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Standard for the

Installation, Maintenance and Use of

MUNICIPAL FIRE ALARM SYSTEMS

May
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Fifty Cents*

NATIONAL FIRE PROTECTION ASSOCIATION

International

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National Fire Protection Association

International

Executive Office: 60 Batterymarch St., Boston 10, Mass.

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the cooperation of its members in establishing proper safeguards against loss of life and property by fire. Its membership includes two hundred national and regional societies and associations (list on outside back cover) and nearly eighteen thousand individuals, corporations, and organizations. Anyone interested may become a member; membership information is available on request.

This is one of a large number of publications on fire safety issued by the Association; a complete list is available without charge on request. All NFPA standards adopted by the Association are published in the **National Fire Codes** which are re-issued annually. The standards, prepared by the technical committees of the NFPA and adopted in the annual meetings of the Association, are intended to prescribe reasonable measures for minimizing losses of life and property by fire. All interests concerned have opportunity through the Association to participate in the development of the standards and to secure impartial consideration of matters affecting them. Complete information on Committees will be found in the NFPA Year Book.

Official NFPA Definitions

SHALL is intended to indicate requirements.

SHOULD is intended to indicate recommendations, or that which is advised but not required.

APPROVED refers to approval by the authority having jurisdiction.

Units of measurements used here are U. S. standard. 1 U. S. gallon = 0.83 Imperial gallons = 3.785 liters. One foot = 0.3048 meters. One inch = 24.50 millimeters. One pound per square inch = 0.06805 atmospheres = 2.307 feet of water.

Approved Equipment

The National Fire Protection Association does not "approve" individual items of fire protection equipment, materials or services. The suitability of devices and materials for installation under these standards is indicated by the listings of nationally recognized testing laboratories, whose findings are customarily used as a guide to approval by agencies applying these standards. Underwriters' Laboratories, Inc., Underwriters' Laboratories of Canada, the Factory Mutual Laboratories and the American Gas Association (gas devices) test devices and materials for use in accordance with the appropriate standards, and publish lists which are available on request.

Municipal Fire Alarm Systems

No. 73 — May 1960

This edition of the Standard on Municipal Fire Alarm Systems supersedes all previous editions dating back to 1898. The 1960 edition is a revision of the latest previous (1958) edition, and was prepared by the NFPA Sectional Committee on Municipal Fire Alarm Systems, approved by the NFPA Committee on Signaling Systems and Thermostats and adopted by the NFPA at its Annual Meeting in May 1960.

Initially these standards were general rules and requirements covering many phases of signaling and alarm systems. In 1904 a set of standards was compiled to cover all the separate standards previously prepared. A general revision of the standards was made in 1911. In 1934 a complete revision was adopted. More recent amendments have been adopted by the NFPA in 1940, 1941, 1946, 1948, 1949, 1950, 1952, 1954, 1955, 1956, and 1958.

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MUNICIPAL FIRE ALARM SYSTEMS

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CHAPTER I. FUNDAMENTALS.

ARTICLE 100. SCOPE.

1010. A municipal fire alarm system is an electrically operated means of notifying a fire department that a fire has occurred. A complete municipal fire alarm system fulfills two functions, that of receiving alarms from the public through fire alarm boxes located on the street and that of transmitting the alarm to those fire companies which should respond to extinguish the fire.

Municipal fire alarm facilities also include the provisions for receipt of alarms from persons using commercial telephones and the provisions necessary to alert other interested parties and organizations, such as the police and water departments, that a fire emergency exists.

This Standard covers the installation, maintenance and use of all municipal fire alarm facilities. Radio systems are included if so used as to perform one or more of the above functions.

1020. An auxiliary fire alarm system provides protection to an individual occupancy or building or to a group of buildings of a single occupancy and utilizes the municipal fire alarm facilities to transmit an alarm of fire to the fire department. Fire alarms from an auxiliary system are received at municipal fire alarm headquarters on the same equipment and by the same alerting methods as alarms transmitted from fire alarm boxes located on streets.

Installation requirements for an auxiliary fire alarm system within the protected premises and up to the point of connection to the municipal fire alarm facilities are contained in the Standard for Proprietary Protective Signaling Systems (No. 72).

1021. There are two types of auxiliary systems transmitting coded alarms; the local energy type and the shunt type. They are distinguished by their operating characteristics.

The local energy type of auxiliary system is isolated from the municipal alarm system. Since the auxiliary system has its own power supply, tripping of the master box does not depend on the current in the municipal circuit. Whether or not the alarm will be received by the fire department if the municipal circuit is accidentally opened, depends on the design of the master box and associated municipal fire alarm headquarters equipment; i.e., whether or not the municipal system is designed to receive alarms through automatic ground operational facilities.

A shunt-type auxiliary system is electrically connected to, and is an integral part of, the municipal alarm system. A ground fault on the auxiliary circuit is a fault on the municipal circuit, and an accidental opening of the auxiliary circuit will send a needless (or false) alarm to the municipal fire department. An open circuit in the master box trip coil will not be indicated either at the protected property or at the municipal fire alarm headquarters; if a signal initiating device is operated, an alarm will not be transmitted but an open circuit indication will be given at the municipal fire alarm headquarters. If a municipal circuit is open when a connected shunt type system is operated, the master box will not trip until the municipal circuit returns to normal at which time the alarm will be transmitted, unless the auxiliary circuit is first returned to a normal condition.

ARTICLE 110. TYPES OF FIRE ALARM SYSTEMS.

The two basic types of municipal fire alarm systems are differentiated by their operational method of performing the functions described in Section 1010.

1110. Type A (Manual Retransmission) Systems.

1111. A Type A system is one where alarms from municipal fire alarm boxes of any type require an operator to check their receipt and to retransmit all alarms to fire stations and, if used, to outside sounding devices.

1112. Type A systems are permissible for any size community or area and are required where the number of alarms and emergency calls, however received, approximate 1500 per year.

1120. Type B (Automatic Retransmission) Systems.

1121. A Type B system is one where it is not necessary for an operator to check the receipt and transmission of alarms from municipal fire alarm boxes of any type as the headquarters equipment automatically retransmits the alarm to fire stations and to outside sounding devices when used.

1130. Sub-Station Arrangements.

1131. It may be desirable, for purposes of economy, operational efficiency or other local conditions, to sub-divide the system, terminating some circuits at equipment located in various sub-stations in the protected area. Such arrangements are basically combinations of the types of systems covered by Sections 1110 and 1120, suitably coordinated and connected.

1132. The requirements governing sub-station arrangements shall be applicable only to a system which provides protection through headquarters equipment installed at two or more locations, all of which are under the jurisdiction of the same fire protection authority. They shall not apply to independent fire alarm systems, under separate fire protection authorities, which are inter-connected for mutual aid purposes.

1133. Sub-stations shall comply with all requirements of this Standard which are applicable to headquarters equipment.

1134. Type A sub-stations, with at least one operator on duty at all times, may operate independently within an assigned fire protection area but shall have sufficient circuit connections with the central fire alarm headquarters to permit exchange of alarm and response information.

1135. Type B sub-stations shall have sufficient circuit connections with the central fire alarm headquarters to permit receipt at headquarters of all alarms received from municipal fire alarm boxes on sub-station circuits. The circuits between headquarters and the sub-station shall not be used as part of a required alarm circuit from headquarters to a fire station when the number of alarms per year transmitted over such circuits approximates 1500. When the number of alarms from municipal fire alarm boxes to a Type B sub-station approximates 1500 per year, the Type B sub-station shall become a Type A sub-station with at least one operator on duty at all times, or shall be divided into two or more Type B sub-stations.

ARTICLE 120. FUNDAMENTAL CHARACTERISTICS OF A MUNICIPAL FIRE ALARM SYSTEM.

1210. General.

1211. Municipal fire alarm systems may incorporate various operating principles but all such systems shall comply with this Article as well as with the intent of this Standard.

1212. Systems shall be designed, installed and maintained so as to provide the maximum practicable reliability for continuous and correct receipt and transmission of fire alarms. All systems shall comply with applicable requirements of this Standard.

1213. A system or device having materials, methods of operation or forms different from those detailed in this Standard may be examined and tested by the authority having jurisdiction according to the intent of the requirements and, if satisfactory, will be judged the equivalent.

1214. Plans and complete information regarding the system should be submitted to the authority having jurisdiction for approval before the construction of the fire alarm building or the installation of apparatus is begun and preferably, before the awarding of contracts.

1215. The fire alarm system may be adapted or used for the transmission of other signals or calls of an emergency nature provided such transmission does not interfere with the receipt of alarms of fire.

The system may be used in whole or in part as a police signaling system provided that the fire alarm operator is not required to answer routine police calls when such exceed approximately ten times the number of emergency calls averaged over a one-year period.

1220. Equipment and Installation.

1221. The system shall be adequate in extent to protect all built-up sections of the city and shall be extended as needed to maintain adequacy.

1222. Means for transmission of alarms by the public shall be available on the streets within distances as specified for fire alarm boxes elsewhere in this Standard, shall be conspicuous and readily accessible for easy operation, and shall not depend upon voice transmission solely for designating the locations.

1223. Simultaneous or concurrent operation of street facilities for transmission of alarms by the public shall not cause loss of an alarm or interference except to the degree and in the circumstances specifically permitted by this Standard.

1224. The system shall be so designed and installed that it shall be capable of performing its intended function at 80 per cent and at 110 per cent of the rated voltage.

1225. All devices and equipment constructed and installed under this Standard shall be suitable for the purpose for which they are intended.

All systems shall be installed in a workmanlike manner in accordance with established practices and applicable requirements of this Standard.

1226. To assure reliability, circuits upon which transmission and receipt of alarms depend shall be under electrical supervision or have equivalent provisions to give prompt warning of conditions adversely affecting reliability.

1227. The normal operating condition of the system shall be such that grounds will not be necessary to secure any required function, and, that circuits extending outside

headquarters shall normally test free of ground. This shall not prevent the use of the ground to secure functioning under abnormal line conditions provided such use would not prevent reception or transmission of a signal under normal conditions if the circuit was accidentally grounded.

1228. Upon completion of a system installation, a satisfactory test of the entire equipment shall be made in the presence of an authorized representative of the purchaser, and, if required by the authority having jurisdiction, in the presence of its representative.

1229. All apparatus shall be restored to normal condition as promptly as possible after each test or alarm in which the apparatus functioned, and shall be maintained in the normal condition for operation.

1230. Maintenance and Operation.

1231. The methods employed in maintaining, inspecting and testing the fire alarm system shall be efficient and reliable; no system is sufficiently automatic or durable as to do away with the necessity for periodical inspections and working tests of all its parts.

1232. Maintenance, control and supervision by an organization or person other than the municipality or a municipal employee shall be by written contract guaranteeing performance acceptable to the authority having jurisdiction.

1233. The system shall be under the supervision of a responsible municipal employee. When maintenance, control or supervision is by an organization or person other than the municipality or its employees, complete written records of the installation, maintenance, test, failure, repair and extension of the system shall be forwarded to the supervising municipal employee as soon as possible; notice of failures and restoration of service shall be made immediately.

1234. Fire alarm operators or other persons responsible for the receipt and transmission of alarms shall be specifically chosen for the position on the basis of competency and shall be thoroughly trained to perform the duties. When the responsibility is delegated to other than municipal employees, the arrangements shall be satisfactory to the authority having jurisdiction.

1235. Complete inspections and tests shall be made at regular intervals and not less frequently than specified in this Standard.

1236. A complete record shall be kept by the municipality of all tests and alarm signals whether true or false, all circuit interruptions and observations or reports of apparatus failures or derangements, and all seriously abnormal or defective circuit conditions indicated by test or inspection; these records shall include the date and time of all occurrences.

1237. All alarms of fire received by fire alarm headquarters by any means whatever shall be promptly and accurately transmitted to the fire department for proper response of fire companies unless otherwise directed in writing by a responsible municipal official who shall assume full responsibility for any consequences of his directive.

ARTICLE 130. DEFINITIONS.

1301. An emergency is any condition endangering life or property.

1302. Fire Alarm Headquarters is the building or portion of a building used to house the central operating part of the fire alarm system; usually the place where the necessary testing, switching, receiving, transmitting and current supply devices are located; sometimes called Fire Alarm Headquarters or Central Station or Central Office.

1303. Station or Fire Station refers to a building occupied by mobile apparatus of the fire department. Also includes Salvage or Patrol Stations and, in some instances, water works pumping stations.

1304. Circuits are conductors used to perform a definite function in connection with a fire alarm system. Box circuits are those on which fire alarm boxes are connected, and in Type B systems must also connect to receiving equipment at fire stations. Alarm circuits are the circuits over which alarms are transmitted, automatically or manually, from headquarters to stations. Local circuits are those contained wholly in headquarters; also those, in fire stations or to firemen's homes, which are not an essential part of the alarm system.

CHAPTER II. FIRE ALARM FACILITIES AND INSTALLATION.

ARTICLE 200. CIRCUITS.

2010. General.

2011. Circuits and associated equipment shall be installed in a workmanlike manner and in accordance with the requirements of this Standard. The National Electrical Safety Code, National Bureau of Standards Handbook H30, shall be used as a guide for installation of outdoor circuitry (available from the National Bureau of Standards, Publications Section, Washington, D. C.).

2012. All circuits outside of headquarters or sub-stations shall be normally of the closed, all-metallic type in order to insure electrical supervision, electrical isolation of circuits and associated equipment and continuity of operation. This shall not preclude alternate methods of complying with the intent of this paragraph provided that other requirements of this Standard are observed.

Further, open local circuits within single buildings are permissible for operation of alerting devices and alarm equipment additional to that required by this Standard.

2013. All circuits shall be so routed as to permit ready tracing of circuits for trouble. However, main cables should not be brought to terminals in box standards and the installation of test points on circuits shall be kept to a minimum; where test points are essential, they should be in fire stations or other properly protected and accessible locations.

In all installations, first consideration shall be given to continuity of service; particular attention should be given to liability of mechanical injury, to disablement from heat incident to a fire, to injury by falling walls and damage by floods, corrosive vapors or other causes.

2020. Box Circuits.

2021. The wires or other transmission carrying agency whereby an alarm is conveyed between a fire alarm box and fire alarm headquarters shall be considered as a box circuit when performing this function.

2022. Box circuits shall be so routed as to permit easy patrolling of any territory or area left without fire protec-

tion due to breakdown of a circuit. The interlacing of circuits is inadvisable, especially where circuits are in cables.

2023. Box circuits should not enter buildings or property which is not owned by or under the control of the municipality or the agency responsible for operating or maintaining the system, because of the possibility of damage to conductors or disruption of service.

When municipal fire alarm boxes are installed in buildings, they shall be placed as near as practicable to the point of entrance of the circuit and the interior wires shall be installed in conduit or electrical metallic tubing, installed in accordance with Chapter 3 of the National Electrical Code. Accessible and reliable means, available only to the authority in control of the municipal fire alarm system, shall be provided for disconnecting loops to boxes inside the buildings, and definite notification shall be given to the occupants of the building when interior boxes are not in service.

2024. Box circuits shall be sufficient in number and so laid out that the area which would be left without box protection in case of disruption of a circuit will not exceed that covered by 20 properly spaced boxes where all or any part of the circuit is in aerial open wire, or 30 properly spaced boxes where the circuit is entirely in underground or messenger-supported aerial cable. If all boxes on any individual circuit and the associated equipment, particularly at alarm headquarters, are designed and installed to provide for receipt of alarms through the ground in event of a break in the circuit, the area covered by this box circuit may be twice the above figures for aerial open wire circuits and cable circuits, respectively.

NOTE: A circuit serving an area greater than that which would be protected by properly spaced boxes, as outlined above, would be considered as "overloaded" even though the circuit was connected to less than this number of boxes. In this case, the circuit should be split into two or more independent circuits. Also, the installation of additional boxes in an area served by the number of properly spaced boxes indicated above does not constitute overloading of a circuit.

2030. Alarm Circuits.

2031. The wires or other transmission carrying agency whereby an alarm is conveyed from fire alarm headquarters

to fire companies in their stations shall be considered as alarm circuits when performing this function.

NOTE: Circuits to telephone instruments which require action on the part of the personnel to answer the call shall not be considered as an alarm circuit.

2032. Two separate and distinct alarm circuit facilities shall be provided for transmitting alarms to fire stations except as permitted elsewhere in this Standard. One alarm circuit facility shall consist of supervised metallic circuits for transmission of coded signals or signals for graphic recording, such as the printing telegraph or teletype systems. The other alarm circuit facility may consist of supervised metallic circuits for transmission of coded signals, signals for graphic recording, or voice signals, such as voice amplification system, or may consist of a radio system for transmission of voice signals. Alarm circuit facilities shall conform to the applicable requirements of this Standard.

2033. A metallic or wired alarm circuit shall not be connected to alarm instruments in more than five (5) fire stations or other buildings.

2034. A metallic or wired alarm circuit shall not enter buildings or property which is not owned by or under the control of the municipality or the agency responsible for operating or maintaining the system because of the possibility of damage to conductors or disruption of service.

NOTE: Alarm instruments installed in private residences or buildings not owned by or under the control of the municipality should be on special circuits responsive to relays preferably located in nearby fire stations or other municipal buildings.

2040. Teletype Circuits and Voice Amplification Circuits.

2041. Where used as one of the required alarm circuits, such circuits should preferably be individual to each fire station.

If more than one receiving device is connected to a circuit, they should be connected in parallel.

2042. When receiving units in fire stations are dependent for operation upon a local power supply, the local power supply shall be visually supervised by a normally illuminated light.

2043. Means of acknowledging receipt of the alarm shall be provided from the fire station to the alarm transmitting operator.

2044. Wiring shall be installed in accordance with the requirements of Article 210.

ARTICLE 210. CIRCUIT CONDUCTORS.

2110. Fundamentals.

2111. The integrity of any fire alarm system is dependent upon the kind of material used and the maintenance provided. In general, wires in cable, either underground or suspended on messenger wires, are preferable to overhead open wire construction. This applies especially to alarm circuits and to circuits serving boxes in the principal business districts and industrial areas.

2112. Wires shall be terminated so as to provide good electrical conductivity and prevent breaking from vibration or stress.

2113. Circuit conductors on terminal racks shall be identified and isolated from conductors of other systems whenever possible and shall be suitably protected from mechanical injury.

2120. Cables, General.

2121. All cables shall be constructed to provide a high degree of dependability under the most severe conditions of use.

2122. The insulation and covering or sheath of cabled conductors shall have adequate dielectric and mechanical strength for the service to which it will be subjected and the ability to withstand any necessary abuse of installation.

NOTE (1): Cables which meet the requirements of Article 310 of the National Electrical Code for installation in wet locations are satisfactory for overhead or underground installation except that direct-burial cable must be specifically approved for the purpose.

NOTE (2): Paper or pressed pulp insulation is not considered satisfactory for emergency service such as a fire alarm system. Natural rubber sheathed cable shall not be used where it may be exposed to oil, grease or other substances or conditions which may tend to deteriorate the cable sheath. Braided sheathed cables shall be used only inside of buildings when run in conduit or metal raceways and used in lieu of individual conductors.

2123. Wires shall be of solid copper construction; stranded conductors shall not be used.

The sizes of conductors shall be not smaller than as indicated in the table below for the number of cabled conductors:

No. of Conductors	AWG Size of Conductor
2	14
4	16
10	18
20 or over	22

2124. Other municipally-controlled signal wires may be installed in the same cable with fire alarm wires. Cables controlled by, or containing wires of, private signaling organizations can be used for fire alarm purposes only on permission of the authority having jurisdiction.

Signaling wires which, because of the source of current supply, might introduce a hazard, shall be protected and supplied as required for lighting circuits (see Section 2360).

2125. All cables, when installed, with all taps and splices made, but before connection to terminals, shall be tested for insulation resistance. Such tests shall be made with suitable instruments and shall indicate an insulation resistance of at least 200 megohms per mile between any one conductor and all others and the sheath, or ground.

2130. Underground Cables.

2131. Underground cables in duct or direct burial shall be brought above ground only at points where liability of mechanical injury or of disablement from heat incident to fires in adjacent buildings is minimized.

2132. Cables should be in duct systems and manholes containing low-tension signaling system conductors only, except low-tension secondary power cables. If in duct systems or manholes containing power circuit conductors in excess of 250 volts to ground, fire alarm cables shall be located as far as possible from such power cables and shall be separated from them by a noncombustible barrier or by such other means as may be practicable to protect the fire alarm cables from injury.

2133. All cables installed in manholes shall be properly racked and marked for identification.

2134. All conduits or ducts entering buildings from underground duct systems shall be effectively sealed against moisture or gases entering the building.

2135. Cable joints shall be located only in manholes, fire stations, and other buildings where proper accessibility is provided and where there is little liability of injury to the cable by falling walls or by operations in the buildings. Cable joints shall be so made as to provide and maintain specific conductivity, insulation and protection at least equal to that afforded by the cables which are joined. Cable ends shall be sealed against moisture.

2136. Cables laid in direct burial without enclosure in ducts, shall be in grass plots, under sidewalks and in other places where the ground is not apt to be opened for other underground construction. If splices are made, such splices shall, where practicable, be accessible for inspection and tests. Such cables shall be buried at least 18 inches deep and, where crossing streets or other areas likely to be opened for other underground construction, shall be in duct or conduit or be covered by creosoted planking at least two inches thick and eight inches wide or consisting of two creosoted 2 inch x 4 inch planks with half round grooves, spiked or banded together after the cable is installed.

2140. Aerial Construction.

2141. Fire alarm system wires shall be run under all other wires except communication wires. Suitable precautions shall be provided where passing through trees, under bridges, over railroads and other places where injury or deterioration is possible. Wires and cables shall not be attached to a cross-arm carrying electric light and power wires.

2142. Aerial cables shall be supported on messenger wire of adequate tensile strength.

NOTE: See specifications of the International Municipal Signal Association.

2143. Single wires may be bare or may have a covering or insulation.

NOTE (1): A double- or triple-braided weather-resistant covering has little dielectric strength and is not considered as an insulation.

NOTE (2): If a covering or insulation is desired, specifications of the International Municipal Signal Association are recommended.

2144. Single wire shall not be smaller than No. 10 Roebling gage if of galvanized iron or steel, No. 10 AWG if of hard-drawn copper, No. 12 AWG if of approved copper covered steel, or No. 6 AWG aluminum. If spans exceed 150 feet, the wire cross-section shall be increased in the ratio of the squares of the lengths of span. The use of 2-conductor cable is permissible if its tensile strength is not less than that of a No. 10 hard-drawn copper wire.

NOTE: The 2-conductor cable is not considered suitable for line wire, particularly through trees; its purpose is for distribution from cable terminal to nearby boxes, preferably along messenger wires, thus eliminating numerous cable terminal boxes and associated terminal boxes.

2145. Wires to buildings shall contact only intended supports and shall enter through an approved weather head or suitable sleeves slanting upward and inward. Drip loops shall be formed on wires outside of buildings.

2150. Leads Down Poles.

2151. Leads down poles shall be protected against mechanical injury. Any metallic covering shall form a continuous conducting path to ground. Installation shall in all cases be such as to prevent water from entering the conduit or box.

NOTE: It is recommended that metallic coverings shall not be extended within six feet of power lines.

2152. Leads to boxes shall be not smaller than No. 14 AWG copper, or equivalent, with 600 volt insulation approved for wet locations as defined in the National Electrical Code.

2160. Wiring Inside Buildings.

2161. Wires inside buildings, including those from point of first attachment, shall be in conduit, electrical metallic tubing, metal moulding, or raceways. Installation shall be in accordance with the National Electrical Code.

2162. Wires shall have an approved insulation; the insulation or other outer covering shall be flame-retardant and moisture-resistant.

2163. Wires shall be installed as far as possible without joints. Splices will be permitted only in junction or terminal boxes. Wire terminals, splices and joints shall conform with the National Electrical Code.

2164. Wires bunched together in a vertical run connect-

ing two or more floors shall have a fire-resisting covering sufficient to prevent the carrying of fire from floor to floor. This requirement shall not apply if the wires are encased in a noncombustible enclosure, or are located in a fireproof shaft having firestops at each floor.

2165. Signal wires and electric light and power wires may be run in the same shaft, if the two systems are separated at least two inches, or if either system is encased in a noncombustible enclosure.

2166. At headquarters, wires shall extend as directly as possible to the operating room. All cables and wires shall be installed in conduits, ducts, shafts, raceways or overhead racks and troughs of a type of construction affording protection against mechanical injury.

2167. All cables and wiring at headquarters, and cables carrying more than four circuits in fire stations or other buildings where extending through garage sections or other places where exposure to fire is probable shall be enclosed in masonry ducts or shafts capable of withstanding a standard two-hour fire test, without injury to the cables.

2170. Wiring on Switchboards.

2171. Wires on switchboards shall be not smaller than No. 22 AWG. Unsupported wires and wires subject to vibration shall be not less than No. 18 AWG. The outer covering over the insulation on such wires, or the insulation itself if no outer covering is present, shall be flame retardant and moisture resistant.

ARTICLE 220. CIRCUIT PROTECTION.

2210. Design.

2211. Lightning arresters, or equivalent protection devices shall dependably discharge without permanently grounding the circuit at a potential between 400 and 500 volts d.c. and may permanently ground the circuit at higher potentials. Lightning arresters shall be marked with the name of the manufacturer and model designation.

2212. All lightning arresters shall be connected to a suitable ground.

2213. An unenclosed No. 8 AWG copper wire or equivalent shall be used to connect a grounded device to a suitable ground in order to provide adequate mechanical strength

or, if enclosed in a grounded metal pipe, a No. 14 copper wire may be used. Suitable grounds are: (1) an underground metallic water piping system; (2) the grounded neutral of a power system provided the neutral is effectively grounded in at least four places per mile; (3) a ground rod not less than ½-inch diameter of copper or equivalent driven to permanently moist soil.

NOTE (1): The National Electrical Safety Code recommends, as a safety to life provision, a resistance in ground connections not in excess of 25 ohms.

NOTE (2): As the adequacy of a ground connection varies widely due to changing local conditions such as moisture content of soil, it is strongly recommended that the ground resistance of all ground connections be measured and recorded and checked periodically thereafter.

2214. All fuses shall be plainly marked with their rated ampere capacity. All fuses rated over two amperes should be of the enclosed type.

2220. Protection at Headquarters.

2221. Circuit protection required at fire alarm headquarters shall be required in every building housing headquarters equipment when such equipment is separated and installed in more than one building.

2222. All conductors entering fire alarm headquarters shall be protected by the following devices in the order named, starting from the exterior circuit:

(a) A fuse rated at 3 amperes and not less than 2000 volts;

(b) A lightning arrester meeting the requirements of Section 2210; and,

(c) A fuse rated at one-half ampere.

NOTE: In headquarters where an operator is constantly on duty, mechanical circuit breakers may be used in addition to the above.

2230. Protection at Other Buildings.

2231. Each conductor entering fire stations or other buildings from lines partly or entirely aerial shall be protected by a lightning arrester meeting the requirements of Section 2210.

NOTE: Fuses are not recommended for such circuits at the point of entrance to fire stations, except that for systems having a

headquarters operator always on duty, and in fire stations having a house watch normally on duty, a 2000-volt, 5-ampere enclosed fuse may be installed on the station side of the lightning arrester.

2240. Protection on Aerial Construction.

2241. At junction points of open aerial conductors and cable, and between aerial and underground cables, each conductor shall be protected by a lightning arrester meeting the requirements of Section 2210 and, in addition, being of a weatherproof type or suitably protected from the weather. There shall also be a connection between the lightning arrester ground and any metallic sheath and messenger wire.

2242. Aerial open wire circuits should be protected by a lightning arrester meeting the requirements of Section 2210 at intervals of approximately 2000 feet.

NOTE: The installation of lightning arresters in fire alarm boxes is not recommended.

2243. All protective devices shall be readily reached for inspection.

ARTICLE 230. POWER SUPPLY.

2310. Fundamentals.

2311. Power supply circuits, together with their associated motors, generators, rectifiers, transformers, fuses and controlling devices, shall be in accordance with the requirements of the National Electrical Code.

2312. The conductors of a fire alarm system power supply circuit shall be connected on the line side of the main service of a commercial light or power supply circuit or to the main bus bars of an isolated power plant located on the premises. A circuit disconnecting means shall be so installed that it will be accessible only by authorized personnel. A fuse, enclosed in a locked or sealed cabinet located immediately adjacent to the point of connection to the light and power conductors, shall be provided in series with each ungrounded conductor.

2313. Each box circuit and each alarm circuit or each alarm transmitting or receiving device shall be provided with two sources of power. The secondary source shall be independent of other sources and of a high degree of re-

bability. The secondary source shall be arranged as follows:

(a) It shall not operate through or be dependent upon the same motor generator, converter, or other device having moving parts which supplies the primary or normal supply, except that a storage battery, floating on a rectifier or generator, will be considered as a secondary source.

(b) It shall be of such capacity and reliability as to assure operation in case of interruption of the normal supply.

(c) It shall automatically supply the circuit or circuits upon loss of the normal source within 30 seconds; in a Type A system this automatic feature may be omitted if suitable provisions are made for manually restoring service within 30 seconds.

2314. The two sources of power may include:

(a) One supply circuit from a public utility distribution system of not more than 250 volts and a second from a storage battery or from a generator driven by a continuously available prime mover.

(b) Two supply circuits of not more than 250 volts from separate public utility distribution system, so serviced or connected that normal supply to one will not be affected by trouble which would put the other out of service.

NOTE: This would usually require supply from two building services on entirely separate distribution networks from preferably independent generating stations or, at least, independent primary transformers.

2315. The forms and arrangements of current supply shall be classified as follows:

Form 1. Individual circuits served by separate duplicate sets of storage batteries on each circuit; permissible for Type A systems only.

Form 2. Several circuits served in multiple by duplicate sets of storage batteries, or by a rectifier with a floating storage battery, or by a motor-generator with a storage battery floating; permissible for Type A systems only.

NOTE (1): This arrangement is permissible but is not recommended where circuits are wholly or partly open wire because of the possibility of trouble from multiple grounds.

NOTE (2): Batteries, motor-generators or rectifiers shall be sufficient (a) to supply all connected circuits without exceeding the capacity of any battery or overloading any generator or

rectifier; (b) to supply box circuits independently from alarm circuits; and (c) so that circuits developing grounds or crosses with other circuits may be supplied each by an independent source to the extent required by Note 3 below.

NOTE (3): Provision shall be made in the operating room for supplying any circuit from any battery, generator or rectifier. Enclosed fuses shall be provided at points where supplies for individual circuits are taken from common leads. Necessary switches, testing and signal transmitting and receiving devices shall be provided to permit the isolation, control and test of each circuit, to the extent of at least 10 per cent of the total number of box and alarm circuits, but never less than two.

NOTE (4): If common-current source systems are grounded, the ground shall not exceed 10 per cent of resistance of any connected circuit and be located at one side of the battery. Visual and audible indicating devices shall be provided for each box and alarm circuit to give immediate warning of ground leakage endangering operability.

Form 3. Individual circuits served by separate rectifiers or generators for each circuit with individual storage batteries floating on each circuit.

Form 4. Individual circuits served by separate rectifiers or motor-generators on each circuit with a secondary supply from a prime mover-driven generator, or from a second electric distribution system, or from a storage battery operating through an inverter.

NOTE (5): Where circuits are independently supplied by rectifiers, or motor generators, with or without storage battery floating (Forms 2, 3 and 4), each rectifier or generator shall be effectively isolated electrically from each other, in which case, a primary source of power common to all circuits may be used.

2316. Devices to give warning of dangerous decreases in the normal power supply or other derangements jeopardizing service shall not be dependent upon the normal power source supplying the circuits so supervised.

2317. Local circuits at headquarters may be supplied either in common with box or alarm circuits or by a separate power source. The source of power for local circuits on which the operation of essential features of the system depend shall be supervised.

2320. General Requirements for Constant-Current Systems.

2321. Means shall be provided for manually regulating current in box and alarm circuits so that operating current may be maintained within 10 per cent of normal throughout

changes in external circuit resistance from 20 per cent above to 50 per cent below normal.

2322. The voltage supplied to maintain normal line current on box or alarm circuits shall be not less than 10 volts nor exceed 150 volts, measured under "no load" conditions and shall be such that the line current will not be reduced below safe operating value by the simultaneous operation of eight boxes.

2323. Visual and audible indication of current decrease approaching 80 per cent of normal in any box or alarm circuit shall be provided.

2324. Sufficient meters shall be provided to indicate the current in any box or alarm circuit and the voltage of any power source. Meters used in common for several circuits shall be provided with cut-in devices designed to reduce the probability of cross-connecting circuits.

2330. Batteries.

2331. Batteries used shall be of the storage type; primary batteries, or dry cells, shall not be used. All cells shall be of the sealed type. Lead-acid batteries shall be in jars of glass or other suitable transparent material; other types of batteries shall be in containers suitable for the purpose.

2332. Batteries shall be located in the same building as the operating equipment, preferably on the same floor, readily accessible for maintenance and inspection. The battery room shall be above ground level and shall be ventilated to prevent accumulation of explosive gas mixtures; special ventilation is required only for unsealed cells.

2333. Batteries shall be mounted in such a manner as to provide effective insulation from the ground and from other batteries. The mounting shall be suitably protected against deterioration and consideration shall be given to stability, especially in territory subject to seismic disturbances.

2334. Facilities shall be provided for giving floating batteries a charge at a rate not less than the normal 24-hour charge rate recommended by the manufacturer on the basis of one high rate charging source for each 10 sets of floating batteries, unless sufficient capacity is provided in the individual normal charging sources. The high rate charge may be applied while the battery is connected to line, provided that only one battery is charged at a time from any

high rate source.

A battery normally floating may be used alone to supply the circuit, for a period not exceeding one-half its operating capacity in terms of hours of service, just prior to an overcharge.

2335. Batteries shall have the following capacities:

(a) Alternate charge and discharge: 60 hours normal operating capacity in each set with a single source of charging current (Form 1 and Form 2); or 24 hours normal operating capacity in each set where there are two independent, reliable and constantly available sources of charging current.

(b) Battery normally floating: 60 hours normal operating capacity for all connected load, with a single source of charging current (Form 2 and Form 3); or 24 hours normal operating capacity where there are two independent reliable and constantly available sources of charging current.

(c) Where the battery is used to supply an inverter only during interruption of primary power (Form 4), the battery shall have 24 hours normal operating capacity.

2336. Batteries shall be protected by enclosed fuses of not less than 3-ampere capacity, nor more than 200 per cent of maximum connected load. Fuses shall be suitably located so that they are not subject to corrosion from battery gases. Battery leads of both polarities shall not be in the same conduit, tubing or cable between the battery terminals and fuse.

2340. Rectifiers, Converters, Motor-Generators, etc.

2341. (a) A rectifier is a device without moving parts which changes alternating current to direct current.

(b) An inverter is a device which changes direct current to alternating current.

(c) A converter is a device consisting of a direct current electric motor driving an alternating current generator.

(d) A motor-generator is a device consisting of an alternating current or direct current motor driving a direct current generator.

2342. Rectifiers shall be supplied through an insulating transformer taking energy from a circuit of not to exceed 250 volts.

2343. Rectifiers or motor-generators employed pursuant to *Forms 2, 3* and *4* shall have reserve as follows:

For *Form 2.* There shall be at least two complete equipments so arranged that the batteries can be switched from one to the other.

Forms 3 and *4.* For systems exceeding 10 circuits, complete ready to use units, or spare parts, shall be available, equal to five per cent of the total number of circuits.

2344. Leads from rectifiers or motor-generators, with storage battery floating, shall have fuses rated at not less than one ampere and not more than 200 per cent of maximum connected load. Where not provided with battery floating the fuse shall be not less than 3 amperes.

2350. Engine-driven Generator Sets.

2351. The provisions of this Section shall apply to alternating current or direct current generators driven by internal combustion engines which may operate on gasoline, diesel oil, liquefied petroleum gas, or other fuel suitable to the design.

2352. The installation of such units shall conform to the provisions of the Standard for Internal Combustion Engines (No. 37) except as restricted by the provisions of this Section.

2353. The unit shall be located in an adequately ventilated cut-off area of the building housing the fire alarm headquarters equipment; the room shall be used for no other purpose except that new spare parts or equipment may be kept in storage in the room with not less than 15 feet clearance on all sides of the unit. Exhaust fumes shall be directly vented outside the building.

2354. Fuel shall be stored in outside underground tanks whenever possible and gravity feed shall not be used. Sufficient fuel shall be available for 12 hours of operation at full load if a reliable source of supply is available at any time on two hours notice; if a source of supply is not reliable or readily available or if special arrangements must be made for refueling as necessary, a supply sufficient for 24 hours of operation at full load must be maintained.

2355. The unit shall be of sufficient capacity to supply power for operating all fire alarm facilities, emergency

lighting of the operating rooms or headquarters building and, in addition, such other facilities as may be designated by the responsible municipal official.

2356. It is recommended that a storage battery be installed floating on the normal power supply on the system and arranged to provide current for operating the system until the generator unit reaches operating speed as well as providing starting current for the internal combustion engine. The battery should have sufficient capacity for operation of the system for at least one hour.

2357. The generator unit shall be operated under load by disconnecting the normal supply to the system for a minimum of three hours in a continuous period weekly. It is recommended that this be carried out at a definitely scheduled time every week.

2360. Current Supply to Designating Lights.

2361. Current supply for designating lamps at street boxes should preferably be secured at lamp locations from the local electric utility company.

2362. When the above is not possible, however, lighting circuit wires for supplying such lamps may be included in cables containing fire alarm wires. The lighting circuit wires shall be not larger than No. 10 AWG and the applied load shall not exceed 80 per cent of the current carrying capacity of the conductor as rated by the National Electrical Code. The lamps shall be connected in multiple and both wires of the circuit shall be in the same cable. The potential between any lighting circuit wire and ground shall not exceed 150 volts and shall be supplied by special devices (such as insulating transformers, motor-generators or batteries) which effectively isolate the circuits from all other electrical circuits. The special supply devices shall be energized by a permanently grounded supply of not more than 250 volts. The neutral wire of a three-wire circuit or one wire of a two-wire transformer secondary circuit shall be permanently grounded and each ungrounded wire shall be fused at its current carrying capacity as rated by the National Electrical Code. No lighting circuit wire shall be connected to any fire alarm signaling system terminal, junction or test board located outside of headquarters. Lighting circuit conductors in box pedestals or similar places,

where not in fire alarm cables under conditions as above, shall be installed in approved conduit or cable.

NOTE: In view of greater facility with which circuits may be run aboveground, it is not considered necessary nor advisable to provide in aerial fire alarm cables special conductors for supplying designating lamps at boxes.

2363. Alternating current power may be superimposed on metallic fire alarm circuits for supplying designating lamps or for control or actuation of equipment and devices for fire alarm or other emergency signals, provided:

(1) Voltage between any wire and ground or between one wire and any other wire of the system shall not exceed 150 volts; the total resultant current in any line circuit shall not exceed ¼ ampere.

(2) Coupling capacitors, transformers, choke coils, etc., shall be rated for 600 volts working voltage and have a break-down voltage of at least twice the working voltage plus 1000 volts.

(3) There is no interference with fire alarm service under any conditions.

ARTICLE 240. FIRE ALARM BOXES.

2410. General.

2411. A fire alarm box is the device which, when properly actuated, will transmit to fire alarm headquarters a signal indicating the location at which it is installed.

NOTE: Transmitters connected to box circuits will be considered as boxes for the purposes of this rule, except that where sounding or recording devices are provided to warn operators of the receipt of an alarm the transmitter need not be of non-interfering type.

2412. Non-interference devices, either mechanical or electrical, shall be designed so that manipulation of box starting levers, singly, concurrently or consecutively, will not, under any circumstances, result in a false signal.

2413. Succession devices, either mechanical or electrical, shall be designed so that no signal will be lost if the starting levers of two boxes are pulled at or about the same time.

2414. It is desirable that all fire alarm boxes, regardless of make or method of operation, be recognizable as such in all municipalities. Therefore, fire alarm boxes should be of conventional shape, closely resembling the "cottage" style, and should have instructions for use plainly marked on the outer door.

The operating device shall be readily available and of such design and so located as to make the method of its use apparent. It is recommended that essentially like methods of operating for use by the public be provided for all boxes in the municipality.

NOTE: Doors with a glass guard covering a permanently attached handle or key for opening door to give access to the means of operation are permissible but not recommended.

2415. Box cases and parts at any time accessible to users shall be of insulating materials or permanently and effectively grounded.

2416. All ground connections to boxes shall comply with the requirements of Paragraph 2213.

2417. Boxes shall be as conspicuous as possible. The color shall be distinctive and preferably bright red. Indicating lights of a distinctive color visible for at least 1500 feet in all directions shall be installed over boxes in mercantile and manufacturing areas and should be installed in residential areas.

NOTE: Provision should be made so that the location of a box is visible from all directions. In general, a wide band of distinctive colors, preferably red and white, visible over the tops of parked cars, should be painted on supporting poles. Adequate signs, when completely visible from all directions, are acceptable.

2420. Design of Coded Signal Boxes.

2421. Boxes transmitting a coded indication shall send three or four rounds of the box number. Four rounds are required where outside alarm devices are operated for summoning firemen.

2422. Boxes transmitting a coded alarm shall be capable of being adjusted to a desired speed. For a Type A system they shall preferably be operated at 4 or more strokes per second but never slower than 2 strokes per second. For a

Type B system they should be operated at not slower than 1 stroke per second.

2423. Boxes shall be non-interfering and succession, except as follows:

1. In a system consisting of not to exceed 60 boxes, up to 20 boxes on a circuit may be of interfering type, but if more than one such circuit, non-interference between circuits shall be provided.

2. In a Type A system operating at 4 or more strokes per second, circuits may include boxes of plain interfering type if the area served is of a residential nature composed of one and two family detached dwellings.

2424. Boxes shall leave the circuit closed when in a run-down condition.

2430. Location of Boxes.

2431. Boxes shall be sufficient in number and so located as to protect all built-up areas of the muncipality.

2432. Boxes shall be installed at street intersections in a manner such that they are visible from all intersecting streets whenever possible.

2433. A box should be visible from the main entrance of any building in congested districts. In order to reach a fire alarm box it shall not be necessary to travel in excess of one block or 500 feet in mercantile or manufacturing districts, with a distance of 300 feet being preferable, nor in excess of two blocks or 800 feet in residential areas, with a distance of 500 feet being preferable.

2434. Schools, hospitals, nursing homes and places of public assembly should have a box at or near the entrance.

2435. Where firemen are not normally on watch duty at fire stations, a fire alarm box shall be provided at each station, located where constantly accessible to the public. It is recommended that a fire alarm box be installed at or near the entrance to all fire stations.

2436. When boxes are located in buildings, it is not generally desirable to place them on circuits with street boxes.

2437. Box numbers should be assigned, as far as practicable, so that consecutive numbers will be closely grouped.

ARTICLE 250. TELEPHONE FACILITIES.

2510. Scope.

2511. It is generally recognized that there is no other thoroughly satisfactory means of sending and receiving fire alarms than a municipal fire alarm system. Telephones in the home or place of business, although a valuable adjunct to a municipal fire alarm system, should not be relied upon to replace needed boxes on the street, nor to supplement any inadequacy in number or location of street boxes.

2512. The provisions of this Article apply to the facilities necessary to receive alarms transmitted by citizens using the commercial telephone system and the facilities necessary to provide communication between the various fire department stations and offices.

2513. Telephone connections to and between fire stations are not to be considered as one of any required alarm circuits. A fire alarm system, as required by this standard, should be employed for the transmission to fire stations of all fire alarms, whether originating from boxes, from telephones, or verbally.

2514. This Article does not apply to the municipal fire alarm facilities of a telephone-type fire alarm system, whether owned by the municipality or leased from an outside agency.

2520. Commercial Telephone System.

2521. There should be a telephone number assigned for fire alarm emergency purposes only. In addition, another telephone number should be assigned for the normal fire department business. The emergency and service call information in the introductory pages of the telephone directory should include the instruction, "To report a fire, dial or call .... (Number) .... or dial or call the operator." In

all cases the emergency number should also be listed under "FIRE DEPARTMENT" in the alphabetical section of the telephone directory; if the directory lists all numbers in an area which is protected by more than one fire department authority or protection district, each such authority or district shall be listed alphabetically under the heading "FIRE DEPARTMENT."

Both the emergency and the business telephone numbers shall also be listed in the alphabetical section of the directory under the name of the community as follows:

"Fire Department
To report a Fire, Dial or Call.... (Number)....
For all other Purposes, Dial or Call.. (Number).."

Preferably, full knowledge of the fire call number should be further assured through the distribution by the fire department of suitable cards to all homes and places of business.

2522. At the location where telephone alarms are received, at least one telephone line shall be reserved for fire alarm emergency calls responsive to the emergency number; in larger communities, at least two lines and as many more as may be necessary, should be so reserved. In addition, sufficient telephone lines shall be provided responsive to the business number to fit the needs of the department.

In a telephone system, where manual switching is used, connection to reserved lines shall be made only for reporting a fire; where dial system service is used provision shall be made for automatically selecting the reserved lines first and progressing to the general business lines, when the emergency number is dialed, but the reserved lines shall not be made selective to a dialing of the general business number.

2523. At the telephone central office, the supervisor or other responsible employee should give special attention to all incoming alarms and oversee their proper transmission to the fire department.

2524. In communities where the above requirements cannot be met a system comprising suitable outside sound-

ing devices and transmission facilities may be directly utilized by the telephone central office employees, under conditions satisfactory to and by consent of the authority having jurisdiction.

2530. Departmental Telephone System.

2531. Where there is more than one fire station in the community, the telephone lines from the different fire stations should connect with a common switching point, preferably at the headquarters of the fire alarm system. At this location facilities shall be provided for communication with any fire station and with all public telephone systems within the district of the connected fire stations, together with required alarm transmission means.

2532. In communities having more than five fire stations where men are normally on duty, such switching point facilities shall comprise a private branch switchboard operated by a person under control of the municipality.

2533. In communities where one or more operators are required at fire alarm headquarters, such common switching point should be located in the room with the fire alarm headquarters apparatus.

2534. Receipt and retransmission of fire alarms and other emergency calls by telephone shall be automatically recorded in communities having a switchboard. Such recording is desirable in all communities.

2540. Telephones in Fire Stations.

2541. There shall be a telephone at each fire station. Such telephones shall be used exclusively for fire department purposes, and should be connected by individual lines to the departmental system.

NOTE: Should local conditions justify, the authority having jurisdiction may permit two or more fire stations per line, in cities having a population of less than 20,000.

2542. Telephones at fire stations should be so arranged that they cannot be called from any public telephone central office except as follows:

1. Telephones connecting with commercial telephone central offices only through a common switching point arranged as required by Paragraph 2531.

2. Telephones located in fire alarm headquarters or elsewhere where there is always some person on duty who is competent to send and has facilities for sending alarms over the fire alarm system.

3. Telephones at offices of chiefs or other executive officers.

4. Where there is but one fire station in the community.

2543. When telephones are installed in fire stations for the personal use and convenience of firemen and are connected to a commercial telephone central office, they shall not be listed in the telephone directory.

NOTE: This is to prevent their being used by the public for the transmission of alarms.

ARTICLE 260. FIRE ALARM HEADQUARTERS.

2610. Scope.

2611. Fire Alarm Headquarters is the building or portion of a building used to house the central operating part of the fire alarm system; usually the place where the necessary testing, switching, receiving, transmitting and current supply devices are located.

2620. Building Construction.

2621. The building shall be of "fire-resistive (3-hour classification) construction" as defined in the Standard Types of Building Construction (NFPA No. 220) and in the National Building Code published by the National Board of Fire Underwriters.

NOTE: No combustible material should be permitted in the construction even for window or door trim, closets, instrument cases, etc.; floor surfacing, laid directly upon noncombustible base, may be of combustible material.

2622. The building should be used for no other purpose than that relating to municipal signaling or fire department service. When any portion of the building is occupied as a heater or boiler room, garage, machine shop or for storage purposes, the part so used shall be cut off and any opening to such portion shall be protected by fire doors on each side of the wall at each opening.

2623. Two approved portable extinguishers, suitable for the hazards involved, shall be provided for each 2,500 square feet of floor area.

2624. Lighting of the operating room shall be such that all lights are not dependent on a single branch line fuse. For Type A Systems two independent services shall be provided or emergency lights, of sufficient illumination to permit operation, shall be operated from an emergency supply.

2630. Building Location.

2631. The building should preferably be located so as to be unexposed for a distance of at least 150 feet. If so located as to be exposed, then especial attention shall be given to guard against damage from such exposure by protection for exposed openings, and by so constructing the roof as to resist damage which might be caused by falling walls.

NOTE: It is desirable to locate the building in a park or public square where the conditions of exposure can be fully met. As the building, even for a large city, need be only of moderate size, and since for a slight increase in cost it can be made ornamental in appearance, objection to such locations should not be insurmountable.

ARTICLE 270. FIRE ALARM EQUIPMENT.

2710. General.

2711. All devices and instruments shall be mounted upon non-combustible bases, pedestals, switchboards, panels or cabinets. All mountings shall be of such design and construction that all connections and components shall be readily accessible.

Magnet windings of instruments or devices connected to circuits either wholly or partly aerial shall be considered as possible sources of heat.

2712. Cable terminal and cross-connecting facilities shall be provided, located in or adjoining the operating room. To avoid the possibility of flooding, all cable terminals should be located in rooms having a floor above the outside ground level.

2713. The protective devices shall be located close to, and may be combined with, the cable terminal.

2720. Facilities for Receipt of Alarms from Street Boxes.

2721. There shall be means by which alarms from fire alarm boxes will be automatically received and recorded at fire alarm headquarters.

2722. Both a visual and an audible signal are required to indicate the receipt of an alarm. The visual signal shall indicate the exact location from which the alarm is being transmitted. The audible signal may be common to several box circuits and may be arranged so that the fire alarm operator may manually silence the signal temporarily by a self-restoring switch.

2723. Facilities shall be provided which will automatically record the time of receipt of each alarm and the exact location from which the alarm is transmitted. In addition, all voice transmission shall be recorded; separate equipment may be used for this purpose.

NOTE (1): It is preferable to connect registering devices directly in the box and alarm circuits but relays may be provided for each circuit of each class when needed in order to secure proper functioning of required operating facilities.

NOTE (2): A reserve register shall be provided when systems have more than 4 box circuits.

NOTE (3): Automatic time recording equipment may be omitted when there are less than 5 box circuits.

2730. Facilities for Transmission of Alarms.

2731. Facilities shall be provided for transmitting alarms to fire stations by two separate means, consecutively or concurrently, except as otherwise permitted by this Standard.

2732. The facilities shall include automatic recording, for each means of transmission, of all alarms. Provision shall be made to record the date and time of transmission and shall be automatic in operation whenever possible.

NOTE: Graphic indication of time and date by the operator is satisfactory when graphic symbol transmission is used. Vocal announcement of time is satisfactory when alarm transmission is by voice and all transmissions are automatically recorded consecutively. See also Paragraph 2723 (Note).

2733. Transmitting devices shall be arranged for simultaneous transmission over all alarm circuits for the particular type of signals involved.

2734. Devices for transmitting coded signals, and devices for transmitting other types of signals where practicable, shall be arranged for manual setting or adjustment for all necessary alarm and special signals, and shall be of a design that, after setting or adjustment, the device may be actuated to automatically and completely transmit such alarms or signals for the required number of rounds.

In addition, this shall be supplemented by a manually operable coding device or telegraph key.

NOTE: Coded signals shall be transmitted over a metallic circuit at not slower than two strokes per second. If outside sounding devices are employed, transmission should preferably be over separate circuits but shall be at a speed suitable for such devices.

2740. Supervisory Facilities.

2741. Trouble signals shall be distinct from alarm signals and shall be indicated by both a visual light and an audible signal. The audible signal may be common to several supervised circuits.

Such indication shall be in the operating room.

2742. A switch for silencing the audible trouble signal may be provided only if the visual signal remains operated until the silencing switch is restored to its normal position. However, the audible signal must be responsive to faults on any other circuits which may occur prior to restoration of the silencing switch to normal.

2743. The power supply to all required circuits and devices of the system shall be supervised. The trouble signal shall be automatically activated upon the occurrence of an interruption or dangerous diminution of current which would jeopardize operation of the system.

2750. Testing Facilities.

2751. Testing facilities shall be installed at fire alarm headquarters except that, if satisfactory to the authority having jurisdiction, those facilities for testing leased from a non-municipal organization may be located elsewhere. This shall not be construed to mean that signals indicating occurrence or clearing of faults need not be in fire alarm headquarters with the operating equipment.

2752. Circuits operating on a constant-current basis shall have facilities for: