

whenever the means is in the silence position and no telephone circuits are in an off-hook condition.

24.5.1.9 If a selective talk system is used, means as specified in 24.5.1.8 shall be permitted, provided that subsequent telephone circuits going off-hook operate the distinctive off-hook signal.

24.5.1.10 Two-way telephone systems with common talk mode (i.e., a conference or party line circuit) shall be permitted.

24.5.1.11 In buildings provided with a two-way telephone communications system, at least one telephone station or jack shall be provided at the following locations:

- (1) Each floor level
- (2) Each notification zone
- (3) Each elevator cab
- (4) Elevator lobbies
- (5) Elevator machine room(s)
- (6) Emergency and standby power room(s)
- (7) Fire pump room(s)
- (8) Area(s) of refuge
- (9) Each floor level inside an enclosed exit stair(s)
- (10) Other room(s) or area(s) as required by the authority having jurisdiction

24.5.1.12 If the two-way telephone system is intended to be used by fire wardens in addition to the fire service, the minimum requirement shall be a selective talk system, where phones are selected from the control location.

24.5.1.13 Telephone circuits shall be selectable from the control location either individually or, if approved by the authority having jurisdiction, by floor or stairwell.

24.5.1.14 If the control equipment provided does not indicate the location of the caller (common talk systems), each telephone station or telephone jack shall be clearly and permanently labeled to allow the caller to identify his or her location to the control center by voice.

24.5.1.15 If telephone jacks are provided, two or more portable handsets, as determined by the authority having jurisdiction, shall be stored at each control center for use by emergency responders.

24.5.1.16 Telephone appliances shall be in accordance with EIA Tr 41.3, *Telephones*.

24.5.1.17 Wall-mounted telephone appliances or related jacks shall be not less than 36 in. (910 mm) and not more than 66 in. (1.68 m) above floor level with clear access to the appliance that is at least 30 in. (760 mm) wide.

24.5.1.18 If accessible to the general public, one telephone appliance per location shall be not more than 48 in. (1.22 m) above floor level.

24.5.1.19* All circuits necessary for the operation of two-way telephone communications systems shall be installed in accordance with the pathway survivability requirements in 24.3.6.7.

24.5.2* Two-Way Radio Communications Enhancement Systems.

24.5.2.1 General.

24.5.2.1.1 Non-Interference. No amplification system capable of operating on frequencies or causing interference on frequencies assigned to the jurisdiction by the FCC shall be installed without prior coordination and approval of the authority having jurisdiction. The building manager/owner shall

suspend and correct other equipment installations that degrade the performance of the public safety radio system or public safety radio enhancement system.

24.5.2.1.2 Approval and Permit. Plans shall be submitted for approval prior to installation. At the conclusion of successful acceptance testing, a renewable permit shall be issued for the public safety radio enhancement system where required by the authority having jurisdiction.

24.5.2.2 Radio Coverage. Radio coverage shall be provided throughout the building as a percentage of floor area as specified in 24.5.2.2.1 through 24.5.2.2.3.

24.5.2.2.1 Critical Areas. Critical areas, such as the fire command center(s), the fire pump room(s), exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations, and other areas deemed critical by the authority having jurisdiction, shall be provided with 99 percent floor area radio coverage.

24.5.2.2.2 General Building Areas. General building areas shall be provided with 90 percent floor area radio coverage.

24.5.2.2.3 Amplification Components. Buildings and structures that cannot support the required level of radio coverage shall be equipped with a radiating cable system or a distributed antenna system (DAS) with FCC-certified signal boosters, or both, or with a system that is otherwise approved, in order to achieve the required adequate radio coverage.

24.5.2.3 Signal Strength.

24.5.2.3.1 Inbound. A minimum inbound signal strength of -95 dBm, or other signal strength as required by the authority having jurisdiction, shall be provided throughout the coverage area.

24.5.2.3.2 Outbound. A minimum outbound signal strength of -95 dBm at the donor site, or other signal strength as required by the authority having jurisdiction, shall be provided from the coverage area.

24.5.2.3.3 Isolation. If a donor antenna exists, isolation shall be maintained between the donor antenna and all inside antennas and shall be a minimum of 15 dB above the signal booster gain under all operating conditions.

24.5.2.4* System Radio Frequencies. The public safety radio enhancement system shall be capable of transmitting all public safety radio frequencies assigned to the jurisdiction and be capable of using any modulation technology.

24.5.2.4.1 List of Assigned Frequencies. The authority having jurisdiction shall maintain a list of all inbound/outbound frequency pairs for distribution to system designers.

24.5.2.4.2* Frequency Changes. Systems shall be capable of upgrade, to allow for instances where the jurisdiction changes or adds system frequencies, in order to maintain radio system coverage as originally designed.

24.5.2.5 System Components.

24.5.2.5.1 Component Approval. Components utilized in the installation of the public safety radio enhancement system, such as repeaters, transmitters, receivers, signal boosters, cabling, and fiber-distributed antenna systems, shall be approved and shall be compatible with the public safety radio system.

24.5.2.5.2 Component Enclosures. All repeater, transmitter, receiver, signal booster components, and battery system components shall be contained in a NEMA 4- or 4X-type enclosure(s).

24.5.2.5.3 External Filters. Permanent external filters and attachments shall not be permitted.

24.5.2.5.4 Signal Booster Components. If used, signal boosters shall meet the following requirements, as well as any other requirements determined by the authority having jurisdiction:

- (1) *Signal boosters shall have FCC certification prior to installation.
- (2) All signal boosters shall be compatible with both analog and digital communications simultaneously at the time of installation. The authority having jurisdiction shall provide the maximum acceptable propagation delay standard.

24.5.2.5.5 Power Supplies. At least two independent and reliable power supplies shall be provided for all repeater, transmitter, receiver, and signal booster components, one primary and one secondary.

24.5.2.5.5.1 Primary Power Source. The primary power source shall be supplied from a dedicated branch circuit and comply with 10.6.5.1.

24.5.2.5.5.2* Secondary Power Source. The secondary power source shall consist of one of the following:

- (1) A storage battery dedicated to the system with at least 12 hours of 100 percent system operation capacity and arranged in accordance with 10.6.10.
- (2) An automatic-starting, engine-driven generator serving the dedicated branch circuit or the system with at least 12 hours of 100 percent system operation capacity and storage batteries dedicated to the system with at least 2 hours of 100 percent system operation capacity and arranged in accordance with 10.6.11.3.

24.5.2.5.5.3 Monitoring Integrity of Power Supplies. Monitoring the integrity of power supplies shall be in accordance with 10.6.9.

24.5.2.6 System Monitoring.

24.5.2.6.1 Fire Alarm System. The public safety radio communications enhancement system shall include automatic supervisory and trouble signals for malfunctions of the signal booster(s) and power supply(ies) that are annunciated by the fire alarm system and comply with the following:

- (1) The integrity of the circuit monitoring signal booster(s) and power supply(ies) shall comply with 10.6.9 and Section 12.6.
- (2) System and signal booster supervisory signals shall include the following:
 - (a) Antenna malfunction
 - (b) Signal booster failure
 - (c) Low-battery capacity indication when 70 percent of the 12-hour operating capacity has been depleted.
- (3) Power supply signals shall include the following for each signal booster:
 - (a) Loss of normal ac power
 - (b) Failure of battery charger

24.5.2.6.2* Dedicated Panel. A dedicated monitoring panel shall be provided within the fire command center to annunciate the status of all signal booster locations. The monitoring

panel shall provide visual and labeled indication of the following for each signal booster:

- (1) Normal ac power
- (2) Signal booster trouble
- (3) Loss of normal ac power
- (4) Failure of battery charger
- (5) Low-battery capacity

24.5.2.7 Technical Criteria. The authority having jurisdiction shall maintain a document of technical information specific to its requirements, which shall contain, as a minimum, the following:

- (1) Frequencies required
- (2) Location and effective radiated power (ERP) of radio sites used by the public safety radio enhancement system
- (3) Maximum propagation delay (in microseconds)
- (4) List of specifically approved system components
- (5) Other supporting technical information necessary to direct system design

24.5.3* Area of Refuge (Area of Rescue Assistance) Emergency Communications Systems.

24.5.3.1* Where required by the building code in force, an area of rescue assistance two-way emergency communications system shall be installed in accordance with 24.5.3.

24.5.3.2 The area of refuge (rescue assistance) emergency communications system shall be comprised of remotely located area of refuge stations and a central control point.

24.5.3.3 The remote area of refuge stations and the central control point shall communicate with each other.

24.5.3.4* If the central control point is not constantly attended, it shall have a timed automatic communications capability to connect with a constantly attended monitoring location acceptable to the authority having jurisdiction where responsible personnel can initiate the appropriate response.

24.5.3.5 The physical location of the central control point shall be as designated by the building code in force or the authority having jurisdiction.

24.5.3.6 The area of refuge station shall provide for hands-free, two-way communication, provide an audible and visible signal to indicate communication has occurred and indicate to the receiver the location sending the signal.

24.5.3.7 Instructions for the use of the two-way communications system, instructions for summoning assistance via the two-way communications system, and written identification, included in braille, of the location shall be posted adjacent to the two-way communications system.

24.5.4 Elevator Emergency Communications Systems.

24.5.4.1 Elevator two-way emergency communications systems shall be installed in accordance with the requirements of ANSI/ASME A17.1/CSA B44, *Safety Code for Elevators and Escalators*.

24.5.4.2 Communication shall be provided for the lobbies where the elevators are used for occupant-controlled evacuation.

24.6* Information, Command, and Control. The requirements of Section 24.6 shall apply to the communications methods and equipment used to receive and transmit information between premises sources or premises systems and the emergency command center(s).