**Chapter 27 Public Emergency Alarm Reporting Systems**

27.1 Application

27.1.1

The provisions of this chapter shall apply to the proper configuration, performance, installation, and operation of public emergency alarm reporting systems and auxiliary alarm systems.

27.1.1.1

Public emergency alarm reporting systems shall consist of alarm boxes and alarm processing equipment that communicate on a wired or wireless network(s), one-way or two-way, meeting the requirements of this chapter.

27.1.1.2

Public emergency alarm reporting systems shall include systems that use a communications infrastructure that is publicly owned, operated, and controlled or where public emergency alarm reporting systems and equipment are used in other applications.

27.1.2

The installation and use of public emergency alarm reporting systems and auxiliary alarm systems shall comply with the requirements of this chapter.

27.1.3

The requirements of this chapter shall apply to systems and equipment for the transmission and reception of alarm and other emergency signals, including those from auxiliary alarm systems, connected to the public emergency alarm reporting system.

27.1.4

The requirements of Chapters 10 and 14 shall apply unless otherwise noted in this chapter.

27.1.5

Only those requirements from Chapter 7 that are required by Chapter 14 shall apply.

27.1.6

The application of public emergency alarm reporting systems and auxiliary alarm systems to provide defined reporting functions from or within private premises shall be permitted where approved by the authority having jurisdiction.

27.1.7\*

Where a protected premises fire alarm system or other emergency system at the protected premises has its signals sent to a communications center via public emergency alarm reporting system, the protected premises system shall become an auxiliary alarm system.

27.2 General

27.2.1\*

Public emergency alarm reporting systems shall be designed, installed, operated, and maintained in accordance with this chapter to provide reliable transmission and receipt of alarms in a manner acceptable to the authority having jurisdiction.

27.2.2

A public emergency alarm reporting system, as described herein, shall be permitted to be used for the transmission of other signals or calls of a public emergency nature, provided that such transmission does not interfere with the transmission and receipt of fire alarms.

27.2.3\*

All devices shall be designed to function satisfactorily under the climatic and environmental conditions to which they could be exposed.

27.2.3.1

All devices shall be identified as suitable for the location and conditions for which they are installed.

27.2.4

All circuits, paths, and equipment necessary for the receipt of signals from a protected premises shall be monitored for integrity.

27.3 Management and Maintenance

27.3.1

All systems shall be under the control of a designated jurisdictional employee.

27.3.2

Maintenance by an organization or person other than from the jurisdiction or an employee of the jurisdiction shall be by written contract, guaranteeing performance acceptable to the authority having jurisdiction.

27.3.3

Where maintenance is provided by an organization or person(s) other than the jurisdiction or its employees, complete written records of the installation, maintenance, test, and extension of the system shall be forwarded to the designated employee in a time period and manner approved by the authority having jurisdiction.

27.3.4

All equipment shall be installed in locations accessible to the authority having jurisdiction for the purpose of maintenance and inspection.

27.3.5

Records of wired public emergency alarm reporting system circuits shall include all of the following:

Outline plans showing terminals and box sequence

Diagrams of applicable office wiring

List of materials used, including trade name, manufacturer, and year of purchase or installation

27.3.6

Public emergency alarm reporting systems as defined in this chapter shall, in their entirety, be subject to a complete operational acceptance test upon completion of system installation.

27.3.6.1

The test(s) required by 27.3.6 shall be made in accordance with the requirements of the authority having jurisdiction; however, in no case shall the operational functions tested be less than those stipulated in Chapter 14.

27.3.6.2

Operational acceptance tests shall be performed on any alarm-reporting devices, as covered in this chapter, that are installed or modified subsequent to the test required by 27.3.6.

27.3.7 Personnel Qualification

Personnel shall be qualified and experienced in accordance with the requirements of 10.5.6.

27.4 Communications Methods

27.4.1 Application

27.4.1.1

A public emergency alarm reporting system shall include wired or wireless network(s), for one-way signaling or two-way command and control communications between alarm boxes, alarm processing equipment, and the communications center.

27.4.1.2

A public emergency alarm reporting system shall be permitted to be used with emergency communications systems covered under Chapter 24.

27.4.2 Wired Network(s)

The terms wired network and public cable plant shall be considered the same and interchangeable throughout this chapter.

27.4.2.1

All wired networks or public cable plants shall meet the requirements of Section 27.7.

27.4.2.1.1

Fiber-optic cabling shall be considered an acceptable transmission medium, provided that the cabling and installation comply with the requirements of Section 27.7 and the conversion equipment used to interface to the fiber-optic signal complies with all applicable requirements of Chapter 27.

27.4.2.2

Alarm processing equipment at the communications center shall meet the requirements of 27.5.2 and 27.5.4.

27.4.2.3

Alarm processing equipment at a remote communications center shall meet the requirements of 27.4.2.2 and 27.5.3.

27.4.2.4

Alarm boxes shall meet one of the following requirements:

Publicly accessible boxes shall meet the requirements of 27.6.1 through 27.6.2 and 27.6.5.

Auxiliary boxes shall meet the requirements of 27.6.1, 27.6.3, and 27.6.5.

Master boxes shall meet the requirements of 27.6.1 through 27.6.3 and 27.6.5.

27.4.3 Wireless Network(s)

The terms wireless network and radio system shall be considered the same and interchangeable throughout this chapter.

27.4.3.1

All wireless networks shall meet the requirements of 27.4.3.2 through 27.4.3.5.

27.4.3.2

In addition to the requirements of this Code, all wireless equipment shall be designed and operated in compliance with all applicable rules and regulations of the Federal Communications Commission (FCC) or, where required, the National Telecommunications and Information Administration (NTIA).

27.4.3.3\*

Unlicensed radio frequencies shall not be permitted.

27.4.3.4

Fire alarm signals, other emergency alarm signals, and monitoring for integrity signals shall be permitted on the same radio frequency, dedicated for that purpose.

27.4.3.5

The wireless network capacity for the number of alarm boxes permitted on a single radio frequency shall comply with one of the following:

For networks that use one-way transmission in which the individual alarm box automatically initiates the required message (see 27.5.5.3.3) using circuitry integral to the alarm box, not more than 500 alarm boxes are permitted on a single radio frequency.

For networks that use a two-way concept in which interrogation signals (see 27.5.5.3.3) are transmitted to the individual alarm boxes from the communications center on the same radio frequency used for receipt of alarms, not more than 250 alarm boxes are permitted on a single radio frequency.

For networks that use a two-way concept where interrogation signals are transmitted on a radio frequency that differs from that used for receipt of alarms, not more than 500 alarm boxes are permitted on a single radio frequency.

27.4.3.6

Alarm processing equipment at the communications center shall meet the requirements of 27.5.2 and 27.5.5.

27.4.3.7

Alarm processing equipment at a remote communications center shall meet the requirements of 27.4.3.6 and 27.5.3.

27.4.3.8

Alarm boxes shall meet one of the following requirements:

Publicly accessible boxes shall meet the requirements of 27.6.1 through 27.6.2 and 27.6.6.

Auxiliary boxes shall meet the requirements of 27.6.1, 27.6.3, and 27.6.6.

Master boxes shall meet the requirements of 27.6.1 through 27.6.3 and 27.6.6.

27.5 Alarm Processing Equipment

The alarm processing equipment required to receive and control the public emergency alarm reporting system shall be installed in the communications center or remote communications center used by emergency response agencies as defined in NFPA 1221.

27.5.1 General

The requirements of 27.5.2 shall apply to all processing equipment, wired or wireless, for a public emergency alarm reporting network.

27.5.2 Alarm Processing Equipment at Communications Center

27.5.2.1 Type A and Type B Systems

27.5.2.1.1

Alarm systems shall be Type A or Type B.

27.5.2.1.2

A Type A system shall be provided where the number of all alarms required to be retransmitted exceeds 2500 per year.

27.5.2.1.3

Where a Type A system is required, the automatic electronic retransmission of incoming alarms shall be permitted, provided that both of the following conditions are met:

Approved facilities are provided for the automatic receipt, storage, retrieval, and retransmission of alarms in the order received.

The operator(s) of the dispatch facility has the capability to immediately override the automatic retransmission and revert to manual retransmission.

27.5.2.2 Visual Recording Devices

27.5.2.2.1

Alarms from alarm boxes shall be automatically received and recorded at the communications center.

27.5.2.2.2

A device for producing a permanent graphic recording of all alarm, supervisory, trouble, and test signals received or retransmitted, or both, shall be provided at each communications center for each alarm circuit and tie circuit.

27.5.2.2.3

Reserve recording devices shall be provided in accordance with 27.5.2.2.3.1 and 27.5.2.2.3.2.

27.5.2.2.3.1

Where each circuit is served by a dedicated recording device, the number of reserve recording devices required on-site shall be equal to at least 5 percent of the circuits in service and in no case less than one device.

27.5.2.2.3.2

Where two or more circuits are served by a common recording device, a reserve recording device shall be provided on-site for each circuit connected to a common recorder.

27.5.2.2.4

In a Type B wired system, one such recording device shall be installed in each emergency response facility, and at least one shall be installed in the communications center.

27.5.2.2.5

Permanent visual records shall comply with 27.5.2.2.5.1 and 27.5.2.2.5.2.

27.5.2.2.5.1

A permanent visual record and an audible signal shall be required to indicate the receipt of an alarm.

27.5.2.2.5.2

The permanent record shall indicate the exact location from which the alarm is being transmitted.

27.5.2.2.6

The audible signal device shall be permitted to be common to two or more box circuits and arranged so that the emergency alarm operator is able to manually silence the signal temporarily by a self-restoring switch.

27.5.2.2.7

Facilities shall be provided with a device that automatically records the date and time of receipt of each alarm.

27.5.2.3 System Integrity

27.5.2.3.1

Wired circuits upon which transmission and receipt of alarms depend shall be constantly monitored for integrity to provide prompt warning of conditions adversely affecting reliability.

27.5.2.3.2

The power supplied to all required circuits and devices of the system shall be constantly monitored for integrity.

27.5.2.4 Trouble Signals

27.5.2.4.1

Trouble signals shall be indicated where there is a trained and competent person on duty at all times.

27.5.2.4.2

Trouble signals shall be distinct from alarm signals and shall be indicated by a visual and audible signal.

27.5.2.4.3

The audible signal shall be permitted to be common to more than one circuit that is monitored for integrity.

27.5.2.4.4

A switch for silencing the audible trouble signal shall be permitted, provided that the visual signal remains operating until the silencing switch is restored to its normal position.

27.5.2.4.5

The audible signal shall be responsive to faults on any other circuits that occur prior to restoration of the silencing switch to its normal position.

27.5.2.5 Power Supply

27.5.2.5.1

Each box circuit or wireless receiving system shall be powered by one of the following:

\*Form 4A, which is an inverter, powered from a common rectifier, receiving power by a single source of alternating current with a floating storage battery having a 24-hour standby capacity

\*Form 4B, which is an inverter, powered from a common rectifier, receiving power from two sources of alternating current with a floating storage battery having a 4-hour standby capacity

\*Form 4C, which is a rectifier, converter, or motor generator receiving power from two sources of alternating current with transfer facilities to apply power from the secondary source to the system within 30 seconds

27.5.2.5.2

Form 4A and Form 4B shall be permitted to distribute the system load between two or more common rectifiers and batteries.

27.5.2.5.3

The capacity of batteries, motor generators, rectifiers, or other permitted power supplies shall exceed the calculated load of all connected circuits, so that circuits developing grounds or crosses with other circuits each shall be able to be supplied by an independent source to the extent required by 27.5.2.5.1.

27.5.2.5.4

Provision shall be made to connect any circuit to any battery, generator, or rectifier, or other permitted power supply.

27.5.2.5.5

Individual circuits supplied from common leads shall be protected by the installation of enclosed fuses located at the point where the circuit conductors receive their supply.

27.5.2.5.6

Local circuits at communications centers shall be supplied in accordance with 27.5.2.5.6.1 and 27.5.2.5.6.2.

27.5.2.5.6.1

The source of power for local circuits required to operate the essential features of the system shall be monitored for integrity.

27.5.2.5.6.2

Local circuits at communications centers shall be permitted to be connected to the same power source as box circuits, wireless receiving system circuits, or a separate power source.

27.5.2.5.7

Visual and audible means to indicate a 15 percent or greater reduction of normal power supply (rated voltage) shall be provided.

27.5.2.5.8

Where the electrical service/capacity of the equipment required under Section 4.7 of NFPA 1221 satisfies the needs of equipment in this chapter, such equipment shall not be required to be duplicated.

27.5.2.6 Rectifiers, Converters, Inverters, and Motor Generators

27.5.2.6.1

Rectifiers shall be supplied from the secondary of an isolating transformer.

27.5.2.6.1.1

The primary of the isolating transformer shall be connected to a circuit not exceeding 250 volts.

27.5.2.6.2

Complete spare units or spare parts shall be in reserve.

27.5.2.6.3

Systems with at least one rectifier shall comply with 27.5.2.6.3.1 and 27.5.2.6.3.2.

27.5.2.6.3.1

One spare rectifier shall be provided for every 10 operating rectifiers on a system.

27.5.2.6.3.2

All systems shall have at least one spare rectifier.

27.5.2.6.4

Leads from rectifiers or motor generators that have a float-charged battery shall be protected by fuses rated at a minimum of 1 ampere and a maximum of 200 percent of connected load at nominal circuit voltage.

27.5.2.6.5

Leads from rectifiers or motor generators that do not have a float-charged battery shall be protected by fuses rated at a minimum of 3 amperes and a maximum of 200 percent of connected load at nominal circuit voltage.

27.5.2.7 Engine-Driven Generators

The installation of engine-driven generator sets shall conform to the provisions of NFPA 37, NFPA 110, and NFPA 1221.

27.5.2.8 Float-Charged Batteries

27.5.2.8.1

Float-charged batteries shall be of the storage type. Primary batteries (i.e., dry cells) shall not be used.

27.5.2.8.1.1

Vented lead-acid batteries shall be in approved transparent materials.

27.5.2.8.1.2

Other types of batteries shall be in containers identified or approved for the purpose.

27.5.2.8.2

Float-charged batteries shall be above building grade level.

27.5.2.8.3

Float-charged batteries shall be located on the same floor of the building as the operating equipment.

27.5.2.8.4

Float-charged batteries shall be accessible for maintenance and inspection.

27.5.2.8.5

Float-charged batteries shall be installed in accordance with Article 480 of NFPA 70.

27.5.2.8.6

Batteries shall be mounted to provide effective isolation from the ground or working platform and from other batteries.

27.5.2.8.6.1

Mounting equipment shall be listed and identified for the location.

27.5.2.8.6.2

It shall be permissible for the authority having jurisdiction to waive this requirement to allow the use of alternative mounting equipment where it is assured that equivalent objectives can be achieved.

27.5.2.8.7

Battery mounting shall be protected against deterioration and shall provide stability, especially in geographic areas subject to seismic disturbance.

27.5.2.9 Equipment Fire Protection

Where applicable, electronic computer/data processing equipment shall be protected in accordance with NFPA 75.

27.5.3\* Remote Communications Center

Where the communications center is remotely located from the wired or wireless alarm processing equipment, the requirements of 27.5.3.1 through 27.5.3.7, in addition to all of the requirements of Section 27.5, shall apply.

27.5.3.1

All equipment shall be listed for its intended use and shall be installed in accordance with NFPA 70.

27.5.3.2

Alarm processing equipment located remote from the communications center shall be capable of providing basic dispatching information independent of the communications center.

27.5.3.3

The alarm processing equipment shall be located where it can be monitored for alarm and trouble conditions and shall be accessible to be manned in case of a pathway or communications failure with the communications center.

27.5.3.4

Wired or wireless alarm repeating systems used to repeat signals between a remote communications center and the alarm processing equipment location shall meet the requirements of 27.5.3.4.1 through 27.5.3.4.7.

27.5.3.4.1

There shall be a minimum of two complete and independent alarm repeater systems, including batteries and power supplies, to provide redundancy.

27.5.3.4.2

If the alarm repeater system is configured with one alarm repeater in standby mode, the system shall be capable of detecting a communications failure and shall automatically switch to the backup system without interruption or loss of any alarm or trouble transmission.

27.5.3.4.3

Alarm repeater systems shall not be used for any purpose other than alarm communications between the communications center and the alarm processing equipment.

27.5.3.4.4

Wireless alarm repeaters shall operate on a licensed frequency dedicated for this purpose.

27.5.3.4.4.1

Wireless alarm repeaters shall be licensed to a public entity.

27.5.3.4.4.2

Unlicensed frequencies shall not be permitted.

27.5.3.4.5

The communications method used for the alarm repeater, wired or wireless, shall be two-way.

27.5.3.4.6

The public emergency alarm reporting system communications infrastructure shall be used to repeat alarm and trouble signals between the alarm processing equipment and a remote communications center.

27.5.3.4.7

Where it is not possible to use the public emergency alarm reporting system communications infrastructure to provide communications between the alarm processing equipment and the remote communications center, an alternative repeater method shall be permitted and shall meet the requirements of 27.5.3.4.7.1 and 27.5.3.4.7.2.

27.5.3.4.7.1

If an alternative alarm repeater method is used it shall be publically owned, operated, and controlled.

27.5.3.4.7.2

The alternative alarm repeater method shall meet the requirements of 27.5.3, except 27.5.3.4.2 shall not apply.

27.5.3.5

Pathways between the remote communications center and the alarm processing equipment shall be monitored for integrity and shall be dedicated and not used for any other purpose.

27.5.3.6

When communications between the communications center and the alarm processing equipment fails, the requirements of 27.5.3.6.1 through 27.5.3.6.3 shall apply.

27.5.3.6.1

A pathway or communications trouble condition shall be detected and annunciated at both the communications center and the alarm processing equipment location within 200 seconds and shall meet the requirements of 27.5.2.4.

27.5.3.6.2

Visual and audible trouble alarm indications pertaining to a pathway or communications failure between the communications center and the alarm processing equipment location shall be distinct from all other trouble alarms.

27.5.3.6.3

The alarm processing equipment shall be manned by trained personnel until communications can be reestablished.

27.5.3.7

Power supplies shall be provided in accordance with 27.5.2.5.

27.5.4 Wired Network Systems

27.5.4.1 System Arrangement and Operation

27.5.4.1.1

For a Type B system, the effectiveness of noninterference and succession functions between box circuits shall be no less than between boxes in any one circuit.

27.5.4.1.2

A metallic box open circuit condition shall cause a warning signal in all other circuits, and, thereafter, the circuit(s) not in the open circuit condition shall be automatically restored to operative condition.

27.5.4.1.3

Box circuits shall be sufficient in number and laid out so that the areas that would be left without box protection in case of disruption of a circuit do not exceed those covered by 20 properly spaced boxes where all or any part of the circuit is of aerial open-wire, or by 30 properly spaced boxes where the circuit is entirely in underground or messenger-supported cable.

27.5.4.1.4

Where all boxes on any individual circuit and associated equipment are designed and installed to provide for receipt of alarms through the ground in the event of a break in the circuit, the circuit shall be permitted to serve twice the number of aerial open-wire and cable circuits, respectively, as are specified in 27.5.4.1.3.

27.5.4.1.5

The installation of additional boxes in an area served by the number of boxes spaced as indicated in 27.5.4.1.1 through 27.5.4.1.4 shall not constitute geographical overloading of a circuit.

27.5.4.1.6

Sounding devices for signals shall be provided for box circuits.

27.5.4.1.6.1

A common sounding device for more than one circuit shall be permitted to be used in a Type A system and shall be installed at the communications center.

27.5.4.1.6.2

In a Type B system, a sounding device shall be installed in each emergency response facility at the same location as the recording device for that circuit, unless installed at the communications center, where a common sounding device shall be permitted.

27.5.4.2 Constant-Current (100 Milliampere) Systems

Constant-current systems shall comply with the requirements of 27.5.4.2.1 through 27.5.4.2.6.

27.5.4.2.1

Means shall be provided for manually regulating the current in box circuits so that the operating current is maintained within 10 percent of normal throughout changes in external circuit resistance from 20 percent above normal to 50 percent below normal.

27.5.4.2.2

The voltage supplied to maintain normal line current on box circuits shall not exceed 150 volts, measured under no-load conditions, and shall be such that the line current cannot be reduced below the approved operating value by the simultaneous operation of four boxes.

27.5.4.2.3

Visual and audible means to indicate a 20 percent or greater reduction in the normal current in any alarm circuit shall be provided.

27.5.4.2.4

All devices connected in series with any alarm circuit shall function when the alarm circuit current is reduced to 70 percent of normal.

27.5.4.2.5

Meters shall comply with 27.5.4.2.5.1 and 27.5.4.2.5.2.

27.5.4.2.5.1

Meters shall be provided to indicate the current in any box circuit and the voltage of any power source.

27.5.4.2.5.2

Meters used in common for two or more circuits shall be provided with cut-in devices designed to reduce the probability of cross-connecting circuits.

27.5.4.2.6

Necessary switches, testing, and signal transmitting and receiving devices shall be provided to allow the isolation, control, and test of each circuit up to at least 10 percent of the total number of box and dispatch circuits, but never less than two circuits.

27.5.4.3 Grounded Common-Current Systems

Where common-current source systems are grounded, the requirements of 27.5.4.3.1 and 27.5.4.3.2 shall apply.

27.5.4.3.1

Where common-current source systems are grounded, the resistance of the ground shall not exceed 10 percent of resistance of any connected circuit and shall be located at one side of the battery.

27.5.4.3.2

Visual and audible indicating devices shall be provided for each box and dispatch circuit to give immediate warning of ground leakage current that will have a detrimental effect on circuit operation.

27.5.4.4 Telephone (Series) Reporting Systems

27.5.4.4.1

A permanent visual recording device installed in the communications center shall be provided to record all incoming box signals.

27.5.4.4.2

A spare recording device shall be provided for five or more box circuits.

27.5.4.4.3

A second visual means of identifying the calling box shall be provided.

27.5.4.4.4

Audible signals shall indicate all incoming calls from box circuits.

27.5.4.4.5

All voice transmissions from boxes for emergencies shall be recorded with the capability of instant playback.

27.5.4.4.6

A voice-recording facility shall be provided for each operator handling incoming alarms to eliminate the possibility of interference.

27.5.4.4.7

Box circuits shall be sufficient in number and laid out so that the areas that would be left without box protection in case of disruption of a circuit do not exceed those covered by 20 properly spaced boxes where all or any part of the circuit is of aerial open-wire, or 30 properly spaced boxes where the circuit is entirely in underground or messenger-supported cable.

27.5.4.4.8

Where all boxes on any individual circuit and associated equipment are designed and installed to provide for receipt of alarms through the ground in the event of a break in the circuit, the circuit shall be permitted to serve twice the number of aerial open-wire and cable circuits, respectively, as is specified in 27.5.4.4.7.

27.5.4.4.9

The installation of additional boxes in an area served by the number of boxes spaced as indicated in 27.5.4.4.7 shall not constitute geographical overloading of a circuit.

27.5.5 Wireless Network

27.5.5.1 System Arrangement and Operation

27.5.5.1.1\*

Type A systems shall comply with 27.5.5.1.1.1 through 27.5.5.1.1.7.

27.5.5.1.1.1

Two separate receiving networks shall be required for each frequency.

27.5.5.1.1.2

Each receiving network shall include the following:

Antenna

RF receiver

Signaling processing equipment

Time/date alarm printer

Audible alerting device

Power supply

27.5.5.1.1.3

Both receiving networks shall be installed at the communications center.

27.5.5.1.1.4

The failure of one receiving network shall not interfere with the other receiving network's ability to receive messages from boxes.

27.5.5.1.1.5

Where the system configuration is such that a polling device is incorporated into the receiving network to allow remote or selective initiation of box tests, a separate device shall be included in each of the two required receiving networks.

27.5.5.1.1.6

The polling devices shall be configured for automatic cycle initiation in their primary operating mode, shall be capable of continuous self-monitoring, and shall be integrated into the network(s) to provide automatic switchover and operational continuity in the event of failure of either device.

27.5.5.1.1.7

Test signals from boxes shall not be required to include the date as part of their permanent recording, provided that the date is automatically printed on the recording tape at the beginning of each calendar day.

27.5.5.1.2

Type B systems shall comply with 27.5.5.1.2.1 through 27.5.5.1.2.3.

27.5.5.1.2.1

For each frequency used, a single, complete receiving network shall be permitted in each emergency response facility, provided that the communications center conforms to 27.5.5.1.1.1 through 27.5.5.1.1.3.

27.5.5.1.2.2

Where the jurisdiction maintains two or more alarm reception points in operation, one receiving network shall be permitted to be at each alarm reception point.

27.5.5.1.2.3

Where alarm signals are transmitted to an emergency response facility from the communications center using the wireless-type receiving equipment in the emergency response facility to receive and record the alarm message, a second receiving network conforming to 27.5.5.1.2.1 shall be provided at each emergency response facility, and that receiving network shall employ a frequency other than that used for the receipt of box messages.

27.5.5.1.3

A device for producing a permanent graphic recording of all alarm, supervisory, trouble, and test signals received or retransmitted, or both, shall be provided at the communications center.

27.5.5.1.4\*

Where box message signals to the communications center or acknowledgment of message receipt signals from the communications center to the box are repeated, associated repeating facilities shall conform to the requirements of 27.5.5.1.1.2(1), (2), (3), and (6) and include two separate transmitters.

27.5.5.2 Power

Power shall be provided in accordance with 27.5.2.5.

27.5.5.3 Monitoring for Integrity

27.5.5.3.1

All wireless box systems shall comply with 27.5.5.3.1.1 and 27.5.5.3.1.2.

27.5.5.3.1.1

All wireless box systems shall provide constant monitoring of each radio frequency in use.

27.5.5.3.1.2

Both an audible and a visual indication of any sustained signal in excess of a 15-second duration shall be provided for each receiving system at the communications center.

27.5.5.3.2

The power supplied to all required circuits and devices of the system shall be monitored for integrity.

27.5.5.3.3\*

Each wireless box shall automatically transmit a test message at least once in each 24-hour period.

27.5.5.3.4

Receiving equipment associated with wireless-type systems shall comply with 27.5.5.3.4.1 and 27.5.5.3.4.2.

27.5.5.3.4.1

Receiving equipment associated with wireless-type systems, including any related repeater(s), shall be tested at least hourly.

27.5.5.3.4.2

The receipt of test messages that do not exceed 60-minute intervals shall meet the requirement in 27.5.5.3.4.1.

27.5.5.3.5

Radio repeaters upon which receipt of alarms depend shall be provided with dual receivers, transmitters, and power supplies.

27.5.5.3.5.1

Failure of the primary receiver, transmitter, or power supply shall cause an automatic switchover to the secondary receiver, transmitter, or power supply.

27.5.5.3.5.2

Manual switchover shall be permitted, provided that it is completed within 30 seconds.

27.5.5.3.6

Trouble signals shall activate a sounding device located where there is always a trained, competent person on duty.

27.5.5.3.7

Trouble signals shall be distinct from alarm signals and shall be indicated by a visual and audible signal.

27.5.5.3.7.1

The audible signal shall be permitted to be common to two or more monitored circuits.

27.5.5.3.7.2

A switch for silencing the audible trouble signal shall be permitted where the visual signal remains operating until the silencing switch is restored to its normal position.

27.5.5.3.8

The audible signal shall be responsive to subsequent faults in other monitored functions prior to restoration of the silencing switch.

27.5.5.4 Physical Protection of Transmission Line

The antenna transmission line between the transmitter and the antenna shall be installed in rigid metal, intermediate metal conduit, or electrical metallic tubing in accordance with NFPA 70.

27.6 Alarm Boxes

27.6.1\* General

The requirements of 27.6.1.1 through 27.6.1.6 shall apply to all alarm boxes.

27.6.1.1

Concurrent operation of at least four boxes shall not result in the loss of an alarm.

27.6.1.2

Boxes and associated equipment, when in an abnormal condition, shall not disable the public emergency alarm reporting system circuit.

27.6.1.3

Boxes shall be designed so that recycling does not occur when a box-actuating device is held in the actuating position and shall be ready to accept a new signal as soon as the actuating device is released.

27.6.1.4\*

Boxes, when actuated, shall give a visual or audible indication to the user that the box is operating or that the signal has been transmitted to the communications center.

27.6.1.5

Box cases and parts that are accessible to the public shall be permitted to be of nonconductive material.

27.6.1.6

Box cases and parts that are accessible to the public and that are constructed of conductive materials shall be installed in accordance with the requirements of NFPA 70, Articles 250 and 760.

27.6.2\* Publicly Accessible Alarm Boxes

27.6.2.1 Fundamental Requirements

The requirements of 27.6.2.1.1 through 27.6.2.1.11 shall apply to all publicly accessible alarm boxes.

27.6.2.1.1

Means for actuation of alarms by the public shall be located where they are visible, unobstructed, and readily accessible.

27.6.2.1.2

The box housing shall protect the internal components and shall be identified for the location installed.

27.6.2.1.3

Doors on boxes shall remain operable under adverse climatic conditions, including icing and salt spray.

27.6.2.1.4

Boxes shall be recognizable as such and shall have instructions for use plainly marked on their exterior surfaces.

27.6.2.1.5

Boxes shall be securely mounted on poles, pedestals, or structural surfaces as directed by the authority having jurisdiction.

27.6.2.1.6\*

The location of publicly accessible boxes shall be designated by the authority having jurisdiction.

27.6.2.1.7

Schools, hospitals, nursing homes, and places of public assembly shall have a box located at the main entrance, as directed by the authority having jurisdiction.

27.6.2.1.8

Boxes shall be conspicuously visible and be highlighted with a distinctive color.

27.6.2.1.9

All publicly accessible boxes mounted on support poles shall be identified by a wide band of distinctive colors or signs placed 8 ft (2.44 m) above the ground and visible from all directions wherever possible.

27.6.2.1.10\*

Location-designating lights shall comply with 27.6.2.1.10.1 and 27.6.2.1.10.2.

27.6.2.1.10.1

Location-designating lights of distinctive color, visible for at least 1500 ft (460 m) in all directions, shall be installed over boxes.

27.6.2.1.10.2

The street light nearest the box, where equipped with a distinctively colored light, shall meet 27.6.2.1.10.1.

27.6.2.1.11

Where boxes are installed inside a structure, the installation shall comply with 27.6.2.1.11.1 through 27.6.2.1.11.4.

27.6.2.1.11.1

The box shall be placed as close as is practicable to the point of entrance of the circuit.

27.6.2.1.11.2\*

Outside plant cables entering buildings or other structures shall be installed in rigid metal conduit, intermediate metal conduit, or electrical metallic tubing.

27.6.2.1.11.3

Schedule 80 PVC or RTRC rigid nonmetallic conduit shall be permitted for underground installations, provided that all elbows are rigid or intermediate metal conduit.

27.6.2.1.11.4

The installation shall comply with the requirements of the applicable raceway article of NFPA 70.

27.6.3 Auxiliary Alarm Box

27.6.3.1 Fundamental Requirements

The requirements of 27.6.3.1.1 through 27.6.3.1.6 shall apply to all auxiliary alarm boxes.

27.6.3.1.1

The authority having jurisdiction shall designate the location of the auxiliary box.

27.6.3.1.2\*

Outside plant cables entering buildings or other structures shall be installed in rigid metal conduit, intermediate metal conduit, or electrical metallic tubing.

27.6.3.1.2.1

Schedule 80 PVC or RTRC rigid nonmetallic conduit shall be permitted for underground installations, provided that all elbows are rigid or intermediate metal conduit.

27.6.3.1.2.2

The installation shall comply with the requirements of the applicable raceway article of NFPA 70.

27.6.3.1.3\*

Wiring between the auxiliary alarm system and the auxiliary alarm box or master alarm box shall be installed in rigid metal conduit, intermediate metal conduit, or electrical metallic tubing and shall meet the requirements of pathway survivability Level 2 (see 12.4.3).

27.6.3.1.4

Where installed outside a structure, the requirements of 27.6.2.1.2 and 27.6.2.1.5 shall apply.

27.6.3.1.5

Where the auxiliary box is a wired box, the requirements of Section 27.7 shall apply.

27.6.3.1.6

Where the auxiliary box is a wireless box, the requirements of 27.6.6 shall apply.

27.6.3.2 Auxiliary Alarm Systems

27.6.3.2.1 Application

The equipment and circuits necessary to connect a protected premises to a public emergency alarm reporting system shall comply with the requirements of 27.6.3.2.

27.6.3.2.1.1

Where permitted by the authority having jurisdiction, the use of systems described in Chapter 27 shall be permitted to provide defined reporting functions from or within private premises.

27.6.3.2.1.2

The requirements of Section 27.7 shall also apply to wired auxiliary alarm systems.

27.6.3.2.2 Types of Systems

27.6.3.2.2.1

Auxiliary alarm systems shall be one of the following types:

\* Local energy-type

Local energy-type systems shall be permitted to be of the coded or noncoded type.

Power supply sources for local energy-type systems shall conform to Chapter 10.

Transmitter trouble signals shall be indicated at the control unit and the building fire command center in accordance with 10.15.7.

\* Shunt-type

Shunt-type systems shall be noncoded with respect to any remote electrical tripping or activating devices.

All conductors of the shunt circuit shall be installed in accordance with NFPA 70, Article 344, for rigid metal conduit, or Article 358, for electrical metallic tubing.

Both sides of the shunt circuit shall be in the same conduit.

Where a shunt loop is used, it shall not exceed a length of 750 ft (230 m) and shall be in conduit.

Conductors of the shunt circuits shall not be smaller than 14 AWG and shall be insulated as prescribed in NFPA 70, Article 310.

The power for shunt-type systems shall be provided by the public emergency alarm reporting system.

\* A local system made to an auxiliary alarm system by the addition of a relay whose coil is energized by a local power supply and whose normally closed contacts trip a shunt-type master box shall not be permitted.

27.6.3.2.2.2

The interface of the two types of auxiliary alarm systems with the three types of public emergency alarm reporting systems shall be in accordance with Table 27.6.3.2.2.2.

Table 27.6.3.2.2.2 Application of Public Emergency Alarm Reporting Systems with Auxiliary Alarm Systems

Reporting Systems Local Energy-Type Shunt-Type

Wired Yes Yes

Wireless Yes No

Telephone series Yes No

27.6.3.2.2.3

The application of the two types of auxiliary alarm systems shall be limited to the initiating devices specified in Table 27.6.3.2.2.3.

Table 27.6.3.2.2.3 Application of Initiating Devices with Auxiliary Alarm Systems

Initiating Devices Local Energy-Type Shunt-Type

Manually actuated alarm-initiating device Yes Yes

Waterflow or actuation of the fire extinguishing system(s) or suppression system(s) Yes Yes

Automatic detection devices Yes No

27.6.3.2.3 System Arrangement and Operation

27.6.3.2.3.1

Shunt-type auxiliary alarm systems shall be arranged so that one auxiliary transmitter does not serve more than 100,000 ft2 (9290 m2) total area or as otherwise permitted by the authority having jurisdiction.

27.6.3.2.3.2

A separate auxiliary transmitter shall be provided for each building, or where permitted by the authority having jurisdiction, for each group of buildings of single ownership or occupancy.

27.6.3.2.3.3

The same box shall be permitted to be used as a public emergency alarm reporting system box and as a transmitting device for an auxiliary alarm system where permitted by the authority having jurisdiction, provided that the box is located at the outside of the entrance to the protected property.

27.6.3.2.3.4

Where 27.6.3.2.3.3 is applied, the authority having jurisdiction shall be permitted to require the box to be equipped with a signal light to differentiate between automatic and manual operation, unless local outside alarms at the protected property serve the same purpose.

27.6.3.2.3.5

The transmitting device shall be located as required by the authority having jurisdiction.

27.6.3.2.3.6

Unless otherwise modified by 27.6.3.2.3.7, the system shall be designed and arranged so that a single fault on the auxiliary alarm system shall not jeopardize operation of the public emergency alarm reporting system and shall not, in case of a single fault on either the auxiliary or public emergency alarm reporting system, transmit a false alarm on either system.

27.6.3.2.3.7

The requirements of 27.6.3.2.3.6 shall not apply to shunt systems complying with 27.6.3.2.2.1(2).

27.6.3.2.3.8

A means that is available only to the agency responsible for maintaining the public emergency alarm reporting system shall be provided for disconnecting the auxiliary loop to the connected property.

27.6.3.2.3.9

Notification shall be given to the designated representative of the property when the auxiliary box is not in service.

27.6.3.2.3.10

An auxiliary alarm system shall be used only in connection with a public emergency alarm reporting system that is approved for the service.

27.6.3.2.3.11

A system approved by the authority having jurisdiction shall meet the requirement in 27.6.3.2.3.10.

27.6.3.2.3.12

Permission for the connection of an auxiliary alarm system to a public emergency alarm reporting system, and acceptance of the type of auxiliary transmitter and its activating mechanism, circuits, and components connected thereto, shall be obtained from the authority having jurisdiction.

27.6.3.2.3.13

Paragraph 27.6.3.2 shall not require the use of audible alarm signals other than those necessary to operate the auxiliary alarm system.

27.6.3.2.3.14

Where it is desired to provide evacuation signals in the protected property, the notification appliances, circuits, and controls shall comply with the provisions of Chapter 23 in addition to the provisions of 27.6.3.2.

27.6.3.2.3.15

Where an auxiliary alarm system is in an alarm condition that has been acknowledged, deactivated, or bypassed, subsequent actuation of initiating devices on other initiating device circuits or subsequent actuation of addressable initiating devices on signaling line circuits shall cause an alarm signal to be transmitted to the communications center.

27.6.3.2.3.16

Where an auxiliary transmitter is located within a private premises, it shall be installed in accordance with 27.6.2.1.11 and 27.7.2.

27.6.3.2.3.17

Where data communications between a microprocessor-based control unit and an auxiliary alarm system are utilized, they shall comply with all of the requirements in 27.6.3.2.3.17(A) through 27.6.3.2.3.17(C).

(A)

The monitoring for integrity shall include communications test messages transmitted between the control unit and the auxiliary alarm system.

(B)

The communications test message shall be initiated by either the control unit or the auxiliary alarm system and shall require a response from the corresponding unit, and the following shall apply:

An invalid response or no response from the control unit or the auxiliary alarm system shall be recognized as a communications failure.

A communications failure shall initiate a specific communications failure trouble message, which shall be transmitted from the auxiliary alarm system and shall be automatically indicated within 200 seconds at the communications center.

A trouble condition in 27.6.3.2.3.17(B)(2) shall activate an audible and distinctive visual signal at the auxiliary box indicating a communications failure.

A trouble condition shall be indicated at the control unit and the building fire command center in accordance with 10.15.7.

(C)

Where a separate device is required to interface the control unit to the auxiliary alarm system, all communication paths shall be monitored for integrity and shall comply with 27.6.3.2.3.17.

27.6.4 Master Alarm Boxes

Master alarm boxes shall comply with the requirements of 27.6.2 and 27.6.3.

27.6.5 Wired Network Boxes

The requirements of Section 27.7 shall apply to wired network boxes.

27.6.5.1 Telephone Boxes

The requirements of Section 27.7 shall also apply to telephone boxes.

27.6.5.1.1

Where a handset is used, the caps on the transmitter and receiver shall be secured to reduce the probability of the telephone box being disabled due to vandalism.

27.6.5.1.2

Telephone boxes shall be designed to allow the communications center operator to determine whether or not the telephone box has been restored to normal condition after use.

27.6.6 Wireless Network Boxes

27.6.6.1

In addition to the requirements of this Code, wireless boxes shall be designed and operated in compliance with all applicable rules and regulations of the Federal Communications Commission (FCC) or, where required by other governing laws, the National Telecommunications and Information Administration (NTIA).

27.6.6.2\*

Each wireless box shall automatically transmit a test message at least once in each 24-hour period.

27.6.6.3

Wireless network boxes shall be capable of transmitting no less than three specific signals to the communications center, in addition to the box number, with priority as follows:

Alarm

Tamper

Test

27.6.6.4

Wireless boxes shall transmit to the communications center with priority as follows:

No less than two repetitions for "alarm"

No less than one repetition for "tamper"

No less than one repetition for "test"

27.6.6.5

Where wireless network boxes transmit more than one alarm signal, in addition to those in 27.6.6.3, each such signal shall be individually identifiable.

27.6.6.6

Where wireless network boxes transmit more than one alarm signal, they shall be designed to prevent the loss of supplemental or concurrently activated signals.

27.6.6.7\*

Where wireless network boxes transmit more than one alarm signal, the priority of each alarm shall be as assigned by the authority having jurisdiction.

27.6.6.8

An actuating device held or locked in the activated position shall not prevent the activation and transmission of other signals.

27.6.6.9

The primary power source for wireless boxes shall be permitted to be from one or more of the following, as approved by the authority having jurisdiction:

Utility distribution system

Solar photovoltaic power system

User power

Self-powered, using either an integral battery or other stored energy source

27.6.6.10

Boxes powered by a utility distribution system shall comply with 27.6.6.10.1 through 27.6.6.10.6.

27.6.6.10.1

Boxes shall comply with 27.6.6.10.1.1 and 27.6.6.10.1.2.

27.6.6.10.1.1

Boxes shall have an integral standby, sealed, rechargeable battery that is capable of powering box functions for at least 60 hours in the event of primary power failure.

27.6.6.10.1.2

Transfer to standby battery power shall be automatic and without interruption to box operation.

27.6.6.10.2

A local trouble indication shall activate upon primary power failure.

27.6.6.10.3

Boxes operating from primary power shall be capable of operation with a dead or disconnected battery.

27.6.6.10.4

A battery charger shall be provided in compliance with 10.6.10.3, except as modified in 27.6.6.10.

27.6.6.10.5

When the primary power has failed, boxes shall transmit a power failure message to the communications center as part of subsequent test messages until primary power is restored.

27.6.6.10.6

A low-battery message shall be transmitted to the communications center where the remaining battery standby time is less than 54 hours.

27.6.6.11

Boxes powered by a solar photovoltaic system shall comply with 27.6.6.11.1 through 27.6.6.11.5.

27.6.6.11.1

Solar photovoltaic power systems shall provide box operation for not less than 6 months.

27.6.6.11.2

Solar photovoltaic power systems shall be monitored for integrity.

27.6.6.11.3

The battery shall have power to sustain operation for a minimum period of 15 days without recharging.

27.6.6.11.4

Boxes shall comply with 27.6.6.11.4.1 and 27.6.6.11.4.2.

27.6.6.11.4.1

The box shall transmit a trouble message to the communications center when the charger has failed for more than 24 hours.

27.6.6.11.4.2

The trouble message shall be part of all subsequent transmissions.

27.6.6.11.5

Where the remaining battery standby duration is less than 10 days, a low-battery message shall be transmitted to the communications center.

27.6.6.12

User-powered boxes shall have an automatic self-test feature.

27.6.6.13

Self-powered boxes shall comply with 27.6.6.13.1 through 27.6.6.13.3.

27.6.6.13.1

Self-powered boxes shall operate for a period of not less than 6 months.

27.6.6.13.2

Self-powered boxes shall comply with 27.6.6.13.2.1 and 27.6.6.13.2.2.

27.6.6.13.2.1

Self-powered boxes shall transmit a low-power warning message to the communications center for at least 15 days prior to the time the power source will fail to operate the box.

27.6.6.13.2.2

The low-power warning message shall be part of all subsequent transmissions.

27.6.6.13.3

Self-powered boxes shall comply with 27.6.6.13.3.1 and 27.6.6.13.3.2.

27.6.6.13.3.1

Use of a charger to extend the life of a self-powered box shall be permitted where the charger does not interfere with box operation.

27.6.6.13.3.2

The box shall be capable of operation for not less than 6 months with the charger disconnected.

27.7 Public Cable Plant

Metallic and fiber-optic cabling systems and interconnections between alarm transmission equipment and alarm-receiving equipment shall comply with the requirements of Section 27.7.

27.7.1 Requirements for Metallic and Fiber-Optic Systems — Metallic and Fiber-Optic Interconnections

27.7.1.1 Circuit Conductors and Fiber-Optic Strands

27.7.1.1.1

Exterior metallic, fiber-optic cable and wire, other than those provided by a public utility on a lease basis, shall conform to International Municipal Signal Association (IMSA) specifications or an approved equivalent.

27.7.1.1.2

Where a public box is installed inside a building, the circuit from the point of entrance to the public box shall be installed in rigid metal conduit, intermediate metal conduit, or electrical metallic tubing in accordance with NFPA 70.

27.7.1.1.3

Wires and fiber-optic strands shall be terminated so as to prevent breaking from vibration or stress.

27.7.1.1.4

Circuit conductors and fiber-optic cables on terminal racks shall be identified and isolated from conductors of other systems wherever possible and shall be protected from mechanical injury.

27.7.1.2 Cables

The requirements of 27.7.1.2 shall apply to 27.7.1.3 through 27.7.1.6.

27.7.1.2.1

Exterior metallic and fiber-optic cable and wire shall conform to IMSA specifications or an approved equivalent.

27.7.1.2.2

Overhead, underground, or direct burial cables shall be specifically approved for the purpose.

27.7.1.2.3

Metallic and fiber-optic cables used in interior installations shall comply with NFPA 70 and shall be installed in accordance with the manufacturer's installation instructions and practices.

27.7.1.2.4

Conductors and/or fiber-optic strands used to transmit signals of other systems that are under the control of a governmental agency shall be permitted to be contained within the same multi-conductor cable as conductors and/or fiber-optic strands used to transmit signals of public emergency alarm reporting systems.

27.7.1.2.5

By special permission as defined in NFPA 70, cables not under the control of a governmental agency shall be permitted to contain conductors and/or fiber-optic strands used to transmit signals of a public emergency alarm reporting system.

27.7.1.2.6

Signaling wire and fiber-optic cables containing metallic protection or strength members shall comply with 27.7.1.2.6.1 and 27.7.1.2.6.2.

27.7.1.2.6.1

Signaling wires supplied by a power source having a voltage and/or current rating sufficient to introduce a hazard shall be installed in accordance with NFPA 70, Article 760, Part II.

27.7.1.2.6.2

Fiber-optic cables containing metallic protection or strength members shall be grounded and protected in accordance with NFPA 70.

27.7.1.2.7

Metallic cables shall comply with 27.7.1.2.7.1 and 27.7.1.2.7.2.

27.7.1.2.7.1

All metallic cables, with all taps and splices made, shall be tested for insulation resistance when installed but before connection to terminals.

27.7.1.2.7.2

Tests shall indicate an insulation resistance of at least 200 megohms per mile between any one conductor and all other conductors, the sheath, and the ground.

27.7.1.3 Underground Cables

27.7.1.3.1

Underground metallic and fiber-optic cables in duct or direct burial shall be permitted to be brought aboveground only at locations approved by the authority having jurisdiction.

27.7.1.3.1.1

Protection from physical damage or heat incidental to fires in adjacent buildings shall be provided.

27.7.1.3.2

Only fiber-optic and power-limited cables and conductors shall be permitted to be located in duct systems and manholes that contain power-limited public emergency alarm reporting system conductors.

27.7.1.3.3

Where located in duct systems or manholes that contain power circuit conductors over 250 volts to ground, metallic and fiber-optic emergency alarm cables shall be located as far as possible from such power cables and shall be separated from them by a noncombustible barrier or other means approved by the authority having jurisdiction to protect the emergency alarm cables from physical damage.

27.7.1.3.4

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

27.7.1.3.5

Raceways or ducts entering buildings from underground duct systems shall be effectively sealed with an identified sealing compound or other means acceptable to the authority having jurisdiction to prevent the entrance of moisture or gases from the underground duct system.

27.7.1.3.6

All cable joints shall be located in manholes, emergency response facilities, or other accessible locations acceptable to the authority having jurisdiction where equivalent protection is provided to minimize physical damage to the cable.

27.7.1.3.6.1

Cable joints shall be made to provide and maintain conductivity, optical continuity for fiber-optic cable, insulation, and protection at least equal to that afforded by the cables that are joined.

27.7.1.3.6.2

Open cable ends shall be sealed against moisture.

27.7.1.3.7

Direct-burial cable, without enclosure in ducts, shall be laid in grass plots, under sidewalks, or in other places where the ground is not likely to be opened for other underground construction.

27.7.1.3.7.1

Where splices are made, such splices shall be accessible for inspection and tests.

27.7.1.3.7.2

Such cables shall be buried at least 18 in. (460 mm) deep and, where crossing streets or other areas likely to be opened for other underground construction, shall be in duct or conduit.

27.7.1.4 Aerial Construction

27.7.1.4.1

Cables containing conductors and/or fiber-optic strands used to transmit signals of public emergency alarm reporting systems shall be located below all other cables and conductors, except those used for communications purposes.

27.7.1.4.1.1

Precautions shall be provided where passing through trees, under bridges, over railroads, and at other places where subject to physical damage.

27.7.1.4.1.2

Conductors and cables for public emergency alarm reporting system use shall not be attached to a crossarm that carries electric light and power conductors.

27.7.1.4.1.3

Conductors that operate at 250 volts or less and are part of the public emergency alarm reporting system shall be permitted to share the crossarm with conductors and cables for public emergency alarm reporting systems.

27.7.1.4.2

Aerial cable shall be supported by messenger wire of approved tensile strength or shall conform to one of the following:

IMSA specifications as a self-supporting cable assembly or an approved equivalent

Fiber-optic cable with integral supporting means or all-dielectric self-supporting (ADSS) type

27.7.1.4.3

Single wire shall comply with 27.7.1.4.3.1 and 27.7.1.4.3.2.

27.7.1.4.3.1

Single wire shall meet IMSA specifications and conform to one of the following:

Be at least No. 10 Roebling gauge if of galvanized iron or steel

Be at least 10 AWG if of hard-drawn copper

Be at least 12 AWG if of approved copper-covered steel

Be at least 6 AWG if of aluminum

27.7.1.4.3.2

Span lengths shall not exceed the manufacturer's recommendations.

27.7.1.4.4

Wires to buildings shall contact only intended supports.

27.7.1.4.5

Wires to buildings shall enter through an approved weatherhead or sleeves slanting upward and inward.

27.7.1.4.6

Drip loops shall be formed on wires outside of buildings.

27.7.1.5 Leads Down Poles

27.7.1.5.1

Leads down poles shall be protected from physical damage. Any metallic covering shall form a continuous conducting path to ground. Installation, in all cases, shall prevent water from entering the conduit or box.

27.7.1.5.2

Leads to boxes shall have 600-volt insulation listed or approved for wet locations, as defined in NFPA 70.

27.7.1.6 Wiring Inside Buildings

27.7.1.6.1

At the communications center, all conductors, cables, and fiber-optic cables shall extend as directly as possible to the operations center in conduits, ducts, shafts, raceways, or overhead racks and troughs listed or identified as suitable to provide protection against physical damage.

27.7.1.6.2\*

Where installed in buildings, conductors and fiber-optic cables shall be installed in any of the following wiring methods:

Electrical metallic tubing

Intermediate metal conduit

Rigid metal conduit

27.7.1.6.2.1

Where installed in buildings, conductors and fiber-optic cables shall be permitted to be installed in rigid nonmetallic conduit where approved by the authority having jurisdiction.

27.7.1.6.3

Conductors and fiber-optic cables shall comply with 27.7.1.6.3.1 and 27.7.1.6.3.2.

27.7.1.6.3.1

Conductors and fiber-optic cables shall have an approved insulation.

27.7.1.6.3.2

The insulation or other outer covering shall be flame-retardant and moisture resistant.

27.7.1.6.4

Conductors and fiber-optic cables shall comply with 27.7.1.6.4.1 and 27.7.1.6.4.2.

27.7.1.6.4.1

Conductors and fiber-optic cables shall be installed as far as possible without splices or joints.

27.7.1.6.4.2

Splices or joints shall be permitted only in listed junction or terminal boxes.

27.7.1.6.5

Enclosures shall comply with 27.7.1.6.5.1 and 27.7.1.6.5.2.

27.7.1.6.5.1

Enclosures containing public emergency alarm reporting system circuits shall be provided with red covers or doors.

27.7.1.6.5.2

The words "public emergency alarm reporting system circuit" shall be clearly marked on all enclosures, terminal boxes, and junction locations to prevent unintentional interference.

27.7.1.6.6

Wire and fiber-optic terminals, terminal boxes, splices, and joints shall conform to NFPA 70.

27.7.1.6.7

Metallic and fiber-optic cables and wiring exposed to a hazard shall be protected in an approved manner.

27.7.1.6.8

Metallic and fiber-optic cable terminals and cross-connecting facilities shall be located in or adjacent to the operations room.

27.7.1.6.9

Where signal conductors, non-dielectric fiber-optic cables, and electric light and power wires are run in the same shaft, they shall be separated by at least 2 in. (51 mm), or either system shall be encased in a noncombustible enclosure.

27.7.2 Signal Transmission and Receiving Circuits

Signal transmission and receiving circuits shall comply with the requirements of 27.7.2.1 and 27.7.2.2.

27.7.2.1 General

27.7.2.1.1

ANSI/IEEE C2, National Electrical Safety Code, shall be used as a guide for the installation of outdoor circuitry.

27.7.2.1.2

Installation shall provide for the following:

Continuity of service

Protection from mechanical damage

Disablement from heat that is incidental to fire

Damage by floods, corrosive vapors, or other causes

27.7.2.1.3

Open local circuits within single buildings shall be permitted in accordance with Chapter 23.

27.7.2.1.4

All circuits shall be routed so as to allow tracing of circuits for trouble.

27.7.2.1.5

Circuits shall not pass over, under, or through or be attached to buildings or property not owned by or under the control of the authority having jurisdiction or the agency responsible for maintaining the system.

27.7.2.1.5.1

The requirements of 27.7.2.1.5 shall not apply where the circuit is terminated at a public emergency alarm reporting system initiating device on the building or property.

27.7.2.2 Interior Box Circuits

27.7.2.2.1

A means accessible only to the authority having jurisdiction or the agency responsible for maintaining the public emergency alarm reporting systems shall be provided to disconnect all circuit conductors inside a building or other structure.

27.7.2.2.2

Definite notification shall be given to the designated building representative when the interior box(es) is out of service.

27.7.3\* Circuit Protection

27.7.3.1

The protective devices shall be located close to or be combined with the cable terminals.

27.7.3.2

Surge protective devices designed and approved for the purpose shall be installed at a location accessible to qualified persons and shall be marked with the name of the manufacturer and model designation.

27.7.3.3

All surge protective devices shall be connected to a ground in accordance with NFPA 70.

27.7.3.4

All fuses, fuseholders, and adapters shall be plainly marked with their ampere rating. All fuses rated over 2 amperes shall be of the enclosed type.

27.7.3.5

Circuit protection required at the communications center shall be provided in every building that houses communications center equipment.

27.7.3.6

Each metallic conductor entering an emergency response facility from partially or entirely aerial lines shall be protected by a surge protective device.

27.7.3.7

All metallic conductors entering the communications center shall be protected by the following devices, in the order named, starting from the exterior circuit:

Fuse rated at 3 amperes minimum to 7 amperes maximum and not less than 2000 volts

Surge protective device(s)

Fuse or circuit breaker rated at 1/2 ampere

27.7.3.8

In regard to 27.7.3.7, the 1/2-ampere protection on the tie circuits shall be omitted at subsidiary communications centers.

27.7.3.9

Open aerial metallic conductors and metallic cable shall comply with 27.7.3.9.1 and 27.7.3.9.2.

27.7.3.9.1

At junction points of open aerial metallic conductors and metallic cable, each conductor shall be protected by a surge protective device of the weatherproof type.

27.7.3.9.2

A connection shall also be between the surge protective device ground, any metallic sheath, and the messenger wire.

27.7.3.10

Aerial open-wire and nonmessenger-supported, two-conductor cable circuits shall be protected by a surge protective device at intervals not to exceed 2000 ft (610 m).

27.7.3.11

Where used for aerial construction, surge protective device, other than of the air-gap or self-restoring types, shall not be installed in public emergency alarm reporting circuits.

27.7.3.12

All protective devices used for aerial construction shall be accessible for maintenance and inspection.

27.8 Emergency Communications Systems (ECS)

27.8.1\*

Public emergency alarm reporting systems that are capable of two-way wired or wireless communications with command and control capabilities and/or voice communications capabilities shall be permitted to be used as part of the communications infrastructure of an emergency communications system (ECS), provided that it does not interfere with the public emergency alarm reporting system.

27.8.2

The method of interfacing and monitoring for integrity between the public emergency alarm reporting system and the ECS shall be in accordance with 27.6.3.2.3 and treated as an auxiliary alarm system connected to a protected premises.

27.8.3

Wired or wireless alarm boxes shall be permitted for shared use with an emergency communications system and shall meet all the requirements of .

Trouble and alarm indications in the emergency communications system shall be visually and audibly annunciated at the communications center, except under fault conditions that prevent such a notification process.

27.8.5

When a fault condition prevents communications between the ECS and the communications center, an audible and visual trouble indication shall be activated at the fire command center in the protected premises.

27.8.6

Communications between the public emergency alarm reporting system and the emergency communications system shall be monitored for integrity, and faults shall be annunciated at the communications center, as well as at the fire command center or the emergency command center or both, in the protected premises.