NFPA 1221

Standard for the

Installation, Maintenance, and Use of Emergency Services

Communications Systems

2002 Edition

This edition of NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, was prepared by the Technical Committee on Public Emergency Service Communication, and acted on by NFPA at its May Association Technical Meeting held May 19–23, 2002 in Minneapolis, MN. It was issued by the Standards Council on July 19, 2002, with an effective date of August 8, 2002, and supersedes all previous editions.

This edition of NFPA 1221 was approved as an American National Standard on July 19, 2002.

Origin and Development of NFPA 1221

This standard dates back to 1898. Originally, it was part of a general standard on signaling systems, but the material on municipal fire alarm systems was separated from the general standard in 1911. This standard has been revised and reissued in editions dated 1904, 1911, 1926, 1934, 1940, 1941, 1946, 1948, 1949, 1950, 1952, 1954, 1955, 1956, 1962, 1963, 1964, 1967, 1973, 1975, 1978, 1980, 1984, 1988, 1991, 1994, and 1999.

The 1999 edition of this standard was a result of very hard work by committee members, and especially the previous chairman, Evan E. Stauffer, Jr. The goal of the committee was to completely rewrite the standard to reflect the following: an emergence of joint communication centers, the increase in technology-based information systems that assist both those in the communication center and those users in the field of operations, and the role communications play in emergency scene operations within the Incident Command System. To reflect the fact that the standard is applicable to all emergency responders, not just the fire service, the title was changed to *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems.*

The 2002 edition of this document continues to enhance both the capabilities of personnel assigned to the communication centers as well as the interoperability of systems. As

technology is continually changing, committee members have begun to assess potential changes to the next edition of this standard. It is incumbent to both users and enforcers of this standard to understand the impact of this standard, both in the area of service delivery and to the safety of those emergency response personnel delivering these services.

Competing interests and/or priorities within a communication center need to be addressed by the AHJ to develop standard operating procedures on how calls for service are processed, dispatched, and tracked. The mission of the communication center should be to serve as a conduit between those requesting services and those providing it. This standard with current revisions provides the document to accomplish this.

The committee wishes to recognize the many years of dedicated work to this committee by the late Timothy G. Stillman, who served this committee well. His insight, professionalism, and distinct humor will be sorely missed.In Memoriam, September 11, 2001

In Memoriam, September 11, 2001

We pay tribute to the 343 members of FDNY who gave their lives to save civilian victims on September 11, 2001, at the World Trade Center. They are true American heroes in death, but they were also American heroes in life. We will keep them in our memory and in our hearts. They are the embodiment of courage, bravery, and dedication. May they rest in peace.

Technical Committee on Public Emergency Service Communication

Gary S. Santoro, *Chair*
Town of Wethersfield Connecticut, CT [E]

Catherine L. Stashak, *Secretary*
Schirmer Engineering Corporation, IL [I]

Douglas M. Aiken, Lakes Region Mutual Fire Aid, NH [U]
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Alternates

Russell L. Shaw, Poquonnock Bridge Fire District, CT [U]
(Alt. to D. M. Aiken)

Stephen N. Foley, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents relating to the operation, installation, and maintenance of public emergency services communication systems.

This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

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Installation, Maintenance, and Use of Emergency Services Communications Systems
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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, Annex F lists the complete title and edition of the source documents for both mandatory and nonmandatory extracts. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the appropriate technical committee.

Information on referenced publications can be found in Chapter 2 and Annex F. Annex C contains portions of the former NFPA 297, *Guide on Principles and Practices for Communications Systems*.

Chapter 1 Administration

1.1 Scope.

1.1.1 This standard shall cover the installation, performance, operation, and maintenance of public emergency service communications systems and facilities.

1.1.2 This standard shall not be considered to be a design specification or an instruction manual.

1.2 Purpose.

The purpose of this standard shall be as follows:

(1) To specify operations, facilities, and communications systems that receive alarms from the public

(2) To provide requirements for the retransmission of such alarms to the appropriate emergency response agencies

1.2.1* The intent of this standard shall be to establish the required levels of performance and quality of installations.

1.2.2 Communications systems shall include, but shall not be limited to, public reporting, dispatching, telephone systems, and one-way and two-way radio systems that fulfill the following functions:

(1) Communications between the public and emergency response agencies

(2) Communications within the emergency response agency under emergency and nonemergency conditions

(3) Communications among emergency response agencies

1.2.3 Public fire alarm systems and fire alarm systems on private premises from which signals are received directly or indirectly by the communications center shall be in accordance with *NFPA 72®, National Fire Alarm Code®*.

1.2.4 Emergency reporting systems that are not covered by this standard shall be in accordance with *NFPA 72, National Fire Alarm Code*.

1.3 Equivalency.

Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.3.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.3.2 The system, method, or device shall be approved for the intended purpose by the

authority having jurisdiction.

Chapter 2 Referenced Publications

2.1 General.

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2002 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2002 edition.

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, 2002 edition.

NFPA 54, *National Fuel Gas Code*, 2002 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 2001 edition.

NFPA 70, *National Electrical Code®*, 2002 edition.

NFPA 72®, *National Fire Alarm Code®*, 2002 edition.

NFPA 75, *Standard for the Protection of Electronic Computer/Data Processing Equipment*, 1999 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2002 edition.

NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, 2002 edition.

NFPA *101®*, *Life Safety Code®*, 2000 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems*, 2002 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, 2001 edition.

NFPA 220, *Standard on Types of Building Construction*, 1999 edition.

NFPA 221, *Standard for Fire Walls and Fire Barrier Walls*, 2000 edition.

NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*, 1999 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 2000 edition.

NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*, 1998 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, 2000 edition.

NFPA 1061, *Standard for Professional Qualifications for Public Safety Telecommunicator*, 2002 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2002 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System*, 2002 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 1999 edition.

2.3 Other Publications.

2.3.1 ANSI Publications.

American National Standards Institute, Inc., 11 West 42nd Street, 13th floor, New York, NY 10036.

ANSI/TIA/EIA 102BAAA Project, *Common Air Interface (CAI)*.

ANSI/UL 752, *Standard for Safety Bullet-Resistant Equipment*, 1985 (Rev. 1988).

2.3.2 ASME Publication.

American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

ASME Boiler and Pressure Vessel Code, 2001.

2.3.3 IEEE Publication.

Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331.

IEEE C2, *National Electrical Safety Code*, 1997.

2.3.4 IMSA Publication.

International Municipal Signal Association, P.O. Box 539, 165 East Union Street, Newark, NJ 14513.

Official IMSA Wire and Cable Specifications Manual, 1998.

2.3.5 U.S. Government Publication.

U.S. Government Printing Office, Washington, DC 20402.

Title 47, *Code of Federal Regulations*, Part 90, Federal Communications Commission, “Private Land Mobile Radio Services.”

2.3.6

GR-30-CORE Local Switching Systems Generic Requirements: Voiceband Data Transmission Interface (FSD 05-01-0100), December 1998.

2.3.7

TM-26023 A Proposed Signal and Data Protocol and CPE Compatibility Considerations for Transmission and Reception of Public Safety–Related Alerting and Information Messages Using GR-30-CORE.

Chapter 3 Definitions

3.1 General.

The definitions contained in this chapter shall apply to the terms as used in this standard. Where terms are not included, common usage of the terms shall apply.

3.2 NFPA Official Definitions.

3.2.1* **Approved.** Acceptable to the authority having jurisdiction.

3.2.2* **Authority Having Jurisdiction (AHJ).** The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* **Listed.** Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.2.7 Standard. A document, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Addressable Public Alerting System (APAS). See 3.3.84.5.1.

3.3.2 Alarm. A signal or message from a person or device indicating the existence of a fire, medical emergency, or other situation that requires fire department action.

3.3.3 Alert Data Message (ADM). An analog or digital signal containing instructions for

how a public alerting system alerting appliance (PASAA) is to deliver and, if capable, to acknowledge a public alert.

3.3.4 Antenna. A device connected to a receiver, transmitter, or transceiver that radiates the transmitted signal, receives a signal, or both.

3.3.5 Band. A range of frequencies between two definite limits.

3.3.6 Base Station. A stationary radio transceiver with an integral AC power supply.

3.3.7 Baud. A unit of signaling speed equal to the number of discrete conditions or signal events per second.

3.3.8* Bit. The smallest unit of computer storage.

3.3.9 Box Circuit. See 3.3.16.1.

3.3.10* Byte. The common unit of computer storage.

3.3.11 Cable. A factory assembly of two or more conductors having an overall covering. [**70:**800.2]

3.3.11.1* Coaxial Cable. A transmission line in which one conductor completely surrounds the other, the two being coaxial and separated by a continuous solid dielectric or by dielectric spacers.

3.3.12 Call Detail Recording (CDR). A system that provides a record of each call, including automatic number identification (ANI), trunk number, and answering attendant number; and the time of seizure, answer, and disconnect/transfer.

3.3.13 Certification. Attests authoritatively; specifically, the issuance of a document that states that one has demonstrated the knowledge and skills necessary to function in a field. [**1000:**2.1]

3.3.14 Channel.

3.3.14.1 Data Communication Channel. A single path for transmitting electric signals that is distinct from other parallel paths.

3.3.14.2* Radio Channel. A band of frequencies of a width sufficient to allow its use for radio communications. [***72:***1.4]

3.3.14.2.1 Simplex Radio Channel. A radio channel using a singular frequency that allows transmission or reception only at a given time.

3.3.14.3 Talkgroup Channel. See 3.3.85.

3.3.14.4 Voice Communication Channel. A single path for transmitting electric signals that is distinct from other parallel paths.

3.3.15 Channel Access Time. See 3.3.89.1.

3.3.16* Circuit. The conductor, or radio channel, and associated equipment that are used to perform a specific function in connection with an alarm system.

3.3.16.1 Box Circuit. A circuit that is connected to boxes that transmit an alarm to the communications center.

3.3.16.2* Dispatch Circuit. A circuit over which an alarm is retransmitted automatically or manually from the communications center to an emergency response facility (ERF).

3.3.16.3 Local Circuit. A circuit that does not depend on the receipt of alarms over box circuits or the retransmission of alarms over dispatch circuits.

3.3.16.4 Radio Circuit. A means for carrying out one radio communication at a time, either unidirectionally or bidirectionally.

3.3.16.5 Tie Circuit. A circuit that connects a communications center with an alternate communications center or with a public safety answering point (PSAP).

3.3.16.6 Wired Circuit. A metallic circuit provided to or by a jurisdiction and dedicated to a specific alarm system that is under the control of or operated by, or is both under the control of and operated by, the jurisdiction or is shared with another jurisdiction.

3.3.17 Coaxial Cable. See 3.3.11.1.

3.3.18 Common Battery. The battery used to power recorders, transmitters, relays, other communications center equipment, and subsidiary communications center equipment.

3.3.19 Communications Center. A building or portion of a building that is specifically configured for the primary purpose of providing emergency communications services or public safety answering point (PSAP) services to one or more public safety agencies under the authority or authorities having jurisdiction.

3.3.19.1 Subsidiary Communications Center (Subsidiary). A structure used to house a part of the control equipment of an emergency reporting system or communications system; also, a normally unattended facility that is remote from the communications center and is used to house equipment necessary for the functioning of an emergency communications system.

3.3.20* Communications Officer/Unit Leader. The individual responsible for development of plans to make the most effective use of incident-assigned communications equipment and facilities, installation and testing of all communications equipment, supervision and operation of the incident communications center, distribution and recovery of equipment assigned to incident personnel, and maintenance and on-site repair of communications equipment.

3.3.21 Communications System. See 3.3.84.1.

3.3.22* Comprehensive Emergency Management Plan (CEMP). A disaster plan that conforms to guidelines established by the authority having jurisdiction and is designed to address natural, technological, and man-made disasters.

3.3.23 Computer. A programmable electronic device that contains a central processing unit(s), main storage, an arithmetic unit, and special register groups.

3.3.24 Computer-Aided Dispatching (CAD). See 3.3.33.1.

3.3.25 Control Console. A system containing controls to operate communications equipment.

3.3.26 Conventional Radio. See 3.3.70.1.

3.3.27 Coordinated Universal Time (UTC). See 3.3.89.2.

3.3.28 Data Communication Channel. See 3.3.14.1.

3.3.29 Digital Radio System. See 3.3.84.2.

3.3.30 Direct Exterior Window. A window in a communications center that faces an area that is not part of the secure area assigned solely to the communications center or that is accessible to the public.

3.3.31 Dispatch Circuit. See 3.3.16.2.

3.3.32 Dispatcher. See 3.3.86.

3.3.33 Dispatching. A process by which an alarm received at the communications center is retransmitted to emergency response facilities (ERFs) or to emergency response units in the field.

3.3.33.1* Computer-Aided Dispatching (CAD). A dispatching method or process in which a computer and its associated terminal(s) are used to provide relative dispatch data to the concerned telecommunicator.

3.3.34 Display Screen. A general term that includes display devices that provide text, video, and graphics capabilities.

3.3.35 Electromagnetic Propagation. The travel of electromagnetic waves through a medium.

3.3.36 Emergency. A condition that is endangering or is believed to be endangering life or property; an event that requires the urgent response of a public safety agency.

3.3.37* Emergency Response Agency (ERA). An organization that engages in law enforcement, rescue, fire suppression, emergency medical, disaster assistance, and other related operations.

3.3.38* Emergency Response Facility (ERF). A structure or a portion of a structure that houses emergency response agency equipment or personnel for response to alarms.

3.3.39 Emergency Response Personnel (ERP). Personnel who respond to fire, emergency medical, and other emergency situations for the preservation of life and property.

3.3.40 Engine-Driven Generator. See 3.3.43.1.

3.3.41 Enhanced 9-1-1. Emergency telephone service that provides selective routing, automatic number identification (ANI), and automatic location identification (ALI).

3.3.42 Frequency.

3.3.42.1* Radio Frequency. The number of electromagnetic wave frequency cycles transmitted by a radio in 1 second; specifically, the time taken by a radio signal to complete

one cycle.

3.3.42.2 Ultra High Frequency (UHF). Radio frequencies of 300 MHz to 3000 MHz.

3.3.42.3 Very High Frequency (VHF). Radio frequencies of 30 MHz to 300 MHz.

3.3.43 Generator. A device that develops either direct or alternating electrical voltage at any frequency.

3.3.43.1 Engine-Driven Generator. A generator driven by an internal combustion engine.

3.3.43.2 Motor-Generator. A machine that consists of a generator driven by an electric motor.

3.3.44 High-Band VHF. See 3.3.98.1.

3.3.45 Incident Management System. See 3.3.84.3.

3.3.46 Instant Recall Recorder. See 3.3.74.1.

3.3.47 Intelligent Transportation System. See 3.3.84.4.

3.3.48 Keying. Activating the transmitter by pressing the push-to-talk button.

3.3.49 Local Circuit. See 3.3.16.3.

3.3.50 Logging Voice Recorder. See 3.3.74.2.

3.3.51 Low-Band VHF. See 3.3.98.2.

3.3.52 Microwave. Radio waves with frequencies of 1000 MHz and higher.

3.3.53 Mobile Unit. A two-way radio-equipped vehicle or person; also a two-way radio by itself that is associated with a vehicle or person.

3.3.54 Modem (Modulator/Demodulator Unit). A device that converts data that is compatible with data-processing equipment to a form that is compatible with transmission equipment, and vice versa.

3.3.55 Monitor. To listen to radio messages without transmitting a response.

3.3.56 Monitoring for Integrity. Automatic monitoring of circuits and other system components for the existence of defects or faults that interfere with receiving or transmitting an alarm.

3.3.57 Motor-Generator. See 3.3.43.2.

3.3.58 Nonaddressable Public Alerting System (NPAS). See 3.3.84.5.2.

3.3.59* Notification. The time at which an alarm is received and acknowledged at a communications center.

3.3.60 Operations Room. The room in the communications center where alarms are received and retransmitted.

3.3.61 Pager. A compact radio receiver used for providing one-way communication or limited digital/data two-way communication.

3.3.62 Portable Radio. See 3.3.70.2.

3.3.63 Power Source. The power obtained from the utility distribution system, an engine-driven generator, or a battery.

3.3.64 Public Alert. A signal or message delivered to a person or device indicating the existence of a situation that affects public safety.

3.3.65 Public Alerting System (PAS). See 3.3.84.5.

3.3.66 Public Alerting System Alerting Appliance (PASAA). A device that receives a signal from a public alerting system (PAS), subsequently transmitting an audible and visual alarm and, if necessary, text or speech.

3.3.67 Public Reporting System. See 3.3.84.6.

3.3.68 Public Safety Agency/Public Safety Organization. See 3.3.37.

3.3.69 Public Safety Answering Point (PSAP). A facility in which 9-1-1 calls are answered, either directly or though rerouting.

3.3.70 Radio.

3.3.70.1 Conventional Radio. A radio system in which automatic computer control of channel assignments is not required or used, system-managed queuing of calls is not provided, and channels are selected manually by the users.

3.3.70.2 Portable Radio. A battery-operated, hand-held transceiver.

3.3.70.3 Trunked Radio. A radio system that uses computer control to automatically assign channels from an available pool to users and groups of users.

3.3.71 Radio Channel. See 3.3.14.2.

3.3.72 Radio Circuit. See 3.3.16.4.

3.3.73 Radio Frequency. See 3.3.42.1.

3.3.74 Recorder.

3.3.74.1 Instant Recall Recorder. A device that records voice conversations and that is intended to provide a telecommunicator with a means to review such conversations in real time.

3.3.74.2 Logging Voice Recorder. A device that records voice conversations and automatically logs the time and date of such conversations; normally, a multichannel device that keeps a semipermanent record of operations.

3.3.75 Rectifier. A device without moving parts that changes alternating current to direct current.

3.3.76 Repeater. A device for receiving and re-transmitting one-way or two-way communication signals.

3.3.77* Response Unit. A vehicle, equipment, or personnel identified by the AHJ for

dispatch purposes.

3.3.78 Security Vestibule. A compartment that is provided with two or more doors to prevent continuous and unobstructed passage by allowing the release of only one door at a time.

3.3.79 Simplex Radio Channel. See 3.3.14.2.1.

3.3.80* Standard Operating Procedures (SOP). Written organizational directives that establish or prescribe specific operational or administrative methods that are to be followed routinely for the performance of designated operations or actions.

3.3.81 Stored Emergency Power Supply System (SEPSS). See 3.3.84.7.

3.3.82 Subsidiary Communications Center (Subsidiary). See 3.3.19.1.

3.3.83 Supervisor. An individual responsible for overseeing the performance of other personnel. [**1021:**1-4]

3.3.84 System.

3.3.84.1 Communications System. A combination of links or networks that serve a general function such as a system made up of command, tactical, logistical, and administrative networks.

3.3.84.2 Digital Radio System. A radio system that uses a binary representation of audio from one radio to another.

3.3.84.3 Incident Management System. A system that defines the roles and responsibilities to be assumed by personnel and the operating procedures to be used in the management and direction of emergency incidents and other functions. The system is also referred to as an incident command system (ICS). [**1561:**1-4]

3.3.84.4 Intelligent Transportation System. A means of electronic communications or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system.

3.3.84.5 Public Alerting System (PAS). A system that creates, transmits, and receives a public alert message or signal, or both, that is intended to protect the public from loss of life, health, and property.

3.3.84.5.1 Addressable Public Alerting System (APAS). A system that transmits a specific alert to a specific location or public alerting appliance or to multiple specific locations or appliances.

3.3.84.5.2 Nonaddressable Public Alerting System (NPAS). A system that transmits alerts to nondesignated recipients or locations.

3.3.84.6 Public Reporting System. A system of alarm-initiating devices, receiving equipment, and connecting circuits, other than a public telephone network, used to transmit alarms from street locations to the communications center.

3.3.84.7 Stored Emergency Power Supply System (SEPSS). A system consisting of an

uninterruptible power supply (UPS), a central battery system, or a motor generator, powered by a stored electrical energy source, together with a transfer switch designed to monitor preferred and alternate load power source and provide desired switching of the load, and all necessary control equipment to make the system functional. [**111:**2.1]

3.3.85 Talkgroup. A group of radios addressed as a single entity by the system and functionally equivalent to a conventional repeater channel.

3.3.86 Telecommunicator. An individual whose primary responsibility is to receive, process, or disseminate information of a public safety nature via telecommunication devices. [**1061:**3.3]

3.3.87 Terminal. As used in relation to computer-aided dispatching (CAD) systems/networks, an electronic device that combines a keyboard and a display screen to allow exchange of information between a telecommunicator and one or more computers in the system/network.

3.3.88 Tie Circuit. See 3.3.16.5.

3.3.89 Time.

3.3.89.1 Channel Access Time. The time elapsed from radio push-to-talk (PTT), to the time the receiving unit's speaker emits audio.

3.3.89.2 Coordinated Universal Time (UTC). A coordinated time scale, maintained by the Bureau Interntionale des Poids et Mesures (BIPM), which forms the basis of a coordinated dissemination of standard frequencies and time signals.

3.3.90 Transceiver. A combined transmitter and receiver unit.

3.3.91 Transfer (9-1-1 call). The rerouting of a 9-1-1 call from one public safety answering point (PSAP) to another.

3.3.92 Trouble Signal. A signal initiated by the fire alarm system or device indicative of a fault in a monitored circuit or component. [***72:***1-4]

3.3.93 Trunk Line. A telephone line or channel between telephone central offices or switching devices, including lines between communications centers.

3.3.94 Trunked Radio. See 3.3.70.3.

3.3.95 Ultra High Frequency (UHF). See 3.3.42.2.

3.3.96 Uninterruptible Power Supply (UPS). A system designed to provide power, without delay or transients, during any period when the power source is incapable of performing.

3.3.97 Very High Frequency (VHF). See 3.3.42.3.

3.3.98 VHF.

3.3.98.1 High-Band VHF. Radio frequencies of 132 MHz to 174 MHz.

3.3.98.2 Low-Band VHF. Radio frequencies of 30 MHz to 50 MHz.

3.3.99 Voice Communication Channel. See 3.3.14.4.

3.3.100 Wired Circuit. See 3.3.16.6.

Chapter 4 Communications Centers

4.1 General.

4.1.1* Communications centers shall provide the following services:

(1) Communications between the public and the communications center

(2) Communications between the communications centers, the emergency response agency (ERA), and the emergency response facility (ERF)

(3) Communications within the ERA and between different ERA

4.1.2* The following shall apply to communications equipment:

(1) Communications equipment shall be kept in working order at all times.

(2) In the event of the loss of function of communications equipment, an alternative means of communication shall be readily available.

4.1.3* The alternative means of communication identified at the communications center shall be compatible with the alternative means of communication provided by the ERF.

4.1.4 Management. The public emergency service communications system shall be under the control of a qualified individual, as designated by the authority having jurisdiction.

4.1.5 Operations. Radio, telephone, and other electronic equipment, operating procedures, and personnel training shall enable messages to be conveyed as the situation necessitates.

4.1.6 Design. The systems provided shall respond to normal peak loads in the same manner in which they do when message loads are minimal.

4.1.7 Equipment and personnel capacities shall be designed to handle peak loads rather than average loads.

4.2 Location.

4.2.1 If the building that houses a communications center is located within 46 m (150 ft) of another structure, special attention shall be given to guarding against damage from exposure by such a building by protecting openings and by constructing the roof to resist damage that can be caused by falling walls.

4.2.2 The lowest floor elevation of the communications center shall be located above the 100-year-flood plain established by the Federal Emergency Management Agency.

4.2.3* Communications centers located below grade shall comply with NFPA *101®, Life Safety Code®,* Section 11.7, and shall be specifically designed for the location.

4.2.4* Each jurisdiction shall maintain an alternative communications facility that meets

both of the following criteria:

(1) The facility shall be capable, when staffed, of performing the emergency functions provided at the communications center.

(2) The facility shall be separated geographically from the primary communications center at a distance from the alternative facility concept.

4.2.5* Each jurisdiction shall develop a formal plan to maintain and operate the alternative communications facility.

4.2.5.1 The plan shall include the ability to reroute incoming alarm traffic and to process and retransmit emergency alarms.

4.2.5.2 The plan shall be included in the Comprehensive Emergency Management Plan (CEMP).

4.3 Construction.

4.3.1 Buildings that house communications centers shall be of Type I, Type II, or Type III construction as defined by NFPA 220, *Standard on Types of Building Construction*.

4.3.2 Buildings that house communications centers shall have a Class A roof as defined by NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*.

4.3.3 Separation for communications centers from other portions of buildings occupied for purposes other than emergency communications shall be separated from the other portions of the building by a fire resistance rating of 2 hours and shall comply with NFPA *101, Life Safety Code*, Section 8.2.

4.3.3.1 Openings in fire barriers shall be protected by listed, self-closing fire doors or other assemblies that have a fire resistance rating of not less than 1½ hours.

4.3.3.2 Openings in fire barriers with a fire resistance rating of greater than 2 hours shall be protected by listed, self-closing fire doors or other assemblies that have a fire resistance rating of not less than 3 hours.

4.3.4 Communications center interior finish material, as defined by NFPA *101*, *Life Safety Code*, shall have a flame spread rating of 25 or less, and a smoke development rating of 50 or less, when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*.

4.3.5 The communications center shall be equipped with both a toilet and a lunch area that are directly accessible to the operations room within the secured area as required by 4.6.1.

4.3.6 The communications centers shall be protected against seismic damage in accordance with applicable building codes that are required by the authority having jurisdiction.

4.4 Utilities.

4.4.1 Heating, ventilating, and air conditioning (HVAC) systems shall meet both of the following criteria:

(1) They shall be independent systems that serve only the communications center.

(2) Intakes for fresh air shall be arranged to minimize smoke intake from a fire inside or outside the building.

4.4.1.1 The air supply for HVAC systems shall be in accordance with NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, and NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*.

4.4.1.2* Alternative HVAC shall be provided for the communications center for use during routine maintenance of the primary system or in the event of a primary system failure.

4.4.1.3 Alternative HVAC systems shall provide sufficient conditioning of air to allow efficient functioning of telecommunicators and equipment in the communications center.

4.4.2 No main utility services shall pass through those portions of the communications center where equipment essential to receiving, processing, and retransmitting alarms is installed.

4.5 Fire Protection.

4.5.1 The communications center shall be provided with fire extinguishers that meet the requirements of NFPA 10, *Standard for Portable Fire Extinguishers.*

4.5.2 The communications center, and spaces adjoining the communications center, shall be provided with an automatic fire detection, alarm, and notification system in accordance with *NFPA 72, National Fire Alarm Code.*

4.5.3 The alarm system shall be monitored in the operations room.

4.5.4 Operation of notification appliances shall not interfere with communications operations.

4.5.5 The building that houses the communications center and the communications center itself shall be protected throughout by an approved, automatic fire sprinkler system that complies with NFPA 13, *Standard for the Installation of Sprinkler Systems.*

4.5.6 The sprinkler system shall be supervised in accordance with *NFPA 72, National Fire Alarm Code*.

4.5.7 The sprinkler system shall be monitored in the operations room.

4.5.8 Electronic computer/data processing equipment shall be protected in accordance with NFPA 75, *Standard for the Protection of Electronic Computer/Data Processing Equipment.*

4.5.9* In the event of a fire in the communications center, or in the building that houses the communications center, the communications center shall be capable of continuous operation long enough to enable the transfer of operations to an alternative communications center that is capable of continuous operation.

4.6 Security.

4.6.1 The communications center and other buildings that house essential operating

equipment shall be protected against damage due to vandalism, terrorism, and civil disturbances.

4.6.2 Entry to the communications center shall be restricted to authorized persons.

4.6.3 Entryways to the communications center that lead directly from the exterior shall be protected by a security vestibule.

4.6.4 Door openings shall be protected by a 1-hour, listed, self-closing fire door assembly.

4.6.5 Where a communications center has windows, the following requirements shall apply:

(1) Windows shall be a minimum of 12.2 m (4 ft) above floor level.

(2) Windows shall be rated for bullet resistance to medium-power small arms, high-power small arms, super-power small arms, and high-power rifles as specified in ANSI/UL 752, *Standard for Safety Bullet-Resistant Equipment*

(3)* Windows that are not bullet resistant shall be permitted, provided that they are located facing an area that cannot be accessed or viewed by the general public.

(4) Windows shall be arranged so that they cannot be opened.

4.7 Power.

4.7.1 General. Under all conditions, the following two sources of power shall be provided for the operation of the communications network and its related support systems and equipment:

(1) One circuit from a utility distribution system and a second from an engine-driven generator

(2) Two engine-driven generators with one unit that supplies normal power and another unit serving as a standby

4.7.1.1 Automatic transfer upon power failure shall be provided.

4.7.1.2 A stored emergency power supply system (SEPSS), Type O or Type U, Level 1, in accordance with NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, shall be provided and shall be of a class that is able to maintain essential operations long enough to implement the formal plan required by 4.2.4.

4.7.2 Power and lighting circuits, together with their associated motors, generators, rectifiers, transformers, fuses, and controlling devices, shall be installed in accordance with NFPA 70, *National Electrical Code*®.

4.7.3 The conductors of the power circuit shall be connected to the line side of the main service of a commercial utility distribution system circuit or to the main conductors of an isolated power plant that is located on the premises.

4.7.3.1 Power shall be permitted to be obtained from the load side of the main disconnect switch only where the building is used exclusively for the housing of emergency communications facilities.

4.7.3.2 The power circuit disconnecting means shall be installed so that it is accessible only to authorized personnel.

4.7.4 Circuit protection shall be enclosed in a locked or sealed cabinet that is located adjacent to the point of connection to the light and power conductors and shall be provided in series with each ungrounded conductor.

4.7.5 Power circuit conductors shall be installed in independent conduit that is not used for any other circuit conductors.

4.7.5.1 The conduit in which power circuit conductors are installed shall run from the disconnect switches to the current-consuming devices.

4.7.5.2 The conductors specified in 4.7.5 and 4.7.5.1 shall not be routed over any heat-producing equipment, including a distribution transformer or an engine-driven generator set.

4.7.6 Engine-Driven Generator.

4.7.6.1 The engine-driven generator shall conform to the provisions of NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, and NFPA 110, *Standard for Emergency and Standby Power Systems.*

4.7.6.2 The engine-driven generator shall be located in a ventilated and secured area that is separated from the communications center and its equipment.

4.7.6.3 The area that houses the engine-driven generator shall be used only for the storage of spare parts or equipment that is related to the generator system.

4.7.6.4 Liquid fuel shall be stored in accordance with NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, and gravity feed shall not be used.

4.7.6.5 Natural gas installations shall comply with NFPA 54, *National Fuel Gas Code*.

4.7.6.6 Liquefied petroleum gas (LPG) installations shall comply with NFPA 58, *Liquefied Petroleum Gas Code.*

4.7.6.7 The engine-driven generator shall be of such capacity, as determined by the authority having jurisdiction, that it is able to supply power for the operation of all functions of the communications center.

4.7.6.8 Fuel to provide the engine-driven generator with 24 hours of operation at full load shall be available on site.

4.7.6.9 Equipment essential to the operation of the generator, such as fuel transfer pumps and other on-site equipment that is required to comply with the requirements of this sub-section, shall be supplied with standby power from the generator.

4.7.6.10 The generator shall not use the public water supply for engine cooling.

4.7.7 Uninterruptible Power Supply (UPS) and Battery Systems. Each uninterruptible power supply (UPS) shall be provided with a bypass switch that maintains the power

connection during switchover and that is capable of isolating all UPS components while allowing power to flow from the source to the load.

4.7.7.1 The following UPS conditions shall be annunciated in the operations room:

(1) Source power failure, overvoltage or undervoltage

(2) High/low battery voltage

(3) UPS in bypass mode

4.7.7.2* Stored batteries shall meet all of the following criteria:

(1) The batteries shall be located in the same building as the operating equipment.

(2) The batteries shall be readily accessible for maintenance and inspection.

(3) The space in which the batteries are stored shall be ventilated to prevent the accumulation of explosive gas mixtures.

4.7.7.2.1 Batteries shall be mounted as follows:

(1) They shall be mounted to provide insulation from ground and from other batteries.

(2) The battery mounting shall be protected against corrosion.

4.7.7.2.2 Battery leads of both polarities shall be fused at the battery and shall not be located in the same conduit, tubing, or cable between the battery terminals and fuses.

4.7.7.3 All UPS and battery systems shall be installed in accordance with the requirements of NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems.*

4.8 Lighting.

4.8.1 General. Lighting shall be provided to enable authorized personnel to operate communications equipment that is used for the receipt or transmission of alarms.

4.8.2 Emergency Lighting.

4.8.2.1* The communications center shall be equipped with emergency lighting that shall be placed in service immediately upon a power failure and shall be independent of the power source that is normally used for lighting purposes. Illumination shall be sufficient to allow all essential operations.

4.8.2.2 In addition to the requirement of 4.8.2.1, the operations room shall be equipped with not less than one self-charging, battery-operated emergency lighting unit that lights automatically upon power loss.

4.8.2.3 In addition to the requirements of 4.8.1 and 4.8.2, a self-charging, battery-operated emergency lighting unit shall be provided at the location of the communications equipment.

4.9 Communications Wiring.

4.9.1 Circuit Construction and Arrangement.

4.9.1.1 IEEE C2, *National Electrical Safety Code*, shall be used for the installation of outdoor circuitry.

4.9.1.2* All installations shall be protected against damage due to mechanical injury, fire, falling walls, floods, corrosive vapors, and other risks that are identified in the Comprehensive Emergency Management Plan (CEMP).

4.9.1.3 Open local circuits within single buildings shall be permitted for the operation of alerting devices and alarm equipment that are provided in addition to those required by this standard.

4.9.1.4 All circuits shall be routed to allow circuits to be traced.

4.9.1.5 Circuits shall not pass over, pass under, pass through, or be attached to buildings or property that is not owned by, or under the control of, the municipality or the agency that is responsible for maintaining the system.

4.9.1.6 Alarm instruments installed in private buildings shall be on separate dedicated circuits.

4.9.1.7 Where circuit wires are installed in the same cable with other signal wires, the emergency circuits shall be identified as such at all points that can be exposed to maintenance personnel.

4.9.1.8 Wiring for control equipment shall be not smaller than 24 AWG.

4.9.1.9 Unsupported wires and wires that are subject to vibration shall be not smaller than 18 AWG.

4.9.1.10 The outer covering over the insulation of wiring for control equipment, and the insulation itself, shall be flame retardant and moisture resistant.

4.10 Circuit Conductors.

4.10.1 General.

4.10.1.1 Wires shall be terminated so as to prevent breakage from vibration or strain.

4.10.1.2 Circuit conductors on terminal racks shall be identified and isolated from conductors of other systems and shall be protected from mechanical damage.

4.10.1.3 Exterior cable and wire shall conform to the *Official IMSA Wire and Cable Specifications Manual* or its equivalent, except where conductors are provided by a public utility on a lease basis.

4.11 Cables and Wires.

4.11.1 General.

4.11.1.1 Cables that are installed overhead, underground, or by direct burial shall be in accordance with NFPA 70, *National Electrical Code.*

4.11.1.2 Cable containing conductors using paper or pressed pulp insulation shall not be

permitted for emergency services such as public emergency service dispatching system, unless pressurized with dry air or nitrogen.

4.11.1.3 Loss of pressure in cables shall comply with both of the following requirements:

(1) The pressure loss shall be indicated by a visual or audible warning system that is situated in a constantly attended location.

(2) The individual in attendance shall be able to interpret the pressure readings and shall be given the power to authorize the correction of an abnormal conditions.

4.11.1.4 Natural rubber-sheathed cable shall not be used where it can be exposed to oil, grease, or other substances or conditions that deteriorate the cable sheath.

4.11.1.5 Braided-sheathed cable shall be permitted to be used inside buildings only where it is run in conduit or metal raceways.

4.11.1.6 Municipally controlled signal wires other than rubber-sheathed and braided-sheathed cable shall be permitted as follows:

(1) They shall be permitted to be installed in the same cable with circuit wires.

(2) Cables that are controlled by, or that contain wiring for, private signaling organizations shall be permitted only with the approval of the authority having jurisdiction.

4.11.1.7 Signaling wires shall be protected and installed in accordance with NFPA 70, *National Electrical Code.*

4.12 Underground Cables.

Underground cables in duct or direct buried cable shall be brought above ground only at points where the authority having jurisdiction has determined there is no potential for mechanical damage or damage from fires in adjacent buildings.

4.12.1 Cables shall be located in duct systems and manholes that contain only low-tension signaling system conductors, secondary power cables, or both.

4.12.2 Where cables are located in duct systems or manholes that contain power circuit conductors in excess of 250 volts to ground, circuit cables shall be located away from power cables.

4.12.2.1 The circuit cables shall be separated by a noncombustible barrier or by other means that are designed to protect them from damage.

4.12.3 Underground cables shall be installed in accordance with NFPA 70, *National Electrical Code.*

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

4.12.5 All conduits or ducts that enter buildings from underground duct systems shall be sealed to prevent moisture or gases from entering the building.

4.12.6 Cable joints shall be located only where accessibility is provided and where the authority having jurisdiction has determined that no potential for damage to the cable due to falling walls or building operations exists.

4.12.7 Direct-burial cable shall be installed in accordance with NFPA 70, *National Electrical Code.*

4.12.8 If splices are made in cable, such splices shall be accessible for inspection and tests.

4.12.9 Cable joints shall be made to provide and maintain levels of conductivity, insulation, and protection that are at least equivalent to those afforded by the cables that are joined.

4.12.10 Cable ends shall be sealed against moisture.

4.13 Aerial Cables and Wires.

Circuit cables and wires shall be run under all other wires but shall not be required to run under other communication wires, and both of the following criteria shall be met:

(1) Precautions shall be provided where cables and wires pass through trees, under bridges, and over railroads, and at other locations where damage or deterioration is possible.

(2) Wires and cables shall not be attached to a crossarm that carries electric light and power wires.

4.13.1 Aerial cable shall be supported by messenger wire that is designed for the application.

4.13.2 Self-supported aerial cable and single-wire cable shall be permitted if of a mechanical strength equivalent to 10 AWG hard-drawn copper.

4.13.3 Span lengths shall not exceed the manufacturer's recommendations.

4.13.4 Aerial wires and cables connected to buildings shall contact only intended supports and shall enter through an approved weatherhead or designed sleeves that slant upward and inward. Drip loops shall be formed on wires and cables outside of buildings.

4.14 Leads Down Poles.

4.14.1 Leads down poles shall be protected against mechanical damage and shall meet both of the following requirements:

(1) Any metallic covering shall form a continuous conducting path to ground.

(2) In all cases, installation shall prevent water from entering the conduit.

4.14.2 Leads shall have 600-volt insulation that is approved for wet locations, as defined in NFPA 70, *National Electrical Code.*

4.15 Wiring Inside Buildings.

4.15.1 Conductors at the communications center shall extend to the operations room in conduits, ducts, shafts, raceways, or overhead racks and troughs of a construction type that

protects against fire and mechanical damage.

4.15.2 All conductors located inside buildings shall be installed in accordance with NFPA 70, *National Electrical Code,* in one of the following:

(1) Conduit

(2) Electric metal tubing

(3) Metal molding

(4) Raceways

4.15.3 Wire and cable shall be listed for the environment in which they are installed.

4.15.4 The insulation or other outer covering for wire and cable shall be flame retardant and moisture resistant.

4.15.5 Wire terminals, splices, and taps shall conform with NFPA 70, *National Electrical Code*.

4.15.5.1 Conductors shall be installed without splices to the extent possible.

4.15.5.2 Splices, where used, shall be permitted only in junction or terminal boxes.

4.15.6 Conductors that are bunched together in a vertical run that connects two or more floors shall have a flame-retardant covering to prevent the spread fire from floor to floor.

4.15.7 The requirement of 4.15.6 shall not apply if the conductors are in metallic conduit or are located in a fire-resistive shaft with fire stops at each floor.

4.15.8 Where cables or wiring is exposed to fire hazards, they shall be protected.

4.15.9 Cable terminals and cross-connecting facilities shall be located either in or adjacent to the operations room.

4.15.10 Where signal conductors and electric light and power conductors are run in the same shaft, the light and power conductors shall be in conduit.

4.15.11 All wired dispatch devices and instruments whose failure can adversely affect the operation of the system shall be mounted as follows:

(1) On noncombustible bases, pedestals, switchboards, panels, or cabinets

(2) With mounting designed and constructed so that all components are readily accessible

4.16 Circuit Protection.

4.16.1 General.

4.16.1.1 All surge arresters shall be connected to a ground in accordance with NFPA 70, *National Electrical Code.*

4.16.1.2 Fuses and surge suppressors shall be located in proximity to, or shall be combined with, the cable terminals.

4.16.1.3 All protective devices shall be accessible for maintenance and inspection.

4.16.1.4* Wired communications circuits shall have fast surge suppression installed at the point of entrance to the communications center.

4.16.1.5* Surge arresters that are designed for the applicable purpose shall be provided.

4.16.1.6 Surge arresters shall be marked with the name of the manufacturer and the model designation.

4.16.1.7* Each conductor that enters a communications center from partially or entirely aerial lines shall be protected by a surge arrester.

4.16.1.8 At the junction points of open aerial conductors and cable, each conductor shall be protected by a surge arrester that complies with the following:

(1) The surge arrester is weatherproof or is protected from the weather.

(2) A connection is provided between the surge arrester ground and any metallic sheath and messenger wire.

4.16.1.9 Aerial open wire and nonmessenger-supported, two-conductor cable circuits shall be protected by surge arresters at intervals of approximately 610 m (2000 ft).

4.16.1.10 Wired portions of a radio dispatch circuit shall be protected in a manner that is consistent with the provisions of this section.

4.16.2 Lightning. Buildings that house communications centers shall have lightning protection that complies with NFPA 780, *Standard for the Installation of Lightning Protection Systems.*

4.16.3 Fuses.

4.16.3.1 All fuses shall be marked with their rated ampere capacity.

4.16.3.2 All fuses that are rated over 2 amperes shall be of the enclosed type.

4.16.3.3 Fuses shall be located only at the power source.

4.16.4 Grounding.

4.16.4.1 Systems that provide power to critical equipment that is necessary for the receipt, processing, and retransmission of alarms shall be wired using the single-point method of grounding.

4.16.4.1.1 All equipment that is connected to systems specified in 4.16.4.1 shall not connect to critical equipment power ground by means other than through the single-point ground provided by the system.

4.16.4.1.2 Listed isolated ground outlets shall be provided for all equipment.

4.16.4.2 Unused wire or cable pairs shall be grounded where permitted by the authority having jurisdiction.

4.16.4.3 Electric ground for connection to surge suppressers shall be made to a single-point

grounding system established for the communications center.

Chapter 5 Emergency Response Facilities

5.1 General.

5.1.1 Communications equipment shall be kept in working order at all times.

5.1.2 A primary and a secondary means of communication shall be provided at the ERF as follows:

(1) The primary means of communication at the ERF shall be compatible with the primary means of communication that is provided at the communications center.

(2) The secondary means of communication at the ERF shall be compatible with the secondary means of communication that is provided at the communications center.

5.1.3 Commercial Telephone Circuits.

5.1.3.1 In addition to the required dispatch circuits and receiving equipment, commercial telephone facilities shall be provided and shall meet the requirements of 5.1.3.

5.1.3.2 A telephone shall be provided at each emergency response facility.

5.1.3.3* Where no other means of voice communications with an ERF is provided, the telephone at such an ERF shall be arranged so that it cannot be used by the public.

5.2 Construction.

Communications equipment that is used for the receipt or transmission of alarms shall be separated from other portions of the ERF by one of the following means:

(1) Vertical and horizontal separations shall have a fire resistance of 1 hour in accordance with NFPA 221, *Standard for Fire Walls and Fire Barrier Walls*.

(2) Horizontal fire barriers shall have a fire resistance of 1 hour in accordance with NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*.

(3) Openings within fire barriers shall be protected by listed, self-closing fire doors or other assemblies with a fire resistance rating of 45 minutes.

5.3 Utilities.

No main utility services shall pass through those portions of an emergency response facility that house communications equipment used for the receipt or transmission of alarms.

5.4 Fire Protection.

Fire protection shall be provided as required by the building code adopted by the authority having jurisdiction.

5.4.1 Sprinkler systems shall comply with NFPA 13, *Standard for the Installation of*

Sprinkler Systems.

5.4.2 Fire alarm systems shall comply with *NFPA 72, National Fire Alarm Code.*

5.5 Security.

Communications equipment that is used for the receipt or transmission of alarms shall be installed and maintained so that unauthorized access is prevented.

5.6 Power.

Communications equipment that is used for the receipt or transmission of alarms shall be provided with two sources of power.

5.7 Lighting.

5.7.1 Lighting shall be provided to enable authorized personnel to operate communications equipment that is used for the receipt or transmission of alarms.

5.7.2 A self-charging, battery-operated emergency lighting unit shall be provided at the location of the communications equipment.

5.8* Communications Conductors.

Communications conductors in an ERF shall extend to alarm equipment in conduits, ducts, shafts, raceways or overhead racks, and troughs of a type of construction that provides protection against fire and mechanical damage.

5.9 Circuit Protection.

Circuit protection shall be in accordance with Section 4.16.

5.10 Lightning Protection.

Lightning protection shall be in accordance with 4.16.2.

5.11 Dispatching Systems.

Each ERF shall have two independent systems for receiving notification from the communications center.

Chapter 6 Operations

6.1 Management.

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

6.1.1.1 Where maintenance is provided by an organization or person 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 responsible employee.

6.1.1.2 Maintenance performed by an organization or person other than the jurisdiction or a

jurisdiction employee shall be by written contract and shall guarantee performance as approved by the authority having jurisdiction.

6.1.1.3 The failure of any one component of the primary dispatch circuit shall not cause the secondary dispatch circuit to fail.

6.1.2 All equipment shall be accessible to the authority having jurisdiction for the purpose of maintenance.

6.1.3* At least one supervisor shall be on duty and available to the telecommunicator when more than two telecommunicators are on duty.

6.1.4* The supervisor shall be assigned to the operations room when there are more than three telecommunicators on duty.

6.2 Telecommunicator Qualifications and Training.

6.2.1 Telecommunicators shall meet the qualification requirements of NFPA 1061, *Standard for Professional Qualifications for Public Safety Telecommunicator.*

6.2.2* The authority having jurisdiction shall require telecommunicators to be certified.

6.2.3 Telecommunicators shall be trained in general emergency service operations and shall have access to information regarding the following:

(1) Locations of streets

(2) Locations of important structures, including schools, hospitals, and other buildings with a high life hazard

(3) Locations of congested or hazardous areas

6.2.4 Telecommunicators shall have knowledge of all communications equipment and systems.

6.2.5 Telecommunicators shall know which rules and regulations relate to equipment use, including those of the Federal Communications Commission that pertain to emergency service radio use.

6.2.6 The telecommunicators assigned at the communications center shall be capable of operating and testing the communications system.

6.2.7 Telecommunicators shall not be required to operate and test the system where other qualified persons on duty are assigned these tasks.

6.3 Staffing.

6.3.1* The authority having jurisdiction shall ensure that the number of telecommunicators needed to effect the prompt receipt and processing of alarms shall meet the requirements of Section 6.4.

6.3.2* Communications centers that provide emergency medical dispatching (EMD) protocols shall have two telecommunicators on duty at all times.

6.3.3* The authority having jurisdiction in charge of the communications center shall develop standard operating procedures, with each emergency response agency, that identify when a dedicated telecommunicator is required to be assigned to an emergency incident.

6.4 Operating Procedures.

6.4.1 When alarms are received, they shall be recorded and tabulated to indicate the origin of the call.

6.4.2* Ninety-five percent of alarms shall be answered within 15 seconds, and 99 percent of alarms shall be answered within 40 seconds.

6.4.3 Ninety-five percent of emergency dispatching shall be completed within 60 seconds.

6.4.4* For law enforcement purposes, the authority having jurisdiction shall determine time frames for completion of dispatch.

6.4.5 Where alarms are transferred from the public safety answering point (PSAP), the transfer procedure shall not exceed 30 seconds for 95 percent of all alarms processed.

6.4.6 In cases where the communications center is not the primary answering agency (PSAP) for alarms, the answering agency shall transfer alarms as follows:

(1) The alarm shall be transferred directly to the telecommunicator.

(2) The answering agency shall remain on the line until it is certain that the transfer is effected.

(3) The transfer procedure shall be used instead of relaying the information to the communications center.

6.4.7 All alarms, including requests for additional resources, shall be transmitted to the identified emergency response units over the required dispatch circuit or circuits.

6.4.8 An indication of the status of all emergency response units shall be available to telecommunicators at all times.

6.4.9* Records of the dispatch of emergency response units in response to alarms shall be maintained and shall identify the following:

(1) Units

(2) Companies and supervisors for emergencies and subsequent emergencies

(3) Supervisory officers for alarms and subsequent alarms

(4) Time of acknowledgment by each unit

(5) Time of arrival of each unit at the scene

(6) Time each unit returned to service

6.4.10* Where voice transmission is used as a dispatch method, the announcement for the emergency response shall be preceded by an audible warning or alerting signal that differentiates the emergency from routine radio traffic.

6.4.11 The first emergency response unit that arrives at the location of the alarm shall provide a brief preliminary report on observed conditions to the communications center.

6.4.12* A communications officer shall be assigned at major incidents.

6.4.13* All emergency response agencies shall use common terminology and integrated incident communications.

6.4.14 The communications equipment involved in each alarm shall be restored promptly after each alarm.

6.4.15 One of the following actions shall be taken when the device monitoring for integrity indicates that trouble has occurred anywhere on the system:

(1) The telecommunicator shall take appropriate steps to repair the fault.

(2) If repair is not possible, the fault shall be isolated and the official responsible for maintenance shall be notified.

6.4.16 Standard operating procedures/standard operating guidelines (SOP/SOG) in accordance with NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, and NFPA 1561, *Standard on Emergency Services Incident Management System*, shall include the following:

(1) All standardized procedures that the telecommunicator is expected to perform without direct supervision

(2) Implementation plan that meets the requirements of 4.2.5 through 4.2.5.2

(3) Procedures related to the Comprehensive Emergency Management Plan

(4) Emergency response personnel emergencies

(5) Activation of an emergency distress function

(6) Assignment of incident radio communications plan matrix

(7) Time limit for acknowledgement by units that have been dispatched

6.4.17 A distinctive alert tone signal shall precede the transmission of "emergency message traffic" as required by NFPA 1561, *Standard on Emergency Services Incident Management System.*

6.4.18 In the event that the emergency unit(s) has not acknowledged dispatch within the time limits established, the telecommunicator shall perform one or more of the following:

(1) Re-dispatch of the unit(s) in accordance with 6.4.10

(2) Activation of the secondary dispatch system

(3) Initiation of two-way communication with the service's supervisor

6.5 Time.

6.5.1* The clock for the main record-keeping device in the communications center shall be

synchronized weekly to coordinated universal time (UTC).

6.5.2 All time-keeping devices in the communications center shall be maintained within ±5 seconds of the main record-keeping device clock.

6.6 Recording.

6.6.1 Communications centers shall have a logging voice recorder, with one channel for each of the following:

(1) Each transmitted or received radio channel or talk group

(2) Each dispatch alarm circuit

(3)* Each telecommunicator telephone

6.6.2 An instant recall recorder shall be provided for each telecommunicator position in the communications center.

6.6.3 Alarms shall be recorded as follows:

(1) Alarms that are transmitted over the required dispatch circuit(s), including the dates and times of transmission, shall be automatically recorded.

(2) Where telegraphic retransmission of alarms is used, manual entry of dates and times by the telecommunicator shall be permitted.

6.7* Quality Assurance.

Communications centers shall establish a quality assurance program to ensure the consistency and effectiveness of alarm processing.

Chapter 7 Telephones

7.1 Telephone Receiving Equipment.

7.1.1 The provisions of Section 7.1 shall apply to facilities and equipment that are needed to receive alarms that are transmitted by public use of commercial telephone systems.

7.1.2 The provisions of Section 7.1 shall apply regardless of the provision of other reporting systems.

7.2 Directory Listing.

7.2.1 Where 9-1-1 service is not provided all of the following requirements shall be met:

(1) A specific telephone number shall be assigned for emergency services.

(2) The telephone number shall be publicized as such.

(3) A separate number shall be assigned for business (nonemergency) use.

7.2.1.1 Where 9-1-1 service is provided, the telephone directory listings shall indicate that

9-1-1 is the number to call for all emergencies.

7.2.1.2 A seven-digit number that is not released to the public shall be maintained for communication with other emergency service agencies and receipt of central station alarms.

7.2.1.3* A separate number shall be assigned for business (nonemergency) use.

7.2.2 Telephone directory listings shall be as specified in 7.2.2.1.

7.2.2.1 The text and symbols shown in Figure 7.2.2.1(a) through Figure 7.2.2.1(c) shall appear on the inside front cover or the page facing the front cover of the white pages directory.

FIGURE 7.2.2.1(a) Telephone Directory Listing for Fire Departments.

FIGURE 7.2.2.1(b) Telephone Directory Listing for Police Departments.

FIGURE 7.2.2.1(c) Telephone Directory Listing for Emergency Medical Services.

7.2.2.2 The emergency services listing shall appear in the directory under the name of the jurisdiction, including government listings, and under the headings *Police, Fire,* and *Ambulance* where provided.

7.2.2.3 The following listings and telephone numbers shall appear as follows in the white pages directory:

(1) FIRE DEPARTMENT

(a) To report an emergency (*FIRE NUMBER*) or, where available, 9-1-1

(b) Nonemergency purposes (*BUSINESS NUMBER*)

(2) POLICE DEPARTMENT

(a) To report an emergency (*POLICE NUMBER*) or, where available, 9-1-1

(b) Nonemergency purposes (*BUSINESS NUMBER*)

(3) EMERGENCY MEDICAL SERVICES

(a) To report an emergency (*EMERGENCY MEDICAL NUMBER*) or, where available, 9-1-1

(b) Nonemergency purposes (*BUSINESS NUMBER*)

7.2.2.4 If the directory covers an area that is protected by more than one emergency service, each agency or district shall appear in the listing as specified in 7.2.2.1.

7.2.2.5 If the emergency service protects an area that is covered by more than one directory, each directory shall list the agency or district as specified in 7.2.2.1.

7.2.2.6* Where an ERF that is not continuously staffed by trained personnel is listed in the telephone directory, callers shall be provided with a recorded message that refers them to the appropriate emergency number.

7.3 Equipment and Operations.

At the communications centers, telephone lines shall be provided as follows:

(1) At least two telephone lines shall be assigned exclusively for receipt of emergency calls.

(2) Additional emergency lines shall be provided as required for the volume of calls handled.

(3) Additional telephone lines shall be provided for the normal business (nonemergency) number(s) as needed.

(4) At least one outgoing-only line shall be provided.

7.3.1 Where 9-1-1 service is not in use, provisions shall be made for answering the designated emergency lines first and the following requirements shall be met:

(1) When all emergency lines are in use, emergency calls shall hunt to other predetermined lines that are approved by the authority having jurisdiction.

(2) Calls to the business number shall not hunt to the designated emergency lines.

7.3.2 When a public safety answering point (PSAP) receives an emergency call for a location that is not in its jurisdiction, or a call for an agency not under the control of the PSAP, the PSAP shall transfer the call directly to the responsible communications center, when possible and the following requirements shall be met:

(1) The PSAP shall remain on the line until it is certain that the transfer is effected.

(2) The transfer procedure shall be used instead of relaying the information to the communications center.

7.3.3 All incoming calls on designated emergency lines shall be recorded in accordance with this standard.

7.3.4* If an incoming call on any designated emergency line is not answered within 60 seconds, an alarm indication shall be automatically transmitted to a location approved by the authority having jurisdiction.

7.3.5* Where the authority having jurisdiction permits the communications center to receive automated voice alarms, the following requirements shall apply:

(1) A separate, unlisted telephone line(s) shall be provided to receive such alarms.

(2) Such voice alarms shall not be permitted to connect to the telephone lines required by 7.2.1 and Section 7.3.

7.3.6 Where the communications center is permitted to receive automated data alarms through dial-up telephone service, the following requirements shall apply:

(1) A separate, unlisted telephone line(s) shall be provided to receive such alarms.

(2) Such data alarms shall not be permitted to connect to the telephone lines required by

7.2.1 and Section 7.3.

7.4 Universal Emergency Number 9-1-1 Service.

See Annex D.

7.4.1 General. Universal emergency number 9-1-1 service shall meet the minimum requirements as specified in Section 7.4.

7.4.2 Reliability.

7.4.2.1 The universal emergency number service equipment shall be designed so that an equipment failure cannot prevent calls from being answered.

7.4.2.2 Under failure conditions, the full-feature complement shall not be required to be maintained but the calling party shall be able to communicate with the telecommunicator.

7.4.3 Circuits.

7.4.3.1 At least two 9-1-1 circuits with diverse routes arranged so that no single incident interrupts both routes shall be provided to each communications center from each serving telephone central office.

7.4.3.2* Where multiple communications centers that serve a jurisdiction are not located in a common facility, at least two circuits with diverse routes, arranged so that no singular incident interrupts both routes, shall be provided between communications centers.

7.4.4 9-1-1 Alternative Routing.

7.4.4.1* Routing to an Alternative Public Safety Answering Point (PSAP).

7.4.4.1.1 Communications centers shall maintain a plan for rerouting incoming 9-1-1 calls when the center is unable to accept such calls.

7.4.4.1.2 The plan for rerouting incoming 9-1-1 calls shall be included in the Comprehensive Emergency Management Plan.

7.4.4.2* Routing to Alternative Numbers. Where the authority having jurisdiction requires that overflow 9-1-1 calls shall be routed to 7-digit or 10-digit numbers within the PSAP, the 7-digit or 10-digit numbers shall meet the requirements of this standard for monitoring for integrity and recording.

7.4.4.3 Night Service. Where a PSAP operates on a part-time basis, an automatic alternative routing plan shall be put in place that ensures the rapid transfer of calls to the designated backup PSAP, even if the transfer switch, where provided, is not turned on.

7.4.4.4* 9-1-1 Queuing.

7.4.4.4.1 Any call that has not been answered after 20 seconds shall be routed to a recording that informs the caller that he or she has reached 9-1-1, while simultaneously placing the call in a queue.

7.4.4.4.2 The system shall periodically remind 9-1-1 callers who are in the queue that they are connected during their wait.

7.4.4.4.3 There shall be an audible and visible indication within the communications center that unanswered calls are waiting in the queue.

Chapter 8 Dispatching Systems

8.1 Fundamental Requirements of Alarm Dispatching Systems.

8.1.1* General.

8.1.1.1 An alarm dispatching system shall be designed, installed, operated, and maintained to provide for the receipt and retransmission of alarms.

8.1.1.2 The transmission of any signal shall not interfere with the transmission and receipt of alarms.

8.1.1.3 The required number of dispatching circuits shall be in accordance with 8.1.1.3.1 through 8.1.1.3.3.

8.1.1.3.1* In jurisdictions that receive 730 alarms or more per year, they shall provide two separate and dedicated dispatch circuits as follows:

(1) Primary and secondary circuits shall be provided for transmitting alarms.

(2) The failure of any component of the primary circuit shall not affect the operation of the secondary circuit and vice versa.

8.1.1.3.2* In jurisdictions that receive fewer than 730 alarms per year, one dedicated dispatch circuit shall be provided for transmitting alarms.

8.1.1.3.3 A circuit that terminates at a telephone handset only shall not be considered as fulfilling the requirements for a dispatch circuit. *(See 8.2.2.2.)*

8.1.1.4 The primary dispatch circuit shall be provided with one of, or a combination of, the following:

(1) Wired circuit monitored for integrity

(2)* Analog voice radio channel with duplicate base transmitters, transceivers, repeaters, receivers (where required), microphones, encoders control circuitry, and antennas capable of visual and audible alerting of failure of signal activation as required by 8.1.2.6

(3) Microwave carrier channel monitored for integrity

(4) Polling or self-interrogating digital data radio channel with the following features:

(a) Automatic switchover to the second transmitter if the primary transmitter fails upon operation

(b) Audible and visual indications to the telecommunicator

(5) Approved, dedicated telephone circuit that is monitored for integrity, excluding the following:

(a) Telephone connection through a public-switched telephone network via regular dial-up mode

(b) Nondedicated phone lines

(6) Where used as the primary dispatch circuit, trunked radio systems in compliance with 8.1.1.4(2) or 8.1.1.4(4).

8.1.1.5 The secondary dispatch circuit shall not be required to be monitored for integrity and shall be one of the following:

(1) A wired circuit shall be permitted to be used.

(2)* A designated radio channel shall not be required to have duplicate transmitting/receiving equipment.

(3) If radio is used for both the primary and secondary dispatch circuits, the following shall apply:

(a) The primary dispatch circuit shall comply with 8.1.1.4.

(b) The secondary dispatch circuit shall consist of a separate radio system operating on a separate channel with a separate receiver for the secondary circuit at each ERF.

(4) An approved dedicated telephone circuit shall be permitted to be used.

(5) Where a telephone dispatch circuit is used as a primary dispatch circuit, a telephone circuit shall not be used as the required secondary dispatch circuit.

(6) A telephone connection through a public-switched telephone network via a regular dial-up modem and nondedicated telephone line shall not be considered to be an approved dispatch circuit.

(7)* The dispatch signal circuit path for the secondary dispatch circuit specified in 8.1.1.5(5) shall be separate and independent of the dispatch signal circuit path of the primary dispatch circuit from the dispatch console to separate control/relay switching equipment connection ports at the ERF.

8.1.1.6* Where voice transmission is used as a dispatch method, the announcement for the emergency response shall be preceded by an audible warning or alerting signal that differentiates the emergency from routine voice traffic.

8.1.1.7 Alarms shall be retransmitted to emergency response facilities from the location at which alarms are received.

8.1.1.7.1 Alarms from the communications center shall be automatically received at emergency response facilities.

8.1.1.7.2 Dispatch methods shall provide for the operation of houselights or other auxiliary functions at the ERF as required by the authority having jurisdiction.

8.1.1.8 The following shall apply to alarms that are transmitted over the required dispatch circuit(s):

(1) The alarms, including the dates and times of transmission, shall be recorded automatically at the communications center.

(2) Where telegraphic retransmission is used, the telecommunicator shall be permitted to enter dates and times manually where approved by the authority having jurisdiction.

8.1.1.9 Audible devices shall be installed throughout the ERF to ensure that all emergency response personnel are alerted to alarms.

8.1.1.10 Equipment shall be provided to allow watch personnel to alert personnel in the ERF.

8.1.1.11 A means of acknowledging receipt of an alarm from the emergency response personnel to the telecommunicator shall be provided.

8.1.2* Monitoring for Integrity. Wired circuits, microwave carrier channels, dedicated telephone circuits, and devices upon which transmission and receipt of alarms depend shall be monitored constantly to provide prompt warning of trouble that will impact reliability.

8.1.2.1 A polling or self-interrogating radio system shall be monitored hourly for integrity to ensure system reliability.

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

8.1.2.3 Trouble signals shall actuate an audible device, and a visual signal shall be located at a constantly attended location.

8.1.2.4 Trouble signals shall be distinct from alarm signals.

8.1.2.4.1 The audible trouble signal shall be permitted to be common to several monitored circuits and devices.

8.1.2.4.2 A switch for silencing the audible trouble signal shall be permitted if the visual signal continues to operate until the silencing switch is restored to the designated normal position.

8.1.2.4.3 The audible trouble signal shall respond to faults that occur on all other circuits prior to the restoration of the silencing switch to the “normal” position.

8.1.2.5 Where dispatch systems use computer diagnostic software, monitoring of the primary dispatch circuit components shall be as follows:

(1) Monitoring shall be routed to a dedicated terminal(s).

(2) The dedicated circuit-monitoring terminal(s) shall meet the following requirements:

(a) They shall be labeled and identified as DISPATCH CIRCUIT INTEGRITY STATUS.

(b) They shall be located within the communications center.

(c) They shall not be used for routine dispatch activities.

8.1.2.5.1 The program software shall be capable of displaying and testing each circuit that can be electronically monitored from the dispatch console to the station control unit or junction relay switching equipment in the ERF.

8.1.2.5.2 Any fault condition within the dispatch circuit shall display on the dedicated terminal screen in a prominent (highlighted) fashion that satisfies the visual alarm requirement with an audible alarm that actuates and sounds in accordance with the type of dispatch circuit that is being monitored.

8.1.2.6 The radio communications system shall be monitored as follows:

(1) It shall indicate faults and failures.

(2) Audible and visual indications of faults or failures shall be provided to the telecommunicator and radio system manager.

(3) Monitoring for integrity of portable radios and radio equipment installed in an ERF and in emergency response vehicles shall not be required.

8.2 Wired Dispatching Systems.

8.2.1 Wired Circuits — General.

8.2.1.1 Where a wired dispatch circuit is part of a public alarm reporting system, it shall meet the requirements of *NFPA 72*, National Fire Alarm Code.

8.2.1.2 A wired circuit shall not be connected to alarm instruments in more than five emergency response facilities.

8.2.1.3 Coded signals shall be transmitted as follows:

(1) At a minimum rate of two strokes per second

(2) Over separate circuits at a rate that is suitable for such devices where outside alerting devices are employed

8.2.1.4 Where wired voice dispatch circuits are used, each circuit shall be dedicated to each emergency response facility.

8.2.1.5 For coded and telegraphic systems, a permanent record that indicates the exact location from which the alarm is being received and an audible signal shall be required to indicate the receipt of an alarm.

8.2.1.6 A separate tie circuit shall be provided from the communications center to each subsidiary communications center.

8.2.1.7 Equipment shall be designed and installed so that it is capable of performing its intended function at 85 percent and at 110 percent of the rated voltage.

8.2.1.8 The normal operation of the system shall not require the use of a ground return to provide any essential function.

8.2.1.8.1 Circuits that extend outside the communications center shall test free of ground.

8.2.1.8.2 The ground connection shall be permitted to be used to provide function under abnormal line conditions where such use does not prevent the reception or transmission of a signal under normal conditions if the circuit were accidentally grounded.

8.2.1.9 A public alarm reporting system circuit that enters an emergency response facility and that is connected to automatic recording and sounding equipment shall be permitted to be one of the two required dispatch circuits.

8.2.1.10 In jurisdictions where fewer than 730 alarms per year are received, or where all stations have recording and sounding devices that respond to each public reporting circuit, the second dispatch circuit shall not be required; only the circuit that is monitored for integrity shall be required.

8.2.1.11 The following requirements shall apply to Type B systems:

(1) Equipment shall be installed to automatically transmit alarms that are received from any public reporting circuit to all emergency response facilities and, where employed, to outside sounding devices.

(2) Control equipment shall allow any or all circuits to be individually connected to, or disconnected from, the repeating mechanism.

(3) Coded transmitting devices that use metal conductors shall be provided with a means to transfer the signal from one dispatch circuit to another.

8.2.2 Telephone Circuits.

8.2.2.1 A telephone circuit that is used as one of the dispatch circuits shall meet the requirement in 8.1.1.4.

8.2.2.2 Where the primary or secondary dispatch circuit is a telephone dispatch circuit, it shall have voice amplification with the following capabilities:

(1) It shall be equipped with a loudspeaker(s).

(2) The use of the handset shall automatically disconnect the loudspeaker(s) from the circuit(s).

8.3 Radio Dispatching Systems.

8.3.1 General.

8.3.1.1* All radio communications shall comply with the rules and regulations governing wireless communications in the country of operation.

8.3.1.2 The communications center shall be equipped for radio communications with emergency response units and portable radios.

8.3.1.3* A separate simplex radio channel shall be provided for on-scene tactical communications.

8.3.1.4 Communications system design shall be such that a portable radio is capable of operating within the dispatch area without the use of mobile radio frequency (RF)

amplifiers.

8.3.1.5 If the radio includes scanning capability, it shall have an automatic priority feature that causes the radio receiver to revert automatically to its primary channel when the channel is being used.

8.3.1.6 Visual indication shall be provided to alert that radio equipment is turned on.

8.3.1.7 With the exception of mobile and portable radios, radio antenna systems shall include surge arresters.

8.3.1.8 Radio communications equipment shall be capable of transmitting a distinctive alert tone for emergency traffic as required in NFPA 1561, *Standard on Emergency Service Incident Management System.*

8.3.2 Signaling and Control Systems.

8.3.2.1 Signaling and control systems that are used to alert a specific ERF(s) shall initiate announcement tones for various voice alarms.

8.3.2.2 Signaling and control systems shall use both polling and automatic transmission communications methods and shall support redundant designs as required in 8.1.1.4(4).

8.3.2.3 If used for signal and control systems, internet protocol (IP) wide area networks shall comply with the following:

(1) They shall comply with the communication methods of 8.3.2.2.

(2) If the primary network connector fails during operations, switchover to the second network connection shall be automatic, with audible and visual indicators to the telecommunicator.

8.3.3 Conventional Two-Way Voice Systems.

8.3.3.1* Analog System Requirements. Systems shall be equipped with a coded squelch system to minimize interference.

8.3.3.2 Digital Conventional System Requirements. Digital conventional systems shall comply with the ANSI Standard ANSI/TIA/EIA 102BAAA *Common Air Interface (CAI).*

8.3.4 Trunked Two-Way Voice Systems.

8.3.4.1* Analog Trunked System Requirements.

8.3.4.1.1* Signaling Channel Concept.

8.3.4.1.1.1 The trunked system shall operate using a dedicated signaling control channel protocol concept.

8.3.4.1.1.2 System control messages and calls, and mobile requests for service shall be transmitted to and from the system on the signaling channel.

8.3.4.1.2 Unique Address Transmission. Each unit shall send its unique discrete address identification to the system each time the unit transmits, regardless of whether the system is operating in the message trunking mode or transmission trunking mode.

8.3.4.1.3 Minimum Channel Capability. Mobile and portable units shall be capable of operating on at least five radio channels.

8.3.4.1.4 Scanning. Mobile and portable units shall be capable of scanning up to five talkgroups, with one group being a priority.

8.3.4.1.5* "Time-Out" Timer. Mobile and portable units shall be equipped with a timer circuit that automatically shuts off the transmitter and signals the operator with a distinctive tone after a predetermined transmission time.

8.3.4.1.6 Automatic Channel Assignment. A system controller shall automatically assign all channels so that all system users (field units and console dispatchers) shall have access to all voice channels via a system priority protocol.

8.3.4.1.7 Channel Access Time. Channel access time in single-site systems, assuming a channel is available, shall be less than ½ second.

8.3.4.1.8* Priority Levels.

8.3.4.1.8.1 A minimum of eight levels of operational talkgroup priority shall be incorporated into the system.

8.3.4.1.8.2 Dispatch consoles shall be capable of elevating the operational priority of a talkgroup by one increment to facilitate channel assignments in critical situations.

8.3.4.1.9* Emergency Priority.

8.3.4.1.9.1 All field units in the system shall be capable of gaining access to the system within ½ second of activation of an instantaneous emergency switch.

8.3.4.1.9.2 When emergency activation occurs, the field unit ID shall be displayed at the dispatch terminal, console, or both, and an audible alert shall be activated.

8.3.4.1.9.3 A voice channel shall be immediately assigned, to handle the emergency communications regardless of system loading.

8.3.4.1.10* Failure of Trunking System.

8.3.4.1.10.1 The system shall be configured so that, in the event of a failure of the system controller which prevents automatic functioning of the system, mobile units shall automatically operate in the conventional mode on preassigned channels based on a selected talkgroup.

8.3.4.1.10.2 Emergency response units that share trunked radio systems with other emergency services, or other nonemergency services, shall operate on a channel that is not shared with nonemergency users.

8.3.4.1.11* Queuing of Request for Voice Channel.

8.3.4.1.11.1 If all available talking channels are assigned, the second and lower precedence level requests for a talking channel shall be placed in a queue according to the priority levels involved.

8.3.4.1.11.2 The queue shall cause the system to assign talking channels (as they become

available) on a priority level basis.

8.3.4.1.11.3 If multiple talkgroups with the same priority are in the queue, they shall be assigned a channel on a first-in-first-out (FIFO) basis.

8.3.4.1.11.4 The queuing protocol shall process and assign channels to requesting units that have been involved in recent conversations before processing and assigning channels to units not involved in any recent conversations (assuming both talkgroups have equal priorities).

8.3.4.1.12 System-Busy Queuing Call-Back. When any unit is placed into a system-busy queue, the unit requesting the channel shall be notified automatically by the system when it assigns a channel to the unit.

8.3.4.1.13 Talkgroup Reception. All units operating within the same talkgroup shall receive both sides of every conversation addressed to or from the talkgroup.

8.3.4.1.14 Selective Alerting. Where required for mobile or portable units, the system shall provide a means for selectively alerting one unit from another unit or from a dispatch location.

8.3.4.1.15 Continuous Talkgroup Affiliation Notification.

8.3.4.1.15.1 The system shall broadcast a continuous update of the talkgroup channel assignments to field units.

8.3.4.1.15.2 Units that become activated during a conversation, or units that leave the system coverage and return, shall use the continuous update to immediately affiliate with their assigned talkgroup.

8.3.4.1.16* Out-of-Contact Indication. Whenever a field unit leaves the coverage of the signaling channel and attempts to access the system using the push-to-talk (PTT) button, an audible alert shall be sounded.

8.3.4.1.17* Individual Unit Disable.

8.3.4.1.17.1 Hardware and software that allows disablement of any mobile or portable unit(s) currently operating on the system shall be provided.

8.3.4.1.17.2 Disablement of such a unit(s) shall be possible even if the system manager terminal or the console is inoperative.

8.3.4.1.18* Remote Talkgroup Assignment. The system shall allow a telecommunicator to initiate a change in the operating talkgroup of any field unit from a system manager terminal.

8.3.4.1.19* Telephone Interconnect Restriction. Where telephone interconnect has been provided as a part of the system, the system shall be configured so that no telephone call prevents or delays any dispatch communications required by the authority having jurisdiction.

8.3.4.1.20 Monitoring for Integrity.

8.3.4.1.20.1 A subsystem dedicated to monitoring the trunked system infrastructure backbone shall be provided.

8.3.4.1.20.2 Fault and status information, including information on the condition of base station repeaters and controllers, shall be accessible from a system manager terminal.

8.3.4.1.20.3 A printer capable of recording system problems as they occur shall be provided with the system manager terminal.

8.3.4.1.21 Console Call Indicator.

8.3.4.1.21.1 A call indicator shall be provided for each talkgroup and conventional repeater controlled from the control center console.

8.3.4.1.21.2 When a channel is selected, the call indicator shall flash when audio is available.

8.3.4.1.22 Console Full Duplex. The console shall operate in the full duplex mode so that a telecommunicator can simultaneously transmit to a trunked talkgroup and receive their response without releasing the PTT button.

8.3.4.1.23 Console Trunked Busy Indication.

8.3.4.1.23.1 If the dispatcher attempts to make a call and all trunked channels are busy, a visual and audible alert shall be initiated at the console.

8.3.4.1.23.2 When the channel becomes available, the console shall automatically alert the dispatcher with an audible tone and “hold” the channel for the dispatcher for 2 seconds to 4 seconds to allow the dispatcher time to activate a PTT for the appropriate talkgroup.

8.3.4.1.24* Console Dispatch Preemption.

8.3.4.1.24.1 The system shall be configured so that no “busy” indication is received by a telecommunicator when attempting to access a talkgroup required for dispatch of an alarm.

8.3.4.1.24.2 If necessary, the requirement of 8.3.4.1.24(1) shall be met by preemption of the lowest-priority communication on the system at the time of attempted access to the talkgroup.

8.3.4.1.25 Elevation of Priority. The telecommunicator shall have the following capabilities:

(1) The telecommunicator shall be able to designate a higher tactical priority for certain talkgroups at their workstation.

(2) Designation of higher tactical priority shall be achieved by means of a switch on that talkgroup appearance.

8.3.4.1.26* Tactical Communications. Trunked system talkgroups shall not be used to fulfill the requirement for the provision of a simplex radio channel for on-scene tactical communications.

8.3.4.2 Digital Trunked System Requirements. Digital trunked systems shall comply with the ANSI Standard ANSI/TIA/EIA 102BAAA *Common Air Interface (CAI)* and meet the

requirements in 8.3.4.1.

8.3.5 Two-Way Mobile Equipment.

8.3.5.1 All emergency response units shall be equipped with a two-way mobile radio that is capable of communications with the communications center.

8.3.5.2 Mobile radios shall be equipped with a visual transmit indicator.

8.3.5.3 All mobile radios shall be equipped with a carrier control timer that disables the transmitter after a predetermined time that is determined by the authority having jurisdiction.

8.3.5.4 Mobile radios and associated equipment shall be manufactured for the environment in which they are to be used.

8.3.5.5 Mobile radios shall be capable of multiple-channel operation to enable on-scene radio communications that are independent of dispatch channels.

8.3.5.6 Where a data transmission function is used, mobile radios shall have the ability to transmit data without distortion, and the equipment shall be designed to ensure data transmission at full power.

8.3.5.7 Spare mobile radio units shall be provided for emergency response units as follows:

(1) Minimum of one spare unit for each model not directly interchangeable

(2) Minimum of one spare unit for each 20 units, or fraction thereof, in service

8.3.6 Two-Way Portable Equipment.

8.3.6.1 All emergency response units shall be equipped with a portable radio that is capable of two-way communication with the communications center.

8.3.6.2 Portable radios shall be manufactured for the environment in which they are to be used and shall be of a size and construction that allow their operation with the use of one hand.

8.3.6.3 Portable radios that are equipped with key pads that control radio functions shall have a means for the user to disable the keypad to prevent inadvertent use.

8.3.6.4 All portable radios shall be equipped with a carrier control timer that disables the transmitter after a predetermined time that is determined by the authority having jurisdiction.

8.3.6.5 Portable radios shall be capable of multiple-channel operation to enable on-scene simplex radio communications that are independent of dispatch channels.

8.3.6.6 Portable radios shall be designed to allow channels to be changed while emergency response personnel are wearing gloves.

8.3.6.7 Single-unit battery chargers for portable radios shall be capable of fully charging the radio battery while the radio is in the receiving mode.

8.3.6.8 Battery chargers for portable radios shall automatically revert to maintenance charge

when the battery is fully charged.

8.3.6.9 Battery chargers shall be capable of charging batteries in a manner that is independent of and external to the portable radio.

8.3.6.10 Spare batteries shall be maintained in quantities that allow continuous operation as determined by the authority having jurisdiction.

8.3.6.11 Where a data transmission function is used, portable radios shall have the ability to transmit data without distortion, and the equipment shall be designed to ensure data transmission at full power.

8.3.6.12 A minimum of one spare portable radio shall be provided for each 10 units, or fraction thereof, in service.

8.3.7* Mobile Command Vehicles. Vehicles that are used in command or communications functions shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.*

8.3.8 Microwave Systems. (Reserved)

8.4 Radio Alerting Systems.

8.4.1 General.

8.4.1.1 Radio alerting systems shall include voice receivers, coded tone receivers, noncoded tone receivers, numeric receivers, and alphanumeric devices.

8.4.1.2 Where radio home alerting receivers, hand-held units, pagers, and similar radio devices are used to receive fire alarms, or are used on-scene, they shall conform to the requirements of this standard.

8.4.2 Radio Paging Systems and Pagers.

8.4.2.1* The paging system shall be under the direct control of the authority having jurisdiction where used as a method of emergency dispatch.

8.4.2.2 Page-encoding equipment shall be located in the communications center where used as a method of emergency dispatch.

8.4.2.3 The paging system shall comply with the general requirements for radio systems as outlined in this document.

8.4.2.4 Pagers shall audibly indicate a low-battery condition.

8.4.2.5 Alphanumeric pagers shall support the maximum text message that can be sent from the communications center.

8.4.3 Alerting Receivers. Where radio alerting receivers are used to receive emergency dispatch messages, they shall be provided with two sources of power.

8.5 Outside Audible Alerting Devices.

8.5.1 Where outside alerting devices are used to indicate an emergency, they shall be

located to alert all emergency response personnel expected to respond.

8.5.2 Coded alerting devices shall operate at speeds of at least one actuation per second, with three or four rounds of coded signals required where outside alerting devices are operated for summoning emergency personnel.

8.5.3 Compressed air alerting devices shall have a distinctive tone; if coded, the duration of the blast shall be neither less than ½ second nor longer than 1½ seconds, with silent intervals of 1 to 1½ times the blast duration.

8.5.4 Storage tanks shall meet the following criteria:

(1) Storage tanks shall comply with ASME specifications for unfired pressure vessels.

(2) Storage tanks shall be equipped with safety relief valves.

(3) Storage tank size shall be such that, at 85 percent of working pressure, eight times the largest number of blasts assigned to any signal, but not less than 50 blasts, shall be capable of being sounded.

8.5.5 Compressors shall have the capacity to fill storage tanks to working pressure within 30 minutes.

8.5.5.1 Piping of ferrous materials shall be provided with scale traps that are accessible for cleaning.

8.5.5.2 All piping shall be arranged to allow inspection and repair.

Chapter 9 Computer-Aided Dispatching (CAD) Systems

9.1 General.

See Annex E.

9.1.1 Personnel Qualifications. Emergency services dispatching entities that employ computer-aided dispatching (CAD) systems shall have trained and certified technical assistance available for trouble analysis and repair by in-house personnel or by authorized outside contract maintenance services.

9.1.2 Backup. Where a CAD system is used for emergency service dispatch operations, a manual backup method shall be provided and shall be available for use in the event of a failure of the CAD system.

9.1.3 Security.

9.1.3.1 CAD systems shall have different levels of security to restrict unauthorized access to sensitive and critical information, programs, and operating system functions.

9.1.3.2 Access to CAD systems shall be limited by log on/ password control, workstation limitations, or other means as required by the authority having jurisdiction.

9.1.4 Alarm Data Exchange.

9.1.4.1 The computer-aided dispatching (CAD) system shall permit alarm data exchange between the CAD system and other CAD systems.

9.1.4.2 The CAD system shall permit alarm data exchange between the CAD system and Intelligent Transportation Systems.

9.1.4.3 The CAD system shall permit alarm data exchange between the CAD system and central stations.

9.1.4.4 The CAD system shall permit alarm data exchange between the CAD system and 9-1-1 databases.

9.2* Support Dispatch Information.

An up-to-date hard copy file of stored information shall be located on the premises to support the dispatching operation if the CAD system fails.

9.3 Dispatch Capabilities.

The installation of a CAD system in emergency service dispatching shall not negate the requirements for a second dispatch method.

9.3.1 The CAD system shall consist of dedicated pieces of equipment whose use serves only to enhance emergency services dispatching operations.

9.3.1.1 CAD systems installed in emergency service dispatching shall not be permitted to serve unrelated services or other departments.

9.3.1.2 Where dispatching operations are of a combined public service nature, the computer system shall be permitted to be used jointly, provided an automatic control function is installed in the dispatching control console positions to allow the telecommunicator to control the override of all agency dispatching for the purpose of dispatching priority traffic.

9.3.1.3 Any emergency that, in the judgment of the telecommunicator in charge, is categorized as life-threatening shall take precedence over all other traffic in a combined dispatch communications center that uses a shared computer system.

9.3.2 The CAD printer that is located in an ERF shall be capable of printing four pages per minute.

9.4 Classification of CAD Systems.

CAD systems in emergency services shall be categorized as Class 1, Class 2, or Class 3.

9.4.1 Class 1 CAD System.

9.4.1.1 A Class 1 CAD system shall be equipped with a level of computer technology and equipment that selects and recommends to the telecommunicator the appropriate units to be dispatched.

9.4.1.2 A Class 1 CAD system shall be redundant and shall provide automatic switchover in case of failure of the primary operating processors and shall transmit and receive data transmissions from an ERF, other administrative sites, and mobile units that are operated by

the emergency services.

9.4.2 Class 2 CAD System.

9.4.2.1 A Class 2 CAD system shall be equipped with a level of computer technology and equipment that is used in the communications center to support dispatching operations.

9.4.2.2 A Class 2 CAD system shall be redundant and shall transmit and receive data transmissions from an ERF, other administrative sites, and mobile units that are operated by the emergency services.

9.4.3 Class 3 CAD System. A Class 3 CAD system shall be equipped with a level of computer technology that is used as a support function to emergency service dispatching and that is used for status and logging information.

9.5* Class 3 CAD System Requirements.

9.5.1 General. A Class 3 CAD system shall consist of a computer software program and databases that operate on a system that consists of a computer, monitor, keyboard, and printer.

9.5.1.1 The system shall permit manually entering alarm information such as hazardous materials, location, emergency contact, and other information that is deemed necessary by the authority having jurisdiction.

9.5.1.2 The system shall provide support to the monitoring and management of in-process incidents.

9.5.1.3 The system shall provide detailed and accurate reports of all operations in a format that is approved by the authority having jurisdiction.

9.5.1.4 Alarm data shall be printed in a readable format.

9.5.2 Computer System Requirements.

9.5.2.1 The system shall accommodate the call volumes and other sizing parameters that are required by the authority having jurisdiction.

9.5.2.2 The system shall provide the operational capabilities that are required by the authority having jurisdiction.

9.5.2.3 The system full-load response time, measured from the time a telecommunicator completes a keyboard entry to the time of full display of the system response on the CRT screen, shall not exceed 5 seconds.

9.5.3 Applications Software and Database Support.

9.5.3.1 The system applications software shall be written in a high-order programming language that meets all of the following criteria:

(1) It shall be modular.

(2) It shall be fully documented in the source code.

(3) It shall be designed and implemented in accordance with the standards of software

engineering.

9.5.3.2 The system applications shall function under the overall control of a standard operating system that includes support functions and features as required by the authority having jurisdiction.

9.5.3.3 The data files shall be maintained and updated in an on-line interactive mode that is supported by a set of telecommunicator commands, data entry screens, and related software provided for the update of all user-modified files.

9.5.4 Computer Hardware. Each computer shall be provided with the memory and the input and output (I/O) capacity that are necessary to support software functions and to meet the performance requirements of this standard.

9.5.4.1 Storage Network.

9.5.4.1.1 The system shall provide on-line storage that meets all functional and performance requirements of this standard for programs and data.

9.5.4.1.2 Capacity shall be provided for the storage of a minimum of 100 days of history log data.

9.5.4.2 Workstations.

9.5.4.2.1 The workstation shall have a display screen, keyboard, and printer.

9.5.4.2.2 A spare workstation loaded with the required software shall be immediately available.

9.5.4.2.3 A workstation that is used for other than the required applications shall be considered to be a spare workstation if it is immediately available.

9.5.4.3 Display Screens.

9.5.4.3.1 The display screen shall be of a size that has the capacity to display the information that is required by the authority having jurisdiction.

9.5.4.3.2 Characters shall be displayed on the display screen in a manner that is approved by the authority having jurisdiction.

9.5.4.3.3 Display intensity shall be adjustable from completely dark to maximum display brightness by using controls that are available to the telecommunicator.

9.5.4.3.4 All characters shall be visible in a lighted room without obstruction from the glare of ambient lighting.

9.5.4.3.5 The display screen shall be stable and free of unintentional motion.

9.5.4.3.6 Characters shall have a uniform appearance on all parts of the screen.

9.5.4.4 Keyboards and Pointers.

9.5.4.4.1 The keyboard shall be capable of controlling all CAD operational functions as well as all display screens that are associated with the specific workstation.

9.5.4.4.2 The keyboard design shall prevent malfunction caused by spilled liquids.

9.5.4.4.3 Pointing devices shall be resistant to dust, dirt, and accidental falls.

9.6 Class 2 CAD System Requirements.

9.6.1 General. A Class 2 CAD system shall consist of an integrated system of computers, keyboards, terminals, display screens, printers, local and remote administrative terminals, databases, and computer software.

9.6.1.1 The system shall be capable of interfacing with related alarm-receiving systems and alarm-dispatching systems.

9.6.1.2 The system shall perform the following functions:

(1) Process emergency calls for service

(2) Handle peak call loads

(3) Provide initial alerting and dispatch communications to assigned response units

(4) Provide assigned response units with all necessary information

(5) Provide response unit status monitoring

(6) Support direct entry of status information from response unit.

9.6.1.3 The system shall provide automated support to the monitoring and management of in-process incidents.

9.6.1.4 Each computer shall be provided with the memory and I/O capacity that are necessary to support software functions and to meet the performance requirements of this standard.

9.6.2 Computer Systems Requirements.

9.6.2.1 The system shall accommodate the call volumes and other sizing parameters that are required by the authority having jurisdiction.

9.6.2.2 The system shall provide the operational capabilities that are required by the authority having jurisdiction.

9.6.2.3 The system full-load response time, measured from the time a console telecommunicator completes a keyboard entry to the time of full display of the system response on the screen, shall not exceed 5 seconds.

9.6.2.4 The system shall be available and fully functional at least 99.5 percent of the time.

9.6.2.5 The failure of any single component shall not disable the system.

9.6.2.6 The system shall include automatic power-fail recovery capability.

9.6.3 Applications Software and Database Support.

9.6.3.1 The system applications software shall be written in a high-order programming language that meets all of the following criteria:

(1) It shall be modular.

(2) It shall be fully documented in the source code.

(3) It shall be designed and implemented in accordance with the accepted standards of software engineering.

9.6.3.2 The system applications shall function under the overall control of a standard operating system that includes support functions and features as required by the authority having jurisdiction.

9.6.3.3 The data files shall be maintained and updated in an on-line interactive mode, using workstations that are supported by a set of telecommunicator commands, data entry screens, and related software provided for update of all user-modified files.

9.6.4 Computer Hardware.

9.6.4.1 The CAD system shall be based on two identical computers, herein designated as A and B.

9.6.4.2 The mass storage configuration of computers A and B shall meet the following requirements:

(1) It shall maintain redundant copies of all critical CAD on-line files.

(2) It shall provide protection from the detrimental effect of failure or from the maintenance outage of any single disk, tape drive, or device controller.

(3) It shall allow the connection to the computers of any device that is independent of the other devices.

(4) It shall be automatically reconfigurable under software control.

9.6.4.3 Each computer shall be provided with the memory and I/O capacity that are necessary to support software functions and to meet the performance requirements of this standard.

9.6.4.4 Each of the on-line CAD system computers shall perform the following functions:

(1) The computers shall continuously monitor the CAD system peripheral devices and interfaces for equipment failures, device exceptions, and time-outs.

(2) On detection of system failure, the computers shall send messages to the supervisor and computer console terminal by visible and audible means.

(3) The computers shall continuously monitor each other's operation by means of periodic inquiries that necessitate positive acknowledgments.

9.6.4.5 The system shall provide the telecommunicator with the ability to switch over equipment and resume operations within 2 minutes.

9.6.4.6 Computers A and B shall each have a dedicated terminal that includes the following:

(1) Keyboard

(2) Display screen

(3) Printer for hard copy log of system messages and transactions

9.6.5 Storage Network.

9.6.5.1 The system shall provide on-line storage that meets all of the functional and performance requirements of this standard for programs and data.

9.6.5.2 Capacity shall be provided for the storage of a minimum of 100 days of history log data.

9.6.6 Workstations. Each workstation shall have a display screen and keyboard.

9.6.6.1 A spare display screen and keyboard shall be available in the communications center for immediate changeout for every three workstations, or fraction thereof, up to a maximum of three spare display screens and keyboards.

9.6.6.2 For the purpose of this subsection, any administrative display screens and keyboards beyond those required for telecommunicator workstations that are not considered essential to the receipt and dispatch of emergencies shall be permitted to be considered as spare display screens and keyboards.

9.6.7 Display Screens.

9.6.7.1 The display screen shall be of a size that has the capacity to display the information that is required by the authority having jurisdiction.

9.6.7.2 Characters shall be displayed on the display screen in a manner that is approved by the authority having jurisdiction.

9.6.7.3 Display intensity shall be adjustable from completely dark to maximum display brightness by using controls that are available to the telecommunicator.

9.6.7.4 All characters shall be visible in a lighted room without obstruction from the glare of ambient lighting.

9.6.7.5 The display screen shall be stable and free of unintentional motion.

9.6.7.6 Characters shall have a uniform appearance on all parts of the screen.

9.6.8 Keyboards and Pointers.

9.6.8.1 The keyboard shall be capable of controlling all CAD operational functions as well as all display screens that are associated with the specific workstation.

9.6.8.2 The keyboard design shall prevent malfunction caused by spilled liquids.

9.6.8.3 Pointing devices shall be resistant to dust, dirt, and accidental falls.

9.6.9 Printers.

9.6.9.1 The system shall include two printers for dispatch logging in addition to the printer required in 9.6.4.6.

9.6.9.2 All printers shall be interchangeable.

9.6.9.3 Logging or utility functions shall be assignable to any printer under system control.

9.6.9.4 A spare printer shall be available.

9.6.10 Information Transmittal. Data communications systems that connect ERFs and administrative sites with the system shall communicate at a minimum rate of 9600 bits per second.

9.6.10.1 Mobile units shall communicate with the CAD system at a minimum rate of 2400 bits per second.

9.6.10.2 The transmission of computer information to mobile units or fixed locations that are associated with emergency operations shall be in accordance with Federal Communications Commission (FCC) rules and regulations for the type of service being used.

9.6.10.3 The message formats shall be uniform across the system as required by the authority having jurisdiction.

9.7 Class 1 CAD System Requirements.

9.7.1 General. A Class 1 CAD system shall consist of all the components and meet all the requirements of a Class 2 CAD system and shall also meet the requirements of 9.7.1.1 through 9.7.1.4.

9.7.1.1 In addition to the requirements of 9.6.1.2, the system shall select response units for assignment to calls and shall ensure that the optimum response units are selected.

9.7.1.2 In addition to the requirements of 9.6.4.4, on detection of a failure, the computers shall perform any required reconfiguration and shall queue notification messages to the supervisor and computer terminal.

9.7.1.3 When a failure is detected, the backup computer shall assume the operation of the on-line CAD applications.

9.7.1.4 In addition to automatic switchover capabilities, the system shall provide the capability to manually initiate computer switchover.

9.8 Remote Data Terminals (RDTs).

9.8.1 General.

9.8.1.1 RDTs and associated equipment shall be manufactured for the environment in which they are to be used.

9.8.1.2 Data communications at RDTs shall perform at least the following functions:

(1) Indicate to the CAD that the RDT system is operational

(2) Indicate to the CAD the success or failure of any message to an RDT

(3) Download forms not permanently stored at all RDTs

9.8.1.3 Emergency messages to RDTs shall take priority and shall be immediately indicated and printed if printers are included in the system.

9.8.1.3.1 An RDT display screen shall not be automatically updated.

9.8.1.3.2 Displays shall be configured to indicate that a message is waiting.

9.8.1.4 The RDT shall be capable of acknowledging the receipt of a message by automatic and manual means.

9.8.1.4.1 The RDT shall automatically transmit an acknowledgment that it has received and stored a message.

9.8.1.4.2 A manual acknowledgment shall indicate that the responding personnel have viewed the message and are taking appropriate action.

9.8.1.4.3 Failure to receive an automatic or manual acknowledgment from the RDT shall cause a notification to the controlling telecommunicator display screen in the communications center.

9.8.1.5 The RDT shall not require power to maintain programmed functions.

9.8.2 Equipment and Operation.

9.8.2.1 The RDTs shall be interchangeable so that any RDT can be installed in any vehicle or fixed location.

9.8.2.2 The RDT shall connect to its associated radio transceiver by a plug-in locking-cable assembly.

9.8.2.3 The RDT shall perform all functions as required by the authority having jurisdiction while keeping keystrokes to a minimum.

9.8.2.3.1 The terminal shall provide single keystroke operation for response unit status reporting functions.

9.8.2.3.2 The terminal shall display information with a minimum use of multipage display.

9.8.2.4 The RDTs shall provide visual indication that the unit is energized and shall have manual controls mounted on the unit for the following:

(1) Display intensity

(2) Audible alarm volume

(3) Alarm test

(4) Power on/off

9.8.2.5 The RDTs shall have an emergency alert button (MAYDAY) that transmits a distress signal to the controlling telecommunicator.

9.8.2.6* The RDTs shall activate audible and visual indication of incoming messages with the volume of the audible alarm sufficient to overcome ambient noise.

9.8.2.7 The RDTs shall have a last-in/first-out feature that allows the user to recall the last

10 messages transmitted or received.

9.8.2.8 Each RDT shall have an individual addressing identifier that is transmitted automatically with each message and shall be capable of receiving single, group, or all-call messages.

9.8.2.9 The RDT shall continuously display a current response unit status that includes the indicators specified in 9.8.2.9(1) through (6).

(1) *Transmitter Keyed.* Transmitter keyed indicates that a message sent by the RDT is currently being transmitted.

(2) *Message Received.* Message received indicates that the last transmission has been correctly received by the communications center.

(3) *No Acknowledgment/Fail.* No acknowledgment/fail indicates that a transmission was not received after a predetermined number of retransmissions.

(4) *Channel Busy.* Channel busy indicates that the terminal cannot transmit due to other traffic on the frequency and that the message will be sent as soon as the frequency is clear; no manual retransmission is necessary.

(5) *Message Waiting.* Message waiting indicates that a new message is waiting to be sent to the terminal and the user needs to clear the page to allow the message to be accepted.

(6) *Acknowledgment Required.* Acknowledgment required indicates that manual acknowledgment by the user of a received message is required.

9.8.3 Keyboard.

9.8.3.1 The bottoms of detachable keyboards shall have nonskid surfaces.

9.8.3.2 The keyboard design shall prevent malfunction caused by spilled liquids.

9.8.4 Display Screens.

9.8.4.1 All information shall be visible in daylight conditions.

9.8.4.2 The display screen shall be stable and free of unintentional motion.

9.8.4.3 Characters shall have a uniform appearance on all parts of the screen.

9.9 Mobile Printers. (Reserved)

Chapter 10 Testing

10.1 General.

10.1.1 Tests and inspections shall be made at the intervals specified in this standard.

10.1.2 All equipment shall be restored to operating condition promptly after each test or alarm for which the equipment functioned.

10.1.3 Where tests indicate that trouble has occurred anywhere on the system, one of the following shall be required:

(1) The telecommunicator shall take steps to repair the fault.

(2) If repair is not possible, action shall be taken to isolate the fault and to notify the official responsible for maintenance.

10.2 Acceptance Testing.

10.2.1 New equipment shall be provided with operation manuals that cover all operations and testing procedures.

10.2.2 All functions of new equipment shall be tested in accordance with this chapter and the manufacturers' specifications before being placed in service.

10.2.3 All cables shall be tested in accordance with this chapter where installed with all taps and splices made.

10.2.3.1 Before connection to terminals, cables shall be tested for insulation resistance.

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

10.2.4 The frequency, modulation, power output, and receiver sensitivity and selectivity shall be tested and recorded when the radio is installed or repaired.

10.3 Operational Testing.

10.3.1 Wired Dispatch Circuits. Manual test of wired dispatch circuits shall be as follows:

(1) A test shall be performed and recorded at least once every 24 hours.

(2) Circuits for transmission of graphic signals shall be tested by a message transmission.

10.3.2 Power Supply for Wired Dispatch Circuits. Manual tests of the power supply for wired dispatch circuits shall be made and recorded at least once during every 24 hours and shall include the following:

(1) The current strength of each circuit shall be tested and changes in the current of any circuit that amount to 10 percent of normal current shall be investigated.

(2) The voltage across terminals of each circuit inside terminals of protective devices shall be tested and changes in the voltage of any circuit that amount to 10 percent of normal voltage shall be investigated immediately.

(3) The voltage between ground and circuits shall be tested as follows:

(a) Where the test indicates a reading in excess of 50 percent of that shown in the test specified in 10.3.2, the trouble shall be located immediately and cleared.

(b) Readings in excess of 25 percent shall be given early attention.

(c) Systems in which each circuit is supplied by an independent current source

shall require tests between ground and each side of each circuit that are performed with a voltmeter of not more than 100 ohms resistance per volt.

(4) A ground current reading shall be permitted in lieu of the test specified in 10.3.2, and all grounds that indicate a current reading in excess of 5 percent of the normal line current shall be given immediate attention.

(5) The voltage across common battery terminals on the switchboard side of fuses shall be tested.

(6) The voltage between common battery terminals and ground shall be tested and abnormal ground readings investigated immediately.

(7) If more than one common battery is used, each common battery shall be tested.

10.3.3 Alerting Means. Outside audible alerting devices, radio, telephone, or other means for alerting emergency response personnel shall be tested as required by the authority having jurisdiction.

10.3.4 Radio and Voice Amplification Circuits. All primary and secondary radio and voice amplification circuits shall be subjected to a voice test twice daily.

10.3.5 Public Safety Answering Point (PSAP) Telephone Testing. Each incoming circuit of a PSAP shall be tested daily.

10.3.6 Emergency Lighting. Emergency lighting shall be tested in accordance with *NFPA 101, Life Safety Code.*

10.3.7 Stored Emergency Power Supply System/Uninterruptible Power Supply (SEPSS/UPS). An SEPSS/UPS shall be tested in accordance with NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems.*

10.4 Power.

10.4.1 Emergency and standby power systems shall be tested in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems.*

10.4.1.1 Emergency power sources other than batteries shall be operated to supply the system continuously for 1 hour weekly.

10.4.1.2 The test for emergency standby power systems shall require simulated failure of the primary power source.

10.4.2 Periodic tests shall be performed to ensure that the batteries are capable of supplying the system with power.

10.4.3 To maximize battery life, the battery voltage for lead-acid cells shall be maintained within the limits specified in the Table 10.4.3.

Table 10.4.3 Battery Maintenance Voltage

Float Voltage Battery (Lead Calcium)	High-Gravity Battery (Lead Antimony)	Low-Gravity Battery

Table 10.4.3 Battery Maintenance Voltage

Float Voltage Battery (Lead Calcium)	High-Gravity Battery (Lead Antimony)	Low-Gravity Battery
Maximum	2.25 V/cell	2.17 V/cell
Minimum	2.20 V/cell	2.13 V/cell
High-rate voltage	2.33 V/cell	

Note: High- and low-gravity voltages are +0.07 volts and –0.03 volts, respectively.

10.4.4 To maximize battery life, the battery shall be charged as specified in Table 10.4.4.

Table 10.4.4 Battery Charging Voltage

Float voltage	1.42 V/cell ±0.01 V
High-rate voltage	1.58 V/cell + 0.07 V – 0.00 V

Chapter 11 Records

11.1 General.

Complete records to ensure operational capability of all dispatching system functions shall be maintained.

11.2 Installation.

11.2.1 Wired Circuits. Records of wired dispatch circuits shall include the following:

(1) Outline plans that show all terminals in sequence

(2) Diagrams of office wiring

(3) Materials used, including trade name, manufacturer, and year of purchase or installation

11.2.2 Radio Channel. Records of radio dispatch channels, and any associated wired circuits, shall include the following:

(1) Outline plans that show transmitters and receivers

(2) Diagrams of interconnecting office wiring

(3) Materials used, including trade name, manufacturer, and year of purchase or installation

11.2.3 Changes and Additions. Changes or additions shall be recorded in accordance with 11.2.1 and 11.2.2.

11.3 Acceptance Test Records/As-Built Drawings.

After completion of acceptance tests that have been approved by the authority having jurisdiction, the following shall be provided:

(1) A set of reproducible, as-built installation drawings

(2) Operation and maintenance manuals

(3) Written sequence of operation

(4) Results of all operational tests and values at the time of installation

11.4 Training Records.

Training records shall be maintained for each employee as required by the authority having jurisdiction.

11.5 Operational Records.

11.5.1 Performance statistics shall be compiled and maintained in accordance with Section 6.4.

11.5.2 Statistical analysis for performance measurement shall be done monthly and compiled over a 1-year period.

11.5.3 Records of the following, including the corresponding dates and times, shall be kept by the jurisdiction:

(1) Test, alarm, and dispatch signals

(2) Circuit interruptions and observations or reports of equipment failures

(3) Abnormal or defective circuit conditions indicated by test or inspection

11.6 Maintenance Records.

11.6.1 Records of maintenance, both routine and emergency, shall be kept for all alarm receiving equipment and alarm dispatching equipment.

11.6.2 All maintenance records shall include the date, time, nature of maintenance, and repairer's name and affiliation.

11.7 Retention of Records.

11.7.1 Records required by Sections 11.2, 11.3, 11.5, and 11.6 shall be maintained for the life of the affected equipment.

11.7.2 Records that are required under Sections 6.4, 6.6, 10.3, and 11.5 shall be maintained for 2 years, or as required by law or the authority having jurisdiction.

11.7.3 Where call detail recording (CDR) is provided, records shall be maintained for 2 years, or as required by law or the AHJ.

Chapter 12 Public Alerting Systems

12.1 General.

Public alerting systems shall meet the requirements specified in this chapter.

12.1.1 All public alerting systems and related components shall comply with national, state, provincial, and local rules and regulations governing public alerting systems and related system components.

12.1.2 The authority having jurisdiction shall develop and maintain standard operating procedures and standard operating guidelines for systems used.

12.1.3 A public alerting system that utilizes a communications network(s) developed and used for other purposes shall be engineered to work within the capacity of such network.

12.1.4* A public alerting system (PAS) with a public alerting system alerting appliance (PASAA) that is part of a communications network developed and used for the delivery of data messages other than public safety shall be engineered to give priority to the public alerting system, as needed.

12.1.5 A public alerting system shall be backwards compatible.

12.2 Security.

12.2.1 The authority having jurisdiction shall enforce security procedures to prevent unauthorized use.

12.2.2 The authority having jurisdiction shall enforce security procedures to prevent the misuse of sensitive information.

12.2.3* In the absence of national, state, provincial, or local rules and regulations, the authority having jurisdiction shall develop and enforce security procedures to prevent unauthorized use and misuse of sensitive information.

12.3 Permitted Uses.

12.3.1* Systems shall be used for alerting the public to natural and man-made events that can be expected to result in the loss of life, health, and property, including tornadoes, hurricanes, floods, fire, and chemical release.

12.3.2 Use of the system to alert public officials shall be permitted in accordance with 12.1.2.

12.4 Permitted Systems.

The following types of systems shall be permitted:

(1) Automated telecommunications dial-out systems delivering recorded voice messages

(2) Automated telecommunications dial-out systems with signals transmitted to PASAA

(3)* Radio broadcast systems and tone alert systems using PASAA

(4) Cellular systems with PASAA

(5) Paging systems with PASAA

(6) Siren systems with loud speakers

12.5* Public Alerting System Alerting Appliances (PASAA).

Public alerting system appliances shall be capable of the following:

(1) Receiving an alert data message (ADM) from a public alerting system.

(2) Providing an audible alert in response to an ADM that meets the audible characteristics of an alarm as defined in *NFPA 72, National Fire Alarm Code.*

(3) Providing a visual alert signal in response to an ADM that meets the following requirements:

  (a) The signal shall be a flashing light.

  (b) The signal shall be red or blue in color.

  (c) The signal shall only be used for an ADM, and the loss of public alerting services, where such capabilities exist.

(4) Providing trouble signal in response to a low-battery condition.

  (a) The signal shall not use lights of the same color used for other purposes.

  (b) The trouble signal shall have a battery source of power that serves as either the primary or secondary power supply.

(5) Providing an alert that is distinctly different from that used with an ADM, if the PASAA is capable of detecting loss of service or functions.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.2.1 The intent of this standard should not be to establish the methods by which the requirements of this section are to be achieved.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase “authority having jurisdiction,” or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.8 Bit. A bit is a single digit in a binary number (0 or 1).

A.3.3.10 Byte. A byte is made up of eight binary digits (bits). A byte holds the equivalent of a single character, such as the letter A, a dollar sign, or a decimal point.

A.3.3.11.1 Coaxial Cable. Coaxial cable is also known as a coaxial line or a concentric line.

A.3.3.14.2 Radio Channel. The width of the channel depends on the type of transmissions and the tolerance for the frequency of emission. A radio channel is normally allocated for radio transmission in a specified type of service or by a specified transmitter.

A.3.3.16 Circuit. Specific types of circuits include dispatch, local, and tie circuits.

A.3.3.16.2 Dispatch Circuit. A dispatch circuit was formerly called an alarm circuit.

A.3.3.20 Communications Officer/Unit Leader. The position is a function that falls under the logistics section of the Incident Command System (ICS).

A.3.3.22 Comprehensive Emergency Management Plan (CEMP). In some jurisdictions a CEMP might also be known as a disaster management plan.

A.3.3.33.1 Computer-Aided Dispatching (CAD). Dispatch data can include response assignments, address locations, equipment status, utility locations, and special hazards.

A.3.3.37 Emergency Response Agency (ERA). An emergency response agency includes any public, governmental, private, industrial, or military organization that engages in the operations specified in the definition.

A.3.3.38 Emergency Response Facility (ERF). Examples of emergency response facilities include a fire station, police station, ambulance station, rescue station, ranger station, and similar facilities.

A.3.3.42.1 Radio Frequency. The present practicable limits of radio frequency are roughly 10 kH to 100,000 MHz. Within this frequency range, electromagnetic waves can be detected

and amplified as an electric current at the wave frequency. Radio frequency usually refers to the radio frequency of the assigned channel.

A.3.3.59 Notification. Notification can be made by either electronic or mechanical means.

A.3.3.77 Response Unit. Some examples of response units could include patrol car, ambulance, rescue vehicle, pumper, ladder truck, elevating platform, service vehicle, marine unit, supervisor, tow truck, motor assistance vehicle, construction equipment, mass transit vehicles, or personnel assigned a unique identification number or name used for dispatches.

A.3.3.80 Standard Operating Procedures (SOP). In some jurisdictions standard operating procedures are also known as standard operating guidelines (SOG).

A.4.1.1 The complexity and size of the communications center varies with different jurisdictions. While a large communications center can be staffed 24 hours a day by several telecommunicators, other jurisdictions can use a continuously attended watch desk in an ERF. The staffing needs for watch desk telecommunicators or communications center telecommunicators pose problems for agencies with limited funds and limited full-time personnel. Some jurisdictions solve this problem by having one center handle the emergency calls of all public safety organizations.

A.4.1.2 Another solution for emergency response agencies is to have a number of neighboring emergency response agencies operate a joint communications center. To achieve maximum value from limited facilities, emergency response agencies can pool operations with mutual aid arrangements, which are facilitated when a common communications center is used. Many regions and rural and suburban areas exist where no one emergency response agency can afford a communications center. However, a multijurisdictional communications center can be established, and the expense can be shared.

A.4.1.3 Populated areas frequently extend over several contiguous communities within multiple jurisdictions. A telephone company does not limit or separate services on the basis of municipal boundaries. The continued expansion of the public telephone network can cause calls to a telephone company telecommunicator to be routed to a distant location. A person dialing the telephone company telecommunicator to report a fire is not assured that the telecommunicator can transmit the alarm to the proper emergency response agency.

Emergency response agencies and other public safety services recognize the need for the public to be able to reach them quickly, regardless of their location when an emergency arises. In January 1968, a proposal was made to implement throughout the country a single national emergency number that the public could use to reach the police, emergency response agencies, and other emergency agencies from any location. The number 9-1-1 was chosen. The 9-1-1 system is an easy-to-remember, three-digit telephone number that is used to provide the general public with direct access to emergency service resources.

A.4.2.3 Design considerations for below-grade centers should include the following:

(1) Special requirements for means of egress

(2) Depth of the local water table relative to the floor elevation

(3) Humidity control

(4) Sumps and pumps having the capacity to prevent flooding under the heaviest possible rainfall

(5) Smoke removal or control systems

(6) Additional backup power needs

(7) Employee morale

(8) Other pertinent issues

A.4.2.4 Arrangements with another jurisdiction to allow the use of its facility as the alternative facility are acceptable. Such agreements should be made in writing.

A.4.2.5 The Comprehensive Emergency Management Plan (CEMP) is included as part of the SARA Title III requirements. The plan should be exercised on a regular basis to ensure that the plan is workable and that employees are familiar with the procedures.

The local emergency planning committee (LEPC) is comprised of emergency response agency representatives, local government, schools, emergency management personnel, other government agencies, and the private sector. The CEMP is developed by this committee and used as part of the planning process in emergency management.

NFPA 1600, *Standard on Disaster/Emergency Management and Business Continuity Programs,* also outlines the requirements for emergency planning. The communications center is a critical component of any emergency plan and serves as a link between the emergency operations center (EOC) and emergency response agencies.

A.4.4.1.2 The ability to provide fresh, properly conditioned air is critical to the operation of the communications center. Security requirements, co-location of communications centers in buildings with other uses, operation of computer equipment, uninterruptible power supply (UPS), and radios combine to create a very high cooling demand that is often added without proper engineering to an existing building HVAC system.

The primary HVAC system is to be designed for the task. The goal is to provide uninterrupted conditioning under all types of climatic conditions and to simultaneously protect communications center occupants from hazardous airborne contaminants (such as smoke) that can be drawn into the communications center from the rest of the building.

Methods of providing backup HVAC to the communications center include the use of other systems within a building that is shared by the center and the use of prepositioned portable air-conditioning units. Another method is to install an HVAC system that can provide the minimum cooling necessary, using an alternate air source, and that is connected to the cooling system ducts.

When HVAC systems fail and no backup is provided, the first casualty is usually security. Doors or windows that are required to be closed are opened, often without the knowledge or consent of the authority having jurisdiction.

A.4.5.9 The decision to evacuate or to not evacuate the communications center in the event

of a fire or threat of fire is not simple. It involves moving the telecommunicators to a backup dispatch center or to a cooperating agency in a nearby jurisdiction. The communications center should be assigned dedicated fire suppression resources in the event of a fire in the communications center or a fire in the building housing the communications center. Decisions that involve continued operation or evacuation of the center should be made by the fire suppression officer and the telecommunicator supervisor.

A.4.6.5(3) For instance, a window facing a break area within the secure area assigned solely for the use of the communications center does not require bullet-resistant glass as long as a block wall surrounds the break area.

A.4.7.7.2 Stored batteries should preferably be located on the same floor as the operating equipment.

A.4.8.2.1 The following extract is from NFPA 70, *National Electrical Code:*

700.12 General Requirements. Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, emergency lighting, emergency power, or both shall be available within the time required for the application but not to exceed 10 seconds. The supply system for emergency purposes, in addition to the normal services to the building and meeting the general requirements of this section, shall be one or more of the types of systems described in 700.12(A) through (D). Unit equipment in accordance with 700.12(E) shall satisfy the applicable requirements of this article.

In selecting an emergency source of power, consideration shall be given to the occupancy and the type of service to be rendered, whether of minimum duration, as for evacuation of a theater, or longer duration, as for supplying emergency power and lighting due to an indefinite period of current failure from trouble either inside or outside the building.

Equipment shall be designed and located to minimize the hazards that might cause complete failure due to flooding, fires, icing, and vandalism.

Equipment for sources of power as described in 700.12(A) through (D) where located within assembly occupancies for greater than 1000 persons or in buildings above 23 m (75 ft) in height with any of the following occupancy classes — assembly, educational, residential, detention and correctional, business, and mercantile — shall be installed either in spaces fully protected by approved automatic fire suppression systems (sprinklers, carbon dioxide systems, and so forth), or in spaces with a 1-hour fire rating.

FPN No. 1: For the definition of occupancy class, see 4.1 of NFPA *101, Life Safety Code.*

FPN No. 2: Assignment of degree of reliability of the recognized emergency supply system depends on the careful evaluation of the variables at each particular installation.

See also 700.12(B) and 700.12(F) [of the *NEC*].

A.4.9.1.2 See NFPA 1600, *Standard on Disaster/Emergency Management and Business Continuity Programs.*

A.4.16.1.4 Examples of fast surge suppression criteria for power lines can be found in Telcordia Technologies TR-NWT-001011, which are generic requirements for surge

protective devices (SPDs) on AC power circuits. See Issue 1, February 1992. Examples of fast surge suppression criteria for telephone lines can be found in Telcordia Technologies TR-NWT-001361, which are generic requirements for gas tube protector units. See Issue 1, December 1992.

A.4.16.1.5 For further information, see *NFPA 72, National Fire Alarm Code.*

A.4.16.1.7 For additional information, consult NFPA 70, *National Electrical Code.*

A.5.1.3.3 Such an arrangement is not meant to apply to the office of the chief and other executive officers or to the communications center, which can be housed in an ERF.

A.5.8 Local area network (LAN) computer and telephone cable are examples of communications wiring.

A.6.1.3 The supervisor position(s) in the communications center should be provided in addition to the telecommunicator(s) position(s). These supervisory personnel are intended to be available for problem solving.

A.6.1.4 The supervisor position(s) in the communications center is provided in addition to the telecommunicator(s) position(s). These supervisory personnel are intended to be available for problem solving.

A.6.2.2 Certification programs for telecommunicators are offered by organizations including the following:

(1) Associated Public Safety Communications, Officials International, Inc.

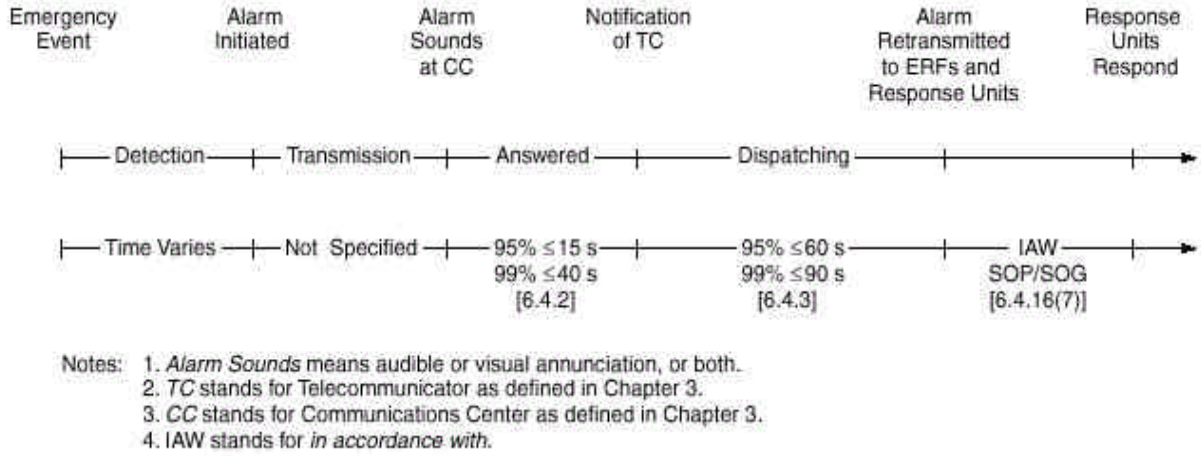
(2) International Municipal Signal Association

A.6.3.1 In jurisdictions receiving fewer than 730 alarms per year (an average of two alarms per 24-hour period), provision of a dedicated telecommunicator might not be necessary where alternate means approved by the authority having jurisdiction can effect the prompt receipt and processing of alarms in accordance with Section 6.4.

A.6.3.2 Emergency medical dispatch (EMD) protocols exist when telecommunicators provide prearrival emergency medical instructions.

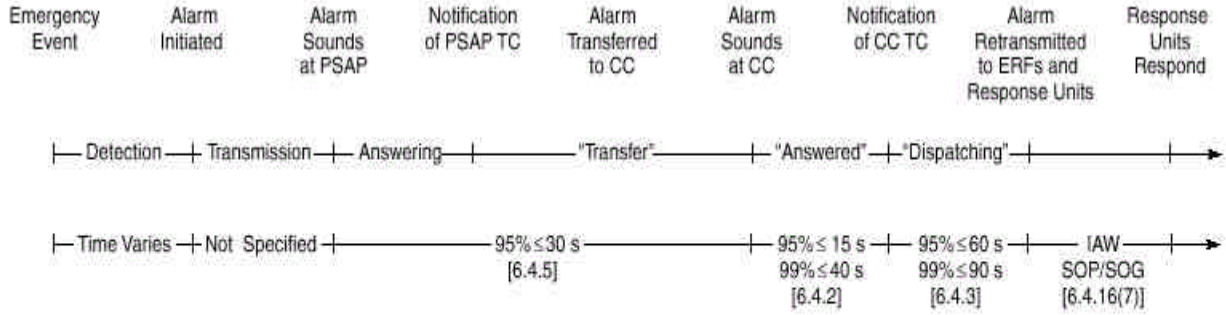
A.6.3.3 The issue of communication capabilities and/or failures is cited by NIOSH as one of the top five reasons for fire fighter fatalities. The importance of an assigned telecommunicator for specific incidents is a critical factor in incident scene safety. The assignment process should be outlined in specific standard operating procedures (SOP) within each agency represented in the communications center. This assignment process is further assisted when a command/communications vehicle is being staffed at the incident scene.

A.6.4.2 Statistical analysis for performance measurement should be completed over a period of 1 month. See Figure A.6.4.2(a) and Figure A.6.4.2(b).



Notes: 1. *Alarm Sounds* means audible or visual annunciation, or both.
2. *TC* stands for Telecommunicator as defined in Chapter 3.
3. *CC* stands for Communications Center as defined in Chapter 3.
4. IAW stands for *in accordance with*.

FIGURE A.6.4.2(a) Alarm Time Line Where Primary PSAP Is Communications Center.



Notes: 1. *Alarm Sounds* means audible or visual annunciation, or both.
2. *TC* stands for Telecommunicator as defined in Chapter 3.
3. *CC* stands for Communications Center as defined in Chapter 3.
4. IAW stands for *in accordance with*.

FIGURE A.6.4.2(b) Alarm Time Line Where Primary PSAP Is Other Than Communications Center.

A.6.4.4 Alarms should be retransmitted to emergency response personnel as soon as the location and general nature of the emergency have been ascertained by the telecommunicator. However, for some alarms involving criminal activity, the safety of emergency response personnel might require the telecommunicator to ascertain additional information from the caller, such as a description(s) of the suspect(s), a description(s) of the vehicle(s), the direction of travel, and the weapon(s) involved, which might make compliance with the 60-second time limit impractical. Therefore, the authority having jurisdiction for each law enforcement agency served by the communications center should establish time frames for the dispatch of law enforcement personnel in accordance with the corresponding agency's standard operating procedures.

A.6.4.9 The first unit to arrive at an emergency incident is responsible for notifying the communications center by radio of its arrival and for providing a brief description of the

conditions observed and the precise location of the incident. The responding officer should report arrival and should establish the initial command post at the emergency. As soon as conditions allow, the incident commander should report supplementary information to the communications center and should make additional progress reports if operations keep the units at the emergency longer than a few minutes. An extended or complex emergency incident can necessitate the use of a communications unit for effective coordination, command, and control.

A.6.4.10 The audible warning or signal is typically a distinctive tone.

A.6.4.12 The assignment of a communications officer/unit leader to incidents that are more complex ensures that adequate communication is achieved, using available telephone and radio systems. Such an assignment also ensures that the availability of existing frequencies or networks is maximized and that system overloading is minimized. An assigned communications officer can be particularly important and useful during multiagency fires and other incidents. It can be necessary to establish specific nets and monitoring systems to guarantee communications in some situations. In complex incidents, communications discipline is critical in avoiding system overload.

A.6.4.13 The common emergency organization, that is, the incident management system (IMS), includes two important communications concepts as follows:

(1) *Common Terminology.* All participating departments and agencies use clear text and established standard terms and phrases. In multiagency emergencies, it is extremely difficult to guarantee that all agency and department codes represent identical meanings. To avoid potential misunderstandings between telecommunicators, the IMS requires clear text or plain language for all radio messages. Although this is a significant departure from public safety agency tradition, it has been found to be efficient in actual practice.

(2) *Integrated Incident Communications.* Participating departments and agencies plan in advance for the use of integrated radio frequencies to tie together all tactical and support units assigned to an incident. To ensure the best possible use of all participating department and agency radios at major incidents, an Incident Radio Communications Plan matrix is developed. The matrix lists all available radio systems on an incident and aids in assigning them to provide command, tactical, and logistical coverage for a complete operation.

Preparation of the matrix necessitates training and a knowledge of cooperating department and agency frequencies and radio components. Use of the matrix is greatly enhanced by the existence of a frequency-sharing agreement. *(See Annex B.)*

The FCC has no prohibition against public agencies sharing frequencies during emergencies, provided that the responsible agency has granted permission to assisting agencies to do so. The agreement specifies the mutual permission of participating agencies to use other agency frequencies when providing assistance. The agreement lists the terms and conditions of use by others and includes all frequencies that can be made available under critical conditions. Such agreements facilitate better multiagency dispatching and incident communications and can be prepared by groups or agencies who work together

frequently.

A.6.5.1 The clock can be synchronized automatically by the use of a radio receiver that receives broadcasts by stations broadcasting standard time and interval signals, such as WWV, WWVH, WWVB in the United States and CHU in Canada; or through the use of GPS satellite time receivers; or by calling NIST in Boulder, CO, or the U.S. Naval Observatory in Washington, DC.

A.6.6.1(3) Recording by telecommunicator position, rather than by line, allows all telephone lines that are used in the communications center to be taped using a minimum of recorder resources.

A.6.7 The purpose of the quality assurance program is to follow up and review calls with communications center employees, improve procedures, and make the corrections needed to improve service and response. Generally accepted statistical methods should be used when selecting calls for review.

A.7.2.1.3 The separate business number listed in the telephone directory and used for nonemergency purposes should terminate at a location where personnel are on duty at least 40 hours per week, Monday through Friday.

A.7.2.2.6 A telephone line terminating at an unstaffed ERF and provided with a recorded message should not be used to meet the intent of the business line (nonemergency) listed in the directory and assigned for business (nonemergency) use as specified in 7.2.2.4.

A.7.3.4 The monitoring service is to be provided by the 9-1-1 vendor. Monitoring at the communications center itself is not sufficient, since a failure at the communications center can also involve a failure of the monitoring and also does not cover situations where 9-1-1 calls are not completed due to cable failure or intermediate central office failure.

A.7.3.5 Automated voice alarms, by their design, repeat their message many times and, therefore, can monopolize an inbound line for a considerable time. Therefore, they are not permitted to connect with published emergency numbers, and their use is not encouraged. Many state and local statutes prohibit such connections to designated emergency lines or to 9-1-1.

A.7.4.3.2 Two (wired) circuits run in the same conduit, duct bank, or trench, or run on the same pole line do not provide the level of safety intended by the committee.

A.7.4.4.1 It can be necessary to reroute 9-1-1 calls to another PSAP, either because the communications center is closed or because the authority having jurisdiction has decided that calls that cannot be handled on existing 9-1-1 trunks are to be handled by another PSAP.

A.7.4.4.2 Overflow occurs when there are more incoming 9-1-1 calls than there are 9-1-1 trunks available. Arrangements are to be made with the 9-1-1 provider to specify the seven-digit numbers to which such calls are to be routed.

A.7.4.4.4 Callers who are not informed by a recorded message that they have reached 9-1-1 can assume that their call will not be answered. If they hang up and dial 9-1-1 again, they remove themselves from the queue. Technology is available that provides callers with an

estimate of the waiting time. However, agencies should not make promises to 9-1-1 callers regarding the estimated time to connect a caller with a telecommunicator.

A.8.1.1 Communications centers that dispatch for volunteers or paid-call personnel have the responsibility of summoning such personnel at any hour of the day or night. Personnel can be summoned by the use of the telephone or radio, supplementing sirens or horns that provide an outside alarm. Alarms can be telephoned to the central telephone office where the telephone telecommunicator can start a siren or operate an air horn to indicate that there is an alarm. In areas where a communications center is not attended 24 hours a day, telephone companies can provide a telephone line that connects to special telephones that are located in places of business or residences selected by the jurisdiction. The jurisdiction then arranges to activate the alarms. In emergency response agencies that have an emergency response facility desk attendant, the telephone central telecommunicator can call the ERF, and the attendant can sound the outside alarm to call volunteers. If there is a code-sounding siren or air horn, coded signals can be sent. Usually a transmitting apparatus is used to send out the code.

If radio equipment is used, a receiver with selective calling equipment can be placed in the home of each volunteer or call person. Selective signaling is accomplished on a group-call principle, allowing the volunteer or call forces to be divided into several groups that can be summoned as a whole or as individual groups to handle a particular incident. Pagers are commonly used for this purpose, since they can be carried anywhere. Pagers can include either a tone alarm, a voice receiver, or a digital display.

A.8.1.1.3.1 In jurisdictions receiving fewer than 730 alarms per year (average of two alarms per 24-hour period), a second dedicated dispatch circuit might not be necessary.

A.8.1.1.3.2 When an alarm is transmitted to an ERF, it should be audible throughout the ERF, without the time delay caused by a responder going to a telephone instrument, picking up the handset, and then relaying the information to other affected responders.

A.8.1.1.4(2) It is not the intent to require duplicate equipment at each ERF for a voice radio primary dispatch circuit.

A.8.1.1.5(2) Where the primary dispatch circuit is provided through a radio system, regardless of whether the system is a conventional radio, a trunked radio, or a microwave radio, the system cannot also be used to provide the secondary means of dispatch.

A.8.1.1.5(7) The separate control/relay switching equipment connection ports in the ERF are permitted to connect common audio alerting devices and auxiliary equipment such as audio amplifiers and loudspeakers, ERF response lights, and printer equipment.

A.8.1.1.6 The audible warning or signal is typically a distinctive tone.

A.8.1.2 Portions of any dispatch system circuit can need a metal wire connection, such as a wired cable from a microphone to the transmitter/receiver equipment of a microwave/radio dispatch circuit. Such wired circuit connections in a portion of a radio or telephone dispatch circuit do not constitute a wired dispatch circuit.

A.8.3.1.1 Frequencies, their assignment, and the widths of channels are regulated throughout the world. In the United States, the Federal Communications Commission (FCC)

provides this regulation through allocation, licensing, and rules for all except federal government allocations. In Canada, the comparable regulating agency is Industry Canada. The National Telecommunications Information Administration (NTIA), under the U.S. Department of Commerce, performs functions similar to the FCC, but only for federal agencies. Wire line and radio communications are subject to FCC rules and regulations, which govern many areas of radio usage known as *service*. Of primary concern to emergency communications systems users are the public safety radio services, which provide for the use of radio communications systems by nonfederal governmental entities.

A.8.3.1.3 The telecommunicator should have the ability to monitor all tactical radio communications.

A.8.3.3.1 Coded squelch systems might utilize a specific tone or digital code, transmitted continuously, simultaneous with the desired message traffic. Examples of such a tone or code are a continuous tone-coded squelch system (CTCSS) and a continuous digital-coded squelch system (DCS). Analog trunked radio systems utilize a digital code for system access, specific to that analog trunked system, which accomplishes the same goal.

A.8.3.4.1 A complete overview of trunked system performance considerations, design, procurement, and use is contained within the documents collectively titled APCO Project 16.

A.8.3.4.1.1 In a digital access radio system, all units turned on and unassigned within the radio system coverage area monitor the signaling channel. Talkgroup assignments, emergency assignments, individual signaling calls, and special signal calls are broadcast to all monitoring units on the signaling channel. Requests for service (for example, talkgroup calls, emergency calls, selective alerting) from unassigned units are transmitted by the requesting unit, as data bursts, to the system on the signaling channel.

A.8.3.4.1.5 The use of such a timer can prevent a mobile *or* portable unit that transmits continuously, due either to equipment failure or to operator error, from monopolizing its assigned talkgroup. In a trunked system, units attempting to access the system while a talkgroup member is transmitting could be denied, unless such a unit activates the emergency function.

A.8.3.4.1.8 A system manager terminal allows the system supervisor to assign individual or talkgroup priority levels, or both, to all field units. The signaling language is structured so that access to the system is in accordance with the level of priority involved.

A.8.3.4.1.9 The emergency level of priority is intended for use only when immediate communications are necessary to preserve safety or protect life.

A.8.3.4.1.10 Trunked radio systems often are configured with many more talkgroups than can be accommodated by available voice channels. During a system controller failure, radios devolve to particular repeater channels and operate conventionally, which might result in overcrowding or busy channels. The authority having jurisdiction should require emergency services units to devolve to channels reserved specifically for emergency dispatch.

A.8.3.4.1.11 Handling requests by units that have been involved in recent conversations

before processing and assigning channels to units not involved in any recent conversations is intended to keep current conversations from becoming fragmented by any delays that might be caused by a new user request for a channel.

A.8.3.4.1.16 The alert should have a different sound from any other audible alert capable of being generated by the field unit. This enables the end user to determine that the unit is out of contact with the system.

A.8.3.4.1.17 The disabling of a field unit should prevent the unit from monitoring any voice communications on any channel or talkgroup in the system. A disabled unit should not be able to transmit or otherwise join into any voice conversation on the system. This disabling function occurs while the field unit is on the system anywhere within radio frequency (RF) coverage. The system should have the capability to automatically search for the unit multiple times, if so requested by the telecommunicator, and indicate when it succeeds in disabling the unit.

A.8.3.4.1.18 Remote talkgroup assignment is also known as dynamic regrouping. The system should include the ability to perform this function manually, as well as with a stored software plan, to allow for the automatic programming of many units into predetermined talkgroups. This preprogramming allows the saved plan to be initiated by the telecommunicator at any future time.

A.8.3.4.1.19 Telephone interconnect, while a popular selling point for trunked radio systems, represents a significant load on the system because it monopolizes one RF channel of the trunked system for the duration of the call. Multiple telephone calls can cause two-way voice users to receive busy indications from the system.

A.8.3.4.1.24 In the design and operation of a trunked radio system, dispatching of alarms must have priority over all other communications and is equal in priority to emergency messages from the field. For this reason, when units are dispatched over radio, the necessary priority is high enough to require “ruthless preemption,” which is the seizure and re-use of channels already in use by other conversations previously defined as lower in priority.

A.8.3.4.1.26 If the simplex frequencies selected for tactical use are the same as the output frequencies of any repeaters used by the system, a method of positive lockout of automatic system use of that frequency should be provided, controlled from the responsible telecommunicator workstation.

A.8.3.7 Emergency situations that result from large fires, transportation accidents, floods, severe storms, and other disasters often create a need for a temporary communications center to be located close to the scene of the disaster. Such a need is filled by a communications vehicle, sometimes called a mobile command post. The vehicle, which is a mobile command and control headquarters, serves as the hub from which the activities necessary to control an emergency situation can be directed and coordinated without dependence on the department's fixed communications center. Such activities for the control of emergencies include the efforts of local and outside departments and of other public safety organizations, such as police departments and emergency management agencies, in addition to public utilities.

Proximity to the site of the disaster provides communications vehicle personnel and those in

command with immediate access to the latest information in situations where changes occur rapidly. In addition, the ready availability of communications provides the means to call for additional help or to inform other jurisdictions of the situation.

A communications vehicle should carry a variety of equipment that allows communication with other emergency response agencies, public safety organizations, and utilities. Other equipment that can increase the flexibility of the system includes cellular telephones. Some vehicles can be equipped for mobile relay operation that allows them to pick up transmissions of mobile units and to retransmit them to the communications center at higher power levels or on different frequencies.

The communications vehicle can provide the following:

(1) Ability to exchange data messages between vehicles and communications centers or ERFs

(2) Improved command and control by television transmission of emergency activity to communications centers or ERFs

(3) Facsimile transmission of maps, preplans, and other written data

(4) Vehicle tracking and geographical locations, which can include global positioning system (GPS) receivers

A.8.4.2.1 Paging systems not under the direct control of the authority having jurisdiction are permitted to be used for administrative purposes but are not considered acceptable for use as a required dispatch system.

A.9.2 The authority having jurisdiction should regularly issue a hard copy of on-line dispatch (CAD) information, based on the frequency of database updates that is sufficient to provide a manual dispatch backup.

A.9.5 The exchange of digital alarm information between CAD systems should be accomplished in accordance with APCO guidelines.

A.9.8.2.6 To ensure that the audible alarm can be clearly heard, it should have a sound level at least 15 dBA above the average ambient sound level, or at least 5 dBA above the maximum sound level having a duration of at least 60 seconds, whichever is greater, measured 1.5 m (5 ft) from the RDT.

A.12.1.4 The education of the public, and distribution of PASAA, needs to be considered when planning or making a system improvement. PAS should take into consideration the special needs of individuals in the community.

A.12.2.3 Standard terminology used in the United States of America is defined by CFR 11, Federal Communications Commission, “Emergency Alert System.”

A.12.3.1 See NFPA 1600, *Standard on Disaster Management and Business Continuity Planning.*

A.12.4(3) Radio broadcast systems include systems identified as using public radio, private radio, television, cable, cellular, and pager technologies.

A.12.5 Reporting is an issue that varies greatly depending on the PAS solution used. A simple broadcast system might offer little to report, and a telecommunications-based system might offer the opportunity to identify specific locations or telephone lines to which a recorded message or an ADM was sent, as well as information that a PASAA, a telephone answering device, or a person has received the voice message or ADM.

Annex B Frequency-Sharing Memorandum of Understanding

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Memorandum of Understanding.

See Figure B.1.

Frequency-Sharing Memorandum of Understanding

This Memorandum of Understanding is between the following partner agencies: _____ Department of Forestry;
_____ Office of Emergency Services;
_____ City Emergency Response Agency;
_____ County Emergency Response Agency;
U.S. Forest Services (etc.)

The purpose of this Memorandum of Understanding is to establish terms and conditions for use of radio frequencies when partner agencies are engaged in a mutual aid effort on incident(s).

The Reciprocal Fire Protection Act of May 27, 1955 (PL 84-46) authorizes the United States government to enter into this Memorandum of Understanding.

The following terms and conditions are agreed to:

[Insert Terms Here]

_____ Department of Forestry	_____ County Emergency Response Agency
_____ Date	_____ Date
_____ Office of Emergency Services	_____ U.S. Forest Service
_____ Date	_____ Date
_____ City Emergency Response Agency	_____ County Emergency Response Agency
_____ Date	_____ Date
_____ County Emergency Response Agency	_____ County Emergency Response Agency
_____ Date	_____ Date

The following radio frequencies are licensed by the FCC under call sign _____ to the state of _____, Department of Forestry. _____ is licensed to use them in the state of _____ and vicinity with the exceptions noted. Partner agencies are subject to the same limitations. Partner agencies can use these frequencies on Department of Forestry–Partner Agency fires only after permission to use is given by the Department of Forestry Dispatch and Communication Center responsible for the fire.

Radio Frequency	Exceptions
1. _____	1. _____
2. _____	2. _____
(etc.)	(etc.)

FIGURE B.1 Sample Frequency-Sharing Memorandum of Understanding.

Annex C Guide on Principles and Practices for Communications Systems

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 Extracted Material.

Annex C contains portions of the former NFPA 297, *Guide on Principles and Practices for Communications Systems.*

C.2 Introduction.

This guide addresses systems and their components and operations that involve the transfer of information over a distance by electric or electronic means. This guide is intended to provide general information only. More specific technical data should be secured from manufacturers or communications specialists in state, provincial, or local governments.

C.3 Purpose.

The need for reliable communications has long been recognized in the emergency services. This guide focuses on the following four basic elements in the communications requirements for a communications system:

(1) Communications between the public and the emergency response agency

(2) Communications within the emergency response agency under emergency and nonemergency conditions

(3) Communications among emergency response agencies

(4) Communications between the emergency response agencies and other agencies

C.4 Basic Concepts.

C.4.1 System Elements. There are four basic elements in the communications requirements of an emergency response agency. Each plays an essential part in enabling the emergency response agency to meet its protection responsibility. The particular method used should meet the criteria for each element to be effective.

Radios, telephones, and other electronic equipment; operating procedures; and personnel training should enable messages to be conveyed as quickly and reliably as a situation requires. Messages should be sent and received correctly without delay. Time delay and the number of messages to be handled are strongly related to proper service. Systems and equipment should be provided so that the public can notify the emergency response agency of fires or other emergencies. Attention should be given to message types, number and length of messages, equipment capabilities, radio frequencies, and system organization. Effective operating practices should be developed and training should be provided to meet the needs of each agency.

The measure of adequate service is the ability of the system to handle emergency situations as well as the normal daily activities of the agency. A major conflagration, or multiple fires, generates a much greater need for communications than do normal daily activities.

C.4.2 Communications between the Emergency Response Agency and Other Agencies. Another function of a communications system is to pass messages between the emergency response agency and public safety–oriented agencies, such as public works; highway

maintenance departments and utilities; hospitals and ambulance services; towing and wrecking services; law enforcement agencies; civil defense units; industries; media; and weather forecasters.

Emergency response agencies exchange a large variety of information with other agencies. Since many of these agencies are equipped with radios, they can assist during major incidents.

One of the greatest demands for communications with other agencies can occur during major emergencies. The ability to meet this demand necessitates planning for message volumes and for possible language barriers. Communications for an emergency response agency should include contingency plans for emergency situations. During an emergency, there is little time to set up new communications links. The volume of messages to be handled is likely to exceed most estimates; therefore, plans should include a means for handling the volume of message traffic to prevent system breakdown due to overloading. Concerned public and media can rapidly overload a telephone system. Other agencies can lack the ability to understand the standard language of the ERA radio system. Therefore, liaison personnel who are familiar with the radio language of the emergency services and the assisting organizations are needed to maintain effective communications.

Any incident management system should include the following two important communications concepts that should improve communications effectiveness during major emergencies:

(1) Common terminology — use of clear text or plain language and established standard terms and phrases

(2) Integrated incident communications —the best possible use of all participating agency radio systems, including frequency-sharing agreements

Annex D Universal Emergency Number 9-1-1 Service

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1

Planning Guidelines for Universal Emergency Number (9-1-1) Systems is intended as a guide to assist those jurisdictions that are contemplating or that are planning 9-1-1 systems. There are three parts to the document as follows:

(1) Feature definitions

(2) Jurisdictional characteristics

(3) Feature versus characteristics correlation

In the feature definition section, all known 9-1-1 features are described. It should be noted, however, that this is a listing of all features, and not all features are technically compatible with each other. Furthermore, certain features can only be provided if special equipment is

available at the central office of the telephone company. The local telephone company should be consulted as early as possible when planning a 9-1-1 system.

The jurisdiction section considers various characteristics of municipalities that can influence the feature complement of a 9-1-1 system.

A graph that relates municipal characteristics to 9-1-1 features is included in the feature versus characteristics correlation.

It should be emphasized that the outline that follows is only a planning guideline. Each jurisdiction has a unique set of characteristics that should be evaluated and matched to a set of 9-1-1 features.

D.1.1 Feature Definitions. Feature definitions follow in (1) through (14).

(1) *Alternate Routing.* Alternate routing provides routing of 9-1-1 calls to a predesignated PSAP if the primary PSAP is unable to accept the call.

(2) *Automatic Location Identification (ALI).* Automatic location identification displays the calling party's address and other preselected information at the PSAP attendant position.

(3) *Automatic Number Identification (ANI).* Automatic number identification displays the calling party's telephone number at the PSAP attendant position.

(4) *Call Detail Recording (CDR).* Call detail recording provides a hard copy printout, after every call, of the ANI number, trunk number, and answering attendant number; and the time of seizure, answer, and disconnect/transfer.

(5) *Called Party Hold.* Call party hold allows the PSAP attendant to hold the established connection to the station from which the 9-1-1 call was originated, regardless of calling party action.

(6) *Default Routing.* Default routing provides routing of 9-1-1 calls to a designated PSAP when the primary PSAP cannot be selectively routed.

(7) *Emergency Ringback.* Emergency ringback allows the PSAP attendant to ring the calling station, regardless of the station switch-hook status.

(8) *Forced Disconnect.* Forced disconnect enables the PSAP attendant to terminate an existing 9-1-1 call at any time, regardless of the action of the calling party.

(9) *Idle Tone Application.* Idle tone application provides the PSAP attendant with an audible indication if the 9-1-1 caller abandons before the attendant answers the call or if the 9-1-1 caller terminates the call after the attendant answers the call.

(10) *Night Service.* Night service routes calls to an alternate PSAP when a PSAP closes down for a time.

(11) *Public Safety Answering Point (PSAP).* A public safety answering point is a facility where 9-1-1 calls are answered, either directly or through rerouting.

(12) *Selective Routing.* Selective routing routes a 9-1-1 call to the correct PSAP based on the calling party's telephone number, regardless of jurisdiction and telephone

company central office boundary mismatches.

(13) *Switch-Hook Status.* Switch-hook status provides a visual, audible, or visual and audible indication of whether the originating station on an established 9-1-1 call is on-hook or off-hook.

(14) *Transfer.* Transfer allows an incoming 9-1-1 call to be rerouted from one PSAP to another.

There are three generic types of transfer as follows:

(1) *Manual.* Voice only is rerouted using a series of operations at the attendant console.

(2) *Fixed.* Voice, ANI, and ALI are rerouted to a specific secondary PSAP by pressing a button associated with the desired PSAP.

(3) *Selective.* Voice, ANI, and ALI are rerouted to any number of secondary PSAPs based on the telephone number of the calling party by the operation of a single button.

D.1.2 Jurisdictional Characteristics.

D.1.2.1 Number of 9-1-1 Centers. The number of 9-1-1 emergency reporting centers [or public safety answering points (PSAP)] is one of the key factors that should be considered in planning a 9-1-1 system. If multiple answering points are located throughout the system (jurisdiction), many factors can influence the way in which 9-1-1 calls are handled. For instance, telephone company and jurisdiction boundaries are rarely coincident. Therefore, calls are routed to improper answering points, and time delays are encountered in handling or rerouting the 9-1-1 calls.

On the other hand, having a single answering point minimizes the boundary problem. However, other functions, such as dispatch, become more difficult.

When planning a 9-1-1 system, many factors should be considered. The administrative and operational procedures of the answering bureau and the available 9-1-1 system features should be reviewed carefully.

D.1.2.2 Force Utilization. Both the number and types of personnel that will handle 9-1-1 calls should be considered when planning a 9-1-1 system. For instance, if a large percentage of calls are to be rerouted (that is, calls are answered by personnel who are not affiliated with any particular emergency agency), then 9-1-1 features that provide for the expeditious handling of such calls should be considered.

If the primary objective is to optimize force, 9-1-1 features that minimize the number of misrouted calls should be considered.

D.1.2.3 Third-Party Call-Handling and Conference Calls. The characteristics of a particular jurisdiction can necessitate the frequent use of interpreters or subsidiary centers (secondary public safety answering points). Frequent rerouting and conferencing of 9-1-1 calls can be necessary under such circumstances. The 9-1-1 system features that provide expeditious call-handling should be considered under such conditions.

D.1.2.4 Improper Call Termination by Call Originator. When the calling party does not

hang up after a 9-1-1 call, whether deliberately or accidentally, telephone facilities are tied up for a time, limiting access to the 9-1-1 center by other emergency callers. Where such circumstances exist, 9-1-1 system features and quantities of telephone access facilities should be reviewed.

D.1.2.5 Inadequate or Untimely Location Information. Some jurisdictions or portions of jurisdictions have a higher incidence of calls for which location information is inadequate or untimely due to such circumstances as the inability of the caller to speak, a caller's speech or hearing problem, a prank call, or a false alarm. Where the frequency of such occurrences hampers the effectiveness or costs of the municipality emergency services, administrative procedures, operational plans, and 9-1-1 system features should be reviewed.

D.1.2.6 Computer-Aided Dispatching (CAD). Many jurisdictions are considering or are already employing a CAD system. Several enhanced 9-1-1 system features complement CAD systems and should be carefully considered when planning a 9-1-1 system with a CAD interface. To comply with 6.4.2, 6.4.3, and Section 11.5, it is essential that the call detail recording (CDR) and the dispatching interface for each alarm to capture the following:

(1) Time of seizure

(2) Time of answer

(3) Time of disconnect/transfer

(4) Time of notification

(5) Time of initial dispatch processing

(6) Time of dispatch completion

D.1.2.7 Fire Emergency Call-Handling. In most cases, 9-1-1 fire calls are not routed directly to fire dispatch centers. The first response centers are required to reroute the calls to the appropriate fire communications center. Therefore, 9-1-1 features that minimize call-handling time (especially rerouting) should be considered when planning a 9-1-1 system.

D.1.2.8 Recommended 9-1-1 System Feature Groupings. Forced disconnect and transfer should always be provided. Forced disconnect prevents the system from being tied up, and transfer ensures the expeditious handling of calls.

Either ANI or called party hold, idle tone application, switch-hook status, and emergency ringback should be provided. Such features are referred to as basic calling party status identification.

It should be noted that some features are technically incompatible with one another (ANI, SR, and ALI are incompatible with switch-hook status, emergency ringback, and called party hold). Also, certain features can only be provided if special equipment is available in the telephone company central office. The local telephone company should be consulted when planning a 9-1-1 system.

D.1.3 Features to Be Considered for Various Jurisdictional Characteristics. See Table D.1.3.

SR, and ALI are incompatible with switch-hook status, emergency ringback, and called party hold). Also, certain features can only be provided if special equipment is available in the telephone company central office. The local telephone company should be consulted when planning a 9-1-1 system.

D.1.3 Features to Be Considered for Various Jurisdictional Characteristics. See Table D.1.3.

Table D.1.3 Force Third Party

Character Feature	Number of 9-1-1 Centers	Utilization Calls	Conference Termination	Improper Calls	Location Information	Computer-Aided Dispatch	Fire Call
ALI					X	X	
CDR					X	X	
Calling party status[1]					X		
Alternate routing[2]		X		X			
Forced disconnect				X			
Selective routing	X	X					X
Transfer	X	X	X				X

[1] Called party hold, emergency ringback, switch-hook status, idle tone application, or ANI.

[2] Default routing, night transfer, or alternate routing.

Annex E Computer-Aided Dispatching (CAD) Systems

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

E.1

The CAD system should provide automated decision-support aids to telecommunicators by organizing and managing the real-time processing of informational items belonging to the following classes:

(1) Alarms, including other requests for service

(2) Incidents and events

(3) Resources utilized by the communications center

(4) Other classes, as directed by the authority having jurisdiction

E.1.1 Each item should have the following characteristics:

(1) Unique identifier

(2) Status

(3) Location

(4) Description

(5) Relationship to other items

(6) Other characteristics, as directed by the authority having jurisdiction

E.1.1.1 Alarm times should, as a minimum, also include the following characteristics:

(1) Source

(2) Priority

(3) Type

E.1.1.2 Incident items should, as a minimum, also include the following characteristics:

(1) Incident management structure

(2) Evidentiary information

E.1.1.3 Resource items should, as a minimum, also include the following characteristics:

(1) Capabilities

(2) Authorizations

(3) Assignments

(4) Activities

E.2

The CAD system should archive items in a records management system for later retrieval, analysis, and reporting.

E.3

The CAD system should record a history (audit trail) of the following actions taken with the items:

(1) Creation

(2) Change, including modification, deletion, or supplementation

(3) Disposition, including close-out, archiving, and transfer

E.3.1 Each entry in the history should include the following:

(1) Coordinated universal time (UTC) of action

(2) Identification of the individual performing the action

(3) Effects of action on the characteristics of the items

E.4

The automated exchange of digital information related to alarm objects between the communications center and external systems should be accomplished in accordance with standards published by the National Emergency Numbering Association (NENA) and the Association of Police Communications Officials, International (APCO).

The automated exchange of digital information between communications centers should be accomplished in accordance with standards published by APCO.

The automated exchange of information between the communications center and transportation information systems should be accomplished in accordance with standards registered with the Intelligent Transportation Systems (ITS) Data Registry.

E.5 Reference Material.

E.5.1 APCO Project 36 addresses standard format and content requirements that apply to information exchanged between CAD systems.

APCO International, Inc., World Headquarters, 351 N. Williamson Blvd., Daytona Beach, FL 32114-1112 (904)322-2500, (888)272-6911; Fax: (904)322-2501.

E.5.2 NENA Standard 02-010 addresses standard format and content requirements that apply to information exchanged with 9-1-1 databases.

National Emergency Number Association, P. O. Box 360960, Columbus, OH 43236 (800) 332-3911, (614) 741-2080; Fax: (614) 933-0911.

E.5.3 Intelligent Transportation Systems Data Registry includes standards with standard format and content requirements that apply to information exchanged with transportation information systems.

Institute of Electrical and Electronics Engineers, ITS Data Registrar, P. O. Box 1331, Piscataway, NJ 08855-1331 USA (732) 981-0060; Fax: (732) 981-1721.

Annex F Informational References

F.1 Referenced Publications.

The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not part of the requirements of this document unless also listed in Chapter 2.

F.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P. O. Box 9101, Quincy, MA 02269-9101.

NFPA 70, *National Electrical Code®*, 1999 edition.

NFPA 72®, *National Fire Alarm Code®*, 1999 edition.

NFPA 1600, *Standard on Disaster Management and Business Continuity Programs*, 2000 edition.

F.1.2 Other Publications.

F.1.2.1 APCO Publications. Associated Public Safety Communications, Officials International, Inc., 2040 South Ridgewood Ave., South Daytona, FL 32119.

Project 16, "Application of the 900 MHz Band to Law Enforcement Communications — An Analysis of Technical and Regulatory Factors," 1985.

Project 16A, "The Identifications of the Specific Operational Capabilities That Should Be Incorporated in a Demonstration Trunked Communication System for Law Enforcement," 1985.

Project 16B, "Planning Guidelines for 900 MHz Trunked Communication Systems — Functional Requirements," 1985.

Project 16C, "System Implementation Plan for Digitally Addressed Trunked Communication Systems," 1985.

Project 16D, "National Public Safety Communications Plan," 1978.

Project 36, "Standard Method of CAD–to–CAD Communications," June 2002.

F.1.2.2 NENA Publication. National Emergency Numbering Association, 422 Beecher Road, Columbus, OH 43230.

NENA Standard 02–010, *Planning Guidelines for Universal Emergency Number (9-1-1) Systems*, January 2002.

F.1.2.3 U.S. Government Publication. U.S. Government Printing Office, Washington, DC 20402.

Code of Federal Regulations, 11, Federal Communications Commission, "Emergency Alert System."

F.2 Informational References.

The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

F.2.1 Communications Organizations.

American Association of State Highway and Transportation Officials (AASHTO)

444 N. Capitol Street, N.W.

Washington, D.C. 20001

Associated Public Safety Communications Officials International, Inc. (APCO)

2040 South Ridgewood Avenue

South Daytona, FL 32119

Forestry-Conservation Communications Association (FCCA)

444 N. Capitol Street, N.W.

Washington, D.C. 20001

International Municipal Signal Association (IMSA)

P.O. Box 539

165 East Union Street

Newark, NY 14513-0539

F.3 References for Extracts.

The following documents are listed here to provide reference information, including title and edition, for extracts given throughout this standard as indicated by a reference in brackets [ ] following a section or paragraph. These documents are not a part of the requirements of this document unless also listed in Chapter 2 for other reasons.

NFPA 70, *National Electrical Code®*, 2002 edition.

NFPA 72®, *National Fire Alarm Code®*, 2002 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems,* 2001 edition.

NFPA 1000, *Standard for Fire Service Professional Qualifications Accreditation and Certification Systems,* 2000 edition.

NFPA 1021, *Standard for Fire Officer Professional Qualifications*, 1997 edition.

NFPA 1061, *Standard for Professional Qualifications for Public Safety Telecommunicator*, 2002 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System*, 2002 edition.