rear when the connections are on the back.

Note: This is also desirable when all connections are in front of board.

Order 1142-c. **Required Equipment and Construction.** (1) Switchboards which control outgoing supply circuits shall be equipped with such instruments as are necessary to show operating conditions.

Exception: Switchboards in substations without regular attendance are exempted.

(2) Switchboards shall be made of non-combustible material.

(3) In wiring switchboards, the ground detector, volt-meter, pilot lights and potential transformers shall be connected to a circuit of not less than No. 14 wire that is properly protected by fuses. This circuit shall not carry over 660 watts.

(4) Insulated conductors, where closely grouped as in rear of switchboards, shall each have a substantial flameproof outer covering. Such flame proofing shall be stripped back on all conductors a sufficient distance from the terminals to give the necessary insulation for the voltage of the circuit on which the conductor is used.

Order 1217-e. **Pole Identification.** (1) Each utility owner in whole or in part, poles, towers, or structures for supporting supply or signal conductors shall mark such structures with the initials of its name, abbreviation of its name, corporate symbol, or other distinguishing marks, as follows:

(I) In a community where a particular kind of service is supplied by only one utility, structures owned in whole by this utility need not be marked.

(II) In a community where a particular kind of service is supplied by more than one utility at least every fifth structure owned in whole shall be marked by each such utility.

(III) All jointly owned structures in urban districts shall be marked by all utilities owning an interest.

Note: The marking of the first, last and each tenth intervening structure of continuous runs of uniformly and jointly owned structures in urban districts and the marking of the first, last and fortieth intervening structure in rural districts will be considered compliance.

- (IV) Structures adjacent to a point where the ownership in whole or in part changes shall be marked by the utilities concerned.
- (V) Structures at one side of railroad crossing shall be marked.
- (VI) Double structures, such as span poles, supporting wires, "H" fixtures, etc., shall be identified by marking one structure of the pair.
- (2) The identification marks shall be made with paint, stamps, metal tags, brands, or other effective means. The marks shall be of such size and so spaced and maintained as to be easily readable from the ground.
- (3) The identification mark shall be placed where practicable between five and seven feet from the ground and on the side of the structure facing the ordinary vehicle traffic.

Order 1218-c. **Protective Covering.** All supply conductors in urban districts, except trolley contact conductors and railway feeders supported on span wires between trolley contact conductors, operating at less than 5000 volts between conductors, when installed, shall have standard weatherproof covering or its equivalent.

Order 1220-a. **Heights of Wires.** The clear space between the lowest overhead line conductor, guy, messenger, arc or trolley span wire or lightning protection wire and the surface of rails, streets, highways, alleys or generally accessible spaces across or above which the former pass, shall not be less than that given in Table 3 at 60 F, with no wind, where the conductor or wire has fixed supports and the span does not exceed 150 feet.

Table 3. CLEARANCE FROM RAILS, STREETS, HIGHWAYS, ETC.

The numbers represent the clearance in feet to be provided by the conductors or wires of classes specified at the heads of columns above places specified at the side of the table.

Nature of Crossing	Signal Conductors Messengers, Guys, Spans, Lightning Protection Wires, and Supply Lines and Services Less than 300 Volts to Ground	All Con- ductors Operating at Voltages from 300 Volts to Ground up to 15,000 volts Between Conductors	All Con- ductors Operating at voltages from 15,000 to 50,000 Volts Between Conductors	Trolley contact conductors (Not feeder cables)
	Feet	Feet	Feet	Feet
Crossing above track rails of steam railroads.....	(1) 27	(1) 28	30	22
Along streets or alleys in urban districts	(2) 18	20	22	(3) 16
Crossing streets or roads in urban or rural districts	24	24	24	24
Along the roads in rural districts or other places where vehicles are liable to pass	(2) 14	18	20	(3) 16
Crossing above spaces or ways accessible to ped- estrians only	(4) 10	15	17	(3) 16

(Reference numbers refer to exceptions and additions on next page).

- (1) This clearance may be reduced to 25 feet when paralleled by trolley contact conductor on same street or highway.
- (2) This does not apply to guys which are not carried over, but merely beside, streets or alleys unless also over driveways. Over roadways to residence garages 10 feet is sufficient clearance.
- (3) This clearance is the minimum clear height in the middle of the trolley contact conductor span and the point of support at the trolley hanger should be at a height not less than 2 feet in addition to this minimum, thus allowing 2 feet for the total maximum sag at 60 F. in span wire and trolley contact conductor.
- For trolley contact conductors of more than 750 volts to ground this clearance shall be increased by 2 feet.
- (4) For guys 8 feet will be sufficient and no clearance is required for anchor guys not passing across pathways, or for those parallel with sidewalk curbs where traffic guards are provided.

Order 1228-c. **Clearance of Supply Lines of not More than 7500 Volts.**

- (1) Supply conductors operating at voltages not exceeding 7500 (unless in grounded conduit or metal sheath cable or otherwise rendered inaccessible) shall be so arranged that they do not come nearer than 3 feet measured horizontally from any point on the surface of a building or its attachments, or nearer than 8 feet above the top of any building or above any balcony or other platform crossed over.
- Exception: Service drops operating at less than 300 volts are exempted from this requirement for horizontal clearance and need not be more than 3 feet above building roofs which cannot readily be walked on.
- (2) Where the above clearance can not be provided or where supply conductors are placed near enough to windows, verandas, fire escapes or other ordinarily accessible places to be exposed to contact of persons, the conductors shall be properly guarded by conduit barriers or otherwise.

Order 1228-d. **Clearance of Lines of More than 7500 Volts.** Conductors operating at voltages exceeding 7500 volts (unless in grounded conduit or metal sheathed cable or otherwise rendered inaccessible) shall be carried at such height and distance from buildings as not to interfere with firemen in event of fire. If within 25 feet of a building they shall be carried at a height not less than that of the front cornice. The height shall be greater than that of the cornice as the wires come nearer to the building in accordance with the following table:

Distance of Wire from Building	Elevation of Wire above Cornice of Building
Feet	Feet
25	0
20	2
15	4
10	6
5	8
2½	9
0	10

Note: It is evident that where the roof of the building continues nearly in line with the walls, as in Mansard roofs, the height and distance of the line must be reckoned from the nearest point of the building instead of from the cornice.

Order 1228-f. **Crossing Roofs.** When it is necessary to attach wires to the roofs of buildings, the supporting structure shall be of substantial construction. Whenever feasible, wires crossing over buildings shall be supported on structures which are independent of the buildings crossed over.

Order 1295-a. **Protection.** Ducts shall be suitably reinforced or be laid on suitable foundations of sufficient mechanical strength where necessary to protect them from settling, and shall be protected by concrete or other covering where necessary to prevent their disturbance by workmen when digging, or by other causes.

Order 1295-c. Termination in Manhole. Iron pipe conduit terminating in manholes, handholes, or other permanent openings of underground systems shall be provided with an effective shield, bushing or other smooth outlet.

Order 1295-d. Clearances.

- (1) Duct runs shall provide as great a clearance from other underground structures as practicable, and particularly from gas lines. The distance between the top of the conduit covering and the pavement surface or other surfaces under which the duct run is constructed, shall be sufficient to protect the conduit from injury.
- (2) The top of the conduit structures shall generally be located at a depth of not less than 30 inches below the base of rail of street railway tracks, nor less than 42 inches below the base of rail of steam and electric railroads. By agreement, of the parties concerned, these clearances, where practicable or for other reasons, may be reduced, but in no case shall the top of the conduit structure extend higher than the bottom of the ballast section which is subject to working and cleaning.

Note: The above clearances are based on a duct formation, the width of which is not more than three creosoted wood, four vitrified clay, or four impregnated fibre ducts, or four iron or mild steel pipes, and do not apply to bridge type structures designed to sustain the weight of the roadbed and the operating load. When a wider duct formation is contemplated, additional strength of construction and protection should be provided or the conduit placed at a greater depth.

Order 1295-e. Walls Between Supply and Signal Conduits. Conduits, including laterals, to be occupied by signal conductors for public use shall, where practicable, be separated from underground conduit and laterals for supply conductors by not less than 3 inches of concrete or its equivalent.

Exception: Cable extensions may, however, be made to existing inter-connected or jointly owned and jointly occupied duct systems used in common by municipalities, signal and power companies, with less effective separations than above specified.

Order 1295-f. Supply and Signal Conduits Entering Manholes. Where signal conductors and supply conductors occupy ducts terminating in the same manhole, the two classes of ducts shall be separated as widely as practicable, and where practicable, shall enter the manhole at opposite sides, so that cables can be racked along side walls with a minimum of crosses between the two classes of conductors.

Order 1295-h. Opening into Manholes. Duct openings into manholes or handholes shall where practicable, have a clearance above the floor or below the roof line of not less than six inches, and from either side wall of at least four inches.

Order 1295-j. Dissipation of Heat. Conduits designed to carry supply cables of large current capacity shall be arranged, where practicable, so that ducts carrying such cables will not dissipate heat solely through other ducts.

Note: Conductors of large current carrying capacity should, where practicable, be placed in outside ducts where they will not necessarily dissipate heat solely through adjacent ducts.

Order 1296-a Separation of Supply and Signal Systems. Underground systems of electrical supply conductors and of signal conductors for public use shall in general, be maintained in separate conduits and particularly in separate manholes.

Exception: Cable extensions to existing interconnected or jointly owned and jointly occupied duct systems used in common by municipalities, signal companies, and power companies are exempted from the above.

Order 1297-a. Cable Sheath. Cables, unless rubber insulated, shall be provided with a water tight metal sheath or other water proof covering over their insulated coverings, except when used as ground connections or neutrals.

Note: Closely grouped lead covered supply cables should have suitable fire resistive coverings to prevent damage from arcing.

Order 1297-b. Guarding of Live Parts.

- (1) Protective, control or other apparatus on supply lines where installed and maintained in manholes and handholes shall have live parts inclosed in suitable cases. The metal sheathing of all conductors or cables shall be made mechan-

ically and electrically continuous with the metal cases of protective, control or other apparatus.

- (2) Joints or terminals of conductors or cables of underground electrical supply systems shall be so arranged that there are no bare underground current-carrying metal parts exposed to accidental contact within manholes or handholes.

Order 1297-c. Supports. Mechanical support shall be provided, where necessary, for all cables at each manhole, handhole, or other permanent opening.

Note: In handholes, which reach the top line of ducts only, or in small manholes, the conduit line itself serves as sufficient support for the cables.

Order 1297-d. Underground Risers.

- (1) Conductors or cables from underground systems which connect to overhead systems shall be mechanically protected. Exposed metal risers pipes containing supply conductors shall be grounded unless such conductors are covered with a grounded metal sheath or are themselves grounded.
- (2) Conductors or cables from underground system which connect to overhead systems shall, if operating at more than 750 volts to ground, terminate in suitable potheads, switches, or similar devices of approved design or construction.
- (3) Open supply wiring connecting to underground systems shall begin not less than 8 feet above the ground surface or platform accessible to the public.
- (4) When practicable, risers to contain conductors or cables used for signal systems shall not be placed on the same pole with risers to be used for supply systems. If, however, it is necessary to use the same pole for risers of both systems, the risers for the different systems shall, in so far as practicable, be placed on opposite semi-circumferences of the pole.

Order 1299. Multiple Connections. When transformers, regulators, or other similar apparatus not located in the same manhole, operate in multiple, special tags, diagrams, or other suitable means shall be used to indicate that fact.

Exception: Such marking is not required when suitable cut-outs are provided on both high and low tension sides of apparatus.

Order 1301. Equipment Accessible to Qualified Persons Only. Electrical utilization equipment, however, as well as generating equipment, if inclosed in a separate room or similar inclosed area, which is in charge of a qualified person and which is accessible only to such persons, may be installed in conformity with the orders applying to Electrical Supply Stations (Part 1) and in that case does not come under these orders.

Order 1310-a. Equipment.

- (1) All underground current-carrying parts of equipment operating at voltages higher than 100 volts to ground, shall be suitably guarded, if elevated less than 8 feet above floor or platform, or if exposed to contact above that level.

Exception: In locations where there are no exposed grounded surfaces within reach of persons when touching the parts under consideration and where none of the conditions listed as hazardous in Order 1312 exist, such parts operating at voltages less than 150 volts to ground are exempted from this order.

Note: See Orders 1100-1199 and Order 1354-a-1 for equipment located in inclosure accessible to qualified persons only.

- (2) Where guards must at times be opened, thereby exposing live parts, they shall be of insulating material or so arranged that they cannot readily make contact with live parts while being removed.
- (3) Where persons must at times enter inclosures while parts are alive the guards shall be of insulating material unless removed 4 feet horizontally from all live parts.
- (4) Under the conditions of (2) and (3) above, insulating mats or platforms shall be provided in locations having grounded floors.

Note: Switches and fuses, except on switchboards, must be inclosed at any elevation. (See also orders 1350-h and 1351-d.)

- (5) Such guards in locations subject to moisture shall be of the weatherproof type.

- (6) Such guards in locations subject to corrosive vapors shall be constructed of materials and in such manner that they will resist corrosion under the particular conditions.

Order 1310-b. Conductors.

- (1) All exposed conductors, not included in (2), (3) and (4) below, when brought closer to floor or platform than 8 feet, or when exposed to mechanical injury above that level, shall be guarded by inclosure in conduit, armored cable or surface metal raceways.

Exception: (1) At small platforms erected subsequent to the installation of the wiring or where metallic conduit, armored cable or metal raceways are subject to rapid deterioration from excessive dampness or other causes, open wiring may be inclosed by substantial wooden boxing, with an air space of one inch around the wires. Where boxing is used on vertical wires for part of the distance only, top of boxing shall be closed, and wires shall pass through holes bushed with non-absorptive, non-combustible insulating material.

(2) Trolley conductors, and lightning arrester ground conductors are exempted from this order.

- (2) All conductors in schools, theaters, assembly halls, hotels, hospitals, and public garages shall be guarded by inclosure in rigid or flexible conduit, armored cable or surface metal raceways.

Exception: Wiring for lighting purposes in schools and assembly halls of frame construction, may be of concealed knob and tube construction.

Note: (1) The Building Code defines assembly halls as including all buildings or parts of buildings not included under theaters where 100 or more persons assemble for entertainment, instruction, worship or dining purposes.

(2) A public garage is defined by the Code to include every building which accommodates more than two motor-driven vehicles.

- (3) Conductors operating at voltages higher than 300 volts to ground shall be guarded by inclosure in conduit, in all buildings and at all elevations.

- (4) Bus-bars and other open bare ungrounded conductors operating at voltages higher than 100 volts to ground, which are elevated less than 8 feet above floor or platform, shall be inclosed by suitable guards.

Order 1312. Where Explosives and Inflammables Exist. In locations where explosives, inflammable gas, or inflammable flyings normally exist in dangerous quantities, there shall be no exposed live parts. For enclosing live parts one or more of the following methods of protection shall be employed as may be required:

(1) When equipment is near inflammable material or when inflammable dust or flyings are present, casings of the inclosed type shall be used. All lamps shall be equipped with a vapor-tight globe and portable lamps with a substantial guard in addition. Wiring shall be in conduit, armored cable or surface metal raceways.

(2) When equipment is located where explosive or inflammable vapors or gases exist in dangerous quantities, casings of the explosion-proof type shall be used; sockets and incandescent lamps shall be inclosed in vapor-tight globes, rigidly supported and wired with rubber-covered wire soldered directly to the circuit. Wiring shall be in rigid metal. Conduit and all fittings and outlets shall be electrically and mechanically continuous with the conduit and fittings shall be sealed by effective means to prevent entrance of gases. Portable lamps shall not be used.

Order 1313-b. Alternating-Current Systems.

- (1) All secondary distribution systems operating at voltages less than 300 volts to ground shall be grounded.

Exception: Electrical furnace circuits are exempted from grounding requirements.

- (2) Secondary distribution systems supplying lighting service shall be grounded at each service entrance.
- (3) Secondary distribution systems supplying power service shall be grounded at the service entrance when the grounded conductor is extended to the service entrance and is necessary to supply service to the customer.
- (4) Electrical Utilities shall not make service connections from such systems to electrical utilization equipment unless the provisions of (1), (2) and (3) above have been complied with.

Order 1313-c. Noncurrent-Carrying Metal Parts. All exposed noncurrent-carrying metal parts of equipment operating at voltages above 100 volts to ground shall be bonded together and permanently and effectively grounded.

Exceptions: Grounding is not required for the following equipment:

- (1) All equipment in locations where there are no exposed grounded surfaces within the reach of persons when touching the parts under consideration, (normally elevated less than eight feet above the floor or distant less than five feet horizontally) and where none of the conditions listed as hazardous in Order 1312 exist, and provided the voltage at which the equipment operates is less than 150 volts to ground.
- (2) All equipment accessible only to qualified persons, provided it is effectively insulated from ground, provided insulating mats, platforms or floors are present, on which qualified persons may stand, and provided there are no exposed grounded surfaces within reach of said qualified persons, at such times as said qualified persons may be in contact with any live part.
- (3) Cases of toy and bell-ringing, transformers, cases of meters operating at less than 750 volts to ground, portable lamps and household appliances such as toasters, percolators, vacuum cleaners, etc., cases of transformers used exclusively to supply current to switchboard instruments installed and guarded in all respects as required for the higher voltages to which they are connected and name plates on switchboards and other apparatus.

Order 1314. Identification.

Note: (1) This order includes all such parts as frames of motors, cranes, cars, and switchboards, cases of transformers and switches, conduits, external metal parts of lighting fixtures, etc.

(2) The permanent grounding of frames of portable devices (especially in connection with voltages above 100 to ground, when the devices are used within 8 feet of the floor in locations such as bathrooms, laundries, etc., where persons may easily touch grounded surfaces at the same time as the device) may be obtained by the use of a three-wire portable cord with the portable device, one wire being used for the ground conductor and the connectors being properly designed so that wrong connections cannot be made by the user of the device.

(3) Where such grounding is difficult, as with lighting fixtures connected to knob-and-tube wiring, apparatus having external parts composed of non-absorbent, non-combustible insulating material is suggested.

(a) General. All electrical utilization equipment shall be suitably marked to indicate the voltage, capacity, intended use and other essentials for safe operation.

(b) Polarity. Unless sufficiently identified by position, the terminals of fixtures, lamp sockets and receptacles, plug receptacles and other outlet devices to which identified grounded conductors are to be attached, shall be composed of or plated with a white metal or alloy, such as zinc, nickel, silver, etc.

Order 1320. Services. Each building shall have a separate service.

Exception: When this is impossible or impracticable, or in the case of buildings of private plants not on opposite sides of a highway they may be interconnected with yard wires.

Note: Industrial Lighting Code also calls for two services for factories, mills, offices and other work places. School Lighting Code makes similar requirement for school buildings of more than one story hereafter constructed. (See Appendices G and H.)

Order 1321-b. Entrance Wires.

- (1) Service wires, operating at less than 750 volts, shall be enclosed in continuous rigid metal conduit, from the first support on the outside of the building to the main switch and fuses, and shall be run on the exterior of the wall to a point as close as practicable to the service switch required by Order 1324, except that the service conduit may be imbedded in tile, brick, concrete masonry and similar non-inflammable materials.

Exception: Where service can be brought directly into the back of the main service cabinet, porcelain tubes slanting upward to the inside may be used.

- (2) Conduit fittings equipped with non-combustible, non-absorptive insulating covers, with separate hole for each wire, slanting upward to the inside, shall be provided at the point of entrance of service wires.
- (3) Entrance wires shall be so arranged as to prevent the entrance of water to the building.

Order 1324. **Switches, Fuses and Circuit Breakers.** At a readily accessible point of the basement or first floor and as close as practicable to the point where service conduit enters the building, there shall be installed a main switch to disconnect all service conductors and equipment and main fuses to protect all ungrounded service conductors.

Exceptions: (1) The switch blade may be omitted in any grounded conductor if other means is provided within the service cabinet for disconnecting such conductors.

(2) Where the service switch, service fuses and meter are combined in a self-contained device, or compact combination of such devices, having no exposed wiring or live parts and having all other parts protected by fuses, main fuses may be installed on the line side of service switch and meters need not be protected by service switches and fuses.

(3) Yard wires of private plants supplying more than one building not on opposite sides of the highway are not considered as service wires, so that fuses would not be required in each building, if there are other cut-outs, which afford proper protection; conveniently located on the mains.

(4) Where not more than four meters are required for different classes of service or separate customers in the same building and these meters are located adjacent to each other, the requirement of a main switch will be waived if each service has its own switch and fuses and may be disconnected independently of the other.

Order 1330-d. **Drainage of Conduit in Damp Places.** Where there is probability of accumulation of water in conduit, due to condensation or other causes, the conduit shall be suitably drained or wires and cables shall be lead sheathed or have other covering designed to give equal or better protection.

Order 1331-a. **Number of Wires Permitted.** Wires installed in conduits shall conform to Tables 1, 2 and 2A.

Note: The following tables apply only to complete conduit systems, and do not apply to short sections of conduit used for the protection of exposed wiring from mechanical injury.

(For groups or combinations not included in the above tables, see Appendix C.)

TABLE 1. TWO-WIRE AND THREE-WIRE SYSTEMS.

Size of Wires	Number of Wires in One Conduit								
	1	2	3	4	5	6	7	8	9
	Minimum Size of Conduit in Inches								
14	1/2	1/2	1/2	3/4	3/4	1	1	1	1
12	1/2	1/2	3/4	3/4	3/4	1	1	1	1 1/4
10	1/2	3/4	3/4	1	1	1 1/4	1 1/4	1 1/4	1 1/4
8	1/2	3/4	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4
6	1/2	1	1 1/4	1	1 1/2	1 1/2	2	2	2
5	3/4	1 1/4	1 1/4	1 1/4	1 1/2	2	2	2	2
4	3/4	1 1/4	1 1/4	1 1/2	2	2	2	2	2 1/2
3	3/4	1 1/4	1 1/4	1 1/2	2	2	2	2 1/2	2 1/2
2	3/4	1 1/4	1 1/2	1 1/2	2	2	2 1/2	2 1/2	2 1/2
1	3/4	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3
0	1	1 1/2	2	2	2 1/2	2 1/2	3	3	3
00	1	2	2	2 1/2	2 1/2	3	3	3	3 1/2
000	1	2	2	2 1/2	3	3	3	3 1/2	3 1/2
0000	1 1/4	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4
200000 C. M.	1 1/4	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4
225000	1 1/4	2 1/2	2 1/2	3	3	3 1/2			
250000	1 1/4	2 1/2	2 1/2	3	3	3 1/2			
300000	1 1/4	2 1/2	3	3	3 1/2	3 1/2			

Size of Wires	Number of Wires in One Conduit								
	1	2	3	4	5	6	7	8	9
	Minimum Size of Conduit in Inches								
350000	1 1/4	2 1/2	3	3 1/2	3 1/2	4			
400000	1 1/4	3	3	3 1/2	4	4			
450000	1 1/2	3	3	3 1/2	4	4 1/2			
500000	1 1/2	3	3	3 1/2	4	4 1/2			
550000	1 1/2	3	3 1/2	4	4 1/2	5			
600000	2	3	3 1/2	4	4 1/2	5			
650000	2	3 1/2	3 1/2	4					
700000	2	3 1/2	3 1/2	4 1/2					
750000	2	3 1/2	3 1/2	4 1/2					
800000	2	3 1/2	4	4 1/2					
850000	2	3 1/2	4	4 1/2					
900000	2	3 1/2	4	4 1/2					
950000	2	4	4	5					
1000000	2	4	4	5					
1100000	2 1/2	4	4 1/2	6					
1200000	2 1/2	4 1/2	4 1/2	6					
1250000	2 1/2	4 1/2	4 1/2	6					
1300000	2 1/2	4 1/2	5	6					
1400000	2 1/2	4 1/2	5	6					
1500000	2 1/2	4 1/2	5	6					
1600000	2 1/2	5	5	6					
1700000	3	5	5	6					
1750000	3	5	5	6					
1800000	3	5	6	6					
1900000	3	5	6						
2000000	3	5	6						

Exceptions to Table 1.

Where single conductor, single braid, solid wires only, are used, four No. 14 wires may be installed in a 1/2 inch conduit and up to seven No. 14 wires in a 3/4 inch conduit. Three No. 12 wires may be installed in a 1/2 inch conduit, four No. 10 wires in 3/4 inch conduit and three No. 8 wires in a 1/2 inch conduit.

TABLE 2. THREE-CONDUCTOR CONVERTIBLE SYSTEM.

Size of Wires			Electrical Trade Size	
			Size Conduit	
two	14	and one	10	1/2 Inch
"	12	"	8	3/4 Inch
"	10	"	6	1 Inch
"	8	"	4	1 Inch
"	6	"	2	1 1/4 Inch
"	5	"	1	1 1/4 Inch
"	4	"	0	1 1/2 Inch
"	3	"	00	1 1/2 Inch
"	2	"	000	1 1/2 Inch
"	1	"	0000	2 Inch
"	0	"	250000	2 Inch
"	00	"	350000	2 1/2 Inch
"	000	"	400000	2 1/2 Inch
"	0000	"	550000	3 Inch
"	250000	"	600000	3 Inch
"	300000	"	800000	3 Inch
"	400000	"	1000000	3 1/2 Inch
"	500000	"	1250000	4 Inch
"	600000	"	1500000	4 Inch
"	700000	"	1750000	4 1/2 Inch
"	800000	"	2000000	4 1/2 Inch

TABLE 2A. STAGE POCKET AND BORDER CIRCUITS
ELEVATOR CONTROL CIRCUITS, ETC.

Size of Wire	Inch	Maximum Inch	Number of Wires Inch	Conduit Inch	Inch	Inch
	1	1 1/4	2	2 1/2	3	
14	11	19	26	43	61	95
12		15	21	34	50	77
10		12	16	27	38	60
8			13	22	31	49
6					14	22

Order 1331-b. **Wires of Different Systems.** A conduit shall never contain circuits of different systems.

Order 1334. **Wooden Raceways.** Wooden raceways shall not be used except in accordance with Exceptions (1) and (2) of Order 1310--b-1.

Order 1340-a. **Identification of Wires.**

- (1) The grounded conductor of lighting circuits, from the service head to every terminal, and all grounding conductors of circuits and equipment shall have a continuous identifying outer covering, readily distinguishing such conductors from other conductors.

Exception: Such grounded conductors of existing installation and all such grounded conductors larger than No. 8 A. W. G. in size may be identified by another effective method, such as by means of tags.

- (2) Identified grounded conductors of such lighting circuits shall be run without transposition throughout the entire installation and shall be properly connected at all fittings to identified terminals (See also Order 1314) in order to preserve continuity. The identifying covering of rubber covered wire shall be white or natural gray.

Exception: Grounded conductors of fixtures, pendant and portable cords need not have continuous identifying outer covering, but shall be identified in another effective and ineradicable manner.

- (3) Rubber covered wire, except armored cable and on switchboards, having white or natural gray continuous identifying outer covering, shall not be used as un-grounded conductors.

Order 1341-a. **General Table.** The following tables (Tables 3 and 3A), showing the allowable carrying capacity of copper wires and cables of ninety-eight per cent conductivity, according to the standard adopted by the American Institute of Electrical Engineers, shall be followed in placing wires.

TABLE 3. ALLOWABLE CARRYING CAPACITIES OF COPPER WIRES.

A. W. G. Number	Diameter of Solid Wires in Mills	Area in Circular Mills	Column A Rubber In- sulation Amperes	Column B Varnished Cloth Insula- tion Amperes	Column C Other Insulation Amperes
18	40.3	1,624	3		5
16	50.8	2,583	6		10
14	64.1	4,107	15	18	20
12	80.8	6,530	20	25	25
10	101.9	10,380	25	30	30
8	128.5	16,510	35	40	50
6	162.0	26,250	50	60	70
5	181.9	33,100	55	65	80
4	204.3	41,740	70	85	90
3	229.4	52,630	80	95	100
2	257.6	66,370	90	110	125
1	289.3	83,690	100	120	150
0	325.	105,500	125	150	200

A. W. G. Number	Diameter of Solid Wires in Mills	Area in Circular Mills	Column A Rubber In- sulation Amperes	Column B Varnished Cloth Insula- tion Amperes	Column C Other Insulation Amperes
00	364.8	133,100	150	180	225
000	409.6	167,800	175	210	275
		200,000	200	240	300
0000	460.	211,600	225	270	325
		250,000	250	300	350
		300,000	275	330	400
		350,000	300	360	450
		400,000	325	390	500
		500,000	400	480	600
		600,000	450	540	680
		700,000	500	600	760
		800,000	550	660	840
		900,000	600	720	920
		1,000,000	650	780	1,000
		1,100,000	690	830	1,080
		1,200,000	730	880	1,150
		1,300,000	770	920	1,220
		1,400,000	810	970	1,290
		1,500,000	850	1,020	1,360
		1,600,000	890	1,070	1,430
		1,700,000	930	1,120	1,490
		1,800,000	970	1,160	1,550
		1,900,000	1,010	1,210	1,610
		2,000,000	1,050	1,260	1,670

1 Mil—0.001 inch.

Exception:

Elevators, cranes, welders and other similar apparatus, which inherently is of such character as to require only intermittent service, may be wired in accordance with Table 6 of Appendix D.

TABLE 3A. STANDARDIZED STRANDING

Strands		Cable	Allowable Carrying Capacities in Amperes			
No of Strands Mils Dia.	A. W. G. No.	Area in Cir. Mills	Outside Dia over Copper	Column A Rubber Insulation	Column B Varnished Cloth Insulation	Column C Other Insulation
7/ 25	22	4,490	.075	15	18	20
7/ 32	20	7,150	.096	20	25	25
7/ 40	18	11,370	.120	25	30	35
7/ 51	16	18,080	.153	35	40	50
7/ 64	14	28,740	.192	50	60	70
7/ 81	12	45,710	.253	70	85	90
7/ 91	11	58,000	.273	80	95	110
7/102	10	72,680	.306	90	110	130
19/ 64	14	78,030	.320	100	120	150
19/ 72	13	98,380	.360	125	150	175
19/ 81	12	124,900	.405	150	180	210
19/ 91	11	157,300	.455	175	210	250
19/107	*	217,500	.540	225	270	325
19/114	9	248,700	.570	250	300	350
37/ 91	11	306,400	.637	275	330	400
37/ 97	*	347,500	.679	300	360	450
37/102	10	381,200	.714	325	390	500
37/116	*	484,300	.798	400	480	600
61/102	10	633,300	.918	475	565	700
61/107	*	698,000	.963	500	600	750
61/114	9	798,300	1.030	550	660	825

Strands		Cable	Allowable Carrying Capacities in Amperes			
No of Strands	A. W. G.	Area in	Outside	Column A	Column B	Column C
Mils Dia.	No.	Cir. Mils	Dia over Copper	Rubber Insulation	Varnished Cloth Insulation	Other Insulation
61/121	*	893,100	1.090	600	720	900
61/128	8	1,007,000	1.150	650	780	1000
91/114	9	1,191,000	1.250	725	870	1125
91/128	8	1,502,000	1.410	850	1020	1350
127/114	9	1,660,000	1.480	900	1100	1460
127/128	8	2,097,000	1.660	1100	1300	1700

*These individual strands are odd sizes not listed in the American Wire Tables.

Order 1341-f. Neutral Wires.

- (1) In three-wire direct current or single phase alternating-current systems the neutral shall be of sufficient capacity to carry the maximum current to which it may be subjected.
- (2) Such neutrals of branch circuits shall not be interconnected except at the center of distribution.

Order 1343-h. Flexible Tubing.

- (1) Wires at distributing centers, meters, switches or other places where space is limited and the proper separation of wires cannot be maintained, or when fished shall be separately enclosed in a continuous length of flexible tubing, extending from support to support.
- (2) At all outlets in concealed knob-and-tube work, the flexible tubing shall extend from the last non-combustible non-absorbent insulating support into and be secured to the outlet boxes or plates required by (m) below.
- (3) In the case of combination gas and electric outlets, the tubing on the wires shall extend at least flush with the lower end of gas caps.
- (4) Wires may be fished only in places where suitable inspection can be made to assure that the work is in compliance with this code.

Order 1343-k. Wires Entering Cabinets, etc. Where entering cabinets, cut-out boxes or junction boxes, except where they are in conduit, armored cable or metal raceways, wires shall be protected by non-combustible, non-absorbent, insulating bushings which fit tightly into the holes in the box or cabinet and are well secured in place. Not more than one conductor may enter through one bushing.

Note: The wires should completely fill the holes in the bushings so as to keep out dust, tape being used to build up the wires if necessary.

Order 1346-b. Voltage Limit. Portable and pendant conductors, except in electric railway property, shall not be used where the voltage between wires is over 300 volts.

Exception: Portable cords for portable or moveable motors for grinding and other uses, operating between 300 and 500 volts to ground may be used if the following construction requirements are complied with:

- (1) The insulation on portable cords shall be at least 3/64 inch in thickness and the size shall not exceed No. 8 A. W. G. unless flexible cord of the reinforced steel armored type is used.
- (2) Steel armor of portable cord and all other exposed non-current carrying parts shall be grounded in accordance with requirements for grounding of section 103, Introductory Part.
- (3) There shall be no exposed live parts of wall receptacles, and such receptacles shall be located at least 5 feet above the floor. Floor receptacles shall not be used.
- (4) Wall receptacles shall be of a distinctive type not interchangeable with ordinary wall receptacles of the lighting system.
- (5) Plug connectors shall be arranged so that they can be inserted in receptacle in one position only, thereby insuring against wrong connection of ground required above.

Order 1346-c. Use of Flexible Cords.

- (1) The use of flexible cords, shall be limited to wiring of pendants, (See order

1360-g), such as single lamps, (not clusters), portable equipment and chain fixtures.

- (2) Flexible cord shall not be hung on or fastened with or come in contact with nails, staples, hooks, pipes, machinery or other metal supports.
- (3) Flexible cords for pendants in dry places, where not subject to hard usage, may be cotton or silk covered twisted or parallel lamp cord, but where subject to hard usage shall be reinforced, armored or other similar heavy duty cord.
- (4) Flexible cords for pendants in damp places shall be brewery, canvasite or other similar heavy duty water proofed cords.

Order 1346-d. Cord for Portable Equipment.

- (1) Flexible cords for portable equipment in dry places shall meet the requirements of Order (c-3) above.
- (2) Flexible cords for equipment in damp places shall be reinforced weatherproof, packing house, armored reinforced weatherproof or other similar heavy duty waterproofed cords.
- (3) Flexible cords for theater stages and borders shall be stage cable having cotton weatherproof covering on each conductor and two cotton weatherproof outer coverings.
- (4) Flexible cord for elevator lighting and control shall be special elevator cable, approved for this service.

Order 1346-f. Use of Fixed Receptacles for Portables. Where portable conductors are required, fixed sockets or receptacles shall be provided at safely accessible points with the more exposed conducting part attached, where practicable, to the grounded side of the circuit, and so located that liability of such conductors being brought into dangerous proximity with other live parts will be reduced as far as practicable.

Order 1346-k. Protection of Cord at Sockets. If the socket is not attached to a fixture, the inlet shall be equipped with an insulating bushing, which if threaded shall not be smaller than 3-8 inch in size. The edges of bushings shall be rounded and all inside fins removed, in order to provide a smooth bearing surface for the wire.

Note: It is recommended that bushings having holes 9/32 inch in diameter be employed with plain pendant cord and holes 13/32 inch in diameter with reinforced cord.

Order 1346-m. Portable Electric Hand Lamps. Portable electric hand lamps shall be equipped with a socket of non-combustible, non-absorbent insulating material, large handle of non-absorbent insulating material (such as impregnated wood), basket guard, reflector and proper cord.

Order 1350-a. Where Switches are Required.

- (1) Suitable switches shall be installed in all circuits to lamps, motors, transformers, storage batteries, welders, furnaces and similar utilization equipment to make possible the independent disconnection of all such equipment from the source of supply.

Exceptions:

- (1) Parts or pieces of utilization equipment intended to operate as a unit, as for instance a motor and its starting device, may be controlled by one switch.
- (2) An automatic circuit-breaker complying with Order 1351-f-3 may serve as a switch for motors if it disconnects all ungrounded wires of the circuit.
- (3) Utilization equipment may be disconnected by plug connectors, arranged as required by Orders 1346-g-h-i and j.
- (4) A group of incandescent lamps on the same branch circuit may be disconnected by one switch.
- (2) Switches shall be so placed in motor circuits that each motor and its starting device may be disconnected from the source of supply.

Exception: One switch may serve to disconnect several motors and their starters from the source of supply, if within sight of the several motor starters it serves.

Note: If a branch circuit has connected to it only one motor and its starter, the above switch may be installed on the distribution panel board. Moreover, it may be of the open knife type, provided, the cabinet or enclosure is locked and accessible only to qualified persons.

- (3) Switches shall be so placed in feeder conductors supplying panel boards that each panel board may be independently disconnected from the source of supply.

Exceptions:

- (1) Such switches will not be required if the panel boards are equipped with switches for disconnecting individual branch circuits or groups of branch circuits from their supply circuit.
- (2) If the installation comprises only one panel board, the service switch may serve as the disconnecting switch for the panel board.
- (3) Panel boards supplying emergency lighting (stair and exit lights) are exempted.
- (4) Switches shall be provided as necessary to make possible the disconnection of all fuses from the source of electrical supply before being handled.

Exception: It will not be required that such switches be located within sight of the fuses to be disconnected from the source of supply.

Note: Switches installed in accordance with Order 1324, subdivisions a-1, a-2, a-3 above and subdivisions d-1 and d-2 of Order 1351, provide in general a satisfactory arrangement to meet this requirement.

- (5) Switches or plug connectors, shall be installed to permit the disconnection of temporary wiring or portable conductors from permanent or fixed wiring.

Order 1350-b. Switches to be Readily Accessible.

- (1) All switches shall be readily and safely accessible and shall be installed in such a manner as to minimize the danger of accidental operation.
- (2) Manual starters for motors or the manually operated part of any motor controller shall be within sight of equipment controlled. Manually operated parts or switches for heaters and furnaces shall be within sight of the equipment such device controls.

Note: General Safety Order 3 requires all machines, not individually motor driven, to be equipped with a loose pulley or a clutch or some other adequate means of stopping the machinery quickly. This has been interpreted to mean that the stopping device must be within easy reach of the machine operator when operator is in his or her working position. Although individually motor driven machines are exempted from this requirement, it is strongly recommended that the starting and stopping device of new or reconstructed electrically driven machinery be located in accordance with Order 3, so that in the event it later becomes necessary to include such equipment under Order 3, it will not be necessary to make changes for this reason.

Order 1350-d. Number of Conductors to be Disconnected.

- (1) Switches required by (a) above shall open all ungrounded conductors of circuits supplying current to utilization equipment.

Exception: Single pole switches will be permitted in two-wire ungrounded lighting branch circuits.

- (2) Single pole switches and three-way and four-way switches, which shall be classed as single pole switches, shall be placed in the ungrounded conductors.

Note: This order forbids the so-called "live-line" wiring scheme for three-way switches.

Order 1350-f. Motor Starting Switches.

- (1) Where a switch is used to shunt the fuses or other motor protective devices during the starting period, it shall be of such type that it will be held in off and running positions, but cannot be left in the starting position without the proper running overload protective device in circuit.
- (2) When the disconnecting switch required by (a-2) above is accessible to other than qualified persons, the motor starter including switches used as starters, shall be equipped with under or low voltage protection, in accordance with

Order 1357-f.

Exception: Motors of one-fourth horse-power or less need not have their starters so equipped.

Order 1350-k. Switch blades to be Dead. Where practicable, switches shall be so wired that blades will be dead when switch is open.

Order 1351-a. Where Fuses and Circuit-Breakers are Required.

- (1) Fuses or circuit-breakers shall be provided in all circuits to protect all ungrounded conductors.
- (2) Two-wire branch circuits shall be protected by a fuse or circuit-breaker in each conductor.

Exception: On systems having a grounded neutral or having one side grounded and where the grounded conductor is identified with a continuous white or natural gray outer covering and is properly connected in accordance with Order 1340-a, the fuse in the grounded conductor of branch circuits may be omitted.

- (3) Fuses or circuit-breakers shall be placed at every point where a change is made in the size of the wire, unless the fuse or circuit breaker in the larger wire will protect the smaller.

Exception: In large industrial buildings where mains are run at considerable elevations and in which the fuses or circuit breakers therefor may not be readily accessible, as required by (h) below, when placed in accordance with this order, the fuses or circuit breakers may be omitted at the point where such change in size is made, provided the following conditions are met:

- (1) Plans in duplicate showing location and size of mains and distribution cabinets of the proposed installation shall be submitted to the Industrial Commission for approval before the installation is made.
- (2) The current-carrying capacity of the smaller conductors shall be at least one-third that of the mains.
- (3) The smaller conductors, between the point where they tap the mains and the fuses or circuit breakers for their protection, shall be enclosed in rigid metal conduit, the length between these two points shall be as short as practicable, but in no case greater than 50 ft. and there shall be no taps or branches between these points.
- (4) Each motor shall be protected by an automatic overload protective device, (fuses, thermal cut-outs, overload relays or circuit breaker), except as provided in the exception to Order 1358-c-3. If fuses are used, one fuse shall be provided in each ungrounded conductor. If circuit breakers or overload relays are used the number of trip coils shall not be less than required by (f) below.

Exception: If an A. C. starter when in running position opens all the ungrounded wires of the circuit automatically under overload and is equipped with the number of trip coils called for in (f) below, it may also serve as a circuit breaker.

- (5) Each motor shall be protected by running fuses, thermal cut-outs, relays or circuit breaker in accordance with the following:

Note: To comply with the above order in the case of a squirrel cage or similar type motor having a large starting current, it will be necessary to use a motor starter or switch so designed that the protective device will be shunted or cut out of service during the starting period, unless a time limit circuit breaker or similar device is used, which will prevent the opening of the circuit during the starting period.

- (I) If fuses or thermal cut-outs are used, their rated capacity shall not exceed 125% of the name plate current rating of the motor, except that when no fuses or thermal cut-outs of the required capacity exist, those of the next higher standard rating may be used.
- (II) If a circuit breaker is used, it shall have a continuous current-carrying capacity of at least 110% of the name plate current rating of the motor.
- (III) If an overload relay is used, its rated capacity shall not be exceeded when the motor it protects is carrying 110% of its continuous current capacity as indicated on its name plate.
- (IV) If the circuit breaker or over-load relay is of the time limit type, it shall have a setting of not over 125%, and if of the continuous type, a setting of not over 160%, of the name plate current rating of the motor.

Exceptions:

- (1) Motors of other than continuous rating or used on other than continuous load duty, shall be considered as being sufficiently protected by the fuses or circuit breakers used to protect the conductors of the motor circuits.
- (2) Continuous rated motors of two-horse power or less shall be considered sufficiently protected by the fuses or circuit breakers protecting the conductors of the motor circuits.

Order 1351-d. Guarding Live Parts of Fuses.

- (1) Cartridge fuses and plug fuses larger than 20 amperes capacity shall always be so arranged that they may be disconnected from the supply circuit by properly placed switches. An individual switch shall be installed in each branch circuit of this or larger capacity.

Exception: Service entrance fuses may be placed on the supply side of the service entrance switch in accordance with Exception 2 of Order 1324.

- (2) Plug fuses of 20 amperes capacity or less shall be arranged so that they may be disconnected from the supply circuit in groups, if they are not arranged to be disconnected by individual switches.
- (3) All fuses shall be installed in locked cabinets or otherwise made inaccessible to other than qualified persons while the fuses are alive.

Exception: Receptacles of plug fuses on so called dead front or protected type panel boards need not be dead when fuse is removed.

Order 1351-f. Interlocking Circuit-Breakers.

- (1) Automatic overload circuit-breakers shall have the overload trip coils arranged so that the operation of any one pole will open all of the ungrounded conductors simultaneously.
- (2) In two or three-phase three-wire circuits and two-phase four-wire circuits and in four-wire three-phase circuits there shall be a trip-coil in each phase.
- (3) If a circuit breaker is used in place of a switch as permitted by Order 1350-a-1, Exception 2, it shall be so arranged that no one pole can be opened manually without disconnecting all the ungrounded conductors.

Exception: The above order does not apply to grounded return circuits of electric railway systems.

Order 1351-g. Fuses and Circuit-Breakers in Neutral Wires Ground Wires and Fixture Canopies.

- (1) Permanently grounded conductors including service wires shall be arranged without fuses and circuit-breakers interrupting their continuity, unless the device used opens all conductors of the circuit with one operation.

Exception: Two-wire and three-wire branch circuits, in which the conditions of the exception to (a-2) above are not met, shall have fuses in all branches.

- (2) Automatic cut-outs shall not be placed in fixture canopies.

Order 1352-b. Fuses for Branch Circuits.

- (1) Branch circuits in general, except as given in (3), (5) and (6) below, shall be protected by fuses of no greater rated capacity than,
 15 amperesat 125 volts or less
 10 amperesat 126 volts to 250 volts

Exception: Fixture wire or flexible cord of No. 18 or No. 16 A. W. G. shall be considered as properly protected by 15 ampere fuses.

- (2) On a 2-wire branch circuit and on either side of a 3-wire branch circuit the number of outlets (See definition 3—Order 1020) shall not exceed twelve.
- (3) Branch circuits supplying only sockets or receptacles of the mogul type or vapor lamps (See Order 1362) shall have the wires protected by fuses having a rated capacity not greater than,
 40 amperesat 125 volts or less
 20 amperesat 126 to 250 volts

Exception: The wiring of such lamps, or fixtures for such lamps, shall be considered as protected by the above fuse sizes, if the size of such wires is No. 12 A. W. G. or larger. Taps from circuit wires to lamps or fixtures when No. 12 A. W. G. or larger and not longer than 18 inches shall also be considered as protected by the above fuse sizes.

- (4) The number of mogul sockets or vapor lamps on a 2-wire branch circuit and on either side of a 3-wire branch circuit shall not exceed eight.
- (5) Each heating appliance shall be supplied by a separate branch circuit protected in accordance with Order 1352-a.

Exceptions:

- (1) Heating appliances of six amperes or 660 watts or less may be grouped with lamps, etc., under the protection of a single set of fuses, on branch circuits operating at 125 volts or less, provided the rated capacity of the fuses does not exceed 15 amperes.
- (2) Heating appliances each of 10 amperes or 1200 watts or less may be grouped on a special heater circuit protected by fuses having a rated capacity not greater than 15 amperes.
- (3) Subdivided circuits of a heater need not be separately fused.
- (6) Each motor shall be supplied by a separate branch circuit protected in accordance with Order 1352-a.

Exceptions:

- (1) Motors of one-fourth horse-power or less may be grouped with lamps etc., under the protection of a single set of fuses, on branch circuits operating at 125 volts or less, provided the rated capacity of the fuses does not exceed 15 amperes.
- (2) Motors may be grouped under the protection of a single set of branch circuit fuses, provided the rated capacity of the fuses does not exceed 15 amperes and the total wattage of the circuit does not exceed 1200.
- (3) The number and size of motors grouped under the protection of a single set of fuses, need be limited only by the maximum size of the fuses with which the thermal cut-outs can be safely used and each thermal cut-out shall be marked to indicate the size of this fuse.

Order 1353. Cut-out Boxes and Cabinets.

(a) **Material.** Cut-out boxes, switch cases, cabinets or other similar enclosures shall be of metal and of such design and construction as to secure ample strength and rigidity.

(b) **Wiring Spaces, Gutters, Compartments.**

- (1) Cut-out boxes and cabinets which contain devices or apparatus connected within the box or cabinet to the wires of more than four power or eight lighting circuits, including branch circuits, meter loops, sub-feeder circuits, power circuits from lighting panels and similar circuits, but not including the supply circuit or a continuation thereof, shall have back wiring spaces or one or more side wiring spaces, side gutters or wiring compartments, unless the wires leave the box or cabinet directly opposite their terminal connections.
- (2) The wiring spaces required by (1) above shall be rendered tight enclosures by means of covers, barriers or partitions which are firmly secured in position and which fit closely with the bases of devices and with the frame or door. The enclosed wires shall not be exposed when the doors of such cabinets or cut-out boxes are open.

(c) **Spacings within Cut-out Boxes and Cabinets.** The spacing within the cut-out boxes and cabinets shall be sufficient to provide ample room for the distribution of wires and cables placed in them, and for a separation between metal parts of boxes and cabinets and current-carrying parts of devices and apparatus mounted within them as follows:

- (1) There shall be an air space of at least 1/16 inch except at points of support, between the base of the device and the wall of any metal box or cabinet on which the device is mounted.
- (2) There shall be an air space of at least one inch between any live metal part (including metal parts of enclosed fuses) and the door, unless the door is lined with an adequate insulating material or is of a thickness of at least that of No. 12 U. S. gage metal, when the air space shall not be less than one-half inch.
- (3) Except as noted, there shall be an air space of at least one-half inch between the walls, back, gutter partition, if of metal, or door of any box or cabinet and the nearest exposed current-carrying part of the devices mounted within the box or cabinet where the potentials do not exceed 250 volts. This spacing shall be increased to at least one inch where the potentials exceed 250 volts.

(d) **Depth of Cut-out Boxes and Cabinets.** Cut-out boxes and cabinets shall be deep enough to permit the closing of the doors, when switches are opened as far as their construction will permit.

Order 1354-b. Panelboards.

- (1) Panelboards and cut-out bases for lighting distribution centers shall be enclosed in metal cabinets and the combination of cabinet and enclosed device shall be of such design as to be dead-front.
- (2) The following minimum distances between bare live metal parts (busbars, etc.) shall be maintained:

I. Between parts of opposite polarity except at switches.

When mounted on the same surface	When held free in air.
Not over 125 volts ¼ inch.....	½ inch
Not over 250 volts 1¼ inch.....	¾ inch
Not over 600 volts 2 inches.....	1 inch

II. Between parts of the same polarity a distance sufficient to permit of convenience in handling shall be maintained.

- (3) When there are exposed live metal parts on the back of board, a space of at least one-half inch shall be provided between such live metal parts and the cabinet in which the panelboard or cut-out box is mounted.

Order 1355-d. Guarding Live Parts of Controllers. All manual controllers, such as starting rheostats, auto transformer starters and other similar devices for starting motors shall have suitable solid casings or enclosures of such design as to permit of operation without opening the enclosure or shall be so located that the operator is at all times protected against danger.

Exception: Pre-setting speed devices and other devices manipulated by and accessible to qualified persons only are exempted from this order, provided they are within a locked enclosure.

Order 1356-a. Location.

Note: Manual speed regulators that may be used as motor starters are included in this order.

- (1) Transformers shall not be attached to the wall of any building when the voltage exceeds 750.
- (2) Oil transformers of more than 5 K. W. capacity shall not be placed on or inside of any building, except electrical test rooms, generating stations and substations, unless inclosed in a transformer vault. (See definition 52, Section 102, Introductory Part.)
- (3) Air cooled transformers shall not be placed inside of any building, excepting generating stations or substations, if the highest voltage of either primary or secondary exceeds 750 volts, unless inclosed in a transformer vault.
- (4) Air cooled transformers of less than 750 volts, with the exception of bell ringing and other signalling transformers, shall be so mounted that the case is a distance of at least one foot from combustible material or separated therefrom by non-combustible, non-absorptive insulating material, such as slate, marble or soapstone. This will require the use of a slab or panel somewhat larger than the transformer.

Exception: The requirements of (1), (2), (3) and (4) above do not apply to apparatus or fittings, the operation of which depends either wholly or in part upon special transformers embodied in the devices, or auto-transformers used in connection with motor starters, but all such apparatus or fittings shall comply to these orders in all other respects.

Order 1357-g. Reverse-Phase Relays for Motors.

- (1) Electric freight or passenger elevators, operated by polyphase alternating current motors, shall be provided with protective devices (relays) which will prevent starting the motor if phase rotation is in the wrong direction or if there is a failure in any phase.

Exception: Limit switches placed in the elevator shaftway in accordance with Order 471 of the elevator code will make unnecessary the installation of reverse phase relays.

- (2) Electric cranes operated by polyphase current motors, shall have the runway feeders or other sources of supply protected by relays, which will prevent starting any of the motors on the crane if the phase rotation of these feeders is in the wrong direction.

Order 1357-h. Operation. Only motors especially designed for the purpose may be run in series-multiple or multiple-series.

Order 1358-b-1. All conductors except bare collector conductors, those between resistances and contact plates of rheostats and those subjected to severe external heat, shall be stranded rubber-covered and not smaller in size than No. 12 A. W. G.

Order 1360. Fixtures.

(a) Construction of Fixtures.

- (1) Fixtures shall be composed of metal or wood, or other materials approved for the purpose. Materials other than metal shall be reinforced by metal or the fixtures shall be otherwise constructed to secure the requisite mechanical strength.
- (2) In all fixtures not made entirely of metal, wireways shall be lined with metal unless approved armored conductors with suitable fittings are used.
Exception: This requirement shall not apply to wireways in glass, marble or similar non-absorptive insulating materials.
- (3) All methods of fastening arms, sockets, bodies, supports and receptacles by threading, soldering, brazing or otherwise shall be such as to secure in every case ample strength and reliability and to prevent turning. Tubing used in making threaded arms and stems shall be composed of metal having a thickness not less than .04 inch. It shall not be kinked, flattened or cracked.
- (4) Fixtures shall be constructed so that wires may be drawn in, remain in place, or withdrawn without injury to the insulation of the wires.

Note: To accomplish this result all burrs and fins in wireways should be removed and all edges which wires pass should be smooth and rounded so as to prevent the possibility of cutting or abraiding the insulation at time wires are inserted or later through movement or vibration of the fixture. It is suggested that openings for the entrance of wires be made large.

- (5) Fixtures exposed to moisture, whether located indoors or outdoors shall be so constructed that water cannot enter the wireways, sockets or other electrical parts.
- (6) Fixture studs which are not parts of outlet boxes, hickeyes, tripods and crowfeet shall be made of malleable iron or other approved material.
- (7) All forms of fixtures in which the wiring is liable to be exposed to temperatures in excess of 120 F. (49 C.) shall be so designed or ventilated and installed as to operate at temperatures which will not cause deterioration of the wiring.
- (8) Canopies and outlet boxes or plates shall, taken together, provide ample space for the reception of wires and their connecting devices.
- (9) Receptacles having exposed terminals shall not be placed in canopies unless completely enclosed in metal.
- (10) Canopy insulators, used where insulating joints are required, shall be of approved type and shall be securely fastened in place, so as to separate the canopies effectively and permanently from the conducting surfaces from which they are intended to be insulated. The insulating strip or sheet shall be secured by rivets or screws which shall be so placed or countersunk that the desired effective insulation distance will be obtained.

Note: A strip of a good grade of hard fiber, 1/16 inch in thickness, permanently attached to the canopy at the ends and at intermediate points in such a manner that the strip will extend permanently at least 3/16 inch beyond the upper edge of the canopy rim, will be accepted. Where this is impracticable, a flat sheet of said fiber, cut to conform to the general outline of the canopy and having the edges of the sheet at least flush with the edges of the canopy may be employed, if permanently attached to the canopy.

- (11) Insulating joints shall be composed of materials especially approved for the purpose. Those which are not designed to be mounted with screws or bolts

shall have a substantial exterior metal casing, insulated from both screw connections.

(b) Wiring of Fixtures.

- (1) No conductor shall be smaller than No. 18 A. W. G. On chains or other movable parts, stranded conductors shall be used unless the wires are completely enclosed in metal. Where the fixture is externally wired, wires shall be secured in a manner which will not tend to cut or abrade the insulation and shall be protected from abrasion where they pass through sheet metal pans, canopies, etc. No splice or tap shall be located within an arm or stem.

Note: It is recommended that approved splicing devices or approved plug connections be used for attaching the fixture wires to the circuit wires.

- (2) Each fixture shall be so wired that all screw shells of sockets will be connected to the same fixture stem wire, or supply wire, or terminal in the fixture, and this wire or terminal shall be marked in an approved manner by which it may be readily distinguished. The marked wire shall be in all cases the grounded wire.
- (3) Chain fixtures shall be wired with flexible conductors so arranged that the weight of the fixture will not put tension on the conductors.
- (4) Fixture wire, flexible cord, or rubber-covered wire shall be employed, unless the wiring is exposed to temperatures in excess of 120 degrees F. (49 degrees C.) in which case conductors having slow-burning or other heat-resisting covering shall be used. Fixtures intended for outdoor use shall be wired with rubber covered conductors. Wires shall always be so disposed as to avoid exposure to high temperatures as far as practicable. Fixtures intended for use in rooms where inflammable gases may exist shall consist of rigid stems, internally wired with rubber covered conductors, soldered directly to the circuit, and shall be equipped with vapor-tight globes.
- (5) Fixture wires or the individual conductors of flexible cords used where the voltage between any two conductors or between any conductors and the ground is over 300 volts, shall have insulation at least 3/64 inch in thickness for sizes No. 8 and smaller.

(c) Installation of Fixtures.

- (1) Fixtures having exposed noncurrent-carrying metal parts, if not permanently and effectively grounded, shall be insulated from their supports by insulating joints placed as close as possible to the ceiling or wall and by canopy insulators if wall or ceiling is composed of sheet metal or plaster on metal lath.

Exception: Such insulating joints and canopy insulators may be omitted with straight electric fixtures connected to knob-and-tube work or open work on walls and ceilings of wood frame and plaster on wood lath construction.

- (2) Fixtures having so called flat canopies, tops or backs, shall not be installed where outlet plates are used.

Note: It is recommended that for all side wall and partition outlets in concealed work in new buildings under construction outlet boxes having a depth of approximately 1½ inch be used. Such boxes should have covers which will reduce the opening to not more than three inches in finished plaster wall. Switch boxes are also suggested for this purpose.

- (3) No externally wired fixture shall be located in the immediate vicinity of especially inflammable material; nor shall any externally wired fixture, other than of the chain type, be placed in a show window. Armored cord pendants shall be considered to be internally wired fixtures.
- (4) Fixtures shall be so installed that the connections between the fixtures and the branch circuit wires will be easily accessible for inspection without requiring the disconnecting of any portion of the wiring, unless the fixture is attached by an approved plugging device.

Note: This order does not forbid the disconnection of a socket or sockets when necessary in order to make possible the lowering of the fixture for inspection.

- (5) Fixtures shall be supported in a substantial manner.

Note: Ordinary fixtures may be supported from gas pipe, conduit, outlet boxes or fixture studs. Fixtures known as ceiling collars, especially constructed for the

purpose of supporting a shade, bowl or globe at ceiling, may be fastened to the plaster or wall by means of wood screws, providing such support is substantial within the meaning of the order. Wall brackets with specially designed backs of metal, composition, wood or other approved material, made to fit flat against the wall, (where outlet boxes are used) may be fastened to the plaster or side walls by means of wood screws, if such method provides a substantial support. Proper grounding should be provided where required by Order 1313-c.

(d) Lamp Sockets and Receptacles.

- (1) Lamp holding devices shall be classed according to diameters of lamp bases, as candelabra, medium and mogul bases, to be known respectively as ½ inch, 1 inch and 1½ inch nominal sizes.

Note: (1) It is recommended that 660 watt sockets and receptacles be used wherever the attachment of flexible cords thereto is likely.

(2) Receptacles for attachment plugs (convenience outlets) are strongly recommended in order to facilitate the use of electrical appliances which, otherwise, must be connected to sockets designed primarily only as lamp holders. (See (10) below.)

- (2) The inside of metal shells shall be lined with insulating material, which shall prevent the shell from becoming a part of the circuit, even though the wires inside the sockets should become loosened or detached from the position under the terminal screws.
- (3) The lining shall not extend beyond the metal shell more than ¼ inch, but shall prevent any current-carrying part of the lamp base from being exposed when a lamp is in the socket.
- (4) The cap also shall be lined.
- (5) The socket as a whole shall be so put together that parts will not rattle loose or fall apart under the most severe conditions they are likely to meet with in practice. The base of the socket shall be secured or held in the shell in such a manner as to prevent turning or displacement relative to the shell.
- (6) Lead wires furnished as a part of sockets and intended to be exposed after installation shall be of approved, stranded, rubber-covered wire, not less than No. 14 A. W. G. (No. 18 A. W. G. for a candelabra socket) and shall be sealed in place.
- (7) In places where combustible dust is thrown into suspension in the air in sufficient quantities to produce explosive mixtures, dust-tight fixtures enclosing lamps and sockets shall be used. Such fixtures shall be supported by conduit hangers or chains to prevent any strain on the wires. Where rubber-covered wire is used it shall have insulation not less than 3/64 inch thick.
- (8) Sockets and receptacles installed over specially inflammable material or where exposed to flyings of combustible material shall be of the keyless type and, unless individual switches are provided, shall be located at least 7½ feet above the floor, or shall be otherwise so located or guarded that the lamps cannot readily be backed out by hand.
- (9) Weatherproof sockets, especially approved for the location, shall be employed in damp or wet places or where corrosive vapors exist. If not attached to fixtures, they shall be hung from separate stranded wires not less than No. 14 A. W. G. which are soldered directly to the circuit wires but supported independently thereof.

Note: Basements of residences ordinarily would not come under the classification of damp or wet places, but if sockets or fixtures can be reached from the floor or while a person is in contact with other grounded surfaces, they must of course be constructed of non-combustible non-absorbent insulating material or exposed metal parts must be grounded in accordance with Order 1313-c.

- (10) Receptacles for attachment plugs, when located less than four feet above the floor, shall be of the flush type having live parts suitably guarded against contact.

Note: Edison screw receptacles are not considered as having their live parts suitably guarded. Flush receptacles in accordance with this order are recommended for use at all elevations.

(e) Rosettes. Separable rosettes which make possible a change in polarity shall not be used.

(f) **Inflammable Matter Attached to Fixtures.** Decorations of paper, cotton, cloth or other combustible materials shall not be attached to wires, globes, shades, lamp bulbs or other parts of fixtures liable to temperatures which may char or ignite such materials.

Note: Properly constructed cloth, parchment or similar shades of portable table and floor lamps are not included in this order.

(g) **Pendant Cords.** Pendant lamp cords shall hang vertically in space and neither the cord nor the lamp shall be in contact with any other body.

Order 1361. **Gas-Filled Incandescent Lamps.** Gas-filled incandescent lamps shall not be equipped with medium bases above 250 watts rating, nor with mogul bases if above 1500 watts rating.

(b) **When Installed in Show Windows.** Gas-filled incandescent lamps shall not be located in show windows nor where liable to contact with inflammable material unless installed in approved fixtures equipped with shades or guards or suitably designed to operate at a safe temperature.

Order 1362. **Mercury Vapor Lamps.**

(a) Enclosed mercury vapor lamps shall be equipped with only such resistances or regulators as are enclosed in non-combustible cases, such resistances or regulators being treated as sources of heat. Where these resistances or regulators are subject to flyings of lint or combustible material, all openings in their casings shall be covered by fine wire gauze.

(b) **Mercury Vapor Lamps Enclosed in Fixtures.**

Fixtures carrying enclosed mercury vapor lamps shall be wired with insulated conductors not smaller than No. 12 A. W. G.

Order 1378-c. **Wiring.** All exposed wiring in the booth shall have slow burning insulation.

Order 1378-e. **Equipment.**

(1) Generators, rectifiers and other equipment for transforming electric current shall not be placed within the booth.

Exception: If the booth is not less than 10 feet wide, by 19 feet long, by 8 feet high, and all such equipment is inclosed in fireproof material on thirty mesh wire screen, this requirement will be waived.

(2) Fuses, switches, flashes or other devices for control of lighting or motors shall not be located within the booth.

Exceptions: (1) Switches and dimmers for auditorium and stage lighting may be located within the booth and shall comply with Order 1374.

(2) Fuses and switches for picture machine equipment may be located within the booth.

Order 1378-f. **Rheostats.** Rheostats, transforming devices or any substitutes therefore shall be of types expressly designed for the purpose.

Order 1382. **Portables.**

(a) **Flexible Cord.**

(1) Flexible cord for portable equipment shall comply with Order 1346-d-2.

(2) Flexible cord for pendant lamps shall comply with Order 1346-c-4.

(3) Cables for charging purposes shall comply with Order 1346-d-3.

(b) **Connectors.**

(1) The portable cord shall carry the male end of an approved pin-plug connector, or equivalent device, the female end being of such design or so hung that the connector will break apart readily at any position of the cord. The connector shall be kept at least four feet above the floor.

(2) Current-carrying parts of connectors shall be guarded to prevent accidental contact.

(3) Connectors for charging purposes shall have at least 50 amperes capacity and shall be so designed or so hung that at least one will break apart readily at any position of the cable. Live parts shall be guarded from accidental contact. The fixed, or wall connector shall be kept at least four feet above the floor.

(c) **Portable Lamps.** Portable lamps shall comply with Order 1346-m.

Order 1384. **Special Precautions.**

(a) **Location of Cut-outs, Switches, etc.** Cut-outs, switches and receptacles shall be placed at least four feet above the floor.

(b) **Hatch Limit Switches.** Hatch limit switches of elevators shall be located at least four feet above the lowest floor level.

Order 1391-b. **Insulating Joint in Aerial Cables.** Where metal sheathed aerial cables, which are liable to contact with electric light or power wires, enter a building the sheath shall be interrupted by means of an insulating point or by equivalent means placed immediately outside the building.

Exception: Such insulating joint will not be required if the cable sheath is permanently and effectively grounded, and to a water piping system if it is available.

Order 1391-e. **Protector Required. Location.** Signal wires shall be provided with an effective protective device located as near as practicable to the entrance of wires to building and in a readily accessible place. The protector shall not be placed in the immediate vicinity of inflammable materials, or where exposed to inflammable gases, dust or flyings.

Exception: The protector required may be located at the cable terminal pole from which the drop wires run to the building, if the drop wires are free from liability to accidental contact with electrical light or power lines of over 250 volts.

Order 1391-i. **Requirements for Signal Protectors.** The protector to be approved shall comply with the following requirements:

(1) It shall be mounted on a non-combustible, non-absorptive insulating base, so designed that when protector is in place all parts which may be alive will be thoroughly insulated from the surface on which the protector is mounted.

(2) It shall have an arrester between each line wire and ground and a fuse in each line wire.

(3) The fuses shall be so placed as to protect the arresters.

(4) The protector terminals shall be so marked as to indicate clearly the "line," "instrument" and "ground" terminals.

Exception: Orders 1391-c to i inclusive, do not apply when the entire circuit is run underground from the central station to the block in which the building is located, provided the circuit within the block is so placed as to be free from liability of accidental contact with electric light and power wires of over 250 volts.

The repeal of the orders listed above will become effective 30 days after publication, namely August 27, 1924. The new orders published herewith will become effective on the same date.

F. M. WILCOX, Chairman.

R. G. KNUTSON,

L. A. TARRELL,

Commissioners.

Attest: A. J. Altmeyer, Secretary.

C. T. July 28, 1924.