

Ordonnance portant modification à l'Ordonnance provisoire par rapport à l'Installation de l'Éclairage Électrique.

La Cour, en renouvelant les dispositions de l'Ordonnance portant modification à l'Ordonnance provisoire par rapport à l'installation de l'éclairage

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électrique passée le 20 Octobre 1900, et renouvelée aux Chefs-Plaids d'après Noël, tenus le 19 Janvier 1903, ouïes les conclusions des Officiers du Roi, en modifiant les dispositions de l'Ordonnance par rapport à l'Installation de l'Éclairage Électrique des Chefs-Plaids d'après Pâques tenus le 23 Avril 1900, a ordonné et ordonne ;—

Défense de se servir de la lumière électrique que sous certaines conditions.

Il est défendu à qui que ce soit de se servir de la lumière électrique après le 21 Janvier 1901 sans avoir produit au Comité des États un Certificat signé d'un Ingénieur électrique dûment qualifié et approuvé par le dit Comité, constatant, en ce qui regarde une installation faite avant le 1er Juin 1900 qu'elle est bonne et suffisante, et en ce qui regarde une installation faite à compter de la dite date, qu'elle a été faite conformément aux règlements contenus dans la cédule annexée à la susdite Ordonnance, le tout sous peine d'une amende qui n'excédera pas £5 stg.

Cédule à laquelle référence est faite dans la susdite Ordonnance.

**INSTALLATION OF THE ELECTRIC LIGHT IN
PUBLIC AND PRIVATE DWELLINGS.**

List of Essential Conditions and Regulations which must be adhered to in order that Installations may meet the rules issued by the leading Fire Insurance Companies, and in order that the Installation shall be passed as safe by the Electric Lighting Committee.

The principal sources of danger are :—

- 1.—Conductors of inadequate size and conductivity.
- 2.—Perishable and inferior insulating materials.
- 3.—Undue heating of cables, and current-carrying parts of fitting.

4.—Switches, cut-outs, and the other fittings, not suited to the pressure of the circuit, or fittings of antiquated design.

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5.—Inferior materials and workmanship, particularly in faulty joints, fittings, and connections.

6.—Neglect of frequent testing and inspection.

INCANDESCENT LAMPS.

1.—Under certain conditions Incandescent Lamps are capable of communicating fire to combustible materials left in contact with the lamp bulbs. Tissue paper or celluloid shades must not be used, and the lamps should not be draped with delicate muslins unless the bulbs are first protected by an outer glass globe or its equivalent.

2.—When used in show windows they should preferably be permanently fixed and not be capable of attachment in hazardous positions by window dressers.

ARC LAMPS.

1.—Arc lamps should be completely enclosed so that no sparks or heated carbons can fall on to combustible materials.

2.—Where naked Arc Lamps are essential (*i.e.*, for photography or photo printing, &c.), then the whole surroundings of the lamp should be fire-proof.

3.—Each Arc Lamp, or set of two or more Arc Lamps arranged in series, should have its own double pole cut-out to automatically break circuit before the resistance coil or any conductors become dangerously over-heated. A double pole switch should control each circuit.

4.—All resistance coils for use with Arc Lamps or otherwise should be mounted upon incombustible materials only. If separate from the lamp, motor &c., they should be fixed in plain sight upon a brick

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or stone wall, and must be thoroughly isolated from all combustible materials.

Resistance coils must not be placed in textile, corn or oil mills, or in store rooms used for cotton, flour, or other hazardous goods.

5.—The conductor forming the resistance should be so proportioned as to effect the desired object without excessive heating. The general arrangement of the coil and its mounting should be such, that accidental heating to redness of the resistance wire shall not endanger any combustible material, including the insulation, and the wood casing, of the connecting conductors.

Where considerable dust or flyings exist the resistance coil should be so enclosed that accumulations of dust, &c., may not lodge upon and become fired by the heated resistance.

Special care should be taken to avoid "earth" faults due to these resistances. And in no case should a resistance be placed where an accumulation of coal gas is possible.

CONDUCTORS.

1.—The current carrying capacity for conductors of 98 % conductivity is as follows :—

Incandescent Lamps only, = 1,500 ampères per square inch sectional area for currents up to 10 ampères.

1,000 ampères per square inch of sectional area for currents from 10 to 100 ampères.

800 ampères per square inch of sectional area for currents over 100 ampères.

Arc Lamps, Motors, Heating Apparatus, &c.

Up to 50 ampères = 1,000 ampères per square inch sectional area.

Over 50 ampères = 800 ampères per square inch sectional area.

In proportioning the sizes of the conductors for incandescent lamp circuits no higher efficiency of the lamp than $3\frac{1}{2}$ watts per candle power may be assumed, whatever may be the actual efficiency of the first lamps installed, and every position should be prepared to receive with safety a lamp giving at least 16 c.p. nominal.

2.—No *solid* conductor smaller or larger than No. 18 S.W.G. will be permitted.

No *stranded* conductor having a less carrying capacity than a No. 18 S.W.G. should be used.

3.—It is preferable to avoid joints in conductors as far as possible, especially where lead-sheathed conductors are used. When joints are necessary they should be made mechanically and electrically sound, and should be soldered, using resin only as a flux; the joint should be carefully insulated so as to permanently secure good insulating and waterproof qualities.

If joints are made in lead-sheathed conductors the lead-sheathing should be made continuous and waterproof over the joint.

Joints should not occur within metal pipes or in any inaccessible or concealed portions of the wiring. Two or more conductors must not be clamped under a single terminal without previously being soldered together.

4.—Conductors (other than twin flexible conductors) should be insulated as follows:—

- 1.—Copper Conductor to be tinned.
- 2.—Then to receive a serving of pure india-rubber.
- 3.—Then vulcanised india-rubber.
- 4.—India-rubber coated tape.
- 5.—Braided flax or cotton, and coated preservative compound.

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5.—The minimum insulation resistance per mile of all wires before use shall be at the rate of 750 megohms per mile, when tested in water at 60° F. after one minute's electrification, with 500 volts testing pressure.

6.—Each conductor of a twin flexible conductor should be insulated with one serving cotton, then pure india-rubber, then vulcanised rubber, then cotton, and finally covered by silk or cotton braiding. For damp places the silk or cotton braiding should be replaced by a strong braiding treated with tar or preservative compound.

Twin or twisted flexible conductors which are not insulated with vulcanised rubber will not be permitted.

7.—All conductors attached to portable fittings should be stranded.

8.—The insulating coverings of conductors for internal wiring insulated with materials other than india-rubber, will be subject to special approval before use, and should conform to the following conditions :

- (a) Minimum insulation resistance before use per mile (5) 600 megohms.
- (b) Insulating material to be of substantial thickness.
- (c) When heated to 160° Fah. should not soften so as to allow any change of position of the wires within the insulating envelope.
- (d) The material relied upon for insulation must be of a permanently damp-resisting nature.
- (e) The cable or wire must be suitably protected from mechanical injury.

SUPPORTING CONDUCTORS.

1.—Conductors insulated as above may be supported in any of the following manners.—

+&— Conductors may not be bunched together, 1903.
except in cases mentioned under heading 2.

2.—By being enclosed in damp-proof, fire-proof, and impenetrable tubes, free from internal roughness or burrs, in a manner such that fire cannot spread from the inside, nor water, nor gas from the outside, in which case +&— conductors *may* be bunched together wherever so enclosed.

3.—By being enclosed in wood casings, so that +&— conductors are mechanically and rigidly separated from each other, and from earthed metal work or the like, by at least $\frac{3}{4}$ inch.

4.—In special approved cases conductors may be supported in plain sight, at sufficiently frequent intervals to prevent undue sagging upon porcelain insulators, and in such a manner that +&— conductors do not approach each other nearer than 6 inches. The same distance must be maintained between the conductors and any wall or earthed metal work.

5.—Where conductors are enclosed in metallic tubing in buildings, where gas pipes or sprinkler pipes exist, the whole of the metallic casing should be efficiently and permanently “earthed” through a bare conductor of a section at least equal to a No. 8 S.W.G. copper wire.

Where lead sheathing is used this should be metallically continuous throughout, and the sheathing should be thoroughly “earthed.”

6.—Where conductors enter or leave metallic tubing, the arrangement should be such that fire cannot spread from the inside of the tubing through the ends, unless the ends open into a fire-proof boxing. Conductors passing through the sides of fire-proof metal cases such as those enclosing Motors, Heating Apparatus, &c., should be suitably protected from abrasion at these points by insulating bushes.

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7.—All wood casing, woodwork, &c., should be treated before erection, and on all sides, with a water-proofing paint or varnish. Wherever woodwork is used, it should be recognised that *damp* woodwork may, under certain conditions, become charred and ultimately fired.

8.—The covers of casing, wood blocks and the like, should be fixed by means of screws only.

9.—Where casings pass vertically through floors, they should be protected at the floor level by sheet iron, or its equivalent, extending 2 inches below to at least 3 inches above the floor line.

Sheet lead, not less than 1-16" in thickness, may be employed as a protection to the casing at these points, and in this case the lead covering in lieu of passing through the floor may be turned up at right angles to the casing forming a flange on the surface of the floor at least $\frac{1}{2}$ " wide, which must be secured to the floor boards by means of brass brads or copper tacks.

10.—In permanently damp situations conductors (unless lead sheathed) should not be enclosed or supported by wood.

11.—Twin conductors or flexibles should not be run in wood casings or along walls or ceilings, as a substitute for separate single conductors (lead sheathed twin conductors excepted).

12.—Twin conductors improperly treated and of poor quality form one of the most dangerous points of an installation. They should be protected from injury with the greatest care, and should have suitable insulating bushes in all holes of metal fittings where twin wires enter.

13.—Flexible twin conductors, carrying current to heating and cooking apparatus and the like, should terminate at a fire-proof wall socket or ceiling rose

at their fixed points of support. No fuses will be allowed in ceiling roses or wall sockets, but independent cut-outs on the distributing boards must be provided for such circuits.

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14.—No “*earthed*” metal work, water or gas pipes, or the like, may be utilised as part of a circuit.

FITTINGS.

1.—Combination gas and electric light fittings cannot be permitted. Gas fittings may, however, be converted and adapted for use for the electric light, but in this case the gas supply must be cut off and the fitting electrically insulated from the gas service piping.

2.—Twin flexible conductors must not be used for the internal wiring of electroliers, brackets and other fittings; special wire is made for this purpose.

3.—No fuses can be allowed in ceiling roses, switches or wall sockets.

4.—The terminals and other metal parts of fittings carrying current should, in every case, be mounted only upon a fire-proof, non-conducting base, and in no case upon wood, vulcanised fibre, or other damp absorbing or combustible materials. It is preferable that such metal parts of small switches, ceiling roses and the like, shall be so secured to the base that no bare conducting metal is exposed at the back of the fitting.

5.—All such fittings should be mounted upon varnished wood blocks, and not directly to the walls or ceilings.

6.—All fittings in which fusible metal is used should be completely enclosed in a fire-proof manner; there should be ample clearance within the covers to prevent metallic deposits from melted fuse forming an arc. Cut-outs without covers are a source of danger; broken covers should be replaced without delay.

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7.—All switches should be of a “quick break” type automatically flying to full “off” when released. It is preferable that double pole main switches shall be so coupled that a single movement will disconnect the switches upon both, or upon all poles.

8.—The construction of ceiling roses and wall sockets, lamp holders and the like, should be such as to enable the twin conductor to be firmly held independently of the terminals.

9.—It is preferable that all switches, cut-outs, &c., should be grouped together in an accessible position in each room. In no case should fittings be fixed otherwise than in plain sight; they should be so fixed as to prevent the possibility of being covered up by combustible materials.

10.—All installations are to be wired on the Distributing Board system, the cut-outs on the distributing boards to have a break of not less than $1\frac{1}{2}$ inch metal work carrying current to be mounted on slate or porcelain. A suitable partition must separate the positive and negative sides of the distributing boards and suitable covers must be provided.

Small 1-5 light single pole porcelain cut-outs having screwed porcelain covers should have air vents in covers, otherwise when the fuse melts the covers are liable to be blown off. The terminals should be separated by a dividing partition of porcelain, and the air break across the fuse must not be less than $1\frac{1}{2}$ inch. No fuse should have a less break than $1\frac{1}{2}$ inch for use on a 210 volt supply; 100 volt type cut-outs are inadmissible.

11.—Switches of the tumbler type for use on 210 volt circuits should have long breaks at least $\frac{3}{8}$ inch; the ordinary 100 volt tumbler switch cannot be permitted on 210 volts circuits.

The total minimum air break on main switches should not be less than $1\frac{1}{2}$ inch for each pole.

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12.—Porcelain ceiling roses for use on 210 volt circuits should not be fitted with fuses. The terminals must be separated by a central dividing piece of porcelain; they should be provided with a suitable cord grip in order that the weight of the attached fitting may not be sustained by the terminals.

13.—The type of wall sockets for use on 210 volts should be very carefully selected; the ordinary 100 volt type is inadmissible. The metal parts of both socket and plug should be mounted on porcelain or its equivalent. The terminals of both socket and detachable plug should be efficiently separated by porcelain sleeves or bridge pieces. A separate cut-out should be provided for each circuit carrying wall sockets. Combination wall sockets and fuses are inadmissible. The detachable plug should be fitted with an efficient cord grip.

14.—Combination switch lamp holders are not recommended. If these are installed they must be of approved type, and should meet the following requirements:—

- (a) All metal parts carrying current to be mounted on porcelain or its equivalent.
- (b) The mechanism of the switch and the lamp contact mechanism to be readily detachable from the metal cover without breaking any electrical joints.
- (c) The switch to be of the "quick make and break" type. It must break circuit on *both lamp* terminals, and must when in the "off" position leave a clear air space between the switch contacts of at least $\frac{1}{4}$ of an inch. The fixed contacts should be separated by a bridge piece of porcelain or its equivalent.

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- (d) The contact made by the switch must be a *rubbing* contact and not merely "dead pressure" contact.
- (e) A suitable cord grip must be provided where the weight of the holder, or any portion of the fitting, is sustained by the conducting wires.

ELECTRO MOTORS 210 VOLT CIRCUIT.

1.—It is preferable that these should be of the enclosed type, and if exposed to flyings or considerable dust, the motor must either be of the enclosed type or completely enclosed in a fire-proof metal case. Motors situated in a separate compartment expressly set apart for their use, and built of or lined with incombustible materials, need not be of an enclosed type.

2.—Where possible motors should be furnished with a special starting resistance fitted with an automatic cut-off of such design that in the event of the current failing the motor circuit would be automatically broken, and the motor could not be started again until after the resistance switch lever had been brought to zero.

3.—Every motor should be controlled by a double pole switch and a double pole cut-out (in addition to the usual regulating switch and resistance).

4.—Where it is essential that the motor should be enclosed, the regulating resistance should also be enclosed.

5.—No open type or partially enclosed type of motor should be on a wood floor in any building unless the wood floor is protected by fire-proof material. A completely enclosed motor may be placed upon a wood floor without additional precautions.

6.—Each motor should be on a separate circuit.

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MOTORS, 420 VOLTS CIRCUIT.

In addition to the above the Board of Trade have issued the following regulations for motors on 400 to 420 volt circuits :—

1.—The frame and shaft of every motor shall be efficiently connected with earth.

2.—The electric lines forming the connections to motors, or otherwise, in connection with this supply, shall be, as far as practicable, completely enclosed in strong metal casing efficiently connected with earth.

3.—The supply to every motor shall be controlled by means of an efficient double pole cut-off switch, placed in such a position as to be easily handled by the person in charge of the motor, and connected, so that by its means all pressure can be cut off from the motor itself, and from any regulating switch resistance or other device in connection therewith.

Efficient fuses on both poles, or other automatic cut-outs, shall also be provided, so as to protect the branch circuit to every motor from excess of current. The switches and cut-outs shall be so enclosed and protected that there shall be no danger of any shock being obtained in the ordinary handling thereof, or of any fire being caused by their normal or abnormal action.

4.—A notice shall be fixed in a conspicuous position at every motor and switch-board in connection with this supply forbidding unauthorised persons to touch the motors or apparatus.

GENERAL 400—420 VOLT CIRCUITS.

The insulation resistance of conductors for use on 400 to 420 volt circuits shall be not less than 2,500 megohms per mile when tested in water after 24 hours' immersion, and after one minute's electrica-

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tion. Concentric conductors may be used, but the outer conductor must be insulated from the earth in all cases.

Conductors of a less total area than No. 16 S.W.G. will not be permitted. No flexible cords may be used.

The design of the switches and cut-outs must be suitable for use with 400 volts and must be such that they cannot remain in any intermediate position between "on" and "off." The contacts must be protected, and the handles must be thoroughly insulated.

To guard against damage to motors from a rush of current on the resumption of supply after any possible interruption thereof; the automatic cut-out apparatus mentioned in "Electric Motors—210 Volt Circuit," paragraph 2, is an essential for this supply.

The motors should be shunt-wound, and preferably provided with carbon brushes.

The insulation resistance to earth of all wiring and fittings (exclusive of the motor) must not be less than 5 megohms. Each motor must have an insulation resistance to earth of not less than 1 megohm.

COOKING AND HEATING APPARATUS.

1.—These appliances, if absorbing over 3 ampères at 210 volts, should be fitted with incombustible supports, which will raise the appliances at least two inches from the table, &c., upon which they are placed; they should be isolated from wood-work or other combustible materials. No air space under the appliances less than $\frac{3}{4}$ inch will be permitted.

2.—These appliances should each be provided with its own double-pole switch and cut-out at the point where the movable conductors are attached to the fixed conductors.

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3.—The connections should be such that it is necessary to disconnect the whole current upon both poles when discontinuing the use of the apparatus.

4.—Coupling should be arranged in a manner such that when the cooking or heating appliance is removed, the "live" end of the coupling shall have the conducting surfaces shielded from danger of accidental short-circuiting.

5.—The holders intended for incandescent lamps must not be utilised as points from which to obtain a supply of current for heating and cooking apparatus, or for motors, or the like.

6.—Electrically heated irons should be provided with proper incombustible stands, similar to those provided for irons heated by gas, or other means.

TELEPHONES.

1.—Where Telephones and Electric Light wires co-exist in a building, it is necessary to guard against possible damage to the Telephone system through contact with the Electric Lighting conductors.

—The two systems should never approach closer than 18 inches when running parallel. When crossing of one system by the other is necessary, the crossing should be made at right angles, and both Telephone and Electric Lighting Conductors should be encased in dry wood or porcelain at the crossing point and for at least 8 inches on each side of it. Nails or screws or metal fastenings to be allowed nearer the crossing point than 6 inches.

—The small and poorly insulated wires of Telephone and Bell circuits should not be stapled or otherwise fixed to Electric Light casings.

—When a building previously containing Telephone circuits is to be fitted with the Electric Light, licence must be given to the Telephone Department, the Telephone Superintendent will inspect and

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GENERAL.

1.—Precautions in excess of these specified may be prescribed by the Regulations of the Board of Trade, or the nature of the installation may render special precautions necessary.

2.—No installation can be passed in which it is found that all these regulations are not reasonably provided against.

3.—Notice of the intended use of an Electrical installation should in all cases be given to the States Electrical Engineer.

4.—Before a supply is permitted to any installation a certificate must be produced, signed by a qualified Electrical Engineer of independent position, certifying that the installation has been inspected by him and that the herein-mentioned regulations have been carried out.

Where States telephone wires are installed in the same building, the Telephone Superintendent will likewise inspect the work.

5.—No installation may have a lower insulation resistance from earth than at the rate of 75 megohms per point ($\frac{75}{\text{points}}$) when tested with 200 volts, all fittings and apparatus being connected. Previous to this test being made every fuse must be in position, all switches turned on, and lamps removed from their holders.

In no case must the insulation resistance of 420 volt circuits fall below 1 megohm.

The insulation resistance of an installation of 210 volts must not fall below 25,000 ohms.

6.—In the event of alterations and additions to existing installations, notice of such, with particulars of the work to be undertaken, must be forwarded to the States Engineer. 1903.

7.—For the convenience of those interested, samples of fittings which comply with these regulations may be inspected at the Engineer's Office.
