

c. The wattage capacity provided for show window lighting shall be based on a minimum of 100 watts, in the underground district, and 50 watts outside the underground district, per lineal foot of window exposure measured horizontally along the base of the window.

(Fine print note) For the purpose of the above rule the term "underground district" shall include all territories of the City where the installation of overhead wires in the street area is not permitted.

1802 - Wattage Requirements in Dwellings.

a. In arranging circuits in residences, flats, and apartments, fixture outlets shall be wired for not less than the wattage specified below:

1. The wattage for ceiling outlets shall total not less per room than shown in the table following; provided that where the floor area of any room exceeds 300 square feet, the wattage specified in the table shall be doubled.

Parlors.....	200
Living rooms.....	200
Dining rooms.....	200
Libraries.....	150
Dens.....	150
Sun rooms.....	150
Billiard rooms.....	100
Bed rooms.....	100
Kitchens.....	100
Breakfast rooms.....	100
Reception halls.....	100

2. Outlets not included in item (1) above shall be wired for not less than 80 watts each.

b. Approved receptacles for attachment plugs, connected directly to the circuit conductors with not less than No. 14 wire, shall be provided in parlors, living rooms, dining rooms and kitchens. This requirement shall not apply in the wiring of finished buildings.

c. A light shall be so placed as to illuminate the front of every furnace or heating boiler. A light shall also be provided within 5 feet of any wash tray unless the furnace light will be so located as to comply with this requirement. This requirement shall apply to all buildings (either new or old) which are to be wired for light.

(Fine print note) It is the purpose of rules (b) and (c) above to prevent as far as possible unlawful and dangerous extensions of flexible cord in order to provide outlets that are nearly always needed.

1803 - Separate Branch Circuits - When Required.

a. Basement lighting in single and two family dwellings, show window lighting, show case lighting, signs, and exterior decorative lighting shall be individually connected to a separate circuit or circuits to which no other outlets shall be connected except as permitted by section 1806 of this Code and except as follows:

1. Vestibule lighting outlets may be connected to a window lighting circuit if capacity is provided on a basis of 100 watts minimum for each such vestibule light.

2. Window outlets on exposed conduit or raceway work, need not be connected to a separate circuit unless the window is at least partially enclosed, having either a top or back.

b. For the purpose of arranging circuits at the time of roughing in, all outlets within 6 feet of store windows shall be considered as show window outlets.

c. Motors used for the operation of oil burners, permanently placed heating devices of more than 660 watts capacity, and permanently placed A. C. Motors rated at more than $\frac{1}{2}$ horse power or D. C. Motors rated at more than $\frac{1}{2}$ horse power shall not be connected to branch lighting or appliance circuits except as permitted for heaters in paragraph (d) of Section 1805.

(Fine print note) Portable devices shall, for the purpose of the above rule, be considered permanently placed when they are plainly intended to be used in one location only.

1804 - Number of Lighting Circuits Required.

NOTE:- For the requirements relating to size of conductors for services and mains see Article 12 of this Code.

a. The number of circuits which must be provided for lighting outlets shall be determined from the wattage requirements prescribed in Section 1801 and 1802 of this Code on the basis of 1000 watts load on a 2-wire circuit or on each side of a 3-wire circuit, with the following exceptions:

1. The number of circuits may be determined on the basis of not more than 1800 watts load on a 2-wire circuit or on each side of a 3-wire circuit under the conditions specified in paragraph (b) of section 1805. Special lighting installations, such as theatre foot, border and proscenium lights, marquee, sign, decorative and outline lighting shall be considered as coming within this class.

2. The number of circuits may be determined on the basis of not more than 4000 watts load on a 2-wire circuit or on each side of a 3-wire circuit, under the conditions specified in paragraph (c) of section 1805.

b. Receptacles for attachment plugs shall, on new circuits, be rated at 150 watts each as a minimum in addition to the wattage specified in sections 1801 and 1802, inclusive, of this Code except, that, when computing the load on a circuit, one such receptacle may be rated at 100 watts.

c. In buildings, other than dwellings, there shall be provided on each panel board (or group of outlet bases used in lieu of panel board) not less than one spare circuit for each 9 circuits, or fraction thereof, supplied by such panel or group of outlets. This shall not apply in finished buildings.

1805 - Maximum Wattage Permissible on Branch Lighting and Appliance Circuits.

NOTE:- This section relates to the loading of branch circuits after an installation has been completed and placed in service. When roughing in lighting installations the necessary number of circuits is determined as specified in section 1804 of this Code.

a. The connected load on a 2-wire branch lighting or appliance circuit or on each side of a 3-wire circuit shall not exceed 10 amperes or 1200 watts except as permitted by this section.

b. A total load of not more than 1800 watts may be connected on a 2-wire branch lighting circuit or on each side of a 3-wire branch lighting circuit, subject to the following limitations and requirements:

1. All sockets and receptacles shall be keyless type and shall be so located or installed that they are not easily nor conveniently accessible for the attachment thereto of flexible cords.

2. The size of circuit conductors shall be not smaller than No. 12; medium base sockets and receptacles shall be wired with rubber insulated conductors not smaller than No. 14 or with slow-burning insulated conductors not smaller than No. 16. Mogul base sockets shall be wired with slow-burning insulated conductors not smaller than No. 16 or, when used in wet locations with rubber insulated conductors not smaller than No. 14.

3. Sockets and receptacles shall be considered as requiring not less than 100 watts each if of medium size or 300 watts each if of mogul size except as provided by other sections of this Code for special lighting installations such as theatre foot, border and proscenium lights, marquee, sign, decorative and outline lighting.

4. In no case shall any outlet on such high-wattage circuit be located in any office, living room, living quarters, guest room or suite, dormitory, ward, or bed room in any building.

5. In all rooms or spaces where outlets on such high-wattage circuits are located there shall be installed on other circuits a sufficient number of plug receptacles so located and distributed as to afford convenient usage of such flexible cords as may be necessary for the area served. No plug receptacle shall be connected to the high wattage circuit. The requirement for plug receptacles on other circuits may be waived where the conditions of occupancy or use are such that the attachment of flexible cords to the high-wattage circuits is unlikely; as, for example, in some industrial plants and in auditoriums, lobbies, etc.

c. By special permission obtained in advance and in writing, a total load of not more than 4000 watts may be connected on a 2-wire branch lighting circuit or on each side of a 3-wire branch lighting circuit, subject to the following limitations and requirements.

1. All limitations and requirements noted in sub-paragraphs 1, 4 and 5 of paragraph (b) of this section shall apply to the circuits provided for by this rule.

2. The circuit shall supply only sockets or receptacles of the mogul type. The number of sockets on a 2-wire branch circuit or on each side of a 3-wire branch circuit shall not exceed eight except by special permission.

3. The circuit conductors shall be of proper size to carry the total connected load without over-fusing. Conductors not smaller than No. 12 rubber covered or No. 14 slow-burning shall be used for wiring fixtures with mogul sockets and may also be used for taps not over 18 inches long from the circuit conductors to the point of suspension of the fixtures, except that No. 14 rubber covered conductors (or No. 16 slow-burning) may be used for said purposes when the required size of the branch circuit conductors does not exceed No. 10.

d. Heaters (either portable or stationary) may be connected to a special 250 volt circuit of No. 10 wire or larger carried direct to the terminals of the heater or into receptacles of not less than 20 amperes rating. Not more than four heaters or receptacles nor more than 5000 watts total load nor 2500 watts individual load shall be connected to such circuit.

e. Portable appliances such as heating, cooking and small motor operated devices may, with the exceptions noted in paragraph (e) of Section 1803, be used on branch lighting and appliance circuits provided the connected load in use at any one time will not exceed 1200 watts and provided the required size of branch circuit fuse will not exceed 15 amperes. Appliances rated at more than 660 watts shall be connected only to plug receptacles of proper rating wired with not less than No. 14 wire.

1806 - Additions to Existing Installations.

a. The wattage and circuit requirements specified in sections 1801 to 1804, inclusive, of this Article shall apply to all new installations and to new circuits added to existing installations. In making extensions to existing circuits in completed buildings, the actual connected load shall be considered; provided, however, that sockets and lamp receptacles (with the exception of signs and outline lighting) shall be considered as requiring not less than 50 watts (100 watts if connected to high-wattage circuit) each if of medium size, 35 watts each if of candelabra size, or 500 watts each if of mogul size. Attachment plug receptacles shall be considered as requiring not less than 100 watts each.

(Fine print note) The connected load on any circuit or circuits must not exceed the safe carrying capacity of the service or feeder supplying such circuit or circuits unless a demand factor has been allowed.

ARTICLE 19FIXTURES, LAMP SOCKETS AND RECEPTACLES, FUSE
RECEPTACLES AND OTHER OUTLET DEVICES.1901 - Construction of Fixtures.

- a. Fixtures shall be composed of metal or wood, or such other material as may have been submitted for examination and approved. Materials other than metal shall be reinforced by metal or the fixtures shall be otherwise constructed to secure the requisite mechanical strength.
- b. In all fixtures not made entirely of metal wireways shall be lined with metal unless approved armored conductors with suitable fittings are used. This requirement shall not apply to wireways in glass, marble or similar non-absorptive, non-combustible insulating materials.
- c. 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. Screw joints shall have not less than five threads engaging. 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.
- d. All burrs and fins in wireways shall be removed and all sharp edges rounded, where practicable, so that wires may be drawn in and withdrawn without injury. Fittings having smooth, rounded edges, shall be placed at entrance to casings of fixture stems.
- e. Fixtures exposed to moisture, whether located indoors or outdoors, shall be so constructed that water cannot enter the wireways, sockets or other electrical parts.
- f. Fixture studs which are not parts of outlet boxes, hickys, tripods and crowfeet shall be made of malleable iron or other approved material.
- g. All fixtures shall, where practicable, be sufficiently ventilated. All forms of fixtures in which the wiring is liable to be exposed to temperatures in excess of 120 degrees F. (49 degrees C.) shall be so designed or ventilated and installed as to operate at temperatures which will not cause deterioration of the wiring.

h. Canopies and outlet boxes or plates shall, taken together, provide ample space for the reception of the wires and their connecting devices.

i. Receptacles having exposed terminals shall not be placed in canopies unless completely enclosed in metal.

j. 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.

(Fine print note) A strip of a good grade of hard fiber, 1/16 inch in thickness, securely attached to the canopy at the ends and at intermediate points in such a manner that the strip will extend 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.

k. 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.

1902 - Wiring of Fixtures.

a. No conductor shall be smaller than No. 16. On chains or other moveable 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 a stem. Fixture wire on outside of bracket arms shall be secured in place in an approved manner. This will usually require that it be suitably fastened at intervals of not less than 4 inches.

b. Each fixture shall be so wired that all screw shells of sockets are connected to the same fixture stem wire or supply wire or terminal. A fixture stem wire or supply wire connected to the screw shells of sockets shall be identified as required by section 903(c) of this Code. A terminal attached to the screw shells of sockets shall be marked in the manner specified in section 903 of this Code.

c. Chain fixtures shall be wired with flexible conductors so arranged that the weight of the fixture will not put tension on the conductors.

d. Approved fixture wire, approved flexible cord or approved 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 approved rubber covered conductors. Wires shall always be so disposed as to avoid exposure to high temperatures as far as practicable.

(Fine print note) All indoor fixtures intended to carry any lamp rated at more than 75 watts shall be considered as subject to temperatures in excess of 120° and shall be wired with conductors having approved heat-resisting insulation. In no case shall any mogul socket be wired with heat-resisting wire smaller than No. 16. (See Section 1805(c)).

e. Fixture wires or the individual conductors of flexible cords used where the voltage between any two conductors or between any conductor and the ground is over 300 volts, shall have insulation at least 5/64 inch in thickness for sizes No. 8 and smaller unless Type S cord is used.

f. Wires of different systems shall not be contained in or attached to a fixture; nor shall electric gas lighting wiring, other than for the frictional system, be attached thereto.

g. All wiring shall be free from short circuits and grounds, and shall be tested for these defects prior to being connected to the circuit.

h. When fixtures are equipped with receptacles for attachment plugs, such receptacles shall be connected to the circuit conductors with conductors not smaller than No. 14.

i. Fixtures intended for use in rooms where inflammable gases may exist shall consist of rigid stems, internally wired with approved rubber covered conductors, soldered directly to the circuit, and shall be equipped with vapor-tight globes.

1903 - Installation of fixtures.

a. Fixture supports shall in all cases be of adequate mechanical strength and security. Fixtures of both wall and ceiling types shall, except as provided in paragraphs (b) and (c) of this section, be supported from the outlet box studs or equivalent fittings or by metal straps fastened to studs or lugs in the boxes.

When straps are used, fixtures shall be fastened to straps with machine screws. The weight of the fixture shall not be supported from box ears or lugs or from the canopy or spinning, except in the case of small light weight fixtures.

b. When installing fixtures on old wiring where outlet box or plate is not present, canopy cord drops, single light flexible pendants, receptacle collar and wall brackets may be supported by suitable wood screws screwed into laths; other fixtures shall be supported from gas pipe or by suitable wood screws screwed into a $7/8$ inch header fastened between floor timbers and flush with the back of the lathing, except that, where gas pipe or header is not present, they may be supported from outlet plates or from suitable metal straps screwed to laths or they may be supported by wooden base blocks, at least $3/4$ inch thick, securely screwed to laths. (See Section 1102(a)).

c. In old or new work, fixtures of special types which can not be supported except by wood screws may be so installed by special permission. Such fixtures shall be submitted for inspection before installation.

d. Fixtures having so-called flat canopies, tops or backs shall not be used unless outlet boxes having a depth of approximately 1 1/2 inches are provided. (See Section 1102).

e. Fixtures shall be so installed that the connections between the fixtures and the branch circuit conductors will be accessible for inspection without requiring the disconnecting of any portion of the wiring, unless the fixture is attached by an approved plugging device.

f. In knob and tube work (either new or old), where gas pipe is present, the flexible tubing over circuit conductors shall be of sufficient length to extend beyond the insulating joint, hickey or cap and shall be firmly secured in place; grounded ends of gas pipes and insulating joints shall be protected by approved flexible tubing or shall be covered by at least two layers of rubber tape and two layers of friction tape. (See Section 1904(c)).

g. No externally wired fixture shall be located in the immediate vicinity of especially inflammable material; nor shall any externally wired fixture other than the chain type be placed in a show window. Armored cord pendants shall be considered to be internally wired fixtures.

h. The ends of all conductors at outlets where fixtures are not installed shall be taped and, where outlet boxes are present, they shall be provided with covers by the person installing the fixtures. (See also Section 1102(a)).

i. Flexible pendants or cord drops shall not be installed on porches or in entrances that open directly on the street, nor in other similar locations where the motion of the fixture would cause abrasion of the conductor insulation.

j. When lights are installed in clothes closets, they shall be installed on the ceiling or on the wall above the door and shall be controlled by suitable wall, door or pendant switches or pull chain sockets. No drop cord shall be installed in any clothes closet.

k. Fixtures located within reach of grounded or partially grounded surfaces and fixtures intended for use in locations where flying dust accumulates or in locations where especially inflammable stuff is stored shall have sockets and receptacles installed as prescribed by section 1905. (See also section 1902(1) and paragraph (g) of this section).

1904 - Fixtures to be Grounded - Exceptions.

a. Straight electric fixtures shall be grounded except as described in 1 and 2 below.

1. Fixtures mounted on metal ceilings or side walls, or on walls or ceilings containing metal lathing, shall be grounded or shall be insulated from their supports by approved insulating joints or by approved insulating fixture supports, and canopy insulators shall be used.

2. Fixtures in open wiring, knob-and-tube work or wooden raceways and not on metal ceilings or side walls nor on plaster walls or ceilings containing metal lathing need be neither grounded nor insulated.

b. Fixtures shall be considered as grounded when mechanically connected in a permanent and effective manner to metal conduit, armored cable or metal raceway systems or to a separate grounding wire not smaller than No. 14, or to gas piping which is grounded in the manner specified in section 1708(a) of this code.

c. Combination gas and electric fixtures shall be insulated from their supports by approved insulating joints, placed as close as possible to the ceiling or wall and, if mounted on metal ceilings or on walls or ceilings containing metal lathing, canopy insulators shall be used.

1905 - Lamp Sockets and Receptacles.

- a. If the socket is not attached to a fixture, the inlet shall be equipped with an approved insulating bushing which, if threaded, shall be not smaller than $\frac{3}{8}$ 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.
- b. In places where combustible dust or flyings are liable to be present in the air in sufficient quantities to produce an explosive or inflammable mixture, 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 $\frac{3}{64}$ -inch thick.
- c. Sockets and receptacles installed over specially inflammable material shall be of the keyless type and, unless individual switches are provided, shall be located at least $7\frac{1}{2}$ feet above the floor, or shall be otherwise so located or guarded that lamps cannot readily be backed out by hand.
- d. When necessary to prevent portable lamps from coming into contact with inflammable materials, or to protect them from breakage, their flexible cord leads shall be equipped with handle, socket and substantial guard, the guard being securely attached to socket or handle.
- e. Weatherproof sockets especially approved for the location shall be employed in places where flying dust accumulates or where sockets are exposed to moisture or corrosive vapors as, for example, in stables, barns, breweries, public laundries, packing houses, dye works, blacksmith shops, foundries, woodworking plants, flour mills and similar locations. If not attached to fixtures, they shall be hung from separate stranded conductors not smaller than No. 14 which are soldered directly to the circuit conductors but supported independently thereof. (See also paragraphs (j) and (k) of this section).
- f. Receptacles of the Edison base type shall be located not less than four feet from the floor unless for use only as lamp holding devices. (See section 1906(a)).
- g. Sockets or receptacles having exposed terminals shall not be placed in fixtures or canopies. If placed in outlet boxes, a clearance of at least $\frac{1}{2}$ inch shall be maintained between the bare live parts and the nearest adjacent metal. Surface type receptacles, rosettes, and similar fittings shall have no live parts normally exposed, except that cleat type receptacles and rosettes may be used when temporary open wiring is permitted. (See section 1901(f)).

h. On grounded circuits, the screw shells of all fixed lamp sockets and receptacles (including sockets on drop cords, sign receptacles, etc.) shall be connected to the grounded conductor of the circuit. (See sections 903 and 906(e)).

i. Switches shall be provided for the control of keyless sockets and for the control of key sockets that are not within safe and convenient reach.

j. Lamp sockets, lamp receptacles, or pendant switches having fibre or paper linings shall not be used in damp or wet locations nor where exposed to moisture through condensation. (See also Par. (e) of this section and Par. (e) of Section 1901.)

k. Unless the outer shell is permanently grounded (as by attachment to a permanently grounded metal fixture), metal shell key sockets or metal shell pendant switches shall not be installed where they will be within reach from permanently damp or conducting floors, or from other conducting surfaces such as metal stairways, metal piping radiators, machine frames, etc. Concrete floors in basements or close to and directly over the ground shall be considered as conducting floors.

(Fine print note) Sockets and receptacles installed within 8 feet vertically or 8 feet horizontally of grounded or partially grounded surfaces shall be considered "within reach".

1906 - Plug Receptacles - Special Requirements For.

a. All receptacles for attachment plugs shall have an approved rating of not less than 660 watts and shall be of recessed or concealed contact type, so designed and constructed that the plug may be removed without leaving any live parts exposed to accidental contact; provided, that when the capacity of the receptacle exceeds 25 amperes, it may be of a type equipped with automatically self-closing covers that will prevent accidental contact. No screw base receptacle shall be installed for use of attachment plugs. (See section 1905(f)).

b. Where flush receptacles are used they shall be enclosed in approved boxes as prescribed by section 1101(g) and 1102(g) of this code.

c. Plug receptacles operating at more than 125 volts shall be of such design and construction that attachment plugs of the standard type commonly used with 125 volt portable devices cannot be inserted in the higher voltage receptacle.

1907 - Classification and Rating of Lamp Holding Devices.

a. Lamp holding devices shall be classed according to diameters of lamp bases, as candelabra, medium and mogul base.

b. Miniature sockets and receptacles having screw shells smaller than candelabra size may be used only for Christmas tree lighting outfits and for similar decorative purposes.

c. All sockets and receptacles shall be marked with the name or the trade-mark of the manufacturer and with the watts and volts for which such sockets or receptacles are rated.

ARTICLE 20LAMPS.2001 - Arc Lamps.

a. Arc lamps shall be equipped only with such resistances or regulators as are enclosed in non-combustible cases, said resistances or regulators being treated as sources of heat. An incandescent lamp shall not be used as a resistance or regulator. Economy and compensator coils shall be mounted on non-combustible, non-absorptive insulating supports, such as glass or porcelain, providing an air space of at least one inch between frame and support. Such coils shall generally be treated as sources of heat.

b. Arc lamps shall be carefully isolated from inflammable material and shall not be installed in locations where they are exposed to flying particles of easily ignitable material or to inflammable gases.

c. Open arcs shall not be used. Only enclosed arc lamps, having tight inner globes, shall be installed in buildings. They shall be suspended at least ten feet above floors or sidewalks.

d. Leads to arc lamps shall have a current-carrying capacity approximately 50 per cent in excess of the normal current of the lamp. If the leads are larger than No. 14 and the lamp suspension provides for raising and lowering, the leads shall be composed of stranded wires.

e. There shall be provided a cutoff for each lamp or series of lamps.

(Fine print note) For special rules governing portable arc lamps in theatres and motion picture shows, see Sections 3402 and 3615.

2002 - 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 resistance 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. A cutout shall be provided for each enclosed mercury vapor lamp or series of lamps, except where not more than five lamps are contained in a single frame and lighted by a single operation. By special permission, lamps may be so grouped that not more than 4000 watts will be dependent upon one cutout.

c. Fixtures carrying enclosed mercury vapor lamps shall be wired with insulated conductors not smaller than No. 12. Taps from circuit wires to points of suspension of fixtures shall not exceed 18 inches in length.

(Fine print note) For high potential Vacuum Tube Systems see requirements of Section 2905.

2903 - Gas-Filled Lamps.

a. Gas-filled incandescent lamps shall not be equipped with medium bases if above 250-watt rating, nor with mogul bases if above 1500-watt rating. They 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.

b. Fixtures carrying gas-filled incandescent lamps shall be wired in accordance with Section 1902(d).

2904 - Portable Lamps.

a. When necessary to prevent portable lamps from coming in contact with inflammable materials, or to protect them from breakage, they shall be surrounded with a substantial guard, which shall be securely attached to the socket or handle.

ARTICLE 21.SIGNS AND OUTLINE LIGHTING.2101 - General.

a. All electric signs and the electrical wiring and equipment of all bill-boards, sign-boards, and other electrically equipped advertising structures, shall, in addition to the requirements of this Article, be constructed, installed, and maintained in compliance with the applicable requirements of other Articles of this Code and in compliance with other Ordinances of the City of Portland.

(Fine print note) The Electrical Sign Ordinance and Bill-board Ordinance specify the signs and other advertising structures for which an erection permit is required; prescribes certain limiting dimensions, various structural and installation requirements, when illumination is required and the minimum amount thereof, etc.

b. Every electric sign shall be provided with an inspection label or other satisfactory evidence showing that it is approved by the Underwriters' Laboratories of the National Board of Fire Underwriters; provided, however, that this requirement may be waived if the sign is constructed in full compliance with all requirements herein prescribed and provided a complete inspection has been made by the inspector.

c. When small transparencies, display devices, etc., which consume not over 600 watts are installed inside of buildings, they shall be considered as electric fixtures or portable devices rather than as electric signs. They shall, however, be of approved type and construction.

2102 - Construction of Signs.

a. Electrical signs internally wired shall be constructed entirely of metal or other approved non-combustible material, except that wood may be employed for the external decoration of signs if kept at least two inches distant from the nearest socket or receptacle.

b. Metal used in the construction of signs shall be not less than No. 26 U. S. sheet metal gage (.0156-inch). It shall be galvanized, treated with at least three coats of anti-corrosive paint, or otherwise suitably protected from corrosion.

c. The design shall be such as to afford ample strength and rigidity to render the box practically weather-proof, to enclose all terminals and wiring, other than the leads; and to provide drainage for each compartment by means of one or more holes, each not less than one-fourth inch in diameter.

d. A separate, completely enclosed, accessible approved box or cabinet shall be provided to contain outlets, flashers, non-weather-proof transformers, or other similar devices placed on or within the body or structure of a sign, or on the exterior of the building.

e. Electrical signs shall have the maker's name or trademark permanently attached to the exterior, where it may be readily seen when the sign is installed.

2103 - Sockets and Receptacles for Signs.

a. Sockets and receptacles for signs shall be of the keyless porcelain type, and shall be so designed as to afford permanent and reliable means to prevent turning. Terminals of sign receptacles shall be kept at least one-half inch from other terminals and from the metal of the sign. Miniature receptacles shall not be employed for outdoor work.

2104 - Wiring of Signs.

a. No open wiring shall be installed on any electric sign or other advertising structure. All wiring on the outside of every advertising structure shall be installed in approved rigid metal conduit made weatherproof or in approved lead-sheathed and steel armored cable or in approved weather-proof metal gutters. When metal gutters are used, they shall be constructed of galvanized sheet metal of such thickness and so supported and stayed as to secure strength and rigidity fully and equal to that of the body of the sign; but in no case shall they be of thickness less than No. 20 U. S. sheet metal gage.

b. Inside of sign structure approved rubber-covered conductors, not smaller than No. 14 shall be used. Such conductors shall be neatly run, and so disposed and fastened as to be mechanically secure.

c. Conductors shall be soldered to all receptacle terminals (which will be inaccessible), and exposed parts of conductors and terminals shall be painted with an insulating compound to prevent corrosion.

d. Approved bushings shall be employed to protect wires passing through walls or partitions of the structure. Sign leads not encased in conduit or metal armor may be cabled before passing through non-combustible, non-adsorptive bushings.

e. In signs and other advertising structures, the wiring shall be so arranged that the connected load on any branch circuit will not exceed that permitted by section 1805 of this Code. In no case shall the number of sockets and receptacles on a circuit exceed the number given in the table below:

Location of sockets or receptacles	Size of circuit wire.	
	14	12
Interior of sign.....	20	30
Outlining letters or figures	40	60
In borders, chasers or effects	100	150

f. Signs shall not be wired in series multiple or multiple series, except by special permission.

2103 - Supply Conductors and Connection to Signs.

a. Each outside electric sign or other outside advertising structure shall be supplied through a separate feeder, sub-feeder, or circuit, protected by a separate cutoff; provided, however that such signs may, in the case of extensions to completed installations, be connected to an existing branch lighting circuit if the maximum permissible load of such circuit will not thereby be exceeded. (See sections 1803, 1805, and 1806.)

b. The supply conductors or main feeders for signs shall be of size sufficient to carry the full connected load, whether flashers are used or not; but in no case shall they have carrying capacity of less than 50 watts for each socket and receptacle used in the interior of sign, nor less than 25 watts for each socket and receptacle used in letters or figures, nor less than 10 watts for each socket and receptacle used in borders, chasers, or effects.

c. With swinging or movable signs, the conduit shall terminate in an approved fitting which shall be placed within 12 inches or as close as practicable to the sign axis; from this fitting, the conductors shall be neatly cabled and well taped and shall enter the sign through one or more non-combustible, non-adsorptive bushings. Drip loops shall be provided in the conductors between the conduit terminal fitting and the sign. The length of open conductors between conduit terminal fitting and sign shall not exceed 3 feet.

d. With stationary signs, the conduit shall enter the sign and be properly secured thereto.

2106 - Outline and Marquise Lighting.

- a. The wiring for outline lighting shall be installed in conduit. Such conduit on the exterior of buildings shall be installed as prescribed by section 1906 of this code.
- b. Marquise wiring shall be installed in conduit or armored cable or it shall be installed in metal wireways inside of marquise structure. Such wireways shall be constructed of sheet metal not less than No 28 U. S. sheet metal gage in thickness. Terminal connections shall be made as prescribed for signs in section 2104.(c) hereof.
- c. Sockets and receptacles shall be of the keyless porcelain type. Miniature base devices shall not be used.
- d. In marquise and outline lighting, the wiring shall be so arranged that the connected load on any branch circuit will not exceed that permitted by Section 1905 of this Code. In no case shall the number of sockets and receptacles on a circuit exceed the number given in the table below:

Type of Installation	Size of circuit wire	
	14	12
Marquise Lighting.....	25	36
Outline Lighting.....	60	90

- e. Marquise and Outline Lighting shall be supplied through a separate feeder, sub-feeder, or circuit, to which no other load is connected; provided, however, that such lighting may in the case of extensions to completed installations, be connected to an existing branch lighting circuit if the maximum permissible load of such circuit will not thereby be exceeded. See Sections 1903, 1905, and 1906.)

ARTICLE 22ELECTRICAL APPLIANCES2201 - General.

a. Each electrical appliance shall be provided with a name-plate, giving the maker's name and the normal capacity in volts and amperes or in volts and watts. If the power factor of any appliance is less than unity the rating shall be given in volts and amperes or in volts and K. V. A.

b. Conductors supplying smoothing irons, sad irons and all portable electrical heating appliances which are rated at more than 50 watts and which produce temperatures in excess of 250 degrees Fahr. (121 degrees C.) on surfaces with which the wire is liable to be in contact, shall be approved heater cord, type H. (See section 906(b)).

c. Conductors supplying stationary electrically heated appliances (which are obviously intended by size, weight, and service to be installed in a fixed location), shall be rubber-covered up to the terminals of the appliance; provided, however, that heat resisting insulation shall be used in place of rubber where wires outside the terminal box are subjected to a temperature in excess of 120 degrees Fahrenheit (49 degrees C.)

d. Each portable electrical appliance shall be equipped with an approved plug connector so designed that the plug may be pulled out to open the circuit without leaving any live parts so exposed as to render likely accidental contact therewith. The connector may be located at either end of the flexible conductor or inserted in the conductor itself.

e. Heating appliances of more than 2500 watts capacity shall be designed for operation, either on three-wire, 125-250 volt systems, or two wire, 250 volt systems. Deviation from this rule will be allowed only under special permission. (See section 1906 (a)).

2202 - Special Protective Requirements - Grounding.

a. Each sad iron and smoothing iron installed in laundries, tailor shops, cleaning establishments and similar places, shall be equipped with an approved signal device to indicate when the appliance is energized.

b. Heating appliances which are fixed as to location (such as radiators, ranges, plate warmers and similar devices), shall be spaced not less than three inches from a protected wall, nor less than six inches from an unprotected wall, except in the case of heaters intended for installation in partitions or in other parts of the building structure, and which have been especially approved for such use.

c. Smoothing irons, sad irons and other heating devices that are intended to be applied to combustible articles, shall be provided with approved stands.

d. The metal frames of all stationary appliances, when within five feet of conducting surfaces, such as metal piping, plumbing fixtures, damp floors or similar conducting surfaces, shall be permanently and effectively grounded, as provided in Article 17 of this Code.

2203 - Electric Furnaces and Welders.

a. All wiring, apparatus, etc., used in connection with electric furnaces, shall conform to other provisions of this Code, insofar as they apply, and, in addition thereto, shall comply with the special rules herein given.

b. The wiring for furnaces shall be adequately guarded to prevent mechanical injury. When the use of insulated cables is impracticable, the connection from the secondary bus of the transformer used with arc furnaces may be made with bare copper cables, provided they are adequately guarded or isolated by elevation.

c. Transformers installed as a part of electric furnaces and similar devices shall, when the highest voltage of either primary or secondary exceeds 600 volts, be installed to conform to the requirements of Article 27 of this Code. When the highest voltage of either primary or secondary is 600 volts or less, they shall be treated as other equipment of like capacity and voltage.

d. The outside noncurrent-carrying metal frames of furnaces and similar apparatus shall be permanently grounded if they contain current-carrying parts connected to circuits of more than 150 volts to ground. The circuits for electric furnaces are not required to be grounded.

e. Conductors which must necessarily be flexible shall have insulation of a suitable type designed for the particular use to which they will be subjected. The conductor attached to the electrode of welding and cutting equipment shall be insulated but the other conductor of such circuits need not be insulated.

f. The maximum voltage obtainable at the electrodes of welding or cutting apparatus shall be limited to 100 volts between conductors or from either conductor to ground; provided, that the voltage of electric welding and cutting circuits may exceed 100 volts but shall not exceed 125 volts, under the following conditions: The portable cord or cable from the generator or transformer to the welding or cutting electrode shall be approved for heavy duty service and all handles for holding welding or cutting electrodes used on circuits operating at over 110 volts shall be equipped with an insulating shield between the exposed current-carrying parts of the electrode holder and the grip of the handle.

g. Except at points where necessarily left exposed (as at spot welder contacts), all current-carrying parts of furnaces, welders, and control equipment shall be suitably guarded against accidental contact by suitable enclosures or barrier guards.

ARTICLE 23.**ROTATING MACHINERY AND ITS CONTROL APPARATUS.**

NOTE:- For protection of motors and motor circuits see sections 1310 to 1314 inclusive. The requirements for motor starting and disconnecting switches are given in Article 14.

2301 - Motors - Restrictions as to Use.

a. Motors shall not be operated at a potential exceeding 2500 volts to ground except in central stations, substations or motor rooms nor shall they be operated on circuits connected to any electric railway system with ground return except motors used for, or in connection with, or located on premises used for, the operation of electric railways. Deviation from this rule may be allowed by special permission in exceptional cases. (See section 802).

b. Motors shall not be operated in series-multiple or multiple-series except on constant-potential systems where permission has been granted by the Electrical Division.

2302 - Requirements as to Location of Rotating Machinery.

a. Motors having brushes or sliding contacts exposed to combustible dust shall be located in separate dust-tight rooms or non-combustible housings provided with effective ventilation from a source of clean air. (See also Section 3608).

b. In places where combustible dust is thrown into suspension in the air in sufficient quantity to produce explosive mixtures, such as in flour mills, grain elevators, etc., or where it is impracticable to prevent dust or flying material collecting in dangerous quantities on or in motors, all motors shall be either of the totally enclosed type or enclosed ventilated type or they shall be placed in separate dust-tight rooms or non-combustible housings. Such rooms or housings shall be effectively ventilated from a source of clean air.

c. Motors permanently located on wooden floors shall be provided with suitable drip pans, if so required by the Electrical Division.

d. When any motor or control equipment is installed in any location where the windings or other current-carrying parts will be exposed to liability of mechanical injury, or where they will be exposed to dripping oil, excessive moisture, steam, vapors, chemicals or other injurious agencies, suitable screens, covers, enclosures, guards, or other means shall be provided to afford such adequate protection as is reasonably possible under the conditions.

e. When located in elevator shafts, dumb waiter motors shall be installed inside of metal enclosures unless the walls and floor of the shaft are constructed of fire resistive materials, in which case, a complete metal enclosure need not be provided but a metal cover shall be installed over the motor and its control equipment when such equipment is located in bottom of shaft.

f. Generators shall be located in dry places. They shall not be placed in a room where any hazardous process is carried on, nor where they will be exposed to inflammable gases or flyings of combustible material.

2303 - Terminals and Terminal Connections.

a. Metal conduit, armor, etc., terminating at cabinets or casings which enclose switches, starters, or control equipment shall properly enter and be secured to such enclosures except where conductors terminate at resistor grids and similar places. Terminal boxes or casings shall be provided for all control equipment (including connecting leads) unless such equipment is located as prescribed by Section 2304(c) of this Article. In exceptional cases, where the use of terminal boxes or casings would be impracticable, these devices may be omitted by special permission.

b. Metal conduit, armor, etc., terminating at motors shall properly enter and be secured to a terminal box or casing attached to the motor frame and enclosing the motor terminals or leads. This rule shall not apply where the size of conduit required would be larger than 2 inches, nor for leads terminating at motors rated at less than one horse power, nor to secondary leads terminating at any slip-ring motor provided there are no bare live parts exposed to probably contact or short circuit and provided the open portion of the leads is effectively protected by covering with cord or tape or by other suitable means.

(Fine print note) When motors are necessarily movable in position or where excessive vibration is likely to be present the above rule will require the use of flexible metal conduit from the motor terminal box to the rigid conduit.

c. Where terminal blocks are permitted or used, they shall be composed of approved non-combustible, non-absorptive insulating material, such as slate, marble, or porcelain. (See paragraph (b) above and section 2304).

d. Soft rubber bushings may be used to protect lead wires, where they pass through the frame, provided they will not be exposed to oils, grease, oily vapors or other substances having a deleterious effect on rubber. Where so exposed, bushings composed of porcelain, micanite or hardwood treated with a preservative shall be used.

2304 - Protecting Live Parts of Rotating Machinery and Control Equipment.

a. When motor terminals and terminal connections are not enclosed (See Section 2303(b)), they shall be guarded against accidental contact with, or short-circuit of, live parts. Motors operating at more than 150 volts to ground and having exposed bare live parts (such as brush rigging, commutators, or collector rings) shall, unless located in compliance with paragraph (c) of this Section, be provided with suitable permanent screens, covers, enclosures, railings or other guards, arranged so as to prevent inadvertent contact with persons or conducting objects and also arranged so as to permit ready access to authorized persons for making necessary adjustments or repairs. This rule shall not be construed to require the guarding of slip rings of wound-rotor motors when the rings and brush rigging are located inside of the bearing bracket.

b. Live parts of all control equipment shall be guarded against accidental contact either by enclosure or by locating the equipment in compliance with paragraph (c) of this section. Manually operated starting boxes, speed controllers and the like shall have enclosures of such design that all live parts are completely enclosed and shall be so arranged that the device can be operated from the outside of the enclosure. Automatic controllers and starting devices having exposed live parts shall be placed in standard cabinets provided with hinged doors.

c. Protection of live parts may be obtained by so locating apparatus that the live parts are not easily accessible. This may be accomplished by (1) installation in a room or enclosure which is accessible only to authorized persons; or (2) by installation on a suitable balcony, gallery, or platform, so elevated and arranged as to exclude unauthorized persons; or (3) by elevating the apparatus 8 feet or more above the floor line or working platform. If the equipment so elevated will require frequent inspection, adjustment, or repairs a permanent platform and rail shall be provided. (For equipment over 600 volts see Section 2902).

d. Control equipment having exposed live contacts, which in their ordinary operation produce arcs, shall not be used for the control of motors in the locations noted in paragraphs (a) and (b) Section 2302, nor in extra-hazardous locations as described in Section 3607 of this Code.

(Fine print note) It is the intent of the above rules to require such protection of live parts of electrical apparatus as will eliminate, as far as possible, accidents from contact with live parts, and fires which may result from sparks or flames produced in the operation of electrical apparatus. As a general rule, the protection of live parts against accidental contact will be required on all apparatus where a person unfamiliar with electrical apparatus may come in contact with such live parts. The protection of arcing contacts will be required on all apparatus so situated that such arcing contacts might produce fires.

2305 - Grounding Rotating Machinery and Control Apparatus.

a. Exposed non-current-carrying metal parts of motors, generators and control apparatus shall, except as noted in paragraphs (b) and (c) of this Section, be permanently grounded in compliance with Article 17 of this Code and under the following conditions:

1. On all circuits operating at more than 150 volts to ground, regardless of location.
2. In all locations where highly inflammable gases, liquids, mixtures or other substances are manufactured, used or stored in other than original containers, and in all locations where deteriorating chemical fumes or excessive moisture exist.
3. In all locations where within 5 feet horizontally of exposed grounded surfaces (such as metal frames of other machines, plumbing fixtures, grounded pipe or conduit, and conducting floors or walls) and within 8 feet vertically of the floor or working platform.

(Fine print note) The grounding of portable equipment in all cases is strongly recommended when this can be readily accomplished.

b. Motors which are combined with ceiling fans shall not be grounded. Such motors shall be hung from insulating hooks or shall have an insulator interposed between the motor and its support.

c. Parts of apparatus, such as name-plates, screws in wood, and similar small parts, which are not liable to become alive except under very unusual circumstances may be left ungrounded.

2306 - Motor Starting Devices.

NOTE:- See also Section 1408.

a. Direct current motors rated at one horsepower and above shall be provided with starting boxes unless the motors are especially designed for use without starting devices and unless the starting current is automatically limited to a value which will permit proper overload protection of the motor. (See Section 1311.)

b. All alternating current motors rated at 6 horsepower and above shall, except as noted in paragraphs (c) and (d) of this Section, be provided with a compensator or equivalent device which will reduce the starting current to a value not greater than the allowable starting current prescribed by the Motor Rules Committee of the National Electric Light Association. Specially designed motors having starting currents within the permissible limit shall be so marked or identified that they may be readily distinguished from the standard squirrel cage motor.

(Fine print note.) As a general rule the locked rotor current of motors under the N.E. L. A. rules will not exceed 4 to $4\frac{1}{2}$ times their normal full load current rating.

d. Poly-phase motors not larger than 10 horsepower capacity having a rated speed of 1800 r. p. m. and less, if furnished with starting devices equipped with overload relays (either thermal or magnetic), need not be provided with a compensator. High speed motors (over 1800 r. p. m.) of 10 horsepower and less may be used without compensators by special permission. (See Section 707(b).)

d. Where special permission is obtained from the serving agency, compensators may be omitted on the smaller motors of a group installation when their omission will not result in a starting current in excess of the allowable starting current of the largest motor of the group. The size of starting fuse and motor branch conductor in such case shall be determined by Section 1310(d) of this code.

(Fine print note) Motors operated without compensators should be guaranteed for such operation by the manufacturer. In the absence of specific information on this point the rated capacity of motors started directly on the line should not exceed 5 horsepower per pole.

e. Adjustable speed motors, unless of special and appropriate design, if controlled by means of field regulation, shall be so arranged and controlled that they cannot be started under weakened field.

f. Motor starting rheostats shall be so designed that the contact arm cannot be left on the intermediate segments and, for direct current circuits, shall be provided with an automatic device which will interrupt the supply circuit before the speed of the motor falls to less than $1/3$ of its normal value. (See Section 2308 for no-voltage release requirements in general).

g. Resistance type starting devices shall conform to the requirements of Article 24 of this Code. Auto transformer starters shall conform to the requirements of Section 2307 of this Article. Motor switches shall conform to the requirements of Article 14 of this Code.

h. Motor starting devices shall be plainly marked, where the marking may be readily seen after the device is installed, with the rating and name of the maker.

2307 - Auto Transformer Starters.

a. The coils and switches of auto-transformer starters shall be completely enclosed in a substantial dust-proof metal case. All load-carrying contacts of such switches shall be oil immersed unless enclosed in a dust-tight metal case.

b. Cases for coils or switches shall afford access to the interior for inspection and oil renewal, and shall be so constructed that when mounted on a plane surface the case will make contact with such surface only at points of support. An air space of at least $1/4$ inch shall be maintained between case and surface.

c. The oil tank shall be marked in a suitable manner to indicate the proper oil level. When such device carries a visual oil indicator, the marking shall be for the proper oil level with the starter assembled. If the visual indicator is not used, markings shall indicate the oil level prior to assembling.

d. The switch shall provide an off position, a running position and at least one starting position. It shall be so designed that it cannot rest in a starting position, or in any position which will render inoperative the overload protective devices in the circuit.

2308 - No-Voltage and Phase Reversal Protection.

a. When used under the following conditions, each motor shall be provided with a suitable protective device that will automatically open the circuit to the motor upon failure of voltage and cause circuit to remain open until manually re-closed:

1. Wherever the unexpected re-starting of a motor would obviously result in probable danger of injury or of fire (as, for example, in the case of a motor driving the oil pump and atomizer for an oil burner or in the case of a motor driving the ammonia compressor for a refrigerating machine).

2. Whenever a motor rated at more than 2 horsepower drives a group of two or more machines.

(Fine print note) Low-voltage protection will not be required when protection equivalent in effect is otherwise provided by mechanical or other means nor when the motor is controlled by a fully automatic starter or controller that is actuated by some impersonal agency, such as change in pressure, temperature, or water level.

b. Alternating current motors operating freight or passenger elevators or cranes that are dependent on phase relation for the direction of rotation shall be protected by approved automatic circuit breakers (or reverse phase relays) operative in the event of any phase reversal that would cause a reverse motor rotation, or in the event of the motor being connected to the line single phase. Such protection may be provided in the feeders supplying a group of crane or elevator motors. The rule shall not apply to floor operated cranes or hoists or to sidewalk elevators.

2509 - Name Plate Data Required.

a. Generators shall each be provided with a name plate, giving the maker's name, the rating in kilowatts (KW) for direct current, in kilo-volt-amperes (KVA) for alternating current, the normal volts and amperes corresponding to this rating, also the speed in revolutions per minute.

b. Each motor shall be provided with a name-plate, giving the maker's name, the capacity in volts and amperes, and the normal full load speed; also the interval during which they can safely operate at full rated load starting cold. The time interval given shall be either 5, 10, 15, 30, 60 or 120 minutes, or continuous.

c. When a motor is rebuilt or rewound with any change in its rating or characteristics, it shall be provided with a name plate, giving the name of the person or firm by whom the changes were made and giving the new rating and characteristics in the same detail as specified in paragraph (b) above.

2310 - Motor Wiring Data.

a. The following tables are intended for use as a general guide in, and will apply to the installation of motors of the standard types and ratings most commonly used when the operating conditions are of the average or ordinary character. If, as a result of the motor being of unusually slow speed in relation to its horsepower rating, or of its being of special or unusual or poor design, the normal full load current rating of the motor is in excess of the value used in the table, then conductor, fuse, and conduit sizes larger than those given in the table may be required. The same statement applies to cases where the operating conditions are abnormal, as for example, when the starting duty is unusually severe or occurs with unusual frequency. On the other hand, when large motors are involved, it may be found possible to effect some economy by obtaining exact data concerning the motor and the operating conditions and laying out the particular installation on the basis of such data, and in accordance with the provisions of this Code applying to the case in hand. All persons are, therefore, cautioned to consider carefully, before applying these tables, the type and rating of the motor and the load and operating conditions.

b. The current values given in the tables are determined for standard speeds, as follows:

Size of Motor	Standard Speed.
1 to 10 H. P.	1800 r.p.m. and above
11 to 25 H. P.	1200 r.p.m. and above
30 to 75 H. P.	900 r.p.m. and above
100 to 150 H. P.	720 r.p.m. and above
200 to 300 H. P.	600 r.p.m. and above
400 to 600 H. P.	450 r.p.m. and above
Over 600 H. P.	280 r.p.m. and above

c. The conductor size indicated in the tables for squirrel cage A. C. motors applies to that portion of the motor branch circuit which is between the motor running protective device and the line. The conductors in that portion of the motor branch circuit which is between the motor running protective device and the motor, shall, for continuous duty work, have a current-carrying capacity not less than 110% of the normal current rating of the motor, nor less than the rating of the fuses or the setting of the circuit breaker protecting them.

(Fine print note) Particular attention is called to the fact that voltage drop has not been considered in determining the conductor sizes given in these tables. In some cases, particularly with long runs, consideration of the question of satisfactory operation, or of operating economy, may indicate the desirability or necessity of having conductors installed which are larger than those specified in the tables.