

NEW YORK BOARD OF FIRE UNDERWRITERS.

Amended Standard for Electric Equipments, Adopted February 27, 1889.

CONDUCTORS.

CAPACITY OF WIRES.

1. The conducting wires must be of copper and must have a weight per running foot at least equal to that of the wire (or parallel group of wires) constituting the main circuit of the magnetic regulator of the electric lamps (arc lamps), or of the armature of the machine employed, whichever of these be greatest.

JOINTS OR SPLICES.

2. All joints on wires must be so made as to secure perfect and durable contacts, which shall always maintain a degree of conductivity at the joint, at least equal to that of the wire generally.

3. The joint must be so made as in the ordinary "telegraph splice" that it be mechanically secure against motion or displacement, and must then be further electrically connected by solder so applied as to leave no corrosive or otherwise injurious substance on the connection. After joining and soldering, the joint must be covered with insulating material in such a way as to make the insulation of the joint as good as that of the rest of the line.

4. A joint made by the process of electric welding would be the equivalent of one made as indicated above, but no joint depending upon solder for its mechanical integrity, either wholly or in part, will be allowed.

WIRES EXTERIOR TO BUILDINGS.

5. Outside wires must be covered with at least two coatings, one of insulating material impervious to water, next to the wire, and the other of some substance fitted to resist abrasion or like mechanical injury, and must be firmly secured to substantial approved insulators, adequately supported. All "tie wires" or those used to secure the conductors to the "insulators" must be themselves covered with waterproof insulating and mechanically resistant material similar to that used on the conductors themselves.

6. Overhead conducting wires must be supported on poles as far as possible, so that they can be easily reached for inspection, and when this cannot be done, and special permit be granted allowing them to be carried over attached to buildings, they must be supported at least seven feet above the general level of the roof and at least one foot above the ridge of "pitch roofs."

7. Where wires approach buildings to enter them they should be so located as not to be readily

reached by the occupants of such buildings, and in the case of arc light systems must maintain a minimum distance of ten inches and for incandescent systems of six inches except where the wires are carried in conduits.

8. When these exterior electric light wires are near other conductors of any kind capable of carrying off a part of the current if contact should be made, dead insulated guard-irons must be placed so as to prevent any such contact in case of accident affecting the wires or their supports.

9. Like precautions must be taken where acute angles occur in the line wires.

10. Overhead wires from the main circuit or pole lines in the street to the insulators attached to the buildings which they enter, must not be less than ten inches apart for arc wires or six inches for incandescent wires carrying currents of 250 volts E. M. F. as a maximum. They must be securely and rigidly supported on "insulators" of glass, porcelain or other approved material.

WIRES ENTERING BUILDINGS.

11. Whenever electric light wires enter buildings through their exterior walls the wires must be firmly supported and incased in tubes of non-conducting material not liable to absorb moisture (*e.g.* porcelain or glass) and so placed as to prevent the entrance of rain water along the wires (*e.g.* the tubes must slope *upward* as they pass *inward* through the wall).

12. Both the ingoing and return wires should enter the building at the same location, and pass through an approved manual "cut-out box" or switch, which must be placed where it will be easy of access to firemen and the police.

HIGH POTENTIAL WIRES WITHIN BUILDINGS.

13. In the interior of buildings wires for arc lights, besides being covered with an insulating covering, such as has already been described, must be in all cases securely attached and supported by insulators which shall keep them out of contact with any wall, partition, ceiling or floor, so as to secure an air space of at least one-quarter inch between the wire and any adjacent wall, partition or floor, and whenever the wires cross or come near to any other wires, pipes or other conductors, the wires must all be rigidly secured and separated from each other or any other conductors by means of some rigid non-conducting material.

14. Arc wires of opposite polarities (*i. e.* the incoming and outgoing wires from each lamp or of

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each circuit) must be kept at a distance not less than eight inches from each other except within the structure of lamps or on switch-boards, cut-out boxes or the like, where a nearer approach is necessary.

15. In exceptional cases, however, where the wires are so rigidly secured and insulated that contact or connection between them is quite impossible, they may be allowed to approach nearer. (e. g. If each wire or conductor be covered with a thick and undisplaceable insulation, which in turn is covered by a leaden sheath or pipe and then two or more such pipes are inclosed in an iron pipe in such manner that injury to the lead-covered cables be impossible, this would be an allowable substitute for the eight inches of absolute separation called for in the general rule.)

16. Whenever wires are carried through walls, partitions or floors within a building, they must be surrounded by a special rigid insulating tube or casing impervious to water, and must be so attached and supported as to be secure from abrasion or other mechanical injury.

NOTE.—Rubber tubing will not meet the above requirements as an insulation.

ARC LAMPS.

17. The exterior frames and other exposed parts of arc lamps must be securely insulated from the electric circuit, and all such lamps must have glass globes surrounding the light and inclosed below, so as to prevent the fall of ignited particles. Where inflammable materials are placed below such lamps the globe must be surrounded by a wire netting capable of keeping the parts of the globe in place if it be fractured in use.

NOTE.—Broken globes must be replaced as soon as practicable by new ones.

18. In show windows and other places where inflammable materials are displayed and in factories or wood-working establishments where "flyings" may be present in the air, each lamp must be provided with "spark arresters."

19. Each lamp must be provided with a hand-switch and also with an automatic switch which shall shunt the current round the carbons before the arc between them reaches a dangerous length.

LOW POTENTIAL SYSTEMS.

DIRECT SYSTEMS.

20. In direct incandescent systems, the rules as to the capacity, location and arrangement of conductors are substantially the same as has been already stated, with the following exceptions:

21. In case the difference of potential at the positive and negative posts of the dynamo or dynamos developing the current is not more than 250 volts the positive and negative wires in aerial lines and elsewhere which would otherwise be required to maintain a minimum distance of ten inches, may be brought to within six inches of each other. Also underground conductors may be inclosed both in the same tube, and if rigidly and securely supported, and surrounded by and embedded in a solid insulating substance, may lie within one-quarter inch of each other.

22. When underground-service conductors enter a building care must be taken that they be at once separated to the required distance (see below) and are adequately and permanently insulated from each other and from the pipe in which they were inclosed, if they were inclosed in a metallic pipe or conduit.

23. They must also be adequately protected from mechanical injury, and must be so located that a cut-out can be safely and conveniently located close to the end of the service pipe or conduit by which they are brought in.

LOW POTENTIAL WIRES WITHIN BUILDINGS.

24. In the distribution of the conductors through buildings "concealed work," such as the placing of wires under floors or within partitions, walls or ceilings should be avoided as much as possible.

25. In perfectly and securely dry localities an approved insulated wire without water-proof covering may be used, provided the wires are not concealed and are supported by cleats or insulators.

26. Wherever the wires are to be in any way covered up they must be coated with an approved water-proof insulation.

27. In all cases of concealed work the company proposing to introduce the same will be required to furnish the Board with a detailed diagram of the work, showing the kind and size of wire used at the different branches, with particulars as to the insulation and in what materials embedded, location of cut-outs, switches, etc. The diagram to be signed and sworn to by an officer of the company and filed with the Board for reference.

28. If wires be embedded in the plaster of walls, ceiling or partitions, they must be separated not less than ten inches from each other, in addition to being insulated as above described.

29. In buildings in course of construction, terminal wires must be so arranged as to be secure from injury by the plasterers.

30. Wires insulated as above may be covered by or embedded in mouldings in dry locations, but in breweries, paper-mills, dye-houses, and other like places where they are exposed to moisture,

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they must be carried out of contact with the walls, ceilings and the like on approved "insulators."

SECONDARY SYSTEMS.

31. In these systems where alternating currents of high electro-motive force are used on the main lines, and secondary currents of low electro-motive force are developed in local "converters" or "transformers," it is important that the entire primary circuit and the transformers should be excluded from any insured building, and be confined to the aerial line (the transformers being attached to the poles or the exterior of the buildings) or to underground conduits, if such be used, or placed in fire-proof vaults or exterior buildings.

32. In those cases, however, where it may not be possible to exclude the transformers and entire primary from the building, the following precautions must be strictly observed.

33. The transformer must be constructed with or inclosed in a fire-proof or incombustible case, and located at a point as nearly as possible to that at which the primary wires enter the building. Between these points the conductors must be heavily insulated with a coating of approved water-proof material, and, in addition, must be so covered in and protected that mechanical injury to them, or contact with them, shall be practically impossible.

34. These primary conductors, if within a building, must also be furnished with a double-pole switch, or separate switches on the ingoing and return wires and also with automatic double pole cut-out where they enter the building or where they leave the main line, on the pole or in the conduit. The switches above referred to should, if possible, be inclosed in secure and fire-proof boxes outside the building.

35. In the case of isolated plants using the secondary system, the transformers must be placed as near to the dynamos as possible, and all primary wires must be protected in the same manner as is indicated in the second paragraph above.

INSULATION.

36. Where there is a possible exposure to water, the first or second coating must be impervious to the fluid.

37. For incandescent lamp fixtures and electricians, exceptions may be made to the foregoing rule in which the wires can be placed nearer than the prescribed distance to each other, or to other conductors, provided the fixture is fully insulated at the base from house and ground piping, and further provided that a double-pole safety catch is placed at the base of each fixture, or at the nearest branch connection, as may be required by the Inspector of the Board.

38. In all cases when combination (gas and electric) fixtures are used, extra precaution must be used to secure complete and continuous insulation from the gas piping.

INSULATION IN GENERAL.

39. It is to be understood as a general or universal rule that all machines, lamps, wires and other parts of electric systems, are to be so constructed, mounted and secured as to insure complete and continuous insulation; with such exceptions only as are hereinbefore stated, and that in no case shall ground circuits be employed, or any part of the system be allowed to come in contact with the earth through gas or water pipes or the like.

AUTOMATIC SHUNT.

40. Wherever a current of such high electro-motive force be employed that if concentrated on one lamp or motor of the series it would produce an arc capable of destroying or fusing parts of such lamp, an automatic switch must be introduced in each lamp or motor by which it will be thrown out of circuit before the arc approaches any such dangerous extent.

41. Means by which those in charge of the dynamo electric machines will be warned of any excessive flow of current, or means whereby the same will be automatically checked, must in all cases be provided.

FUSIBLE OR OTHER AUTOMATIC CUT-OUTS FOR LOW POTENTIAL CIRCUITS.

42. Wherever a connection is made between a larger and smaller conductor at the entrance to or within a building, some approved automatic device must be introduced into the circuit of the smaller conductor at or close to its junction, by which it shall be interrupted whenever the current passing is in excess of its safe carrying capacity.

43. The safe carrying capacity of a wire is the current which it will convey without becoming painfully warm when grasped for a minute in the closed hand.

CUT-OUT BOXES OR SWITCHES.

44. All cut-out boxes or switches which shift, transmit, or break a current, must be mounted on incombustible bases, and so arranged as to close one circuit before they open another, and operate in such a manner that no arc can be formed between the contact surfaces when thrown "on" or "off." It must be so far positive in its action that it can not stop between its extreme positions. It must indicate on inspection whether current is "on" or "off." This rule applies to isolated plants as well as to those connected with central stations.

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MOTORS.

45. The rules and regulations under the head of *capacity of wires*, insulation, automatic cut-outs, and switches shall be observed, where electric motors are used, and in addition the motor frames must be properly insulated, and so mounted as to be free from grounds, and each motor shall be provided with an approved switch to prevent an excessive flow of current.

STORAGE BATTERIES.

46. When the current for lights or power is taken from storage batteries, the same general regulations are to be observed.

MEANING OF TECHNICAL TERMS, ETC.

47. HIGH POTENTIAL CIRCUITS OR WIRES.—This term includes all wires arranged with the view of

carrying currents of more than 250 volts difference of potential between any two parts of the system, even if such current be used to run incandescent lamps.

48. LOW POTENTIAL CURRENTS OR WIRES are such as do not carry currents of more than 250 volts.

49. Companies furnishing electricity from central stations must enter into an agreement with the New York Board of Fire Underwriters, binding themselves to test their lines for ground connections at least *once* every day (and preferably three times per day), and to report the result of such tests to the Board weekly.

50. The rules and regulations of the Board of Electrical Control and all existing regulations of the local authorities in reference to stringing of wires must be strictly observed.



These Rules, so far as they pertain to insulation, are in every case complied with when Okonite Wire is used.