

RULES AND REGULATIONS

Of the New England Insurance Exchange and Boston Fire Underwriters' Union for Electric Lighting. [Adopted April 15th, 1889, and superseding all previous rules.]

ARC SYSTEM.

OUTSIDE WIRES.

All outside overhead wires must be covered with some material of high insulating power, not easily abraded; they must be firmly secured to properly insulated and substantially built supports. All tie wires must have an insulation equal to that of the conducting wires.

2. All joints must be so made that a perfectly secure and unvarying connection, fully equal to the cross-section of the conducting wire, will be secured—and they should be soldered. Resin should not be used as a flux. Nothing but an acid solution should be used, and any excess should be washed off before the splice is covered. This also applies to inside wires. All joints must be securely wrapped with an approved tape.

The following formula for soldering fluid is recommended, viz.:

Saturated solution of zinc.....	5 parts
Alcohol.....	5 “
Glycerine.....	1 “

3. Care must be taken that conducting wires are not placed in such position that it would be easy for water, or any liquid, to form cross connection between them, and they should not approach each other nearer than one foot.

4. The wires must never be allowed in contact with any substance other than air, and their proper insulating supports.

5. Conducting wires carried over or attached to buildings, *must* be at least seven feet above the highest point of flat roofs, and one foot above the ridge of pitch roofs. Lines constructed subsequent to the adoption of these regulations should not be run over and attached to buildings other than those in which the light or power is being, or is to be used, but should be on separate poles, or structures, where they can be easily reached for inspection.

6. When they are in proximity to other conducting wires, or any substance likely to divert any portion of the current, *dead, insulated* guard-irons must be placed so as to prevent any possibility of contact in case of accident to the wires, or their supports. The same precautions must be taken

where sharp angles occur in the line wires, and also where any wires (telegraph, telephone or others) could possibly, owing to their position, come in contact with the electric light wires.

7. Overhead wires from the main circuit or pole in the street to the terminal insulators attached to buildings, and at the point where they enter a building, must not be less than twelve inches apart. They must be rigidly and neatly run, and supported by glass or porcelain insulators, or rubber hooks. The rubber hooks must be of an approved pattern, *i. e.*, with the rubber insulation free from flaws, and projecting over the hook in cup form.

8. Service blocks must be protected by at least two coats of water-proof paint over their entire surface; and when used to support rubber hooks, must have at least one inch of wood between the inner end of the hook and the back of the block.

9. For entering buildings, wires with an extra heavy water-proof insulation must be used from the terminal insulators outside to the inside of a building. They must loop down, so that water may drip off, without entering the building, and the holes through which they enter should, where possible, slant upward. If an approved glass insulator for bushing the hole be used, the extra heavy water-proof insulation will not be required.

10. Service wires must come in contact with nothing save air, and their insulating supports, except in unavoidable cases, when a wire with an extra heavy insulation suitable for the purpose must be used.

11. The use of porcelain knobs, as insulators, except in perfectly dry places, or for the support of specially insulated wire, will not be accepted unless of some approved shape.

12. None but an approved tubing will be accepted as a durable water-proof insulation.

13. Wires must enter and leave the building through an approved cut-out switch.

14. The cut-out switch must be “double contact,” and should effectually close the main circuit, and cut off the interior when turned “off.”

NEW ENGLAND RULES—Continued.

It must be so constructed that there shall be no arc between the points when thrown "on" or "off." It should be automatic in its action in either direction, not stopping between points when once started. It should indicate upon inspection whether current be "on" or "off."

15. It must be mounted on a non-conducting base, kept free from moisture, and easy of access to firemen and police.

INSIDE WIRING.

16. Wires must not be concealed; they must be run in plain sight so as to be open to inspection at any time. They should be kept apart at least twelve inches.

17. In perfectly dry places wires may be supported by cleats of wood (filled to prevent the absorption of moisture) or porcelain. Cleats should be so made as to separate the wire at least one-fourth of an inch from the building.

18. In places liable to dampness, wires must be separated at least one and one-half inches, they must be thoroughly and carefully put up, and supported upon porcelain or glass insulators, or hard rubber hooks. They should also be provided with an approved insulation covering.

19. When wires pass through walls, floors, partitions, etc., in-doors, glass insulators, or an extra covering of hard rubber, should be used. Wires must never be left exposed to disturbance or mechanical injury.

ARC LAMPS.

20. The frames and other exposed parts of arc lamps must be carefully insulated from the circuit.

21. Each lamp must be provided with a proper hand switch, and also with an automatic switch that will shunt the current around the carbons, should they fail to feed properly.

22. Stops of some kind must be provided to prevent the carbons from falling out in case their clamps fail to hold them; and these stops must always be in place when the lamp is burning.

23. For inside use the light must be surrounded by a globe resting in a tight stand, so that no particles of melted copper or heated carbon can escape. When inflammable material is near or under the lamp, the globe must be protected by a wire netting. Unless a very high globe, which closes in as far as possible at the top, be used, it must be provided with some protector or spark arrester, reaching to a safe distance above the light. Broken or cracked globes must be replaced by perfect ones immediately. (By inflammable material is meant such as dry goods, clothing, millinery and the like in stores; flyings or goods in fabric factories, shavings and saw-dust in wood-working shops, or any other substance that can be readily ignited by droppings or flyings from the lamp.)

24. Electrical connection between the conducting wires and lamps must be made through a suitable "hanger-board" and rods on which the lamp is hung.

INCANDESCENT LAMPS ON ARC-LIGHT CIRCUITS.

25. The rules for running wires for arc lamps apply also to incandescent lamps run in series.

26. These must be provided with a proper hand switch, and also with an approved automatic device which will shunt the circuit around the carbon filament should it break. No electromagnet device will be accepted for this purpose.

27. Any method of distributing current to incandescent lamps on arc-light circuits, other than as above provided for, must receive the approval of this Exchange before being put into use.

DYNAMOS AND MOTORS.

28. They must be located in dry places, not exposed to the flyings of combustible material, and must be insulated upon dry wood, filled to prevent absorption of moisture. They must be kept thoroughly clean and dry. They must be provided with a reliable automatic regulating device, or a competent person must be in attendance near the machine whenever it is in operation. In wiring for motive power, the same precautions should be taken as with a current of the same volume and potential for lighting.

29. The wires leading to motors should be separated at least twelve inches from each other, and must be provided with an approved cut-out switch at the point where they enter the building. The same precautions must be observed in entering the building that are required for lighting circuits.

TESTING.

30. All circuits should be tested at least twice a day with a suitable magneto, or other approved device, in order to discover any escapes to ground that may exist. One test should be made in the morning, and another in ample time before starting, to remove any defect, should it be found to exist. The rules for testing should be observed in any separate or isolated plant the same as in Central Stations.

31. The New England Insurance Exchange reserves the right at any time to add to, change or modify these rules, and to enforce such modifications, changes, etc., as it shall deem necessary for safety; and it will use all reasonable efforts to promptly notify all electric light companies of any change.

32. The signing of these rules by an electric light company, or persons controlling electric lights, shall be considered a guaranty on their part that they will have the testing performed on their circuits or lines as above required.

NEW ENGLAND RULES—Continued.

INCANDESCENT SYSTEM.

OUTSIDE WIRES.

1. All outside overhead wires must be covered with some material of high insulating power, not easily abraded, and they must be firmly secured to properly insulated and substantially built supports. All the wires must have an insulation equal to that of the conducting wires.

2. All joints must be so made that a perfectly secure and unvarying connection, fully equal to the cross-section of the conducting wire, will be secured—and they should be soldered. All joints must be securely wrapped with an approved tape.

3. Care must be taken that conducting wires are not placed in such position that it would be easy for water, or any liquid, to form cross connection between them, and main conductors or feeders should not approach each other nearer than one foot.

4. The wires must never be allowed in contact with any substance other than air, and their proper insulating supports.

5. Conducting wires carried over or attached to buildings, *must* be at least seven feet above the highest point of flat roofs, and one foot above the ridge of pitch roofs. Lines constructed subsequent to the adoption of these regulations should not be run over and attached to buildings other than those in which the light or power is being, or is to be, used, but should be on separate poles, or structures, where they can be easily reached for inspection.

6. When they are in proximity to other conducting wires, or any substance likely to divert any portion of the current, *dead, insulated* guard-irons must be placed so as to prevent any possibility of contact in case of accident to the wires or their supports. The same precautions must be taken where sharp angles occur in the line wires, and also where any wires (telegraph, telephone, or others) could possibly, owing to their position, come in contact with the electric light wires.

7. Wires from main circuit to main cut-out inside of buildings, must be separated by a distance of not less than six inches, for currents having an electro-motive force of 250 volts or less, and this distance must be increased for currents of higher potential.

8. They must also be rigidly and neatly run, and must be supported by glass or porcelain insulators, or by rubber hooks. Rubber hooks must be of an approved pattern; *i. e.*, with the rubber insulation free from flaws, and projecting over the hook in cup form.

9. Service blocks must be protected by at least two coats of water-proof paint over their entire surface; and, when used to support rubber hooks,

must have at least one inch of wood between the inner end of the hook and the back of the block.

10. For entering buildings, wires of extra heavy and durable water-proof insulation, protected by an outside covering not easily abraded, must be used from the terminal insulator outside, to the main cut-out inside of the building. They must loop down, so that water may drip off without entering the building, and the holes through which they enter should, where possible, slant upward. If an approved glass insulator for bushing the holes be used the extra heavy insulation will not be required.

11. Service wires must come in contact with nothing save air, and their insulating supports, except in unavoidable cases, when a wire with an extra heavy insulation, suitable for the purpose, must be used.

12. The use of porcelain knobs as insulators, except in perfectly dry places, or for the support of a specially insulated wire, will not be accepted, unless of some approved shape.

UNDERGROUND SERVICE.

13. Where underground service conductors, enclosed in a metal tube, enter a building, special care must be taken at the point where the conductors leave the tube, and thence to the main cut-out, to protect them in such a manner that they can not come in contact with each other, nor with the tube, nor be acted upon by falling moisture, nor disturbed by anything being moved against them, etc.

14. This service must not end in any place where it would be unsafe or undesirable to place a cut-out, but should be continued by means of specially insulated conductors (and a space of ten inches should be maintained between them) to a suitable location.

INSIDE WIRING.

15. Copper wire used for incandescent lighting must be procured from manufacturers whose products have been found, by reliable tests, to be at least 95 per cent. conductivity. Samples of wire to be used, or in actual use, must be submitted to this Exchange, for tests of conductivity, at any time when required. Samples of wire must also be submitted for tests of insulation, at any time when required.

For inside work, no wires smaller than No. 16 "B. & S." or No. 18 "B. W. G." will be approved.

16. Permission will not be granted for the use of the lights unless the wire come fully up to the standard of conductivity, no matter how well the wiring may be done.

17. All parties, firms or corporations proposing to do construction work or wiring, either out-

NEW ENGLAND RULES—Continued.

side or inside, must fully satisfy this Exchange of their ability to do the work in a safe and acceptable manner.

18. Before using any new form of insulation, the approval of this Exchange for its use under the proposed circumstances must be secured.

19. The use of lead covered wire, or wire the covering of which contains paraffine, is prohibited.

20. Mouldings with open grooves laid against the walls or ceilings will not be approved. A wood moulding having a backing of at least one-fourth inch thickness to intervene between the wire and the wall or ceiling of the building, the backing to be protected by at least two coats of water-proof paint, and the moulding of such shape as to protect the wire from moisture, will be approved.

21. When wires are run in new buildings, and are to be concealed from view by walls and ceilings, care must be taken to separate them ten inches or more, whenever it be possible to do so, by running them singly on separate timbers, studding, etc. Cleats are not desirable for concealed work. All concealed wires should be supported on insulators, such as porcelain knobs, or other equally good, non-combustible, insulating substance. Wires should, where it be possible, be kept from contact with any part of the building by means of such insulators, rather than to depend upon the insulation covering. Where complete separation from the building by air space and insulators be not possible, an approved insulation covering, that shall be water-proof and non-combustible, will be required. Wires run in non-combustible and water-proof tubes, made of a suitable insulating material, will be approved.

Care must be taken to keep the wires away from metal pipes and other conductors. Outlet wires should be left in such a way as not to be injured by plasterers. They should not, as a rule, be brought through the same opening with gas-pipes, but must be carefully insulated from them.

22. Approval will not be given to any work where the wires have been "fished" any great distance.

23. Moulding must not be used in wet places.

24. In dye-houses, paper and pulp mills, and other buildings specially liable to moisture, all wires (except when used for pendants) must be separated at least six inches. The wire must be thoroughly and carefully put up, and must be supported by glass or porcelain insulators, or by rubber hooks.

25. In crossing any metal pipes, or any other conductor, wires must be separated from the same by an air space of at least one-half inch, where possible, and so arranged that they can not come in contact with each other by accident. Wires should go over water-pipes where possible.

26. Where wires pass through partitions, floors, etc., glass insulators, or an outer covering of hard rubber should be used to protect them.

27. Wires must never be left exposed to mechanical injury, or to disturbance of any kind.

28. Metallic staples must never be used; when staples are used they must be of an approved insulating material.

29. None but an approved tubing will be accepted as a durable water-proof insulation.

30. Wires of the same polarity, but belonging to different circuits, or leading to and from a double-pole switch, must not run in one groove through the same tube, nor in the same slot in a cleat.

31. Cleats should be made of well-seasoned hardwood (filled to prevent the absorption of moisture), porcelain or other approved material, and so made as to separate the wire at least one-fourth inch from the building. When secured by cleats not over four feet apart and tightly stretched in the same horizontal plane, wires having a difference of potential of 120 volts or less, should be separated at least one and one-half inches; when they are confined in moulding a half-inch space is sufficient. This rule applies only to small mains, taps, etc., mains carrying currents of large volume should be separated a greater distance.

32. The dividing strip between grooves in moulding must never be reduced below one-half inch in thickness by cutting out to admit joints in wires.

33. Where exposed to acid fumes, vapors of ammonia, etc., wires should be provided with an insulation that will not be injured thereby, and should be put up in the manner described in Rule 24.

34. All splices in wires must be soldered; a soldering-bolt should be used for this purpose, if possible. Care must be taken not to render the wire brittle by over-heating. Resin should not be used as a flux. Nothing but an acid solution should be used, and any excess should be washed off before the splice is covered.

35. The insulation of any joint must be equal to that of the other parts of the same wire.

SAFETY CUT-OUTS AND SWITCHES.

36. Every system of conductors must be protected by safety cut-outs that will interrupt the passage through the conductors of a current stronger than they can safely carry. The carrying capacity (in amperes) of a fusible metal must be less than that of the smallest conductor it is designed to protect. Conductors include wire, cord, binding-screws, contact points of switches, sockets, cut-outs, etc.

NEW ENGLAND RULES—Continued.

Any fuse must melt immediately with any excess of the amperes which it is marked to carry.

37. A cut-out must be placed where the underground or overhead service joins the inside wires, and at every point where a change is made in the size of the wire (unless the cut-out in the larger wire be intended to protect the smaller).

38. Cut-outs, switches, and other devices which occasion a break in the circuit, must be so arranged that leakage of electricity from them is impossible, and should be mounted on non-combustible material; must not be put in places liable to become damp; must be protected from rubbish, etc., and should be easy of access.

39. Where it be necessary to use cut-outs and switches in damp places, great care must be taken to protect them from moisture, and to use only such as are provided with bases that will not absorb moisture.

40. When necessary, cut-out devices must be covered with some fire-proof and water-repelling material.

41. All cut-outs must be double-pole.

42. The plug or other device for enclosing or supporting the fusible strip or wire should be incombustible and moisture-proof, and so constructed that an arc can not be maintained across its terminals by the fusing of its metals.

43. No lead or composition strips carrying more than ten amperes before melting shall be used, unless provided with contact surfaces of some harder metal having perfect electrical connection with the fusible part of the strip.

44. All switches must have a firm and secured contact that will make and break readily, and that will not stick between "full on" and "off," nor get out of repair easily in other ways. The points of contact must not be allowed to scrape or rub the entire surface of an insulating material between the contact strips—an air space must intervene. The carrying capacity of the different parts must be sufficient to prevent heating.

45. Where points varying widely in potential are brought near each other by means of cut-outs, or switches, hard rubber, lava or other approved material must be used in the construction of the cut-outs and switches.

46. Switches *should* be double-pole, and they *must* be when the circuits which they operate are connected to fixtures attached to gas-pipes.

47. On any combination fixture, no group of lamps requiring a current of seven amperes or over shall be ultimately dependent on one cut-out.

FIXTURE WORK.

48. In all cases where wires are concealed within, or attached to fixtures, the latter must be insulated from the gas-pipe by some device ap-

proved by this Exchange. An exception to this rule will sometimes be made in the case of a wall gas-bracket wired for one or two lights.

49. When holes are drilled in fixtures, all burrs or fins must be removed from the edge of the holes before the conductors are drawn through.

50. When wired outside, the conductors used must be so secured as not to be cut or abraded by the pressure of the fastenings or motion of the fixture.

51. All wire used for fixture work must have an insulation that is durable, and not easily abraded, and must not in any case be smaller than No. 18 "B. & S." or No. 20 "B. W. G."

52. Each fixture must be tested for possible "contact" between wire and fixture, and for "short circuit," before current is turned on.

53. The tendency to condensation within the pipes or fixtures should be guarded against by sealing the upper end.

54. No combination fixture with less than one-fourth inch clear space between the inside pipe and the outside casing will be approved.

PENDANTS AND SOCKETS.

55. No portion of the lamp-socket exposed to contact with outside objects will be allowed to come into electrical connection with either of the conducting wires.

56. Cord pendants must be protected by hard rubber bushing, or something equally good, where they enter the socket.

57. The use of paraffined insulation for pendants will not be approved.

58. Key sockets must not be used with wire pendants, unless the wire be composed of strands, *i. e.*, flexible.

59. When exposed to the weather, or used in wet rooms, care must be taken to keep moisture from the inside of sockets.

60. The weight of every socket and lamp suspended by a cord must be borne by a ceiling block, rosette, or cleat, and by a knot under the bushing in the socket, in order to take all strain from the joints and binding-screws.

61. Flexible cord must not be used except for pendants, wiring of fixtures, portable lamps, and "mill work."

62. The two conductors of flexible cord must *not* have an insulation composed of an inflammable water-proof compound between them, but should be separated by a fibre insulation, or the like. If a water-proof insulation be necessary, it must be placed *outside* the two conductors, and must in all cases be covered with a non-inflammable outside coating, to prevent cord from carrying fire.

NEW ENGLAND RULES—Continued.

DYNAMOS AND MOTORS.

63. They must be located in dry places, not exposed to flyings of combustible material, and must be insulated upon dry wood, filled to prevent absorption of moisture. They must be kept thoroughly clean and dry. They must be self-regulating, or a competent person must be in attendance near the machine whenever it be in operation. In wiring for motive power, the same precautions should be taken as with a current of the same volume and potential for lighting. The motor (and resistance box) should be protected by a cut-out, and controlled by a switch.

SECONDARY GENERATORS OR CONVERTERS.

64. Converters must not be placed inside of any building. They may be placed on the outer walls when in plain sight and easy of access, but must be thoroughly insulated from them. If placed on wooden walls, or the woodwork of stone or brick buildings, the insulation must be fire-proof. When an underground service be used, the converter may be put in any convenient place that is dry and does not open into the interior of the building; this location must have the approval of the inspector before the current is turned on.

65. The converter should be enclosed in a metallic or non-combustible case.

66. If for any reason it become necessary that the primary wires leading to and from the converter should enter a building, they must be kept apart a distance of not less than twelve inches, and the same distance from all other conducting bodies. The insulation of the wire must be of the very best.

67. Safety fuses must be placed at the junction of all feeders and mains, and at the junction of mains and branches where necessary, also in both the primary and secondary wires of the converter, in such manner as not to be affected by the heating of the coils. Secondary wires, after leaving the converter, will be subject to rules already given for services, inside wiring, etc.

68. Any provision for grounding the secondary circuit by means of "film cut-out" or other approved automatic device, will be approved. A permanent ground will not be approved.

MISCELLANEOUS.

69. Companies or individuals furnishing electricity from central stations must enter into an agreement with this Exchange, binding themselves to maintain at all times in their stations some approved device to indicate any escape to earth, which may tend to develop leakage to water or gas pipes, or other earth connections within buildings. This approved means of testing shall also apply to

separate or isolated plants, where special conditions of moisture exist, or in buildings subject to mechanical changes of piping, etc.

70. The signing of these Rules and Requirements shall constitute and be considered an agreement on the part of the signer that such approved device or tell-tale shall at all times be employed on their circuits.

71. The wiring in any building must test free from "grounds" before the current be turned on. This test may be made with a magneto that will ring through a resistance of 10,000 ohms, where currents of less than 200 volts potential are used.

72. All incandescent work should be inspected before being concealed, and notice should be given this Exchange as soon as work be commenced.

73. The New England Insurance Exchange reserves the right at any time to add to, change, or modify these Rules, and to enforce such modifications, changes, etc., as it shall deem necessary for safety; and it will use all reasonable efforts to promptly notify all Electric Light Companies of any change.

74. Any additional loading of wires, either in a building as a whole, or in any department thereof, without the previous approval of the Exchange, or the inspector, shall be deemed a sufficient cause for the suspension of permits until such approval be secured. (*See Form F, Inspector's Certificate.*)

NOTES.

A certificate for all new work or changes in old work (Form C for Arc, Form F for incandescent) should be signed by the party installing or controlling any apparatus. The certificate should be filed with the Secretary of the Local Board of Fire Underwriters having jurisdiction, if there be such, otherwise with the Secretary of the New England Insurance Exchange, Boston.

This certificate is relied upon as a guarantee until the work can be inspected. Permits for the use of the light or power may be granted as soon as the certificate be duly filed.

Concealed work should be inspected before being covered up, and, as a rule, incandescent work generally should be inspected before current be turned on.

The above Rules and Requirements are jointly adopted by the New England Insurance Exchange, "Associated Factory Mutuals," and Boston Fire Underwriters' Union, and are applicable to all Electric Lighting and Power work in New England, exclusive of buildings in the State of New Hampshire not insured by the "Associated Factory Mutuals."

[Also adopted by the New York State Board.]