

covered with a substantial waterproof and flameproof braid. The physical characteristics shall not be affected by any change in temperature up to 200 degrees Fahrenheit. After two weeks' submersion in salt water at 70 degrees Fahrenheit it must show an insulation resistance of one megohm per mile after three minutes' electrification, with 550 volts.

b. Must have no single wire larger than No. 12 B. & S. Wires to be stranded when greater carrying capacity is required. No single solid wire smaller than No. 14 B. & S., except in fixture wiring, to be used.

Stranded wires must be soldered before being fastened under clamps or binding screws, and when they have a conductivity greater than No. 10 B. & S. copper wire, they must be soldered into lugs.

c. Must be supported in approved moulding, except at switchboards and portables.

Special permission may be given for deviation from this rule in dynamo rooms.

d. Must be bushed with hard rubber tubing one-eighth inch in thickness when passing through beams and non-water-tight bulkheads.

e. Must have when passing through water-tight bulkheads and through all decks, a metallic stuffing tube lined with hard rubber. In case of deck tubes they shall be boxed near deck to prevent mechanical injury.

f. Splices or taps in conductors must be avoided as far as possible. Where it is necessary to make them, they must be so spliced or joined as to be both mechanically and electrically secure without solder. They must then be soldered, to insure preservation, covered with an insulating compound equal to the insulation of a wire, and further protected by a waterproof tape. The joint must then be coated or painted with a waterproof compound.

62. PORTABLE CONDUCTORS—

a. Must be made of two stranded conductors, each having a carrying capacity equivalent to not less than No. 14 B. & S. wire, and each covered with an approved insulation and covering.

Where not exposed to moisture or severe mechanical injury, each stranded conductor must have a solid insulation at least one-thirty-second of an inch in thickness, and must show an insulation resistance between conductors, and between either conductor and the ground, of at least one megohm per mile after one week's submersion in water at seventy degrees Fahrenheit and after three minutes' electrification, with 550 volts, and be protected by a slow-burning, tough-braided outer covering.

Where exposed to moisture and mechanical injury as for use on decks, holds and fire-rooms—each stranded conductor shall have a solid insulation, to be approved, of at least one-thirty-second of an inch in thickness and protected by a tough braid. The two conductors shall then be stranded together, using a jute filling. The whole shall then be covered with a layer of flax, either woven or braided, at least one-thirty-second of an inch in thickness, and treated with a non-inflammable, waterproof compound. After one week's submersion in water at seventy degrees Fahrenheit, with 550 volts and a three minutes' electrification, must show an insulation between the two conductors, or between either conductor and the ground, of one megohm per mile.

63. BELL OR OTHER WIRES—

a. Shall never be run in same duct with lighting or power wires.

64. TABLE OF CAPACITY OF WIRES—

| B. & S. G. | Area Actual C. M. | No. of Strands | Size of Strands B. & S. G. | Amperes |
|------------|----------------------|----------------|-------------------------------|---------|
| 10 | 1,988 | .. | .. | .. |
| 11 | 1,674 | .. | .. | .. |
| 12 | 1,360 | .. | .. | .. |
| 13 | 1,046 | .. | .. | .. |
| 14 | 832 | .. | .. | .. |
| 15 | 658 | .. | .. | .. |
| 16 | 523 | .. | .. | .. |
| 17 | 410 | .. | .. | .. |
| 18 | 320 | .. | .. | .. |
| 19 | 251 | .. | .. | .. |
| 20 | 197 | .. | .. | .. |
| 21 | 156 | .. | .. | .. |
| 22 | 124 | .. | .. | .. |
| 23 | 99 | .. | .. | .. |
| 24 | 78 | .. | .. | .. |
| 25 | 62 | .. | .. | .. |
| 26 | 50 | .. | .. | .. |
| 27 | 40 | .. | .. | .. |
| 28 | 32 | .. | .. | .. |
| 29 | 25 | .. | .. | .. |
| 30 | 20 | .. | .. | .. |
| 31 | 16 | .. | .. | .. |
| 32 | 13 | .. | .. | .. |
| 33 | 10 | .. | .. | .. |
| 34 | 8 | .. | .. | .. |
| 35 | 6 | .. | .. | .. |
| 36 | 5 | .. | .. | .. |
| 37 | 4 | .. | .. | .. |
| 38 | 3 | .. | .. | .. |
| 39 | 2 | .. | .. | .. |
| 40 | 1 | .. | .. | .. |

When greater conducting area than that of 12 B. & S. G. is required, the conductor shall be stranded in a series of 7, 19, 37, 61 or 107 wires, as may be required; the strand consisting of a central wire, the remainder laid around it concentrically, each layer to be twisted in the opposite direction from the preceding.

65. SWITCHBOARDS—

a. Must be made of non-combustible, non-absorptive, insulating material, such as marble or slate.

b. Must be kept free from moisture, and must be located so as to be accessible from all sides.

c. Must have a main switch, main cut-out and ammeter for each generator.

Must also have a voltmeter and ground detector.

d. Must have a cut-out and switch for each side of each circuit leading from board.

66. RESISTANCE BOXES—

a. Must be made of non-combustible material.

b. Must be located on switchboard or away from combustible material. When not placed on switchboard they must be mounted on non-inflammable, non-absorptive insulating material.

c. Must be so constructed as to allow sufficient ventilation for the uses to which they are put.

67. SWITCHES—

a. Must have non-combustible, non-absorptive, insulating bases.

b. Must operate successfully at fifty per cent. overload in amperes with twenty-five per cent. excess voltage under the most severe conditions they are liable to meet with in practice, and must be plainly marked where it will always be visible, with the name of the maker and the current and voltage for which the switch is designed.

c. Must be double-pole when circuits which they control supply more than six 16-candle-power lamps or their equivalent.

d. When exposed to dampness, they must be enclosed in a water-tight case.

68. CUT-OUTS—

a. Must have non-combustible, non-absorptive insulating bases.

b. Must operate successfully, under the most severe conditions they are liable to meet with in practice, on short circuit with fuse rated at fifty per cent. above, and with a voltage twenty-five per cent. above the current and voltage they are designed for, and must be plainly marked where they will always be visible with the name of the maker and current and voltage for which the device is designed.

c. Must be placed at every point where a change is made in the size of the wire (unless the cut-out in the larger wire will protect the smaller).

d. In places, such as upper decks, holds, cargo places and fire-rooms a water-tight and fireproof cut-out may be used, connecting directly to mains when such cut-out supplies not more than six 16-candle-power lamps or their equivalent.

e. When placed anywhere except on switchboards and certain places, as cargo spaces, holds, fire-rooms, etc., where it is impossible to run from centre of distribution, they shall be in a cabinet lined with fire-resisting materials.

f. Except for motors, search-lights and diving lamps shall be so placed that no group of lamps, requiring a current or more than six amperes, shall ultimately be dependent upon one cut-out.

A single-pole covered cut-out may be placed in the moulding when same contains conductors supplying current for not more than two 16-candle-power lamps or their equivalent.

69. FIXTURES—

a. Shall be mounted on blocks made from well seasoned lumber treated with two coats of white lead or shellac.

b. Where exposed to dampness, the lamp must be surrounded by a vaporproof globe.

c. Where exposed to mechanical injury, the lamp must be surrounded by a globe protected by a stout wire guard.

d. Shall be wired with same grade of insulation as portable conductors which are not exposed to moisture or mechanical injury.

70. SOCKETS—

a. No portion of the lamp socket or lamp base exposed to contact with outside object shall be allowed to come into electrical contact with either of the conductors.

71. WOODEN MOULDING—

a. Must be made of well seasoned lumber, and be treated inside and out with at least two coats of white lead or shellac.

b. Must be made of two pieces, a backing and a capping, so constructed as to thoroughly incase the wire and provide a one-half-inch tongue between the conductors, and a solid backing which, under grooves, shall not be less than three-eighths inch in thickness.

c. Where moulding is run over rivets, beams, etc., a backing strip must first be put up and the moulding screwed to this.

d. Capping must be secured by brass screws.

72. MOTORS—

a. Must be wired under the same precautions as with a current of same volume and potential for lighting. The motor and resistance box must be protected by a double-pole cut-out and controlled by a double-pole switch, except in cases where one-quarter horse-power or less is used.

The leads or branch circuits should be designed to carry a current at least fifty per cent. greater than that required by the rated capacity of the motor to provide for the inevitable overloading of the motor at times.

b. Must be thoroughly insulated. Where possible, should be set on base frames made from filled, hard, dry wood and raised above surrounding deck. On hoists and winches they shall be insulated from bed-plates by hard rubber, fibre or similar insulating material.

c. Shall be covered with a waterproof cover when not in use.

d. Must each be provided with a name-plate giving maker's name, the capacity in volts and amperes and the normal speed in revolutions per minute.