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ENGINEERING SUPPORT PROGRAM

Contract No. EDH-I-00-08-00027-00
Task Order No. 1
WO-LT-0070 AMD2
Tarakhil Thermal Power Plant Fire Brigade Training Documents

January 19, 2015

This publication was prepared by Tetra Tech, Inc. for review by the United States Agency for International Development.

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January 19, 2015

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Re: **USAID Contract No. EDH-I-00-08-00027-00 / Task Order No. 1**
Afghanistan Engineering Support Program (AESP)

Work Order LT-0070 AMD2
Tarakhil Thermal Power Plant Fire Brigade Training Documents

Dear Mr. Kaufman and Ms. Katin,

Enclosed is the subject work order Fire Brigade Training Documents for the Tarakhil Thermal Power Plant located in Kabul, Afghanistan. These documents are presented for fulfillment of the training document requirements of work order WO-LT-0070 Amendment 2.

A companion report titled: *Tarakhil Thermal Power Plant Fire Suppression System Field Investigation Report* dated September 27, 2014 was previously submitted.

Together these reports are intended to guide the repair of the fire suppression systems at the Tarakhil Thermal Power Plant and guide the training and development of a competent fire brigade.

Enclosed are eleven (11) significant appendices to support these training documents compiled by the AESP team. These appendices are developed from standards established by the National Fire Protection Association (NFPA), the US Federal Emergency Management Agency (FEMA), and the US Occupational Safety and Health Administration (OSHA). These world class standards that when properly implemented will form the backbone of a comprehensive fire protection and response training program.

Please contact us should you have any questions or comments regarding these documents.

Respectfully,
Tetra Tech, Inc.

Michael J. Petti, PE, BCEE
Chief of Party (AESP)

cc: Rasool Wardak (USAID-OEGI)

AFGHANISTAN ENGINEERING SUPPORT PROGRAM

Contract No. EDH-I-00-08-00027-00
Task Order No. 1

WO-LT-0070 AMD2
TARAKHIL THERMAL POWER PLANT
FIRE BRIGADE TRAINING DOCUMENTS

January 19, 2015

DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

Contents

1.0 TPP Industrial Fire Brigade Organizational Statement 1
1.1 Membership 1
1.2 Organization 1
1.3 Functions 1
1.4 Training 1
1.5 Safety 2
1.6 Resources 2
2.0 TPP Industrial Fire Brigade Occupational Health and Safety Policy 3
2.1 Purpose 3
2.2 Administration 3
2.3 Objectives 3
2.4 Occupational Rules 3
2.5 Health and Safety Committee 4
2.6 Record Keeping 4
2.7 Resources 4
3.0 TPP Industrial Fire Brigade Roles and Response Duties 5
3.1 Purpose 5
3.2 Organization 5
3.3 Roles and Response Duties 5
3.4 Additional Requirements 8
3.5 Resources 8
4.0 Standard Operating Procedures for Site-Specific Conditions and Hazards 9
4.1 Purpose 9
4.2 Scope 9
4.3 Policy 9
4.4 Procedure 9
4.5 Responsibilities 11
4.6 SOP Evaluation 11
4.7 Record Keeping 12
4.8 Resources 12
5.0 Standard Operating Procedures for Site-Specific Conditions and Hazards 13
5.1 Purpose 13

5.2 Scope 13
5.3 Policy 13
5.4 Procedures 13
5.5 Responsibilities 15
5.6 SOP Evaluation 16
5.7 Recordkeeping 16
5.8 Resources 16
6.0 TPP Industrial Fire Brigade Training and Education Program 17
6.1 Purpose 17
6.2 Scope 17
6.3 Policy 17
6.4 Objective 17
6.5 Responsibilities 17
6.6 Training 17
6.7 Drills 18
6.8 Recordkeeping 19
6.9 Resources 19

APPENDICES

Appendix A TTP Training Program
Appendix B Establishment of Hot and Warm Fire Zones
Appendix C FEMA FA-197 Developing Effective Standard Operating Procedures
Appendix D NFPA 600 Standard on Industrial Fire Brigade
Appendix E NFPA 1081 Standard for Industrial Fire Brigade Member Professional Qualification
Appendix F NFPA 1002 Standard for Fire Apparatus Driver/Operator Professional Qualifications
Appendix G NFPA 1401 Recommended Practice for Fire Service Training Reports and Record
Appendix H NFPA 1403 Standard on Live Fire Training Evolutions
Appendix I NFPA 1500 Standard on Fire Department Occupational Safety and Health Program
Appendix J NFPA 1852 Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA),
Appendix K 29 CFR 1910 Subpart L, Occupational Safety and Health Administration – Fire Protection

1.0 TPP Industrial Fire Brigade Organizational Statement

The Tarakhil Thermal Power Plant (TPP) Fire Brigade will be organized to safeguard the employees and the property of TPP from the hazards associated with fire. The Industrial Fire Brigade is intended to function as an advanced exterior and interior structural firefighting brigade as identified by OSHA, 29 CFR 1910 subpart L, see appendix K.

1.1 Membership

All employees of the TPP are welcome to enlist in the Industrial Fire Brigade, although certain specific positions are appointed, based on the employees particular job and location within the facility. At the present time, there is no organized fire brigade organization. Members will be chosen to fill the positions of Fire Brigade Leaders and Fire Brigade Instructors.

Positions are classified as firefighting members and support members. Firefighting members are expected to perform both interior and advanced exterior firefighting duties. Support members are not expected to fight fires but are expected to perform specialized response duties that are intended to support the firefighting operations. The response duties of the fire brigade members can be found in the Industrial Fire Brigade Roles and Response Duties document.

All members are expected to attend mandatory meetings and stay current with all training activities and drills, in accordance with the Training and Education Program.

1.2 Organization

The Industrial Fire Brigade is headed by the Industrial Fire Brigade Chief. The Fire Brigade Chief will appoint two Assistant Fire Brigade Chiefs. An Industrial Fire Brigade Supervisor is also assigned to each shift. In the absence of the Fire Brigade Chief, one of the Assistant Fire Brigade Chiefs must take control of the brigade. During a fire incident, all Industrial Fire Brigade members shall follow the command of the Fire Brigade Chief or highest ranking Fire Brigade member.

Shifts duration and number of personnel per shift will be determined by the TPP management. There will also be Fire Brigade Chief present during each shift.

1.3 Functions

The primary function of the Industrial Fire Brigade is to perform firefighting operations to minimize damage due to an unexpected fire. The firefighting operations cannot exceed the capabilities of the brigade members present to prevent fires from spreading.

Additional functions include the provision of advanced first aid assistance that may be necessary during any incident, including a fire, and the checking of fire protection and life safety equipment throughout the facility on a daily basis.

1.4 Training

The initial source of training for firefighting members is that conducted within the facility by the Industrial Fire Brigade Instructor(s). This training is conducted on a quarterly basis in accordance with the Training and Education Program. Training and education provided after initial training is to be provided by designated Industrial Fire Brigade Instructors.

Support members receive training on the operation of the fire protection equipment, building evacuation information, and other related topics in accordance with the Training and Education Program. This training is provided by the Industrial Fire Brigade Instructor(s) and other personnel from the facility, such as the maintenance supervisor, the emergency coordinator, and/or the safety director.

1.5 Safety

While this Industrial Fire Brigade exists to help safeguard the people and property of TPP, the first and foremost consideration must be for the safety of the Industrial Fire Brigade members. The fire brigade has limited resources and training and thus has limited abilities. These limits must be recognized by all members to ensure that members are not extended beyond their capabilities or the limitations imposed by the equipment with which they must operate. Safety procedures and operations shall be governed by the Health and Safety Policy.

1.6 Resources

1. NFPA 600, Standard on Industrial Fire Brigades, see Appendix D
2. NFPA 1401, Recommended Practice for Fire Service Training Reports and Record, see Appendix G
3. NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, see Appendix I
4. 29 CFR 1910 Subpart L, Occupational Safety and Health Administration – Fire Protection, see Appendix K

2.0 TPP Industrial Fire Brigade Occupational Health and Safety Policy

2.1 Purpose

The management of Tarakhil Thermal Power Plant (TPP) is vitally interested in the health and safety of its workers. This document is intended to integrate health and safety plans, policies, and procedures into daily unit work activities.

2.2 Administration

All personnel must adhere to this policy to help ensure a safe work environment, whether performing day to day routine tasks or providing emergency services under adverse conditions.

2.3 Objectives

Protection of members of the Fire Brigade from injury or occupational disease is a major continuing objective. In an effort to ensure the health and safety of Fire Brigade members who are called upon to protect the TPP facilities in the case of fire emergencies, the following measureable goals and objectives have been identified:

1. Require the use of personal protective equipment;
2. Increase the knowledge of safety issues.
3. Increase the awareness of the on-site hazards;
4. Decrease the amount of personnel and property damage resulting from fires; and
5. Continually build this document from lessons learned through training, drills and other circumstances, in accordance with NFPA 1500, see appendix I.

2.4 Occupational Rules

Shift supervisors will be held accountable for the health and safety of workers under their supervision. Shift supervisors are subject to various duties in the workplace, including the duty to ensure that systems and equipment are safe and that work is conducted in compliance with established safe work practices and procedures.

Every fire brigade member must protect their own health and safety by working in compliance with safe work practices and procedures established by the employer. Members will receive information, training and competent supervision in their specific work tasks to protect their health and safety. As such, members of the TPP Industrial Fire Brigade must adhere to the occupational rules. All Fire Brigade members shall:

1. Be physically and mentally fit to satisfactorily perform their assigned emergency response duties under adverse conditions
2. Report to work alert, rested and in good physical condition
3. Wear personal protective equipment (such as safety glasses, hearing protection, thermal protective clothing, and footwear) when required for specific job tasks or work areas
4. Report all accidents, incidents and injuries, regardless of how minor, immediately to the supervisor in charge
5. Perform all work in a safe manner, according to the written policies and procedures. If there is a concern about the safety of a task, bring this to the attention of an immediate supervisor
6. Understand your response duties and perform only the duties in which you are fully trained
7. Discuss any unfamiliar work assignments with your Shift Supervisor, prior to beginning the task, in order to receive proper training on the subject
8. Not operate equipment unless trained and authorized for its use
9. Always use the proper tool, equipment, or process for the job
10. Understand that ignoring safe work practices, policies, procedures, rules or other safety instruction could be cause for disciplinary action up to and including termination of employment.

It is in the best interest of all parties to consider health and safety in every activity. Commitment to health and safety must form an integral part of this organization. Safety begins with a strong foundation in the understanding of the present hazards, and the actions required to combat those hazards, in accordance with the Standard

Operating Procedures (SOPs). All members of the TPP Industrial Fire Brigade are required to read and understand the SOPs and shall be required to perform their response duties in accordance with the applicable SOPs for the given situation, whether it be a fire emergency or a drill.

It is the responsibility of each individual Fire Brigade member to keep themselves in good health, both physically and mentally. Each Fire Brigade member shall inform their superior of any negative change in their physical or mental health that could potential affect their ability to perform their job as intended.

2.5 Health and Safety Committee

There shall be a Safety and Health Committee that is continuously engaged in safety matters as they relate to the TPP Industrial Fire Brigade. The committee will be comprised of an equal number of representatives from Plant Management and the Industrial Fire Brigade. This committee shall be responsible for identifying specific goals and objectives for the prevention and elimination of accidents, injuries, illness, and fatalities while performing fire brigade response duties. Meetings by the committee shall be on a quarterly basis. The agenda during the meetings shall include any matters that impact the health and safety of the TPP Industrial Fire Brigade. The mission of this committee is as follows:

1. Reduce the risk of injury, death, and illness in the Fire brigade service
2. Resolve health and safety issues that arise in the Fire Brigade service
3. Constantly work to improve the Health and Safety Policy for a proactive reduction of hazards
4. Maintain an effective means of recordkeeping for all fire related events including but not limited to: fire emergencies, training, drills, and participation of all such events

The findings of the Health and Safety Committee shall be collected and when applicable, used to update the Standard Operating Procedures as necessary. Topics of discussion for committee meetings shall revolve around activities of the Fire Brigade and ideas for how to improve upon existing processes and response duties. An effective way to increase health and safety is through accurate recordkeeping.

2.6 Record Keeping

Recordkeeping is a necessary component to the success of the Health and Safety Policy. An effective means of record and data management makes it possible for existing process to be improved based upon previous experience. Records shall be developed and kept in a suitable location that is protected from hazard. As it relates to the Health and Safety Policy, records shall be maintained for instances that involve, but are not limited to, the following:

1. Meeting times, events, topics of discussion and conclusions
2. Personnel safety incidents occurring during a fire emergency
3. Outcomes of training events
4. Changes to SOPs

2.7 Resources

1. NFPA 600, Standard on Industrial Fire Brigade, see Appendix D
2. NFPA 1081, Standard for Industrial Fire Brigade Member Professional Qualification, see Appendix E
3. NFPA 1401, Recommended Practice for Fire Service Training Reports and Records, see Appendix G
4. NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, see Appendix I
5. 29 CFR 1910 Subpart L, Occupational Safety and Health Administration – Fire Protection, see Appendix K

3.0 TPP Industrial Fire Brigade Roles and Response Duties

3.1 Purpose

The role of the Industrial Fire Brigade at the Tarakhil Thermal Power plant (TPP) is to provide manual fire suppression to fire-related emergencies on site. In order to effectively provide reliable fire services to TPP, the fire brigade must work in unison as a team. All Industrial Fire Brigade members must become familiar with this policy and understand their roles and associated response duties in order to provide an effective means of fire protection.

3.2 Organization

The TPP Fire Brigade shall be organized to follow a specified chain of command. The head of the fire brigade shall be the Fire Brigade Chief and shall be chosen by TPP management. The Fire Brigade Chief shall have a vast knowledge of fire science and all the fire protection systems on site. The Fire Brigade Chief shall have two Assistant Fire Brigade Chiefs who can take command in the Chief's absence. The Assistant Chiefs shall also have a deep understanding of fire science and the fire protection systems on site.

The remaining fire brigade members shall consist of fire brigade shift supervisors, fire brigade firefighting members and fire brigade support members. The selection of each position shall be chosen by TPP management and the Fire Brigade Chief. These positions shall be selected based on knowledge of fire science, the plant fire protection systems, competency in training, and success with drills.

The specific roles and response duties of the TPP Industrial Fire Brigade shall be as defined below and based upon the requirements of NFPA 600, *Standard on Industrial Fire Brigades*, see Appendix D and NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications*, see Appendix E.

3.3 Roles and Response Duties

Industrial Fire Brigade Coordinator

The Fire Brigade Coordinator shall be responsible for establishing programs to accomplish the items identified in the TPP Industrial Fire Brigade Organizational Statement, as well as the following items:

1. Establishing the appropriate size and organization of the TPP Industrial Fire Brigade;
2. Coordinating and scheduling necessary meetings;
3. Establishing and maintaining fire protection equipment inspection programs for Industrial Fire Brigade equipment;
4. Coordinating the maintenance and review of necessary reports and records;
5. Maintaining liaison with local fire authorities;
6. Informing Fire Brigade members on hazardous materials and processes to which the brigade can be exposed and ensuring that information is readily available to them;
7. Establishing job-related physical performance requirements for the Industrial Fire Brigade members;
8. Verifying the qualifications of instructors that will be providing the Fire Brigade members with future training and education;
9. Administering the Industrial Fire Brigade Training and Educational Program;
10. Maintaining and enforcing the Standard Operating Procedures to ensure safety of the Industrial Fire Brigade members;
11. Ensuring that the Industrial Fire Brigade Instructors are knowledgeable in the subjects being presented;
12. Ensuring that the training administered by the designated Fire Brigade Instructors is accomplished by utilizing prepared lesson plans and performance-based standards that have been approved by the coordinator; and
13. Arranging separate meetings between the Coordinator and the Fire Brigade Instructors about continual training and educations programs to ensure they understand the importance of their duties and adhere to the prepared lesson plans.

Industrial Fire Brigade Instructors

Industrial Fire Brigade Instructors shall be selected by the Industrial Fire Brigade Coordinator and TPP Management. The Instructors shall be responsible for:

1. Planning and scheduling of training drills based on realistic fire scenarios;
   i. Drills may be announced or unannounced.
2. Administering the prepared lesson plans on a regular basis; and
3. Monitoring fire brigade member performance during emergencies, training exercises, and normal job activities by means of:
   i. Supervisor observations
   ii. Interviews with personnel
   iii. Team meetings and discussions
   iv. Incident debriefings
   v. Drills and exercises – observations and critiques
   vi. Surveys

Lessons learned should be implemented into the training and education program to improve performance. This may also result in upgrades to the SOPs.

Industrial Fire Brigade Members

All fire brigade members, regardless of role, shall abide by the following rules:

1. Prior to being accepted for TPP Industrial Fire Brigade duties, employees who are expected to perform advanced exterior or interior structural firefighting shall be examined as medically and physically fit by a qualified healthcare professional. These requirements shall take into account the risks and tasks associated with the expected response duties.
2. Industrial fire brigade members who perform advanced firefighting shall be evaluated medically every year and after each medical leave of absence by a qualified healthcare professional.
3. Minimum physical performance requirements should be established for fire brigade members to ensure that members are satisfactorily able to perform their assigned emergency response duties under adverse conditions. The Fire Brigade members shall meet this minimum requirement prior to joining the Fire Brigade and each year they remain in service. If a member is found to not meet the job-related physical performance requirements, then they shall no longer be permitted to continue to perform those duties.
4. Members are required to report to management any changes to their physical fitness that may affect the performance as an industrial fire brigade member.
5. All members are required to read the Standard Operating Procedures and to fully comprehend their response duties, as it relates to each scenario.

Industrial Fire Brigade Chief

The TPP Industrial Fire Brigade Chief shall be selected by TPP Management and shall be qualified for the position. The Fire Chief must be knowledgeable in fire science, the hazards on site and the means of protection for combating those hazards. Specific duties of the Fire Chief include, but are not limited to:

1. Working with TPP management to establish a chain of command within the Fire Brigade to act in the absence of the Fire Brigade Chief
2. Assisting in the selection process of brigade members and placement within the TPP Fire Brigade
3. Establishing and maintaining a Fire Brigade roster
4. Selecting Assistant Industrial Fire Brigade Chiefs as appropriate to the size of the Fire Brigade and keeping them informed of all operations of the Fire Brigade
5. Developing pre-emergency plans for site-specific hazards and making information on hazardous materials and processes, to which the Fire Brigade can be exposed to, available to all Fire Brigade members
6. Selecting and managing the maintenance of equipment used by the Fire Brigade

7. Issuing written reports on the status of the Industrial Fire Brigade to management, at least annually
8. Assisting in fire investigations; and
9. Additional duties as determined appropriate by TPP Management.

Industrial Assistant Fire Brigade Chief

The role of the Assistant Fire Brigade Chief is just as important as that of the Fire Brigade Chief. As such, the Assistant Chief must have a sound engineering background and the ability to take over for the Fire Brigade Chief when the Chief is off duty. Additionally, the Assistant Fire Brigade Chief shall:

1. Be aware of and understand the response duties of the Fire Brigade Shift Supervisor(s);
2. Understand all aspects related to the fire command center and its operation; and
3. Perform additional duties as deemed appropriate by TPP Management.

Fire Brigade Shift Supervisors

The Fire Brigade Shift Supervisor will report to the Fire Chief or the Assistant Fire Chief in the absence of the Fire Chief. The Shift Supervisors will also interact directly with Fire Brigade personnel. At the scene of a fire or other hazard, all fire brigade members must check in with the supervisor prior to performing duties. It is the supervisor's duty to ensure that this occurs and that each member of the brigade is accounted for once the hazard has been expunged. The precise method for this activity shall be organized by the Fire Brigade Chief and the supervisors. Other specific duties of the Shift Supervisors include:

1. Understanding all aspects related to the fire command center and its operation
2. Becoming familiar with the roles and responsibilities of all fire brigade staff members on their shift
3. Contacting necessary persons or entities in case of fire/emergency
4. Having an intimate knowledge of all fire protection equipment, including but not limited to:
   i. Location of equipment
   ii. Capabilities of equipment
   iii. Limitations of equipment
   iv. Operation of equipment
5. Maintain safety at the scene of a fire
6. Awareness of all deficiencies to fire protection systems including malfunctioning equipment and systems that may be out of service
7. Maintenance and testing dates and frequencies
8. Ensuring that support members are trained for their assigned response duties
9. Any additional duties deemed appropriate by TPP Management.

Fire Brigade Firefighting Members

The firefighting members of the Industrial Fire Brigade shall:

1. Have a general knowledge of the fire command center operations
2. Have knowledge of the fire protection systems on site, including but not limited to:
   i. Location of equipment;
   ii. Operation of equipment; and
   iii. Understanding of their specific role during a fire scenario
3. Alert the fire brigade shift supervisor of possible emergency situations
4. Have a basic knowledge of medical emergency operations
5. Check in with the Fire Brigade Shift Supervisor at the scene of the incident prior to performing duties, then check out with that Shift Supervisor prior to exiting the scene
6. Inform Shift Supervisors of systems that may appear to be or are out of service, malfunctioning or deficient
7. Represent as many separate areas and departments of the facility as is practical
8. Comply with the provisions of the TPP Industrial Fire Brigade Organizational Statement and the TPP Training and Education Program.

Fire Brigade Support Members

The support members of the Industrial Fire Brigade shall:

1. Be able to demonstrate awareness of the plant's Standard Operating Procedures and any pre-fire plans and shall demonstrate their assigned response duties for those tasks
2. Be responsible for other non-firefighting duties related to the TPP Industrial Fire Brigade as determined by TPP management
3. Shall not enter the warm zone or hot zone

3.4 Additional Requirements

The Organization and Roles and Response Duties of the Industrial Fire Brigade must be maintained in accordance with this document and with the TPP Industrial Fire Brigade Organizational Statement, Training and Education Program, Occupational Health and Safety and Standard Operating Practice documents.

Members of the Industrial Fire Brigade shall not perform any response duties that they have not been trained and educated to perform.

3.5 Resources

1. NFPA 600, Standard on Industrial Fire Brigade, see Appendix D
2. NFPA 1081, Standard for Industrial Fire Brigade Member Professional Qualification, see Appendix E
3. NFPA 1401, Recommended Practice for Fire Service Training Reports and Record, see Appendix G
4. NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, see Appendix I
5. 29 CFR 1910 Subpart L, Occupational Safety and Health Administration – Fire Protection, see Appendix K

4.0 Standard Operating Procedures for Site-Specific Conditions and Hazards

SOP#1: TPP Procedures for Normal Firefighting Activities (Fire Protection Systems Fully Operational)

4.1 Purpose

Due to the inherent risks associated with a thermal power plant, an Industrial Fire Brigade is required to ensure life safety and property protection. The purpose of this standard operating procedure is to establish an effective system of exterior and advanced interior firefighting activities at TPP in order to effectively mitigate the damage caused by fire-related emergencies.

4.2 Scope

This standard operating procedure is meant to provide instructions for the Industrial Fire Brigade stationed at TPP in the case of a fire-related emergency. This standard operating procedure assumes that all systems are in working condition and provides detailed guidance on how to effectively suppress fires within the confines of TPP related to the hazards that are typical for this site.

4.3 Policy

The standard operating procedure sets forth the response duties of the exterior and advanced interior fire brigade members and support members. In no situation will any member of the TPP Industrial Fire Brigade perform any duties or operate any kind of equipment unless trained and authorized to do so. It is the responsibility of the fire brigade chief or highest ranking fire brigade member on-site to determine when fire scenarios involve an excessive amount of risk. In such a scenario, only defensive firefighting methods shall be used. Regardless of the risk, action shall not exceed the scope of the organizational statement and standard operating procedures.

4.4 Procedure

Communications

There shall be an established means of notifying fire brigade members of a report incident. Communications between Fire Brigade members must also be established.

General Procedures

1. Upon notification of an alarm received at the central receiving station, the attendant located at the receiving station shall have a means to notify the fire brigade chief or highest ranking fire brigade member on site directly.
2. The fire apparatus shall respond to any fire emergency. It shall be known prior to arrival whether the fire apparatus is to be used as the primary firefighting source, supplement firefighting source or for backup firefighting duties.
3. There shall be a means in place for the Fire Brigade Chief or highest ranking Fire Brigade member on site, or other Fire Brigade member who is responsible, to notify the Fire Brigade of the specific fire emergency, including pertinent information, and notify the rest of the plant of the situation.
4. The Fire Brigade Chief or highest ranking Fire Brigade member on site shall determine the Fire Brigade capacity required to combat the fire situation.
5. All Fire Brigade members who have received orders to arrive at the scene of the fire emergency shall first equip themselves with full turnout gear prior to arriving at the fire scene; turnout gear should include, but not be limited to, fire helmet, hood, jacket, pants and boots. Fire Brigade members shall not put on an SCBA until they have arrived at the scene of the fire emergency and use of an SCBA has been deemed necessary.
    i. For a small fire where it is obvious that turnout gear is not required the shift supervisor can deem it not necessary to wear such PPE.
    ii. Protective clothing for proximity firefighting shall not be worn for interior structural firefighting.

6. In the situation where a trained Fire Brigade member arrives at the scene of the fire emergency prior to obtaining turnout gear, and determines that the fire can be extinguished in a reasonable fashion with the use of a nearby fire extinguisher, then that means shall be utilized.
7. Where the fire apparatus is required for fighting large scale fires, members shall put on all personal protective clothing and equipment, except for SCBA, prior to entering the apparatus.
8. Only qualified members of the Fire Brigade shall operate the fire apparatus.
    i. Personnel operating the fire apparatus shall be qualified, per the Manufacturer's recommendations and instructions.
9. The Fire Brigade Chief or highest ranking Fire Brigade member shall conduct an initial size-up for large fire situations. Where small-scale fire situations are encountered, Fire Brigade members are permitted to act in accordance with Note 6 above.
10. Firefighting shall not terminate until the fire Brigade Chief or highest ranking Fire Brigade member on site has given orders to stop and the fire has been effectively terminated.

Specific Procedures

1. Fire Involving the Tank Farm:
    i. The fire apparatus shall arrive at the scene and be stationed at an approved location in close proximity to the seat of the fire.
        a. Approved locations shall be determined at the scene of the fire and shall be dependent upon the following:
            1. Upwind of the fire;
            2. Close enough to a fire hydrant to connect the apparatus to the fire hydrant with fire hose; and
            3. Close enough to the fire that the pump nozzle can hit the seat of the fire.
    ii. Foam-water shall be utilized in the fire apparatus to spray the fire in the approved manner.
    iii. The fixed foam-water cannons that surround the tank farm shall be utilized by members of the Fire Brigade who have been trained in their use.
    iv. At least one member of the Fire Brigade shall be stationed at the appropriate Foam House to ensure that the systems are operating as designed including verification that water and foam are flowing properly.
2. Interior Firefighting
    i. Upon arrival to the scene, Fire Brigade members shall put on all appropriate personal protective equipment prior to entering the building.
    ii. Fire Brigade members shall not perform duties beyond their training.
    iii. In no circumstance shall a Fire Brigade member enter a fire zone alone, see Appendix B.
    iv. Means of firefighting within the building shall be portable fire extinguishers, fixed hose reels and Fire Brigade hose lines connected to the fire apparatus and/or fire hydrants.
3. Exterior Firefighting
    i. Exterior firefighting shall be accomplished by the fire apparatus and Fire Brigade hose lines connected to the fire hydrants.
    ii. All firefighting operations shall be commanded by the Fire Brigade Chief or highest ranking Fire Brigade member on site.
4. Fire Involving Transformer
    i. All Fire Brigade members shall be aware that the fire involves the transformer and shall be notified of the hazards associated:
        a. The Fire Brigade personal protective equipment does NOT provide protection from electrical shock.
        b. Avoid contact with all fluids.
        c. Never assume the equipment has been de-energized.
    ii. No attempt shall be made to extinguish the fire until it has been ascertained from appropriate TPP personnel that the transformer has been de-energized. The Fire Brigade Chief shall have authority to order a power shutdown of the transformer; however, the electrical engineer on site shall know all possible chain reactions this may cause. The

Fire Brigade Chief and electrical engineer must work together to determine the best possible outcome.

iii. The Fire Brigade Chief or highest ranking Fire Brigade member on site shall determine the effectiveness of the fixed water spray system. If it is determined that additional firefighting is required, the means of fire suppression shall be dry chemical.

5. Fire Involving Unloading Station
   i. The fire apparatus and the local fire hydrants are the only means of fire protection for the Unloading Stations.
   ii. Fire hydrants shall be connected to the fire hose, opened and operated by Fire Brigade members trained to do so.
   iii. The fire apparatus shall be utilized to spray foam-water to the seat of the fire.
   iv. The Fire Brigade Chief or highest ranking Fire Brigade member on site shall determine the best way to utilize the fire apparatus in conjunction with the fire hydrants.

4.5 Responsibilities

Fire Brigade Chief or Highest Ranking Fire Brigade Member:

1. Determine whether interior or advanced exterior firefighting will be required.
2. Conduct an initial size-up wearing complete turnout gear and inform incoming units of conditions. During this size-up, attempts shall be made to determine location of fire, material involved, extent and magnitude of fire, etc.
3. Direct other fire brigade members with a course of action.

General Fire Brigade Responsibilities:

1. Support members and personnel who are not trained in accordance with this standard are not permitted to enter the warm or hot zones established for a fire emergency, see Appendix B.
2. Experienced industrial fire brigade members are responsible for and must oversee the activities of less experienced brigade members during fire-fighting operations.
3. SCBA and full turnout gear must be worn by Industrial Fire Brigade members entering the hot zone.
4. Industrial Fire Brigade members using SCBA shall operate in teams of two or more. Team members shall maintain communication with each other through visual, audible, physical, safety guide rope, electronic, or other means to coordinate their activities and must maintain close proximity to each other to provide assistance in case of an emergency. Where deemed appropriate, a safety guide rope may be considered an acceptable means of communication.
5. At least one fire brigade member shall remain outside of the area where respiratory protection is required and shall maintain constant awareness of the number and identity of personnel using an SCBA, as well as their location, function and time of entry.
6. Personnel and Industrial Fire Brigade members positioned in any fire zone must have opportunity to relocate to an alternate position should fire conditions change.

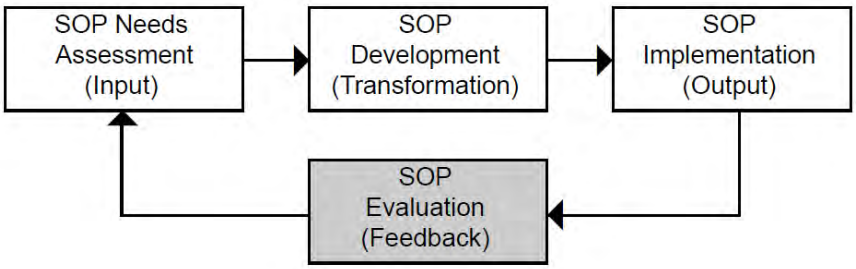
Industrial Fire Brigade Support Member Responsibilities:

1. Ensure that the building is evacuated.
2. Ensure that the fire suppression system valves are open.
3. Ensure that the fire pump is operating properly.
4. Ensure that other logistical needs of the firefighting members are met.

4.6 SOP Evaluation

This standard operating procedure is not a final version with the ability to encompass all firefighting situations and provide guidance for the most effective way to combat each one. It shall be an evolving document that is continually built upon and restructured. That is why this SOP shall be evaluated each year by fire brigade management. There shall also be an evaluation after each fire-related hazard or training exercise where the procedures detailed in this SOP are utilized. All members of the TPP Industrial Fire Brigade are allowed to have input on this evaluation and provide suggestions on how to improve and build upon it. The goal of this evaluation process is to assess the results of the SOP and determine its effectiveness. After each evaluation period, the SOP

shall be updated to reflect the new effective data and expiration date. A typical evaluation process can be seen below.



Other occasions for which standard operating procedures shall be evaluated include but are not limited to the following:

1. New construction
2. A change in a fire protection system
3. A change in plant operation or process
4. The installation of a new fire protection system
5. A new hazard located within the confines of TPP
6. Changes in staffing or equipment.

4.7 Record Keeping

Recordkeeping is a necessary component to the success of Standard Operating Procedures. An effective means of record and data management makes it possible for existing processes to be improved based upon previous experience. Any changes to SOPs shall be documented within the SOP and a new edition of the SOP issued with a new effective date and expiration date. All previous versions of SOPs shall be archived. Records shall be developed and kept in a suitable location that is protected from hazard.

4.8 Resources

1. NFPA 600, Standard on Industrial Fire Brigades, see Appendix D
2. NFPA 1081, Standard for Industrial Fire Brigade Member Professional Qualifications, see Appendix E
3. NFPA 1401, Recommended Practice for Fire Service Training Reports and Records, see Appendix G
4. NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, see Appendix I
5. 29 CFR 1910 Subpart L, Occupational Safety and Health Administration – Fire Protection, see Appendix K
6. FEMA FA-197, Developing Effective Standard Operating Procedures, December 1999, see Appendix C

5.0 Standard Operating Procedures for Site-Specific Conditions and Hazards

SOP#2: TPP Interim Procedure for Firefighting Activities (Fire Protection Systems Not Fully Operational)

5.1 Purpose

Due to the inherent risks associated with a thermal power plant, an industrial fire brigade is required to ensure life safety and property protection. While the plant is undergoing upgrades to the fire protection systems, the only means of fire detection is manual. Manual detection of fire hazards shall be achieved by constantly attended fire watches located strategically throughout the plant. The purpose of this standard operating procedure is to establish an effective interim system of fire detection and fire fighting in the case of a fire emergency while the fire protection systems are not fully operational.

5.2 Scope

This standard operating procedure is meant to provide instructions for the Industrial Fire Brigade stationed at Tarakhil Thermal Power Plant in the case of a fire-related emergency during the fire protection system upgrades. This standard operating procedure assumes that the only means of fire detection is manual and that the fire pump is turned “off” during normal operation.

5.3 Policy

The standard operating procedure sets forth the response duties of the exterior and advanced Industrial Fire Brigade members and support members. In no situation will any member of the TPP Industrial Fire Brigade perform any duties or operate any kind of equipment unless trained and authorized to do so. It is the responsibility of the Industrial Fire Brigade Chief or highest ranking Industrial Fire Brigade member on-site to determine when fire scenarios involve an excessive amount of risk. In such a scenario, only defensive firefighting methods shall be used. Regardless of the risk, action shall not exceed the scope of the organizational statement and standard operating procedures.

5.4 Procedures

Communications

There shall be an established means of notifying fire brigade members of a report incident. Communications between fire brigade members must also be established.

General Procedures

1. A one-man fire watch shall be provided at all times at the following locations:
   i. Fire Pump House/West End of Tank Farm
   ii. East End of Tank Farm by Foam House C
   iii. Power House A
   iv. Power House B (two fire brigade members)
   v. Power House C.
2. Upon detection of a fire or fire-related emergency, the Industrial Fire Brigade Chief or highest ranking Industrial Fire Brigade member shall be notified immediately.
3. The fire watch located at the Fire Pump House shall then be notified of the situation and shall switch the fire pumps to the “on” position.
4. There shall be a method in place for the Industrial Fire Brigade Chief or highest ranking Industrial Fire Brigade member on site to alert all Industrial Fire Brigade members of the fire situation and deliver orders.
5. All fire watch members stationed at their respected posts shall remain at those locations unless instructed otherwise by the Industrial Fire Brigade Chief or highest ranking Industrial Fire Brigade member on site.
6. The Fire Brigade Chief or highest ranking Fire Brigade member on site shall determine the Fire Brigade capacity required to combat the fire situation.

7. All Fire Brigade members who have received orders to arrive at the scene of the fire emergency shall first equip themselves with full turnout gear prior to arriving at the fire scene; turnout gear should include, but not be limited to, fire helmet, hood, jacket, pants and boots. Fire Brigade members shall not put on an SCBA until they have arrived at the scene of the fire emergency and use of an SCBA has been deemed necessary.
    a. For a small fire where it is obvious that turnout gear is not required the shift supervisor can deem it not necessary to wear such PPE.
    b. Protective clothing for proximity firefighting shall not be worn for interior structural firefighting.
8. Where the fire apparatus is required for fighting large scale fires, members shall put on all personal protective clothing and equipment prior to entering the apparatus.
9. Only qualified members of the Fire Brigade shall operate the fire apparatus.
    i. Personnel operating the fire apparatus shall be qualified, per the Manufacturer's recommendations and instructions.
10. The Industrial Fire Brigade Chief or highest ranking Industrial Fire Brigade member shall conduct an initial size-up.
11. Firefighting shall not terminate until the Industrial Fire Brigade Chief or highest ranking Industrial Fire Brigade member on site has given orders to stop and the fire has been effectively terminated.
12. Once it has been confirmed that the fire has been completely extinguished, the fire pump is to be turned back to the "off" position, but not until the Industrial Fire Brigade Chief or highest ranking Industrial Fire Brigade member on site has directed such orders

Specific Procedures

1. Fire involving the Tank Farm:
    i. The fire apparatus shall arrive at the scene and be stationed at an approved location in close proximity to the seat of the fire.
        a. Approved locations shall be determined at the scene of the fire and shall be dependent upon the following:
            1. Upwind of the fire;
            2. Close enough to a fire hydrant to connect the apparatus to the fire hydrant with fire hose; and
            3. Close enough to the fire that the pump nozzle can hit the seat of the fire.
    ii. Foam-water shall be utilized on the fire apparatus to spray the fire in the approved manner.
    iii. The fixed foam-water cannons that surround the tank farm shall be utilized by members of the Industrial Fire Brigade who have trained in their use.
    iv. At least one member of the Fire Brigade shall be stationed at the appropriate Foam House to ensure that the systems are operating as designed including verification that water and foam are flowing properly.
2. Interior Firefighting
    i. Upon arrival to the scene, Industrial Fire Brigade members shall put on all appropriate personal protective equipment prior to entering the building.
    ii. Industrial Fire Brigade members shall not perform duties beyond their training.
    iii. In no circumstance shall an Industrial Fire Brigade member enter a fire zone alone.
    iv. Means of firefighting within the building shall be portable fire extinguishers, fixed hose reels and Fire Brigade hose lines connected to the fire apparatus and/or fire hydrants.
3. Exterior Firefighting
    i. Exterior firefighting shall be accomplished by the fire apparatus and fire brigade hose lines connected to the fire hydrants.
    ii. All firefighting operations shall be commanded by the Industrial Fire Brigade Chief or highest ranking Industrial Fire Brigade member on site.
4. Fire Involving Transformer
    i. All Fire Brigade members shall be aware that the fire involves the transformer and shall be notified of the hazards associated:

a. The Fire Brigade personal protective equipment does NOT provide protection from electrical shock.
b. Avoid contact with all fluids.
c. Never assume the equipment has been de-energized.

ii. No attempt shall be made to extinguish the fire until it has been ascertained from appropriate TPP personnel that the transformer has been de-energized. The Fire Brigade Chief shall have authority to order a power shutdown of the transformer; however, the electrical engineer on site shall know all possible chain reactions this may cause. The Fire Brigade Chief and electrical engineer must work together to determine the best possible outcome.

iii. The Fire Brigade Chief or highest ranking Fire Brigade member on site shall determine the effectiveness of the fixed water spray system. If it is determined that additional firefighting is required, the means of fire suppression shall be dry chemical.

5. Fire Involving Unloading Station
   i. The fire apparatus and the local fire hydrants are the only means of fire protection for the Unloading Stations.
   ii. Fire hydrants shall be connected to fire hose, opened and operated by fire brigade members trained to do so.
   iii. The fire apparatus shall be utilized to spray foam-water to the seat of the fire.
   iv. The Industrial Fire Brigade Chief or highest ranking Industrial Fire Brigade member on site shall determine the best way to utilize the fire apparatus in conjunction with the fire hydrants.

5.5 Responsibilities

Fire Brigade Chief or Highest Ranking Fire Brigade Member:

1. Determine whether interior or advanced exterior firefighting will be required.
2. Conduct an initial size-up wearing complete turnout equipment and inform incoming units of conditions. During this size-up, attempts shall be made to determine location of fire, material involved, extent and magnitude of fire, etc.
3. Direct other Fire Brigade members of the course of action.

General Fire Brigade Responsibilities:

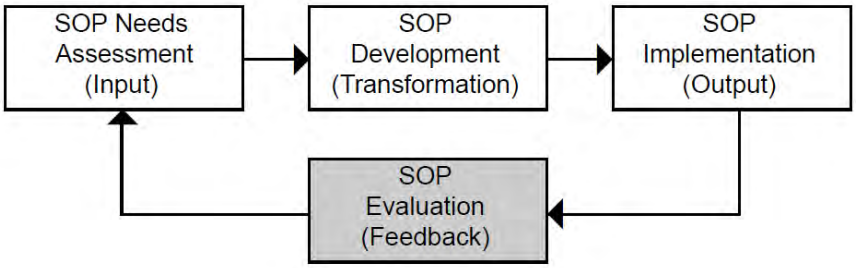
1. Personnel who are not trained in accordance with this standard are not permitted to enter the warm or hot zones established for a fire emergency.
2. Experienced industrial fire brigade members oversee activities of less experienced brigade members during fire-fighting operations.
3. SCBA and thermal protective clothing must be worn by Industrial Fire Brigade members entering the hot zone.
4. Industrial Fire Brigade members using SCBA shall operate in teams of two or more who are in communication with each other through visual, audible physical, safety guide rope, electronic, or other means to coordinate their activities and are in close proximity to each other to provide assistance in case of an emergency.
5. The member who remains outside of the area where the respiratory protection is required shall maintain constant awareness of the number and identity of personnel using the SCBA, their location, function and time of entry.
6. Personnel and Industrial Fire Brigade members positioned in any fire zone must have opportunity to relocate to an alternate position should fire conditions change.

Industrial Fire Brigade Support Member Responsibilities:

1. Ensure that the building is evacuated.
2. Ensure that the fire suppression system valves are open.
3. Ensure that the fire pump is operating properly.
4. Ensure that other logistical needs of the firefighting members are met.

5.6 SOP Evaluation

This standard operating procedure is not a final version with the ability to encompass all firefighting situations and provide guidance for the most effective way to combat each one. It shall be an evolving document that is continually built upon and restructured. That is why this SOP shall be evaluated each year by fire brigade management. There shall also be an evaluation after each fire-related hazard or training exercise where the procedures detailed in this SOP are utilized. All members of the TPP Industrial Fire Brigade are allowed to have input on this evaluation and provide suggestion on how to improve and build upon it. The goal of this evaluation process is to assess the results of the SOP and determine its effectiveness. After each evaluation period, the SOP shall be updated to reflect the new effective data and expiration date. A typical evaluation process can be seen below.



Other occasions for which standard operating procedures shall be evaluated include but are not limited to the following:

1. New construction;
2. A change in a fire protection system;
3. A change in plant operation or process;
4. The installation of a new fire protection system;
5. A new hazard located within the confines of TPP; and
6. Changes in staffing or equipment.

5.7 Recordkeeping

Recordkeeping is a necessary component to the success of Standard Operating Procedures. An effective means of record and data management makes it possible for existing processes to be improved based upon previous experience. Any changes to SOPs shall be documented within the SOP and a new edition of the SOP issued with a new effective date and expiration date. All previous versions of SOPs shall be archived. Records shall be developed and kept in a suitable location that is protected from hazard.

5.8 Resources

1. NFPA 600, Standard on Industrial Fire Brigades, see Appendix D
2. NFPA 1081, Standard for Industrial Fire Brigade Member Professional Qualifications, see Appendix E
3. NFPA 1401, Recommended Practice for Fire Service Training Reports and Records, see Appendix G
4. NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, see Appendix I
5. 29 CFR 1910 Subpart L, Occupational Safety and Health Administration – Fire Protection, see Appendix K
6. FEMA FA-197, Developing Effective Standard Operating Procedures, December 1999, see Appendix C

6.0 TPP Industrial Fire Brigade Training and Education Program

6.1 Purpose

To ensure that all fire brigade members at Tarakhil Thermal Power Plant (TPP) are trained to a level of competency proportionate with the response duties and functions that they are expected to perform, including operation of the firefighting and rescue equipment and the systems they are expected to use.

6.2 Scope

This procedure applies to all members of the TPP Industrial Fire Brigade, including everyone from the Fire Brigade Chief to the Fire Brigade Support Members. It does not apply to other employees at TPP not involved in the fire brigade. All members of the TPP Industrial Fire Brigade are required to comply with this program upon their arrival to the fire brigade. All members must continue to cooperate, participate and comply with the Organizational Statement and the Training and Education Program.

6.3 Policy

The training and education program that is detailed in this document has been constructed relative to the existing layout and fire protection systems located within TPP. This program is also heavily based on NFPA 600 (Appendix D) and NFPA 1081 (Appendix E) and it is recommended that TPP management and the designated person(s) required to maintain this document do so in accordance with this program and other applicable documents.

Training shall comply with the applicable governing standards and follow the manufacturer's instruction and guidelines.

Drills must also be planned and administered in accordance with this program. Drills are meant to test the members of the fire brigade on their knowledge of subject matter related to the training they have received. Drills must be based on specific hazards that would be encountered at TPP, and must not be outside of scope of training that has previously been administered.

6.4 Objective

All TPP Industrial Fire Brigade members must be trained to a level of competency appropriate with the response duties and functions that they are expected to perform. The main objectives of this program are the prevention of accidents, injury, death and illness.

6.5 Responsibilities

All Fire Brigade member responsibilities shall be in accordance with the appropriate Standard Operating Procedure(s), the TPP Industrial Fire Brigade Roles and Response Duties document and other applicable literature.

6.6 Training

Training and drills shall serve to provide the members of the Fire Brigade with a thorough understanding of fire science and hydraulic principles as well as the fire protection systems and anticipated hazards at TPP. TPP Management should develop a plan and schedule to provide training and education to members of the TPP Industrial Fire Brigade on not less than a quarterly basis. Live fire training shall be conducted at least annually. Training involving a live fire evolution shall be performed with recognized safety precautions and in accordance with NFPA 1403 (see Appendix H). The live fire training shall include props that are representative of and that simulate as closely as possible the hazards and conditions that could be encountered by the Industrial Fire Brigade member.

Members of the Fire Brigade must meet the minimum skill and knowledge requirements of NFPA 1081 (see Appendix E) for each specific task expected to be performed by brigade members before their participation in emergency response operations. Fire Brigade members designated as Shift Supervisors and higher shall receive training and education that is more comprehensive than other Industrial Fire Brigade members.

Training shall be provided to all members of the TPP Industrial Fire Brigade in order to provide them with knowledge of, but not limited to, the following subjects:

1. Firefighting techniques
2. The classes of fires and extinguishing methods related to those classes
3. The proper use of the communications system(s)
4. How to perform inspection, maintenance, cleaning or to otherwise service emergency response equipment
5. The location and use of the fire protection systems on site, including the fire apparatus
6. Manual activation of all systems, fire extinguishers, etc.
7. How to extinguish fires, dependent upon the fire class
8. Basic hydraulic principles and their effect on water flow
9. The potential for structural collapse due to fires that have a high heat release
10. How to remove the pin of a fire extinguisher and aim and sweep around the fire
11. How to inspect portable hand held fire extinguishers, including inspecting the hose and gauge
12. How to fully extinguish a liquid fire
13. The inspection and maintenance associated with each fire protection system, in accordance with NFPA 25 and other applicable standards
14. Operation of the portable foam hose reels
15. Operation of the foam firefighting equipment
16. Operation of the fire pumps, including operation while the fire pumps are maintained in the “off” position
17. How to test the fire pump, in accordance with the Manufacturer’s Instructions
18. How to connect the firefighting hose to a fire hydrant valve
19. How to open a fire hydrant
20. How to hold and control the fire hose
21. How to disconnect fire hose from fire hydrant and lay hose out straight
22. How to return fire hose back into the storage cabinet
23. How to open the valves for foam systems
24. How to remotely operate foam release valves
25. How to aim and operate the foam canon mounted on the containment wall around the tank farm
26. Read and fully understand the Standard Operating Procedures
27. How to use all PPE including the SCBA (which is governed by NFPA 1852); see Appendix J
28. How to operate the fire apparatus, for those who are qualified to do so (NFPA 1002); see Appendix F
    a. Fire apparatus shall be operated only by members who have successfully completed an approved driver training program commensurate with the type of apparatus the member will operate or by trainee drivers who are under the supervision of a qualified driver. (NFPA 1500 6.2.1); see Appendix I
    b. The apparatus drivers shall be directly responsible for safe and prudent operation under all conditions
    c. The fire apparatus must be maintained in accordance with the Manufacturer’s Recommendations.
    d. The fire apparatus shall be inspected at least weekly and within 24 hours after any use or repair to identify and correct unsafe measures
    e. If the fire apparatus is found to be unsafe, it shall be placed out of service until repaired.

TPP Industrial Fire Brigade training shall be a continuous program that evolves over time. Eventually, the goal of the program is to train each member of the Fire Brigade to possess the knowledge and skills specifically outlines in the appendix of this Program.

6.7 Drills

Drills shall be conducted as often as necessary to evaluate the effectiveness of the Industrial Fire Brigade Training and Education Program and the competence of Industrial Fire Brigade members in performing assigned response

duties. TPP Management should develop a plan and schedule for TPP Industrial Fire Brigade members to participate in a drill at least semiannually. Training involving a live fire evolution shall be performed with recognized safety precautions and in accordance with NFPA 1403 (Appendix H). All TPP Industrial Fire Brigade Drills shall be based upon training that has already been presented. Under no circumstances shall a fire drill focus on a methodology or aspect of firefighting that the member of the Fire Brigade participating in the drill has not had exposure to in the classroom.

6.8 Recordkeeping

Individual training records shall be maintained for each member of the fire brigade and shall include:

1. Courses completed
2. Subjects studied
3. Refresher courses completed
4. Other evaluations of skills and knowledge
5. Drill attendance records
6. Leadership or other achievements related to the fire brigade

These training records must be evaluated once a year by the Fire Brigade management to determine to evaluate training needs and equipment needs of the brigade.

6.9 Resources

1. NFPA 600, Standard on Industrial Fire Brigades, see Appendix D
2. NFPA 1002, Standard for Fire Apparatus Driver/Operator Professional Qualifications, see Appendix F
3. NFPA 1081, Standard for Industrial Fire Brigade Member Professional Qualifications, see Appendix E
4. NFPA 1401, Recommended Practice for Fire Service Training Reports and Records, see Appendix G
5. NFPA 1403, Standard on Live Fire Training Evolutions, see Appendix H
6. NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, see Appendix I
7. NFPA 1852, Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA), see Appendix J
8. 29 CFR 1910 Subpart L, Occupational Safety and Health Administration – Fire Protection, see Appendix K

APPENDICES

APPENDIX A
TPP Training Program

APPENDIX A: TPP INDUSTRIAL FIRE BRIGADE TRAINING AND EDUCATION PROGRAM

I. TPP INDUSTRIAL FIRE BRIGADE CHIEF KNOWLEDGE:

This duty shall involve establishing command, using emergency response procedures, and overseeing the emergency response and other administrative duties as outlined in Chapter 4 of NFPA 600. The Fire Chief should have knowledge and understanding of the following, in accordance with NFPA 1081:

1. The organizational structure of the industrial fire brigade; operating procedures for administration, emergency operations, and safety; information management and record keeping; incident management system; methods used by leaders to obtain cooperation within a group of subordinates; and policies and procedures regarding the operation of the industrial fire brigade.
2. Verbal communications during emergency situations, techniques used to make assignments under stressful situations, and methods of confirming understanding of assigned tasks.
3. Elements of a size-up, SOPs for emergency operations, and fire behavior.
4. SOPs, resources available, basic fire control and emergency operation procedures, an incident management system, rapid intervention crew (RIC) procedures, personnel accountability system, common causes of personal injury during industrial fire brigade activities, safety policies and procedures, and basic industrial Fire Brigade Member safety.
5. Resource management protocols, principles for establishing lighting, and rescuer rehabilitation practices and procedures.
6. Oral communication techniques to facilitate learning.

II. TPP INDUSTRIAL FIRE BRIGADE CHIEF SKILLS:

1. The ability to operate at all levels in the incident management system as defined by the National Incident Management System (NIMS) and NFPA 1561, Standard on Emergency Services Incident Management System.
2. The ability to condense instructions for frequently assigned unit tasks based upon training and SOPs.
3. The ability to analyze emergency scene conditions, to allocate resources, and to communicate verbally.
4. The ability to implement an incident management system, to communicate verbally, to supervise and account for assigned personnel under emergency conditions, and to identify safety hazards.
5. The ability to implement the site incident management system, to communicate verbally, and to supervise and account for assigned personnel under emergency conditions.
6. The ability to manage resources, provide power, set up lights, use lighting, select rehab areas, and personnel rotations.
7. The ability to distribute issue-guided directions to members during training evolutions.

III. TPP INDUSTRIAL FIRE BRIGADE MEMBER KNOWLEDGE:

Incipient Firefighting

1. Procedures for reporting an emergency.
2. Facility communications procedures and etiquette for routine traffic, emergency traffic, and emergency evacuation signals.
3. Facility layout, special hazards, and emergency response procedures.
4. Types of cleaning methods for various equipment, correct use of cleaning materials, and manufacturer's or facility guidelines for returning equipment to service.
5. Content requirements for basic incident reports, the purpose and usefulness of accurate reports, consequences of inaccurate reports, and how to obtain necessary information.
6. The classifications of fire; risks associated with each class of fire; and the types, rating systems, operating methods, and limitations of portable fire extinguishers.

7. The purpose of property conservation and its value to the organization, methods used to protect property, methods to reduce damage to property, types of and uses for salvage covers, and operations at properties protected with automatic sprinklers or special protection systems.
8. Communication procedures, emergency evacuation methods, what constitutes a safe haven, and elements that create or indicate a hazard.
9. Types of hand lines used for attacking incipient fires, precautions to be followed when advancing hand lines to a fire, observable results that a fire stream has been properly applied, dangerous building conditions created by fire, principles of exposure protection, and dangers such as exposure to products of combustion resulting from fire condition.
10. Types of extinguishing agents, hazards associated with system operation, how the system operates, sequence of operation, system overrides and manual intervention procedures, and shutdown procedures to prevent damage to the operated system or to those systems associated with the operated system.
11. Safe operation of master stream appliances uses for master stream appliances, tactics using fixed master stream appliances, and property conservation.
12. Water sources, operation of site water supply components, hydraulic principles, and the effect of mechanical damage and temperatures on the operability of the water supply source.
13. Organizational policy and procedures, common causes of fire and their prevention, the importance of fire safety, and referral procedures.

Advanced Exterior Firefighting

1. The sources of water supply for fire protection or other fire-extinguishing agents, site-specific hazards, the fundamentals of fire suppression and detection systems including specialized agents, and common symbols used in diagramming construction features, utilities, hazards, and fire protection systems.
2. Mutual aid procedures and the structure of the mutual aid organization, site SOPs, and incident management systems.
3. Conditions that require personal protection, uses and limitations of thermal protective clothing, components of thermal protective clothing ensemble, and putting on and taking off procedures.
4. Conditions that require respiratory protection, uses and limitations of SCBA, components of SCBA, putting on and taking off procedures, breathing techniques, indications for and emergency procedures used with SCBA, and physical requirements of the SCBA wearer.
5. Principles of fire streams; types, design, operation, nozzle pressure effects, and flow capabilities of nozzles; precautions to be followed when advancing handlines to a fire; observable results that a fire stream has been correctly applied; dangerous conditions created by fire; principles of exposure protection; potential long-term consequences of exposure to products of combustion; physical states of matter in which fuels are found; the application of each size and type of attack line; the role of the backup team in fire attack situations; attack and control techniques; and exposing hidden fires.
6. Use of appropriate tools and equipment, psychological effects of operating in obscured conditions and ways to manage them, methods to determine if an area is tenable, primary and secondary search techniques, team members' roles and goals, methods to use and indicators of finding victims, victim removal methods, and considerations related to respiratory protection.
7. The purpose of property conservation and its value to the organization, methods used to protect property, methods to reduce damage to property, operations at properties protected with automatic sprinklers or special protection systems, understanding the impact of using master streams and multiple hose streams on property conservation, particularly as it can relate to the impact on outside facilities.
8. Types of fire handlines and water application devices most effective for overhaul, water application methods for extinguishment that limit water damage, types of tools and methods used to expose hidden fire, dangers associated with overhaul, obvious signs of area of origin or signs of arson, and reasons for protection of a fire scene.
9. Water sources, correct operation of site water supply components, hydraulic principles, and the effect of mechanical damage and temperatures on the operability of the water supply source.
10. Personnel accountability systems, communication procedures, emergency evacuation methods, what constitutes a safe haven, elements that create or indicate a hazard, and emergency procedures for loss of air supply.

11. Identification and care of personal protective equipment; specific hazards associated with the facility; strategic planning for rescue incidents; communications and safety protocols; atmospheric monitoring equipment needs; identification, characteristics, expected behavior, type, causes, and associated effects of personnel becoming incapacitated or trapped; and recognition of, potential for, and signs of impending building collapse.
12. Organizational policy and procedures, common causes of fire and their prevention, and the importance of fire safety and referral procedures.
13. Site drawing reading, access procedures, forcible entry tools and procedures, and site-specific hazards, such as access to areas restricted by railcar movement, fences, and walls. Procedures associated with special hazard areas such as electrical substations, radiation hazard areas, and other areas specific to the site, if needed.
14. Correct operation of master stream appliances, uses for master stream appliances, tactics using master stream appliances, selection of the master stream appliance for different fire situations, the effect of master stream appliances on search and rescue, ventilation procedures, and property conservation.
15. Methods by which foam prevents or controls a hazard; principles by which foam is generated; causes for poor foam generation and corrective measures; difference between hydrocarbon and polar solvent fuels and the concentrates that work on each; the characteristics, uses, and limitations of fire-fighting foams; the advantages and disadvantages of using fog nozzles versus foam nozzles for foam application; foam stream application techniques; hazards associated with foam usage; and methods to reduce or avoid hazards.
16. Characteristics of flammable gases, components of flammable gas systems, effects of heat and pressure on closed containers, boiling liquid expanding vapor explosion (BLEVE) signs and effects, methods for identifying contents, water stream usage and demands for pressurized gas fires, what to do if the fire is prematurely extinguished, alternative actions related to various hazards, and when to retreat.
17. Methods by which special agents, such as dry chemical, dry powder, and carbon dioxide, prevent or control a hazard; principles by which special agents are generated; the characteristics, uses, and limitations of fire-fighting special agents; the advantages and disadvantages of using special agents; special agents application techniques; hazards associated with special agents usage; and methods to reduce or avoid hazards.
18. The different alarm detection systems within the facility; difference between alarm, trouble, and supervisory alarms; hazards protected by the detection systems; hazards associated with each type of alarm condition; knowledge of the emergency response plan; and communication procedures.
19. Different types of extinguishing agents, hazards associated with system operation, how the system operates, sequence of operation, system overrides and manual intervention procedures, and shutdown procedures to prevent damage to the operated system or to those systems associated with the operated system.
20. Methods by which a Class C agent prevents or controls a hazard; methods by which Class C fires are de-energized; causes of injuries from Class C firefighting on live Class C fires with Class A agents and the Class C agents; the extinguishing agents' characteristics, uses, and limitations; the advantages and disadvantages of de-energizing as using water fog nozzles on a Class A or Class B fire; and methods to reduce or avoid hazards.
21. Available tools and equipment, their storage locations, and their correct use in accordance with recognized practices, and selection of tools and equipment given different conditions.
22. Parts of a ladder, hazards associated with setting up ladders, what constitutes a stable foundation for ladder placement, different angles for various tasks, safety limits to the degree of angulation, and what constitutes a reliable structural component for top placement.

Interior Structural Firefighting

1. Conditions that require personal protection, uses and limitations of thermal protective clothing, components of thermal protective clothing ensemble, and putting on and taking off procedures.
2. Conditions that require respiratory protection, uses and limitations of SCBA, components of SCBA, putting on and taking off procedures, breathing techniques, indications for and emergency procedures used with SCBA, and physical requirements of the SCBA wearer.

3. The sources of water supply for fire protection or other fire-extinguishing agents, site-specific hazards, the fundamentals of fire suppression and detection systems including specialized agents, and common symbols used in diagramming construction features, utilities, hazards, and fire protection systems.
4. Principles of conducting initial fire size-up; principles of fire streams; types, design, operation, nozzle pressure effects, and flow capabilities of nozzles; precautions to be followed when advancing hose lines to a fire; observable results that a fire stream has been correctly applied; dangerous building conditions created by fire; principles of exposure protection; potential long-term consequences of exposure to products of combustion; physical states of matter in which fuels are found; common types of accidents or injuries and their causes; and the application of each size and type of handlines, the role of the backup team in fire attack situations, attack and control techniques, and exposing hidden fires.
5. Basic construction of typical doors, windows, and walls within the facility; operation of doors, windows, and their associated locking mechanisms; and the dangers associated with forcing entry through doors, windows, and walls.
6. The principles, advantages, limitations, and effects of horizontal and vertical ventilation; safety considerations when venting a structure; the methods of heat transfer; the principles of thermal layering within a structure on fire; fire behavior in a structure; the products of combustion found in a structure fire; the signs, causes, effects, and prevention of backdrafts; and the relationship of oxygen concentration to life safety and fire growth.
7. Types of fire handlines and application devices most effective for overhaul, application methods for extinguishing agents that limit damage, types of tools and methods used to expose hidden fire, dangers associated with overhaul, obvious signs of area of origin and signs of arson, and reasons for protection of fire scene.
8. Personnel accountability systems, communication procedures, emergency evacuation methods, what constitutes a safe haven, elements that create or indicate a hazard, and emergency procedures for loss of air supply.
9. Water sources, correct operation of site water supply components, hydraulic principles, and the effect of mechanical damage and temperatures on the operability of the water supply source.
10. Mutual aid procedures and the structure of the mutual aid organization, site SOPs, and incident management systems.
11. Use of appropriate tools and equipment, psychological effects of operating in obscured conditions and ways to manage them, methods to determine if an area is tenable, primary and secondary search techniques, team members' roles and goals, methods to use and indicators of finding victims, victim removal methods, and considerations related to respiratory protection.
12. The purpose of property conservation and its value to the organization, methods used to protect property, methods to reduce damage to property, types of and uses for salvage covers, operations at properties protected with automatic sprinklers or special protection systems, and understanding the impact of using master streams and multiple hose streams on property conservation, particularly as it can relate to the impact on outside facilities.
13. Identification and care of personal protective equipment; specific hazards associated with the facility; strategic planning for rescue incidents; communications and safety protocols; atmospheric monitoring equipment needs; identification, characteristics, expected behavior, type, causes, and associated effects of personnel becoming incapacitated or trapped; and recognition of, potential for, and signs of impending building collapse.
14. The different alarm detection systems within the facility; difference between alarm, trouble, and supervisory alarms; hazards protected by the detection systems; hazards associated with each type of alarm condition; the emergency response plan; and communication procedures.
15. Different types of extinguishing agents on site, manual fire suppression activities within areas covered by fixed fire suppression systems, hazards associated with system operation, how the system operates, sequence of operation, system overrides and manual intervention procedures, and shutdown procedures to prevent damage to the operated system or to those systems associated with the operated system.
16. Correct operation of master stream appliances, uses for master stream appliances, tactics using master stream appliances, selection of the master stream appliances for different fire situations, and the effect of master stream appliances on search and rescue, ventilation procedures, and property conservation.
17. Methods by which foam prevents or controls a hazard; principles by which foam is generated; causes for poor foam generation and corrective measures; difference between hydrocarbon and polar solvent fuels

and the concentrates that work on each; the characteristics, uses, and limitations of fire-fighting foams; the advantages and disadvantages of using fog nozzles versus foam nozzles for foam application; foam stream application techniques; hazards associated with foam usage; and methods to reduce or avoid hazards.

18. Characteristics of flammable gases, components of flammable gas systems, effects of heat and pressure on closed containers, BLEVE signs and effects, methods for identifying contents, water stream usage and demands for pressurized gas fires, what to do if the fire is prematurely extinguished, alternative actions related to various hazards, and when to retreat.
19. Methods by which special agents, such as dry chemical, dry powder, and carbon dioxide, prevent or control a hazard; principles by which special agents are generated; the characteristics, uses, and limitations of fire-fighting special agents; the advantages and disadvantages of using special agents; special agent application techniques; hazards associated with special agent usage; and methods to reduce or avoid hazards.
20. Available tools and equipment, their storage locations, and their correct use in accordance with recognized practices; and selection of tools and equipment given different conditions.
21. Parts of a ladder, hazards associated with setting up ladders, what constitutes a stable foundation for ladder placement, different angles for various tasks, safety limits to the degree of angulation, and what constitutes a reliable structural component for top placement.
22. Mutual aid procedures and the structure of the mutual aid organization, site SOPs, and incident management systems.
23. Organizational policy and procedures, common causes of fire and their prevention, and the importance of fire safety and referral procedures.
24. Methods by which a Class C agent prevents or controls a hazard; methods by which Class C fires are de-energized; causes of injuries from Class C firefighting on live Class C fires with Class A agents and the Class C agents; the extinguishing agents' characteristics, uses, and limitations; the advantages and disadvantages of de-energizing using water fog nozzles on a Class A or Class B fire; and methods to reduce or avoid hazards.

IV. TPP INDUSTRIAL FIRE BRIGADE MEMBER SKILLS:

Incipient Firefighting

1. The ability to operate facility communications equipment, relay information, and record information.
2. The ability to operate facility communications equipment and discriminate between routine and emergency communications.
3. The ability to recognize response hazards and to safely use each piece of response equipment provided.
4. The ability to clean, inspect, and maintain equipment and to complete recording and reporting procedures.
5. The ability to collect necessary information, proof reports, and operate facility equipment necessary to complete reports.
6. The ability to select, carry, and operate portable fire extinguishers, using the appropriate extinguisher based on the size and type of fire.
7. The ability to deploy covering materials, control extinguishing agents, and cover building openings, including doors, windows, floor openings, and roof openings.
8. The ability to follow facility evacuation routes, evaluate areas for hazards, and identify a safe haven.
9. The ability to recognize inherent hazards related to the material's configuration; operate handlines; prevent water hammers when shutting down nozzles; open, close, and adjust nozzle flow; advance charged and uncharged hose; extend handlines; operate handlines; evaluate and modify water application for maximum penetration; assess patterns for origin determination; and evaluate for complete extinguishment.
10. The ability to operate fixed fire protection systems via electrical or mechanical means.
11. The ability to put into service a fixed master stream appliance, and to evaluate and forecast a fire's growth and development.
12. The ability to operate the site water supply components and to identify damage or impairment.
13. The ability to complete forms, recognize hazards, match findings to preapproved recommendations, and effectively communicate findings to the proper authority.
14. ADVANCED EXTERIOR FIREFIGHTING

15. The ability to identify the components of the pre-incident plan such as fire suppression and detection systems, structural features, site-specific hazards, and response considerations.
16. The ability to communicate with mutual aid organizations and to integrate operational personnel into teams under a unified command.
17. The ability to correctly put on and take off thermal protective clothing and to perform assignments while wearing thermal protective clothing.
18. The ability to control breathing, use SCBA in limited-visibility conditions, replace SCBA air cylinders, use SCBA to exit through restricted passages, initiate and complete emergency procedures in the event of SCBA failure or air depletion, and putting on and taking off procedures.
19. The ability to prevent water hammers when shutting down nozzles; open, close, and adjust nozzle flow and patterns; apply water using direct, indirect, and combination attacks; advance charged and uncharged 38 mm (1 1/2 in.) diameter or larger handlines; extend handlines; replace burst hose sections; operate charged handlines of 38 mm (1 1/2 in.) diameter or larger; couple and uncouple various handline connections; carry hose; attack fires; and locate and suppress hidden fires.
20. The ability to use SCBA to exit through restricted passages, use tools and equipment for various types of rescue operations, rescue an industrial fire brigade member with functioning respiratory protection, rescue an industrial fire brigade member whose respiratory protection is not functioning, rescue a person who has no respiratory protection, and assess areas to determine tenability.
21. The ability to deploy covering materials, control extinguishing agents, and cover openings and equipment such as doors, windows, floor openings, and roof openings related to the impact of outside facilities.
22. The ability to deploy and operate a handline, expose void spaces without compromising structural integrity, apply water for maximum effectiveness, expose and extinguish hidden fires, recognize and preserve obvious signs of area of origin and fire cause, and evaluate for complete extinguishment.
23. The ability to operate the site water supply components and identify damage or impairment.
24. The ability to operate as a team member in vision-obscured conditions, locate and follow a guideline, conserve air supply, evaluate areas for hazards, and identify a safe haven.
25. The ability to use personal protective equipment, determine resource needs, select and operate basic and specialized tools and equipment, implement communications and safety protocols, and mitigate specific hazards associated with rescue of trapped or incapacitated personnel.
26. The ability to complete forms, recognize hazards, match findings to pre-approved recommendations, and effectively communicate findings to the proper authority.
27. The ability to read site drawings, identify areas of low overhead clearance, identify areas on roadways having load restrictions, identify access routes to water supplies, identify hazardous materials locations, identify electrical equipment locations (overhead and below grade equipment), ability to open gates by manual and/or automatic means, ability to forcibly gain access to areas, and the ability to identify site hazards.
28. The ability to correctly put in service a master stream appliance and evaluate and forecast a fire's growth and development.
29. The ability to prepare a foam concentrate supply for use, assemble foam stream components, master various foam application techniques, and approach and retreat from fires and spills as part of a coordinated team.
30. The ability to execute effective advances and retreats, apply various techniques for water application, assess gas storage container integrity and changing conditions, operate control valves, and choose effective procedures when conditions change.
31. The ability to operate a special agent supply for use, master various special agent application techniques, and approach and retreat from hazardous areas as part of a coordinated team.
32. The ability to understand the different types of alarms, to implement the response, and to provide information through communications.
33. The ability to operate fixed fire suppression systems via electrical or mechanical means and shutdown procedures for fixed fire suppression systems.
34. The ability to operate Class C fire extinguishers or fixed systems and approach and retreat from Class C fires as part of a coordinated team.
35. The ability to select and use the correct tools and equipment for various tasks, follow guidelines, and restore tools and equipment to service after use.

36. The ability to carry ladders, raise ladders, extend ladders and lock flies, determine that a wall and roof will support the ladder, judge extension ladder height requirements, and place the ladder to avoid obvious hazards.
37. INTERIOR STRUCTURAL FIREFIGHTING
38. The ability to correctly put on and take off thermal protective clothing and perform assignments while wearing thermal protective clothing.
39. The ability to control breathing, use SCBA in limited-visibility conditions, replace SCBA air cylinders, use SCBA to exit through restricted passages, initiate and complete emergency procedures in the event of SCBA failure or air depletion, and complete putting on and taking off procedures.
40. The ability to identify the components of the pre-incident plan such as fire suppression and detection systems, structural features, site-specific hazards, and response considerations.
41. The ability to prevent water hammers when shutting down nozzles; open, close, and adjust nozzle flow and patterns; apply water using direct, indirect, and combination attacks; advance charged and uncharged 38 mm (1 1/2 in.) diameter or larger handlines; extend handlines; replace burst hose sections; operate charged handlines of 38 mm (1 1/2 in.) diameter or larger; couple and uncouple various handline connections; carry hose; attack fires; and locate and suppress hidden fires.
42. The ability to transport and operate site-specific tools to force entry through doors, windows, and walls using assorted methods and tools.
43. The ability to transport and operate tools and equipment to create an opening and implement ventilation techniques.
44. The ability to deploy and operate handlines, expose void spaces without compromising structural integrity, apply extinguishing agents for maximum effectiveness, expose and extinguish hidden fires, recognize and preserve obvious signs of area of origin and fire cause, and evaluate for complete extinguishment.
45. The ability to operate as a team member in vision-obscured conditions, locate and follow a guideline, conserve air supply, and evaluate areas for hazards and identify a safe haven.
46. The ability to operate the site water supply components and take action to address damage or impairment.
47. The ability to communicate with mutual aid organizations and to integrate operational personnel into teams under a unified command.
48. The ability to use SCBA to exit through restricted passages, use tools and equipment for various types of rescue operations, rescue an industrial fire brigade member whose respiratory protection is not functioning, rescue a person who has no respiratory protection, and assess areas to determine tenability.
49. The ability to deploy covering materials, control extinguishing agents, and cover building openings, including doors, windows, floor openings, and roof openings.
50. The ability to use personal protective equipment, determine resource needs, select and operate basic and specialized tools and equipment, implement communications and safety protocols, and mitigate specific hazards associated with rescue of trapped or incapacitated personnel.
51. The ability to understand the different types of alarms, to implement the response, and to provide information through communications.
52. The ability to operate fixed fire suppression systems via electrical or mechanical means and to shut down fixed fire suppression systems.
53. The ability to correctly put in service a master stream appliance and to evaluate and forecast a fire's growth and development.
54. The ability to prepare a foam concentrate supply for use, assemble foam stream components, master various foam application techniques, and approach and retreat from fires and spills as part of a coordinated team.
55. The ability to execute effective advances and retreats, apply various techniques for water application, assess gas storage container integrity and changing conditions, operate control valves, and choose effective procedures when conditions change.
56. The ability to operate a special agent supply for use, master various special agent application techniques, and approach and retreat from hazardous areas as part of a coordinated team.
57. The ability to select and use the correct tools and equipment for various tasks, follow guidelines, and restore tools and equipment to service after use.

58. The ability to carry ladders, raise ladders, extend ladders and lock flies, determine that a wall and roof will support the ladder, judge extension ladder height requirements, and place the ladder to avoid obvious hazards.
59. The ability to communicate with mutual aid organizations and to integrate operational personnel into teams under a unified command.
60. The ability to complete forms, recognize hazards, match findings to pre-approved recommendations, and effectively communicate findings to the proper authority.
61. The ability to operate Class C fire extinguishers or fixed systems and approach and retreat from Class C fires as part of a coordinated team.

APPENDIX B

Establishment of Hot and Warm Fire Zones

APPENDIX B: ESTABLISHMENT OF HOT AND WARM FIRE ZONES

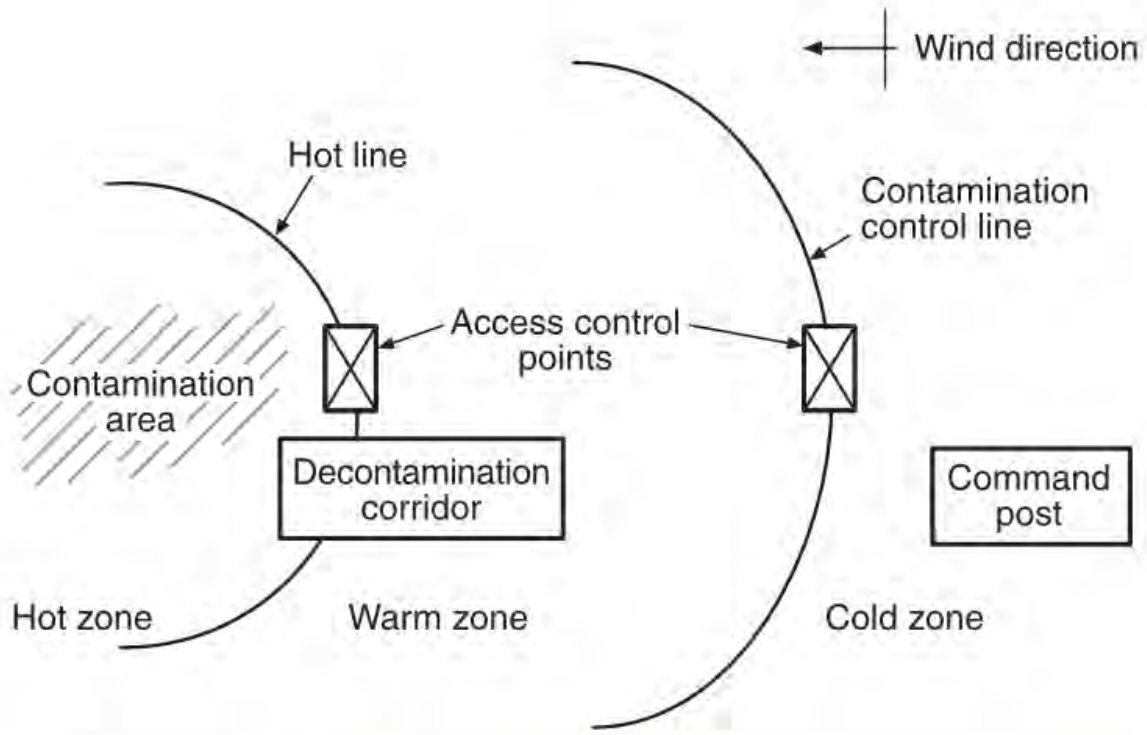


FIGURE 13.8.15 Control Zones

Source: NFPA Handbook Figure 13.8.15, 2008 Edition

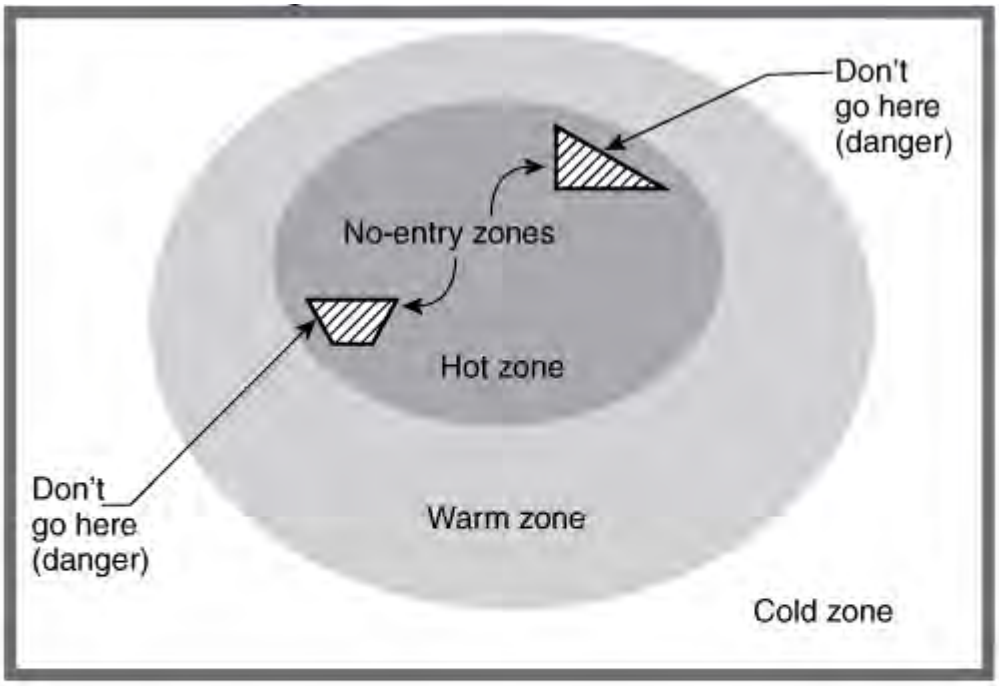
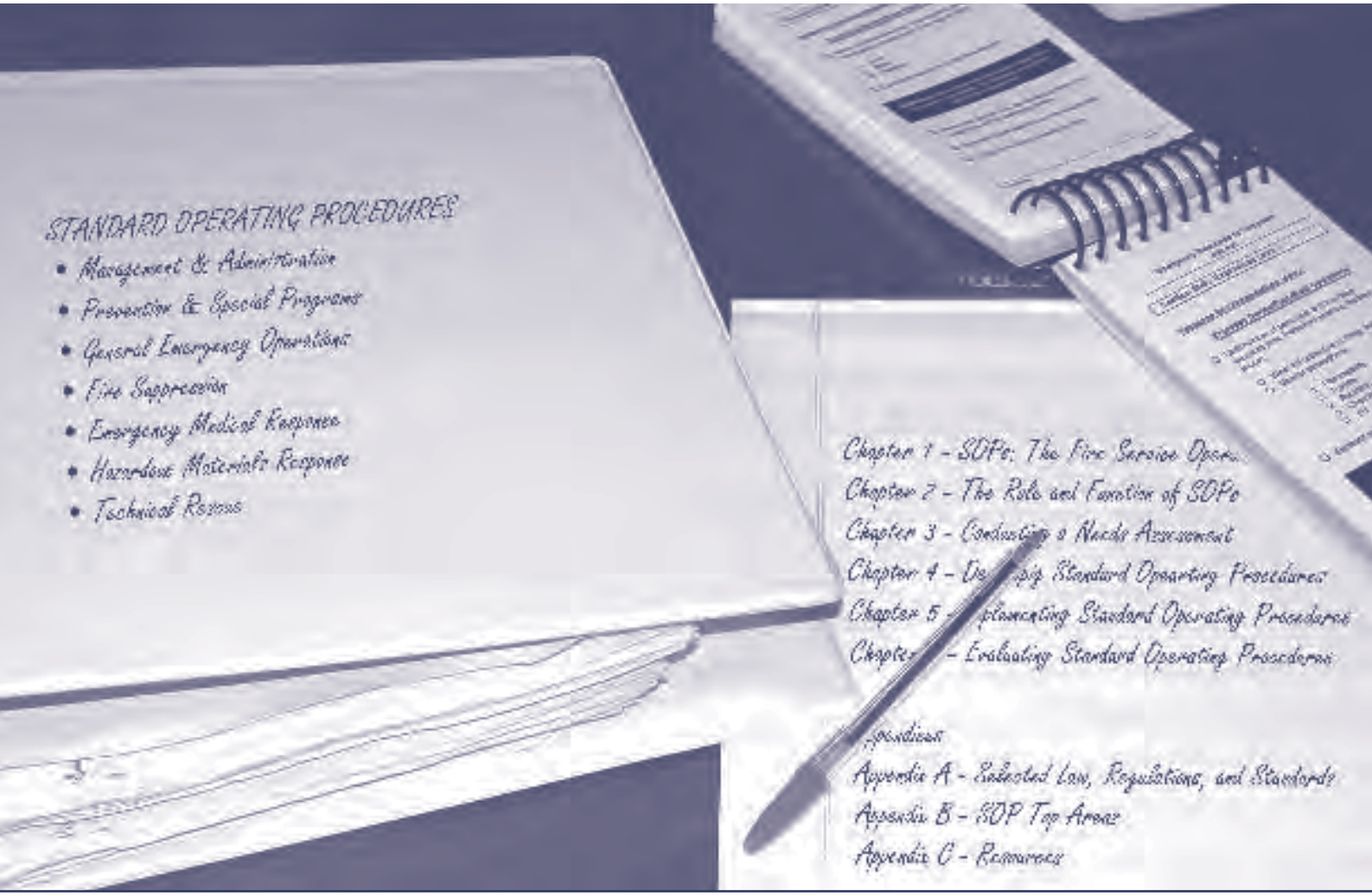


FIGURE A.8.6.4

Example of Control Zones.

Source: NFPA 1500 Figure A.8.6.4, 2013 Edition

APPENDIX C
FEMA FA-197
Developing Effective Standard Operating Procedures



Developing Effective Standard Operating Procedures

For Fire and EMS Departments

FA-197/December 1999

FEMA

GUIDE TO DEVELOPING EFFECTIVE STANDARD OPERATING PROCEDURES FOR FIRE AND EMS DEPARTMENTS

Federal Emergency Management Agency
United States Fire Administration

This guide was produced by IOCAD Emergency Services Group under contract number EME-98-CO-0202 for the Federal Emergency Management Agency's United States Fire Administration. Any information, findings, conclusions, or recommendations in this publication do not necessarily reflect the views of the Federal Emergency Management Agency or the United States Fire Administration.

Preface

Since its inception, the United States Fire Administration (USFA) has been committed to enhancing the health and safety of emergency response personnel. Fire, rescue, emergency medical service (EMS), and other response agencies across the country rely on the USFA for current information and state-of-the-art guidance on critical fire service management and operational issues.

This *Guide to Developing Effective Standard Operating Procedures for Fire and EMS Departments* is designed to assist emergency service managers in establishing effective standard operating procedures (SOPs) within their organizations. It will serve as a valuable resource for personnel seeking a clear understanding of operational issues, and will facilitate compliance with current laws, regulations, and standards related to the emergency services.

The *Guide* explains how SOPs can be developed, lists topic areas that should be covered, and describes various styles and formats. While this material will prove helpful for fire and EMS departments developing SOPs, it is important to note that each department must conduct its own analysis, rather than copy verbatim the policies and procedures of another agency. SOPs are not "one size fits all;" they must be customized to the unique requirements of the department and community.

The *Guide* was developed by a team of experts in the emergency services, put together by IOCAD Emergency Services Group. Participants included fire and EMS of ficers, educators, attorneys, physicians, and other experts. The material was reviewed for accuracy and comprehensiveness by members of a Quality Review Panel made up of experts from the emergency services and pertinent federal agencies, including the U.S. Department of Labor/Occupational Safety and Health Administration (OSHA). The USF A appreciates their contributions to the manual and their commitment to the health, safety, and effectiveness of the fire and emergency medical services.

Members of the IOCAD development and review team included (in alphabetical order):

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- Ray Hawkins, Director, Client Education and Training Services, VFIS
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- William Troup, Firefighter Health and Safety Specialist, U.S. Fire Administration

Table of Contents

PREFACE iv

TABLE OF CONTENTS vii

CHAPTERS

CHAPTER 1 - SOPs: The Fire Service Operator's Manual 1

CHAPTER 2 - The Role and Function of SOPs 7

CHAPTER 3 - Conducting a Needs Assessment 19

CHAPTER 4 - Developing Standard Operating Procedures 33

CHAPTER 5 - Implementing Standard Operating Procedures 49

CHAPTER 6 - Evaluating Standard Operating Procedures 59

APPENDICES

APPENDIX A - Selected Laws, Regulations, and Standards 67

APPENDIX B - SOP Topic Areas 77

APPENDIX C - Resources 99

Chapter 1

SOPs: The Fire Service Operator's Manual

Introduction

Imagine a situation where adjacent communities decide to combine firefighting operations. The members of the new consolidated department know the geographic area and local hazards. They all are well trained, with years of experience on the job. Cost savings have allowed the new department to upgrade facilities and provide better equipment. The result should be an immediate improvement in service quality and efficiency, right?

Unfortunately, the opposite may be true in situations like this. That's because each of the predecessor fire departments had its own unique way of doing things—policies, traditions, plans, methods, etc. Even some of the legal authorities under which they operated were different. As a result, combining organizational systems and personnel leads to miscommunication, conflict, and problems on the fireground.

These problems may have been avoided if the new organization had implemented written guidelines that defined precisely how operations were to be conducted. These guidelines, often called **standard operating procedures** or SOPs, clearly spell out what is expected and required of personnel during emergency response and non-emergency activities. They provide a mechanism to communicate legal and administrative requirements, organizational policies, and strategic plans to the members. In short, they get everybody "reading from the same sheet of music." *

This manual is intended to help fire service organizations develop and implement effective SOPs. The material is designed for use by managers and supervisors in all types and sizes of fire departments. Community officials, employee representatives, individual firefighters, and others with an interest in enhancing fire service operations and administration can also benefit from this information.

CONTENTS

Page

SOP vs. SOG 2
What are SOPs? 2
Why are SOPs Important? . . . 3
Use of the Manual 4

* Terminology may vary. See box on next page.

SOPs vs. SOGs

An issue sometimes arises within fire service organizations about whether to use the terminology "standard operating procedures" (SOPs) or "standard operating guidelines" (SOGs). Some experts feel that the term "procedures" implies relatively inflexible task steps or instructions, while "guidelines" implies more discretion in performing the job. Since emergency incidents are unpredictable and flexibility is essential, these experts advise fire departments to develop SOGs, thereby reducing the need to identify exceptions, and perhaps even limiting liability due to actions by personnel. Other experts believe the opposite is true: the term "guidelines" implies too much flexibility and discretion, thus reducing control and increasing the likelihood of mistakes.

A review of related legal proceedings indicates that terminology is less important than content and implementation of SOPs/SOGs. Courts tend to assess liability based on factors such as:

- Systems in place to develop and maintain SOPs/SOGs
- Compatibility with regulatory requirements and national standards
- Consideration of unique departmental needs
- Adequacy of training and demonstration of competence
- Procedures used to monitor performance and ensure compliance

For convenience, the traditional terminology "standard operating procedures" is used throughout this manual. Other alternatives—including General Orders, Departmental Orders, or Executive Orders, to name a few—may be equally appropriate. Fire service organizations should consult with legal counsel and use the terminology that best reflects their unique needs. Regardless of the term used for these policies and procedures, it is important to note that judgement and discretion must be used on all incidents.

What Are SOPs?

According to the National Fire Protection Association (NFPA), a standard operating procedure is "an organizational directive that establishes a standard course of action." In other words, SOPs are written guidelines that explain what is expected and required of fire service personnel in performing their jobs. A comprehensive set of SOPs defines in significant detail how the department intends to operate.

SOPs may be prepared for any function that fire service organizations perform, including administration (hiring, equipment maintenance, building inspections, rehabilitation, etc.) and emergency response operations (fire suppression, medical services, hazardous materials response, etc.). The procedures can be organized and presented in many different ways, depending on the department's needs and preferences. (Sample topic areas are described in Chapter 2 and Appendix B.)

SOPs should not be confused with pre-incident plans or pre-plans, which describe strategies for emergency response at a specific facility. Pre-plans allow the department to gather information on designated locations, identify potential hazards, and assess site-specific factors. SOPs, on the other hand, are more generic in nature. They address general functions like equipment placement and tactical operations, and they are applicable to all emergency incidents, or at least to a specific category or type of emergency situation.

SOPs are not intended to duplicate technical information or provide step-by-step instructions for doing the job. The knowledge and skills that personnel need to perform specific job tasks—manage programs, fight fires, provide medical care, etc.—are addressed in technical protocols and professional training. SOPs, conversely, describe related considerations: safety, use of supplies, equipment maintenance, duties and rights of personnel, command structures, coordination with other organizations, reporting requirements, and so forth.

Stated differently, SOPs don't describe how to do the job (technical skills), they describe the department's rules for doing the job (procedural guidance). An example might help to clarify this point. Operating an emergency vehicle requires both technical skills and procedural guidance. Some possible components of each are listed below:

Technical Skills	Procedural Guidance
• Location of vehicle controls	• Use of seat belts
• How to activate warning systems	• Permitted uses of warning systems
• Operation of communications equipment	• Communications protocols
• Vehicle driving skills—accelerating, braking, turning, etc.	• Procedures at intersections, permissible speeds, passing other vehicles
• Parking skills	• Vehicle placement, use of traffic cones

Why Are SOPs Important?

Sometimes it seems like fire service organizations face an insurmountable array of challenges in modern society. In an era of shrinking resources, departments must contend with:

- Expanding organizational missions—emergency medical care, hazardous materials response, technical rescue, fire prevention/public education, and terrorism incidents.

- Increasing legal and regulatory requirements—safe work practices, public and employee right-to-know, equal opportunity (race, gender, age, disability), performance standards, employee relations, and much more.

- Increasing complexity in emergency response techniques and equipment—personal protective measures, chemical safety, infection control, building and industrial codes, information management, training systems, and so forth.

- Increasing coordination and reporting requirements with other groups—emergency response agencies, community managers and planners, mutual aid organizations, federal and state governments, member associations, and others.

Fire service organizations must meet these growing requirements in an environment that itself is a challenge. Budgets are tight and personnel are stretched thin. The experience of the workforce may be declining due to a decrease in the number of structural fires and the retirement of more experienced personnel. Scrutiny by the media, government, and the public is intense. Legal defenses continue to erode—concepts like sovereign immunity have been limited and narrowed by the courts; lawsuits are more common and jury awards are perceived to be greater.

As a result, the decisions that personnel face are more complex and controversial. Mistakes have greater repercussions and costs. Emergency service providers need help understanding and navigating the maze of regulatory and administrative requirements. Managers, on the other hand, need a mechanism to convey operational guidance to the members and ensure departmental compliance with laws, regulations and standards. They need tools to direct and control the rapid pace of change.

Well-designed standard operating procedures help fill both needs. For individual workers, SOPs clarify job requirements and expectations in a format that can be readily applied on the job. They explain in detail what the department wants them to do in the situations they are most likely to encounter. The result is improved safety, performance, and morale. For department managers, the advantages are equally great. SOPs provide a mechanism to identify needed changes, articulate strategies, document intentions, implement regulatory requirements, enhance training, and evaluate operational performance. The result is improved operational efficiency, greater accountability, and reduced liability. Everybody's a winner!

In short, SOPs are a vital component of fire service administrative and emergency response operations. Departments cannot operate safely or effectively in modern society without a comprehensive set of SOPs and the management systems needed to develop and maintain them. Organizations that choose to ignore this fact are increasingly vulnerable to accidents, lawsuits, unnecessary costs, personnel problems, and damage to their professional image.

Use of the Manual

This manual is intended to serve as a planning guide and reference document for fire service organizations in developing, implementing, and maintaining SOPs. It describes general concepts, related legal authorities, specific steps, and resource requirements for managing the SOP process. In addition, sample topic areas and content recommendations are provided. Each department will need to tailor this information to their own unique needs and preferences.

As noted previously, fire service organizations must address both administrative and operational functions in their SOPs. However, general administration requirements and issues—personnel, facilities, equipment, etc.—are considered to be outside the scope of this effort. Managers interested in more information on these subjects should contact the information sources in Appendix C.

This manual has been organized into chapters that reflect logical steps in a formal SOP management program, as follows:

> Chapter 2, *The Role and Function of SOPs*, describes the use and content of SOPs in a typical fire service organization. Sample SOP categories are presented, and the relationship between SOPs and other fire service documents is explored.
>
> Chapter 3, *Conducting a Needs Assessment*, describes elements of an organizational process to examine existing SOPs, identify shortfalls, and develop an action plan. Processes for assessing the current operating environment, standard of practice, and local needs are discussed.
>
> Chapter 4, *Developing Standard Operating Procedures*, describes generic steps and requirements for preparing a comprehensive set of SOPs. Related considerations include the use of committees or teams, staffing, mechanisms for gathering input, document formats, and review and approval processes.
>
> Chapter 5, *Implementing Standard Operating Procedures*, discusses the requirements and systems needed to ensure that new SOPs are understood and used correctly. Subjects include planning, notification, distribution, accessibility, training, and performance monitoring.
>
> Chapter 6, *Evaluating Standard Operating Procedures*, defines the purpose and types of formal processes that departments can use to analyze the effectiveness of existing SOPs. General steps and a detailed case study are presented.

In addition, three appendices provide detailed reference information for use by SOP program managers and process participants:

- Appendix A summarizes important laws, regulations, and professional standards affecting fire service operations.
- Appendix B lists detailed topic areas and content descriptions for fire service administrative and operational functions.
- Appendix C identifies helpful information sources and organizational contacts, including website addresses if available.

Chapter 2

The Role and Function of SOPs

Introduction

As discussed in Chapter 1, experts agree that standard operating procedures are a critical component of fire service operations. Every department needs to prepare a comprehensive set of SOPs to provide structure to important administrative functions and emergency response operations. They also need to set up the management systems and infrastructure necessary to develop, maintain, and enforce them effectively.

This chapter discusses some useful concepts and background information about SOPs and related management processes. Subjects include the role of SOPs in fire service operations; common benefits and applications of SOPs; internal and external documents that should be considered when writing SOPs; and ways to structure SOPs. The chapter concludes with a review of generic steps in the SOP management process.

The Role of SOPs

SOPs have many important functions in fire service organizations. In particular, a complete set of SOPs is the best method for departments to "operationalize" other organizational documents—by-laws, plans, policies, operational strategies, mutual aid agreements, etc. In simple terms, SOPs "boil down" the important concepts, techniques, and requirements contained in these documents into a format that can be readily used by personnel in their daily jobs. As such, SOPs help to integrate departmental operations, linking the work of managers and planners with the activities of other workers.

CONTENTS

Page

The Role of SOPs 7
Interface With Other Documents _ 8
SOP Topic Areas 12
The SOP Management Process _ 15

SOPs are also essential for addressing the diverse legislative and regulatory requirements that affect fire service operations. Many laws and regulations state that fire departments must follow "safe work practices." Courts have generally agreed that this includes the development and maintenance of SOPs. In addition, many communities have ordinances that mandate compliance with standards developed by NFPA or other professional organizations. A very effective way to implement these

legal requirements and national standards is to incorporate them into SOPs. By documenting the department's effort and intention to be compliant, SOPs may also help to limit liability when incidents go awry.

SOPs have many other applications and benefits for fire service organizations, including:

- Explanation of performance expectations—SOPs describe and document what is expected of personnel in the performance of their official duties. As such, they provide a benchmark for personnel, an objective mechanism for evaluating operational performance, and a tool for promoting a positive organizational culture.

- Standardization of activities—SOPs identify planned and agreed-upon roles and actions. This information helps standardize activities and promote coordination and communications among personnel. SOPs also simplify decision-making requirements under potentially stressful conditions.

- Training and reference document—Written SOPs can provide the framework for training programs, member briefings, drills, and exercises. These activities, in turn, improve the understanding of work requirements and help identify potential problems. A comprehensive SOP manual also serves as a self study and reference document for personnel.

- Systems analysis and feedback—The process of researching and developing SOPs provides opportunities for managers to compare current work practices with the state-of-the-art in the fire service. Feedback from outside groups, technical experts, and staff can help to identify potential problems and innovative solutions.

- External communications—SOPs clarify the department's operational philosophy and recommended practices. As such, they may prove useful in communicating organizational intentions and requirements to outside groups, or enhancing the public's understanding of the fire service.

Interface with Other Documents

Standard operating procedures are not implemented in a vacuum. Personnel carry out SOPs within an operational environment that incorporates many internal and external components—laws, plans, agreements, etc. All of these elements must be considered when formulating or amending SOPs.

As noted above, SOPs "operationalize" the strategies and plans of the organization. In other words, they identify specific procedures that must be used to accomplish the mission, goals, and objectives of the agency, as defined in plans and other documents. They also provide a direct link between the tasks assigned to individual department members and the laws, regulations, standards, and policies that control fire service operations. If SOPs are created without adequate

consideration of these internal and external factors, the resulting guideline will be incomplete, ineffective, and possibly even dangerous to the personnel who use them.

This section briefly reviews some of the fire service documents that must be considered when creating or changing SOPs. The relationships among the various documents are depicted graphically in Figure 2-1. However, it is important to note that every fire and emergency service organization is different. Each department must identify the specific plans, documents, and relationships that are appropriate to its unique situation.

By-Laws and Constitutions—Some fire and emergency service organizations, particularly volunteer agencies and private corporations, operate under a set of by-laws and/or a constitution. These enabling documents establish the rules for the organization, including, for example, what personnel are authorized to do, how members vote within the organization, and how the leadership of the agency is organized. By-laws and constitutions are the basic guiding documents for the organization, establishing a form of internal law. If a need exists to change by-laws, the department must often undertake a complicated process to make amendments. In many cases, changes must also be filed with a state agency, such as a state corporation commission.

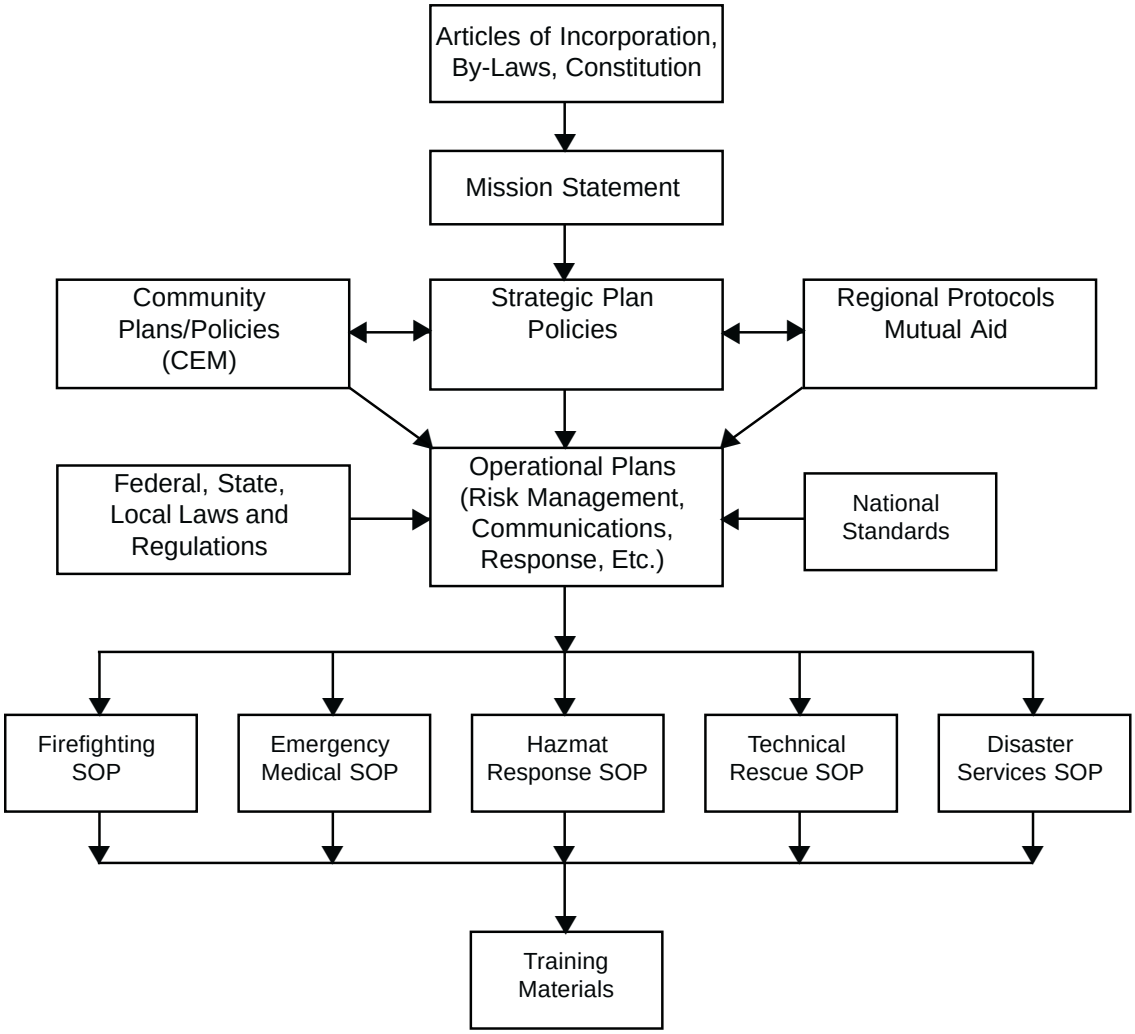
Mission Statement—Most fire and emergency service agencies operate under a general guiding principle called a mission statement. The mission statement broadly defines the purpose and goals of the organization, establishing a philosophical foundation on which to build programs and services. Fire service managers and planners should consider the mission statement in every activity or document produced by the agency, including SOPs.

Strategic Plans—Strategic plans, also called master plans, are developed by fire service agencies in conjunction with the authority having jurisdiction. These plans—whether three, five, or ten years in duration—put in place a set of expectations for the present and the future. They identify short-term and long-term goals and clarify interorganizational relationships and agreements that must be addressed in operations. SOPs must work in concert with strategic plans to meet the goals that the community has established.

Mutual Aid/Automatic Aid Agreements—Mutual or automatic aid agreements are contracts that define working relationships and response plans between departments and outside agencies or jurisdictions. These agreements, like strategic plans, create a set of expectations and requirements for the organizations and personnel involved. Incorporating these elements in SOPs helps ensure that agreements are enforced and joint operations are coordinated. For example, the agreement between the Jonesville Fire Department and the Parkerville Fire Department states that Parkerville will send two engines and one truck to all structure fires when called to respond in Jonesville. However, the Parkerville SOPs define mutual aid assistance as one engine and one truck. The cause of this confusion can easily be corrected by considering all mutual and automatic aid agreements when developing the SOPs.

Figure 2-1

Relationships Among Fire Service Documents



Regional Standard Operating Procedures/Protocols—If a fire or emergency service organization is part of a regional grouping, the possibility exists that regional protocols will come into play. In these situations, agency SOPs must be compatible with regional protocols to eliminate the possibility of confusion or uncoordinated activities. A common example includes agencies that provide emergency medical services. Regional treatment protocols allow basic and advanced life support EMS personnel to administer procedures and treatments in the field under the direct or indirect supervision of a medical director or supervising physician. SOPs must be complementary to, and not conflict with, EMS protocols established by local, state, or regional medical direction.

Comprehensive Emergency Management Plans—Comprehensive emergency management plans (or integrated emergency management plans) describe response activities, assignments, and logistical considerations during major disasters and mass casualty incidents. These documents facilitate the coordination of agencies that work together during emergencies that exceed the capabilities and resources of a single organization. Like other planning documents, comprehensive emergency management plans must be considered when developing or revising SOPs. Key elements include consistent terminology and clear command and control structures. Establishing this framework requires integrating the community's planning processes and incorporating relevant aspects in each emergency service's SOPs.

Laws, Regulations, and Standards—The legal authorities that affect fire service operations include federal, state, and local laws and regulations, case law precedents, and standards developed by national professional associations. These mandates and guidelines describe how jobs are to be performed. SOPs that violate the established fabric of statutes and rules open up the organization to lawsuits, legal actions, or other serious consequences. [The wide variety of laws, regulations, and standards affecting fire and emergency service operations is beyond the scope of this report. However, the concept behind these authorities is summarized in Chapter 3, and more detail on many important statutes and rules is presented in Appendix A.]

Risk Management Plan—Fire and emergency service agencies often develop and adopt a comprehensive risk management plan. In this effort, planners consider all policies and procedures, accident and injury data, and number and types of incidents. Based on the control measures established, new standard operating procedures can be developed.

Other Planning Documents—Like strategic plans, many departments prepare other planning documents to guide the organization and help coordinate activities. These documents might include response plans, communications plans, staffing plans, and so forth. The plans clarify operational goals, strategies, assignments, and expectations. SOPs must work in tandem with these planning documents to allow the agency to accomplish its mission. In particular, careful consideration should be given to the language and terminology used in communications plans. If dispatchers use one set of terms from communications plans, and field personnel use another set from the SOPs, a dangerous situation could develop, both for responders and for the agency.

Training Materials—Training is the best way to ensure that members understand SOPs and have the skills needed to carry them out. As such, training is the primary link between the department's SOPs and the personnel who implement them. Most fire services agencies develop training manuals and other materials to assist instructors and students in the learning process. These materials must incorporate and accurately convey the department's SOPs. In fact, they serve as "quasi-SOPs," specifically designed to facilitate the transfer of information on SOPs in a training environment. Any conflict between training materials and SOPs will cause unnecessary confusion and undermine the operational mission of the organization.

SOP Topic Areas

SOPs are statements that summarize behavioral requirements and expectations in a certain functional area, e.g., safety at emergency scenes, training and education, radio communications, hose testing and maintenance, post-incident analyses, and public education among many, many others. Typically, SOPs also contain some narrative material that explains, for example, the purpose and intent of the guidelines and possible exceptions. The subjects addressed and level of detail in SOPs may vary from department to department. In general, however, SOP writers try to provide enough guidance to control operations without overwhelming personnel or unnecessarily limiting flexibility in special situations. (See Chapter 4 for information on writing SOPs).

SOPs should be organized into a logical framework, using headings and sub-headings that help clarify functional relationships and the roles played by different groups. Most experts recommend that departments divide the SOP manual into separate sections for administration and operations. If desired, operational SOPs can be further subdivided into units that separately address each major component of the organization's mission. Personnel policies may be covered in a separate document or set of documents.

Exhibit 2-1 shows sample SOP categories for general administrative and operational functions. In addition, topic areas for each of five common fire service missions—fire suppression, emergency medical services, technical rescue, hazardous materials response, and disaster operations—are presented. Further breakouts and descriptions of these categories can be found in Appendix B. It should be noted that other ways to organize SOPs might be equally appropriate or more suitable in specific situations. This material is intended solely to give fire departments a starting point in developing their own set of guidelines.

Although the list in Exhibit 2-1 may appear extensive, keep in mind that all SOPs do not have to be written at the same time. Departments should prioritize their needs and establish a realistic SOP development plan. SOPs should be prepared, released, and assimilated into operations at a reasonable pace.

Exhibit 2-1

OVERVIEW OF SOP TOPIC AREAS

MANAGEMENT AND ADMINISTRATION

General Administration
- Organization
- Facilities
- Emergency Vehicles and Specialized Apparatus
- Equipment and Supplies
- Finance
- Fundraising
- Training, Education, and Exercises
- Information Management

Member Health and Assistance Programs
- Medical Screening/Health Assessment
- Health and Wellness Promotion
- Performance Evaluation
- Post-Injury Rehabilitation
- Employee/Member Assistance
- Facility Safety
- Hazard Communication

Organizational Planning and Preparedness
- Strategic/Master Planning
- SOP Development
- Risk Management
- Emergency Operations Planning
- Mutual/Automatic Aid

PREVENTION AND SPECIAL PROGRAMS

Public Information and Education
- Working with the Public
- Working with the Media
- Emergency Public Information
- Public Education
- Public Relations

Building Inspections and Codes Enforcement
- Authorities and Codes
- Design and Plans Review
- Residential Inspections
- Commercial Inspections
- Industrial Inspections
- Code Enforcement
- Record Keeping

Special Programs
- Fire Cause and Arson Investigation
- Hydrant Maintenance
- Other Special Programs

Exhibit 2-1 (continued)

OVERVIEW OF SOP TOPIC AREAS

EMERGENCY OPERATIONS

General Emergency Operations
- Operating Emergency Vehicles
- Safety at Emergency Incidents
- Communications
- Command and Control
- Special Operations
- Post-Incident Operations

Fire Suppression
- Fire Suppression Risk Management
- Company Operations
- Tactical/Strategic Guidelines
- Special Facilities/Target Hazards
- Special Fire Suppression Operations

Emergency Medical Response
- EMS Response Risk Management
- Pre-hospital EMS First Response
- Patient Disposition and Transportation
- Management of EMS Operations
- Special EMS Operations

Hazardous Materials Response
- Hazmat Response Risk Management
- First Responder Operations
- Special Hazmat Operations

Technical Rescue
- Technical Rescue Risk Management
- Rescue Operations
- Special Rescue Operations

Disaster Operations
- Organizing for Disaster Operations
- Disaster Operations Risk Management
- Disaster Operations
- Disaster-Specific Guidelines

The SOP Management Process

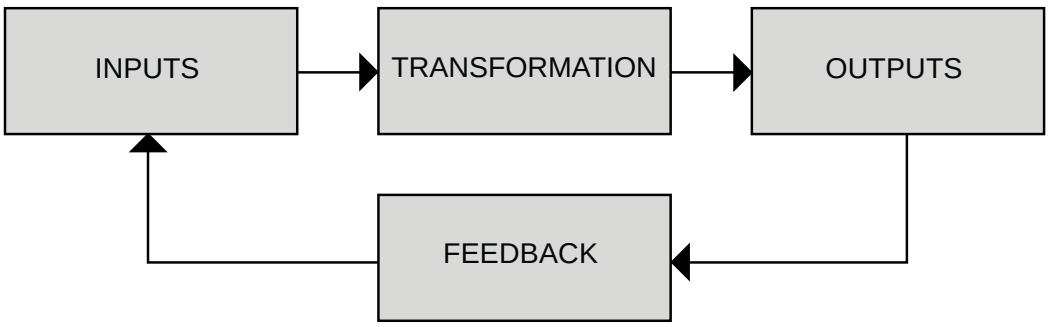
Some fire departments have never developed a formal set of SOPs. In other departments, operating procedures are incomplete, out of date, badly written, poorly understood, or inadequately enforced. Given the obvious advantages of well-designed SOPs, why is this situation so prevalent in the fire service? Reasons might include:

- Lack of appreciation for the benefits of SOPs or the potentially disastrous consequences of weak guidelines and operational systems.
- Belief that the effort required is too time consuming, complex, or controversial, especially given other pressing organizational needs.
- Fear that written SOPs will unnecessarily limit flexibility and individual discretion.
- Concern that SOPs open up the department to greater scrutiny from outside groups and increased liability if incidents go bad.

The biggest reason that departments don't have good SOPs, however, may be even more basic. Many fire agencies simply have not established the management processes—formal plans, personnel assignments, administrative systems, resource allocations—needed to make SOPs a recognized and ongoing element of the organizational culture. Without this emphasis and infrastructure, work gets delayed, and, over time, new requirements may go unrecognized. Before you know it, existing SOPs have become progressively outmoded, unused, and even dangerous.

The first step in solving this problem is deciding what needs to be done. One way to look at SOP management requirements uses *systems theory*, a concept that focuses on the interrelationships among components of a process. In this approach, an organizational **system** is considered to have four basic elements: inputs from the environment, including information and other resources; transformations, the managerial or technological processes used to convert inputs to outputs; outputs in the form of desired products or services; and feedback, the environment's reaction to outputs. Feedback serves as an input during future iterations of the process, thus completing the cycle and continually improving results. These steps are graphically depicted below.

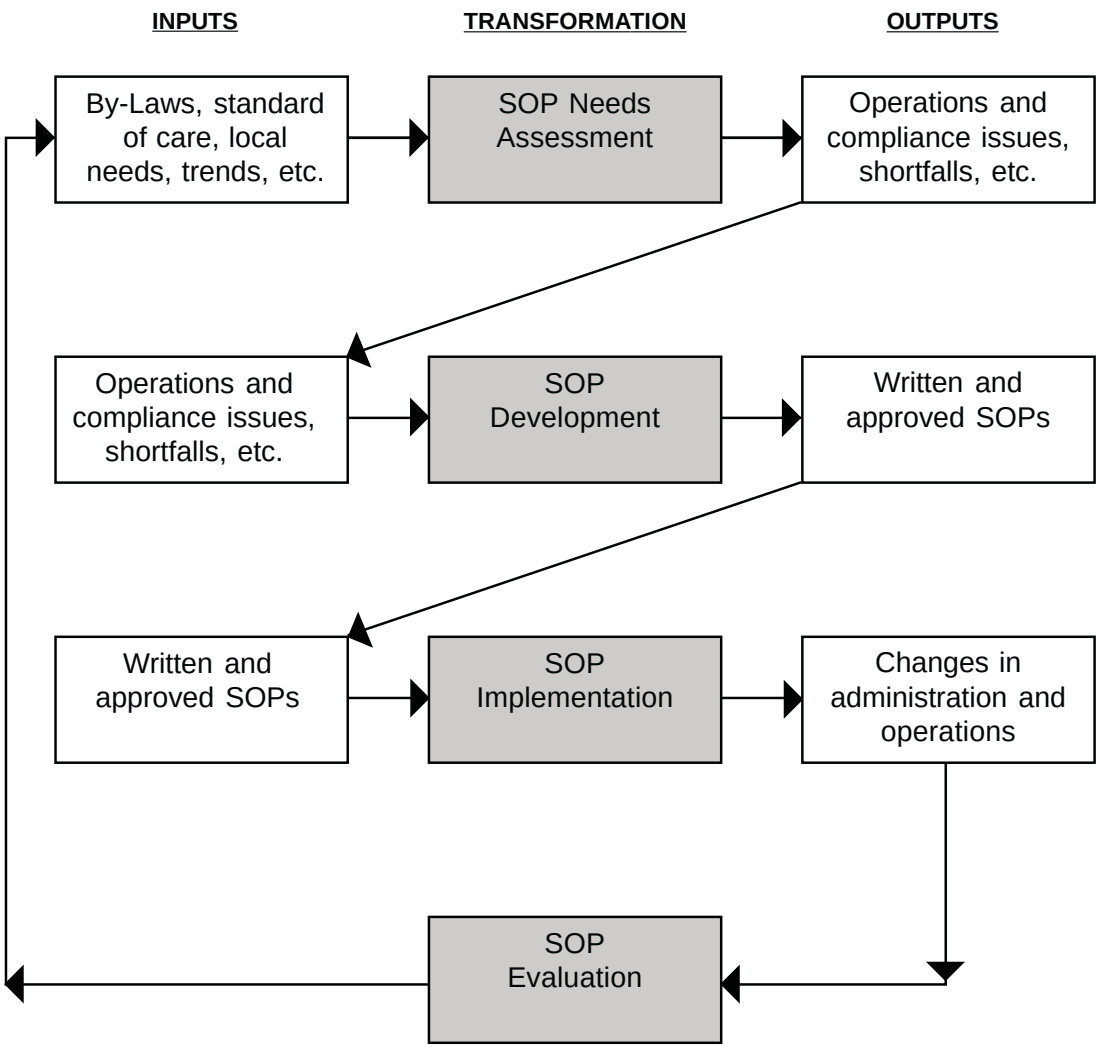
Figure 2-2



Systems theory provides a useful way to conceptualize complex processes. SOP management is shown to consist of a series of linked steps, with outputs of one element serving as inputs for the next. The components and interrelationships of this systems view are depicted in Figure 2-3. More information on each of the major process steps—SOP Needs Assessment, SOP Development, SOP Implementation, and SOP Evaluation—is presented in the following four chapters.

Figure 2-3

A Systems View of SOP Management



Summary

SOPs serve many important functions in fire service operations. When individuals carry out the department's SOPs in their work, they implement the laws, plans, agreements, and policies incorporated in the procedures. Thus, SOPs constitute a key link between organizational policy makers, planners, administration personnel, and emergency service providers.

Fire and emergency service agencies need to consider a wide variety of documents, plans, and agreements when developing or revising SOPs. Ensuring compatibility and consistency among these important components of the organization's operational environment helps standardize behavior, avoid confusion, limit liability, improve efficiency, and enhance safety. SOP documents also can be used to improve training, external communications and public education.

To simplify use, SOPs should be organized in a logical framework of functions and topic areas. Separate sets of SOPs are usually developed for administrative functions and emergency response operations. The approach chosen for structuring SOPs should reflect the needs, management style, and culture of the department.

Departments need to establish formal management systems to ensure that SOPs are adequately developed, maintained, and enforced. The process can be usefully viewed as four interrelated steps—Needs Assessment, SOP Development, SOP Implementation, and SOP Evaluation.

Chapter 3

Conducting a Needs Assessment

Introduction

Fire service managers need to be sure that operating procedures accurately reflect the department's mission, organizational environment, and regulatory requirements. A good way to make this judgement is by conducting a needs assessment. This type of study focuses on internal and external factors that affect SOPs. These might include changes to laws, regulations, or standards; recent legal precedents; modifications to internal response plans; revisions to mutual-aid agreements; demographic changes in the community; and a variety of other possibilities.

Although major changes in legal or operational requirements will prompt a formal needs assessment, the process should be performed continually to help keep SOPs current and valid. While this may seem like a daunting administrative task, it is really a matter of answering two basic questions:

- ***What SOPs do we need?*** — The number and type of SOPs required by the department is determined by examining the operating environment, standard of practice, and local needs. Industry standards, accreditation requirements, Federal or state regulations, and many other information sources can be used to help answer this question.

- ***Do the current SOPs meet our needs?*** — If yes, then update as needed and continue to use them. If no, then modify existing SOPs and/or develop new ones to reflect changes in the operating environment, standard of practice, or local needs. Delete outdated, irrelevant, or conflicting SOPs.

The simple depiction of the evaluation framework shown in Figure 3-1 can be helpful for conceptualizing the needs assessment process. The mechanics of the process are described in more detail in this chapter.

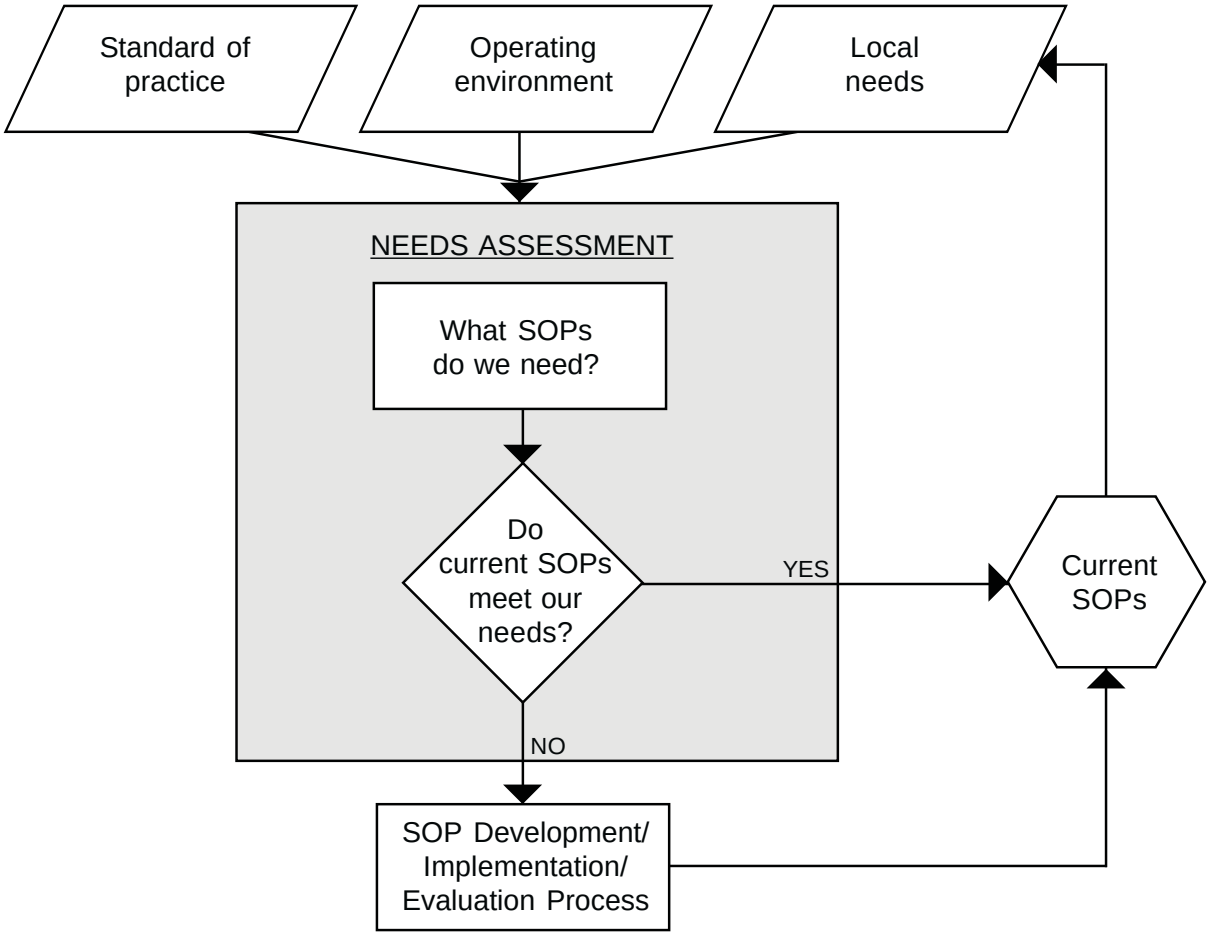
CONTENTS

Page

Operating Environment 21
Standard of Practice 22
Local Needs 26
Information Sources 26
Needs Assessment Process . . . 29

Figure 3-1

Sample Needs Assessment Model



Operating Environment

The first step in conducting a needs assessment is understanding the context in which the department functions. Fire service organizations vary widely in how they operate, depending on many internal and external factors. Examples include the size (number of personnel) and composition of the department (career, volunteer, or combination); the range of services offered (fire suppression, EMS, hazardous materials, technical rescue); funding sources (tax dollars, donations, grants, etc.); service demands; and the department's relationship with local, state, or Federal entities (local governments, mutual-aid networks, state fire service agencies, and OSHA or its equivalent). Official department documents (many of which are described in Chapter 2) define the department's operating environment and should be considered during a needs assessment.

These and other factors directly or indirectly affect the department's operating environment. In turn, the operating environment influences SOPs. For instance, the size and composition of the department has direct bearing on the resources it can provide for emergency response; resource availability affects operational strategies; and strategies are captured in SOPs. Thinking about the answers to some basic questions can help identify aspects of the operating environment that might influence SOPs:

- What is the relationship between the department and state fire/EMS agencies, such as the State Fire Marshal's Office, Department of Health, Department of Insurance, or fire training/certification body? What do these agencies require from the department? Submitting fire/EMS incident reports? Ensuring proper certification or licensure of operational personnel? Maintaining current apparatus safety or ambulance inspections?

- What is the relationship between the department and OSHA or its state equivalent? What does this agency require from the organization? Compliance with workplace health and safety regulations? Submission of employee injury reports? Hazardous materials training and certification?

- How many personnel normally respond on the first-alarm assignment for a building fire? For an automatic fire alarm in a residential or commercial structure? To an emergency medical call at 0700, 1300, 1800, or 0300?

- What mutual-aid agreements, comprehensive emergency management plans, or regional SOPs are currently in place? In different types of response scenarios, what resources should be provided to neighboring departments? What resources will they provide? Is response automatic or must it be requested?

These are just a few examples of the many questions that can be asked while trying to get a handle on the department's operating environment. While this step may seem very basic, it is critical for identifying factors that affect the adequacy of current SOPs.

Standard of Practice

Understanding the context in which the department operates helps provide the basis for the next step: comparing the department's operational systems and procedures with the standard of practice. This process helps identify areas where SOPs need to be added, changed, or deleted to meet operating requirements and legal guidelines.

The term "standard of practice" is often used to describe accepted operating practices within an industry or profession. In EMS, the term "standard of care" has a similar meaning. Several elements combine to define the accepted standard of practice for a fire or EMS department, including laws, regulations, and standards. The interaction among these authorities is often complex and varies from state to state. It is important to develop an understanding of how these factors fit together.

Laws

Laws are rules established by society to help define acceptable behavior. In the United States, most laws applicable to fire and EMS departments are statutory laws, those enacted by the legislative bodies of Federal, state, or local governments. The courts provide oversight for the legal system to ensure that laws are constitutional and fairly applied. As a result of this judicial review process, the law changes based on the outcome of court cases, called precedents.

The following Federal laws and legal precedents are examples of potentially significant considerations for fire and EMS departments. (For more detail on each, see Appendix A.) Departments should also research state and local authorities applicable to their specific situation.

- Americans with Disabilities Act of 1990 (ADA)
- Ryan White Comprehensive AIDS Resources Emergency Act of 1990
- OSHA General Duty Clause– 29 USC[1] §654(a)(1)
- Superfund Amendments and Reauthorization Act (SARA)
- *Michigan v. Tyler*
- *Michigan v. Clifford*

It can be especially difficult for fire and EMS departments to keep current with changes to case law and legal precedent. Several trade publications have regular columns dealing with legal trends, and some smaller publications like *Firehouse Lawyer* deal specifically with legal issues affecting the fire service. State agencies and professional organizations such as the International Association of Fire Fighters (IAFF) and the International Association of Fire Chiefs (IAFC) occasionally produce documents that summarize legal trends for salient issues as well.

Conducting a search of resources like the Lexis-Nexis and Westlaw databases can help departments identify pertinent court cases, both civil and criminal. Departments with access to a law library (through either a university or local court system) might also be able to obtain assistance

from staff librarians. Reference books like *Black's Legal Dictionary* can be consulted for legal definitions. However, a basic understanding of the legal system is required when researching case law and legal precedent, so the involvement of legal counsel should be considered during this effort.

Regulations

Since statutory laws are often general in nature, legislatures create agencies to interpret, apply, and enforce the statutes. The rules promulgated by these agencies, which carry the weight of law, are called regulations.

Regulations are extremely important for evaluating SOPs. Compliance with regulations is usually mandatory, and failure to comply may result in a penalty.[2] (Although some Federal regulations may be *called* standards or rules, this does not affect the mandate to comply with them.) More importantly, compliance with regulations can help protect the safety of citizens, emergency personnel, and the environment.

When evaluating current SOPs, fire departments must ensure compliance in all areas subject to regulation by Federal, state, or local government agencies. Depending on the situation, applicable regulations might govern major aspects of fire and life safety operations, arson and explosives crimes, hazardous materials response, technical rescue, program administration, and other functional areas. Departments with enforcement powers must also pay particular attention to ensure that they do not violate civil rights requirements.

Regulations are developed through a process that allows for input from interested parties including industry, organized labor, advocacy groups, and private individuals. This process has several goals: to produce regulations that follow the spirit of the laws upon which they are based; to provide for equity and consistent application; and to produce realistic regulations that can be readily implemented. The list below contains a few examples of Federal regulations that are potentially relevant to fire and EMS departments; more detail on these regulations is provided in Appendix A. (Note: Federal OSHA standards do not apply to state or local governments, their employees or to volunteers.) State and local government regulations must also be considered during the needs assessment process.

- OSHA 29 CFR[3] § 1910.95, *Occupational Noise Exposure*
- OSHA 29 CFR §1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER)
- EPA 40 CFR §311, Identical to HAZWOPER
- OSHA 29 CFR §1910.156, *Fire Brigades*
- OSHA 29 CFR §1910.132-1910.140, *Personal Protective Equipment*
- OSHA 29 CFR §1910.141, *Sanitation Requirements*
- OSHA 29 CFR §1910.146, *Permit-required Confined Spaces*
- OSHA 29 CFR §1910.147, *Lock-out/Tag-out Requirements*

- OSHA 29 CFR §1910.130, *Occupational Exposure to Bloodborne Pathogens*
- OSHA 29 CFR §1926.650-1926.652, *Trench/Collapse Rescue Operations*
- OSHA 29 CFR §1910.1200, *Hazard Communication*
- OSHA 29 CFR §1977-1970, *Discrimination Against Employees Under OSHA Act of 1970*
- DOT 49 CFR §178 Subpart (c), *Compressed Gas Cylinder Guidelines*

The applicability of a particular regulation to the department depends on several factors. For example, the applicability of workplace health and safety regulations promulgated by Federal OSHA depends on whether the department is located in an "OSHA-plan" or "non-OSHA Plan" state. Figure 3-2 depicts the 24 states and territories that currently operate their own state-run plans for occupational health and safety. The remaining 26 states are covered by Federal OSHA regulations. The applicability of these regulations to volunteer fire and EMS department members depends on the interpretation of individual state regulatory agencies and legal precedent. Regardless of who promulgates workplace health and safety regulations in the state, compliance is mandatory.

Figure 3-2

States with OSHA Plans

Standards

Consensus standards like those developed by the National Fire Protection Association (NFPA) and the American National Standards Institute (ANSI) play a major role in defining the standard of practice for fire and EMS departments. Standards are developed by professional organizations to help establish operating norms and certification requirements for personnel and equipment.

During the standards-making process, people with specialized knowledge work in committees to develop guidelines based on mutual agreement, or consensus. Members of the organization at large then vote to amend and/or adopt the resulting standard. Compliance by fire and EMS departments with standards is voluntary, although governmental entities may adopt nationally recognized standards as law. An example of this practice is the adoption by many state and local jurisdictions of NFPA 1, *The Fire Prevention Code*. Other commonly encountered standards pertinent to fire and EMS departments are listed below. (More detail on these standards and organizational contacts can be found in Appendices A and C.)

- NFPA 471, *Standard on Responding to Hazardous Materials Incidents*
- NFPA 1001, *Standard on Fire Fighter Professional Qualifications*
- NFPA 1403, *Standard on Live Fire Training Evolutions*
- NFPA 1404, *Standard on Fire Department SCBA Program*
- NFPA 1410, *Standard on Initial Fire Attack*
- NFPA 1470, *Standard on Search and Rescue for Structural Collapse*
- NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*
- NFPA 1521, *Standard on Fire Department Safety Officer*
- NFPA 1561, *Standard on Fire Department Incident Management System*
- NFPA 1581, *Standard on Fire Department Infection Control Program*
- ANSI Z87.1, *Eye Protection Standard*

Standards can be an invaluable resource for identifying areas where existing SOPs are inadequate. They can even serve as a blueprint for developing new SOPs. When using a standard in this manner, remember that there is no such thing as a “one-size-fits-all” standard. It may not be possible or desirable to incorporate every aspect of a national standard into the local operating environment. Still, standards serve as useful benchmarks and models in the SOP assessment process. An added benefit is that they are regularly updated and can help ensure compliance with regulations that change frequently.

Local Needs (Community Assessment)

The questioning process used to examine the operating and legal environment probably identified some areas that are not subject to outside authorities where SOPs need to be changed. Laws, regulations, and standards are very useful, but they cannot possibly address every local need. Examples of department-specific or community-specific factors that might prompt the modification of existing SOPs include:

- Target hazard occupancies (e.g., factories, nursing homes, hospitals, pipelines, tank farms, railroads, scrap tire piles, high-rise buildings, etc.)
- Unusual road conditions (e.g., load-limited bridges, steep hills, major road construction, etc.)
- Mission (e.g., coastal or water rescue responsibility, location along airport flight path, proximity to nuclear power plant or industrial site)
- Prevailing weather conditions (e.g., subject to tornadoes/hurricanes, extreme hot/cold weather, etc.)
- Significant increase or decrease in incident volume
- Staffing increase or decrease
- Changes to community plans or mutual-aid agreements

Perhaps the most common reason for initiating a review of fire department SOPs is a bad incident outcome, such as a firefighter injury or death, an EMS patient injury or death, or a catastrophic property loss. The SOP review may by prompted as part of the department's analysis of the event, or be mandated by a regulatory agency like OSHA. Factors might include law suits, public complaints, union grievances, and other negative results.

While standards may address some local situations, departments must critically assess all special needs and capabilities while evaluating current SOPs. The development of SOPs for specific local situations helps to clarify potential hazards, identify special resources, and implement response strategies that are unique to the needs of the community.

Information Sources

Information for evaluating the operating environment, standard of practice, and local needs is available from a wide variety of sources, both internal and external. Departments should take into consideration as many data sources and viewpoints as possible during the needs assessment process. Some common data sources and methods are discussed in the following sections.

Looking Inward

An objective evaluation of internal factors affecting SOPs can sometimes be difficult because the individuals assigned responsibility are themselves members of the organization. By the same token, people within the organization have the best understanding of the strengths and weak-

nesses of existing SOPs. To help mitigate the difficulties posed by this "Catch-22," reviewers should examine as wide a variety of internal information sources as possible.

Post-Incident Analyses. SOPs and reality meet on the scene of a fire or emergency incident. For this reason, post-incident or "after action" analyses are excellent tools for evaluating the adequacy of existing SOPs. If a particular aspect of an operation is successfully conducted according to the SOP, it may signal that the SOP is still valid. The opposite is also true—an aspect of the operation that went badly may indicate the need for modifying pertinent SOPs. Post-incident analyses should be conducted for all responses, with both positive and negative outcomes. This approach prevents the process from becoming punitive in nature and serves to validate beneficial procedures. Keep in mind that many different variables affect an emergency operation, and each must be examined before zeroing in on SOPs as the sole reason for success or failure.

Exercises and Drills. Problems encountered during exercises and drills may signal the need to create new SOPs or change existing ones. If questions arise about the validity or effectiveness of an existing SOP, a drill may be conducted to test it. For these reasons, Federal Aviation Administration (FAA) regulations require airport fire and EMS departments to periodically conduct large-scale drills with mutual-aid resources. Safety is the first concern when conducting drills and exercises since these activities closely simulate the reality of the incident scene. Documenting the drill using photographs, video cameras, and audio equipment can be helpful. Keep in mind that the objective is not to highlight mistakes, but to identify "lessons learned" that can be used to help modify existing SOPs or create new ones.

Surveys and Interviews. The best people to gauge whether or not a SOP is useful are those who use it. Field personnel can be polled or questioned about problems with current SOPs or the need for new ones to address changes on the street. It is important to solicit open, honest opinions without fear of retribution. Interviewing members of other departments can also be helpful, particularly when addressing a new issue. Someone with previous experience may have a better understanding of applicable regulations and standards, and know successful methods for dealing with the situation.

Looking Outward

While it is important to look inward during a needs assessment, fire and EMS departments can also benefit by examining information sources outside the department. Looking outward helps managers identify standards and trends and plan in advance for change, thus preventing problems from developing in the first place.

Literature Review. Monitoring changes in the larger fire and EMS world helps departments safely address new challenges. Trade publications report changes in government regulations, the outcome of significant court cases, and related issues. Textbooks and newsletters track and analyze trends in the fire service and cognizant Federal agencies. The continued appearance

of a particular topic in a government report, magazine, or newspaper might signal that a seemingly inconsequential issue may soon become a problem. Publications like *Congressional Quarterly* track the progress of bills through the law-making process. Changes to Federal regulations are regularly published in the *Federal Register*, available at most university and major public libraries and frequently on the Internet.

Professional and Trade Organizations. Professional and trade organizations are excellent sources of information. For example, the voluntary, consensus-based guidelines developed by the NFPA reflect the standard of practice for many fire departments. NFPA also conducts studies and produces publications on a broad spectrum of fire service issues. Many other professional and trade organizations, while not necessarily standards-setting bodies, provide information that can be useful for evaluating SOPs. Organizations like the International Association of Firefighters, International Association of Fire Chiefs, National Volunteer Fire Council, National Association of Emergency Medical Technicians, and National Association of State EMS Directors all publish documents that can be helpful during a needs assessment. (Contact information for many of these organizations can be found in Appendix C.)

Federal and State Agencies. Federal and state agencies loom large when evaluating current SOPs. Examples include the Centers for Disease Control and Prevention, Occupational Safety and Health Administration, Environmental Protection Agency, and other regulatory agencies. It is vital that existing SOPs do not conflict with regulations promulgated by these agencies. New SOPs and modifications to existing SOPs should reflect the content of Federal and state regulations, as well as programmatic guidance issued by the agencies. Since this information can change frequently or unexpectedly, it is important to stay current. Some ways to keep abreast of changes to regulations were discussed earlier in this chapter. Contact information for many Federal agencies is contained in Appendix C.

Other Departments. Other fire and EMS departments can be excellent sources of information on SOPs, or sources of SOPs to plagiarize (if they are public documents). Although local needs vary, there are few unique problems in emergency response. If you are facing a new challenge or service delivery area, chances are good that another department has already developed SOPs to address it. Most departments are willing to share these SOPs, which can serve as useful models. When using another department's SOP as a model, however, always remember that what works for one department may not work for another. SOPs should be tailored to the department's operating environment and available resources. For example, a SOP developed by a department that staffs ladder companies with six personnel will probably not work for a smaller department unless greatly modified. Still, it is always helpful to have an effective starting place when developing a new SOP.

Accreditation Manuals. Departments seeking accreditation will most likely be required to have SOPs that address certain issues and meet certain standards or indicators of performance. The guides and manuals developed to assist them through the application process contain valuable information for assessing local needs (even if the department is not actively pursuing accredita-

tion). Two organizations involved in accreditation are the Commission on Fire Accreditation International (CFAI) and the Commission on the Accreditation of Ambulance Services (CAAS).

Insurance Organizations. The Insurance Services Office (ISO) maintains evaluation factors for fire and emergency service departments which, when met, help the community served achieve a particular ISO rating. This rating is a variable in determining insurance rates paid by businesses and residential customers when purchasing insurance policies on homes, buildings, offices, or other structures. The evaluation factors may be relevant to the development and implementation of fire department SOPs. For example, if the fire department is pursuing an improved ISO rating, it may have to make changes in operational policies to achieve the higher rating.

Insurance policies held by individual departments may also impact department SOPs. For example, an insurance policy may mandate a minimum age for driving an emergency vehicle. The agency would have to ensure that its own SOP reflects this requirement.

The Internet and the World Wide Web. The Internet and the World Wide Web are quickly becoming important sources of information for fire and EMS departments. Almost all major government agencies maintain informative websites. Periodic checks of these sites can help fire and EMS personnel stay informed on changes to laws or regulations that may affect SOPs. In addition, many publications and reports can be ordered, viewed, and even downloaded on-line. Internet forums, bulletin boards, and "chat rooms" can also be helpful, providing opportunities to learn from the experiences of others. Appendix C contains the Uniform Resource Locator (URL) addresses of many Internet sites useful during a needs assessment. However, keep in mind that few controls exist on the Internet, and some information may prove to be unreliable. For most purposes, it is usually best to rely on credible and known sources (government agencies, professional organizations, etc.) and printed/published documents!

The Needs Assessment Process

Every fire and EMS department should periodically conduct a formal review of SOPs, especially those that lack a comprehensive set of written procedures. Such an assessment will most likely be handled by a committee of department members representing all ranks, with representatives from employee organizations and possibly other agencies (e.g., an attorney or policy analyst from the local government). The product of this formal review is a document that can be used as a "roadmap" for developing SOPs.

At the most basic level, such a document will include a review of existing SOPs; a list of areas where SOPs need to be created or modified; and the rationale for doing so based on an evaluation of the operating environment, standard of practice, and local needs. The document should identify deficiencies or inconsistencies in current SOPs, as well as a specific list of required changes

and additions. The list should be accompanied by references that will allow others to evaluate the rationale (e.g., compliance with a specific law, regulation, or standard) behind the recommendations.

Since it may be impossible to simultaneously address all the changes identified in the needs assessment, a discussion of priorities and an action plan can also be included. An action plan helps ensure that recommendations for change are acted upon. The plan should at a minimum identify desired end products, assign responsibilities, set realistic deadlines, and permit enough flexibility to allow for change.

Revisions to critical health and safety SOPs should receive a high priority in the action plan since they influence the safety of emergency responders and the effectiveness of emergency operations. SOPs that are inconsistent with government regulations should also be highlighted for quick action. While prioritizing, it is important to remember that SOPs must reflect reality. Creating SOPs that cannot be implemented with existing resources serves little purpose and may create a safety hazard. It can also produce significant legal exposure, since a department's standard of practice is ultimately determined by its own SOPs.

The following outline identifies some typical steps in the needs assessment process; more detail on analytical concepts and methods is contained in Chapter 6.

- **Step One: Develop organizational support for conducting the needs assessment.** Support can take many forms, from providing appropriate resources (personnel, time, meeting space, etc.) to demonstrating the commitment of fire and EMS managers to make changes based on the results of the study. The purpose of the needs assessment should be clearly stated and understood by all members of the department.

- **Step Two: Develop a plan of action.** Assign responsibilities, divide tasks, and create a realistic schedule. Conducting a thorough needs assessment can be an intense and time-consuming process. Creating a plan of action helps maintain interest, promote accountability, and help the group stay focused.

- **Step Three: Review current SOPs.** Develop familiarity with existing SOPs. Look for previously identified problem areas and inconsistencies among SOPs. Consider potential impacts of the department's operating environment on existing SOPs.

- **Step Four: Gather information on internal factors affecting SOPs.** Examples include other department documents (see Chapter 2), post-incident analyses, exercises, drills, surveys, and interviews.

- **Step Five: Consider external factors affecting SOPs.** The impact of laws, regulations, and standards should be considered here. Information sources may include literature reviews, professional and trade organizations, Federal and state agencies, other departments, accreditation manuals, and the Internet.

- **Step Six: Develop a list of required SOPs based on the needs identified in Steps 4 and 5.** Consider the impact of internal and external factors, as well as the operating environment and standard of practice.

- **Step Seven: Analyze existing SOPs based on the information gathered in prior steps.** Compare existing SOPs to the list developed in Step 6. Identify areas where new SOPs are needed, or existing ones should be modified or deleted. Realistically prioritize the results in light of department resources. SOPs required by laws or regulations must receive a high priority, as should those addressing critical health and safety issues.

- **Step Eight: Create a formal needs assessment document.** Summarize findings and provide recommendations. Explain priorities and provide a specific rationale for adding, modifying, or deleting SOPs. (E.g., SOP is needed to comply with Federal regulation 29 CFR §1910.120; SOP is needed to address the emerging trend of domestic terrorism, etc.)

Summary

Fire and EMS departments should evaluate existing SOPs on a regular basis by performing a needs assessment. The evaluation should include a review of the current operating environment, the standard of practice, and specific local needs. Based on the results of the study, existing SOPs can be modified or deleted, and new ones added, as necessary.

Often, a review of SOPs occurs after a bad incident outcome. In this situation, it is vital to consider what prompted the review in the first place and to ensure that proper steps are taken. The event may result in strong emotions or perceptual "blinders" that affect decision making. Individuals or groups may try to steer the findings for political or other reasons. These factors can make it difficult reach consensus and prepare the best operational guideline.

SOPs must address applicable regulations to ensure compliance with Federal, state, and local laws. Consensus-based standards can serve as benchmarks to help define the standard of practice and models for developing new SOPs. Many different sources of information, both internal and external to the department, can be used to evaluate local needs.

There are few new problems in the emergency services. Model SOPs are available from other departments, on the Internet, and from the Learning Resource Center at FEMA's National Emergency Training Center. However, it is important to tailor SOPs to specific local needs and resources. An SOP that is suitable for a major metropolitan department, while potentially helpful as a model, may not be useful for a small rural department without extensive modification.

Networking via telephone, Internet, or through personal contacts is a good way to obtain information for a needs assessment. Surveys or interviews of personnel who use SOPs often provide the best indicator of what is, or is not, effective. Post-incident analyses and drills provide the ultimate validation of operational SOPs.

The needs assessment process must be consistent and systematic. The end product should include a written analysis of existing SOPs, recommendations and the rationale for changes (if any), and perhaps priorities and a plan for action. Different process steps and methodologies are possible, depending on the scope and requirements of the study.

Endnotes

[1] *United States Code*, denotes a Federal statute.

[2] It is important to note that some agencies with important and substantial fire/EMS involvement do not have regulatory authority and function primarily to develop information, provide training, or coordinate response. Examples include the Federal Emergency Management Agency (FEMA), of which the United States Fire Administration is a part, and the National Institute for Occupational Safety and Health (NIOSH).

[3] The number (e.g., 29, 40, 49) and letters "CFR" preceding the regulation identify the Title of the *Code of Federal Regulations* in which the regulation is published.

Chapter 4

Developing Standard Operating Procedures

Introduction

SOP development is most effective when a well planned, standardized, and comprehensive process is followed. By contrast, SOPs created quickly and without the use of a systematic approach are more likely to result in problems during implementation. Although the exact methods used to develop SOPs will vary, certain critical strategies help define any successful process. This chapter describes a standardized methodology for developing SOPs that can be useful whether preparing a complete SOP manual or a single written procedure.

It should be noted that the Needs Assessment process discussed in Chapter 3 establishes the foundation for the SOP development effort described here. The Needs Assessment identifies areas where SOPs are deficient and summarizes specific requirements for changes to existing guidelines. A thorough Needs Assessment also streamlines the actual SOP writing process since much of the necessary research and analysis has been completed. The concepts and techniques described in Chapter 3 are not repeated here; rather, they are built upon. Personnel responsible for writing SOPs should be familiar with the material in this chapter as well.

The SOP Development Process

The SOP development process can be viewed as essentially eight sequential steps that address the most important organizational and management considerations for department personnel. The methodology used for these steps can vary, depending on the scope of the project, local needs and resources, and other variables. The steps are listed below, with additional detail on each presented in the following sections:

1. Build the Development Team
2. Provide Organizational Support
3. Establish Team Procedures
4. Gather Information and Identify Alternatives
5. Analyze and Select Alternatives
6. Write the SOP
7. Review and Test the SOP
8. Ratify and Approve the SOP

CONTENTS

Page

The SOP Development Process . . . 33
Summary . . . 43
Sample SOP Formats . . . 43

Build the Development Team

The constantly changing environment in which fire and EMS agencies operate requires that departments regularly analyze and update their SOPs to meet current needs. To manage this ongoing requirement, managers may find it helpful to appoint a standing group or committee to oversee SOP-related work. This team is given authority and responsibility for gathering information from department members and other sources; identifying, analyzing, and selecting from among alternative operating procedures; writing SOPs that address the department's needs; distributing draft materials for peer review and testing; and submitting final SOPs to the Fire Chief or agency head for approval.

SOPs are usually most effective when members of the organization are included in every step of the development process. As a general rule, departments should get input from all groups potentially affected by the SOPs. This strategy borrows on concepts described in *Total Quality Management*, a business philosophy that encourages managers to get feedback from those using a service, as well as from workers who provide it. Member participation helps boost employee morale, increase "buy-in," and promote a better understanding of the final product.

Whenever possible, all affected viewpoints should be represented on the SOP Development Team. Regular members of the team might include:

- Operational or line emergency responders, who carry out SOPs and have the greatest stake in their success.

- Safety program representatives, such as the Health and Safety Officer, Incident Safety Officer, Operational Medical Director, department physician, and safety and health committee members.

- Managers, who have a broad organizational perspective that includes budgeting, public relations, political considerations, and other factors.

- Representatives of labor unions and employee associations, who understand contractual issues, articulate the viewpoints of their members, and provide insight on alternative procedures.

- Mutual-aid and regional response agency representatives, to help integrate and coordinate multi-jurisdictional responses.

- Representatives from other local government agencies that may interface with department operations, such as a third-service EMS agency or municipal health agency.

- Legal counsel or other personnel familiar with the content and implications of related laws, regulations, and standards.

- People with technical expertise in policy or systems analysis, operations research, evaluation theory, survey design, statistical analysis, technical writing, etc.

The number of core members of the SOP Development Team should be limited to maintain a manageable span of control. Membership can be supplemented with temporarily assigned persons who possess specific expertise in needed areas. For example, SOPs affecting hazardous materials or technical rescue operations should be developed with extensive input from department members specializing in these functions.

Periodically rotating members on and off the SOP Development Team at staggered intervals can help preserve continuity while maintaining interest and fresh perspectives. Although it may be helpful or necessary for some people to serve on both the Needs Assessment and SOP Development Teams, most members should be assigned to one or the other. This approach limits the burden on individual members, encourages diverse input, and promotes objectivity throughout the process.

The structure and leadership of the team is also important. Possibilities include assigning special sub-teams or task forces for one-time studies, and creating standing sub-committees for designated functional areas (e.g., health and safety, EMS). Personnel appointed as committee leaders need good interpersonal and group facilitation skills to help build consensus, integrate competing concerns, and facilitate decision-making. Broad technical expertise in a range of functional areas is also helpful.

Top-level management representation can help add credibility and ensure that the team has the appropriate resources to accomplish its mission. Union representation is important for securing "buy-in" from rank-and-file department members, and may be required by collective bargaining agreements. Combination and volunteer departments need representation from all groups potentially affected by changes to the SOPs, including rescue squads, fire police, "utility" or paid-on-call firefighters, etc.

Provide Organizational Support

Depending on the scope and nature of the effort, the SOP Development Team might require a substantial investment of departmental resources to accomplish its mission. Little is gained by setting up a team to prepare SOPs without giving members the organizational support needed to complete the job. Participants need time to attend group meetings, perform research and writing assignments, review draft documents, etc. Computers and dictation machines can be helpful, along with meeting space that is conducive to focused effort and group interaction. Technical writing and clerical support may be necessary for producing a finished document.

In most cases, team members carry out committee work while continuing to perform their regular duties. However, some departments may choose to temporarily assign members to the SOP Development Team in order to streamline the process and encourage focused attention on the

mission. Other departments may use a combination of regular meetings and staff retreats, where members can concentrate completely on the SOP development task without distractions from regular duties.

Establish Team Procedures

At the beginning of the process, members must clearly define the team's mission, goals, and objectives, including a projected timeframe for completing the study. Guidance from management should address such factors as the authority of the group, budget and available resources, and the desired end product. The team leader should then clarify expectations of individual members, including work assignments and standards of conduct in the development process. Meeting minutes and agendas should be prepared and distributed to members on a regular basis. Members should also document the work of the team to ensure accountability for department resources and to provide a written record of group proceedings for future reference.

Committee members should quickly establish the "rules of the game." In particular, individual roles and the mechanics of decision making—voting, negotiation, consensus-building, delegation, comment procedures, etc.—must be determined and communicated to all participants. Related considerations might include meeting dynamics, quorums, rights of appeal, representation of minority opinions, and other procedural aspects of the group decision-making process. Team members also need to understand the process for implementing the new SOPs. For example, does the chief or agency head have authority to alter the SOP without further input from the team? Does the Board of Fire Commissioners or other governing authority have this power?

Department resources and individual efforts will be wasted if the team's work is not kept "on track." Clearly defined roles, procedures, and project management systems are critical. This is where the recommendation to form a standing SOP Development Team can make a real difference. Once the team is in place, it should be able to address new or changing department needs quickly, without the inevitable organizational delays. Within the team, a variety of project management techniques can be used to monitor and facilitate the process. These range from the use of specialized software applications to more "low-tech" solutions like checklists, milestone charts, process diagrams, and flowcharts.

Gather Information and Identify Alternatives

The first task of the Development Team is to ensure that all members have a thorough understanding of work that has already been done. If prepared correctly, the Needs Assessment document described in Chapter 3 summarizes areas where SOPs are missing or deficient. It also contains much of the information required to identify alternative procedures, select the best alternative, and write a department-specific SOP. Finally, it serves as a valuable reference, providing the Development Team with supporting documentation and a comprehensive list of information sources that may be used for additional research.

Members of the SOP Development Team should familiarize themselves with the rationale for changes described in the Needs Assessment, along with any recommendations or comments by the Needs Assessment Team. Various approaches can be used to familiarize committee members with this information. Methods range from individual review of written materials to formal briefings by department managers or other experts. Whatever approach is taken, the goal is to avoid duplicating the work of the Needs Assessment Team.

Additional research undertaken by the SOP Development Team at this stage should focus on gathering information, answering questions, resolving problems, and identifying alternative procedures for consideration as SOPs. For example, the team might decide to examine the different approaches to common problems taken by neighboring departments with similar issues and emergency response requirements.

Procedural alternatives can come from many sources. SOPs from other agencies might be modified to suit department requirements. Input from focus groups, drills, or exercises could form the basis for a new procedure. Specific language from regulations or standards can help identify procedural or technological options for the department to consider. Alternatives might be generated within the Development Team, using information gathered during the research effort, or based on input from other department members. Brainstorming within the group can be particularly helpful in this process; no alternative should be immediately discarded, however unorthodox it may seem at first.

Analyze and Select Alternatives

This step is where the SOP Development Team's real work begins. Members apply the information gathered during the previous research phase to identify specific procedural methods for addressing the department's needs. The basic analytical process involves a systematic review of each alternative from a range of different perspectives. Factors to consider include, but are not limited to, the following:

- Feasibility—Is the proposed procedure realistic? Can it work "on the street" given the department's operating environment? How will responders react?

- Implementation factors—Can the procedural alternative be readily implemented given the current resources of the department? Will extensive training be required, must equipment be procured, or will new positions have to be created?

- Compliance with regulations and standards—Does the proposed procedure comply with regulatory requirements and guidelines found in industry standards? Does it minimize departmental and individual liability?

- Political viability—Will the procedure survive the scrutiny of the public, politicians, and outside interest groups? How will it affect the department's public image? Will member groups be willing to participate? How will individual career and volunteer members react?

A variety of methods can be used to analyze competing alternatives, ranging from the use of a formal policy analysis framework to a simple rating system. Models for assessing alternatives might include cost/benefit analysis, risk/benefit analysis, event-tree analysis, what-if analysis, brainstorming, and group surveys. Whatever method is selected, it is important that *every* possible alternative be thoroughly and critically examined.

The results of the analysis are then summarized and displayed for each alternative. The Development Team next decides on the best alternative procedures to develop into SOPs. The selection may be democratic, or the team might provide recommendations to the Fire Chief or agency head, who makes the ultimate decision. Deciding among competing alternatives can be difficult for a group, especially if the goal is to achieve consensus among all members.

Write the SOP

Once an alternative procedure has been selected, the next task faced by the Development Team is the actual creation of a written document. To be effective and usable by field personnel, SOPs must be written clearly and concisely, using a logical and consistent format.

The following suggestions for writing SOPs will enhance the "user-friendliness" of the final product, a key variable in determining success or failure during implementation.

- Level of detail—Generally speaking, SOPs should provide only broad procedural guidelines, not specific details of task performance. For example, a new SOP may include guidance to "*vertically ventilate the roof of a building with a suspected backdraft condition prior to committing interior forces.*" However, too much detail is provided if the SOP describes related job tasks, such as, "*(1) Check for overhead wires and obstructions prior to raising ladders to the roof; (2) Raise at least two ladders to the roof, ensuring that 3-5 rungs are protruding above the roof line; (3) Take tools to the roof including saws, axes, hooks, ropes, etc.; and (4) Cut at least a 4' by 4' hole and enlarge as needed.*" Remember: SOPs are not training manuals; they are broad organizational guidelines for performing tasks that members have already been trained to accomplish safely and effectively.

- Clarity and conciseness—SOPs should be clear, concise, and written in plain English. While simply excerpting regulatory language is easy for the SOP Development Team, such language is often difficult to understand and apply to operational situations. Clear and simple statements are the best way to describe actions in SOPs. Using an "outline" or "bulleted" style instead of a continuous narrative simplifies the presentation of information and helps clarify relationships among different components of the SOP.

- Target audience—Write for the majority of the department. Some members may require more help understanding the SOP than others. Others might already be highly experienced in the subject area. Generally, SOPs should be written to address the needs and educational level of the majority of department members, using language they can easily understand.

- Flexibility and ambiguity—To be effective, organizational guidelines must be unambiguous. At the same time, SOPs should provide enough flexibility for the on-scene commander to make decisions based on the situation at hand. Balancing the need to reduce ambiguity while maintaining flexibility can be difficult. Department SOPs should be precise but inherently flexible, permitting an acceptable level of discretion that reflects the nature of the situation and the judgement of the incident commander. (This concept should be explicitly stated at the beginning of the department SOP manual.)

A related issue involves use of the terms "shall" and "may" when writing SOPs. An action preceded by the word "shall" is generally considered to be an inviolate rule, while using the term "may" implies greater flexibility and discretion by personnel. However, simply using "may" as an antecedent for every action can reduce the effectiveness of SOPs and lead to unnecessary ambiguity. By the same token, certain actions are so critical to health and safety that the term "shall" is obligatory, e.g., "*companies shall not take the elevator directly to the fire floor in a high-rise building.*" A clear understanding by all department personnel of the purpose and function of SOPs will help eliminate confusion and misunderstanding.

A standardized format or "layout" for SOPs helps streamline the writing process. Additional benefits include improved integration of new SOPs into the department's larger SOP manual, ease of revision or updating, and enhanced usability.

Different formats may be used for SOPs depending on the intended audience and purpose. For example, SOPs intended for fire suppression operations may be formatted differently than operational protocols used by EMS personnel in the field. Regardless of their intended use, however, several items are usually included in any SOP:

- Numbering system—Important for reference, usability, and integrating individual SOPs into the overall manual.

- Effective date—Date the SOP is officially adopted for use in the field. (This may be different from the date of issue. The effective date may be purposefully later than the date of issue to allow for all department members to be informed and/or educated on the new SOP.)

- Expiration/review date—Important for ensuring the currency of SOPs by establishing a date for periodic review and revision, if needed.

- Title—For ease of reference and usability.
- Description of purpose or rationale statement—Describes the purpose of the SOP, why it is needed, and what it intends to accomplish.
- Authority signature(s)—Indicates that the SOP was properly created, reviewed, and approved by the Fire Chief or agency head, department attorney, medical director, and/or other responsible authorities. Some departments include an indication of endorsement by member organizations such at an IAFF local.
- Scope—Describes situations for which the SOP was created and the intended audience.
- General procedures—The "body" of the SOP; sets forth broad procedural guidelines for fire and EMS department operations.
- Specific procedures—Specific actions necessary under the SOP to safely mitigate a situation.
- References—Source material used to create the SOP or useful in future evaluations.

Several sample SOP formats are provided at the end of this chapter. Departments should examine these and other samples to develop a format that reflects their unique operational needs and organizational preferences.

Review and Test the SOP

Conducting a "peer review" of draft SOPs can be extremely informative for team members and department managers. The process involves sending copies of the draft SOP to all or selected department personnel affected by the SOP and others with pertinent knowledge or experience in the subject area. For example, the team might send a draft SOP for "High-Rise Fire Operations" to companies located in response areas with a heavy concentration of large buildings or to members of related special teams (e.g., aircraft firefighting personnel). Drafts might also be sent to mutual-aid or other agencies that are affected by the SOP but not represented on the Development Team.

Comments received during this review often contain valuable insights on the feasibility of the SOP, helping to identify problems before they occur. Conversely, they may simply serve to verify the efforts of the Development Team, also beneficial information. For hard data, formal critiques, drills, and exercises can be conducted to test SOPs. Indeed, there is perhaps no better way to safely determine the effectiveness of a new SOP than by conducting a realistic, real-time exercise.

Information gathered during the peer review and testing process should be analyzed to identify areas where modifications are needed. Documents under review should be clearly marked

"DRAFT" and the revision dates shown, so that reviewers knows which iteration they are examining and what has been done with their earlier comments. While it may be difficult, the Development Team should not be afraid to totally revamp SOPs found deficient during this phase of the process. SOPs are vitally important documents, and it would be irresponsible to release a new guideline without thorough testing and revision. Ideally, the department will live with the SOP for a long time, so it is important to get it right. Peer review and testing should be performed as many times as necessary to ensure the issuance of a valid, usable SOP.

Once an essentially "finished" SOP document is produced, it should be reviewed by legal counsel, the health and safety officer, operational medical director, etc., to ensure compatibility with existing regulations, protocols, and department policies. A review by any member organizations not involved in the development process should also take place to allow for comments and to provide for an opportunity of "ownership."

Ratify and Approve the SOP

The individual or office approving the SOP should have expertise and clearly defined authority in the subject area. Usually, the Fire Chief or agency head performs this role. This person may have taken an active role throughout the development process or may limit involvement to this final phase. If authority derives from persons with no emergency response expertise (e.g., political appointees), a mechanism for a meaningful ratification process must be established. In any case, organizational leaders must fully understand the rationale for, and the implications of, adopting the SOP.

Depending on the complexity of the SOP, it may be necessary to give department decision-makers a detailed briefing on its contents. Team members should stand ready to explain the process used to identify and select the procedural alternative that forms the basis of the SOP. Members should also be prepared to quickly evaluate and provide feedback on recommendations or revisions requested by the Fire Chief and others.

The best way to prevent complications during ratification and approval is to have followed a comprehensive, systematic, and well-conceived process during development. Managers responsible for approving SOPs produced through such a process should carefully consider the negative impact of making last-minute unsupported changes to the work of the Development Team. Such changes might reduce the effectiveness of the team's work and lead to the adoption of less-than-optimal SOPs. In addition, team members and others may be less willing to participate or give their best effort in future development efforts.

Summary

Any official written document that sets forth an operational guideline is defined as a standard operating procedure. SOPs are not training materials; they build on training, providing an organizational blueprint for operational safety and efficiency. Too much or too little detail in SOPs limits their usefulness and effectiveness on the incident scene.

An organized, methodical development process is the best approach for preparing effective and valid SOPs. The process should be conceived as an integrated whole, and as such, its success is determined by the sum of its parts. The quality of SOPs will largely reflect the composition and leadership of the SOP Development Team, the level of support provided by the department, the team's ability to establish realistic goals and acceptable procedures, the nature of research and analysis performed by the team, and the team's ability to select appropriate alternatives and justify the results.

SOPs must be written clearly, concisely, and unambiguously. They should be organized and presented in a manner that is "user-friendly" and readily accessible during operations. All department personnel should understand that, with the exception of critical health and safety issues (identified by the term "shall"), SOPs can be modified to suit the exigencies of a particular situation, based on the judgment of the incident commander.

While certain elements are usually incorporated in all SOPs, a variety of different formats is possible, depending on the purpose and intended audience. Peer review and testing are vitally important for ensuring that potential problems or conflicts are identified prior to finalizing SOPs. Fire Chiefs and agency heads are ultimately responsible for SOPs, and must thoroughly understand them before final approval and distribution.

Sample SOP Formats

The following pages represent several formats used by various fire and EMS department for standard operating procedures. These SOPs are presented as examples of SOP format, not content. SOP content topic areas are discussed further in Appendix B.

VIRGINIA BEACH FIRE DEPARTMENT SOP O 14
Media Releases 05/01/91

MEDIA RELEASES

PURPOSE

To ensure an accurate information flow from the fireground to the news media. This should eliminate faulty, inappropriate information from being relayed to the press.

SCOPE

The following guidelines are to be utilized when releasing information to the news media. Furthermore, Company Officers are encouraged to assist the media at the company level.

POLICY

A public information worksheet has been developed to assist personnel when dealing with the press. All items on the worksheet are appropriate for release to the press. Be factual in your responses. Do not speculate or give "off the record" responses. Appropriate and factual information is a positive public relations tool.

The following guidelines define who is to deal with the press on fire incident related issues:

> On The Fire Scene: Press personnel should be directed to the Incident Commander or the Public Information Officer if he/she is present.
> After Calls: Requests for information should be directed to the Public Information Officer or his/her designee. If the Public Information Officer is not present, the Battalion Officer involved with the call should release information in accordance with departmental guidelines.

Only these people will deal with the press in the majority of cases. Utilize the worksheet to insure appropriate information is relayed to the press. This should eliminate faluty, inappropriate or legally incorrect information from being relayed to the press.

> Dispatchers: If the press contacts the EOC for information, they are to be referred to the appropriate personnel as designated above.
> Battalion Officers: Information concerning any "working" incident, or any incident which may be of interest to the media, should be sent to the department's Public Information Officer via the E-mail system. The information should be the basic data from the Public Information Worksheet.

All other news related matters should be referred to the Chief's Office. The only exception to this would be in the areas of internal issues of a volunteer company.

For additional clarification, contact the Deputy Chief of Operations.

PUBLIC INFORMATION OFFICER

The Fire Department Public Information Officer is responsible for the coordination and release of information regarding fires or other emergency related incidents in which the Fire Department is involved. He/she will assist the Incident Commander by obtaining and disseminating information concerning the incident to the news media.

It should be understood that a Public Information Officer will not be required on every incident. Those times when a PIO does not respond, an officer at the scene should gather information using the "public information worksheet" and provide this information to inquiring media.

VIRGINIA BEACH FIRE DEPARTMENT	SOP O 14
Media Releases	05/01/91

The PIO will be notified of the following types of incidents:

- Working fires
- All technical rescue incidents
- Any accident involving injury or death to citizens or firefighters
- Hazardous materials incidents
- At the request of the Incident Commander

The PIO will use his/her discretion in responding based on the information provided by the dispatcher and/or the Incident Commander.

Lee's Summit Fire Department STANDARD OPERATING PROCEDURE	SECTION	XVII
	SUBJECT	MUTUAL AID

A. SCOPE

This standard operating procedures is designed to set forth the rendering and requesting of mutual aid involving other governmental fire departments and emergency medical services.

B. DEPARTMENTS WITH MUTUAL AID CONTRACTS

The following departments have mutual aid contracts with Lee's Summit Fire Department covering all types of emergencies including fire, emergency medical, rescue, and hazardous materials services:

1. City of Belton
2. Central Cass Fire Protection District
3. Central Jackson County Fire Protection District
4. Fort Osage Fire Protection District
5. City of Grandview
6. City of Harrisonville
7. City of Independence
8. Johnson City Fire Protection District
9. City of Kansas City, Missouri
10 City of Liberty
11. Lone Jack Fire Protection District
12. Lotawana Fire Protection District
13. N.E. Cass Fire Protection District
14. City of Pleasant Hill
15. Prarie Township Fire Protection District
16. Raytown Fire Protection District
17. Sni-Valley Fire Protection District
18. South Metropolitan Fire Protection District
19. City of Sugar Creek
20. City of Warrensburg
21. West Peculiar Fire Protection District

C. RESPONSE TO REQUESTS

1. The on-duty shift commander shall authorize all mutual aid responses. The shift commander shall provide all requested assistance as long as on-going Lee's Summit emergency operations are not adversely affected and minimum coverage standard operating procedures can be met with Lee's Summit or mutual aid units.

2. Our department may be requested for the Western Missouri Fire Chiefs Foam Bank from departments that we do not have a mutual aid contract with. Such aid with the foam bank will be provided if the calling department indicates that they are a Foam Bank member.

Lee's Summit Fire Department STANDARD OPERATING PROCEDURE	SECTION	XVII
	SUBJECT	MUTUAL AID

C. RESPONSE TO REQUESTS (Cont'd)

3. If a department requests mutual aid other than the Foam Bank and does not have a mutual aid contract with Lee's Summit, an inquiry will be made if they are requesting mutual aid through the State Mutual Aid Plan. If their response is in the affirmative, the mutual aid E-O-C will be activated and the regional coordinator will be notified and our department will attempt to provide the assistance that is requested.

D. REQUESTING MUTUAL AID

Requests for mutual aid may be made by the shift commander, the incident commander, the communications specialist, or the E-O-C officer.

1. The on-duty communications specialists are authorized to automatically utilize mutual aid to "fill out" alarm assignments or to provide minimum coverage.

2. The field requests to the Communications Center can be either specific by department and equipment or a general request by the number and type of units needed.

3. When the Communications Center receives general requests from the field, the pre-designated mutual aid departments for specific box numbers shall be utilized.

GENERAL ORDER 95-009

Dec. 1, 1995

SUBJECT: MANDATORY USE OF PERSONAL ALERT SAFETY SYSTEMS (PASS ALARMS)

I. PURPOSE

This order:

A. establishes the Chicago Fire Department's policy and procedures regarding the mandatory use of Personal Alert Safety Systems (PASS Alarms).

B. defines department and member responsibilities in the maintenance, repair and replacement of pass alarms.

C. becomes effective December 16, 1995.

II. POLICY

A. In the event a member or members become disabled or trapped at an incident, the use of the pass alarm shall enable the member or members who are so equipped, to be located more readily.

B. It is mandatory that all personnel – with the exception of engineers – engaged in suppression activities, responding to a fire (confirmed or unconfirmed), hazardous materials incident, and all other incidents of an unknown nature, wear and activate their pass alarm device upon arrival at the scene of the incident.

C. The pass alarm will be affixed to the department issued utility belt, or to the pass alarm device holder if the member's turnout coat is so equipped.

III. PROCEDURE

A. All members equipped with pass alarms shall wear and activate their devices on the fire ground or emergency scene. Possible exceptions would be at ambulance

assist incidents or T.O.C. inspections, etc, where pass alarm would be worn by the member but not activated.

B. The wearing and use of the pass alarm device is required on the fire ground, with the exception of those chief officers and other personnel operating at the command post, staging area or similar areas.

C. A pass alarm device that is damaged (unserviceable) not due to a member's negligence, shall be replaced at the department's expense. If negligence is determined the member shall replace the pass alarm, as per department policy, and may also result in appropriate discipline.

IV. TESTING OF PASS ALARM DEVICES

A. Immediately, upon completion of testing their sefl contained breathing apparatus each morning, all chiefs, company officers and firefighters shall test their pass alarm device that has been turned over to them by their relief.

B. The results of the pass alarm device shall be reported to the company officer, who shall record the results in the company journal. The information in the journal shall consist of the pass alarm unit identification number alongside the name of the member using the unit.

C. Pass alarms shall be retested after each use during the duty day.

D. Chief officers assigned to non-platoon duty shall test their pass alarms at least once each week and after each use.

E. Any need for a replacement battery, defects, or requests for service shall be immediately reported through channels to district headquarters by the company officer. District chiefs/deputy district chiefs shall be responsible for contacting Breathing Apparatus Service, and for issuing a spare pass alarm unit until the problem has been resolved.

F. The results of all testing, replacement of batteries, or exchange of units shall be logged on the individual record card for that pass alarm device, indicating who performed the activity and the name of the officer who supervised such activity.

V. RESPONSIBILITIES

A. Chief officers and company officers shall enter the receipt of all pass alarm devices into their company inventory records.

B. Chief officers and company officers shall have the joint responsibility to ensure all personnel are in compliance with this order.

Chapter 5

Implementing Standard Operating Procedures

Introduction

The act of developing or modifying a standard operating procedure, as discussed in Chapter 4, is not the end of the road. SOPs must be effectively implemented within the department to have the desired impact—improved safety and enhanced performance on the job. In fact, a new or modified SOP that is performed incorrectly or simply ignored by responsible personnel may be more dangerous than the old procedure it was designed to replace.

Implementation includes all the steps that departments take to introduce the SOP to potential users and make it an integral and accepted part of normal operations. The implementation process is designed to ensure that:

- Everyone is informed about the new or modified SOP and understands the significance of the change.
- Copies of the SOP are distributed as needed and readily accessible to all potential users.
- Personnel know their roles and have the knowledge and skills necessary to implement the SOP safely and effectively (including an understanding of consequences for failing to comply).
- A mechanism exists to monitor performance, identify potential problems, and provide support in the implementation process.

The best approach for implementing SOPs depends on many factors, including the nature of the required changes, the size and resources of the department, and management preferences. The first step is developing an implementation strategy and plan. Then, generic steps, which reflect the objectives defined above, include Notification, Distribution and Accessibility, Training, and Performance Monitoring.

CONTENTS

Page

Implementation Planning 50
Notification 50
Distribution and Accessibility . . 51
Training 53
Performance Monitoring 56

Implementation Planning

The development or modification of SOPs must be accompanied by a plan to implement the new procedure within the department. The implementation plan provides an opportunity to think through related tasks, assignments, schedules, and resource needs. The planning process may be formal or informal, depending on the requirement.

The first step is to decide on the purpose and scope of the task to be accomplished. Several important questions need to be considered:

- How many SOPs are being implemented? A whole new set of SOPs? A major portion of the SOPs? One or two SOPs?
- How significant are the changes to existing SOPs? What are the potential consequences if the SOPs are not implemented quickly or effectively?
- Who needs to know about the changes to the SOPs? Do different groups need different types of information?
- What are effective ways of disseminating information within the department? What methods have worked before and what methods have been unsuccessful?
- Is training necessary to ensure competence in the new SOPs? How will performance be monitored and enhanced?
- Would the SOPs be most effectively implemented by using a well publicized changeover date or a defined phase-in period?

The answers to these questions determine the strategy and methods in the implementation plan. The approach might vary from simple notification during member meetings to on-the-job training for selected members to formal classroom sessions for the entire department. For example, a small volunteer fire department creating its first set of SOPs will take a drastically different approach than a larger career department doing a minor update of one or two SOPs affecting only the hazardous materials team.

Notification

The first step is making sure that all personnel are aware of the upcoming change in procedures. In addition, outside groups that influence or coordinate with fire service emergency response operations should be notified as necessary, e.g., community officials, mutual aid organizations, insurance carriers, employee groups, local hospitals, legal counsel, and state or regional regulatory bodies. Management might even consider informing citizens and special interest groups,

thereby taking advantage of the public relations and public education opportunities that arise when fire service operations are improved.

Besides informing people, the notification process has other objectives, such as identifying potential SOP implementation problems and encouraging compliance and personal accountability. Therefore, when possible, managers should provide opportunities for members and outside group representatives to ask questions and give feedback. Departments may also wish to consider mechanisms that require personnel to acknowledge receipt of the notification and understanding of its content.

Notifications like this in career agencies are frequently covered during shift or division roll calls. Company officers are made responsible for disseminating information to their crews and documenting attendance/signoff at these sessions. This approach allows for "real time" questioning and opportunities for "customizing" the information, if necessary, for the personnel involved. In volunteer agencies, notifications may occur at monthly business meetings or training drills. Documentation of notification will be served in this case through attendance records or training rosters.

Because of the legal and operational implications of new SOPs, a formal written notification process is often best. Typically, a letter is sent to each person and organization on the list, sometimes with copies of the new SOPs attached (see *Distribution* in the following section). The letter should, at a minimum, describe the nature and purpose of the organizational change, the SOPs superceded or modified, personnel and/or positions affected, the implementation plan and schedule, and contacts for further information. In particular, the letter should highlight the effective date of the new SOP, making sure that adequate time is available after formal notification for all steps in the implementation process and for personnel to make any necessary transitions.

Other communications methods may be useful to support written notification—articles in department newsletters, mention during staff meetings, posting on bulletin boards, follow-up contact in person or by phone, and even stories in local print and broadcast media. Development of a notification plan and related checklists can be helpful for managing the process. The approach taken should reflect the nature of the SOP, as well as organizational preferences and resources. However, in all cases, departments should view notification as a "process" rather than an "event." The process should include opportunities to reinforce understanding and acceptance of the new SOP by responsible personnel, and mechanisms to document the results.

Distribution and Accessibility

Distribution is the next topic to consider in the implementation plan. Employees cannot implement SOPs if they don't know what they are. Copies of new SOPs must be available to all personnel who may be affected. If personnel do not have access to new or revised procedures, they cannot necessarily be held accountable for carrying them out. SOPs should always be accessible!

Whether the organization is developing its first set of SOPs, reissuing sections of the existing SOP manual, or initiating a single new policy, it's best to provide a copy to every individual with related responsibilities. Some departments may not be able to provide copies of SOPs to every member. In these cases, the department leadership should make every effort to find creative ways of making the information available.

Whether or not a department can make individual copies available, the department should provide all employees with easy access to a complete copy of the SOP Manual. This copy should be up-to-date and maintained in a location that is known and accessible to all. One method is to place a printed copy in a binder or cover that distinguishes it from other materials in a library or common access area. SOP Manuals should be in every fire station and administrative facility. Copies must be tamper-resistant and regularly checked against "master files" since mischief and sabotage in firehouses are possible. Responsibility for maintaining and updating these "official" copies should be given to a member of the leadership team.

If the technology is available, the agency may wish to place SOPs on a computer system. Methods for doing this can vary greatly with the resources available to the department. A sophisticated Intranet type of system is possible, or the SOPs could simply be placed in a folder on a computer or server that all department members can access. Care should be taken to protect the master SOP files so they are not accidentally or purposefully tampered with.

Some departments and agencies now maintain SOPs on their organization's web site. A good example for regional organizations is the Florida Fire Chiefs Association's State Disaster Plan, which contains SOPs for activating units during disaster situations. It can be viewed on their web site located at http://www.floridafire.org/pubs/DRP.htm. An example of a lengthy SOP for high rise fires in a large municipality can be found on the Los Angeles Fire Department web site, accessible at http://www.lafd.org/docfiles.htm.

Another information distribution method gaining favor is "fax on demand." In this system, users telephone a central data point, select a particular SOP, and have it faxed to them. Other departments provide SOPs on computer disks to be loaded in computers at each station.

Organization size, geography, resources, and preferences will influence the process by which the SOPs are distributed. A large organization, spread over several hundred square miles, may rely on computerized distribution systems. Small organizations with few stations and personnel may distribute paper copies. Volunteer organizations might disseminate information at meetings of the membership. Whatever the method selected, the goal is to have the SOPs readily available for personnel to learn from, train with, and reference as needed.

When distributing new or revised SOPs, the agency should maintain records listing the recipient, date, and place. Hand delivery assures that individuals have been given the opportunity to see the SOP. Another method may be to require recipients to sign a receipt, which is kept on file for the time the SOP is valid. Many agencies use their battalion chiefs, company officers and roving fire marshals to distribute information to the field personnel/members, and use a roster for each

person to initial that they received the new or revised SOP. In some agencies, unit, company or battalion/division officers may be required to acknowledge, by signature, that they have made the personnel or members under their command aware of the new or revised SOPs content and intent.

Training

Effective implementation of SOPs often requires that personnel be trained in the new procedure. Depending on the situation, instruction may be formal or informal, conducted in the classroom or on the job. As with any type of training, program design should follow accepted principles of adult education, taking into consideration four general components: motivation, transfer of information, opportunities to practice new skills, and demonstration of competence.

Training Needs Assessment

In Chapter 3, the use of a formal needs assessment was discussed as a tool for analyzing the department's existing SOPs. A needs assessment can also be helpful during the SOP implementation phase to identify training requirements. This type of study asks the following types of questions:

- Who needs to be trained in the new or revised SOP(s)?
- What instructional content should be covered? What training methods will be most effective?
- How will understanding and competence be evaluated?
- How long will the training sessions take? How will training be scheduled and administered?

Training Audience

The first step of the needs assessment process is identifying who needs training. The answer to this question depends on the nature of the SOP, the scope of recent changes, individual responsibilities within the department, and other factors. Suffice it to say that everyone who needs it should receive the appropriate training: skills-level training for those who actually carry out the SOP or evaluate job performance; knowledge-level training for personnel whose work requires them to interface with the first group; and awareness level training for everyone else. However, keep in mind that formal classroom sessions are not always required or the best way to transfer information!

In general, the needs assessment study identifies, at a minimum, the number of people who need training and broad categories of training needs. Other outputs might include a review of previous training and training delivery issues (audience preferences, availability, location, etc.). Methods

for conducting the analysis typically rely on the expertise of staff members and other experts, although more formal approaches—surveys, statistical analyses, performance evaluations, etc.—are possible.

Training Content and Methods

Training should clarify the content and intent of the SOP. Technical content will vary with the SOP and the audience's job assignments. Instruction should also include an explanation of the purpose and rationale behind the procedure. For example, a typical SOP to ensure the safety of personnel during a vehicle accident victim extrication might require two persons in full protective clothing and SCBA to stand by with a charged hose line. Trainees must understand not only how to comply with the SOP, but appreciate why it was created in the first place: for their own safety!

Remember that SOPs are agency guidelines for applying specific job skills and related theory. Training generally assumes that individuals already know how to properly perform the basic job functions: fire suppression, emergency medical care, hazardous materials response, technical rescue, or disaster operations. In other words, SOP training complements basic job skills training by focusing on related decision-making requirements—the "who, what, when, where, and sometimes how" of the procedure. Instruction in the proper manipulation of tools and equipment, treatment side effects, and precautions is addressed in other training and education.

Another important consideration in SOP training is the methods that will be used. Certain methods may be more suitable for specific training requirements. For example, classroom-training sessions, with ample opportunities for group discussion and interaction, may be useful for implementing a new SOP on personnel practices in the municipality. Conversely, a new SOP that covers response to high rise building fires might benefit by training that takes a more "hands-on" approach, perhaps involving personnel in practical evolutions or exercises, or doing walk-throughs in new construction.

Keep in mind that SOPs are important procedural guidelines, implying the application of critical physical and/or decision-making skills in a potentially dangerous and demanding environment. Whenever possible, training should incorporate opportunities to practice these skills in a safe and supportive setting. Instructional methods that are particularly useful for this purpose include role plays, simulations, drills, supervised on-the-job training, tabletop and functional exercises, and other types of classroom activities that require students to perform aspects of the task.

Ensuring Competence

SOPs are vital to the operation of the agency and the safety of fire service workers and the public. For this reason, the department must ensure that personnel thoroughly understand the SOP and are capable of performing the tasks they are assigned. This is particularly important when educating members and personnel on safety-related SOPs.

There are different ways of ensuring competence after training. In some cases, students can demonstrate competence to the instructor's satisfaction through discussions, question and answer sessions, classroom activities, and demonstrations of key skills. In other situations, formal testing mechanisms or performance evaluations may be more appropriate. The method chosen should reflect the nature of the SOP and the potential for adverse consequences, such as injury or death, if students are unable to perform satisfactorily back on the job.

Understanding of and competence in SOPs is critical both immediately after training, and throughout the life of the SOP. An agency's implementation plan should address more than just short-term training. How many members will be competent in the SOP in one year? How about in five years? Periodic reevaluation and refresher training should be considered to ensure that members and personnel not only understand the SOP after it is implemented, but for as long as the new procedure is in effect.

Training Scheduling and Administration

The identification of training requirements—audience members, technical content, instructional methodologies, and evaluation mechanisms—prepares the department for developing a training plan and schedule. The training plan answers the following types of questions:

- What training materials are needed? Who will prepare them?
- What qualifications do instructors need? Who has these qualifications? Who is available to serve as instructors?
- What facilities, special equipment, and supplies are needed? Are they available in house? Can they be procured from outside sources?
- What timeframe is appropriate for initial training and refresher training?
- Can training be integrated with other training or department activities?
- What records should be maintained? What reporting requirements are applicable?

Keep in mind when designing the plan that training is perhaps the most critical component of the SOP implementation process. The best SOP will be ineffective or even dangerous if personnel are not motivated to or are incapable of carrying it out. Poor performance can lead to unnecessary injuries, costs, and lawsuits. For these reasons, an adequate amount of time must be allowed in the training schedule. Some policies will not require extensive orientation and are self-defining; others will require more explanation and definition, depending on the complexity of the procedure/policy. Organizations with many employees may pose problems with scheduling and logistics to assure the intent and content of the SOP is communicated clearly to all who need it.

Performance Monitoring

As part of the implementation process, departments must establish a mechanism to monitor job performance and ensure that personnel carry out the new SOPs correctly. The process should be designed to 1) compare worker performance with expectations established by the new SOP, 2) identify potential problems, and 3) specify ways to improve implementation or provide additional support to personnel.

For SOPs to be effective, individuals must be accountable for their job performance. However, the purpose of performance monitoring as described here is not for enforcing a standard that may lead to disciplinary actions. Individual accountability in this context is related to the effectiveness of the implementation process—personnel cannot be held accountable if they haven't been properly notified about SOP changes, given access to the new SOP, adequately trained in its use, etc. The threat of discipline can sometimes detract from the greater purpose of the SOP, perhaps causing resentment and even resistance among employees. For these reasons, disciplinary processes, although important for departments to define and enforce, should be handled separately as part of personnel policies, not operational procedures.

Like all aspects of the implementation process, performance monitoring should be planned in advance. Planning should identify such factors as the methods to be used, the role of supervisors and other personnel, record keeping and reporting requirements, and processes for correcting deficiencies. The approach selected can be formal or informal, simple or complex, as dictated by the nature of the SOP and the potential consequences of unsatisfactory job performance.

Whenever possible, the methods chosen for performance monitoring should incorporate objective measures of job performance, i.e., ways to compare actual performance with pre-established criteria that reflect current expectations under the new SOP. Ideally, these indicators were identified during the SOP needs assessment; in effect, they are the measurable objectives of the SOP development process. This approach ties together SOP development and implementation, and promotes objectivity in the analysis.

More subjective methods should also be included in the plan. These approaches are often easier to implement and, when interpreted correctly, provide a wealth of information. Examples include:

- Supervisor observations
- Interviews with personnel
- Interviews with members of the public
- Team meetings and discussions
- Incident debriefings
- Drills and exercises—observations and critiques
- Surveys

Besides helping to ensure that SOPs are implemented correctly, the results of performance monitoring provide input for the next phase of the SOP process—evaluation. This subject is discussed in more detail in the next chapter.

Summary

The approach used to implement new or revised SOPs is critical to their success in helping agencies manage operational risks and enhance the actions of employees. Effective implementation generally involves preparation of a strategy and plan that is tailored to the requirement as necessary. Elements of the plan should address:

- Notification of members and others with a need to know
- Distribution of copies to potential users
- Placement and maintenance of reference copies
- Methods to identify and quantify training needs
- Training delivery and administration
- Competency testing and certification
- Ongoing performance monitoring and employee support

Without proper implementation, new SOPs may be ineffective, unused, or unsafe. Therefore, implementation planning should be a key component in any agency's approach when creating new SOPs or revising existing ones.

Chapter 6

Evaluating Standard Operating Procedures

Introduction

Standard operating procedures are not static documents. Once an agency implements new SOPs, they cannot be simply handed on to successive generations without revision. Operational and organizational standards change over time, and SOPs have to change with them.

Evaluation is the systematic analysis of operations and activities for the purpose of determining the overall effectiveness of SOPs. The focus is on 1) identifying changes that have occurred as a result of the SOP, and 2) assessing whether the purpose and objectives of the SOP have been accomplished. This information is then used to decide if the SOP or other department activities need to be modified.

Any fire service program is incomplete without a formal evaluation component. Evaluation is the "feedback loop" in the SOP development process, providing managers with a mechanism to continually refine and improve operations (see Figure 6-1). Although evaluation may seem like the "final step," it actually leads to a new beginning in the ongoing and cyclical SOP management process.

Evaluation is not the same as performance monitoring, which was discussed in the last chapter. Although some of the methods are the same, the purpose of performance monitoring is to make sure that personnel comply with the SOP and perform it correctly—in effect asking, "are we doing things right?" The goal is primarily to improve implementation of the SOP.

Evaluation, on the other hand, looks at the same employee actions, but asks, "are we doing the right thing?" In other words, does the SOP accomplish what was originally intended, and how can it be made more effective? The goal in this case is to assess and redesign the SOP, if needed. The analysis can also be used to justify program efforts and costs, motivate personnel, and improve the overall SOP management program.

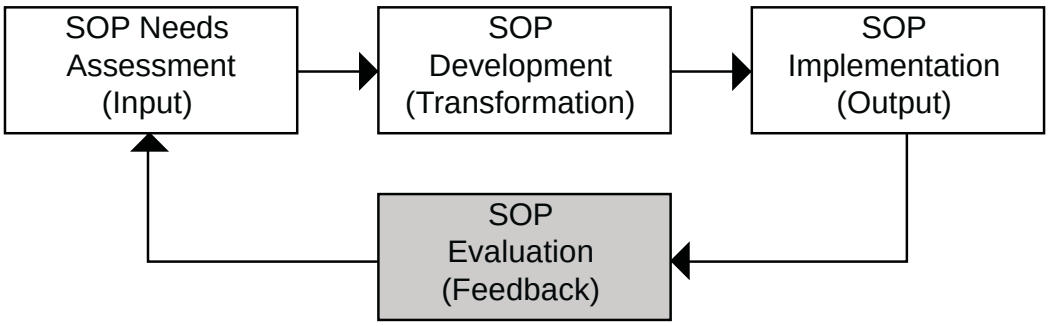
CONTENTS

Page

The Evaluation Process 60
Conducting Evaluations 63
Summary 65

Figure 6-1

A Systems View of Evaluation



The Evaluation Process

Evaluation is a planned process with a distinct series of steps that provide specific types of information. The goal is to assess the results of the SOP, a task that requires asking the following types of questions:

- What were employee behaviors and actions before the SOP was implemented?
- What administrative or operational problem was the SOP designed to address?
- Was the new SOP fully implemented, or were there unexpected barriers to full implementation?
- How did employee behaviors and actions change after introduction of the SOP?
- Were the changes in behaviors and actions what were intended? Was the purpose of the SOP accomplished?
- Is the need for the SOP still current? Is the current SOP still the best solution?

The "purpose and intentions" of the SOP are defined in the form of evaluation criteria, measurable objectives that serve as benchmarks for assessing progress. For example, criteria might be established to help evaluate employee attitudes, technical knowledge, or competence in specific physical skills. Alternatively, managers can compare meaningful operational statistics (e.g., response times, injuries, exposures, inventory levels—virtually any type of response and program data) with accepted standards and practices, if known. This latter approach is particularly useful when technology or regulatory requirements change.

For our purposes, there are two general types of evaluations: periodic or standard reviews and special evaluations. Each is described in the following sections.

Periodic Review of SOPs

Organizations tend to get complacent without a built-in mechanism to ensure regular reviews of operational policies and practices. A periodic review of SOPs allows agencies to look at how they currently do things and determine whether it is the best (i.e., the most effective, efficient, and safe) way to conduct business.

Periodic evaluations are based on the assumption that things will not always go as planned, and fire service leaders need a structured approach to manage change in our fast-paced and complex society. One method to ensure that existing policies and procedures are up to date and effective is to plan regularly scheduled evaluations of SOPs. These wide-ranging reviews also help motivate employees by emphasizing the importance of the SOPs and demonstrating the department's commitment to keeping them current.

There are no hard and fast rules about the frequency and timing of periodic evaluations. For some agencies, a formal review every six months may be prudent. For others, an annual or biannual review might work. Agencies undergoing major organizational changes could decide to time evaluations after significant milestones in the process. Each agency must determine when and how often evaluations are necessary. The results should be institutionalized in management and operations plans.

Creative ways can often be found to get around administrative or technological obstacles. For example, a large department may want to conduct reviews of SOPs every six months, but supervisors are concerned about changing policies and procedures so frequently. The solution might be to review 25% of the SOPs every six months, which would mean evaluating the complete set of SOPs once every two years. Other agencies have found ways to streamline planning processes by incorporating reviews of SOPs into other planning efforts. For example, a small department that conducts reviews of programs and services while putting together the annual budget may find that this is also a perfect opportunity to review SOPs.

Since evaluating and revising SOPs can be complex and time-consuming, the process must be well planned. Evaluations should be undertaken only in response to a compelling need, not simply to "wordsmith" guidelines or to create "busywork." Furthermore, the process should be completed as expeditiously as possible, avoiding situations where SOPs seem to remain in constant flux, with endless drafts floating around for comment.

Special Evaluations

Occasions may arise when agencies need to conduct an unscheduled evaluation of one or more procedures. These reviews fall outside the standard mechanism set up by the agency for periodic reviews of SOPs. Special evaluations are stand-alone, limited studies designed to solve specific challenges and deficiencies. They usually involve only a portion of the SOP set, perhaps focusing on a specific operational function or program element. The methods and techniques used will reflect the targeted nature of the study, as well as departmental preferences and resources.

Special evaluations may be conducted for any number of reasons, including:

- An incident that resulted in a bad outcome for the community or department.
- New construction in the community.
- Special construction buildings.
- A change in federal, state, or local laws and regulations.
- A revision to NFPA or other consensus standards.
- A change in internal policies or labor contracts.
- A leadership turnover resulting in new management priorities.
- Economic and demographic changes in the community.
- Organizational mission changes.
- Legal decisions establishing important new precedents.
- Identified operational performance problems.
- Changes in staffing or equipment.
- Changes in mutual or automatic aid agreements or arrangements.

For example, what would happen if a new stadium is built in the community? Fire and emergency services agencies that will respond to incidents at the stadium may need to develop new SOPs to guide firefighters and emergency medical providers upon arrival. The addition of a gated community or a new high rise building may pose similar challenges.

There are many other situations that could cause the agency to re-think SOPs. Examples might include increased violence towards personnel; a new mutual aid agreement with a neighboring jurisdiction; major organizational or staffing changes; the addition of emergency medical response or a hazmat team; promulgation of new OSHA regulations; purchase of a new fire truck; or an unexplained increase in injuries or response times.

A second category of special evaluations focuses on the SOP development process itself. Every time a new or modified SOP is introduced, agency planners should design a complementary evaluation component to assess its impact and effectiveness. The approach used is similar to other special evaluations, but the study is limited to the new SOP. In addition, planning for the analysis began (or should have begun) during the SOP needs assessment and development phases.

This advantage gives planners a better opportunity to choose methodologies, control variables, and gather data than might otherwise be possible. Often, two or more studies are planned: a short-term evaluation to get rapid feedback, and longer-term studies to assess changes over a specified period of time.

Conducting Evaluations

Theoretically, the evaluation process can be divided into four general steps: 1) establish standards, 2) measure performance, 3) compare measured performance with standards, and 4) analyze and act. Analytical methods can be complex, but more subjective measures (e.g., surveys, simple rating systems) can be used. Ideally, the end product is a quantifiable analysis of the SOP's effectiveness, and specific recommendations for improving it.

Each agency must determine for itself the best method for conducting evaluations. The method chosen should reflect the requirements of the study—the purpose of the analysis, the number and type of SOPs affected, the legal and safety consequences of unacceptable performance, etc. Of course, costs, available resources, time requirements, management preferences, and other administrative factors must also be taken into consideration.

Several major evaluation concepts—such as identifying the operational environment, determining the standard of care, and researching local needs—have already been discussed in Chapter 3. Related laws, regulations, standards, and external resources are described in the appendices. This section looks at some other planning and administrative considerations.

Review Teams

After deciding to conduct either a periodic or a special evaluation, the first step is to establish an evaluation review team or committee. Ideally, all affected viewpoints will be represented. Thus, the team should include many of the same types of personnel that participated in the Needs Assessment and the SOP Development phases. In fact, evaluation studies are often assigned as a separate step to the same standing or specifically appointed SOP team. In addition, the "customers" or "clients" of the fire service agency—local government officials, community group members, and individual citizens—might be included.

As always, the structure and leadership of the committee is important. Personnel appointed as committee leaders must have the requisite technical expertise, as well as good interpersonal and group facilitation skills. Top-level management representation on the committee adds credibility to the process and shows commitment; it can also instill additional motivation in members.

Gathering Input

The first task of the committee is to get as much input as possible from all groups affected by the SOPs. Feedback can be gathered in many creative ways. An all-career fire department may choose to substitute discussions on SOPs for in-service training sessions. Leaders of a volunteer agency might set up special feedback sessions for members, or devote a company meeting to the topic. Input can also be gathered thorough written surveys, comment cards, or other standardized feedback forms. A disadvantage of this method is the lack of "two-way" discussion that occurs with face-to-face meetings, although follow-up sessions are possible.

Input from fire service customers can also prove invaluable in assessing SOPs. Many private companies spend millions of dollars annually contacting end users about their products and services. Think about the last time that you bought a new car or a major appliance. Did you receive surveys from the manufacturer, dealer, and loan company, all interested in your opinion about their products and services? Fire and emergency service agencies are in the same position, trying to provide the best services possible. That means getting input from local officials, community groups, mutual aid partners, individual citizens—anyone that is affected by or can influence fire service operations.

Methodology and Process

Every process needs a plan, and a study potentially as complex as the evaluation of SOPs is certainly no exception. Team members must decide on the methodology, the schedule of activities, and individual assignments. A range of data gathering, analytical, and group decision-making techniques—or combinations of techniques—can then be applied, as long as the process is implemented properly and consistently. Examples include direct observation, drills, exercises, surveys, brainstorming, cause-and-effect diagrams, event tree analysis, decision-making software, and many others.

The precise methodology will be determined by the requirements of the study. The key is to set measurable standards for operational performance, and then to gather data to determine if the standards are being met. If not, the SOPs that control operations may need to be revised, although other variables—notification, training, equipment, etc.—may be the real problem.

Conducting the evaluation study will involve many of the same techniques and considerations discussed in previous chapters. A special emphasis should be placed on quality control measures to ensure that data collection methods are consistent and reliable. Group decision-making techniques help ensure that all team members have an opportunity to influence the end product. The final report should provide enough information to complete the "feedback loop" and facilitate the preparation of new or revised SOPs, if necessary.

Summary

Evaluation, the feedback loop in the SOP management process, is designed to help fire service managers assess the adequacy of new or existing SOPs. The basic methodology is a comparison of operational actions and results with accepted standards or other measurable performance criteria and program objectives. Periodic evaluations provide a structured and ongoing mechanism to manage change in the fire service and community at large. Special evaluations, on the other hand, are studies intended to address a specific change, trend, operational deficiency, or opportunity identified by management.

SOP evaluation teams should represent the viewpoints of all affected groups, including individual members and emergency service customers. In addition, mechanisms should be established to gather input from other members of these groups as part of background research. Many different analytical and group decision-making techniques can be used, depending on the requirements of the study.

Poorly defined committee processes are almost always frustrating and rarely successful. However, a well-designed team strategy can harness the diverse talents of many individuals in a unified and creative effort that is greater than the sum of its parts. Management and team members must continually work together to establish this type of framework for SOP evaluations.

APPENDIX A

SELECTED LAWS, REGULATIONS, AND STANDARDS

Laws, regulations, and standards establish the legal framework for fire service operations. The potential impact of these various types of legal authorities depends on several factors. For example, the applicability of federal Occupational Safety and Health Administration (OSHA) regulations is determined by the character of the employer/employee relationship, the nature of the state occupational safety and health agency, and legal precedent. Since the content and interpretation of statutes and codes can change, the information provided here is intended solely as an introduction to a complex topic. Fire and EMS department managers need to review and understand applicable laws, regulations, and standards in their entirety before making decisions about SOPs.

Laws

Under our constitutional system of governance, no federal laws exist that specifically define the duties and powers of local fire and EMS departments. States may have different laws regarding the organization, duties, and powers of fire and EMS agencies within that state. In addition, cities and counties may have statutory provisions that further define emergency services operations within their jurisdictions. Fire and EMS department officers should understand and be able to cite all statutes that define their authority.

Important federal laws that apply to all fire and EMS departments within the United States are summarized in the following sections.

Americans with Disabilities Act

Title II of the Americans with Disabilities Act (ADA) covers all activities of state and local governments regardless of the entity's size and amount of federal funding it receives. The United States Department of Justice (DOJ) promulgates and enforces regulations under ADA. Title II requires that state and local governments give people with disabilities an equal opportunity to benefit from their programs, services, and activities. Considerations include access to jobs and "reasonable" accommodations, important factors in planning how operations will be conducted (i.e., writing SOPs). Fire and EMS departments incorporated as not-for-profit entities may be covered under either Title II or Title III of ADA; functional requirements are essentially the same.

People with disabilities, including HIV/AIDS, are entitled to receive the same level of medical care as other citizens. There have been several notable instances where medical providers, including EMS personnel, were sued for failing to provide the appropriate level of care to people with HIV/AIDS or other disabilities.

All fire and EMS department dispatch centers or Public Safety Answering Points (PSAPs) are required to equip every dispatcher console with teletypewriters (TTYs). People with disabilities use these devices to communicate via telephone. Call-takers are required to query "silent calls" with the TTYs to ensure that they are not actually calls from a disabled person.

ADA Title III, *Public Accommodations*, contains architectural requirements for new and altered buildings that can influence the conduct of fire and EMS department emergency operations. For example, Title III mandates changes in elevator function and stairwell pressurization during fire alarm activations in multi-story buildings. Fire and EMS personnel must understand how building alterations can affect evacuation and rescue procedures for people with disabilities.

Title II may impact fire and EMS department SOPs in a variety of ways. A great deal of useful information regarding ADA can be found on the DOJ website, including hotline numbers for questions (see Appendix C).

Ryan White Comprehensive AIDS Resources Emergency Act of 1990

The Ryan White Act requires that hospitals notify personnel that may have been exposed to an infectious disease during emergency response. The law further requires that each fire and EMS department appoint a designated officer, typically called an Infection Control Officer (ICO) to facilitate communications between medical facilities and emergency responders. With airborne pathogens like tuberculosis, the law requires medical facilities to contact the ICO within 48 hours after determining that a patient treated by responders is infected. When a bloodborne pathogen is involved, the medical facility must notify the emergency responder after a written request from the ICO.

In 1994, the Centers for Disease Control (CDC) published *CDC Guidelines on Implementation of Provisions of the Ryan White Comprehensive AIDS Resources Emergency Act Regarding Emergency Response Employees*. This supplementary material, which focuses primarily on infectious disease education and planning for emergency responders, may be helpful for developing departmental SOPs. While the CDC guidelines are neither regulations nor standards, many of the recommendations were incorporated into OSHA regulations and industry standards regarding bloodborne pathogens (described later).

OSHA General Duty Clause (29 USC 654(a)(1))

The intent of this statute is to protect employees from workplace accidents and exposures by requiring employers to recognize and correct hazards. In the absence of a specific OSHA regulation addressing a workplace hazard, OSHA may use national consensus standards like those developed by the NFPA to determine whether the existence of a workplace hazard violates the General Duty Clause. Fire and EMS departments can meet the requirements of 29 USC

654(a)(1) by removing workplace hazards and providing emergency responders with the appropriate training, equipment, and procedures to safely operate in hazardous environments (e.g., emergency scenes).

Superfund Amendments and Reauthorization Act

The Superfund Amendments and Reauthorization Act (SARA) mandates certain critical aspects of hazardous materials preparation and response, including training for emergency responders, the creation of State Emergency Response Commissions (SERCs) and Local Emergency Planning Committees (LEPCs), state and local government planning activities, and hazardous waste reporting. SARA also mandated that OSHA and EPA promulgate regulations governing hazardous materials training, operations, and emergency response. (More information on these regulations is presented later.)

Supreme Court Precedents

The legal community recognizes the outcome of specific court cases, called precedents, as an authority for deciding future cases. Courts at every level use precedents to help interpret laws and decide cases. The United States Supreme Court is the ultimate authority on the constitutionality of laws. For example, two precedent-setting cases decided by the Supreme Court concern fire-cause determination and arson investigation. *Michigan v. Tyler*[1] and *Michigan v. Clifford*[2] upheld that fire department personnel may remain in a building and seize evidence of arson without a warrant for a reasonable amount of time after a fire has been extinguished. However, any investigation activities after a property is released back to the owner by the fire department must be conducted with a valid search warrant. Failure to obtain a warrant violates the citizens' rights under the Fourth Amendment to the Constitution.

Regulations

Regulations are rules established by government agencies to implement statutory laws. The applicability of federal regulations to fire and EMS department operations varies according to several factors that were discussed previously (see Chapter 3). State and local regulations also influence the SOP development process. The federal regulations described here represent a small sample of those that may be pertinent to fire and EMS departments.

Occupational Noise Exposure (OSHA 29 CFR § 1910.95)

Requires employers to measure sound levels in the workplace, provide protective hearing equipment, develop a hearing conservation program whenever employee noise exposures exceed permissible levels, and maintain records on employee noise exposure levels.

Hazardous Waste Operations and Emergency Response (HAZWOPER) (OSHA 29 CFR § 1910.120)

Applies to all personnel involved in hazardous materials response, whether volunteer or career, in every state where OSHA standards apply. The regulation requires employers to develop a comprehensive program for hazmat response, and establishes minimum safety standards. (EPA 40 CFR § 311 is functionally similar to 29 CFR 1910.120 and covers emergency responders in all states, regardless of their status under OSHA.)

Fire Brigades (OSHA 29 CFR § 1910.156)

Refers to a wide variety of firefighting issues such as agency mission statements, training requirements, and personal protective equipment. Principally directed at industrial fire and EMS departments, the regulation can apply to state, county, and municipal fire and EMS departments in some jurisdictions.

Personal Protective Equipment (OSHA 29 CFR § 1910.132 - § 1910.140)

Establishes general requirements for employers to provide, test, inspect, and maintain personal protective equipment (PPE) for employees exposed to workplace hazards. Employees must be trained on the proper use of such equipment, to include eye protection, face protection, head and extremity protection, protective clothing, respiratory protection, and protective shields and barriers. In addition, 29 CFR § 1910.134 requires that, when employees enter a hazardous area using respiratory protection, one or more similarly equipped employees must be standing by to provide accountability and assist in rescue if needed. Specific requirements are listed for regular maintenance and testing of respiratory equipment, fit testing, and other requirements. (All of the basic requirements applicable to private sector employees apply to firefighters and EMS personnel. Additional requirements apply specifically to fire suppression and rescue operations.)

Sanitation Requirements (OSHA 29 CFR § 1910.141)

Ensures that fire stations and other fire/EMS department facilities provide clean and sanitary work environments free from health hazards. The regulation addresses fixed facility requirements including general housekeeping, waste disposal, pest control, water supplies, toilet facilities, showers, change rooms, clothes-drying facilities, eating and drinking areas, waste disposal containers, sanitary storage, and food handling.

Permit-Required Confined Spaces (OSHA 29 CFR § 1910.146)

Intended to protect personnel who enter “permit-required confined spaces,” as these terms are specifically defined in the regulation. An employer is required to issue a written permit to employees before they are allowed to enter a permit-required space. The portion of this regulation most applicable to emergency services personnel is paragraph K, *Rescue and Emergency Services.*

Under paragraph K, fire and EMS departments that may respond to a confined-space incident are required to provide personnel with the appropriate PPE, rescue equipment, and training to perform rescues from permit-required spaces. Paragraph K does not require emergency services personnel to complete a permit before entry is made into a confined space for rescue purposes; however, a permit would be required to enter the space for training purposes. Rescuers must have atmospheric monitoring and ventilation equipment, lifelines and harnesses, a mechanical hoist system, communications equipment, and lighting equipment.

Lock-out/Tag-out Requirements (OSHA 29 CFR § 1910.147)

Intended to prevent injury to employees caused by the unexpected start up of machines or equipment or the release of stored energy. The rule mandates that emergency services personnel use certain safety measures to prevent the unexpected release of energy or start up of equipment. Lock-out/tag-out procedures may be necessary when performing rescues involving heavy industrial equipment, elevators, or electrical rooms. Electricity must be shut down and protected so that re-energizing does not occur while the rescue is being performed. This standard also requires employers to create an employee protection program that defines lock-out and tag-out procedures.

Occupational Exposure to Bloodborne Pathogens (OSHA 29 CFR § 1910.1030)

Provides for employee protection from exposure to bloodborne pathogens or other potentially infectious materials. The regulation requires that fire and EMS departments establish a comprehensive education and control program for personnel who may be exposed to bloodborne pathogens or infectious materials. The program must cover the following topics: training for emergency services personnel about the dangers of bloodborne pathogens; methods to dispose of contaminated materials; disposal processes for “sharps,” contaminated instruments, and infectious materials; documentation of rescue worker exposures to infectious materials; and post-exposure medical evaluations. The department is also required to provide all protective equipment necessary to protect employees from bloodborne pathogens. Hepatitis B vaccinations must be offered at no cost to personnel.

Hazard Communication (OSHA 29 CFR § 1910.1200)

Requires that all employers 1) evaluate hazardous materials imported into, produced by, or used in a workplace, and 2) communicate the resulting information to employees through labels, Material Safety Data Sheets (MSDS), and specialized training. In addition, employers must notify and educate employees about hazardous materials locations to which they may have to respond. All employers must develop a hazard communication plan and share copies of the plan and their MSDSs with local emergency responders. OSHA’s definition of hazardous chemicals and specified threshold amounts determine which chemicals must be reported in these plans.

Trench/Collapse Rescue Operations (OSHA 29 CFR § 1926.650 - § 1926.652)

Establishes operational and safety practices for rescue incidents involving trenches. This rule prohibits entry into trenches which are not properly shored, specifies that emergency services personnel wear a lifeline into trenches, and requires that fire/EMS departments provide training to emergency services personnel about the hazards of trench operations.

Discrimination Against Employees Under OSHA Act of 1970 (OSHA 29 CFR § 1977)

Prevents employers from discriminating against employees who exercise the right to file OSHA-related complaints or testify against an employer during an investigation. The rule creates a procedure for employees to file grievances if they feel they are victims of retaliation. Employees who refuse to comply with occupational safety and health procedures implemented by an employer in accordance with OSHA rules are not entitled to protections afforded by this Act.

Compressed Gas Cylinder Guidelines (DOT 49 CFR § 178, Subpart C)

Regulates the construction, testing, and maintenance of compressed gas cylinders including those for self-contained breathing apparatus and medical oxygen. While this is a Department of Transportation (DOT) regulation, it incorporates consensus guidelines from the Compressed Gas Association (CGA) for inspecting and testing compressed gas cylinders. SOPs developed as part of a department's SCBA preventive maintenance and inspection program must ensure that compressed gas cylinders are hydrostatically tested at prescribed intervals.

Consensus Standards

Consensus standards created by the National Fire Protection Association (NFPA) and other professional organizations are extremely important to the development of effective SOPs. A detailed discussion of standards can be found in Chapter 3. The standards excerpted below represent a small sample of those applicable to fire and EMS departments. Managers and team members should become familiar with the most current editions of these standards, in their entirety, during the SOP development process.

NFPA 471, Recommended Practice for Responding to Hazardous Materials Incidents

NFPA 471 outlines minimum requirements and operating guidelines for all organizations that have responsibilities when responding to hazardous materials incidents. The recommended practice specifically covers planning methods, polices, and procedures for determining incident levels, using personal protective equipment, decontamination, incident safety, and communications. Other topics include the use of control zones, monitoring equipment, incident mitigation measures, and medical monitoring.

NFPA 1403, Standard on Live Fire Training Evolutions

This standard sets forth a systematic method to prepare for and conduct training evolutions involving live fire. The standard applies to live fire training in specially constructed "burn buildings," as well as acquired structures. Requirements are organized into five categories: Acquired Structures, Gas-Fired Training Center Buildings, Non-Gas-Fired Training Center Buildings, Exterior Props, and Exterior Class B Fires. Within each category, guidelines are specified for student prerequisites, structures and facilities, fuel materials, safety, and instructors. Requirements for record keeping and reporting are also identified.

NFPA 1404, Standard for a Fire Department Self Contained Breathing Apparatus Program

NFPA 1404 establishes fire/EMS department guidelines for developing a preventive maintenance and training program for self-contained breathing apparatus (SCBA). The standard is designed to meet or exceed federal requirements for worker respiratory protection programs. It identifies minimum program requirements and safety procedures for addressing provision of SCBA, emergency scene use, SCBA training certification, safe operation, in-service inspection, equipment maintenance, breathing air quality control, and program evaluation.

NFPA 1410, Standard on Training for Initial Fire Attack

This standard contains minimum requirements for the evaluation of training in initial fire flow delivery procedures by fire department personnel engaged in structural firefighting. It serves as a standard mechanism for evaluating minimum acceptable performance for hose line and water supply activities during training for initial fire attack. The standard describes methods of evaluation and logistical considerations for basic evolutions that can be adapted to local conditions. Required performance guidelines are represented for handlines, master streams, and automatic sprinkler system support.

NFPA 1470, Standard on Search and Rescue Training for Structural Collapse Incidents

This standard identifies and establishes levels of training for safely and effectively conducting operations at structural collapse incidents. It is designed to help organizations assess the level of operational capability needed, and to establish training and safety criteria. Specific training requirements are defined for personnel at three levels: Basic Operations, Medium Operations, and Heavy Operations. In addition, general safety requirements are identified, including appointment of a Safety Officer, use of personal protective equipment, use of other safety equipment, incident management, and physical fitness of personnel.

NFPA 1500, Standard on Fire Department Occupational Safety and Health Program

NFPA 1500 establishes minimum standards for fire service occupational safety and health programs. It applies to all aspects of the workplace, including incident scene and non-emergency operations. This broad standard requires departments to develop a comprehensive written risk management plan and an occupational safety and health program; designate a safety and health officer; appoint a safety and health committee; use incident command, personnel accountability, and safety systems at incidents; establish written SOPs; and maintain a data collection system and permanent record of job-related accidents, injuries, illnesses, exposures. It also requires that responders maintain minimum levels of health and fitness and use personal protective equipment.

NFPA 1521– Standard for Fire Department Safety Officer

This standard contains minimum requirements for the assignment, duties, and responsibilities of fire/EMS department Health and Safety Officers and Incident Safety Officers. Related organizational requirements are defined, including personnel assignments and backup capabilities. The qualifications and authority of both positions are also described. Functions of the Health and Safety Officer are defined in relation to risk management, safety program rules and SOPs, training and education, accident prevention and investigation, records management and data analysis, apparatus and equipment, facility inspection, health maintenance, infection control, critical incident stress management, and post-incident analysis. Functions of the Incident Safety Officer are also described, to include participation in the incident management system, incident scene safety, fire suppression, emergency medical services operations, hazardous materials operations, and special operations.

NFPA 1561, Standard on Fire Department Incident Management System

This standard establishes a generic structure for the coordination and management of emergency incidents to help ensure the health and safety of emergency responders. It requires the adoption of an incident management system for command and control of all emergency incidents and training exercises. Written plans should be created to anticipate incidents that require standardized procedures and mutual aid with other agencies involved in emergency incidents. Departments should create a command structure and standard supervisory assignments, including incident command, command staff, planning, logistics, operations, communications, staging, and finance functions. Departments are also required to implement a personnel accountability system and address rehabilitation for all members operating at an incident.

NFPA 1581, Standard on Fire Department Infection Control Program

This standard contains minimum requirements for programs to control infectious and communicable disease hazards in the fire department work environment. It is applicable to organizations that provide fire suppression, rescue, emergency medical care, and other emergency services, including public, military, private, and industrial fire departments. The standard identifies minimum criteria for infection control in the fire station, at an incident scene, and at any other area where fire department members are involved in routine or emergency operations. Departments are directed to develop a written infection control policy and risk management plan, to conduct annual training and education programs for all members, and to designate an Infection Control Officer. Other topics include vaccination programs, exposure control techniques, facility/station safety, cleaning and disinfecting, disposal methods, emergency medical operations and equipment, housekeeping, and labeling.

NFPA 1670, Standard on Operations and Training for Technical Rescue Incidents

This standard identifies and establishes levels of functional capability for safely and effectively conducting operations at technical rescue incidents. It applies to organizations and departments who provide technical rescue response. The standard states that the authority having jurisdiction must have standard operating procedures at the awareness, operations or technician level, and must have operational procedures in place to perform safely at technical rescue incidents. Additionally, the standard calls for incident response planning and the provision of appropriate rescue equipment and personal protective equipment.The standard also covers specific types of technical rescue incidents.

Endnotes

[1] 436 U.S. 499 (1978)

[2] 464 U.S. 287, 294, 104 S.Ct. 641 (1984)

Appendix B

SOP TOPIC AREAS

This Appendix presents, in outline format, a detailed categorization system and content descriptions for topic areas of fire service standard operating procedures. The list expands on the SOP topic areas shown in Exhibit 2-2 (see Chapter 2, *The Role and Function of SOPs*). It is intended to serve as a starting point for fire departments and other emergency services organizations that are developing or reviewing SOPs. However, different categorization systems are possible, so departments should tailor the information to their own unique operational needs, organizational structure, and management preferences.

The SOP framework presented here is organized into three broad areas: *Management and Administration*, *Prevention and Special Programs*, and *Emergency Operations*. *Emergency Operations* is, in turn, subdivided into *General Emergency Operations* and five common fire service operational missions: *Fire Suppression*, *Emergency Medical Response*, *Hazardous Materials Response*, *Technical Rescue*, and *Disaster Operations*. The intention is to describe SOP requirements that are similar for all operational missions under *General Emergency Operations*, and mission-specific requirements in the appropriate category. This approach minimizes redundancy and reflects common organizational and administrative patterns. However, some duplication is necessary when SOP categories are appropriate for two or more functional areas (e.g., Personal Protective Equipment), but the content of the categories differs (e.g., firefighting turnout gear versus PPE used in emergency medical care).

CONTENTS

Page

Management and Administration 78
Prevention and Special Programs 80
General Emergency Operations 82
Fire Suppression 86
Emergency Medical Response 89
Hazardous Materials Response 92
Technical Rescue 94
Disaster Operations 96

MANAGEMENT AND ADMINISTRATION

GENERAL ADMINISTRATION—Procedures related to activities that maintain and support the organization, including financial management, resource management, information processing, and maintenance and development of the organizational infrastructure.

- Organization—Establishment of the organization, mission statement, policy on SOPs, chain of command, code of ethics, drug-free workplace, inter-department communications.
- Facilities—Non-smoking areas, telephones and usage, sleeping facilities, apparatus bay doors, portable fire extinguishers, smoke and carbon monoxide detectors, storage and use of fuels, facility maintenance and repairs, facility security, public access policy, workplace violence.
- Emergency Vehicles and Special Apparatus—Fueling of vehicles, inspections of vehicles, out-of-service vehicles, non-departmental riders, care and maintenance of vehicles and special apparatus, repair of vehicles and special apparatus.
- Equipment and Supplies—Personal protective equipment, small tools and equipment, power tools and equipment, SCBA maintenance, hose testing and maintenance, inventory control procedures, ropes and harnesses, communications equipment, public use requests.
- Finance—Budgeting, procurement and purchasing, out-of-town travel, expense reimbursement.
- Fundraising—Income-producing activities, public solicitations, grant applications, special requirements and activities, managing donations.
- Training, Education, and Exercises—In service training (initial and refresher), live fire training exercises, training evaluation, certification, requests for training, training records, interorganizational/community exercises.
- Information Management—Incident reporting system, record-keeping systems, confidentiality and access to information, use of computer equipment, archiving information.

MEMBER HEALTH AND ASSISTANCE PROGRAMS—Procedures affecting member health, fitness, and performance, to include assessment, enhancement, and enforcement activities.

- Medical Screening/Health Assessment—Fire department physician, baseline/entry and annual examinations, post-injury/exposure examinations, exercise screening/stress tests, vaccinations, medical/exposure records.
- Health and Wellness Promotion—Fitness assessment, fitness conditioning programs, healthy lifestyles.
- Performance Evaluation Process—Work performance assessment, appeal process.

- Post-Injury Rehabilitation—Post-traumatic incident debriefing, occupational therapy, work hardening programs, disability/job assessment, ergonomics/job engineering, reassignment options.

- Employee/Member Assistance—Substance abuse cessation, critical incident stress management, professional development, family relations, legal and financial services, mental health services.

- Facility Safety—Code requirements, basic safety standards, personal behavior and hygiene, food preparation safety, infection control in stations (cleaning, disinfecting, storage, etc.), facility maintenance and repairs, station safety and health inspections and enforcement.

- Hazard Communication—Employee right-to-know requirements, employee participation, maintenance and access to safety information, employee notification and training.

ORGANIZATIONAL PLANNING AND PREPAREDNESS—Procedures affecting organizational analysis and planning systems for management, administration, and emergency operations.

- Strategic/Master Planning—Interorganizational coordination and planning, organizational planning (long-term and short-term), administrative systems, organizational evaluation.

- SOP Development—Committee organization, schedule, needs assessment process, development process, approval, distribution, implementation, evaluation.

- Risk Management—Identification of workplace hazards, vulnerability and risk assessment, risk control techniques, safety systems, risk management monitoring.

- Emergency Operations Planning—Community right to know, general operations planning, facility and operational preplanning (fire suppression, emergency medical response, hazardous materials response, technical rescue, disaster operations), resource classification.

- Mutual/Automatic Aid—Requirements for outside aid, resource lists, inter-jurisdictional unified command, evaluating aid agreements.

PREVENTION AND SPECIAL PROGRAMS

PUBLIC INFORMATION AND EDUCATION—Procedures to promote awareness of hazards, provide emergency information, encourage prevention, and foster good will and support in the community.

- Working with the Public—Special populations, use of information technology, distribution and dissemination channels, personal and professional behavior.
- Working with the Media—Media rights and responsibilities, personal and professional behavior, using print and broadcast media (interviews, briefings, news releases, media events, advertising, etc.).
- Emergency Public Information—Rights of privacy and public safety, media access to incident scenes/entry zones, media staging or information center, incident information flow, legal issues.
- Public Education—Program goals and objectives, use of department and community resources, conducting programs and activities, evaluating program accomplishments.
- Public Relations—Customer service strategies, building/maintaining departmental image, dealing with citizen complaints, member contacts with municipal/elected officials and media representatives.

BUILDING INSPECTIONS AND CODE ENFORCEMENT—Procedures for evaluating and enforcing safety in buildings and commercial operations.

- Authorities and Codes—References to applicable government regulations and policies, community plans and zoning ordinances, codes and standards in force locally (buildings, construction, fire prevention, employee safety and accident prevention, hazardous materials, health, etc.).
- Design and Plans Review—Working with business/facility owners and managers, review teams, review processes, approval processes, notification procedures, documentation and reporting.
- Residential Inspections—Working with homeowners, scheduling inspections, conducting inspections, documentation and reporting.
- Commercial Inspections—Working with business owners, scheduling inspections, conducting inspections, documentation and reporting, coordinating company and prevention division inspections.
- Industrial Inspections—Working with industry, scheduling inspections, conducting inspections, documentation and reporting, coordinating company/hazmat and prevention division inspections.
- Code Enforcement—Project monitoring, inspection follow up, negotiations, sanctions.
- Record Keeping—Documentation and reporting systems, information dissemination, archiving.

SPECIAL PROGRAMS

- Fire Cause and Arson Investigation—Procedures for investigating fires, which may include arson detection, cause and origin detection, and evidence collection and preservation.
- Hydrant Maintenance—Programs and procedures for inspecting and maintaining hydrants.
- Other Special Programs—Guidelines for other special programs conducted by the department to support management, administration, or emergency operations.

EMERGENCY OPERATIONS

General Emergency Operations

OPERATING EMERGENCY VEHICLES—Procedures for the safe and effective operation of emergency vehicles and special apparatus, including fire engines, ambulances, trucks, tankers and other fleet vehicles.

- Driving Emergency Vehicles—Driver qualifications, skills maintenance, driver behavior, use of warning devices, roadway operations (traffic laws, intersections, speed, passing, following other vehicles), backing up, parking, operation in high risk areas.

- Riding Emergency Vehicles—Permitted vehicle occupants, passenger behavior, safety in emergency vehicles, reporting safety problems and violations.

- Operating Special Apparatus—Operator qualifications, operator behavior, placement and operation of special apparatus, safety in special apparatus operations, operation in high-risk areas.

- Vehicle Accident Reporting and Investigation—Accident scene procedures (information gathering, injury assessment, notification, etc.), reporting forms and documentation requirements, post-accident investigation (examination of scene, interviews with participants and witnesses, etc.), report preparation and dissemination.

- Use of Personal Vehicles—Driver behavior, roadway operations, permitted vehicle occupants, reporting safety problems and violations.

SAFETY AT EMERGENCY INCIDENTS—General procedures outlining safety considerations for agency personnel at various types of emergency incidents.

- Applicable Standards—Authorities recognized by the department as defining safe work practices in emergency response (e.g., OSHA/EPA regulations, state and local regulations, NFPA 1500, and other professional association or consensus safety standards).

- Risk Management Guidelines—General guidelines for identifying hazards and minimizing risk in emergency response, including, for example, emergency responder qualifications, standard safety guidelines, use of pre-plans, initial evaluation of risk, development of site safety plans, assignment of safety personnel, control of scene access, regular reevaluation of conditions, etc.

- Safety Officer—Authority and responsibilities of the Incident Safety Officer and the Health and Safety Officer, incident scene safety management procedures, post-incident follow up, reporting and documentation.

- Protective Clothing and Equipment—General procedures for selecting, using, maintaining, inspecting, fit testing, decontaminating, and disposing of personal protective clothing and equipment, such as PASS Devices, SCBA, HEPA Mask Respiratory Protection, etc.

- Personnel Accountability System—Supervisor responsibilities, member responsibilities, incident arrival procedures, personnel tracking and inventory procedures, maintenance of supplies.

- Responder Exposure Control—Personal hygiene, use of PPE/barrier protection, incident operations, incident recovery (disposal, cleaning, decontamination, storage, etc.), post-exposure procedures.

- Hearing Conservation—Standards for noise exposure, hearing protection, noise reduction, monitoring incident noise, assessment of hearing problems, documentation and reporting.

- Operating in a Hostile Environment—Assessing hostile environments, dealing with potentially violent persons, identifying civil disturbance situations and terrorism incidents, interaction with law enforcement, delaying or suspending operations, modifying operations, resuming normal operations.

- Operating on Roadways—Operations near moving traffic, traffic control, use of warning devices, vehicle/scene stabilization, coordination with law enforcement personnel, standard procedures and precautions, special situations (e.g., downed power lines).

- Incident Scene Rehabilitation—Rehab officer functions, monitoring responders' emotional and physical condition, rotation of personnel, requesting relief, rehabilitation area and supplies, food and fluid replenishment.

- Medical Support—Systems to provide medical care for injured responders: supplies, treatment area, medical evaluation and treatment, post-incident follow up.

- Incident Termination—Operational debriefing/defusing, release of information, releasing the scene to another party (owner, police, hazmat cleanup crew, etc.).

COMMUNICATIONS—General procedures governing communications during emergency incidents.

- System Access—Activities that provide the community access to the emergency response system, including call receipt, call routing, call processing, and instructions given over the telephone to callers.

- Definition of Alarms/Dispatch Protocols—Procedures and protocols for assigning and dispatching units to specific types of emergencies or to escalating emergencies.

- General Procedures—General procedures and protocols for communications among dispatch and field personnel in emergency and non-emergency incidents.

- Emergency Signals—Initiation of emergency signals, radio signals, other warning signals, personnel actions.

- Alternate Radio Frequencies—The use of alternate radio frequencies on major incidents or incidents where the Incident Command/Incident Management System has been activated.

- Mobile Data Terminals (MDTs)—Procedures outlining the use of Mobile Data Terminals (MDTs) on fire and emergency apparatus, as well as in-station dispatch terminals.

- Mutual Aid Communication—Procedures for communicating with units and personnel from other jurisdictions on mutual aid responses.

- Situation/Status Reports—Procedures describing when and how to complete situation/status reports for major emergency and non-emergency incidents.

COMMAND AND CONTROL—General procedures directing use of the Incident Command/ Incident Management System and controlling inter-agency coordination.

- Incident Command/Incident Management System—General description of the Incident Command/ Incident Management System, including organizational structure, assignments, activation, general procedures, etc.

- Mutual/Automatic Aid—Resources available for different types of emergencies, requesting or responding to requests for aid, interacting with mutual/automatic aid agencies, documentation and reporting, cost/ resource recovery.

- Incident Scene Management—General procedures for activating the Incident Command/Incident Management System, ICS/EOC interface, designating an Incident Safety Officer, organizing the scene, use of control zones, placing resources, supervising personnel, controlling access, controlling bystanders and crowds, coordinating with other agencies, etc.

- Staging—Procedures for staging units and apparatus at emergency scenes, which may include specific procedures for staging and the designation and use of staging officers.

- Transferring Command—Process for transferring command once established on an emergency scene.

- Public Information—Duties and procedures of the Public Information Officer and other personnel at emergency incidents, dealing with relatives/family liaison.

- Record Keeping—Records and information that must be maintained when activating or terminating the Incident Command/Incident Management System.

SPECIAL OPERATIONS—Procedures for special emergency response operations and situations.

- Aircraft Operations—Procedures for using department-owned aircraft in emergency operations: qualifications of personnel, care and maintenance of aircraft, requests for air support, operating aircraft, use of special equipment.

- Boat and Watercraft Operations—Procedures detailing operation of agency boats and watercraft: qualifications of personnel, care and maintenance of watercraft, requests for watercraft support, operating watercraft, use of special equipment.

- Special Unit Operations—Procedures explaining operation of any specialty unit within an agency, such as bicycle teams, all-terrain vehicles, snowmobiles, etc.

- Bomb/Hazardous Device Threats or Confirmed Incidents—Procedures for bomb threat incidents: agency responsibilities, mutual aid assistance, points of contact, bomb squad response protocols, evacuation of civilians, hoax procedures (phone threats), communication policy, preservation of evidence.

- Terrorism Incidents—Procedures for terrorism incidents: agency responsibilities, mutual aid assistance, points of contact, general response protocols, task force operations, secondary devices, mass decontamination of casualties and emergency responders, mass evacuations, preservation of evidence.

- Civil Disturbances—Procedures for operations during civil disturbances: protection of responders, initiating and suspending operations, use of staging areas, task force operations, police escort procedures, interaction with law enforcement and emergency management agencies.

POST-INCIDENT OPERATIONS—Procedures for activities after incidents designed to assess and document actions, restore capabilities, address problems, and improve future results.

- Post-Incident Analysis—Methods for identifying lessons learned and potential corrective actions following response to an emergency incident: incidents to be reviewed/analyzed, participants and roles, format for gathering information, format for conducting analyses, standardized action plan, mechanism for reporting results.

- Post-Incident Recovery—Activities designed to restore the department's response capability after an incident, including consideration of staffing assignments, equipment replacement, and cost recovery.

- Incident Record Keeping and Reporting—Completion of standard incident documentation, preparation and submission of special incident reports, incident review process, incident follow-up procedures.

- Injury/Exposure Reporting and Investigation—Accident and injury reports, exposure reports, death reports, maintenance of the health data base system, identification of injury/exposure trends and problems, liaison with the community's health care system, member notification and testing, confidentiality of personal health records, exposure/injury follow up.

- Critical Incident Stress Debriefing/Defusing—Situations that indicate a need for CISM, identifying individuals needing CISM, procedures for notifying a qualified debriefing team, conducting a defusing, post-incident follow up.

EMERGENCY OPERATIONS

FIRE SUPPRESSION

FIRE SUPPRESSION RISK MANAGEMENT—Procedures designed to minimize risk to responders and implement aspects of the department's health and safety program at fire suppression incidents.

- Required Use of Personal Protective Equipment (PPE)—Use of turnout gear, SCBA, PASS devices/alarms, and other equipment at fire suppression incidents.
- Rapid Intervention Teams—Procedures for deploying intervention teams during incidents: availability, proper uses, activation, proper uses, standard practices, special situations.
- Evacuation (Firefighters)—Evacuating responders from dangerous structures or areas: determining dangerous conditions, activation signal, procedures for evacuation, accounting for personnel, return to normal operations.
- Air Monitoring—Monitoring carbon monoxide (CO) levels during overhaul, equipment and uses, removal of SCBA.

COMPANY OPERATIONS—Procedures covering activities related to specific company operations.

- Incident Staffing—Number and types of personnel, capability, personal protective equipment, etc. for different types of fire suppression incidents.
- Water Supply—Acquiring and maintaining water supply at fire operations.
- Tanker/Tender Operations—Use of tankers/tenders at fire scenes.
- First-In Engine Operations—Duties and functions of the first-in engine company at a fire scene.
- Second-In Engine Operations—Duties and functions of the second-in engine company at a fire scene.
- Truck Company Operations—Duties and responsibilities of the truck company at a fire or other emergency scene.
- Special Units—Duties and responsibilities of units needed to perform special functions, such as rescue units, cascade systems, lighting units, and grass-fire units.

TACTICAL/STRATEGIC GUIDELINES—Procedures that guide fire and emergency personnel in remediation of fire suppression incidents.

- Incident Size-Up—Conducting incident size-up upon arrival on the emergency scene.
- Automatic Alarms—Responding to and dealing with automatic alarms.
- Offensive and Defensive Operations—Agency operations at emergency scenes, including offensive fire attacks, defensive operations, and how to determine which approach will be taken.
- Apparatus Placement—Placement of apparatus on an emergency scene to ensure safety and effective emergency operations.
- Forcible Entry/Gaining Access—Forcible entry activities, to include lockouts of residences and automobiles and use of lock and/or knox boxes in emergency and non-emergency situations.
- Foam Operations—Use of foam on emergency incidents, including when and how to apply foam.
- Ventilation—Conducting safe and effective ventilation operations.
- Hot/Cold Weather Operations—Operating in hot and cold weather or winter environments.
- Sprinkler/Standpipe Operations—Using standpipes and operating in buildings and residences with sprinkler systems.
- Apartment/Condominium Operations—Operations in apartment buildings or condominiums.
- Commercial Building Operations—Operations in commercial buildings.
- Salvage—Conducting salvage operations at a fire scene.
- Overhaul—Conducting overhaul operations at a fire scene, which may include procedures for evidence and crime scene protection.
- Exposures—Checking and protecting exposures and minimizing exposure risk.

SPECIAL FACILITIES/TARGET HAZARDS—Procedures for response to and operations at special structures or hazards.

- High Rise Operations—Responding to and operating at emergency incidents in high rise buildings.
- Clandestine Drug Labs—Responding to an emergency involving a known or suspected clandestine drug lab, which may include safety factors, law enforcement coordination and evidence preservation.
- Correction Facility Operations—Operating at emergency incidents in correctional facilities which may involve safety for personnel, law enforcement coordination and escorts for personnel.

- Industrial Facilities—Operations at industrial facilities that may involve hazardous materials, large buildings, warehouses, and dangerous machines; includes interfacing with industrial fire brigades or fire departments.

- Other Special Structures—Fire suppression operations at any other special structures (arenas, stadiums, historically relevant structures, airports, schools, market places, etc.).

SPECIAL FIRE SUPPRESSION OPERATIONS—Procedures covering special fire suppression response situations and operations.

- Aircraft Firefighting Operations—Responding to and operating at fire suppression incidents involving aircraft.

- Special Unit Operations—Deployment of special units in fire suppression operations.

- Wildfire Operations—Response to wildfire emergencies.

EMERGENCY OPERATIONS

EMERGENCY MEDICAL RESPONSE

EMERGENCY MEDICAL RESPONSE RISK MANAGEMENT—Procedures designed to minimize risk to responders and implement aspects of the department's health and safety program at emergency medical incidents.

- Incident Infection Control—Applicable regulations and standards, rights of patients and responders, personal hygiene and behavior, responder health issues, preparation for response, standard protective measures, special situations, compliance monitoring.
- Protective Clothing and Equipment—Selection, use, and disposal of specialized emergency medical protective clothing and equipment (gloves, masks, protective eyewear, gowns, resuscitation equipment, etc.) based upon specific situations.
- Lifting/Moving Patients—Proper lifting dynamics, proper use of stretchers, special situations (stairways, elevators, etc).
- Hostile Situations—Approaching emergency incidents, use of body armor, cover and concealment, response to crime scenes, suicidal persons, people with weapons, patient restraints, special situations (snipers, hostages, extremist groups, bombing incidents, etc.).

PRE-HOSPITAL EMS FIRST RESPONSE—Procedures directed at the personnel delivering the first pre-hospital EMS resources to the incident scene.

- Delivery Model—The specific configuration of the first response component: type of vehicle, number of vehicles, staffing of the unit (number and care capability).
- Patient care—General procedures addressing patient care delivered in the pre-hospital setting.
- Treatment Protocols—Medically approved protocols for pre-hospital EMS personnel that ensure consistent and appropriate treatment of patients (includes interaction with Medical Director).
- Medical Devices and Equipment—Selection of types of medical devices and equipment appropriate for field use in the defined scope of practice and treatment protocols.
- Biohazard and General Waste Disposal—Types of hazards and disposal methods, disposal area/facility, segregation of waste products, packaging, labeling, storage, treatment, disposal.
- Clothing/Equipment Decontamination—Methods and appropriate applications, decontamination area/facility, use of chemical agents, cleaning clothes, disinfecting.

PATIENT DISPOSITION AND TRANSPORTATION—Procedures directed at how the Fire/ EMS Organization assures the safe and effective delivery of the patient to the appropriate facility.

- Destination Guidelines—Criteria for triage of pre-hospital EMS patients to specific destinations.
- Method/Mode of Transportation—Methods to determine how pre-hospital EMS patients are transported (i.e., ambulance vs. helicopter).
- Ambulance Operations—Behavior in the patient compartment, securing the patient, situating and securing equipment, standard safety devices and techniques, use of hazardous equipment during transport (starting and IV, defibrillation, etc.)
- Helicopter Operations—Choosing and marking a landing zone, arm signals, crowd control, protective gear, approaching a helicopter, behavior and etiquette during transport, standard safety devices and techniques, use of hazardous equipment during transport.

MANAGEMENT OF EMS OPERATIONS—Procedures directed maintaining organizational readiness to provide emergency medical services in compliance with applicable laws, regulations, and standards.

- Re-supply/Procurement of Supplies—Pre-hospital EMS provider supply and re-supply of expendable medical supplies and medications.
- System Inventory—Determining and accounting for appropriate amounts of medical supplies and medications carried/stored by pre-hospital EMS providers.
- Designation of Treatment Facilities—Coordination with facilities to receive patients.
- Data Collecting and Reporting—Collecting and analyzing pre-hospital EMS system data.
- Quality Improvement System—Using pre-hospital EMS data to evaluate the system and provider performance, to include customer satisfaction and patient care.
- Research and Reporting—Research conducted and reported as the result of a collaborative involvement of the EMS community.
- Standard of Care—Methods to define the minimum level of care based on available resources, accepted performance standards, and local community needs.
- Patient Care Reporting—Minimum data sets for patient care reporting and times when reporting is necessary.
- Patient Documentation and Billing —Minimum data required for patient billing activities, procedures for billing activities and times when data collection is necessary.

SPECIAL EMS OPERATIONS—Procedures covering special emergency medical response situations and operations.

- Mass Gatherings—Event types, planning practices, first aid/EMS services, alternate patient access methods, pre-positioning/staging emergency apparatus and resources, expanding response in an emergency.

- Hazardous Materials Team Medical Monitoring—Use of medical monitoring equipment, pre-and post-entry monitoring, criteria for excluding personnel from operations.

- EMS Operations at Hazmat Incidents—Emergency decontamination of victims and team members, patient care and treatment, transport considerations, personal protective equipment.

- EMS Operations at Technical Rescue Incidents—Pre- and post-entry monitoring for team members, patient care and treatment, transport considerations, personal protective equipment.

- EMS Operations During Disasters—Triage methods, alternate treatment procedures, alternate transport procedures, evacuation of hospitals and medical facilities, mass casualty procedures, interfacing outside medical response teams (Disaster Medical Assistance Teams, medical strike teams, community emergency response teams, etc.), shelter medical procedures, “special needs patient” care, patient decontamination.

- EMS Operations in the Rehabilitation Area/Sector—Criteria for excluding personnel from operations, treatment for emergency service personnel, rehabilitation for emergency service personnel.

EMERGENCY OPERATIONS

HAZARDOUS MATERIALS RESPONSE

Standard operating procedures for hazardous materials response are not just for hazardous materials response teams. Fire and EMS departments that respond, or are subject to respond, to any type of incident involving hazardous materials must develop written SOPs. This is a mandatory federal requirement under the Superfund Amendments and Reauthorization Act (SARA) passed in 1986.

Both the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) promulgate regulations under SARA Title I, Section 126. OSHA 29 CFR § 1910.120, *Hazardous Waste Operations and Emergency Response* (commonly known as HAZWOPER) and EPA 40 CFR § 311 are essentially identical regulations applicable to all emergency responders within the United States regardless of their location or status (i.e., as a paid or volunteer employee). These regulations define five training levels for emergency responders based on the functions they may be expected to perform at a hazardous materials incident:

- First Responder Awareness–Individuals likely to witness or discover the release of a hazardous material. Trained to initiate the appropriate response and take no further action.

- First Responder Operations–Respond to releases or potential releases of hazardous substances as part of the initial response. Expected to take defensive actions without trying to stop the release, for the purpose of protecting persons, property, and the environment. (This is generally considered the minimum acceptable level of training for members of fire and EMS departments.)

- Hazardous Materials Technician–Respond to a hazardous materials incident for the purpose of stopping the release. These individuals are often members of a Hazmat team.

- Hazardous Materials Specialist–Respond with and support hazardous materials technicians. Possess specialized knowledge of chemical hazards or container characteristics.

- On-scene Incident Commander–Assume control of the incident beyond the first responder awareness level. This individual must possess minimum training at the first responder operations level with additional knowledge of state, local, and federal response plans.

This appendix identifies SOP topic areas suitable for use by emergency responders trained at the First Responder Operations level. Obviously, a fire or EMS department with members trained and expected to function in an offensive mode (e.g., hazmat technicians or specialists) will require additional SOPs beyond those discussed here.

HAZARDOUS MATERIALS RESPONSE RISK MANAGEMENT—Procedures designed to minimize risk to responders and implement aspects of the department's health and safety program at hazardous materials incidents.

- Personal Protective Equipment—Use of turnout gear, SCBA, PASS devices/alarms, and other equipment at hazardous materials incidents.

- Hazardous Materials Personal Safety—Identifying chemical emergencies, incident levels, chemical safety, general precautions for hazardous materials incidents, roadway operations.

- Air Monitoring—Procedures for conducting air monitoring at incidents, addressing such factors as methods and action levels for air monitoring.

FIRST RESPONDER OPERATIONS—Procedures defining recommended work practices and response techniques for First Responder Operations personnel.

- Roles and Actions—Definition and role of First Responder Operations personnel, explanation of appropriate (defensive) actions during hazardous materials incidents.

- General Response Procedures/Emergency Response Plan—Standard hazardous materials response procedures: types of incidents, dispatch criteria, techniques for approaching incidents, isolation of hazard, denial of entry, etc.

- Recognition and Identification—Information gathering (container characteristics, shipping papers, markings, labels, etc.), use of reference materials and contacts (e.g., Emergency Response Guide, CHEMTREC), hazard categorization and assessment.

- Notification—Reporting requirements, reporting protocols, requesting assistance (hazmat teams, mutual-aid resources, other agencies), incident updates, documentation.

- Site Management and Scene Setup—Identification of hazmat incident levels, use of hazard zones and perimeters, location of decontamination area, placement of vehicles and supplies, etc.

- Emergency Decontamination—Emergency decontamination of personnel and equipment exposed to hazardous substances: methods of decontamination, decontamination procedures, handling and transporting victims.

- Defensive Actions—Procedures for specific First Responder defensive actions (e.g., damming, diking, diversion, using sorbents, application of firefighting foam).

SPECIAL HAZMAT OPERATIONS—Procedures covering special hazardous materials response situations and operations.

- Operating with Hazmat Teams—Pre-designated procedures for working with a hazmat team.

- Public Protection Options—Procedures for public evacuation or sheltering in-place: decision making, alerting the public, coordinating with law enforcement and community services agencies, initial and secondary evacuation, sheltering in-place, incident termination and re-entry.

- Environmental Restoration—Procedures for supporting and monitoring the activities of private remediation or clean-up contractors (may be the responsibility of another agency).

EMERGENCY OPERATIONS

TECHNICAL RESCUE

As defined here, *Technical Rescue* includes emergency response activities designed to locate endangered persons (and sometimes animals), extricate them from entanglements, and remove them from potentially hazardous conditions. Standard operating procedures for emergency patient treatment and transport, often considered part of rescue operations, are covered under *Emergency Medical Response.* Personnel who perform both roles would be subject to both sets of SOPs.

TECHNICAL RESCUE RISK MANAGEMENT—Procedures designed to minimize risk to responders and implement aspects of the department's health and safety program at technical rescue incidents.

- Personal Protective Equipment—Use of specialized technical rescue personal protective clothing and equipment at incidents.
- Lock Out/Tag Out—Procedures ensuring that all electrical and mechanical equipment at or near the rescue site is turned off and physically prevented from being inadvertently turned on.
- Air Monitoring—Procedures for conducting air monitoring at rescue incidents, addressing such factors as methods and action levels for air monitoring.

RESCUE OPERATIONS—Procedures that direct activities related to search and rescue operations, including vehicle rescue, agricultural rescue, and extrication from industrial equipment.

- Scene Stabilization—Assessment and control of hazards, stabilization of vehicles involved in motor vehicle accidents, crowd/bystander control.
- Rescue Equipment—Types, use, and protection of specialized rescue equipment.
- General Rescue Operations—Basic procedures for coordinating with other response agencies, locating endangered persons, setting rescue priorities, patient stabilization and protection, performing technical rescue, dealing with relatives/family liaison, etc.
- Rescue Teams—Procedures describing the use, structure, equipment, and operations of special rescue teams (may be a separate document/section from the general standard operating procedures).

SPECIAL RESCUE OPERATIONS—Procedures covering special rescue activities or programs.

- Ice Rescue—Response to and operations during ice rescues; may include specific information about equipment use and maintenance.

- Water Rescue—Response to and operations during surface, swift water, or dive rescues; may include specific information about equipment use and maintenance.
- Confined Space Rescue—Response to and operations during confined space rescue situations; may also include information on equipment use and maintenance.
- Structural Collapse Rescue—Response to and operations during a structural collapse; may also include information on equipment use and maintenance.
- Rope Rescue—Response to and operations during a rope, vertical, or high-angle rescue situation; may include information on equipment use and maintenance.
- Trench and Excavation Collapse—Response to and operations during a trench or excavation collapse incident; may include information on equipment use and maintenance.
- Aircraft Extrication—Extrication of patients from aircraft; may include information on equipment use and maintenance.

EMERGENCY OPERATIONS

DISASTER OPERATIONS

Modern society is increasingly vulnerable to man-made and natural hazards. As a result, fire departments over the past decade have become increasingly involved in disaster preparedness and response, also known as Emergency Management.

Disaster operations involve responses to incidents that exceed the community's standard emergency service response capabilities. In addition to physically preparing department facilities, apparatus, and personnel for disasters, fire departments typically must undertake non-routine missions and tasks, often under dangerous and demanding conditions. Resource and coordination requirements change and expand. To fulfill their new responsibilities, fire departments must develop SOPs that clarify procedures before such emergencies occur. This section outlines some of those special requirements.

ORGANIZING FOR DISASTER SITUATIONS—Procedures that address modified organizational missions and personnel assignments during disaster operations.

- Disaster Management—Activation of the department's disaster operations plans and systems: emergency finance and procurement, resource management, personnel, information management, public information, etc.

- EOC Organization—Functional structure of disaster operations to facilitate coordination with other community agencies and federal/state resources, including EOC functions (e.g., use of Emergency Support Function categories), staffing, and operational procedures.

- ICS/EOC Interface—Local response agency coordination, mutual aid organization coordination, EOC/ field communications and documentation.

- Activation Levels—Categories that define organizational mobilization requirements and actions depending on the nature of the emergency.

- Personnel Assignments and Responsibilities—Changes in normal operating assignments and responsibilities to accommodate new disaster missions and responsibilities (family issues, temporary roles, teams, task forces, etc.).

- Personnel Notification Procedures—Steps to locate and assign personnel, both during and after normal work hours in a disaster: communication methods, information conveyed, and procedures for tracking the process and resolving problems.

- Disaster Training—Special systems and procedures to brief and train personnel on new roles, assignments, and work requirements.

- Disaster Preparation—Procedures for securing department facilities and verifying the identity of personnel under disaster conditions; may include procedure for securing responders' personal residences and families.

DISASTER OPERATIONS RISK MANAGEMENT—Procedures designed to minimize risk to responders and implement aspects of the department's health and safety program in disaster operations.

- Personal Protective Equipment—Use of turnout gear, SCBA, PASS devices/alarms, and other equipment in disaster operations.
- Disaster Operations Personal Safety—General precautions and procedures for department and responder actions to reduce risk during disaster operations.
- Protection of Facilities and Equipment—Methods to protect fire department facilities, apparatus, and equipment from hazard impacts before and during disaster response.
- Accountability of Personnel—Procedures for monitoring disaster operations and personnel to ensure that tasks are completed safely and effectively.
- Suspending Operations—Designation of conditions in which personnel and apparatus are to remain in/return to quarters or other safe location; may include notification of the EOC and the pubic of operational status.
- Member Injuries and Fatalities—Procedures to evaluate and treat member injuries and to document and report injuries and fatalities that occur during disaster operations.

DISASTER OPERATIONS—Procedures providing general guidance for disaster operations, including methods and actions that differ from routine alarm response and coordination with other local, state, and federal disaster agencies and community groups.

- Disaster Operations Center—Implementing and staffing "area commands" or "fire operations centers," and integrating field activities with the EOC and other response agencies.
- Adjusted Levels of Response—Changes in standard response strategies and resource levels, including the use of task forces and strike teams.
- Disaster Communications—Changes in standard communication roles, protocols, and procedures to facilitate coordination with outside agencies and groups.
- Response Unit Routing and Placement—Routing and placing equipment and personnel on the disaster scene to reflect the nature and requirements of the emergency situation.
- Damage Assessment—Procedures for rapid damage assessment of response areas immediately following a disaster; may include a more thorough assessment of damage at fire department facilities.
- Specialized Equipment—Identifying, accessing, and operating specialized equipment during disaster situations, including equipment controlled by outside agencies, private sector companies, and members of the public.

- Building Safety Evaluations—Inspection priorities, initial rapid evaluation of damage to individual residential and commercial buildings, building posting classifications, working with building owners.

- Community Emergency Response Teams—Integrating and working with CERTs and other emergent volunteer groups during disasters.

- Mitigation Activities—Actions taken during disaster operations that reduce or eliminate the risk of future incidents: identifying opportunities, assessing options, establishing partnerships and collaborative activities, setting priorities, financing and accounting procedures, implementation and evaluation of activities.

- Curtailing Disaster Operations—Steps for monitoring the disaster situation, evaluating hazards and response requirements, terminating disaster operations, and making the transition to normal operations.

DISASTER-SPECIFIC GUIDELINES - Procedures to address disaster missions and response requirements that are specific to different types of hazards. The need to develop SOPs in this category will vary significantly from community to community depending on potential hazard vulnerability and local comprehensive emergency management plans. Potential hazards that might be addressed include the following:

- Flood/dam break
- Hurricane
- Tornado
- Earthquake/tsunami
- Volcano eruption
- Snow/ice storm
- Drought
- Civil Disturbance
- Mass casualty
- Aircraft crash
- Train accident
- Ship fire/accident
- Terrorism incident
- Explosion
- Gas pipeline incident
- Severe storm
- Building collapse
- Cave-in
- Radioactive material emergency
- Special events (Olympics, dignitary visit, etc.)
- Disease epidemic

APPENDIX C

RESOURCES

American College of Emergency Physicians
PO Box 619911
Dallas, TX 75261-9911
(800) 798-1822
(972) 580-2816 fax
www.acep.org

Associated Public-Safety Communications Officers International, Inc. (APCO)
2040 S. Ridgewood Avenue
South Daytona, FL 32119
(888) 272-6911
(904) 322-2501 fax
www.apcointl.org

Bureau of Alcohol, Tobacco and Firearms
Department of Treasury
650 Massachusetts Avenue, NW
Washington, DC 20226
www.atf.treas.gov

Bureau of Justice Assistance
United States Department of Justice
810 Seventh Street, NW
Washington, DC 20531
(202) 616-6500
www.ojp.usdoj.gov/BJA

Centers for Disease Control and Prevention
1600 Clifton Road, NE
Atlanta, GA 30333
(404) 639-3311
www.cdc.gov

Congressional Fire Service Institute (CFSI)
900 Second Street, NE, Suite 303
Washington, DC 20002
(202) 371-1277
(202) 682-3473 fax
www.cfsi.org

Department of Justice – Disability Rights Section
Civil Rights Division
PO Box 66738
Washington, DC 20035-6738
ADA Information Line: (800) 514-0301
ADA Information Line (TDD): (800) 514-0383
www.usdoj.gov/crt/ada/adahom1.htm

Department of Justice – Drug Enforcement Agency
Information Services Section (CPI)
700 Army-Navy Drive
Arlington, VA 22202
www.usdoj.gov/dea/

Department of Health and Human Services
HFE-88
5600 Fishers Lane
Rockville, MD 20857
(800) 532-4440
www.fda.gov

Disaster Research Center
University of Delaware
77 East Main Street
Newark, DE 19716
(302) 831-6618
(302) 831-2091 fax
www.udel.edu/drc

Emergency Management Institute
Federal Emergency Management Agency
National Emergency Training Center
16825 South Seton Avenue
Emmitsburg, MD 21727
(800) 238-3358
(301) 447-1497 fax
www.fema.gov

Federal Bureau of Investigation
935 Pennsylvania Avenue, NW
Washington, DC 20535-0001
(202) 324-3000
www.fbi.gov

Federal Emergency Management Agency
500 C Street, SW
Washington, DC 20472
(202) 646-4600
www.fema.gov

Fire Department Safety Officers' Association
PO Box 149
Ashland, MA 01721-0149
(508) 881-3114
(508) 881-1128 fax
www.fdsoa.org

Food and Drug Administration
Department of Health and Human Services
5600 Fishers Lane
Rockville, MD 20857
(800) 532-4440
www.fda.gov

Health Care Financing Administration
Department of Health and Human Services
7500 Security Boulevard
Baltimore, Maryland 21244
Phone (410) 786-3000
www.hcfa.gov

International Association of Arson Investigators
300 S. Broadway, Suite 100
St. Louis, MO 63102
(314) 621-1966
(314) 621-5125 fax
www.fire-investigators.org

International Association of Emergency Managers
111 Park Place
Falls Church, VA 22046-4513
(703) 538-1795
(703) 241-5603 fax
www.emassociation.org

International Association of Fire Chiefs
4025 Fair Ridge Dr.
Fairfax, VA 22033-2868
(703) 273-0911
(703) 273-9363 fax
www.iafc.org

International Association of Fire Fighters
1750 New York Avenue
Washington, D.C. 20006
(202) 737-8484
(202) 783-4570 fax
www.iaff.org

International Society of Fire Service Instructors
PO Box 2320
Stafford, VA 22555
(800) 435-0005
(540) 657-0154 fax
www.isfsi.org

International Association of Wildland Fire
PO Box 328
Fairfield, WA 99012
(509) 283-2397

International City/County Management Association
777 North Capitol Street, NE, Suite 500
Washington, DC 20002-4201
(202) 289-4262
(202) 962-3500 fax
www.icma.org

International Personnel Management Association (IPMA)
1617 Duke Street
Alexandria, VA 22314
(703) 549-7100
(703) 684-0948 fax
www.ipma-hr.org

National Association of Emergency Medical Service Physicians
PO Box 15945-281
Lenexa, KS 66285-5945
(800) 228-3677
(913) 541-0156 fax
www.naemsp.org

National Association of Emergency Medical Technicians
408 Monroe Street
Clinton, MS 39056-4210
(800) 34-NAEMT
www.naemt.org

National Association of Search and Rescue
4500 Southgate Place
Suite 100
Chantilly, VA 20151-1714
(703) 222-6277
(703) 222-6283 fax
www.nasar.org

National Association of State EMS Directors
111 Park Place
Falls Church, VA 22046
(703) 538-1799
(703) 241-5603 fax

National Emergency Management Association
Council of State Governments
PO Box 11910
Lexington, KY 40578
(606) 244-8000
(606) 244-8239 fax
www.nemaweb.org

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02269
(617) 770-3000
(617) 770-0700 fax
www.nfpa.org

National Highway Transportation Safety Administration (NHTSA)
Emergency Medical Services Division
400 Seventh Street, SW, NTS-14
Washington, D.C. 20590
(202) 366-5440
(202) 366-7731 fax
www.nhtsa.dot.gov/people/injury/ems/

National Institute of Occupational Safety and Health
200 Independence Avenue
Washington, DC 20201
(800) 35-NIOSH
www.cdc.gov/niosh

National Institute of Standards and Technology
Fire Research Information Services
Building and Fire Research Laboratory
Gaithersburg, MD 20899
(301) 975-NIST
www.bfrl.nist.gov

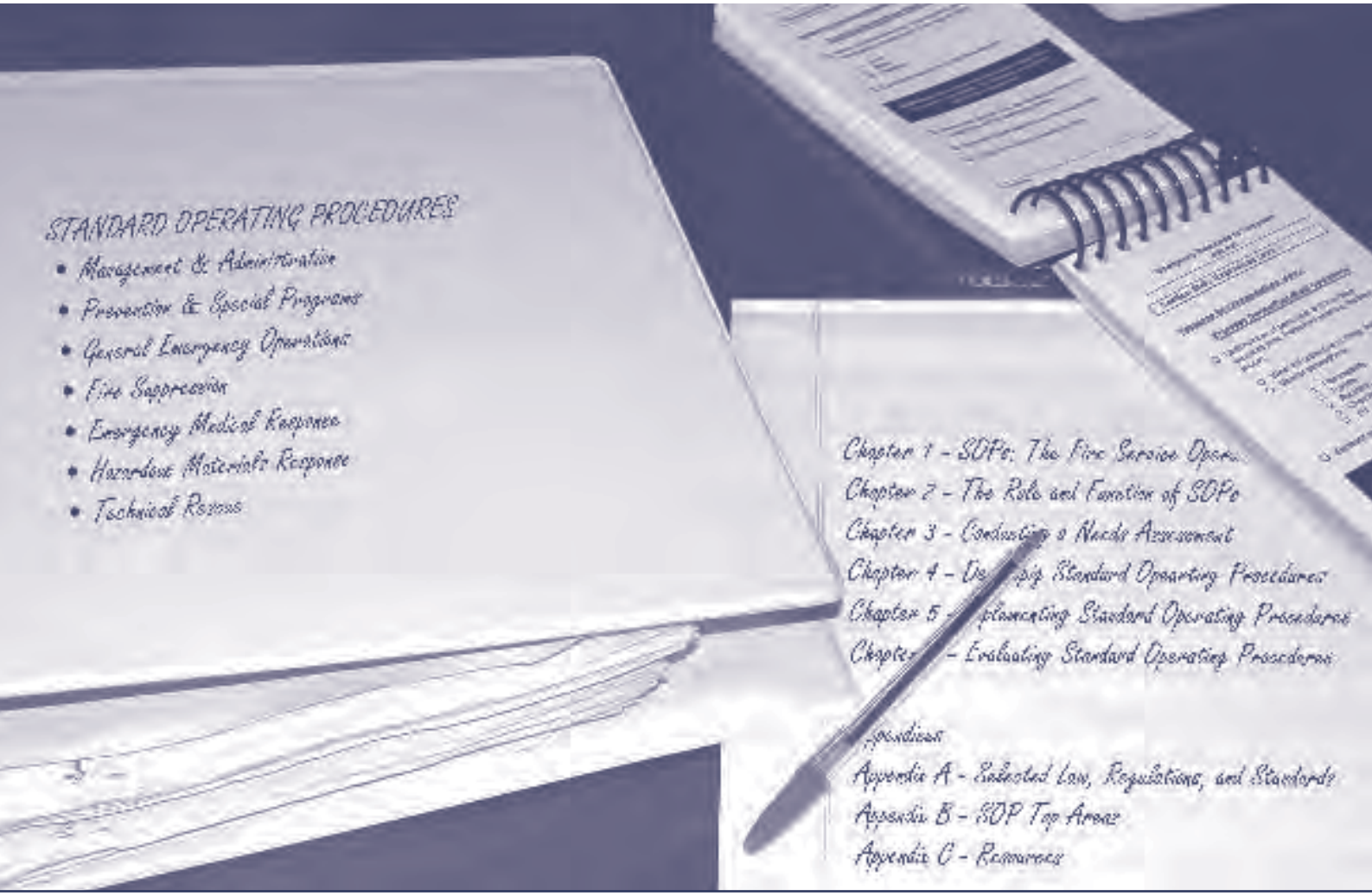
National Safety Council
1121 Spring Lake Drive
Itasca, IL 60143-3201
(630) 285-1121
(630) 285-1315 fax
www.nsc.org

National Volunteer Fire Council
1050 17th Street, NW
Suite 1212
Washington, DC 20036
(888) ASK-NVFC
(202) 887-5291 fax
www.nvfc.org

Occupational Safety and Health Administration
United States Department of Labor
200 Constitution Avenue
Washington, DC 20210
(202) 693-1999
www.osha.gov/index.html

United States Fire Administration
Federal Emergency Management Agency
National Emergency Training Center
16825 South Seton Avenue
Emmitsburg, MD 21727
(800) 238-3358
(301) 447-1270 fax
www.usfa.fema.gov

Women in the Fire Service
PO Box 5446
Madison, WI 53705
(608) 233-4768
(608) 233-4879 fax



Developing Effective Standard Operating Procedures

For Fire and EMS Departments

FA-197/December 1999

FEMA

APPENDIX D
NFPA 600
Standard on Industrial Fire Brigade

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NFPA® 600

Standard on Industrial Fire Brigades

2010 Edition

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NFPA® 600

Standard on

Industrial Fire Brigades

2010 Edition

This edition of NFPA 600, *Standard on Industrial Fire Brigades*, was prepared by the Technical Committee on Loss Prevention Procedures and Practices. It was issued by the Standards Council on October 27, 2009, with an effective date of December 5, 2009, and supersedes all previous editions.

This edition of NFPA 600 was approved as an American National Standard on December 5, 2009.

Origin and Development of NFPA 600

In 1902 NFPA adopted *Suggestions for Organizing Private Fire Departments* recommended by the Committee on Private Fire Department Regulations. In 1912 NFPA adopted two pamphlets, *Organization and Execution of Exit Drills* and *Organization and Drilling of Private Fire Brigades*, on the recommendation of the Committee on Private Fire Departments and Fire Drills. In 1924 the NFPA adopted *Suggestions for the Organization, Drilling and Equipment of Private Fire Brigades* on the recommendation of the Committee on Field Practice, and revisions were adopted in 1930, 1937, and 1949.

Jurisdiction for the publication was transferred in 1948 to the new Committee on Fire Brigades and Watchmen, and a revised edition was published in 1955. The guide was completely revised in 1967.

In 1969 the committee was reorganized as the Technical Committee on Loss Prevention Procedures and Practices, and the guide was reconfirmed in 1975. In 1981 a complete revision was accomplished, and a partial revision was made in the 1986 edition, as well as a redesignation from NFPA 27 to NFPA 600.

In 1992 the document was completely revised as a standard to provide a minimum level of occupational safety and health for industrial fire brigade members consistent with the Occupational Safety and Health Administration (OSHA). The standard incorporated the concepts of advanced exterior fire fighting and site-specific hazards for the first time. These concepts were needed for industrial fire brigades to properly address the types of situations they encounter.

In 1996 the document was revised to include industrial fire departments, which were previously addressed in NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*. This reorganization assisted the authority having jurisdiction and owner/operators in determining the standard they must comply with and if they are in compliance. Other changes made the document more user friendly and better clarified the requirements of the standard.

Changes to the 2000 edition were mainly editorial or were provided for clarification. A noteworthy exception was the change in the number of industrial fire brigade members for interior structural fire fighting. Two industrial fire brigade members were now required to be available for rescue, whereas the previous edition required only one.

The 2005 edition incorporated revised definitions that correspond to preferred terms found in the *Glossary of Terms*. One of the definition changes incorporated a broader scope for the medical professionals who assess medical and physical fitness of fire brigade members. The term "qualified physician" was replaced by "qualified health care professional" to reflect actual practice.

The 2005 edition added references to the professional qualification standard, NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications*, which was adopted after the effective date of the 2000 edition. The standard was also revised and reorganized in accordance with the *Manual of Style for NFPA Technical Committee Documents*.

The 2010 edition represents a reconfirmation of the requirements in the standard. Minor editorial changes have been made for consistency with the *Manual of Style for NFPA Technical Committee Documents*..

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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.

Committee Scope: This Committee shall have primary responsibility for documents on fire brigades, guard services, and techniques for securing effective fire loss prevention programs in industrial, commercial, institutional, and similar properties.

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Contents

Chapter 1 Administration 600– 4
1.1 Scope 600– 4
1.2 Purpose 600– 4
1.3 Alternate Requirements 600– 4
1.4 Limits of Actions and Responsibilities of Industrial Fire Brigade 600– 4

Chapter 2 Referenced Publications 600– 5
2.1 General 600– 5
2.2 NFPA Publications 600– 5
2.3 Other Publications 600– 5
2.4 References for Extracts in Mandatory Sections 600– 5

Chapter 3 Definitions 600– 5
3.1 General 600– 5
3.2 NFPA Official Definitions 600– 5
3.3 General Definitions 600– 5

Chapter 4 Requirements for All Industrial Fire Brigades 600– 7
4.1 General Administration 600– 7
4.2 General Operations 600– 8
4.3 Education, Training, and Drills 600– 8
4.4 Organization of the Industrial Fire Brigade 600– 9
4.5 Medical and Job-Related Physical Requirements 600–10
4.6 Industrial Fire Brigade Equipment 600–10
4.7 Industrial Fire Brigade Apparatus 600–10

Chapter 5 Industrial Fire Brigades That Perform Incipient Stage Fire Fighting 600–10
5.1 General 600–10
5.2 Education, Training, and Drills 600–10
5.3 Protective Clothing and Protective Equipment 600–11
5.4 Medical 600–11

Chapter 6 Industrial Fire Brigades That Perform Advanced Exterior Fire Fighting Only 600–11
6.1 General 600–11
6.2 Education, Training, and Drills 600–11
6.3 Protective Clothing and Protective Equipment 600–11
6.4 Medical 600–11

Chapter 7 Industrial Fire Brigades That Perform Interior Structural Fire Fighting Only 600–11
7.1 General 600–11
7.2 Education, Training, and Drills 600–11
7.3 Protective Clothing and Protective Equipment 600–12
7.4 Medical 600–12

Chapter 8 Industrial Fire Brigades That Perform Advanced Exterior and Interior Structural Fire Fighting 600–12
8.1 General 600–12

Annex A Explanatory Material 600–12

Annex B Informational References 600–18

Index 600–20

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NFPA 600

Standard on

Industrial Fire Brigades

2010 Edition

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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, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex B. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex B.

Chapter 1 Administration

1.1* Scope.

1.1.1 This standard contains minimum requirements for organizing, operating, training, and equipping industrial fire brigades. It also contains minimum requirements for the occupational safety and health of industrial fire brigade members while performing fire fighting and related activities.

1.1.2* This standard shall apply to any organized, private, industrial group of employees having fire-fighting response duties, such as emergency brigades, emergency response teams, fire teams, and plant emergency organizations.

1.1.3* This standard shall not apply to industrial fire brigades that respond to fire emergencies outside the boundaries of the industrial site where the off-site fire involves unfamiliar hazards or enclosed structures with layout and contents that are unknown to the industrial fire brigade.

1.1.4 This standard shall not apply to medical response, confined space rescue response, and hazardous material response activities.

1.2* Purpose. The purpose of this standard is to provide minimum requirements for organization, operation, training, and occupational safety and health for industrial fire brigades.

1.3 Alternate Requirements.

1.3.1 The application of the performance objectives of this standard can vary for many industrial operations.

1.3.2 The authority having jurisdiction shall be permitted to examine and approve organization, operations, training, and occupational safety and health requirements that provide an equivalent level of safety to the level of safety provided by the requirements of this standard.

1.4* Limits of Actions and Responsibilities of Industrial Fire Brigade.

1.4.1 General.

1.4.1.1 The degree of potential exposure to a hazardous environment and the degree of training shall determine the limits of any industrial fire brigade action and responsibility.

1.4.1.2 The written industrial fire brigade organizational statement and standard operating procedures shall define these limits.

1.4.2* Incident Command. At facilities where designated employees are intended to function as the first responders to incipient fires, the industrial fire brigade shall assume command of the incident once the brigade arrives on the fire scene.

1.4.3 Limits for Industrial Fire Brigades Assigned Incipient Fire-Fighting Response Duties.

1.4.3.1 Interior and exterior fires shall be considered incipient stage when industrial fire brigade members function as follows:

(1) They are able to safely fight the fire in normal work clothing.
(2) They are not required to crawl or take other evasive action to avoid smoke and heat.
(3) They are not required to wear thermal protective clothing or self-contained breathing apparatus (SCBA).
(4) They are able to fight the fire effectively with portable extinguishers or handlines flowing up to 473 L/min (125 gpm)

1.4.3.2 Exterior fires shall be considered appropriate for defensive action outside of the hot and warm zones by industrial fire brigade members who have been assigned incipient fire-fighting response duties when the following occurs:

(1) The organizational statement lists it as a response duty of the industrial fire brigade, and it is covered by the standard operating procedures.
(2) The industrial fire brigade has received training for that activity.
(3) SCBA and thermal protective clothing are not required.
(4) Personal evasive action is not required.
(5) The industrial fire brigade is able to perform defensive action effectively, using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application of specialized agents.

1.4.4 Limits for Industrial Fire Brigades Assigned Only Advanced Exterior Fire-Fighting Response Duties. Exterior fires shall be considered appropriate for offensive action within the hot zone by industrial fire brigade members who have been assigned advanced exterior fire-fighting response duties when the following occurs:

(1) The organizational statement lists it as a response duty of the industrial fire brigade, and it is covered by the standard operating procedures.
(2) The industrial fire brigade has received training for that activity.

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(3) SCBA and thermal protective clothing are provided.
(4) The industrial fire brigade is able to perform offensive action effectively, using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application of specialized agents.

1.4.5 Limits for Industrial Fire Brigades Assigned Only Interior Structural Fire-Fighting Response Duties. Interior structural fires shall be considered appropriate for offensive action within the hot zone by industrial fire brigade members who have been assigned interior fire-fighting response duties when the following occurs:

(1) The organizational statement lists it as a response duty of the industrial fire brigade, and it is covered by the standard operating procedures.
(2) The industrial fire brigade has received training for that activity.
(3) SCBA and protective clothing for structural fire fighting are provided.
(4) The industrial fire brigade is able to perform offensive actions effectively, using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application of specialized agents.

1.4.6 Limits of Industrial Fire Brigades Assigned Both Advanced Exterior and Interior Structural Fire-Fighting Response Duties.

1.4.6.1 Both exterior fires and interior structural fires shall be considered appropriate for offensive action within the hot zone for industrial fire brigade members who have been assigned both advanced exterior and interior fire-fighting response duties when the following occurs:

(1) The organizational statement lists it as a response duty of the industrial fire brigade, and it is covered by the standard operating procedures.
(2) The industrial fire brigade has received training for that activity.
(3) SCBA and thermal protective clothing are provided.
(4) The industrial fire brigade is able to perform offensive action effectively, using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application of specialized agents.

1.4.6.2 Protective clothing for proximity fire fighting shall not be worn for interior structural fire fighting.

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, Quincy, MA 02169-7471.

NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications,* 2007 edition.

NFPA 1403, *Standard on Live Fire Training Evolutions,* 2007 edition.

NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus,* 2007 edition.

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting,* 2007 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* 2007 edition.

NFPA 1982, *Standard on Personal Alert Safety Systems (PASS),* 2007 edition.

2.3 Other Publications.

2.3.1 *Merriam-Webster's Collegiate Dictionary,* 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 601, *Standard for Security Services in Fire Loss Prevention,* 2010 edition.

NFPA 1521, *Standard for Fire Department Safety Officer,* 2008 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary,* 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Shall. Indicates a mandatory requirement.

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

3.2.5 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* Combustible Liquid. A liquid that has a closed-cup flash point at or above 37.8°C (100°F).

3.3.2 Designated Employee. An employee who is not a member of an industrial fire brigade but who has been trained to use portable fire extinguishers or small hose lines to fight incipient fires in the employee's immediate work area.

3.3.3 Drill. An exercise involving a credible simulated emergency that requires personnel to perform emergency response operations for the purpose of evaluating the effectiveness of the training and education programs and the competence of personnel in performing required response duties and functions. [**601,** 2010]

3.3.4 Drug. Any substance, chemical, over-the-counter medication, or prescribed medication that can affect performance.

3.3.5* Education. The process of imparting knowledge or skill through systematic instruction.

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3.3.6 Emergency Response Operations. Activities related to emergency incidents, including response to the scene of the incident and specific response duties performed at the scene.

3.3.7 Enclosed Structure. A structure with a roof or ceiling and at least two walls that can present fire hazards to employees, such as accumulations of smoke, toxic gases, and heat, similar to those found in buildings.

3.3.8 Fire Fighting.

3.3.8.1* ***Advanced Exterior Fire Fighting.*** Offensive fire fighting performed outside of an enclosed structure when the fire is beyond the incipient stage.

3.3.8.2 ***Defensive Fire Fighting.*** The mode of manual fire control in which the only fire suppression activities taken are limited to those required to keep a fire from extending from one area to another.

3.3.8.3 ***Incipient Fire Fighting.*** Fire fighting performed inside or outside of an enclosed structure or building when the fire has not progressed beyond incipient stage.

3.3.8.4* ***Interior Structural Fire Fighting.*** The physical activity of fire suppression, rescue, or both, inside of buildings or enclosed structures that are involved in a fire beyond the incipient stage.

3.3.8.5 ***Offensive Fire Fighting.*** The mode of manual fire control in which manual fire suppression activities are concentrated on reducing the size of a fire to accomplish extinguishment.

3.3.9 Fit.

3.3.9.1 ***Medically Fit.*** As determined by a qualified healthcare professional, there are no known medical limitations that would interfere with the process of making decisions and providing direction while exposed to a stressful environment.

3.3.9.2 ***Physically Fit.*** As determined by a qualified healthcare professional, there are no known physical or medical limitations that would interfere with the performance of strenuous heavy lifting and pulling or with the use of self-contained breathing apparatus that can be required during emergency response organizations.

3.3.10* Flammable Liquid. A liquid that has a closed-cup flash point that is below 37.8°C (100°F) and a maximum vapor pressure of 2068 mm Hg (40 psia) at 37.8°C (100°F).

3.3.11* Hazardous Atmosphere. Any atmosphere that is oxygen deficient or that contains a toxic or disease-producing contaminant.

3.3.12 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 operations; the system is also referred to as an incident command system (ICS).

3.3.13* Incipient Stage. The early stage of a fire, in which the progression has not developed beyond that which can be extinguished using either portable fire extinguishers or handlines flowing up to 473 L/min (125 gpm).

3.3.14 Industrial Fire Brigade. An organized group of employees within an industrial occupancy who are knowledgeable, trained, and skilled in at least basic fire-fighting operations, and whose full-time occupation might or might not be the provision of fire suppression and related activities for their employer.

3.3.15 Industrial Fire Brigade Apparatus. An industrial fire brigade emergency response vehicle designed and intended primarily for fire suppression, rescue, or other specialized function that includes pumpers, foam apparatus, aerial ladders, rescue vehicles, and other such apparatus.

3.3.16 Industrial Fire Brigade Management. The individual designated by top management to be responsible for the organization, management, and functions of the industrial fire brigade.

3.3.17 Industrial Fire Brigade Training Coordinator. The designated company representative with responsibility for coordinating effective, consistent, and quality training within the industrial fire brigade training and education program.

3.3.18 Industrial Occupancy. Occupancies that include industrial, commercial, mercantile, warehouse, power plant (utility), and institutional or similar occupancy, including for-profit, not-for-profit, and governmental facilities.

3.3.19 Master Stream. A portable or fixed fire-fighting appliance supplied by either hose lines or fixed piping and that has the capability of flowing in excess of 1140 L/min (300 gpm) of water or water-based extinguishing agent.

3.3.20 Performance Standards. Minimum requirements for knowledge and skills that must be provided to or demonstrated by the industrial fire brigade member upon completion of a training or education session.

3.3.21 Qualified Healthcare Professional. A licensed medical doctor or other licensed healthcare professional qualified to provide professional expertise in the areas of occupational safety and health as they relate to emergency response activities.

3.3.22 Response Duty. A fire-related service, function, or task identified in the industrial fire brigade organizational statement and assigned to a member to perform.

3.3.23* Site. The location of an industrial complex/facility that includes all property within the property lines of the company.

3.3.24 Site-Specific Hazard. A hazard that is present at the specific facility for which the industrial fire brigade has been organized.

3.3.25 Specialized Agents. Fire-extinguishing agents, such as dry chemicals, dry powders, carbon dioxide, halon, and other such non-water-based agents.

3.3.26 Standard Operating Procedure. A written organizational directive that establishes or prescribes specific operational or administrative methods to be followed routinely for the performance of designated operations or actions. [**1521,** 2008]

3.3.27* Support Members. Personnel assigned to the industrial fire brigade to perform specific response duties, including those people who have specific technical knowledge or skills or who have been given specific assignments that indirectly support manual fire suppression efforts.

3.3.28 Thermal Protective Clothing. Protective clothing such as helmets, footwear, gloves, hoods, trousers, and coats that are designed and manufactured to protect the industrial fire brigade member from the adverse effects of fire.

3.3.29 Training. The process of achieving proficiency through instruction and hands-on practice in the operation of equipment and systems that are expected to be used in the performance of assigned response duties.

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3.3.30 Zone.

3.3.30.1 *Cold Zone.* The area immediately outside the boundary of the established warm zone where personnel are safe from the adverse effects of a fire.

3.3.30.2 *Hot Zone.* The area immediately surrounding the physical location of a fire having a boundary that extends far enough from the fire to protect industrial fire brigade members positioned outside the hot zone from being directly exposed to flames, dense smoke, or extreme temperatures.

3.3.30.3 *Warm Zone.* The control area immediately outside the boundary of the established hot zone having a boundary that extends far enough from the hot zone to protect personnel outside the warm zone from the adverse effects of the fire.

Chapter 4 Requirements for All Industrial Fire Brigades

4.1 General Administration.

4.1.1* Corporate or local management shall be responsible for the following:

(1) Evaluating the site-specific conditions and hazards to determine site-specific response duties to be assigned to the industrial fire brigade
(2) Assigning the site-specific response duties of the industrial fire brigade
(3) Establishing, reviewing, and maintaining a written industrial fire brigade organizational statement
(4) Establishing lines of authority and assigning responsibilities to ensure that the components of the industrial fire brigade organizational statement are accomplished
(5)*Establishing a written policy for the occupational safety and health of industrial fire brigade members
(6)*Establishing a written policy for the medical and job-related physical performance requirements for industrial fire brigade members
(7) Developing or adopting performance-based standards that establish baseline levels of proficiency in skills, knowledge, and the safety measures necessary for industrial fire brigade members to accomplish the site-specific response duties described in the industrial fire brigade organizational statement
(8) Developing, reviewing, and maintaining written standard operating procedures for site-specific conditions and hazards
(9) Ensuring that a system exists to advise industrial fire brigade management of changes in an employee's eligibility for participation in an industrial fire brigade, resulting from changes in the employee's medical condition
(10) Establishing a policy to ensure that the records required in this standard are maintained
(11) Establishing a policy to ensure that annual funds are budgeted and available for equipment, vehicles, training and education, medical and job-related physical performance evaluations, and other necessary items to accomplish these objectives

4.1.2* Management shall establish, review, and maintain a written industrial fire brigade organizational statement.

4.1.2.1 This policy statement, which establishes the existence of the industrial fire brigade, shall include the following:

(1) Basic organizational structure
(2) The type, amount, and frequency of training and education to be provided
(3) The expected number of members in the brigade
(4) The response duties that the brigade is expected to perform in the workplace, which define the limits of industrial fire brigade responsibility
(5) The shifts during which the brigade members are available for response

4.1.2.2* The organizational statement shall be available for inspection by the authority having jurisdiction, the industrial fire brigade members, and their designated representatives.

4.1.3 Management shall establish lines of authority and assign responsibilities to ensure that the components of the industrial fire brigade organizational statement are accomplished.

4.1.3.1 Management shall designate the responsible individual for the administration of the industrial fire brigade organizational statement and the training and education program.

4.1.3.2 Management shall establish responsibility for initiating, maintaining, and enforcing standard operating procedures to ensure the safety and health of industrial fire brigade members.

4.1.3.3 Management shall establish a policy to ensure that each industrial fire brigade member cooperates, participates, and complies with the provisions of the industrial fire brigade organizational statement and the training and education program.

4.1.4* Management shall ensure that industrial fire brigade members are a part of a corporate or local company occupational safety and health policy that identifies specific goals and objectives for the prevention and elimination of accidents, injuries, illness, and fatalities while performing industrial fire brigade response duties.

4.1.4.1 Management shall ensure that industrial fire brigade members are adequately represented on corporate or local company occupational safety and health committees as they relate to members performing assigned industrial fire brigade response duties.

4.1.4.2* Management shall delegate the response duties and responsibilities of the industrial fire brigade safety program to a qualified individual(s).

4.1.4.3 The safety program shall include the following:

(1) Records and data management
(2) Liaison with management, equipment suppliers, site or corporate safety, and medical and health departments
(3) Development and maintenance of standard operating procedures
(4) Accident prevention
(5) Equipment specification and maintenance
(6) Accident investigation
(7) Incident scene safety
(8) Training and education

4.1.5* All records associated with the operation of the industrial fire brigade required in this standard shall be maintained in a location where they are available for inspection by the authority having jurisdiction.

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4.2 General Operations.

4.2.1* An incident management system shall be established with written procedures applying to all members involved in emergency and training operations and shall be utilized to manage all emergency and training operations.

4.2.1.1 All members involved in emergency response organizations shall be familiar with the incident management system.

4.2.1.2 The incident management system shall identify roles and responsibilities relating to the safety of industrial fire brigade operations.

4.2.1.3 Safety responsibilities shall be assigned to supervisory personnel at each level of the organization.

4.2.1.4 This system shall include the roles and responsibilities of any responding public fire department and other outside agencies.

4.2.1.5* A standard system shall be used to identify and account for each industrial fire brigade member present at the scene of the emergency.

4.2.1.6 NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications,* shall be used to establish minimum levels of proficiency in both skills and knowledge to permit all industrial fire brigade members to safely accomplish the site-specific response duties described in the industrial fire brigade organizational statement.

4.2.1.7 The incident management system shall ensure that the risk to members is evaluated prior to taking action.

4.2.1.7.1 In situations where the risk to industrial fire brigade members is unacceptable, the emergency response activities shall be limited to defensive operations.

4.2.1.7.2 Regardless of the risk, actions shall not exceed the scope of the organizational statement and standard operating procedures.

4.2.2 Standard operating procedures for site-specific conditions and hazards shall be developed, reviewed, and maintained.

4.2.2.1 These procedures shall be maintained in written form and shall address the site-specific functions identified in the industrial fire brigade organizational statement.

4.2.2.2* These procedures shall include information regarding site-specific hazards to which industrial fire brigade members can be exposed during a fire or other emergency.

4.2.2.3 These procedures shall address the site-specific limitations of emergency response organizations.

4.2.2.4 These procedures shall be accessible to all industrial fire brigade members.

4.2.2.5 These procedures shall ensure that the shift industrial fire brigade leader is notified of all major fire protection systems and equipment that are out of service.

4.2.3 Risk Management Policy.

4.2.3.1 A risk management policy for emergency response shall be established by industrial fire brigade management.

4.2.3.2 The risk management policy shall be routinely reviewed with industrial fire brigade members and shall be based on the following recognized principles:

(1) Some risk to the safety of industrial fire brigade members is acceptable where saving human lives is possible.
(2) Minimal risk to the safety of the industrial fire brigade members, and only in a calculated manner, is acceptable where saving endangered property is possible.
(3) No risk to the safety of industrial fire brigade members is acceptable where saving lives or property is not possible.

4.2.4 Operational safety requirements for industrial fire brigade members responding to a fire emergency shall be established and shall at a minimum include the following:

(1) Personnel who are not trained in accordance with this standard are not permitted to enter the warm or hot zones established for a fire emergency.
(2)*SCBA and thermal protective clothing are worn by industrial fire brigade members entering the hot zone.
(3) Thermal protective clothing is worn by industrial fire brigade members entering the warm zone.
(4) Industrial fire brigade members operate in teams of two or more in response to fires that have advanced beyond the incipient stage.
(5) Industrial fire brigade members operating in the hot and warm zones have an established communications system.
(6) When industrial fire brigade members are operating in the hot zone, at least one industrial fire brigade member with the capability to call for assistance remains outside the hot zone and maintains an awareness of the safety of industrial fire brigade members located inside the hot zone.
(7) When industrial fire brigade members are operating in the hot zone, additional brigade members are standing by in the warm zone with approved equipment to provide assistance or rescue.
(8) Industrial fire brigade members positioned in the warm zone are visible to command positions at all times.
(9) Personnel and industrial fire brigade members positioned in any fire zone have opportunity to relocate to an alternate position should fire conditions change.
(10) Experienced industrial fire brigade members oversee activities of less experienced brigade members during firefighting operations.

4.3 Education, Training, and Drills.

4.3.1 A training and education program shall be established and maintained for all industrial fire brigade members to ensure that they are able to perform their assigned response duties in a manner that does not pose a hazard to themselves or other members.

4.3.2 All members shall be trained to a level of competency commensurate with the response duties and functions that they are expected to perform, including the operation of all of the fire-fighting and rescue equipment and systems they are expected to use.

4.3.3* Members shall meet the minimum skills and knowledge requirements of NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications,* for each site-specific task expected to be performed by brigade members before their participation in emergency response operations.

4.3.4 Industrial fire brigade members shall not perform any response duties they have not been trained and educated to perform.

4.3.5* The quality and frequency of training and education provided shall ensure that industrial fire brigade members are capable of performing their assigned response duties in a manner that does not present a hazard to themselves or endanger other personnel.

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4.3.6 The prevention of accidents, injury, death, and illness during performance of any industrial fire brigade function shall be an established goal of training and education.

4.3.7* A designated industrial fire brigade training coordinator shall provide instruction to the industrial fire brigade or shall verify the qualifications of other instructors providing training and education to industrial fire brigade members.

4.3.8* Industrial fire brigade members designated as leaders shall receive training and education commensurate with their response duties. Such training and education shall be more comprehensive than that provided to the other industrial fire brigade members.

4.3.9* Drills shall be conducted as often as necessary to evaluate the effectiveness of the industrial fire brigade training and education program and the competence of industrial fire brigade members in performing assigned response duties. Lessons learned shall be evaluated and documented, and additional training shall be provided as necessary to improve performance that is below established standards.

4.3.10* The training and education provided to members shall include a review of the applicable provisions of this standard.

4.3.11 The training and education program shall include the principles and practices of fire fighting and emergency response to the extent required by the type of industrial fire brigade established and by the assignment within the brigade.

4.3.12 The training and education program shall address new hazards, equipment, and procedures introduced into the facility.

4.3.13* Training provided to industrial fire brigades shall develop and increase competency in life safety, property conservation, and reduction of business interruption.

4.3.14 Training shall include site-specific hazards. *(See 4.2.2.2.)*

4.3.15 Training Records.

4.3.15.1 Individual training records shall be maintained for each member of the industrial fire brigade.

4.3.15.2 Training records shall include, but not be limited to, courses completed, subjects studied, refresher courses completed, and other evaluations of skills and knowledge, drill attendance records, and leadership or other special accomplishments related to industrial fire brigade activities.

4.3.15.3 Training records shall be maintained and shall be available for inspection by the authority having jurisdiction.

4.3.15.4 Training records shall be reviewed at least annually by industrial fire brigade management and the industrial fire brigade training coordinator to evaluate training needs and equipment needs of the brigade.

4.4 Organization of the Industrial Fire Brigade.

4.4.1 Industrial Fire Brigade Management. Industrial fire brigade management shall be responsible for the following:

(1) Establishing programs to accomplish the items identified in the industrial fire brigade organizational statement
(2) Establishing the size and organization of the industrial fire brigade
(3) Coordinating and scheduling necessary meetings
(4) Establishing and maintaining fire protection equipment inspection programs for industrial fire brigade equipment
(5) Coordinating the maintenance and review of necessary reports and records
(6)*Maintaining liaison with local fire authorities
(7) Making information on hazardous materials and processes to which the brigade can be exposed available to brigade members
(8) Establishing job-related physical performance requirements for industrial fire brigade members

4.4.2 Industrial Fire Brigade Leader. The industrial fire brigade leader shall be responsible for the following:

(1) Establishing a chain of command within the brigade to act in the absence of the brigade leader
(2) Assisting in the selection process of brigade members
(3) Establishing and maintaining a brigade roster
(4) Selecting assistant industrial fire brigade leaders as appropriate to the size of the brigade and keeping them informed of all operations of the brigade
(5) Developing pre-emergency plans for site-specific hazards and making information on hazardous materials and processes to which the industrial fire brigade can be exposed available to all industrial fire brigade members
(6) Selecting and maintaining equipment used by the brigade
(7) Issuing written reports on the status of the industrial fire brigade to management, at least annually
(8) Assisting in fire investigations

4.4.3 Assistant Industrial Fire Brigade Leaders. The assistant industrial fire brigade leader shall complete all tasks assigned by the industrial fire brigade leader and shall substitute in the leader's absence.

4.4.4 Industrial Fire Brigade Members.

4.4.4.1 Industrial fire brigade members shall be selected from employees at the facility.

4.4.4.2 Members shall meet the requirements established for industrial fire brigade members and shall represent as many separate areas and departments of the facility as is practical.

4.4.4.3 Each industrial fire brigade member shall cooperate, participate, and comply with the provisions of the industrial fire brigade organizational statement and the training and education program.

4.4.4.4 Industrial fire brigade leaders or designated representatives shall ensure that support members are trained for their assigned response duties.

4.4.5 Identification. Industrial fire brigade members shall be issued identification for the following purposes:

(1) Assistance in reaching the incident in an emergency
(2) Identification by security personnel
(3) Establishing authority

4.4.6 Industrial Fire Brigade Communications. Means shall be established for the following:

(1) Notification of industrial fire brigade members of a reported incident
(2) Communications between industrial fire brigade members during an emergency

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4.4.7 Support Members.

4.4.7.1 Support members shall demonstrate awareness of the plant's pre-fire plan prior to an incident and shall demonstrate their assigned response duties for those tasks.

4.4.7.2 Support members shall not be permitted to enter the warm zone or the hot zone.

4.5 Medical and Job-Related Physical Requirements.

4.5.1 General Fitness.

4.5.1.1* Prior to being accepted for industrial fire brigade membership, employees who are expected to perform advanced exterior or interior structural fire fighting shall be examined and certified as medically and physically fit by a qualified healthcare professional.

4.5.1.2 The medical and physical fitness requirements shall take into account the risks and the tasks associated with the individual's assigned industrial fire brigade response duties.

4.5.1.3 Industrial fire brigade members who are under the influence of alcohol or drugs shall not participate in any industrial fire brigade operations.

4.5.2 Medical Requirements. Industrial fire brigade members who perform advanced exterior fire fighting or interior structural fire fighting shall be medically evaluated annually and after each medical leave of absence by a qualified healthcare professional.

4.5.3* Job-Related Physical Performance Requirements.

4.5.3.1* Industrial fire brigade management shall establish job-related physical performance requirements for industrial fire brigade members.

4.5.3.2 Industrial fire brigade members shall meet the job-related physical performance requirements of 4.5.3.1 prior to assignment to the industrial fire brigade.

4.5.3.3 Industrial fire brigade members who are expected to perform advanced exterior or interior structural fire fighting shall be evaluated annually to ensure that they continue to meet the job-related physical performance requirements of 4.5.3.1.

4.5.3.4 When the evaluation required in 4.5.3.3 concludes that an industrial fire brigade member does not meet the job-related physical performance requirements of 4.5.3.1, the member shall not be permitted to continue to perform those task-specific activities.

4.5.4* Physical Fitness. Industrial fire brigade members shall be required to report to management any changes in their physical condition that could impact their performance as an industrial fire brigade member.

4.6 Industrial Fire Brigade Equipment.

4.6.1 The industrial fire brigade shall be provided with the appropriate equipment to enable it to perform the response duties assigned in the organizational statement.

4.6.2* The equipment shall be selected based on the nature of the facility and the site-specific hazards present.

4.6.3 Storage space for the industrial fire brigade equipment shall be provided so that fire-fighting equipment is accessible.

4.6.4 A written equipment list that the industrial fire brigade is expected to use shall be maintained on the site, reviewed annually, and updated as necessary. The list shall include the location of the equipment and procedures for obtaining the equipment when needed.

4.6.5 All industrial fire brigade equipment shall be inspected and maintained at least annually.

4.6.6 Operation and maintenance manuals for industrial fire brigade equipment shall be available to the industrial fire brigade.

4.6.7 Maintenance reports of industrial fire brigade equipment shall be available to the industrial fire brigade.

4.7 Industrial Fire Brigade Apparatus.

4.7.1 Industrial fire brigade management shall include industrial fire brigade health and safety as primary concerns in the specification, design, construction, acquisition, operation, maintenance, inspection, and repair of all apparatus.

4.7.1.1* Industrial fire brigade apparatus shall be operated only by members who have been qualified in its proper operation by formal training using performance-based standards.

4.7.1.2 Industrial fire brigade apparatus drivers shall have valid driver's licenses for the applicable type of vehicle as required by state law or corporate policy.

4.7.1.3 Apparatus shall be operated in compliance with all applicable traffic laws.

4.7.1.4 Industrial fire brigade apparatus drivers shall be directly responsible for safe and prudent operation under all conditions.

4.7.1.5* All persons riding on industrial fire brigade apparatus shall be seated and secured with seat belts.

4.7.2 All industrial fire brigade apparatus shall be maintained in accordance with the manufacturer's recommendations.

4.7.3 All industrial fire brigade apparatus shall be inspected at least weekly and within 24 hours after any use or repair to identify and correct unsafe conditions.

4.7.4 Industrial fire brigade apparatus found unsafe shall be placed out of service until repaired.

4.7.5 Fire pumps on apparatus shall be service tested in accordance with the frequency and procedures specified in NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus.*

4.7.6 All aerial devices shall be inspected and service tested in accordance with the frequency and procedures specified in NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus.*

Chapter 5 Industrial Fire Brigades That Perform Incipient Stage Fire Fighting

5.1 General. Industrial fire brigades organized to perform incipient stage fire fighting shall meet the requirements of Sections 5.2 through 5.4 in addition to all applicable requirements of Chapters 1 and 4 of this standard.

5.2 Education, Training, and Drills.

5.2.1* All industrial fire brigade members shall receive training and education at least annually.

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5.2.2 All industrial fire brigade members shall participate in a drill at least annually.

5.2.3* Training and drills involving live fire evolutions shall be performed in accordance with recognized safety precautions.

5.3 Protective Clothing and Protective Equipment. Thermal protective clothing and SCBA shall not be required.

5.4 Medical. Each industrial fire brigade member shall meet the medical and job-related physical performance requirements as specified in Section 4.5.

Chapter 6 Industrial Fire Brigades That Perform Advanced Exterior Fire Fighting Only

6.1 General. Industrial fire brigades organized to perform advanced exterior fire fighting only shall meet the requirements of Sections 6.2 through 6.4 in addition to all applicable requirements of Chapters 1 and 4 of this standard.

6.2 Education, Training, and Drills.

6.2.1 All industrial fire brigade members shall receive training and education at least quarterly to meet the requirements of Section 4.3.

6.2.2 All industrial fire brigade members shall participate in a drill at least semiannually to meet the requirements of Section 4.3.

6.2.3 Live fire training shall be conducted at least annually. Training and drills involving a live fire evolution shall be performed in accordance with recognized safety precautions.

6.2.4 Live fire training shall include props that are representative of and that simulate as closely as possible the hazards and conditions that could be encountered by the industrial fire brigade member.

6.3 Protective Clothing and Protective Equipment.

6.3.1 Thermal protective clothing and protective equipment shall be available in sufficient quantities and sizes to fit each industrial fire brigade member expected to enter the hot and warm zones.

6.3.2 Thermal protective clothing and protective equipment meeting the requirements of 6.3.2.1 and 6.3.2.2 shall be required to be worn by all industrial fire brigade members entering the hot and warm zones.

6.3.2.1* Protective clothing shall be in accordance with NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

6.3.2.2 Helmets, gloves, and footwear shall be in accordance with NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

6.3.3 SCBA and personal alert safety systems (PASS) devices meeting the requirements of 6.3.3.1 through 6.3.3.3 shall be provided for and shall be used by all industrial fire brigade members working in the hot zone.

6.3.3.1 PASS devices shall be in accordance with NFPA 1982, *Standard on Personal Alert Safety Systems (PASS).*

6.3.3.2 Open-circuit-type self-contained breathing devices shall be in accordance with NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services.*

6.3.3.3 Closed-circuit-type self-contained breathing devices shall be approved by the National Institute for Occupational Health and Safety (NIOSH) and Mine Safety and Health Administration (MSHA) with a minimum service duration of 30 minutes and shall operate in the positive pressure mode only.

6.3.4 Thermal protective clothing and protective equipment shall be used and maintained in accordance with manufacturer's instructions.

6.3.4.1 A maintenance and inspection program shall be established for thermal protective clothing and protective equipment.

6.3.4.2 Specific responsibilities shall be assigned for inspection and maintenance of thermal protective clothing and protective equipment.

6.3.5 Industrial fire brigade members using SCBA shall operate in teams of two or more who are in communication with each other through visual, audible, physical, safety guide rope, electronic, or other means to coordinate their activities and are in close proximity to each other to provide assistance in case of an emergency.

6.3.5.1 Where industrial fire brigade members are involved in operations that require the use of SCBA or other respiratory protective equipment, at least one member shall be assigned to remain outside the area where respiratory protection is required.

6.3.5.2 The member who remains outside shall be responsible for maintaining a constant awareness of the number and identity of personnel using SCBA, their location, function, and time of entry.

6.3.5.3 This member, with SCBA, shall be trained, equipped, and available for rescue.

6.3.6 All industrial fire brigade members entering the hot zone shall be provided with approved hoods that provide protection for the ears and neck and interface with the SCBA facepiece, thermal protective coat, and helmet.

6.4 Medical. Each industrial fire brigade member shall meet the medical and job-related physical performance requirements specified in Section 4.5.

Chapter 7 Industrial Fire Brigades That Perform Interior Structural Fire Fighting Only

7.1 General. Industrial fire brigades organized to perform interior structural fire fighting only shall meet the requirements of Sections 7.2 through 7.4 in addition to all applicable requirements of Chapters 1 and 4 of this standard.

7.2 Education, Training, and Drills.

7.2.1 All industrial fire brigade members shall receive training and education at least quarterly to meet the requirements of Section 4.3.

7.2.2 All industrial fire brigade members shall participate in a drill at least semiannually to meet the requirements of Section 4.3.

7.2.3 Live fire training shall be conducted at least annually. Training and drills involving a live fire evolution shall be performed in accordance with NFPA 1403, *Standard on Live Fire Training Evolutions.*

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7.2.4 Live fire training shall include props that are representative of and that simulate as closely as possible the hazards and conditions that could be encountered by the industrial fire brigade member.

7.3 Protective Clothing and Protective Equipment.

7.3.1 Thermal protective clothing and protective equipment for structural fire fighting shall be available in sufficient quantities and sizes to fit each industrial fire brigade member expected to enter the hot and warm zones.

7.3.2 Thermal protective clothing and protective equipment meeting the requirements of 7.3.2.1 through 7.3.2.4 shall be required to be worn by all industrial fire brigade members entering the hot and warm zones.

7.3.2.1 Protective clothing, helmets, gloves, and footwear shall be in accordance with NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

7.3.2.2 PASS devices shall be in accordance with NFPA 1982, *Standard on Personal Alert Safety Systems (PASS).*

7.3.2.3 Open-circuit-type self-contained breathing devices shall be in accordance with NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services.*

7.3.2.4 Closed-circuit-type self-contained breathing devices shall be approved by NIOSH and MSHA with a minimum service duration of 30 minutes and shall operate in the positive pressure mode only.

7.3.3 All industrial fire brigade members entering the hot zone shall be provided with approved hoods that provide protection for the ears and neck and interface with the SCBA facepiece, protective coat for structural fire fighting, and helmet.

7.3.4 Thermal protective clothing and protective equipment shall be used and maintained in accordance with manufacturers' instructions.

7.3.4.1 A maintenance and inspection program shall be established for thermal protective clothing and protective equipment.

7.3.4.2 Specific responsibilities shall be assigned for inspection and maintenance.

7.3.5 Industrial fire brigade members performing emergency response operations below ground level shall be provided with self-contained or externally supplied breathing apparatus and shall use that apparatus unless the safety of the atmosphere can be established by testing and continuous monitoring.

7.3.6* Industrial fire brigade members using SCBA shall operate in teams of two or more who are in communication with each other through visual or voice contact to coordinate their activities and are in close proximity to each other to provide assistance in case of an emergency.

7.3.6.1 Where industrial fire brigade members are involved in operations that require the use of SCBA, at least two members shall be assigned to remain outside the area where respiratory protection is required.

7.3.6.2 One member shall be responsible for maintaining a constant awareness of the number and identity of personnel using SCBA, their location, function, and time of entry.

7.3.6.3 These members with SCBA shall be trained, equipped, and available for rescue.

7.4 Medical. Each industrial fire brigade member shall meet the medical and job-related physical performance requirements specified in Section 4.5.

Chapter 8 Industrial Fire Brigades That Perform Advanced Exterior and Interior Structural Fire Fighting

8.1 General. Industrial fire brigades intended to perform both advanced exterior and interior structural fire-fighting response duties shall meet the requirements of Chapters 1, 4, 6, and 7 of this standard.

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.1.1 A major concern of industrial fire protection professionals is the protection of employees and property from the threat of fire in the workplace. In 1980 the Occupational Safety and Health Administration (OSHA) defined its requirements for industrial fire brigades. These requirements apply to industrial fire brigades once corporate or local management, in the role as an authority having jurisdiction, has determined that they want an industrial fire brigade at a facility.

In OSHA, 29 CFR 1910.156, Subpart L, two types of industrial fire brigades are defined in an attempt to establish levels of industrial fire brigade function and to identify the training and safety requirements for each of those levels. Industrial fire protection professionals have wrestled with categorizing every existing industrial fire brigade into either the incipient stage category or the interior structural category.

In attempting to develop a state-of-the-art industrial fire brigade standard, the Technical Committee on Loss Prevention Procedures and Practices has followed OSHA's lead in setting requirements based on the incipient and interior structural industrial fire brigade definitions.

The adoption of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* by the NFPA in 1987 brought about an entirely new perspective — that of inclusion of the industrial fire brigades in the same category as municipal fire departments. Although the work done by the Technical Committee on Fire Department Occupational Safety and Health is admirable and is intended to safeguard all fire fighters, the Technical Committee on Loss Prevention Procedures and Practices believes that a separate industrial fire brigade standard is needed.

Although every industrial fire brigade is unique, just as every municipal fire department is unique, industrial fire brigades, including those that can be referred to as industrial fire departments, have far different needs in many respects from those of municipal fire departments.

The primary difference between industrial fire brigades and municipal fire departments is that industrial fire brigades must deal with conditions and hazards that are limited to those that exist within a given facility that is generally privately owned and operated. Although these site-specific hazards can

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and do represent the same degree of hazard to both industrial fire brigade members and municipal fire fighters, industrial fire brigade members are not usually concerned with, nor are they expected to deal with, hazards and emergencies beyond the boundaries of the facility that the brigade serves.

In addition to this primary difference, it must be remembered that at an industrial facility a program of occupational safety and health has already been established for all personnel including members of the industrial fire brigade. Further, industrial fire brigades constituted in accordance with this standard will, of necessity, have a much more thorough knowledge of the buildings and facilities where they respond than do municipal fire fighters who must respond to a significantly greater variety of buildings and facilities, many of which have unidentified and undisclosed hazards.

A municipal fire department, as a local government function, must provide a service to a very broad-based municipality with a multitude of unknown factors at every given response. Variables such as property size and accessibility; building size, construction, and contents; manufacturing process hazards; fixed fire-extinguishing systems and special agent availability; and storage and use of solvents, oils, chemicals, or other hazardous materials are all potential unknown factors that can hinder the effectiveness of any municipal fire department and place a greater safety risk on the fire fighters.

This distinct advantage of familiarity achieves a higher level of industrial fire brigade safety and allows for the fundamental difference between a municipal fire department and an industrial fire brigade.

A.1.1.2 This standard is intended to meet or exceed the industrial fire brigade–related requirements of OSHA, 29 CFR 1910, Chapter XVII, Subpart L, "Fire Protection." Further, this standard is intended to assure the industrial fire brigade member with an appropriate degree of occupational safety and health while performing industrial fire brigade response duties, just as NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, assures an appropriate degree of occupational safety and health for the municipal fire department member.

For additional information on industrial fire brigade organization, see Chapter 4 in the NFPA *Industrial Fire Hazards Handbook*.

A.1.1.3 It is the intent that industrial fire brigade members, who are trained and qualified under the guidance of this standard respond to familiar hazards that are common to the industrial facility being protected.

Industrial fire brigades complying with the requirements of this standard should be permitted to respond to fires outside the boundaries of the industrial facility only when the industrial fire brigade is trained and familiar with the hazards associated with the fire. For example, an industrial fire brigade having appropriate training in accordance with this standard can respond to a fire involving an enclosed structure outside the boundaries of the industrial facility, if such response was anticipated and preplanned by industrial fire brigade management. Each industrial fire brigade member should be familiar with the layout and contents of the structure and should be provided with the opportunity to tour the structure at least quarterly.

A.1.2 Requirements for the establishment of industrial fire brigades are established by the authority having jurisdiction.

A.1.4 The potential exposure and training separates an organized industrial fire brigade from designated employees (as defined by OSHA) who have some fire response duties in the general work area. The scope of industrial fire brigade actions and responsibilities is based on the specific response duties that the industrial fire brigade members are expected to perform. If an industrial fire brigade member is not expected to perform a particular fire-fighting function, then management has no obligation to train or equip the industrial fire brigade member to perform that function.

A.1.4.2 Designated employees who are intended to respond to incipient fires in their immediate work area should receive training commensurate with the response duties they are expected to perform. Their responsibilities normally are limited to sounding an alarm, taking immediate action to extinguish the fire, and evacuating the area.

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.3.3.1 Combustible Liquid. Combustible liquids are classified as follows:

(1) Class II. Liquids that have flash points at or above 37.8°C (100°F) and below 60°C (140°F).
(2) Class IIIA. Liquids that have flash points at or above 60°C (140°F) and below 93.4°C (200°F).
(3) Class IIIB. Liquids that have flash points at or above 93.4°C (200°F).

A.3.3.5 Education. It does not necessarily require formal classroom instruction.

A.3.3.8.1 Advanced Exterior Fire Fighting. Advanced exterior fire fighting often requires industrial fire brigade members to contain, control, and extinguish exterior fires involving site-specific hazards, such as flammable and combustible liquid spills or leaks, liquefied petroleum gas releases, and electrical substations. Advanced exterior fire fighting is usually performed using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application

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of specialized agents. Thermal protective clothing is required and the use of SCBA could be required.

A.3.3.8.4 Interior Structural Fire Fighting. This definition is extracted from OSHA, 29 CFR 1910.

Rescue is the activity of removing victims by an industrial fire brigade as part of fire-fighting activities. Rescue activities requiring specialized equipment and training, such as confined space and high-angle rescue, are not included in this standard.

A.3.3.10 Flammable Liquid. Flammable liquids (Class I) are classified as follows:

(1) Class IA. Liquids that have flash points below 22.8°C (73°F) and boiling points below 37.8°C (100°F).
(2) Class IB. Liquids that have flash points below 22.8°C (73°F) and boiling points at or above 37.8°C (100°F).
(3) Class IC. Liquids that have flash points at or above 22.8°C (73°F) and below 37.8°C (100°F).

A.3.3.11 Hazardous Atmosphere. A hazardous atmosphere might or might not be immediately dangerous to life and health.

A.3.3.13 Incipient Stage. A fire is considered to be beyond the incipient stage when the use of thermal protective clothing or self-contained breathing apparatus is required or an industrial fire brigade member is required to crawl on the ground or floor to stay below smoke and heat.

A.3.3.23 Site. A site can include several facilities.

A.3.3.27 Support Members. When organizing the industrial fire brigade, management should take into consideration the need for specialized response duties required in the event of a fire or related emergency and should assign personnel to the brigade to ensure that these response duties are accomplished.

In most cases, personnel are not expected to perform manual fire suppression activities in the event of an emergency but are expected to perform only those specialized tasks for which they have been chosen. Some of these specialized assignments include the following:

(1) Building evacuation: Personnel are expected to perform specialized response duties to ensure that personnel are safely evacuated from an enclosed structure or the facility in the event of fire. They can be known as industrial fire brigade wardens or by a variety of other titles.
(2) Sprinkler system control: Personnel are assigned to perform specialized response duties to ensure that control of the automatic sprinkler protection system within the fire area or the facility is maintained by facility personnel in the event of fire. These personnel can be known as industrial fire brigade sprinkler valve operators or a variety of other titles.
(3) Electrical power control: Personnel are expected to perform specialized response duties to ensure that control of electrical power within the fire area or the facility is maintained by facility personnel in the event of fire. These personnel can be known as industrial fire brigade electricians or by a variety of other titles.
(4) Utility control: Personnel are expected to perform specialized response duties to ensure that control of plant utilities within the fire area or the facility — for example, steam, water, natural gas, and other liquid or vapor piping systems — is maintained by facility personnel in the event of fire. These personnel can be known as industrial fire brigade utility control technicians or by a variety of other titles.
(5) Fire pump operation: Personnel are expected to perform specialized response duties to ensure that stationary fire pumps are placed into operation or are operating properly in the event of fire. They can be known as industrial fire brigade fire pump operators or by a variety of other titles.
(6) Salvage: Personnel are expected to perform specialized response duties to ensure that actions are taken during and after manual fire suppression activities to minimize the resultant damage from the fire. These personnel can be known as industrial fire brigade salvage personnel or by a variety of other titles.
(7) Traffic control: Personnel are expected to perform specialized response duties to ensure that control of foot and vehicular traffic in and around the fire area or the facility is maintained in the event of fire and to ensure that any responding agency is directed to the fire area. These operations can be accomplished by facility security personnel who have been assigned to the industrial fire brigade.

A.4.1.1 Even during times of economic stress, providing adequate funds for proper equipment and training is necessary in order to maintain the safety and operational effectiveness of the industrial fire brigade.

The structure of the brigade should be determined based on an analysis of all factors present in the areas where the brigade will operate, including, but not limited to, the following:

(1) Property size
(2) Property accessibility
(3) Building size and construction
(4) Building contents
(5) Fire protection equipment
(6) Fire hazards
(7) Personnel safety
(8) Public fire department assistance
(9) Availability of personnel
(10) Shift and vacation schedule of the facility
(11) Other response duties of the brigade, such as fire watch and maintenance of fire-fighting equipment

A.4.1.1(5) The establishment of a written policy for the occupational safety and health of industrial fire brigade members is intended to help prevent, and reduce the severity of, accidents, injuries, and exposures that occur. It is possible that an existing corporate safety program or policy satisfies the requirements of this standard.

A.4.1.1(6) The establishment of a written policy for medical and job-related physical performance requirements will help ensure that industrial fire brigade members will be medically and physically capable of performing their required response duties and will help to reduce the risk of injuries and illnesses.

A.4.1.2 The following is a sample industrial fire brigade organizational statement.

ABC Industrial Fire Brigade Organizational Statement
November 2004

Purpose: The ABC Industrial Fire Brigade was organized to safeguard the employees and the property of the ABC Corporation from the threat of fire. The industrial fire brigade is intended to function as an incipient stage industrial fire brigade as identified by OSHA, 29 CFR 1910, Subpart L.

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Membership: Anyone who works at the ABC Corporation is welcome to join the industrial fire brigade, although certain specific members are appointed, based on their particular job and location within the facility. At the present time, there are a total of 25 members in the brigade.

Members are identified as fire-fighting members and support members. Fire-fighting members are expected to perform fire-fighting response duties, utilizing both hand portable fire extinguishers and wheeled fire extinguishers and the 38 mm (1½ in.) hose lines stationed throughout the facility. Support members are not expected to fight fires but are expected to perform specialized response duties that are intended to support the fire-fighting operations. These support functions ensure the following:

(1) Building is evacuated.
(2) Sprinkler valves are open.
(3) Fire department is directed to the scene of the fire.
(4) Fire pump is operating properly.
(5) Other logistical needs of the fire-fighting members are met.

Organization: The brigade is headed by a brigade chief. A shift industrial fire brigade leader is also assigned to each shift. In the absence of the chief, the shift chief is in charge of the brigade. During a fire incident, the shift chief or brigade chief is in charge of the incident until the local municipal fire department arrives. At this time, the officer in charge of the fire department forces on scene and the shift chief will establish a joint incident command.

Functions: The primary function of the industrial fire brigade is to perform fire-fighting operations prior to the arrival of the fire department or operation of the sprinkler system. The fire-fighting operations cannot exceed the capabilities of the brigade members present to prevent fires from spreading.

Additional functions include the provision of advanced first aid assistance in any salvage operations that are necessary during any type of incident, including a fire, and the checking of fire protection and life safety equipment throughout the facility on a daily basis.

Training: The primary source of training for fire-fighting members is that conducted within the facility by the industrial fire brigade training officer. This training is conducted on a monthly basis.

Support members receive training on a bimonthly basis in the operation of the fire protection equipment, building evacuation information, and other related topics. This training is provided by the industrial fire brigade training officer and other personnel from the facility, such as the maintenance supervisor, the emergency coordinator, and the safety director.

Safety: While this industrial fire brigade exists to help safeguard the people and property of the ABC Corporation, the first and foremost consideration must be for the safety of the industrial fire brigade members. The brigade has limited resources and training and thus has limited abilities. These limits must be recognized by all members to ensure that members are not extended beyond their capabilities or the limitations imposed by the equipment with which they must operate.

Sample Organizational Statement — An Alternative Sample

The ABC Corporation, under contract with the XYZ Company for management and operation of the XYZ plant, will use an emergency response team (ERT) for the protection of those facilities.

The ERT is composed of employees whose normal job duties are not that of an ERT. In the event of an emergency, ERT members will leave their normal assigned duties and assume the response duties of the ERT. Responding ERT members will be grouped into teams, and designated ERT leaders (ERTLs) using the Incident Management System will direct and supervise emergency response operations. The total number of available ERT members responding to an emergency will vary from 2 to 40 depending on the particular site, the time of day, and response times. As dictated by the size and duration of the emergency, this number could increase to more than 100 with response by trained ERT members and leaders from other XYZ plant sites.

For fires involving enclosed structures, the ERT will perform only incipient fire fighting and will not enter into a building or enclosed structure involved with fire beyond the incipient stage. For a building involved with fire beyond the incipient stage, ERT members will notify local municipal fire departments or mutual aid organizations to respond and will assist with evacuation, account for personnel, perform first aid, and protect adjacent exposures.

For emergency fire response to the site-specific hazards associated with the storage and transfer of crude oil, the ERT will perform advanced exterior fire fighting. In performing advanced exterior fire fighting, ERT members will wear protective gear and will have responsibilities for rescue, emergency first aid, isolation of fuel sources, and application of water, foam, and dry chemical from the perimeter of the fire, which does not require entry into the interior of enclosed structures involved with fire beyond the incipient stage. Emergency contractors will be employed as necessary for complex fire emergencies that are beyond the training of the ERT.

For response to site-specific hazardous materials emergencies, the ERT will perform limited functions. In performing the limited hazardous materials functions, ERT members will be provided with appropriate personal protective equipment and will approach the source of a spill or leak and attempt to contain, control, and terminate the emergency conditions for which they have been trained. Emergency contractors will be employed as necessary for complex spills, leaks, and cleanups that are beyond that for which the ERT are trained.

Each ERT member will receive training and education commensurate with the response duties and functions they are expected to perform. Forty hours of fire, safety, and hazardous materials response training will be provided annually at the ERT Training Academy using established performance-based standards. Training at the academy will include, but not be limited to, hose and nozzle handling, fire fighter safety, use of protective gear, strategies and tactics, first aid, cardiopulmonary resuscitation (CPR), hazard identification, spill control, and live fire fighting involving flammable liquids and gases. ERT members must attend and successfully complete one ERT Training Academy program before participating in emergency response organizations.

ERT members will receive additional fire training quarterly. Training will be provided at each of the ABC Corporation facilities by qualified personnel to meet established performance standards. Such training will include classroom instruction and hands-on training that has been selected to keep ERT members familiar with site-specific equipment, systems, and standard operating procedures.

Designated ERTLs will annually receive 8 hours of specialized classroom instruction and will train and function as leaders in all live fire and hazardous materials training exercises at

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the ERT Training Academy and at the sites. Such training will be over and above that provided to other members and will be provided by qualified personnel. Instruction will include, but not be limited to, such subjects as leadership, methods of teaching, incident command, communications, tactics and strategies, and standard operating procedures.

A.4.1.2.2 The purpose of the industrial fire brigade's organizational statement is to demonstrate management's commitment to the establishment of an industrial fire brigade. This statement identifies all of the information pertinent to the industrial fire brigade and is intended to provide the industrial fire brigade member with a clear picture of the organization of the brigade and the response duties that he or she is expected to perform as they relate to the industrial fire brigade.

In addition to the information required in the organizational statement, the following information should also be included:

(1) Line of authority of each industrial fire brigade member
(2) Number of industrial fire brigade leaders
(3) Number of industrial fire brigade instructors
(4) List and description of the types of awards or recognition that brigade members are eligible to receive

The industrial fire brigade organizational statement is intended to represent the foundation of the industrial fire brigade and is similar to the mission statement of the organization. Thus, everything that the brigade does should be in accordance with the information in the organizational statement. As such, the organizational statement requires periodic revision as the mission, organization, or response duties of the brigade change.

A.4.1.4 The following is an example of a safety policy statement:

It is corporate or local company policy to operate an industrial fire brigade and to provide all industrial fire brigade members with the highest possible levels of safety and health while they are performing their assigned industrial fire brigade response duties.

A.4.1.4.2 The determination of whether the individual will have a full-time or part-time assignment should be made by the management. This determination should depend on the size and structure of the industrial fire brigade; the activity level; the level of risk in the industrial fire brigade's work environment; and the history of accidents, injuries, occupational illness, deaths, and exposures.

A.4.1.5 Medical records can be stored elsewhere in accordance with company policies.

A.4.2.1 For information on incident management systems, see NFPA 1561, *Standard on Emergency Services Incident Management System.*

A.4.2.1.5 Industrial fire brigades are often organized in such a manner that they respond to the emergency scene and assemble upon arrival. A system should be established to identify each industrial fire brigade member arriving at the emergency scene and to organize them into groups with appropriate supervision. A standard system of "reporting in" at the incident and becoming a part of the organized system of operation should be implemented.

A.4.2.2.2 Site-specific special hazards should be identified and itemized for the industrial fire brigade, along with a detailed explanation of each hazard. Special hazards can consist of unique operations or hazardous materials. Typical operations are emergency response activities for data processing and electronic control equipment, where the discharge of a special extinguishing agent can present a special hazard to industrial fire brigade members; engine test areas; paint dip, mix, and storage rooms; spray booths; flammable liquid tank farms; oil quenching and machinery operations; energized electrical equipment; hazardous materials; and combustible dusts.

A.4.2.4(2) Industrial fire brigade members using SCBA should be fit-tested to meet the requirements of NFPA and 29 CFR 1910.134, "Respiratory Protection."

A.4.3.3 Job training requirements can vary significantly from one location to another. Those requirements should be documented based on site-specific needs. In order to meet the requirements of 4.3.3, industrial fire brigade management should perform an analysis of required industrial fire brigade response duties.

A.4.3.5 Management should develop a plan and schedule to provide training, education, and drills at the minimum specified frequencies required by this standard.

Scheduling difficulties in the industrial setting can make it difficult to provide training, education, or drills for each individual brigade member on a specific day. For this reason, the following clarifications are intended to provide the necessary flexibility for planning and scheduling these activities:

(1) Quarterly requirements should be accomplished every 90 days and should not exceed 120 days between sessions.
(2) Semiannual requirements should be accomplished every 183 days and should not exceed 243 days between sessions.
(3) Annual requirements should be accomplished every 365 days and should not exceed 455 days between sessions.

A.4.3.7 The industrial fire brigade training coordinator should be an employee who is recognized or certified as an industrial fire brigade or fire service instructor by a government authority or national certification organization, or the coordinator should demonstrate the competency to meet the requirements of management in its role as an authority having jurisdiction.

For information on performance standards for industrial fire brigade instructors, see NFPA 1041, *Standard for Fire Service Instructor Professional Qualifications,* or equivalent performance standards.

Where industrial fire brigade training is contracted and provided by individuals or agencies outside of the company organization, the designated fire training coordinator should verify and ensure that instructors providing the training are knowledgeable in the subjects being presented. Such training should be accomplished using prepared lesson plans and performance-based standards that have been approved by the industrial fire brigade training coordinator.

Employees and members of the industrial fire brigade who have been trained in the methods of teaching and are recognized by the fire training coordinator as knowledgeable in the subject being presented can provide instruction to the industrial fire brigade with the use of prepared lesson plans and performance-based standards that have been approved by the fire training coordinator.

The industrial fire brigade training coordinator should oversee the industrial fire brigade training and education program to ensure quality and consistency of the training provided.

A.4.3.8 Industrial fire brigade leaders should be provided training on the incident management system established in 4.2.1 of this standard. For information on performance stan-

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dards for industrial fire brigade leaders, see NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications*; Chapter 2 of NFPA 1021, *Standard for Fire Officer Professional Qualifications*; or other performance standards.

A.4.3.9 Management should designate the person(s) responsible for planning and scheduling drills based on realistic scenarios for credible site-specific emergencies. Drills can be either announced or unannounced as determined by the authority having jurisdiction. Management should consider the use of periodic unannounced drills. Generally, drills are not considered training evaluations. However, announced drills can incorporate a degree of training while performing an evaluation of the industrial fire brigade. Announced drills can vary in types of response, speed of response, and use of equipment. Unannounced drills can be used to evaluate the fire-fighting readiness of the industrial fire brigade, industrial fire brigade leader, and fire protection systems and equipment.

Where mutual aid or other outside agencies play an important role in the emergency response procedures of the site, drills and pre-emergency planning should be conducted in conjunction with these agencies.

Management should designate the person(s) responsible for observing drills and for critiquing industrial fire brigade or outside agency performance. Lessons learned should be incorporated into the training and education program to improve any performance that is below established standards.

While recognizable training benefits are achieved through drills exercising the knowledge and skills of the industrial fire brigade, drills should not be considered as training *(see 3.3.3, Drill)*. For example, if industrial fire brigade members were never trained in the operation of a piece of industrial fire brigade apparatus or in the proper strategies and tactics for emergency fire operations, then industrial fire brigade members could not demonstrate competence in performing these tasks in a drill. Drills can be valuable in determining the frequency of refresher training necessary to maintain industrial fire brigade skills.

Responses to actual emergencies can reduce the necessity to conduct drills, providing the actual responses occur with sufficient frequency and as long as the industrial fire brigade performance during these responses is evaluated in accordance with established performance objectives and is properly documented.

A.4.3.10 Because members will be required to meet the provisions of this standard that apply to the type of industrial fire brigade of which they are members, it is important that the applicable provisions of this standard be reviewed in the training program.

A.4.3.13 Members of the industrial fire brigade should be afforded opportunities to improve their skills and knowledge of fire prevention and fire fighting through attendance at outside meetings and special training classes. Members who belong to volunteer fire departments and who receive certified training from a qualified instructor as a part of their public fire department activities can have this training documented in their individual industrial fire brigade training records.

A.4.4.1(6) Industrial fire brigade management should maintain a close working relationship with all emergency response organizations that could reasonably be expected to respond to the facility during an emergency. This relationship should include the following:

(1) A written mutual aid agreement signed by management and the emergency response organization
(2) Establishment of an incident management system that identifies the roles and responsibilities of both the industrial fire brigade and the emergency response organization
(3) An invitation to the emergency response organizations to participate in a pre-fire planning walk-through or tour of the facility
(4) An invitation to the emergency response organizations to participate in industrial fire brigade drills at least annually
(5) A means of communication between the industrial fire brigade and the emergency response organizations (This communication can be accomplished by the use of common radio frequencies, the exchange of respective portable radios, or other means.)
(6) A means to ensure that fire hose threads are compatible or that adequate adapters are provided and available
(7) Knowledge by both the industrial fire brigade and the emergency response organizations of the other's available equipment (This information should include items such as water supply, pump size, foam capabilities, portable or fixed master stream devices, or both, and other specialized equipment.)

A.4.5.1.1 For information on medical requirements, see OSHA requirements in 29 CFR 1910.156, 29 CFR 1910.134, or NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments.*

A.4.5.3 Minimum physical performance requirements should be established to ensure that industrial fire brigade members are able to satisfactorily perform their assigned emergency response activities under adverse conditions.

A.4.5.3.1 Many critical emergency response activities can be physically demanding. These tasks require muscular strength, muscular endurance, aerobic capacity, flexibility, equilibrium, and anaerobic power. Industrial fire brigade management should include these capabilities for the evaluation of industrial fire brigade members.

A.4.5.4 Industrial fire brigade members should be encouraged to maintain good physical condition.

A.4.6.2 In selecting the equipment necessary to allow the industrial fire brigade members to perform their response duties as specified in the industrial fire brigade organizational statement, management should recognize that such a selection can be drawn from a wide range of equipment. The following is a sample of the equipment more commonly selected:

(1) Portable fire extinguishers (Portable fire extinguishers should be in accordance with NFPA 10, *Standard for Portable Fire Extinguishers.*)
(2) Hose and hose accessories (Fire hose should be in accordance with NFPA 1961, *Standard on Fire Hose.* Hose should be maintained in accordance with NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose.*)
(3) Portable lighting equipment, including portable electric generators, extension cords, electrical adapters, handheld lights, and spare batteries
(4) Forcible entry tools, including axes, saws, power tools, plaster hooks, pike poles, claw tools, door openers, crowbars, sledgehammers, wire and bolt cutters, and battering rams
(5) Ladders

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(6) Salvage and overhaul equipment
(7) Rescue and first aid equipment
(8) Special purpose equipment, such as portable foam-making equipment
(9) Personnel protective equipment

A.4.7.1.1 For information on performance standards for industrial fire brigade apparatus operators, see NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications*; Chapters 2 through 6 of NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*; or other performance standards.

A.4.7.1.5 On existing fire apparatus where there is an insufficient number of seats available for the number of members assigned to or expected to ride on that piece of apparatus, alternate means of transportation that provide seated and belted positions should be used.

A.5.2.1 Training and education objectives can be accomplished in the same session.

A.5.2.3 Live training fire field safety recommendations are as follows:

(1) Site selection preparation: Select an open area with a safe clearance from important buildings, dry vegetation, and storage containers holding flammable liquids and gases and compressed gases.
(2) Safety procedures: The following procedures should be followed:
  (a) Smoking should be permitted only in designated areas.
  (b) Fuel and ignition sources should be separated by safe distances.
  (c) If high winds or other adverse weather conditions present a hazard to members or adjacent property, live fire training should not be conducted.
  (d) Only appropriate ignition sources should be used.
  (e) When participating in an evolution, each student should utilize a charged extinguisher.
  (f) Fire attack should be from the upwind side.
  (g) Care should be taken to ensure that members are not placed at risk of being exposed to the products of combustion.
  (h) For Class B fires, at least two portable extinguishers of the applicable size and rating should be available for each evolution.
  (i) Participants should retreat from an extinguished fire in an organized manner, always being alert for possible reflash or rekindle.
(3) Fire training evolutions: Evolutions should be commensurate with the size of fires that the members are expected to extinguish in their normal response duties.
(4) Student clothing: Individuals participating in field evolutions should be attired in the type of clothing they would normally wear during the performance of their day-to-day job function.
(5) Instructors: The instructor should perform the following functions:
  (a) Guide each student while he or she is approaching, extinguishing, and retreating from each live fire training evolution
  (b) Provide for the proper supervision of members who are not participating in the current evolution
(6) Fuels: Fuels and handling procedures should meet the following criteria:
  (a) Flammable liquids should not be used as accelerants to ignite Class A training fires.
  (b) Only approved safety containers should be used to dispense combustible liquids used as accelerants.
  (c) The person fueling and lighting the fire should be properly instructed and should wear appropriate protective clothing.
  (d) A qualified person equipped with a charged handline or appropriate extinguisher should stand by in any case where a combustible liquid is being used to light a training fire.

A.6.3.2.1 Based on site-specific hazards, the authority having jurisdiction can choose either structural or proximity thermal protective clothing. In most situations, structural fire-fighting clothing will provide an appropriate level of protection. However, in special circumstances, proximity clothing can be used to provide an additional level of protection from high levels of radiant heat.

A.7.3.6 Radios can be used for communication on the fireground; however, they cannot be the sole tool for accounting for one's partner in the interior of a structure fire.

One of the two individuals located outside the hot zone can be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any fire fighters working at the incident. Nothing in this subsection is meant to preclude fire fighters from performing emergency rescue activities before industrial fire brigade team members have assembled.

Separate teams of two or more who remain outside the structure are not required for each team operating in the interior of a structure fire. If a structure is so large that accountability cannot be maintained from a single entry point, or rapid rescue is not possible, additional teams of at least two members should be assigned to appropriate divisions or sectors in accordance with the incident management system for the site.

Annex B Informational References

B.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

B.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2010 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, 2009 edition.

NFPA 1021, *Standard for Fire Officer Professional Qualifications*, 2009 edition.

NFPA 1041, *Standard for Fire Service Instructor Professional Qualifications*, 2007 edition.

NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications*, 2007 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2007 edition.

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NFPA 1561, *Standard on Emergency Services Incident Management System*, 2008 edition.

NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, 2007 edition.

NFPA 1961, *Standard on Fire Hose*, 2007 edition.

NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose*, 2008 edition.

NFPA *Industrial Fire Hazards Handbook*, third edition.

B.1.2 Other Publications.

B.1.2.1 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 29, Code of Federal Regulations, Part 1910, Chapter XVII, Subpart L, "Fire Protection."

Title 29, Code of Federal Regulations, Part 1910.134, "Respiratory Protection."

Title 29, Code of Federal Regulations, Part 1910.156.

B.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.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2008 edition.

B.3 References for Extracts in Informational Sections. (Reserved)

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Index

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-A-

Accountability 4.2.1.5, A.4.2.1.5
Advanced exterior fire fighting ..... Chap. 6, Chap. 8
Definition 3.3.8.1, A.3.3.8.1
Limitations 1.4.4, 1.4.6
Medical requirements 4.5.2
Physical requirements 4.5.3.3, 4.5.3.4
Alternate requirements 1.3
Apparatus, fire brigade ..... *see* Industrial fire brigade apparatus
Approved (definition) 3.2.1, A.3.2.1
Authority having jurisdiction (definition) 3.2.2, A.3.2.2

-B-

Breathing apparatus
Externally supplied 7.3.5
Self-contained breathing apparatus ... *see* Self-contained breathing apparatus (SCBA)

-C-

Clothing ..... *see* Thermal protective clothing
Cold zone (definition) 3.3.30.1
Combustible liquids (definition) 3.3.1, A.3.3.1
Communications 4.4.6, 6.3.5, 7.3.6, A.7.3.6

-D-

Defensive fire fighting (definition) 3.3.8.2
Definitions ..... Chap. 3
Designated employees 4.1.2.2, 4.1.3.1, 4.3.8
Definition 3.3.2
Responsibilities 1.4.2, 4.3.7, 4.4.4.4, A.1.4.2, A.4.3.7
Drills 4.3.9, A.4.3.9
Advanced exterior fire fighting 6.2.2, 6.2.3
Definition 3.3.3
Incipient fire fighting 5.2.2, 5.2.3, A.5.2.3
Interior structural fire fighting 7.2.2, 7.2.3
Drugs (definition) 3.3.4

-E-

Education ..... *see also* Training
Definition 3.3.5, A.3.3.5
Management, responsibility of ..... 4.1.1(11), 4.1.3.1, 4.1.3.3
Electrical power control ..... A.3.3.27(3)
Emergency response operations (definition) 3.3.6
Employees, designated ..... *see* Designated employees
Enclosed structures (definition) 3.3.7
Equipment ..... 4.1.1(11), 4.6, A.4.6.2
Fire brigade apparatus ..... *see* Industrial fire brigade apparatus
Protective ..... *see* Protective equipment
Evacuation, building ..... A.3.3.27(1)
Exterior fire fighting ..... *see* Advanced exterior fire fighting

-F-

Fire apparatus drivers ..... 4.7.1.2 to 4.7.1.4
Fire drills ..... *see* Drills
Fire fighting
Advanced exterior ..... *see* Advanced exterior fire fighting
Combination assignments ..... 1.4.6, Chap. 8
Defensive (definition) 3.3.8.2
Incipient ..... *see* Incipient fire fighting
Interior structural ..... *see* Interior structural fire fighting
Offensive (definition) 3.3.8.5
Fire pump operation ..... A.3.3.27(5)
Fit ..... *see* Medically fit; Physically fit
Flammable liquids (definition) 3.3.10, A.3.3.10

-H-

Hazardous atmosphere (definition) 3.3.11, A.3.3.11
Hazards, site-specific ..... *see* Site-specific hazards
Healthcare professional, qualified 4.5.2
Definition 3.3.21
Hot zone
Definition 3.3.30.2
Limitations, fire fighting 1.4.3.2, 1.4.4, 1.4.5, 1.4.6.1
Protective clothing and equipment ..... 4.2.4(2), 6.3, 7.3, A.4.2.4(2), A.6.3.2.1, A.7.3.6
Safety procedures ..... 4.2.4, A.4.2.4(2)
Support members prohibited from 4.4.7.2

-I-

Identification, brigade members 4.2.1.5, 4.4.5, A.4.2.1.5
Incident command 1.4.2
Incident management system 4.2.1, A.4.2.1
Definition 3.3.12
Incipient fire fighting ..... Chap. 5
Definition 3.3.8.3
Limitations 1.4.3
Incipient stage (definition) 3.3.13, A.3.3.13
Industrial fire brigade (definition) 3.3.14
Industrial fire brigade apparatus ... 4.1.1(11), 4.7, A.4.7.1.1, A.4.7.1.5
Definition 3.3.15
Industrial fire brigade management
Definition 3.3.16
Responsibilities ..... 4.1, 4.4.1, A.4.1.1, A.4.1.2, A.4.4.1(6)
Industrial fire brigade members ..... 4.4.4; *see also* Support members
Professional qualifications 4.2.1.6
Selection 4.4.4.1, A.4.1.2
Training ..... *see* Training
Industrial fire brigade training coordinator 4.3.7, A.4.3.7
Definition 3.3.17
Industrial occupancy (definition) 3.3.18
Inspection, maintenance, and testing
Fire brigade apparatus ..... 4.7.2 to 4.7.6
Protective clothing and equipment 6.3.4, 7.3.4
Interior structural fire fighting ..... Chap. 7, Chap. 8
Definition 3.3.8.4, A.3.3.8.4
Limitations 1.4.5, 1.4.6
Medical requirements 4.5.2
Physical requirements 4.5.3.3, 4.5.3.4

-L-

Leaders, fire brigade
Assistant 4.4.3
Responsibilities 4.4.2
Training and education 4.3.8, A.4.3.8
Limits of actions and responsibilities 1.4, A.1.4

-M-

Management, industrial fire brigade ..... *see* Industrial fire brigade management

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Master stream (definition) 3.3.19
Medically fit .... 4.1.1(6), 4.1.1(9), 4.5.1, A.4.1.1(6), A.4.5.1.1; *see also* Medical requirements
Definition 3.3.9.1
Medical requirements ..... 4.1.1(11), 4.5.2
Advanced exterior fire fighting 6.4
Incipient fire fighting 5.4
Interior structural fire fighting 7.4

-O-

Offensive fire fighting (definition) 3.3.8.5
Operations, general 4.2, A.4.2
Organization ..... 4.4, A.4.4.1(6); *see also* Industrial fire brigade management
Organizational statements ..... 4.1.1(3), 4.1.1(4), 4.1.2, 4.4.4.3
Examples A.4.1.2
Purpose A.4.1.2.2

-P-

Performance standards ..... 4.1.1(7)
Definition 3.3.20
Education and training 4.3
Physical performance 4.5.3, A.4.5.3
Personal alert safety systems (PASS) 6.3.3, 7.3.2.2
Physically fit ..... 4.1.1(6), 4.5.1, 4.5.4, A.4.1.1(6), A.4.5.4
Definition 3.3.9.2
Physical performance requirements ..... 4.1.1(11), 4.5.3, A.4.5.3
Professional qualifications 4.2.1.6
Protective equipment ....*see also* Personal alert safety systems (PASS); Self-contained breathing apparatus (SCBA); Thermal protective clothing
Advanced exterior fire fighting 6.3, A.6.3.2.1
Incipient fire fighting 5.3
Interior structural fire fighting 7.3, A.7.3.6
Purpose of standard 1.2, A.1.2

-Q-

Qualifications
Professional qualifications, industrial fire brigade members 4.2.1.6
Qualified healthcare professional 4.5.2
Definition 3.3.21

-R-

Records ..... 4.1.1(10), 4.1.5, 4.3.15, A.4.1.5
References ..... Chap. 2, Annex B
Requirements, general ..... Chap. 4
Response duty
Definition 3.3.22
Management, role of ..... 4.1.1(1), 4.1.1(2), 4.1.4.2, A.4.1.4.2
Risk management policy 4.2.1.7, 4.2.3

-S-

Safety program ..... 4.1.1(5), 4.1.4, 4.2.1.3, A.4.1.4
Management, responsibility of 4.1.3.2, 4.1.4
Operational requirements ..... 4.2.4, A.4.2.4(2)
Organizational statement A.4.1.2
Risk management policy 4.2.3
Salvage ..... A.3.3.27(6)
Scope of standard 1.1, A.1.1
Self-contained breathing apparatus (SCBA) ..... 4.2.4(2), A.4.2.4(2)
Advanced exterior fire fighting ..... 1.4.4(3), 6.3.3, 6.3.5
Interior structural fire fighting ..... 1.4.5(3), 7.3.2.3, 7.3.2.4, 7.3.3, 7.3.5, 7.3.6
Shall (definition) 3.2.3
Should (definition) 3.2.4
Site (definition) 3.3.23, A.3.3.23
Site-specific hazards ..... 4.1.1(8)
Definition 3.3.24
Evaluation of ..... 4.1.1(1)
Standard operating procedures 4.2.2.2
Training 4.3.14
Specialized agents (definition) 3.3.25
Sprinkler system control ..... A.3.3.27(2)
Standard
Definition 3.2.5
Review 4.3.10, A.4.3.10
Standard operating procedures ..... 4.1.1(8), 4.1.3.2, 4.2.2.2
Definition 3.3.26
Structures, enclosed (definition) 3.3.7
Support members 4.4.7
Assignments, specialized A.3.3.27
Definition 3.3.27, A.3.3.27

-T-

Thermal protective clothing 4.2.4
Advanced exterior fire fighting ..... 1.4.4(3), 1.4.6.1(3), 6.3, A.6.3.2.1
Definition 3.3.28
Incipient fire fighting 5.3
Interior structural fire fighting ..... 1.4.5(3), 1.4.6.1(3), 1.4.6.2, 7.3, A.7.3.6
Traffic control ..... A.3.3.27(7)
Training ..... 4.3, 4.4.4.4, A.4.3; *see also* Industrial fire brigade training coordinator
Advanced exterior fire fighting 6.2
Apparatus 4.7.1.1, A.4.7.1.1
Definition 3.3.29
Incident management system 4.2.1
Incipient fire fighting 5.2, A.1.4.2, A.5.2.1, A.5.2.3
Interior structural fire fighting 7.2
Management, responsibility of ..... 4.1.1(11), 4.1.3.1, 4.1.3.3
Organizational statement A.4.1.2
Records 4.3.15

-U-

Utility control ..... A.3.3.27(4)

-W-

Warm zone
Definition 3.3.30.3
Limitations, fire fighting 1.4.3.2
Protective clothing and equipment ..... 4.2.4(3), 6.3.1, 6.3.2, 7.3.1, 7.3.2, A.6.3.2.1
Safety procedures 4.2.4
Support members prohibited from 4.4.7.2

-Z-

Zone
Cold (definition) 3.3.30.1
Hot ..... *see* Hot zone
Warm ..... *see* Warm zone

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3.3.78 Effective Ground-Fault Current Path. An intentionally constructed, permanent, low impedance electrically conductive path designed and intended to carry ~~underground~~ electric fault current ~~conditions~~ from the point of a ground fault on a wiring system to the electrical supply source.

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APPENDIX E
NFPA 1081
Standard for Industrial Fire Brigade Member Professional Qualifications

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NFPA® 1081

Standard for

Industrial Fire Brigade Member Professional Qualifications

2012 Edition

This edition of NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications,* was prepared by the Technical Committee on Industrial Fire Brigades Professional Qualifications and released by the Technical Correlating Committee on Professional Qualifications. It was issued by the Standards Council on May 31, 2011, with an effective date of June 20, 2011, and supersedes all previous editions.

This edition of NFPA 1081 was approved as an American National Standard on June 20, 2011.

Origin and Development of NFPA 1081

In 1996, the NFPA Standards Council, after receipt of a request for the development of a standard for the professional qualifications of industrial fire brigade members, approved the establishment of a Technical Committee on Industrial Fire Brigades Member Professional Qualifications under the Professional Qualifications project. The purpose of the document was to identify requirements for personnel who perform as members of organized industrial fire brigades at specific sites or facilities. An organizational meeting of the new committee was held in October 1997 in Tampa, FL. The technical committee met a total of eight times during the development of this document.

The development process was coordinated with other professional qualifications documents and with the Technical Committee on Loss Prevention Procedures and Practices, the committee responsible for NFPA 600, *Standard on Industrial Fire Brigades.* To accommodate the site-specific needs of industrial fire brigades at various locations, the committee developed a core set of job performance requirements, as well as site-specific requirements for each defined level in the document. The intent is that the management of a facility utilizing the requirements of NFPA 1081 would identify those site-specific requirements applicable to the facility and incorporate them into the requirements for their industrial fire brigade members. This departure from the traditional style of other professional qualifications documents was necessary in order to track with the NFPA 600 and OSHA requirements in 29 CFR 1910.156 for fire brigades.

The first edition of NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications,* adopted at the May 2001 meeting of the National Fire Protection Association, established job performance requirements for the levels of industrial fire brigade operations defined in NFPA 600: Incipient, Advanced Exterior, and Interior Structural. Requirements for the position of Fire Brigade Leader were also provided in the document.

The 2007 edition of NFPA 1081 was a complete revision of the document and included editorial changes to JPRs, Requisite Knowledge and Requisite Skills statements, and their associated Annex A statements. New material was also added for "site-specific requirements."

In the 2012 edition of NFPA 1081, the committee has added time requirements of 2 minutes (120 seconds) to Chapters 6 and 7 that relate to the donning and doffing of thermal protective clothing and donning and activation of SCBA and PASS devices. In addition, a section has been added that addresses the limits and responsibilities of industrial fire brigade members in order to be consistent with NFPA 600, *Standard on Industrial Fire Brigades.* The committee has also added a chapter to address the qualifications that support members would provide to the industrial fire brigade.

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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.

Committee Scope: This Committee shall have primary responsibility for the management of the NFPA Professional Qualifications Project and documents related to professional qualifications for fire service, public safety, and related personnel.

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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.

Committee Scope: This Committee shall have primary responsibility for documents on the professional competence required for personnel who participate as members of industrial fire brigades.

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Contents

Chapter 1 Administration 1081– 5
1.1 Scope 1081– 5
1.2 Purpose 1081– 5
1.3 Application 1081– 5
1.4 Limits of Actions and Responsibilities of the Industrial Fire Brigade 1081– 5
1.5 Units and Formulas 1081– 6

Chapter 2 Referenced Publications 1081– 6
2.1 General 1081– 6
2.2 NFPA Publications 1081– 6
2.3 Other Publications 1081– 6
2.4 References for Extracts in Mandatory Sections 1081– 6

Chapter 3 Definitions 1081– 6
3.1 General 1081– 6
3.2 NFPA Official Definitions 1081– 6
3.3 General Definitions 1081– 7

Chapter 4 Entrance Requirements 1081– 8
4.1 General 1081– 8
4.2 Emergency Medical Care 1081– 8
4.3 Job Performance Requirements (JPRs) 1081– 8

Chapter 5 Incipient Industrial Fire Brigade Member 1081– 9
5.1 General 1081– 9
5.2 Manual Fire Suppression 1081– 9
5.3 Site-Specific Requirements 1081– 9

Chapter 6 Advanced Exterior Industrial Fire Brigade Member 1081–10
6.1 General 1081–10
6.2 Manual Fire Suppression 1081–10
6.3 Site-Specific Requirements 1081–12

Chapter 7 Interior Structural Industrial Fire Brigade Member 1081–13
7.1 General 1081–13
7.2 Manual Fire Suppression 1081–14
7.3 Site-Specific Requirements 1081–15

Chapter 8 Industrial Fire Brigade Leader 1081–17
8.1 General 1081–17
8.2 Supervisory Functions 1081–17

Chapter 9 Industrial Fire Brigade Support Member 1081–17
9.1 General 1081–17
9.2 Site-Specific Requirements 1081–18

Annex A Explanatory Material 1081–19

Annex B Industrial Fire Brigade Support Member 1081–24

Annex C Job Performance Requirements 1081–25

Annex D Management Review of Site-Specific Job Requirement Process 1081–28

Annex E Informational References 1081–32

Index 1081–33

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NFPA 1081

Standard for

Industrial Fire Brigade Member Professional Qualifications

2012 Edition

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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, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex E. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex E.

Chapter 1 Administration

1.1* Scope. This standard identifies the minimum job performance requirements (JPRs) necessary to perform the duties as a member of an organized industrial fire brigade providing services at a specific facility or site.

1.2 Purpose. The purpose of this standard is to specify the minimum JPRs for industrial fire brigade members. It is not the intent of the standard to restrict any jurisdiction from exceeding these requirements.

1.3 Application.

1.3.1* The management of the industrial fire brigade shall establish instructional priority and the training program content to prepare individuals to meet the JPRs of this standard. The JPRs found in Chapters 5 through 8 are not required to be mastered in the order they appear.

1.3.1.1* The management of the industrial fire brigade shall establish an ongoing process to ensure that members continue to meet the JPRs of this standard.

1.3.2 Wherever in this standard the terms *rules, regulations, procedures, supplies, apparatus,* or *equipment* are referred to, it is implied that they are those of the management of the industrial fire brigade.

1.4* Limits of Actions and Responsibilities of the Industrial Fire Brigade. [**600:** A.1.4]

1.4.1 General. [**600:**1.4.1]

1.4.1.1 The degree of potential exposure to a hazardous environment and the degree of training shall determine the limits of any industrial fire brigade action and responsibility. [**600:**1.4.1.1]

1.4.1.2 The written industrial fire brigade organizational statement and standard operating procedures shall define these limits. [**600:**1.4.1.2]

1.4.2* Incident Command. At facilities where designated employees are intended to function as the first responders to incipient fires, the industrial fire brigade shall assume command of the incident once the brigade arrives on the fire scene. [**600:**A.1.4.2]

1.4.3 Limits for Industrial Fire Brigades Assigned Incipient Fire-Fighting Response Duties. [**600:**1.4.3]

1.4.3.1 Interior and exterior fires shall be considered incipient stage when industrial fire brigade members function as follows: [**600:**1.4.3.1]

(1) They are able to safely fight the fire in normal work clothing. [**600:**1.4.3.1(1)]
(2) They are not required to crawl or take other evasive action to avoid smoke and heat. [**600:**1.4.3.1(2)]
(3) They are not required to wear thermal protective clothing or self-contained breathing apparatus (SCBA). [**600:**1.4.3.1(3)]
(4) They are able to fight the fire effectively with portable extinguishers or handlines flowing up to 473 L/min (125 gpm). [**600:**1.4.3.1(4)]

1.4.3.2 Exterior fires shall be considered appropriate for defensive action outside of the hot and warm zones by industrial fire brigade members who have been assigned incipient fire-fighting response duties when the following occur: [**600:**1.4.3.2]

(1) The organizational statement lists it as a response duty of the industrial fire brigade, and it is covered by the standard operating procedures. [**600:**1.4.3.2(1)]
(2) The industrial fire brigade has received training for that activity. [**600:**1.4.3.2(2)]
(3) SCBA and thermal protective clothing are not required. [**600:**1.4.3.2(3)]
(4) Personal evasive action is not required. [**600:**1.4.3.2(4)]
(5) The industrial fire brigade is able to perform defensive action effectively, using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application of specialized agents. [**600:**1.4.3.2(5)]

1.4.4 Limits for Industrial Fire Brigades Assigned Only Advanced Exterior Fire-Fighting Response Duties. [**600:**1.4.4]

1.4.4.1 Exterior fires shall be considered appropriate for offensive action within the hot zone by industrial fire brigade members who have been assigned advanced exterior fire-fighting response duties when all of the following occur: [**600:**1.4.4]

(1) The organizational statement lists it as a response duty of the industrial fire brigade, and it is covered by the standard operating procedures. [**600:**1.4.4(1)]
(2) The industrial fire brigade has received training for that activity. [**600:**1.4.4(2)]
(3) SCBA and thermal protective clothing are provided. [**600:**1.4.4(3)]
(4) The industrial fire brigade is able to perform offensive action effectively, using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application of specialized agents. [**600:**1.4.4(4)]

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1.4.5 Limits for Industrial Fire Brigades Assigned Only Interior Structural Fire-Fighting Response Duties. [**600:**1.4.5]

1.4.5.1 Interior structural fires shall be considered appropriate for offensive action within the hot zone by industrial fire brigade members who have been assigned interior fire-fighting response duties when the following occur: [**600:**1.4.5]

(1) The organizational statement lists it as a response duty of the industrial fire brigade, and it is covered by the standard operating procedures. [**600:**1.4.5(1)]
(2) The industrial fire brigade has received training for that activity. [**600:**1.4.5(2)]
(3) SCBA and protective clothing for structural fire fighting are provided. [**600:**1.4.5(3)]
(4) The industrial fire brigade is able to perform offensive actions effectively, using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application of specialized agents. [**600:**1.4.5(4)]

1.4.6 Limits of Industrial Fire Brigades Assigned Both Advanced Exterior and Interior Structural Fire-Fighting Response Duties. [**600:**1.4.6]

1.4.6.1 Both exterior fires and interior structural fires shall be considered appropriate for offensive action within the hot zone for industrial fire brigade members who have been assigned both advanced exterior and interior fire-fighting response duties when the following occur: [**600:**1.4.6.1]

(1) The organizational statement lists it as a response duty of the industrial fire brigade, and it is covered by the standard operating procedures. [**600:**1.4.6.1(1)]
(2) The industrial fire brigade has received training for that activity. [**600:**1.4.6.1(2)]
(3) SCBA and thermal protective clothing are provided. [**600:**1.4.6.1(3)]
(4) The industrial fire brigade is able to perform offensive action effectively, using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application of specialized agents. [**600:**1.4.6.1(4)]

1.4.6.2 Protective clothing for proximity fire fighting shall not be worn for interior structural fire fighting. [**600:**1.4.6.2]

1.5 Units and Formulas. In this standard, values for measurement are followed by an equivalent in U.S. units, but only the first stated value shall be regarded as the requirement. Equivalent values are not considered as the requirement, as these values can be approximate. *(See Table 1.5.)*

Table 1.5 SI Conversions

Quantity	SI Unit/Symbol	U.S. Unit/Symbol	Conversion Factor
Length	millimeter (mm)	inch (in.)	25.4 mm = 1 in.
	meter (m)	foot (ft)	0.305 m = 1 ft
Area	square meter (m^2)	square foot (ft^2)	0.0929 m^2 = 1 ft^2
Volume	liters per minute (L/min)	gallons per minute (gpm)	3.78 L/min = 1 gpm
Pressure	newtons/meter^2 (N/m^2)	pounds per square inch (psi)	0.345 N/m^2 = 1 psi

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, Quincy, MA 02169-7471.

NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents,* 2008 edition.

NFPA 600, *Standard on Industrial Fire Brigades,* 2010 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications,* 2009 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System,* 2008 edition.

2.3 Other Publications.

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

Title 29, Code of Federal Regulations, Part 1910.120.

2.3.2 Other Publications. *Merriam-Webster's Collegiate Dictionary,* 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents,* 2008 edition.

NFPA 600, *Standard on Industrial Fire Brigades,* 2010 edition.

NFPA 1000, *Standard for Fire Service Professional Qualifications Accreditation and Certification Systems,* 2011 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications,* 2009 edition.

NFPA 1021, *Standard for Fire Officer Professional Qualifications,* 2009 edition.

NFPA 1031, *Standard for Professional Qualifications for Fire Inspector and Plan Examiner,* 2009 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* 2007 edition.

NFPA 1521, *Standard for Fire Department Safety Officer,* 2008 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System,* 2008 edition.

NFPA 1620, *Standard for Pre-Incident Planning,* 2010 edition.

NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments,* 2010 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary,* 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* 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

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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.

3.2.3 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 Certification. An authoritative attestment; specifically, the issuance of a document that states that an individual has demonstrated the knowledge and skills necessary to function in a particular fire service professional field. [**1000,** 2011]

3.3.2 Drill. An exercise involving a credible simulated emergency that requires personnel to perform emergency response operations for the purpose of evaluating the effectiveness of the training and education programs and the competence of personnel in performing required response duties and functions. [**600,** 2010]

3.3.3 Emergency Response Operations. Activities related to emergency incidents, including response to the scene of the incident and specific response duties performed at the scene. [**600,** 2010]

3.3.4 Enclosed Structure. A structure with a roof or ceiling and at least two walls that can present fire hazards to employees such as accumulations of smoke, toxic gases, and heat, similar to those found in buildings. [**600,** 2010]

3.3.5 Facility. A structure or building located on a site that serves a particular purpose.

3.3.6 Fire Fighting.

3.3.6.1* ***Advanced Exterior Fire Fighting.*** Offensive fire fighting performed outside of an enclosed structure when the fire is beyond the incipient stage. *(See also 3.3.8, Incipient Stage.)* [**600,** 2010]

3.3.6.2 ***Defensive Fire Fighting.*** The mode of manual fire control in which the only fire suppression activities taken are limited to those required to keep a fire from extending from one area to another. [**600,** 2010]

3.3.6.3 ***Incipient Fire Fighting.*** Fire fighting performed inside or outside of an enclosed structure or building when the fire has not progressed beyond incipient stage.

3.3.6.4* ***Interior Structural Fire Fighting.*** The physical activity of fire suppression, rescue, or both, inside of buildings or enclosed structures that are involved in a fire beyond the incipient stage. [**600,** 2010]

3.3.6.5 ***Offensive Fire Fighting.*** The mode of manual fire control in which manual fire suppression activities are concentrated on reducing the size of a fire to accomplish extinguishment. [**600,** 2010]

3.3.6.6 ***Structural Fire Fighting.*** Rescue, fire suppression, and property conservation activities in buildings, enclosed structures, aircraft interiors, vehicles, vessels, aircraft, or like properties that are involved in a fire or emergency situation.

3.3.7 Incident Management System (IMS). A system that defines the roles and responsibilities to be assumed by responders and the standard operating procedures to be used in the management and direction of emergency incidents and other functions. [**1561,** 2008]

3.3.8* Incipient Stage. Refers to the severity of a fire where the progression is in the early stage and has not developed beyond that which can be extinguished using portable fire extinguishers or handlines flowing up to 473 L/min (125 gpm).

3.3.9 Industrial Fire Brigade. An organized group of employees within an industrial occupancy who are knowledgeable, trained, and skilled in at least basic fire fighting operations, and whose full-time occupation might or might not be the provision of fire suppression and related activities for their employer. [**600,** 2010]

3.3.10 Industrial Fire Brigade Apparatus. An industrial fire brigade emergency response vehicle designed and intended primarily for fire suppression, rescue, or other specialized function that includes pumpers, foam apparatus, aerial ladders, rescue vehicles, and other such apparatus. [**600,** 2010]

3.3.11 Industrial Fire Brigade Leader. An individual responsible for overseeing the performance or activity of other members.

3.3.12 Industrial Fire Brigade Management. The individual designated by top management to be responsible for the organization, management, and functions of the industrial fire brigade. [**600,** 2010]

3.3.13 Industrial Fire Brigade Training Coordinator. The designated company representative with responsibility for coordinating effective, consistent, and quality training within the industrial fire brigade training and education program. [**600,** 2010]

3.3.14 Job Performance Requirement (JPR). A statement that describes a specific job task, lists the items necessary to complete the task, and defines measurable or observable outcomes and evaluation areas for the specific task. [**1000,** 2010]

3.3.15 Personal Protective Equipment (PPE). Consists of full thermal protective clothing, plus a self-contained breathing apparatus (SCBA) and a personal alert safety system (PASS) device.

3.3.16 Pre-Incident Plan. A document developed by gathering general and detailed data that is used by responding personnel in effectively managing emergencies for the protection of occupants, responding personnel, property, and the environment. [**1620,** 2010]

3.3.17 Procedure. The series of actions, conducted in an approved manner and sequence, designed to achieve an intended outcome.

3.3.18 Rapid Intervention Crew/Company (RIC). A minimum of two fully equipped members who are on-site and assigned specifically to initiate the immediate rescue of injured or trapped members. [**1500,** 2007]

3.3.19 Requisite Knowledge. Fundamental knowledge one must have in order to perform a specific task. [**1031,** 2009]

3.3.20 Requisite Skills. The essential skills one must have in order to perform a specific task. [**1031,** 2009]

3.3.21 Safely. To perform the assigned tasks without injury to self or others, to the environment, or to property. [**472,** 2008]

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3.3.22 Site. The entire premises within the governed property lines that contains one or more facilities.

3.3.23 Site-Specific Hazard. A hazard that is present at the specific facility for which the industrial fire brigade has been organized. [**600,** 2010]

3.3.24 Standard Operating Procedure (SOP). A written organizational directive that establishes or prescribes specific operational or administrative methods to be followed routinely for the performance of designated operations or actions. [**1521,** 2008]

3.3.25* Support Member. Personnel assigned to the industrial fire brigade to perform specific response duties, including those people who have specific technical knowledge or skills or who have been given specific assignments that indirectly support manual fire suppression efforts. [**600,** 2010]

3.3.26 Task. A specific job behavior or activity. [**1002,** 2009]

3.3.27 Team. Two or more individuals who have been assigned a common task and are in communication with each other, coordinate their activities as a work group, and support the safety of one another.

3.3.28* Thermal Protective Clothing. Protective clothing such as helmets, eye protection, footwear, gloves, hoods, trousers, and coats that are designed and manufactured to protect the fire brigade member from the adverse effects of fire.

3.3.29 Zone.

3.3.29.1 *Cold Zone.* The area immediately outside the boundary of the established warm zone where personnel are safe from the adverse effects of a fire. [**600,** 2010]

3.3.29.2 *Hot Zone.* The area immediately surrounding the physical location of a fire having a boundary that extends far enough from the fire to protect industrial fire brigade members positioned outside the hot zone from being directly exposed to flames, dense smoke, or extreme temperatures. [**600,** 2010]

3.3.29.3 *Warm Zone.* The control area immediately outside the boundary of the established hot zone having a boundary that extends far enough from the hot zone to protect personnel outside the warm zone from the adverse effects of the fire. [**600,** 2010]

Chapter 4 Entrance Requirements

4.1* General. Prior to entering training to meet the requirements of Chapters 5 through 8, the candidate shall meet the entrance and educational requirements established by the management of the industrial fire brigade and the medical- and job-related physical requirements established by NFPA 600, *Standard on Industrial Fire Brigades.*

4.2* Emergency Medical Care. The emergency medical care performance capabilities for industrial fire brigade personnel shall be determined and validated by the management of the industrial fire brigade.

4.3 Job Performance Requirements (JPRs). The JPRs shall be accomplished in accordance with the requirements of the management of the industrial fire brigade and NFPA 600, *Standard on Industrial Fire Brigades.*

4.3.1* In addition to the requirements defined in Chapters 5 through 8, the management of the industrial fire brigade shall define the site-specific requirements for each level of industrial fire brigade membership that are applicable to its employees and shall include those requirements in the evaluation of the employee at the applicable level. The process used to identify the site-specific requirements for a site or facility shall be documented.

4.3.2* Performance of each requirement of this standard shall be evaluated by individuals approved by the management of the industrial fire brigade.

4.3.3 The entrance requirements of Chapter 4 shall be met prior to beginning training at the incipient level.

4.3.4* Prior to being qualified or certified at the incipient level, the candidate shall meet the JPRs defined in Sections 5.1 and 5.2 and the applicable site-specific requirements in Section 5.3 as defined by the management of the industrial fire brigade.

4.3.4.1 The incipient level shall be the first level of progression for the subsequent levels of progression in this standard.

4.3.5 Prior to being qualified or certified at the advanced exterior level, the industrial fire brigade member shall meet the JPRs of Sections 5.1, 5.2, 6.1, and 6.2 and the applicable site-specific requirements in Sections 5.3 and 6.3 as defined by the management of the industrial fire brigade.

4.3.6 Prior to being qualified or certified at the interior structural level, the industrial fire brigade member shall meet the JPRs of Sections 5.1, 5.2, 7.1, and 7.2 and the applicable site-specific requirements in Sections 5.3 and 7.3 as defined by the management of the industrial fire brigade.

4.3.7 Prior to being qualified or certified at the interior structural/advanced exterior level, the industrial fire brigade member shall meet the JPRs of Chapters 5, 6, and 7 and the applicable site-specific requirements as defined by the management of the industrial fire brigade.

4.3.8 Prior to being qualified or certified at the fire brigade leader level, the industrial fire brigade member shall meet the JPRs of Chapter 5, 6, 7, or 8 for the level of the industrial fire brigade he or she is leading and the applicable site-specific requirements as defined by the management of the industrial fire brigade.

4.3.9* Industrial fire brigade members who operate industrial fire brigade apparatus in the performance of their duties at any level of qualification defined by this document shall meet the applicable requirements as determined by the management of the industrial fire brigade in Chapters 4 through 10 of NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications.*

4.3.9.1 Prior to operating industrial fire brigade apparatus, the fire apparatus operator/driver shall meet the entrance requirements of Chapter 4, Sections 5.1 through 5.3, and the applicable site-specific requirements as defined by the management of the industrial fire brigade.

4.3.10* Prior to responding to incidents such as civil unrest, use of weapons of mass destruction, or acts of terrorism, the management of the industrial fire brigade shall provide appropriate training to members that is consistent with their role.

4.3.11 Incident Command Training. The management of the industrial fire brigade shall provide incident management system training to industrial fire brigade members as defined by the National Incident Management System (NIMS) and NFPA 1561, *Standard on Emergency Services Incident Management System.*

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Chapter 5 Incipient Industrial Fire Brigade Member

5.1 General. This duty shall involve initiating communications, using facility communications equipment to effectively relay oral or written information, responding to alarms, returning equipment to service, and completing incident reports, according to the JPRs in 5.1.1 through 5.2.3.

5.1.1 Qualification or Certification. For qualification or certification at the incipient industrial fire brigade level, the industrial fire brigade member shall meet the entrance requirements in Chapter 4 and Sections 5.1 and 5.2; the site-specific requirements in Section 5.3 as defined by the management of the industrial fire brigade; and the requirements defined in Chapter 4 of NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents.*

5.1.2 Basic Incipient Industrial Fire Brigade Member JPRs. All industrial fire brigade members shall have a general knowledge of basic fire behavior, operation within an incident management system, operation within the emergency response operations plan for the site, the standard operating and safety procedures for the site, and site-specific hazards.

5.1.2.1 Initiate a response to a reported emergency, given the report of an emergency, facility standard operating procedures, and communications equipment, so that all necessary information is obtained and communications equipment is operated properly.

(A) Requisite Knowledge. Procedures for reporting an emergency.

(B) Requisite Skills. The ability to operate facility communications equipment, relay information, and record information.

5.1.2.2* Transmit and receive messages via the facility communications system, given facility communications equipment and operating procedures, so that the information is promptly relayed and is accurate, complete, and clear.

(A) Requisite Knowledge. Facility communications procedures and etiquette for routine traffic, emergency traffic, and emergency evacuation signals.

(B) Requisite Skills. The ability to operate facility communications equipment and discriminate between routine and emergency communications.

5.1.2.3 Respond to a facility emergency, given the necessary equipment and facility response procedures, so that the team member arrives in a safe manner.

(A) Requisite Knowledge. Facility layout, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to recognize response hazards and to safely use each piece of response equipment provided.

5.1.2.4* Return equipment to service, given an assignment, policies, and procedures, so that the equipment is inspected, damage is noted, the equipment is cleaned, and the equipment is placed in a ready state for service or is reported otherwise.

(A) Requisite Knowledge. Types of cleaning methods for various equipment, correct use of cleaning materials, and manufacturer's or facility guidelines for returning equipment to service.

(B) Requisite Skills. The ability to clean, inspect, and maintain equipment and to complete recording and reporting procedures.

5.1.2.5* Complete a basic incident report, given the report forms, guidelines, and incident information, so that all pertinent information is recorded, the information is accurate, and the report is complete.

(A) Requisite Knowledge. Content requirements for basic incident reports, the purpose and usefulness of accurate reports, consequences of inaccurate reports, and how to obtain necessary information.

(B) Requisite Skills. The ability to collect necessary information, proof reports, and operate facility equipment necessary to complete reports.

5.2 Manual Fire Suppression. This duty shall involve tasks related to the manual control of fires and property conservation activities by the incipient industrial fire brigade member.

5.2.1* Extinguish incipient fires, given an incipient fire and a selection of portable fire extinguishers, so that the correct extinguisher is chosen, the fire is completely extinguished, proper extinguisher-handling techniques are followed, and the area of origin and fire cause evidence are preserved.

(A) Requisite Knowledge. The classifications of fire; risks associated with each class of fire; and the types, rating systems, operating methods, and limitations of portable fire extinguishers.

(B) Requisite Skills. The ability to select, carry, and operate portable fire extinguishers, using the appropriate extinguisher based on the size and type of fire.

5.2.2* Conserve property, given special tools and equipment and an assignment within the facility, so that the facility and its contents are protected from further damage.

(A) Requisite Knowledge. The purpose of property conservation and its value to the organization, methods used to protect property, methods to reduce damage to property, types of and uses for salvage covers, and operations at properties protected with automatic sprinklers or special protection systems.

(B) Requisite Skills. The ability to deploy covering materials, control extinguishing agents, and cover building openings, including doors, windows, floor openings, and roof openings.

5.2.3 Exit hazardous area, given that the fire has progressed beyond the incipient stage, so that a safe haven is found and the team members' safety is maintained.

(A) Requisite Knowledge. Communication procedures, emergency evacuation methods, what constitutes a safe haven, and elements that create or indicate a hazard.

(B) Requisite Skills. The ability to follow facility evacuation routes, evaluate areas for hazards, and identify a safe haven.

5.3* Site-Specific Requirements. The management of the industrial fire brigade shall determine the site-specific requirements that are applicable to the incipient industrial fire brigade members operating on their site. The process used to determine the site-specific requirements shall be documented, and these additional JPRs added to those identified in Sections 5.1 and 5.2.

5.3.1* Attack an incipient stage fire, given a handline flowing up to 473 L/min (125 gpm), appropriate equipment, and a fire situation, so that the fire is approached safely, exposures are protected, the spread of fire is stopped, agent application is effective, the fire is extinguished, and the area of origin and fire cause evidence are preserved.

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(A) Requisite Knowledge. Types of handlines used for attacking incipient fires, precautions to be followed when advancing handlines to a fire, observable results that a fire stream has been properly applied, dangerous building conditions created by fire, principles of exposure protection, and dangers such as exposure to products of combustion resulting from fire condition.

(B) Requisite Skills. The ability to recognize inherent hazards related to the material's configuration; operate handlines; prevent water hammers when shutting down nozzles; open, close, and adjust nozzle flow; advance charged and uncharged hose; extend handlines; operate handlines; evaluate and modify water application for maximum penetration; assess patterns for origin determination; and evaluate for complete extinguishment.

5.3.2* Activate a fixed fire protection system, given a fixed fire protection system, a procedure, and an assignment, so that the steps are followed and the system operates.

(A) Requisite Knowledge. Types of extinguishing agents, hazards associated with system operation, how the system operates, sequence of operation, system overrides and manual intervention procedures, and shutdown procedures to prevent damage to the operated system or to those systems associated with the operated system.

(B) Requisite Skills. The ability to operate fixed fire protection systems via electrical or mechanical means.

5.3.3* Utilize master stream appliances, given an assignment, an extinguishing agent, and a master stream device, so that the agent is applied to the fire as assigned.

(A) Requisite Knowledge. Safe operation of master stream appliances, uses for master stream appliances, tactics using fixed master stream appliances, and property conservation.

(B) Requisite Skills. The ability to put into service a fixed master stream appliance, and to evaluate and forecast a fire's growth and development.

5.3.4* Establish a water supply for fire-fighting operations, given an assignment, a water source, and tools, so that a water supply is established and maintained.

(A) Requisite Knowledge. Water sources, operation of site water supply components, hydraulic principles, and the effect of mechanical damage and temperatures on the operability of the water supply source.

(B) Requisite Skills. The ability to operate the site water supply components and to identify damage or impairment.

5.3.5 Perform a fire safety survey in a facility, given an assignment, survey forms, and procedures, so that fire and life safety hazards are identified, recommendations for their correction are made, and unresolved issues are referred to the proper authority.

(A) Requisite Knowledge. Organizational policy and procedures, common causes of fire and their prevention, the importance of fire safety, and referral procedures.

(B) Requisite Skills. The ability to complete forms, recognize hazards, match findings to preapproved recommendations, and effectively communicate findings to the proper authority.

Chapter 6 Advanced Exterior Industrial Fire Brigade Member

6.1* General.

6.1.1 Qualification or Certification. For qualification or certification at the advanced exterior industrial fire brigade member level, the industrial fire brigade member shall meet the entrance requirements in Chapter 4 and Sections 5.1, 5.2, 6.1, and 6.2 and the site-specific requirements in Sections 5.3 and 6.3 as defined by the management of the industrial fire brigade.

6.1.2 Basic Advanced Exterior Industrial Fire Brigade Member JPRs.

6.1.2.1 Utilize a pre-incident plan, given pre-incident plans and an assignment, so that the industrial fire brigade member implements the responses detailed by the plan.

(A) Requisite Knowledge. The sources of water supply for fire protection or other fire-extinguishing agents, site-specific hazards, the fundamentals of fire suppression and detection systems including specialized agents, and common symbols used in diagramming construction features, utilities, hazards, and fire protection systems.

(B) Requisite Skills. The ability to identify the components of the pre-incident plan such as fire suppression and detection systems, structural features, site-specific hazards, and response considerations.

6.1.2.2* Interface with outside mutual aid organizations, given standard operating procedures (SOPs) for mutual aid response and communication protocols, so that a unified command is established and maintained.

(A) Requisite Knowledge. Mutual aid procedures and the structure of the mutual aid organization, site SOPs, and incident management systems.

(B) Requisite Skills. The ability to communicate with mutual aid organizations and to integrate operational personnel into teams under a unified command.

6.2 Manual Fire Suppression.

6.2.1 Use thermal protective clothing during exterior fire-fighting operations, given thermal protective clothing, so that the clothing is correctly donned within 2 minutes (120 seconds), worn, and doffed.

(A) Requisite Knowledge. Conditions that require personal protection, uses and limitations of thermal protective clothing, components of thermal protective clothing ensemble, and donning and doffing procedures.

(B) Requisite Skills. The ability to correctly don and doff thermal protective clothing and to perform assignments while wearing thermal protective clothing.

6.2.2* Use SCBA and a PASS device during exterior fire-fighting operations, given SCBA, PASS, thermal protective clothing, and other personal protective equipment, so that the SCBA and the PASS device are correctly donned and activated within 2 minutes (120 seconds), the equipment is correctly worn, controlled breathing techniques are used, emergency procedures are enacted if the SCBA fails, all low-air warnings are recognized, respiratory protection is not intentionally compromised, hazardous areas are exited prior to air depletion, and the SCBA is correctly doffed.

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(A) Requisite Knowledge. Conditions that require respiratory protection, uses and limitations of SCBA, components of SCBA, donning and doffing procedures, breathing techniques, indications for and emergency procedures used with SCBA, and physical requirements of the SCBA wearer.

(B) Requisite Skills. The ability to control breathing, use SCBA in limited-visibility conditions, replace SCBA air cylinders, use SCBA to exit through restricted passages, initiate and complete emergency procedures in the event of SCBA failure or air depletion, and donning and doffing procedures.

6.2.3* Attack an exterior fire operating as a member of a team, given a water source, a handline, personal protective equipment, tools, and an assignment, so that team integrity is maintained, the attack line is correctly deployed for advancement, access is gained into the fire area, appropriate application practices are used, the fire is approached in a safe manner, attack techniques facilitate suppression given the level of the fire, hidden fires are located and controlled, the correct body posture is maintained, hazards are avoided or managed, and the fire is brought under control.

(A) Requisite Knowledge. Principles of fire streams; types, design, operation, nozzle pressure effects, and flow capabilities of nozzles; precautions to be followed when advancing handlines to a fire; observable results that a fire stream has been correctly applied; dangerous conditions created by fire; principles of exposure protection; potential long-term consequences of exposure to products of combustion; physical states of matter in which fuels are found; the application of each size and type of attack line; the role of the backup team in fire attack situations; attack and control techniques; and exposing hidden fires.

(B) Requisite Skills. The ability to prevent water hammers when shutting down nozzles; open, close, and adjust nozzle flow and patterns; apply water using direct, indirect, and combination attacks; advance charged and uncharged 38 mm (1½ in.) diameter or larger handlines; extend handlines; replace burst hose sections; operate charged handlines of 38 mm (1½ in.) diameter or larger; couple and uncouple various handline connections; carry hose; attack fires; and locate and suppress hidden fires.

6.2.4 Conduct search and rescue operations as a member of a team, given an assignment, obscured vision conditions, personal protective equipment, scene lighting, forcible entry tools, handlines, and ladders when necessary, so that all equipment is correctly used, all assigned areas are searched, all victims are located and removed, team integrity is maintained, and team members' safety, including respiratory protection, is not compromised.

(A) Requisite Knowledge. Use of appropriate tools and equipment, psychological effects of operating in obscured conditions and ways to manage them, methods to determine if an area is tenable, primary and secondary search techniques, team members' roles and goals, methods to use and indicators of finding victims, victim removal methods, and considerations related to respiratory protection.

(B) Requisite Skills. The ability to use SCBA to exit through restricted passages, use tools and equipment for various types of rescue operations, rescue an industrial fire brigade member with functioning respiratory protection, rescue an industrial fire brigade member whose respiratory protection is not functioning, rescue a person who has no respiratory protection, and assess areas to determine tenability.

6.2.5* Conserve property operating as a member of a team, given special tools and equipment and an assignment within the facility, so that exposed property and the environment are protected from further damage.

(A) Requisite Knowledge. The purpose of property conservation and its value to the organization, methods used to protect property, methods to reduce damage to property, operations at properties protected with automatic sprinklers or special protection systems, understanding the impact of using master streams and multiple hose streams on property conservation, particularly as it can relate to the impact on outside facilities.

(B) Requisite Skills. The ability to deploy covering materials, control extinguishing agents, and cover openings and equipment such as doors, windows, floor openings, and roof openings related to the impact of outside facilities.

6.2.6 Overhaul a fire scene, given personal protective equipment, a handline, hand tools, scene lighting, and an assignment, so that structural integrity is not compromised, all hidden fires are discovered, fire cause evidence is preserved, and the fire is extinguished.

(A) Requisite Knowledge. Types of fire handlines and water application devices most effective for overhaul, water application methods for extinguishment that limit water damage, types of tools and methods used to expose hidden fire, dangers associated with overhaul, obvious signs of area of origin or signs of arson, and reasons for protection of a fire scene.

(B) Requisite Skills. The ability to deploy and operate a handline, expose void spaces without compromising structural integrity, apply water for maximum effectiveness, expose and extinguish hidden fires, recognize and preserve obvious signs of area of origin and fire cause, and evaluate for complete extinguishment.

6.2.7* Establish a water supply for fire-fighting operations, given a water source and tools, so that a water supply is established and maintained.

(A) Requisite Knowledge. Water sources, correct operation of site water supply components, hydraulic principles, and the effect of mechanical damage and temperatures on the operability of the water supply source.

(B) Requisite Skills. The ability to operate the site water supply components and identify damage or impairment.

6.2.8* Exit a hazardous area as a team, given vision-obscured conditions, so that a safe haven is found before exhausting the air supply, others are not endangered, and the team integrity is maintained.

(A) Requisite Knowledge. Personnel accountability systems, communication procedures, emergency evacuation methods, what constitutes a safe haven, elements that create or indicate a hazard, and emergency procedures for loss of air supply.

(B) Requisite Skills. The ability to operate as a team member in vision-obscured conditions, locate and follow a guideline, conserve air supply, evaluate areas for hazards, and identify a safe haven.

6.2.9* Operate as a member of a rapid intervention crew, given size-up information, basic rapid intervention tools and equipment, and an assignment, so that strategies to effectively rescue the industrial brigade member(s) are identified and implemented; hazard warning systems are established and understood by all participating personnel; incident-specific personal protective equipment is identified, provided, and utilized; physical hazards are identified; and confinement, containment, and avoidance measures are discussed.

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(A) Requisite Knowledge. Identification and care of personal protective equipment; specific hazards associated with the facility; strategic planning for rescue incidents; communications and safety protocols; atmospheric monitoring equipment needs; identification, characteristics, expected behavior, type, causes, and associated effects of personnel becoming incapacitated or trapped; and recognition of, potential for, and signs of impending building collapse.

(B) Requisite Skills. The ability to use personal protective equipment, determine resource needs, select and operate basic and specialized tools and equipment, implement communications and safety protocols, and mitigate specific hazards associated with rescue of trapped or incapacitated personnel.

6.3* Site-Specific Requirements. The JPRs in 6.3.1 through 6.3.11 shall be considered as site-specific functions of the advanced exterior industrial fire brigade member. The management of the industrial fire brigade shall determine the site-specific requirements that are applicable to the advanced exterior industrial fire brigade member operating on their site. The process used to determine the site-specific requirements shall be documented, and these additional JPRs added to those identified in Sections 6.1 and 6.2. Based on the assessment of the site-specific hazards of the facility and the duties that industrial fire brigade members are expected to perform, the management of the industrial fire brigade shall determine the specific requirements of Chapters 5 or 6 of NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, or the corresponding requirements in OSHA 29 CFR 1910.120(q) that apply.

6.3.1 Perform a fire safety survey in a facility, given an assignment, survey forms, and procedures, so that fire and life safety hazards are identified, recommendations for their correction are made, and unresolved issues are referred to the proper authority.

(A) Requisite Knowledge. Organizational policy and procedures, common causes of fire and their prevention, and the importance of fire safety and referral procedures.

(B) Requisite Skills. The ability to complete forms, recognize hazards, match findings to pre-approved recommendations, and effectively communicate findings to the proper authority.

6.3.2* Gain access to facility locations, given keys, forcible entry tools (e.g., bolt cutters, small hand tools, and ladders), and an assignment, so that areas are accessed and remain accessible during advanced exterior industrial fire brigade operations.

(A) Requisite Knowledge. Site drawing reading, access procedures, forcible entry tools and procedures, and site-specific hazards, such as access to areas restricted by railcar movement, fences, and walls. Procedures associated with special hazard areas such as electrical substations, radiation hazard areas, and other areas specific to the site, if needed.

(B) Requisite Skills. The ability to read site drawings, identify areas of low overhead clearance, identify areas on roadways having load restrictions, identify access routes to water supplies, identify hazardous materials locations, identify electrical equipment locations (overhead and belowgrade equipment), ability to open gates by manual and/or automatic means, ability to forcibly gain access to areas, and the ability to identify site hazards.

6.3.3 Utilize master stream appliances, given an assignment, an extinguishing agent, and a master stream device and supply hose, so that the appliance is set up correctly and the agent is applied as assigned.

(A) Requisite Knowledge. Correct operation of master stream appliances, uses for master stream appliances, tactics using master stream appliances, selection of the master stream appliance for different fire situations, the effect of master stream appliances on search and rescue, ventilation procedures, and property conservation.

(B) Requisite Skills. The ability to correctly put in service a master stream appliance and evaluate and forecast a fire's growth and development.

6.3.4* Extinguish an ignitible (or simulated ignitible) liquid fire operating as a member of a team, given an assignment, a handline, personal protective equipment, a foam proportioning device, a nozzle, foam concentrates, and a water supply, so that the correct type of foam concentrate is selected for the given fuel and conditions, a correctly proportioned foam stream is applied to the surface of the fuel to create and maintain a foam blanket, the fire is extinguished, re-ignition is prevented, and team protection is maintained.

(A) Requisite Knowledge. Methods by which foam prevents or controls a hazard; principles by which foam is generated; causes for poor foam generation and corrective measures; difference between hydrocarbon and polar solvent fuels and the concentrates that work on each; the characteristics, uses, and limitations of fire-fighting foams; the advantages and disadvantages of using fog nozzles versus foam nozzles for foam application; foam stream application techniques; hazards associated with foam usage; and methods to reduce or avoid hazards.

(B) Requisite Skills. The ability to prepare a foam concentrate supply for use, assemble foam stream components, master various foam application techniques, and approach and retreat from fires and spills as part of a coordinated team.

6.3.5* Control a flammable gas fire operating as a member of a team, given an assignment, a handline, personal protective equipment, and tools, so that crew integrity is maintained, contents are identified, the flammable gas source is controlled or isolated, hazardous conditions are recognized and acted upon, and team safety is maintained.

(A) Requisite Knowledge. Characteristics of flammable gases, components of flammable gas systems, effects of heat and pressure on closed containers, boiling liquid expanding vapor explosion (BLEVE) signs and effects, methods for identifying contents, water stream usage and demands for pressurized gas fires, what to do if the fire is prematurely extinguished, alternative actions related to various hazards, and when to retreat.

(B) Requisite Skills. The ability to execute effective advances and retreats, apply various techniques for water application, assess gas storage container integrity and changing conditions, operate control valves, and choose effective procedures when conditions change.

6.3.6* Extinguish an exterior fire using special extinguishing agents other than foam operating as a member of a team, given an assignment, a handline, personal protective equipment, and an extinguishing agent supply, so that fire is extinguished, re-ignition is prevented, and team protection is maintained.

(A) Requisite Knowledge. Methods by which special agents, such as dry chemical, dry powder, and carbon dioxide, prevent or control a hazard; principles by which special agents are generated; the characteristics, uses, and limitations of fire-fighting special agents; the advantages and disadvantages of using special agents; special agents application techniques; hazards associated with special agents usage; and methods to reduce or avoid hazards.

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(B) Requisite Skills. The ability to operate a special agent supply for use, master various special agents application techniques, and approach and retreat from hazardous areas as part of a coordinated team.

6.3.7* Interpret alarm conditions, given an alarm signaling system, a procedure, and an assignment, so that the alarm condition is correctly interpreted and a response is initiated.

(A) Requisite Knowledge. The different alarm detection systems within the facility; difference between alarm, trouble, and supervisory alarms; hazards protected by the detection systems; hazards associated with each type of alarm condition; knowledge of the emergency response plan; and communication procedures.

(B) Requisite Skills. The ability to understand the different types of alarms, to implement the response, and to provide information through communications.

6.3.8* Activate a fixed fire suppression system, given personal protective equipment, a fixed fire protection system, a procedure, and an assignment, so that the correct steps are followed and the system operates.

(A) Requisite Knowledge. Different types of extinguishing agents, hazards associated with system operation, how the system operates, sequence of operation, system overrides and manual intervention procedures, and shutdown procedures to prevent damage to the operated system or to those systems associated with the operated system.

(B) Requisite Skills. The ability to operate fixed fire suppression systems via electrical or mechanical means and shutdown procedures for fixed fire suppression systems.

6.3.9* Extinguish a Class C (electrical) or simulated Class C fire as a member of a team, given an assignment, a Class C fire-extinguishing appliance/extinguisher, and personal protective equipment, so that the proper type of Class C agent is selected for the condition, the selected agent is correctly applied to the fuel, the fire is extinguished, re-ignition is prevented, team protection is maintained, and the hazard is faced until retreat to safe haven is reached.

(A) Requisite Knowledge. Methods by which a Class C agent prevents or controls a hazard; methods by which Class C fires are de-energized; causes of injuries from Class C fire fighting on live Class C fires with Class A agents and the Class C agents; the extinguishing agents' characteristics, uses, and limitations; the advantages and disadvantages of de-energizing as using water fog nozzles on a Class A or Class B fire; and methods to reduce or avoid hazards.

(B) Requisite Skills. The ability to operate Class C fire extinguishers or fixed systems and approach and retreat from Class C fires as part of a coordinated team.

6.3.10* Utilize tools and equipment assigned to the industrial fire brigade, given an assignment and specific tools, so that tools are selected and correctly used under adverse conditions in accordance with manufacturer's recommendations and the policies and procedures of the industrial fire brigade.

(A) Requisite Knowledge. Available tools and equipment, their storage locations, and their correct use in accordance with recognized practices, and selection of tools and equipment given different conditions.

(B) Requisite Skills. The ability to select and use the correct tools and equipment for various tasks, follow guidelines, and restore tools and equipment to service after use.

6.3.11 Set up and use portable ladders, given an assignment, single and extension ladders, and team members as appropriate, so that hazards are assessed, the ladder is stable, the angle is correct for climbing, extension ladders are extended to the correct height with the fly locked, the top is placed against a reliable structural component, and the assignment is accomplished.

(A) Requisite Knowledge. Parts of a ladder, hazards associated with setting up ladders, what constitutes a stable foundation for ladder placement, different angles for various tasks, safety limits to the degree of angulation, and what constitutes a reliable structural component for top placement.

(B) Requisite Skills. The ability to carry ladders, raise ladders, extend ladders and lock flies, determine that a wall and roof will support the ladder, judge extension ladder height requirements, and place the ladder to avoid obvious hazards.

Chapter 7 Interior Structural Industrial Fire Brigade Member

7.1 General.

7.1.1 Qualification or Certification. For qualification or certification at the interior structural industrial fire brigade member level, the member shall meet the entrance requirements in Chapter 4 and Sections 5.1, 5.2, 7.1, and 7.2 and the site-specific requirements in Sections 5.3 and 7.3 as defined by the management of the industrial fire brigade.

7.1.2 Basic Interior Structural Fire Brigade Member JPRs.

7.1.2.1 Use thermal protective clothing during structural firefighting operations, given thermal protective clothing, so that the clothing is correctly donned within 2 minutes (120 seconds), worn, and doffed.

(A) Requisite Knowledge. Conditions that require personal protection, uses and limitations of thermal protective clothing, components of thermal protective clothing ensemble, and donning and doffing procedures.

(B) Requisite Skills. The ability to correctly don and doff thermal protective clothing and perform assignments while wearing thermal protective clothing.

7.1.2.2* Use SCBA and a PASS device during interior firefighting operations, given SCBA, a PASS device, thermal protective clothing, and other personal protective equipment, so that the SCBA and the PASS device are correctly donned and activated within 2 minutes (120 seconds), the equipment is correctly worn, controlled breathing techniques are used, emergency procedures are enacted if the SCBA fails, all low-air warnings are recognized, respiratory protection is not intentionally compromised, and hazardous areas are exited prior to air depletion and correctly doffed.

(A) Requisite Knowledge. Conditions that require respiratory protection, uses and limitations of SCBA, components of SCBA, donning and doffing procedures, breathing techniques, indications for and emergency procedures used with SCBA, and physical requirements of the SCBA wearer.

(B) Requisite Skills. The ability to control breathing, use SCBA in limited-visibility conditions, replace SCBA air cylinders, use SCBA to exit through restricted passages, initiate and complete emergency procedures in the event of SCBA failure or air depletion, and complete donning and doffing procedures.

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7.1.2.3 Utilize a pre-incident plan, given pre-incident plans and an assignment, so that the industrial fire brigade member implements the pre-incident plan.

(A) Requisite Knowledge. The sources of water supply for fire protection or other fire-extinguishing agents, site-specific hazards, the fundamentals of fire suppression and detection systems including specialized agents, and common symbols used in diagramming construction features, utilities, hazards, and fire protection systems.

(B) Requisite Skills. The ability to identify the components of the pre-incident plan such as fire suppression and detection systems, structural features, site-specific hazards, and response considerations.

7.2 Manual Fire Suppression.

7.2.1* Attack an interior structural fire operating as a member of a team, given a water source, a handline, personal protective equipment, tools, and an assignment, so that team integrity is maintained, the handline is deployed for advancement, access is gained into the fire area, correct application practices are used, the fire is approached safely, attack techniques facilitate suppression given the level of the fire, hidden fires are located and controlled, the correct body posture is maintained, hazards are avoided or managed, and the fire is brought under control.

(A) Requisite Knowledge. Principles of conducting initial fire size-up; principles of fire streams; types, design, operation, nozzle pressure effects, and flow capabilities of nozzles; precautions to be followed when advancing hose lines to a fire; observable results that a fire stream has been correctly applied; dangerous building conditions created by fire; principles of exposure protection; potential long-term consequences of exposure to products of combustion; physical states of matter in which fuels are found; common types of accidents or injuries and their causes; and the application of each size and type of handlines, the role of the backup team in fire attack situations, attack and control techniques, and exposing hidden fires.

(B) Requisite Skills. The ability to prevent water hammers when shutting down nozzles; open, close, and adjust nozzle flow and patterns; apply water using direct, indirect, and combination attacks; advance charged and uncharged 38 mm (1½ in.) diameter or larger handlines; extend handlines; replace burst hose sections; operate charged handlines of 38 mm (1½ in.) diameter or larger; couple and uncouple various handline connections; carry hose; attack fires; and locate and suppress hidden fires.

7.2.2 Force entry into a structure, given personal protective equipment, tools, and an assignment, so that the tools are used, the barrier is removed, and the opening is in a safe condition and ready for entry.

(A) Requisite Knowledge. Basic construction of typical doors, windows, and walls within the facility; operation of doors, windows, and their associated locking mechanisms; and the dangers associated with forcing entry through doors, windows, and walls.

(B) Requisite Skills. The ability to transport and operate site-specific tools to force entry through doors, windows, and walls using assorted methods and tools.

7.2.3* Perform ventilation on a structure operating as a member of a team, given an assignment, personal protective equipment, and tools, so that a sufficient opening is created, all ventilation barriers are removed, structural integrity is not compromised, and products of combustion are released from the structure.

(A) Requisite Knowledge. The principles, advantages, limitations, and effects of horizontal and vertical ventilation; safety considerations when venting a structure; the methods of heat transfer; the principles of thermal layering within a structure on fire; fire behavior in a structure; the products of combustion found in a structure fire; the signs, causes, effects, and prevention of backdrafts; and the relationship of oxygen concentration to life safety and fire growth.

(B) Requisite Skills. The ability to transport and operate tools and equipment to create an opening and implement ventilation techniques.

7.2.4* Overhaul a fire scene, given personal protective equipment, attack line, hand tools, a flashlight, and an assignment, so that structural integrity is not compromised, all hidden fires are discovered, fire cause evidence is preserved, and the fire is extinguished.

(A) Requisite Knowledge. Types of fire handlines and application devices most effective for overhaul, application methods for extinguishing agents that limit damage, types of tools and methods used to expose hidden fire, dangers associated with overhaul, obvious signs of area of origin and signs of arson, and reasons for protection of fire scene.

(B) Requisite Skills. The ability to deploy and operate handlines, expose void spaces without compromising structural integrity, apply extinguishing agents for maximum effectiveness, expose and extinguish hidden fires, recognize and preserve obvious signs of area of origin and fire cause, and evaluate for complete extinguishment.

7.2.5* Exit a hazardous area as a team, given vision-obscured conditions, so that a safe haven is found before exhausting the air supply, others are not endangered, and the team integrity is maintained.

(A) Requisite Knowledge. Personnel accountability systems, communication procedures, emergency evacuation methods, what constitutes a safe haven, elements that create or indicate a hazard, and emergency procedures for loss of air supply.

(B) Requisite Skills. The ability to operate as a team member in vision-obscured conditions, locate and follow a guideline, conserve air supply, and evaluate areas for hazards and identify a safe haven.

7.2.6* Establish a water supply for fire-fighting operations, given a water source and tools, so that a water supply is established and maintained.

(A) Requisite Knowledge. Water sources, correct operation of site water supply components, hydraulic principles, and the effect of mechanical damage and temperatures on the operability of the water supply source.

(B) Requisite Skills. The ability to operate the site water supply components and take action to address damage or impairment.

7.2.7 Interface with outside mutual aid organizations, given SOPs for mutual aid response and communication protocols, so that a unified command is established and maintained.

(A) Requisite Knowledge. Mutual aid procedures and the structure of the mutual aid organization, site SOPs, and incident management systems.

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(B) Requisite Skills. The ability to communicate with mutual aid organizations and to integrate operational personnel into teams under a unified command.

7.2.8 Conduct search and rescue operations as a member of a team, given an assignment, obscured vision conditions, personal protective equipment, a flashlight, forcible entry tools, handlines, and ladders when necessary, so that all equipment is correctly used, all assigned areas are searched, all victims are located and removed, team integrity is maintained, and team members' safety, including respiratory protection, is not compromised.

(A) Requisite Knowledge. Use of appropriate tools and equipment, psychological effects of operating in obscured conditions and ways to manage them, methods to determine if an area is tenable, primary and secondary search techniques, team members' roles and goals, methods to use and indicators of finding victims, victim removal methods, and considerations related to respiratory protection.

(B) Requisite Skills. The ability to use SCBA to exit through restricted passages, use tools and equipment for various types of rescue operations, rescue an industrial fire brigade member whose respiratory protection is not functioning, rescue a person who has no respiratory protection, and assess areas to determine tenability.

7.2.9* Conserve property operating as a member of a team, given special tools and equipment and an assignment within the facility, so that exposed property and the environment are protected from further damage.

(A) Requisite Knowledge. The purpose of property conservation and its value to the organization, methods used to protect property, methods to reduce damage to property, types of and uses for salvage covers, operations at properties protected with automatic sprinklers or special protection systems, and understanding the impact of using master streams and multiple hose streams on property conservation, particularly as it can relate to the impact on outside facilities.

(B) Requisite Skills. The ability to deploy covering materials, control extinguishing agents, and cover building openings, including doors, windows, floor openings, and roof openings.

7.2.10* Operate as a member of a rapid intervention crew, given size-up information, basic rapid intervention tools and equipment, and an assignment, so that strategies to effectively rescue the brigade member(s) are identified and implemented; hazard warning systems are established and understood by all participating personnel; incident-specific personal protective equipment is identified, provided, and utilized; physical hazards are identified; and confinement, containment, and avoidance measures are discussed.

(A) Requisite Knowledge. Identification and care of personal protective equipment; specific hazards associated with the facility; strategic planning for rescue incidents; communications and safety protocols; atmospheric monitoring equipment needs; identification, characteristics, expected behavior, type, causes, and associated effects of personnel becoming incapacitated or trapped; and recognition of, potential for, and signs of impending building collapse.

(B) Requisite Skills. The ability to use personal protective equipment, determine resource needs, select and operate basic and specialized tools and equipment, implement communications and safety protocols, and mitigate specific hazards associated with rescue of trapped or incapacitated personnel.

7.3* Site-Specific Requirements. The management of the industrial fire brigade shall determine the site-specific requirements that are applicable to the interior structural industrial fire brigade member operating on their site. The process used to determine the site-specific requirements shall be documented, and these additional JPRs added to those identified in Sections 7.1 and 7.2. Based on the assessment of the site-specific hazards of the facility and the duties that industrial fire brigade members are expected to perform, the management of the industrial fire brigade shall determine the specific requirements of Chapters 5 and 6 of NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, or the corresponding requirements in OSHA 29 CFR 1910.120(q) that apply.

7.3.1* Interpret alarm conditions, given an alarm signaling system, a procedure, and an assignment, so that the alarm condition is correctly interpreted and a response is initiated.

(A) Requisite Knowledge. The different alarm detection systems within the facility; difference between alarm, trouble, and supervisory alarms; hazards protected by the detection systems; hazards associated with each type of alarm condition; the emergency response plan; and communication procedures.

(B) Requisite Skills. The ability to understand the different types of alarms, to implement the response, and to provide information through communications.

7.3.2* Activate a fixed fire protection system, given required personal protective equipment, a fixed fire protection system, a procedure, and an assignment, so that the procedures are followed and the system operates.

(A) Requisite Knowledge. Different types of extinguishing agents on site, manual fire suppression activities within areas covered by fixed fire suppression systems, hazards associated with system operation, how the system operates, sequence of operation, system overrides and manual intervention procedures, and shutdown procedures to prevent damage to the operated system or to those systems associated with the operated system.

(B) Requisite Skills. The ability to operate fixed fire suppression systems via electrical or mechanical means and to shut down fixed fire suppression systems.

7.3.3 Utilize master stream appliances, given an assignment, an extinguishing agent, a master stream device, and a supply hose, so that the appliance is set up correctly and the agent is applied as assigned.

(A) Requisite Knowledge. Correct operation of master stream appliances, uses for master stream appliances, tactics using master stream appliances, selection of the master stream appliances for different fire situations, and the effect of master stream appliances on search and rescue, ventilation procedures, and property conservation.

(B) Requisite Skills. The ability to correctly put in service a master stream appliance and to evaluate and forecast a fire's growth and development.

7.3.4* Extinguish an ignitible liquid fire operating as a member of a team, given an assignment, a handline, personal protective equipment, a foam proportioning device, a nozzle, foam concentrates, and a water supply, so that the correct type of foam concentrate is selected for the given fuel and conditions, a correctly proportioned foam stream is applied to the surface of the fuel to create and maintain a foam blanket, fire is extinguished, re-ignition is prevented, and team protection is maintained.

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(A) Requisite Knowledge. Methods by which foam prevents or controls a hazard; principles by which foam is generated; causes for poor foam generation and corrective measures; difference between hydrocarbon and polar solvent fuels and the concentrates that work on each; the characteristics, uses, and limitations of fire-fighting foams; the advantages and disadvantages of using fog nozzles versus foam nozzles for foam application; foam stream application techniques; hazards associated with foam usage; and methods to reduce or avoid hazards.

(B) Requisite Skills. The ability to prepare a foam concentrate supply for use, assemble foam stream components, master various foam application techniques, and approach and retreat from fires and spills as part of a coordinated team.

7.3.5* Control a flammable gas fire operating as a member of a team, given an assignment, a handline, personal protective equipment, and tools, so that team integrity is maintained, contents are identified, the flammable gas source is controlled or isolated, hazardous conditions are recognized and acted upon, and team safety is maintained.

(A) Requisite Knowledge. Characteristics of flammable gases, components of flammable gas systems, effects of heat and pressure on closed containers, BLEVE signs and effects, methods for identifying contents, water stream usage and demands for pressurized gas fires, what to do if the fire is prematurely extinguished, alternative actions related to various hazards, and when to retreat.

(B) Requisite Skills. The ability to execute effective advances and retreats, apply various techniques for water application, assess gas storage container integrity and changing conditions, operate control valves, and choose effective procedures when conditions change.

7.3.6* Extinguish a fire using special extinguishing agents other than foam operating as a member of a team, given an assignment, a handline, personal protective equipment, and an extinguishing agent supply, so that fire is extinguished, re-ignition is prevented, and team protection is maintained.

(A) Requisite Knowledge. Methods by which special agents, such as dry chemical, dry powder, and carbon dioxide, prevent or control a hazard; principles by which special agents are generated; the characteristics, uses, and limitations of fire-fighting special agents; the advantages and disadvantages of using special agents; special agent application techniques; hazards associated with special agent usage; and methods to reduce or avoid hazards.

(B) Requisite Skills. The ability to operate a special agent supply for use, master various special agents application techniques, and approach and retreat from hazardous areas as part of a coordinated team.

7.3.7* Utilize tools and equipment assigned to the industrial fire brigade, given an assignment and specific tools, so that tools are selected and correctly used under adverse conditions in accordance with manufacturer's recommendations and the policies and procedures of the industrial fire brigade.

(A) Requisite Knowledge. Available tools and equipment, their storage locations, and their correct use in accordance with recognized practices; and selection of tools and equipment given different conditions.

(B) Requisite Skills. The ability to select and use the correct tools and equipment for various tasks, follow guidelines, and restore tools and equipment to service after use.

7.3.8 Set up and use portable ladders, given an assignment, single and extension ladders, and team members as appropriate, so that hazards are assessed, the ladder is stable, the angle is correct for climbing, extension ladders are extended to the correct height with the fly locked, the top is placed against a reliable structural component, and the assignment is accomplished.

(A) Requisite Knowledge. Parts of a ladder, hazards associated with setting up ladders, what constitutes a stable foundation for ladder placement, different angles for various tasks, safety limits to the degree of angulation, and what constitutes a reliable structural component for top placement.

(B) Requisite Skills. The ability to carry ladders, raise ladders, extend ladders and lock flies, determine that a wall and roof will support the ladder, judge extension ladder height requirements, and place the ladder to avoid obvious hazards.

7.3.9* Interface with outside mutual aid organizations, given SOPs for mutual aid response and communication protocols, so that a unified command is established and maintained.

(A) Requisite Knowledge. Mutual aid procedures and the structure of the mutual aid organization, site SOPs, and incident management systems.

(B) Requisite Skills. The ability to communicate with mutual aid organizations and to integrate operational personnel into teams under a unified command.

7.3.10 Perform a fire safety survey in a facility, given an assignment, survey forms, and procedures, so that fire and life safety hazards are identified, recommendations for their correction are made, and unresolved issues are referred to the proper authority.

(A) Requisite Knowledge. Organizational policy and procedures, common causes of fire and their prevention, and the importance of fire safety and referral procedures.

(B) Requisite Skills. The ability to complete forms, recognize hazards, match findings to pre-approved recommendations, and effectively communicate findings to the proper authority.

7.3.11* Extinguish a Class C (electrical) fire as a member of a team, given an assignment, a Class C fire-extinguishing appliance/extinguisher, and personal protective equipment, so that the type of Class C agent is selected for the condition, a selected agent is correctly applied to the fuel, fire is extinguished, re-ignition is prevented, team protection is maintained, and the hazard is faced until retreat to safe haven is reached.

(A) Requisite Knowledge. Methods by which a Class C agent prevents or controls a hazard; methods by which Class C fires are de-energized; causes of injuries from Class C fire fighting on live Class C fires with Class A agents and the Class C agents; the extinguishing agents' characteristics, uses, and limitations; the advantages and disadvantages of de-energizing using water fog nozzles on a Class A or Class B fire; and methods to reduce or avoid hazards.

(B) Requisite Skills. The ability to operate Class C fire extinguishers or fixed systems and approach and retreat from Class C fires as part of a coordinated team.

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Chapter 8 Industrial Fire Brigade Leader

8.1 General.

8.1.1 This duty shall involve establishing command, using emergency response procedures, and overseeing the emergency response and other administrative duties as outlined in Chapter 4 of NFPA 600, *Standard on Industrial Fire Brigades,* depending on the site organizational statement.

8.1.2 Qualification or Certification. For qualification or certification as an industrial fire brigade leader, the member shall meet the JPRs of the level of the industrial fire brigade in which they are leading in accordance with the requirements of Chapters 5, 6, or 7 and the JPRs as defined in Sections 8.1 and 8.2.

8.1.3 General Requisite Knowledge. The organizational structure of the industrial fire brigade; operating procedures for administration, emergency operations, and safety; information management and record keeping; incident management system; methods used by leaders to obtain cooperation within a group of subordinates; and policies and procedures regarding the operation of the industrial fire brigade.

8.1.4 General Prerequisite Skills. The ability to operate at all levels in the incident management system as defined by the National Incident Management System (NIMS) and NFPA 1561, *Standard on Emergency Services Incident Management System.*

8.2 Supervisory Functions.

8.2.1 Assign tasks or responsibilities to members, given an assignment at an emergency situation, so that the instructions are complete, clear, and concise; safety considerations are addressed; and the desired outcomes are conveyed.

(A) Requisite Knowledge. Verbal communications during emergency situations, techniques used to make assignments under stressful situations, and methods of confirming understanding of assigned tasks.

(B) Requisite Skills. The ability to condense instructions for frequently assigned unit tasks based upon training and SOPs.

8.2.2 Develop an initial action plan, given size-up information for an incident and assigned emergency response resources, so that resources are deployed to control the emergency.

(A)* Requisite Knowledge. Elements of a size-up, SOPs for emergency operations, and fire behavior.

(B) Requisite Skills. The ability to analyze emergency scene conditions, to allocate resources, and to communicate verbally.

8.2.3* Implement an action plan at an emergency situation, given assigned resources, type of incident, preliminary plan, and industrial fire brigade safety policies and procedures, so that resources are deployed to mitigate the situation and team safety is maintained.

(A) Requisite Knowledge. SOPs, resources available, basic fire control and emergency operation procedures, an incident management system, rapid intervention crew (RIC) procedures, personnel accountability system, common causes of personal injury during industrial fire brigade activities, safety policies and procedures, and basic industrial fire brigade member safety.

(B)* Requisite Skills. The ability to implement an incident management system, to communicate verbally, to supervise and account for assigned personnel under emergency conditions, and to identify safety hazards.

8.2.4* Coordinate multiple resources, such as in-house and mutual aid, during emergency situations, given an incident requiring multiple resources and a site incident management system, so that the site incident management system is implemented and the required resources, their assignments, and safety considerations for successful control of the incident are identified.

(A) Requisite Knowledge. SOPs and local resources available for the handling of the incident under emergency situations, basic fire control and emergency operation procedures, an incident management system, and a personnel accountability system.

(B) Requisite Skills. The ability to implement the site incident management system, to communicate verbally, and to supervise and account for assigned personnel under emergency conditions.

8.2.5 Implement support operations at an incident, given an assignment and available resources, so that scene lighting is adequate for the tasks to be undertaken, personnel rehabilitation is facilitated, and the support operations facilitate the incident objectives.

(A) Requisite Knowledge. Resource management protocols, principles for establishing lighting, and rescuer rehabilitation practices and procedures.

(B) Requisite Skills. The ability to manage resources, provide power, set up lights, use lighting, select rehab areas, and personnel rotations.

8.2.6 Direct members during a training evolution, given a training evolution and training policies and procedures, so that the evolution is performed in accordance with safety plans, and the stated objectives or learning outcomes are achieved as directed.

(A) Requisite Knowledge. Oral communication techniques to facilitate learning.

(B) Requisite Skills. The ability to distribute issue-guided directions to members during training evolutions.

Chapter 9 Industrial Fire Brigade Support Member

9.1 General.

9.1.1 This duty shall involve supporting the operational activities of the fire brigade. In most cases, support member personnel are not expected to perform manual fire suppression activities in the event of an emergency but are expected to perform those specialized tasks, that they have been assigned, depending on the site organizational statement.

9.1.2 Qualification. For qualification as an industrial fire brigade support member, the member shall meet the JPRs of the level of the industrial fire brigade support member in accordance with the requirements of this chapter. Support members shall not be permitted to enter the warm zone or the hot zone.

9.1.3 Education, Training, and Drills.

9.1.3.1 All industrial fire brigade support members shall receive training and education at least annually.

9.1.3.2 All industrial fire brigade support members shall participate in a drill at least annually.

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9.1.3.3 Training and drills that involve supporting live fire evolutions shall be performed in accordance with recognized health and safety precautions.

9.1.3.4 The support members shall have an understanding of how to perform their duties without being engaged by emergency operations.

9.1.4 Protective Clothing and Protective Equipment. Since the industrial fire brigade support member will not be entering the warm or hot zones, neither thermal protective clothing nor SCBA shall be needed.

9.1.5* Medical. Each industrial fire brigade support member shall meet the medical and job-related performance requirements as specified in Section 4.5 of NFPA 600.

9.1.6 Basic Industrial Fire Brigade Support Member. All industrial fire brigade support members shall have a general knowledge of site-specific hazards, operation within an incident management system, operation within the emergency response operations plan for the site, standard operating and safety procedures for the site, and special procedures and duties of the particular industrial support team member's role.

9.1.7 Initiate a response to a reported emergency, given the report of an emergency, facility standard operating procedures, and communication equipment, so that all necessary information is obtained and communication equipment is operating properly.

(A) Requisite Knowledge. Procedures for reporting an emergency.

(B) Requisite Skills. The ability to operate facility communication equipment, relay information, and record information.

9.1.8 Respond to a facility emergency, given the necessary equipment and facility response procedures, so that the support member arrives at the assigned duty location.

(A) Requisite Knowledge. Facility layout, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to recognize response hazards and to operate within the duties for that support member position.

9.2 Site-Specific Requirements. The management of the industrial fire brigade shall determine the site-specific requirements that are applicable to the industrial fire brigade support members operating on their site. The process used to determine the site-specific requirements shall be documented, and these additional JPRs added to those identified above. The duties shall be selected from the list of examples located in Annex B; the management of the industrial fire brigade can develop additional duties for support members as needed.

9.2.1 Building Evacuation. Respond to a facility emergency, given equipment as determined by the AHJ, and facility evacuation procedures, so that the all building personnel are evacuated to their assigned assembly point.

(A) Requisite Knowledge. Facility evacuation plans and building layout, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to assist building occupants to evacuate in a safe manner and to safely operate within the duties for that support member position.

9.2.2 Sprinkler System Control. Respond to a facility emergency, given facility sprinkler system or other fixed fire protection equipment and facility fixed fire protection equipment operation procedures, so that the control of the automatic sprinkler protection system within the fire area or the facility is maintained in the event of fire.

(A) Requisite Knowledge. Facility fixed fire protection equipment operating procedures, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to operate the fixed fire protection system equipment and the understanding of the site emergency procedures to know when to operate the fixed fire protection systems to safely operating within the duties for that support member position.

9.2.3 Electrical Power Control. Respond to a facility emergency, given the site electrical system and facility electrical equipment operation procedures, so that the control of the electrical system within the fire area or the facility is maintained in the event of fire.

(A) Requisite Knowledge. Facility electrical equipment operating procedures, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to operate the electrical system equipment and the understanding of the site emergency procedures to know when to de-energize electrical systems to safely operating within the duties for that support member position.

9.2.4 Utility Control. Respond to a facility emergency, given the plant utilities (e.g., heating, ventilation, and air conditioning; steam, water, LP-Gas or natural gas, and other liquid or vapor piping systems) and facility utilities operation procedures, so that the control of the utilities system within the fire area or the facility is maintained in the event of fire.

(A) Requisite Knowledge. Facility utilities (e.g., heating, ventilation, and air conditioning; steam, water, LP-Gas or natural gas, and other liquid or vapor piping systems) operating procedures, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to operate the plant utilities (e.g., heating, ventilation, and air conditioning; steam, water, LP-Gas or natural gas, and other liquid or vapor piping systems) equipment and the understanding of the site emergency procedures to know when to operate or de-energize systems to safely operating within the duties for that support member position.

9.2.5 Process Control. Respond to a facility emergency, given the process equipment (petrochemical processing, refinery processing, computer processing, etc.) and process operation procedures, so that the control of the process control system within the fire area or the facility is maintained in the event of fire.

(A) Requisite Knowledge. Facility process equipment (petrochemical processing, refinery processing, computer processing, etc.) operating procedures, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to operate the process equipment (petrochemical processing, refinery processing, computer processing, etc.) and the understanding of the site emergency procedures to know when to operate or de-energize systems to safely operating within the duties for that support member position.

9.2.6 Fire Pump/Fire Water System Operation. Respond to a facility emergency, given the fire pump/fire water system and fire pump/fire water system procedures, so that the control of

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fire pump/fire water system within the fire area or the facility is maintained in the event of fire.

(A) Requisite Knowledge. Facility fire pump/fire water operating procedures, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to operate the fire pump/fire water systems and the understanding of the site emergency procedures to know when to operate or de-energize systems to safely operating within the duties for that support member position.

9.2.7 Salvage. Respond to a facility emergency, given salvage equipment and salvage procedures, so that salvage operations in the cold zone within the fire area or the facility are completed in the event of fire.

(A) Requisite Knowledge. Facility salvage operating procedures in the cold zone, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to operate salvage equipment and understanding of the site emergency procedures to know when and how to perform salvage operations safely within the duties for that support member position.

9.2.8 Traffic Control and Site Security Duties. Respond to a facility emergency, given traffic control and security equipment and security procedures, so that traffic control and security outside the fire zone and in the cold zone within the fire area or the facility are completed in the event of fire.

(A) Requisite Knowledge. Facility traffic control and security procedures in the cold zone, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to use traffic control and security devices and to understand the site emergency procedures and traffic control and security procedures to know when and how to perform traffic control and security operations safely within the duties for that support member position.

9.2.9 Escort. Respond to a facility emergency, given escort equipment and escort procedures, so that escorting of personnel outside the fire zone and in the cold zone within the fire area or the facility is completed in the event of fire.

(A) Requisite Knowledge. Escort procedures in the cold zone, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to use escort devices and to understand the site emergency procedures and escort procedures to know when and how to perform escort operations safely within the duties for that support member position.

9.2.10 General Support Services. Respond to a facility emergency, given general support services equipment and specific support services procedures as determined by the facility fire brigade management, so that general support services are completed in the event of fire.

(A) Requisite Knowledge. General support services procedures in the cold zone, special hazards, and emergency response procedures.

(B) Requisite Skills. The ability to use necessary specific support services devices as determined by the facility fire brigade management and to understand the site emergency procedures and specific support services procedures to know when and how to perform specific support services operations safely within the duties for that support member position.

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.1.1 This standard is intended to comply with the industrial fire brigade–related requirements of 29 CFR 1910.156, Subpart L and the industrial fire brigade–related requirements of 29 CFR 1910.134 (2 in/2 out rule). Further, this standard is intended to ensure the industrial fire brigade member has the appropriate degree of occupational safety and health while performing industrial fire brigade duties, just as NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, ensures an appropriate degree of occupational safety and health for municipal fire department members.

For support functions beyond the scope of this document, see Annex B.

A.1.3.1 See Annex C for additional information regarding the use of JPRs for training and evaluation. For support functions beyond the scope of this document, see Annex B.

A.1.3.1.1 Management should define the industrial fire brigades' training requirements to maintain competency for assigned emergency duties that management expects their personnel are to perform. After initial training, recurring training should be required for the industrial fire brigade member to maintain a level of proficiency to perform their duties. 29 CFR 1910 Subpart A paragraphs 1910.120(q), 1910.134(k), 1910.156(c), NFPA 600, *Standard on Industrial Fire Brigades*, Section 4.3, and NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, define some of the requirements for maintaining proficiency.

A.1.4 The potential exposure and training separates an organized industrial fire brigade from designated employees (as defined by OSHA) who have some fire response duties in the general work area. The scope of industrial fire brigade actions and responsibilities is based on the specific response duties that the industrial fire brigade members are expected to perform. If an industrial fire brigade member is not expected to perform a particular fire-fighting function, then management has no obligation to train or equip the industrial fire brigade member to perform that function. [**600:**A.1.4]

A.1.4.2 Designated employees who are intended to respond to incipient fires in their immediate work area should receive training commensurate with the response duties they are expected to perform. Their responsibilities normally are limited to sounding an alarm, taking immediate action to extinguish the fire, and evacuating the area. [**600:**A.1.4.2]

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.

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A.3.2.2 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.3.3.6.1 Advanced Exterior Fire Fighting. Advanced exterior fire fighting often requires industrial fire brigade members to contain, control, and extinguish exterior fires involving site-specific hazards, such as flammable and combustible liquid spills or leaks, liquefied petroleum gas releases, and electrical substations. Advanced exterior fire fighting is usually performed using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application of specialized agents. Thermal protective clothing is required, and the use of self-contained breathing apparatus (SCBA) could be required. [**600:**A.3.3.8.1]

A.3.3.6.4 Interior Structural Fire Fighting. This definition is extracted from 29 CFR 1910. Rescue is the activity of removing victims by an industrial fire brigade as part of fire-fighting activities. Rescue activities requiring specialized equipment and training, such as confined space and high angle rescue, are not included in this standard. [**600:**A.3.3.8.4]

A.3.3.8 Incipient Stage. A fire is considered to be beyond the incipient stage when the use of thermal protective clothing or self-contained breathing apparatus (SCBA) is required or an industrial fire brigade member is required to crawl on the ground or floor to stay below smoke and heat.

A.3.3.25 Support Member. When organizing the industrial fire brigade, management should take into consideration the need for specialized duties required in the event of a fire or related emergency and should assign personnel to the industrial fire brigade to ensure that these duties are accomplished. In most cases, personnel are not expected to perform manual fire suppression activities in the event of an emergency but are expected to perform only those specialized tasks for which they have been chosen. *(See B.2.1 through B.2.9 for a list of specialized tasks.)*

A.3.3.28 Thermal Protective Clothing. For the purpose of this standard, full protective clothing for industrial fire brigade members above the incipient level is considered to include a turnout coat, protective trousers, fire-fighting boots, fire-fighting gloves, a protective hood, and a fire-fighting helmet. All equipment should be compliant with NFPA or applicable standards.

A.4.1 For information on medical requirements, see OSHA requirements in 29 CFR 1910.156, 29 CFR 1910.134, or NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments.*

A.4.2 Where management determines that emergency medical care capability is required to be provided by the industrial fire brigade personnel, programs such as the Department of Transportation First Responder and American Red Cross curricula offer models that can be followed.

A.4.3.1 See Annex D.

A.4.3.2 It is recommended, where practical, that evaluators be individuals who are not directly involved as instructors for the requirement being evaluated.

A.4.3.4 The Technical Committee on Industrial Fire Brigades Professional Qualifications uses the phrase "qualified or certified" throughout the standard because the industrial fire brigade management should determine whether industrial fire brigade members will be certified or qualified to perform emergency response activities. Many different factors are part of the industrial fire brigade management's decision-making process for certification or qualification. These factors can include company policy, local or state statutes, and training agency policy. It is not the intent of this standard to determine if industrial fire brigade members will be certified or qualified upon the completion of applicable JPRs.

A.4.3.9 NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications,* provides the framework for an industrial fire brigade apparatus driver/operator qualification program. Each fire brigade should develop a similar program that ensures that JPRs are developed for the functions that driver/operators will be expected to perform.

It is recognized that some of the JPRs listed in NFPA 1002 do not apply, such as the requirement that driver/operators should meet the requirements of NFPA 1001, *Standard for Fire Fighter Professional Qualifications,* Sections 5.1 and 5.2. In addition, when a practical driving test is developed, it should incorporate situations that industrial fire brigade vehicle operator/drivers will experience, which might not include all of the situations listed in NFPA 1002, Section 4.3.

A.4.3.10 The management of the industrial fire brigade should determine the response expected from the industrial fire brigade during civil unrest, events involving weapons of mass destruction, or other acts of terrorism. At a minimum, industrial fire brigade members should receive basic awareness training on explosives, chemical and biological agents, and radiation, which are often associated with weapons of mass destruction or acts of terrorism, as part of NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents,* awareness-level training *(see 5.1.1).* This training will allow them to take limited defensive actions such as evacuation and isolation. If the fire brigade members are going to respond offensively, they should be provided with training that describes the types of hazards and protection from those hazards that they might encounter. The hazards include, but are not limited to, rioting, gunfire, chemical and/or biological agents, radiation, and improvised explosive devices (IEDs). Training on these hazards is available from several local, county, state, and federal agencies. Additional procedures should also be written for these types of events clearly documenting the expected response.

A.5.1.2.2 The industrial fire brigade member should be familiar with the communication systems and understand how the industrial fire brigade transmits and receives messages on the site. Management of the industrial fire brigade has the responsibility to ensure that industrial fire brigade members are trained to site operating procedures. Facility communications equipment can include, but not be limited to, public address systems, intercom systems, radios, pagers, sirens, beacons, and messengers. All industrial fire brigade members should understand the site procedures to address the intent of 4.4.6 of NFPA 600, *Standard on Industrial Fire Brigades.*

A.5.1.2.4 The incipient level industrial fire brigade member should be able to determine equipment operability and to ensure that equipment is returned to service as per site policy or procedure. Industrial fire brigade members could or could not be required by the management of the industrial fire brigade to perform inspections, maintenance, cleaning, or other-

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wise to service emergency response equipment, but it is incumbent upon the employer to ensure that the equipment is maintained per manufacturer requirements and appropriate codes and standards (e.g., NFPA 10, *Standard for Portable Fire Extinguishers*; NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*; and NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose*). The responsibilities for the maintaining, servicing, and cleaning of emergency response equipment should be identified in the industrial fire brigade organizational statement.

A.5.1.2.5 The incident report could only entail contacting a supervisor and letting the supervisor know there was a fire, what agent was used, and any damage that occurred. The intent is to ensure that the management of the industrial fire brigade trains employees to provide all pertinent information for reporting fire incidents at the site. The report assists the management of the industrial fire brigade to accomplish the incident documentation.

A.5.2.1 The incipient industrial fire brigade member should be able to extinguish fires in stacked or piled materials such as hay bales, pallets, lumber, piles of mulch, sawdust, other bulk Class A materials, or small, unattached structures that are attacked from the exterior. The tactics for extinguishing each of these types of fires are similar enough to be included in one JPR. Live fire evolutions should be conducted in accordance with the requirements of NFPA 1403, *Standard on Live Fire Training Evolutions*. In areas where environmental or other concerns restrict the use of normal fuels for training evolutions, properly installed and monitored gas-fueled fire simulators can be substituted.

With regard to Class D fires, some facilities utilize pyrophoric, water-reactive dry chemicals, and reactive metals such as magnesium, aluminum, and sodium in their facilities and catalysts. Industrial fire brigade members need to know that ordinary extinguishing agents such as water, foam, and carbon dioxide can react with these materials. Members should be trained in recognizing these site-specific hazards and should be trained in the use of Class D and other extinguishing agents. Members need to know that automatic fire protection systems can need to be shut down; therefore, members should be trained in the proper procedures for shutting them down.

Class K fires are fires in cooking appliances that involve combustible cooking media such as vegetable or animal oils and fats. Some facilities have cooking facilities that can have fires involving Class K–type fires. Members should be trained in recognizing these site-specific hazards and should also be trained in the use of Class K fire protection systems and extinguishers.

A.5.2.2 Industrial fire brigade members should be aware of the environmental concerns associated with fire extinguishment and runoff. Brigade members should be familiar with site-specific areas where these types of issues pose potential problems. Areas could include storm drains, sumps, bodies of water, terrain, and other areas where pollution could cause environmental concerns for the facility/site. Depending on the material(s) burning, the brigade members need to deal with concerns regarding flammable liquids or chemicals as well as the foam or other extinguishing agents, including water. The extinguishing agents need to be accounted for in the event of an environmental issue.

A.5.3 Each site can vary significantly in the amount and types of fire protection systems, tools, and equipment that are specific to that site. The management of the industrial fire brigade should document in the site SOPs the types of fire protection systems, tools, and equipment that are available for industrial fire brigade use. If the fire protection system, tool, or equipment is available for use by the industrial fire brigade, the authority having jurisdiction should ensure that the appropriate section knowledge and skills are tested. *(See Annex D.)*

A.5.3.1 When possible, incipient industrial fire brigade members should attack a fire as a team to enhance the safety of the fire-fighting operation. Each incipient industrial fire brigade member should maintain correct body posture when attacking a fire with a handline. Caution should be taken when advancing a handline during a fire attack.

Incipient industrial fire brigade members can handle various-sized handlines during offensive and defensive operations. The handline diameter should be determined by the management of the industrial fire brigade and is site specific. Water pressure and flow rate depend on the water supply and the type of facility operation.

A.5.3.2 The incipient industrial fire brigade member needs to have an understanding of fire protection systems provided. Members need to know how to manually activate systems, their impact on other plant systems and safety of personnel, and policies and procedures for notification of the industrial fire brigade when systems are out of service.

A.5.3.3 Incipient industrial fire brigades who are expected to utilize master stream appliances should be able to perform defensive actions, utilizing master stream appliances safely and effectively.

A.5.3.4 The industrial fire brigade member should understand hydraulic principles and their effect on water flow. Operation of site water supplies could consist of opening valves or hydrants, starting pumps, drafting from static sources, and utilizing standpipes. The fire brigade member should also understand the specific requirements of the site water supply components and their operation (e.g., correct hydrant operation, including drainage and shutdown, and operation of pressure control devices).

A.6.1 Advanced exterior fire fighting is offensive fire fighting performed outside of an enclosed structure when the fire is beyond the incipient stage. Advanced exterior fire fighting often requires industrial fire brigade members to contain, control, and extinguish exterior fires involving site-specific hazards, such as flammable and combustible liquid spills or leaks, liquefied petroleum gas releases, and electrical equipment. Advanced exterior fire fighting is usually performed using handlines flowing up to 1140 L/min (300 gpm), master streams, or similar devices for the manual application of specialized agents. Thermal protection is required, and the use of SCBA could be required.

A.6.1.2.2 Personnel accountability systems vary from site to site and should be incorporated into the site incident management system/SOPs. This system should include the interface between the site personnel and the outside mutual aid personnel, recognizing that the personnel accountability system for the site can be different from the system of the outside mutual aid organization.

A.6.2.2 The physical and medical requirements associated with wearing SCBA are outlined in Section 4.5 of NFPA 600, *Standard on Industrial Fire Brigades*, and 29 CFR 1910.134(c).

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A.6.2.3 Exterior fires can involve Class A materials, such as finished goods, raw materials, bulk materials, and pallets or waste materials stored in various containers and configurations that can be stacked, piled, rolled, baled, or stored in racks or shelving. Industrial fire brigade members need to understand the effects of fire and extinguishing agents and the collapse potential on those types of high-piled storage.

Industrial fire brigade members also need to understand the exposure problem associated with these types of fires, which usually produce flying brands that easily spread fire from one area to another. The industrial fire brigade member should be proficient at deploying and using 38 mm (1½ in.) and 65 mm (2½ in.) hose line and portable and fixed master stream appliances for offensive and defensive fire attack and exposure protection.

The industrial fire brigade member should also understand hose streams and use of straight nozzles for exterior fire fighting. Live fire training can be either Class A or B fires.

Class C fires become Class A or B fires when isolated. The industrial fire brigade member should understand the potential shock hazard associated with Class C fires. The member should understand that high-voltage wiring and equipment can have an electrical field that can create a shock hazard without actually having direct contact with the wire or equipment.

Industrial fire brigade members should understand the company policies for lockout, tagout, and testing equipment to verify that the equipment has been de-energized and that the fire area or component is safe before entering locked electrical rooms or touching electrical equipment. The industrial fire brigade member should understand the safe method of using hose streams on electrical equipment.

A.6.2.5 Combustible or flammable liquids could spread to other areas, exposing additional facilities. Spread could be enhanced by application of water. Environmental impact can result from spread. Actions such as diking or rerouting runoff can be effective means to control exposure to additional facilities.

A.6.2.7 See A.5.3.4.

A.6.2.8 Personnel accountability systems vary from site to site and should be incorporated into the site incident management system/SOPs. When training exercises are intended to simulate emergency conditions, smoke-generating devices that do not create a hazard are required by NFPA 1404, *Standard for Fire Service Respiratory Protection Training*. Several accidents have occurred when smoke bombs or other smoke-generating devices that produce a toxic atmosphere have been used for training exercises.

A.6.2.9 To be in compliance with OSHA 29 CFR 1910.134(g)(4)(ii), a minimum of two industrial fire brigade members should be on-scene with personal protective equipment when industrial fire brigade members are operating in an immediately dangerous to life and health (IDLH) or potentially IDLH atmosphere. Industrial fire brigade members assigned to this function are generally known as a rapid intervention crew (RIC). Their primary purpose is the rescue of injured, lost, or trapped industrial fire brigade members, and they should not be assigned other duties that would delay or impede their rescue effort. It is recognized that industrial fire brigades, utilizing an incident management system along with a personnel accountability system, have incorporated an RIC into their management system. Further, it is the intent of this section to have the rapid intervention personnel standing by in full personal protective equipment (PPE) with RIC equipment immediately available. It is also recommended that NFPA 1407, *Standard for Training Fire Service Rapid Intervention Crews*, be referred to during the training of brigade members in RIC operations. This state of readiness should be maintained until the incident management structure authorizes de-escalation.

A.6.3 Each site can vary significantly in the amount and types of systems, tools, and equipment that are specific to that site. The management of the industrial fire brigade should document in the site SOPs the types of systems, tools, and equipment that are available for industrial fire brigade use. If the system, tool, and equipment is available for use by the industrial fire brigade, the authority having jurisdiction should ensure that the appropriate section knowledge and skills are tested. *(See Annex D.)*

A.6.3.2 The industrial fire brigade member should understand site safety and security practices as identified by local laws, regulations, procedural instructions, and standards of care. Each site can vary significantly as to the duties industrial fire brigade members can be expected to perform when making entry into restricted areas. Entry into these areas can be accomplished by utilizing either forcible entry tools or routine access techniques. It is the intent of the NFPA 1081 technical committee to suggest that industrial fire brigade members are to be trained commensurate with the duties assigned.

A.6.3.4 The industrial fire brigade member should understand the use of various types of foam and other extinguishing agent applications for flammable and combustible liquid fires. Members should understand the various methods of extinguishment and the hazards associated with the various types of flammable and combustible liquid spills, leaks, and fires. Industrial fire brigade members need to review and understand the storage containers, configuration, and processes where flammable and combustible liquids are stored, manufactured, and used. Plans need to be available that show piping layout, isolation valves, and remote shutdown locations.

Industrial fire brigade members should review and understand boilover and slopover hazards associated with flammable and combustible liquid fires. Members should also understand the high-heat release associated with flammable and combustible liquid fires and the impact on exposed processes, equipment, and facilities. The potential for structural collapse of equipment and facilities involved or exposed to this type of fire should be recognized, as well as the possible impact on personnel safety. Industrial fire brigade members should extinguish a Class B fire commensurate with the size of fire that they are or can be expected to extinguish at their facility.

A.6.3.5 Industrial fire brigade members need to understand that most flammable gas fires have a high-heat release, which impacts burning and exposed processes, equipment, and facilities. The potential for structural collapse of equipment and facilities involved or exposed to this type of fire should be recognized, as well as the possible impact on personnel safety.

Industrial fire brigade members also need to review specific flammable gases manufactured, stored, and used at their facilities, and the associated hazards (fire and explosion). Some flammable gas fires, such as hydrogen, can burn with an invisible flame, which creates a serious hazard to personnel.

A.6.3.6 Industrial fire brigade members at sites that have dry chemical or carbon dioxide hose line systems require specialized training to become competent in the use of these devices. The industrial fire brigade member should be thoroughly knowledgeable in the operation of the system, how to activate

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the system, how to stop system flow, and procedures for restoring the system to full operational condition or reporting to the proper authority that the system has been discharged and needs to be returned to service by competent and authorized personnel. Furthermore, the industrial fire brigade member should understand the proper application techniques and effects of air movement on these types of systems. Special procedures for utilizing these systems and standing by until the hazard is completely mitigated are paramount in effectively managing hazards protected by these systems.

Training in using these systems should cover all operational issues with the devices as well as discharging of these or similar systems so that members have a true understanding and feel for how to use these systems. Live fire training using similar devices to the plant system should be performed for accurate assessment of industrial fire brigade members' ability. Such fire training can be done on Class B fuels of at least 4.65 m^2 (50 ft^2) size and 76.2 mm (3 in.) depth. Emphasizing team approach and importance of backup personnel is also essential.

A.6.3.7 There are facilities that employ fixed fire protection and detection systems, and thus the industrial fire brigade member operates in concert with these systems. Understanding these systems and their uses and limitations makes the industrial fire brigade more effective in handling emergency procedures. Because of the many different types of systems and number of facilities that do not have fixed fire protection systems, the requirements for training the industrial fire brigade member are covered as a site-specific hazard.

For fixed detection systems for fire, the industrial fire brigade member needs to understand the different types of systems on the site as well as signals generated by the system such as alarm, trouble, and supervisory. This understanding is important to determining how to respond to the appropriate situation upon arrival at the control panel or annunciation device. First-arriving industrial fire brigade members can then effectively communicate the indications on the control panel to other responding personnel per site procedures. As additional knowledge requirements, industrial fire brigade members should be intimately familiar with system operations such as activate, silence, and reset procedures, as well as possibly releasing a specialized fire protection system such as deluge spray, FM200®, Inergen®, carbon dioxide, or foam.

For fixed gas detection systems, the industrial fire brigade member should understand the different types of gas detection systems at the site. The industrial fire brigade member should also understand the different signals of gas detection systems, which typically include low, medium, and high concentrations of gas as well as fault indications. Other important knowledge for industrial fire brigade members is the understanding of the use of parts per million (ppm) reading and percent of lower flammable and explosive limit readings.

For portable gas monitoring devices, industrial fire brigade members should be thoroughly trained in the safe use of these devices. Further, they should understand flammable and explosive atmospheres and readings. Lastly, they should have an understanding of areas that can accumulate gases and of correct entry and exit procedures.

A.6.3.8 Many sites have fixed fire suppression systems, including sprinkler systems, foam systems, total flooding and local application carbon dioxide systems, dry chemical systems, clean agent systems (e.g., FM200® and Inergen®), and halon systems. These systems are installed to provide a first line of defense of fire protection of areas or specific equipment. Operating with these systems is essential to all industrial fire brigade members. Failure of a system to operate by automatic means can be cause for operating the equipment manually to achieve the desired result of fire control or extinguishment. Further, the shutting down of these systems prematurely can cause the fire to intensify and spread. In the case of the total flooding agents such as carbon dioxide, FM200®, Inergen®, and halon, interrupting the integrity of the enclosing structure can cause the system to be ineffective.

Industrial fire brigade members should know how the specific systems at their site are intended to perform so that the brigade does not unintentionally interfere with the operation of these systems. The industrial fire brigade member should know by which means they can control the system using electrical and mechanical means. Closing a valve or de-energizing a solenoid as well as performing the opposite functions to initiate the system can be one way to shut down a system. Understanding the system overrides such as bypasses, valve opening, and mechanical overrides of electrical devices allows the industrial fire brigade member to institute the system operation in the event of automatic system failure. An industrial fire brigade member should also recognize that operating a damaged fixed fire protection system, such as one damaged by explosion, can create a more dangerous situation by wasting resources; for example, damaged piping flowing water away from the fire and depleting the water supply to other members or agencies working at the emergency.

Understanding the hazard associated with these systems is essential to industrial fire brigade and personnel safety. Discharging carbon dioxide into an occupied area can be life threatening. Large-volume water flow from monitors or deluge systems can present injury hazards to personnel operating in the area of the discharge from both the effects of the agent as well as moving the fire and smoke into areas occupied by personnel.

A.6.3.9 Class C fires become Class A or B fires when de-energized. The industrial fire brigade member should understand the potential shock hazard associated with Class C fires. The member should understand that high-voltage wiring and equipment can have an electrical field that can create a shock hazard without actually having direct contact with the wire or equipment.

Industrial fire brigade members should understand the company policies for lockout, tagout, and testing equipment to verify that the equipment has been de-energized and that the fire area or component is safe before entering locked electrical rooms or touching electrical equipment. The industrial fire brigade member should understand the safe method of using hose streams on electrical equipment.

A.6.3.10 Site-specific tools and equipment can include ropes, handlights, power tools, hand tools, power plants, portable lighting equipment, hose and hose accessories, salvage and overhaul tools and equipment, and special-purpose equipment such as special agent appliances.

A.7.1.2.2 See A.6.2.2.

A.7.2.1 Site-specific hazards should be identified and itemized for the industrial fire brigade, along with a detailed explanation of each hazard. Special hazards can involve operations or materials. Typical operations are data processing and electronic control equipment, where the discharge of a special extinguishing agent can present a hazard to the industrial fire

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brigade members; engine test areas; paint dip, mix, and storage rooms; spray booths; flammable liquid tank farms; machinery operations; energized electrical equipment; hazardous materials; and combustible dusts.

Fire hose should be in accordance with NFPA 1961, *Standard on Fire Hose.* Hose should be maintained in accordance with NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose.*

Handline should be commensurate with the size and type of fires that the members are expected to extinguish in their normal duties.

Radios can be used for communications on the fireground; however, they cannot be the sole tool for accounting for one's partner in the interior of a structure fire *[see 29 CFR 1910.134(g)(4)(i)].*

A.7.2.3 Some sites have fixed smoke removal systems already installed for ventilation of products of combustion. The management of the industrial fire brigade should ensure that appropriate education and training are provided on these systems.

A.7.2.4 The industrial fire brigade member should be able to recognize important evidence as to a fire's cause and maintain the evidence so that further testing can be done without contamination or chain-of-custody problems. Evidence should be left in place (when possible; otherwise, chain of custody should be established); not altered by improper handling, walking, and so forth; and not destroyed. Possible means to protect evidence is to avoid touching, to protect with salvage covers during overhaul, or to rope off the area where the evidence lies. The industrial fire brigade member is not intended to be highly proficient at origin and cause determination.

A.7.2.5 Personnel accountability systems vary from site to site and should be incorporated into the site incident management system/SOPs. When training exercises are intended to simulate emergency conditions, smoke-generating devices that do not create a hazard are required by NFPA 1404, *Standard for Fire Service Respiratory Protection Training.* Several accidents have occurred when smoke bombs or other smoke-generating devices that produce a toxic atmosphere have been used for training exercises.

A.7.2.6 See A.5.3.4.

A.7.2.9 See A.6.2.5.

A.7.2.10 See A.6.2.9.

A.7.3 See Annex D.

A.7.3.1 See A.6.3.7.

A.7.3.2 See A.6.3.8.

A.7.3.4 See A.6.3.4.

A.7.3.5 See A.6.3.5.

A.7.3.6 See A.6.3.6.

A.7.3.7 Site-specific tools and equipment can include ropes, hand lights, power tools, hand tools, power plants, portable lighting equipment, hose and hose accessories, salvage and overhaul tools and equipment, and special-purpose equipment such as special agent appliances.

A.7.3.9 Personnel accountability systems vary from site to site and should be incorporated into the site incident management system/SOPs. This system should include the interface between the site personnel and the outside mutual aid personnel, recognizing that the personnel accountability system for the site can be different from the system of the outside mutual aid organization.

A.7.3.11 See A.6.3.9.

A.8.2.2(A) Size-up includes the many variables that the industrial fire brigade leader collects from the time of the alarm, during response, and upon arrival, in order to develop an initial action plan to control an emergency incident. These observations can include structural type and occupancy, fire involvement, number of occupants, materials spilled or involved in fire, wind direction, topography, and other observations relevant to the incident.

A.8.2.3 An incident safety officer should be included as part of the incident management system as a command staff member, as specified in NFPA 1561, *Standard on Emergency Services Incident Management System.* The incident commander should appoint an incident safety officer for most events. If an incident safety officer is not appointed, the incident commander also functions as the incident safety officer. Personnel accountability systems vary and should be incorporated into the site incident management system/SOPs. This system should include the interface between the site personnel and the outside mutual aid personnel, recognizing that the personnel accountability system for the site can be different from that of the outside mutual aid. The industrial fire brigade leader can assign additional RICs based on the size and complexity of the incident scene.

A.8.2.3(B) This requirement takes into consideration the industrial fire brigade leader's ability to give orders, direct personnel, evaluate information, and allocate resources to respond to the wide variety of emergency situations the industrial fire brigade encounters.

A.8.2.4 One of the industrial fire brigade leader's primary responsibilities is safety during industrial fire brigade activities. This standard defines the minimum requirements for the industrial fire brigade leader. Applicable OSHA regulations define additional requirements for those who could be assigned those duties.

A.9.1.5 Generally, industrial fire brigade members' duties do not require them to meet any special medical or job-related performance requirements to perform their duties.

Annex B Industrial Fire Brigade Support Member

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 General Considerations. When organizing an industrial fire brigade, management should take into consideration the need for specialized duties required in the event of a fire or related emergency. Personnel resources should be assigned to support the industrial fire brigade to ensure that these duties are accomplished. These personnel are not industrial fire brigade members but are personnel who perform specific duties to assist the operations of the industrial fire brigade as part of the incident management system. Such actions performed in the cold zones do not require industrial fire brigade training but specific training on the function being performed. Support functions are those functions that are beyond the normal duties assigned to employees as part of the facility emergency action plan.

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B.2 Support Area Needs. Support personnel are not expected to perform manual fire suppression activities in the event of an emergency but are expected to perform only those specialized tasks for which they have been chosen. Some of these specialized assignments include the systems and functions in B.2.1 through B.2.9.

B.2.1 Building Evacuation. Support personnel are expected to perform specialized duties to ensure that personnel are safely evacuated from an enclosed structure or the facility in the event of fire. They are known as fire wardens or by a variety of other titles.

B.2.2 Sprinkler System Control. Support personnel are assigned to perform specialized duties to ensure that control of the automatic sprinkler protection system within the fire area or the facility is maintained in the event of fire. They are known as sprinkler valve operators or by a variety of other titles.

B.2.3 Electrical Power Control. Support personnel are expected to perform specialized duties to ensure the control of electrical power within the fire area or the facility in the event of fire. They are known as electricians or by a variety of other titles.

B.2.4 Utility Control. Support personnel are expected to perform specialized duties to ensure the control of plant utilities (e.g., heating, ventilation, and air conditioning; steam, water, LP-Gas or natural gas, and other liquid or vapor piping systems) within the fire area in the event of fire. They are known as utility control technicians or by a variety of other titles.

B.2.5 Process Control. Support personnel are expected to perform specialized duties to ensure the control of process equipment within the fire area or the facility in the event of a fire. They are known as process operators or by a variety of other titles.

B.2.6 Fire Pump Operation. Support personnel are expected to perform specialized duties to ensure that stationary fire pumps are placed into operation or are operating properly in the event of fire. They are known as fire pump operators or by a variety of other titles.

B.2.7 Salvage. Support personnel are expected to perform specialized duties to ensure that actions are taken during and after manual fire suppression activities to minimize the resultant damage from the fire. They are known as salvage personnel or by a variety of other titles.

B.2.8 Traffic Control. Support personnel are expected to perform specialized duties to ensure that control of foot and vehicular traffic in and around the fire area or the facility is maintained in the event of fire and to ensure that any responding agency is directed to the fire area. Facility security or other personnel who have been assigned to assist the fire brigade can accomplish these operations.

B.2.9 Escort. Support personnel are expected to escort industrial fire brigade members or other emergency responders to the area of a fire without entering into the warm or hot zones.

Annex C Job Performance Requirements

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 Explanation of the Standard and Concepts of Job Performance Requirements (JPRs). The primary benefit of establishing national professional qualification standards is to provide both public and private sectors with a framework of the job requirements for the fire service. Other benefits include enhancement of the profession, individual as well as organizational growth and development, and standardization of practices.

NFPA professional qualification standards identify the minimum JPRs for specific fire service positions. The standards can be used for training design and evaluation, certification, measuring and critiquing on-the-job performance, defining hiring practices, and setting organizational policies, procedures, and goals. (Other applications are encouraged.)

Professional qualification standards for a specific job are organized by major areas of responsibility defined as duties. For example, the fire fighter's duties might include fire suppression, rescue, and water supply; and the public fire educator's duties might include education, planning and development, and administration. Duties are major functional areas of responsibility within a job.

The professional qualification standards are written as JPRs. JPRs describe the performance required for a specific job. JPRs are grouped according to the duties of a job. The complete list of JPRs for each duty defines what an individual must be able to do in order to successfully perform that duty. Together, the duties and their JPRs define the job parameters; that is, the standard as a whole is a description of a job.

C.2 Breaking Down the Components of a JPR. The JPR is the assembly of three critical components. *(See Table C.2.)* These components are as follows:

(1) Task that is to be performed
(2) Tools, equipment, or materials that must be provided to successfully complete the task
(3) Evaluation parameters and/or performance outcomes

C.2.1 The Task to Be Performed. The first component is a concise, brief statement of what the person is supposed to do.

C.2.2 Tools, Equipment, or Materials that Must Be Provided to Successfully Complete the Task. This component ensures that all individuals completing the task are given the same minimal tools, equipment, or materials when being evaluated. By listing these items, the performer and evaluator know what must be provided in order to complete the task.

C.2.3 Evaluation Parameters and/or Performance Outcomes. This component defines how well one must perform each task for both the performer and the evaluator. The JPRs

Table C.2 Example of a JPR

Component	Example
(1) Task	(1) Ventilate a pitched roof
(2) Tools, equipment, or materials	(2) Given an ax, a pike pole, an extension ladder, and a roof ladder
(3) Evaluation parameters and performance outcomes	(3) So that a 1.22 m × 1.22 m (4 ft × 4 ft) hole is created; all ventilation barriers are removed; ladders are properly positioned for ventilation; ventilation holes are correctly placed; and smoke, heat, and combustion by-products are released from the structure

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guide performance toward successful completion by identifying evaluation parameters and/or performance outcomes. This portion of the JPRs promotes consistency in evaluation by reducing the variables used to gauge performance.

C.2.4 In addition to these three components, the JPRs contain prerequisite knowledge and skills. Just as the term *prerequisite* suggests, these are the necessary knowledge and skills one must have prior to being able to perform the task. Prerequisite knowledge and skills are the foundation for task performance.

Once the components and prerequisites are put together, the job performance requirements might read as follows.

C.2.4.1 Example 1. The Fire Fighter I shall ventilate a pitched roof, given an ax, a pike pole, an extension ladder, and a roof ladder, so that a 1.22 m × 1.22 m (4 ft × 4 ft) hole is created, all ventilation barriers are removed, ladders are properly positioned for ventilation, and ventilation holes are correctly placed.

(A) Prerequisite Knowledge. Pitched roof construction, safety considerations with roof ventilation, the dangers associated with improper ventilation, knowledge of ventilation tools, the effects of ventilation on fire growth, smoke movement in structures, signs of backdraft, and the knowledge of vertical and forced ventilation.

(B) Prerequisite Skills. The ability to remove roof covering; properly initiate roof cuts; use the pike pole to clear ventilation barriers; use the ax properly for sounding, cutting, and stripping; position ladders; and climb and position self on ladder.

C.2.4.2 Example 2. The fire investigator shall interpret burn patterns, given standard equipment and tools and some structural/content remains, so that each individual pattern is evaluated with respect to the burning characteristics of the material involved.

(A) Prerequisite Knowledge. Knowledge of fire development and the interrelationship of heat release rate, form, and ignitability of materials.

(B) Prerequisite Skill. The ability to interpret the effects of burning characteristics on different types of materials.

C.3 Examples of Potential Uses. JPRs can be used to establish the evaluation criteria for certification at a specific job level. When used for certification, evaluation must be based on the successful completion of JPRs.

First, the evaluator would verify the attainment of prerequisite knowledge and skills prior to JPRs evaluation. This might be through documentation review or testing.

Next, the candidate would be evaluated on completing the JPRs. The candidate would perform the task and be evaluated based on the evaluation parameters and/or performance outcomes. This performance-based evaluation can be either practical (for psychomotor skills such as "ventilate a roof") or written (for cognitive skills such as "interpret burn patterns").

Psychomotor skills are those physical skills that can be demonstrated or observed. Cognitive skills (or mental skills) cannot be observed but are rather evaluated on how one completes the task (process oriented) or the task outcome (product oriented).

Using Example 1, a practical performance-based evaluation would measure one's ability to "ventilate a pitched roof." The candidate passes this particular evaluation if the standard was met; that is, a 4 ft hole was created, all ventilation barriers were removed, ladders were properly positioned for ventilation, ventilation holes were correctly placed, and smoke, heat, and combustion by-products were released from the structure.

For Example 2, when evaluating the task "interpret burn patterns," the candidate could be given a written assessment in the form of a scenario, photographs, and drawings, and then be asked to respond to specific written questions related to the JPR's evaluation parameters.

Remember, when evaluating performance, you must give the person the tools, equipment, or materials listed in the job performance requirements; for example, an ax, a pike pole, an extension ladder, and a roof ladder, before he or she can be properly evaluated.

C.4 Curriculum Development/Training Design and Evaluation. The statements contained in this document that refer to job performance were designed and written as JPRs. While a resemblance to instructional objectives might be present, these statements should not be used in a teaching situation until after they have been modified for instructional use.

JPRs state the behaviors required to perform specific skill(s) on the job as opposed to a learning situation. These statements should be converted into instructional objectives with behaviors, conditions, and standards that can be measured within the teaching/learning environment. A JPR that requires a fire fighter to "ventilate a pitched roof" should be converted into a measurable instructional objective for use when teaching the skill. *[See Figure C.4(a).]*

Using Example 1, a terminal instructional objective might read as follows: The learner will ventilate a pitched roof, given a simulated roof, an ax, a pike pole, an extension ladder, and a roof ladder, so that 100 percent accuracy is attained on a skills checklist. (At a minimum, the skills checklist should include each of the measurement criteria from the JPRs.)

Figure C.4(b) is a sample checklist for use in evaluating this objective.

While the differences between job performance requirements and instructional objectives are subtle in appearance, the purpose of each statement differs greatly. JPRs state what is necessary to perform the job in the real world. Instructional objectives, however, are used to identify what students must do at the end of a training session and are stated in behavioral terms that are measurable in the training environment.

By converting JPRs into instructional objectives, instructors will be able to clarify performance expectations and avoid confusion related to using statements designed for purposes other than teaching. Additionally, instructors will be able to add local/state/regional elements of performance into the standards as intended by the developers.

Prerequisite skills and knowledge should be converted into enabling objectives. These help to define the course content. The course content would include each of the prerequisite knowledge and skills. Using the example in Figure C.4(b), the enabling objectives would be pitched roof construction, safety considerations with roof ventilation, removal of roof covering, properly initiated roof cuts, and so on. This ensures that the course content supports the terminal objective.

It is assumed that the reader is familiar with curriculum development or training design and evaluation.

C.5 Other Uses. While the professional qualifications standards are principally used to guide the development of training and certification programs, there are a number of other potential uses for the documents. Because the documents are written using terms specific to JPRs, they lend themselves well to any area of the profession where a level of performance or expertise must be determined. These areas might include the following described in C.5.1 through C.5.5.

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The JPR, prerequisite knowledge, and prerequisite skills are all used as information from which instructional objectives can be written.

JPR

The Fire Fighter I shall ventilate a pitched roof given an ax, a pike pole, an extension ladder, and a roof ladder so that a 1.22 m × 1.22 m (4 ft × 4 ft) hole is created, all ventilation barriers are removed, ladders are properly positioned for ventilations, and ventilation holes are correctly placed.

Prerequisite knowledge:

Pitched roof construction, safety considerations with roof ventilation, the dangers associated with improper ventilation, knowledge of ventilation tools, the effects of ventilation on fire growth, smoke movement in structures, signs of backdraft, and the knowledge of vertical and forced ventilation.

Prerequisite skills:

The ability to remove roof covering; properly initiate roof cuts; use the pike pole to clear ventilation barriers; use ax properly for sounding, cutting, and stripping; position ladders; and climb and position self on ladder.

JPRs can be converted into any instructional objective format. For demonstration purposes, these examples have been written as terminal and example objectives.

EXAMPLE TERMINAL OBJECTIVES

Cognitive/Knowledge Domain

The fire fighter shall describe the methods, processes, and safety precautions to be taken in order to perform ventilation on a pitched roof in a safe manner.

EXAMPLE: ENABLING OBJECTIVES (Cognitive)

The fire fighter shall list the safety precautions to be taken when performing roof ventilation as stated in the "XYZ" ventilation manual, with "X" percent accuracy on a written evaluation.

The fire fighter shall explain the effects of ventilation on fire growth as it relates to fire spread, intensity, and movement through structures, with "X" percent accuracy on a written evaluation.

Given the conditions surrounding an incident, the fire fighter shall identify backdraft, flashover, and other dangerous conditions created by fire and the effects of ventilation on these conditions with "X" percent accuracy on a written evaluation.

Psychomotor/Skills Domain (See example skills checklist.)

The fire fighter shall demonstrate ventilating a pitched roof, given the proper tools, within 5 min and with 100 percent accuracy on the skills checklist.

EXAMPLE: ENABLING OBJECTIVES (Psychomotor)

The fire fighter shall demonstrate removing roof covering in order to prepare a roof for ventilation with 100 percent accuracy on the skills checklist.

The fire fighter shall demonstrate the removal of ventilation obstructions (ceiling materials, insulation, etc.) in order to clear the ventilation opening with 100 percent accuracy on the skills checklist.

The fire fighter shall demonstrate the proper use of fire-fighting tools used for ventilation with 100 percent accuracy on the skills checklist.

FIGURE C.4(a) Converting JPRs into Instructional Objectives.

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OBJECTIVE: The fire fighter shall demonstrate ventilating a pitched roof, given the proper tools, within 5 min and with 100 percent accuracy on the skills checklist.

YES	NO	
❑	❑	1. 1.22 m × 1.22 m (4 ft × 4 ft) hole was created.
❑	❑	2. All ventilation barriers were removed.
❑	❑	3. Ladders were properly positioned.
❑	❑	4. Ventilation holes were correctly placed (directly over fire, at highest point, and so forth).
❑	❑	5. Task completed within 5 min. (Time to complete task: _____)

FIGURE C.4(b) Skills Checklist.

C.5.1 Employee Evaluation/Performance Critiquing. The JPRs can be used as a guide by both the supervisor and the employee during an evaluation. The JPRs for a specific job define tasks that are essential to perform on the job as well as the evaluation criteria to measure when those tasks are completed.

C.5.2 Establishing Hiring Criteria. The professional qualifications standards can be used in a number of ways to further the establishment of hiring criteria. The authority having jurisdiction could simply require certification at a specific job level; for example, Fire Fighter I. The JPRs could also be used as the basis for pre-employment screening by establishing essential minimal tasks and the related evaluation criteria. An added benefit is that individuals interested in employment can work toward the minimal hiring criteria at local colleges.

C.5.3 Employee Development. The professional qualifications standards can be useful to both the employee and the employer in developing a plan for the individual's growth within the organization. The JPRs and the associated prerequisite knowledge and skills can be used as a guide to determine additional training and education required for the employee to master his or her job or profession.

C.5.4 Succession Planning. Succession planning or career pathing addresses the efficient placement of people into jobs in response to current needs and anticipated future needs. A career development path can be established for targeted individuals to prepare them for growth within the organization. The JPRs and prerequisite knowledge and skills could then be used to develop an educational path to aid in the individual's advancement within the organization or profession.

C.5.5 Establishing Organizational Policies, Procedures, and Goals. The JPRs can be incorporated into organizational policies, procedures, and goals where employee performance is addressed.

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Annex D Management Review of Site-Specific Job Requirement Process

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1 Management's Responsibility. Subsection 4.3.1 of this standard requires that the management of the industrial fire brigade define the site-specific requirements for each level of industrial fire brigade membership. The following are examples of a process that could be used to complete this required review.

D.2 Example 1. A small hospital in a rural community creates an in-house fire brigade to respond to fire until the local fire department can arrive. Each shift has four people from maintenance and security personnel who respond to the fire as a fire brigade. The problem is to determine what type of hazards the facility has and what type of fire brigade duties the management wants the fire brigade to perform.

D.2.1 A risk assessment of the fire hazards of the hospital was performed by the fire brigade leader, and the leader determined that an incipient industrial fire brigade would be the appropriate level of responder. The leader conducted a site-specific requirement review, which was incorporated into the hospital fire brigade organizational statement and manual as required by OSHA. The fire brigade leader, as the person in management who determines the site-specific requirements, selected the following JPRs for the brigade.

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The assessment that was made was consistent with the guidance in NFPA 600, *Standard on Industrial Fire Brigades*. It determined what type of fire brigade would be used by the hospital: an incipient industrial fire brigade.

The following JPRs are required for the hospital fire brigade:

(1) "Attack an incipient-stage fire" — The fire brigade is going to use fire extinguishers and fixed standpipe hose streams to attack incipient-stage fires. They call the local fire department immediately to handle all other fires and to assist with incipient-stage fires *(see 5.3.1)*.
(2) "Activate a fixed fire protection system" — The hospital has a wet pipe sprinkler system that the fire brigade supports *(see 5.3.2)*.

The fire brigade leader determined that the following site-specific requirements are not needed for the hospital fire brigade:

(1) "Utilize master stream appliances" — The hospital has no master stream appliances *(see 5.3.3)*.
(2) "Establish a water supply for fire-fighting operations" — The fire brigade is looking to the local fire department to provide this type of service to them *(see 5.3.4)*.
(3) "Perform a fire safety survey" — The security officers and the risk manager conduct this survey outside their duties as fire brigade members *(see 5.3.5)*.

D.2.2 The apparatus operator training requirements were evaluated as required by 4.3.9. None of the fire brigade members complete an apparatus driver training program that meets the JPR outlined in NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, since the facility does not have a fire apparatus.

D.2.3 The first aid and medical training review was conducted as required by Section 4.2, and the fire brigade leader determined that none of the fire brigade members need to be trained in CPR and basic first aid, since the hospital has medical personnel on site.

D.3 Example 2. A major oil refinery establishes an advanced exterior fire brigade that operates three foam engines. They are going to provide all fire suppression services except interior structural fire fighting. They receive mutual aid assistance from a local industry/government mutual aid group when the fire brigade requests it. The problem is to determine what type of hazards the facility has and what type of fire brigade duties the management wants the fire brigade to perform.

D.3.1 The full-time fire chief, as a member of management, in developing the fire brigade organizational statement, reviewed the site hazards and the site-specific requirements and included the assessment documentation as required in Section 6.3.

The assessment that was made was consistent with the guidance in NFPA 600, *Standard on Industrial Fire Brigades*. It determined what type of fire brigade would be used by the refinery: an advanced exterior industrial fire brigade.

The following JPRs are required for the oil refinery fire brigade:

(1) "Gain access to facility locations" — This is a required site-specific requirement, since the advanced exterior fire brigade is expected to gain access to fenced storage yards, elevators, and similar areas in the refinery *(see 6.3.2)*.
(2) "Utilize master stream appliances" — This is a required site-specific requirement, since each foam engine carries four 3785 L/min (1000 gpm) portable monitors for the brigade to use *(see 6.3.3)*.
(3) "Operating as a member of a team, extinguish an ignitible liquid fire" — This is a required site-specific requirement, since it is one of the main hazards that the fire brigade handles in a refinery *(see 6.3.4)*.
(4) "Operating as a member of a team, control a flammable gas fire" — This is a required site-specific requirement, since it is one of the main hazards that the fire brigade handles in a refinery *(see 6.3.5)*.
(5) "Operating as a member of a team, extinguish an exterior fire using special extinguishing agents other than foam" — This is a required site-specific requirement, since the fire brigade is trained in the use of 70 kg (150 lb) and 153 kg (300 lb) dry chemical units to extinguish pressure fires under special situations *(see 6.3.6)*.
(6) "Activate a fixed fire protection system" — This is a site-specific requirement, since the refinery has several fixed water and foam systems that the fire brigade members are expected to be able to operate *(see 6.3.8)*.
(7) "Operating as a member of a team, extinguish a Class C (electrical) fire" — This is a site-specific requirement, since the refinery has electrical switch gear and motors that the fire brigade is expected to be able to extinguish *(see 6.3.9)*.
(8) "Utilize tools and equipment assigned to the industrial fire brigade" — This is a site-specific requirement for all of the tools carried on the apparatus and used in the JPRs *(see 6.3.10)*.

The fire chief also determined the following:

(1) "Perform a fire safety survey" — This is not a site-specific requirement for the advanced exterior fire brigade because these activities are performed by the refinery's safety department and fire protection engineer *(see 6.3.1)*.
(2) "Interpret alarm conditions" — This is not a site-specific requirement for the fire brigade, since these activities are performed by the refinery instrument technicians *(see 6.3.7)*.
(3) "Set up and use portable ladders" — This is not a site-specific requirement for the fire brigade, since they have no ladders on their fire apparatus *(see 6.3.11)*.

D.3.2 The apparatus operator training requirements were evaluated as required by 4.3.9.

All of the fire brigade members are apparatus operators and completed a training program that meets the JPRs outlined in NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, that apply to the facility's conditions and apparatus.

D.3.3 The first aid and medical training review was conducted as required by Section 4.2, and the fire chief determined that all of the fire brigade members need to be trained in CPR and basic first aid.

D.4 Example 3. A 3700-employee automotive manufacturing plant with a full-time fire brigade in a major city has a large career fire department responding into the facility as mutual aid when needed. The facility has standpipes throughout and is fully sprinklered. The problem is to determine what type of hazards the facility has and what type of fire brigade duties the management wants the fire brigade to perform.

D.4.1 The full-time fire chief, as a member of management, in developing the fire brigade organizational statement, reviewed the site-specific requirements and included the assessment documentation as required in Section 7.3.

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An assessment that was made was consistent with the guidance in NFPA 600, *Standard on Industrial Fire Brigades*. It determined what type of fire brigade would be used by the auto manufacturing facility: an incipient fire brigade with portions of the brigade to be trained as an interior structural industrial fire brigade.

The following JPRs will be required for the auto manufacturing incipient fire brigade members:

(1) "Attack an incipient stage fire" — The fire brigade is going to use fire extinguishers and fixed standpipe hose streams *(see 5.3.1)*.
(2) "Activate a fixed fire protection system" — This is a site-specific requirement for the incipient fire brigade members, since the manufacturing plant has a wet pipe sprinkler system *(see 5.3.2)*.
(3) "Establish a water supply for fire-fighting operations" — This is a site-specific requirement for the incipient fire brigade members *(see 5.3.4)*.

The fire chief determined that the following site-specific requirements are not needed for the incipient fire brigade:

(1) "Utilize master stream appliances" — Since the plant has only portable master stream appliances that are used by the interior fire brigade *(see 5.3.3)*.
(2) "Perform a fire safety survey" — Since the security officers and the risk manager conduct these surveys outside their duties as fire brigade members *(see 5.3.5)*.

The fire chief determined that the following site-specific requirements are needed for the interior fire brigade members:

(1) "Interpret alarm conditions" — This is a site-specific interior fire brigade requirement, since the full-time fire brigade members also service the fire alarm system when a trouble alarm occurs and enters the building to investigate and reset alarm signaling systems *(see 7.3.1)*.
(2) "Activate a fixed fire protection system" — This is a site-specific requirement, since the interior fire brigade enters the building to activate specialized fire protection systems *(see 7.3.2)*.
(3) "Utilize master stream appliances" — This is a site-specific requirement, as the interior brigade uses 1892 L/min (500 gpm) ground monitors inside the buildings *(see 7.3.3)*.
(4) "Operating as a member of a team, extinguish an ignitible liquid fire" — This is a site-specific requirement, since the interior fire brigade enters the building to extinguish paint and paint solvents that can be ignited *(see 7.3.4)*.
(5) "Operating as a member of a team, control a flammable gas fire" — This is a site-specific requirement, since the interior fire brigade enters the building to extinguish flammable gas fires in the dryer areas *(see 7.3.5)*.
(6) "Operating as a member of a team, extinguish a fire using special extinguishing agents other than foam" — This is a site-specific requirement, since the interior fire brigade uses Class D agents to extinguish special engine alloy material that can be on fire in the machine shop *(see 7.3.6)*.
(7) "Utilize tools and equipment assigned to the industrial fire brigade" — This is a site-specific requirement for the tools that the interior fire brigade has to use *(see 7.3.7)*.
(8) "Interface with outside mutual aid organizations" — This is a site-specific requirement, since the interior fire brigade can work with the outside fire department during mutual aid operations *(see 7.3.9)*.
(9) "Perform a fire safety survey in a facility" — This is a site-specific requirement for the interior fire brigade *(see 7.3.10)*.

The fire chief also determined that 7.3.8 is not a site-specific requirement: "Set up and use portable ladders" — This is not a site-specific requirement for the brigade, since they have no ladders on their fire apparatus *(see 7.3.8)*.

D.4.2 The apparatus operator training requirements were evaluated as required by 4.3.9.

The facility has one minipumper with 1136 L (300 gal) of water and a pick-up truck with 757 L (200 gal) of water. In addition, they have several scooter-type quick-response vehicles for inside building use. All of the fire apparatus operators need to complete a training program that meets the JPRs outlined in NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, that apply to the facility.

D.4.3 The first aid and medical training review was conducted as required by Section 4.2, and the fire chief determined that all of the fire brigade members need to be trained in CPR and First Responder Medical Training.

D.5 Example 4. This example illustrates the development of new JPRs to support a site-specific hazard or process. The paper manufacturing process is used as the example.

D.5.1 Site-Specific Requirements. The following JPRs are to be considered site-specific functions of interior structural fire brigade members assigned the responsibility of fighting fires involving paper machines. The management of the industrial fire brigade determines the requirements that are applicable to the interior structural fire brigade member operating on their site. The process used to determine the site-specific requirements needs to be documented, and the JPRs identified are added to those identified by this standard.

D.5.2 Operating as a team and given a water source, an attack line, personal protective equipment, and an assignment, attack a paper machine fire so that team integrity is maintained, the attack line is deployed for advancement, access is gained to the fire area, the fire is approached safely, attack techniques are appropriate for the given level of fire, hidden fires are located and controlled, correct body posture is maintained, hazards are avoided or managed, and the fire is brought under control.

(A) Requisite Knowledge. The basic function and design characteristics of site-specific paper machines; the dangers associated with fighting fires in close proximity to paper machines to include nip points on the machine; fire-fighting tactics relating to pressure vessels (dryers); the hazards of steam, lube/hydraulic oil, and paper dust in the machine area; an understanding of when (and when not) to shut down a paper machine during fire attack operations; an understanding of emergency shutdown procedures for the machine; an understanding of flame spread characteristics of materials in and around the paper machine roof and basement areas; and site-specific standard operating guidelines (SOGs) and local emergency procedures for fighting fires in and around site-specific paper machines.

(B) Requisite Skills. The ability to attack a fire on the paper machine while limiting or preventing fire spread to other areas of the machine or other exposures and while limiting thermal shock, which can create stresses in the dryer shell; check sprinkler control valves for the affected area; monitor fire pumps for operation; work with operators to apply a predeveloped written procedure for the orderly and controlled shutdown of the paper machine (to include shutting off steam or other sources of heat to the dryers, notifying personnel

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responsible for the operation of boilers, shutting off ventilation fans in the exhaust system), use ventilation equipment as appropriate for fire and smoke control; protect roof and basement exposures; and extinguish remote fires.

D.6 Example 5. This example illustrates the development of requirements to support a major petrochemical industry association or industry mutual aid group that determines they have common expectation for their industrial fire brigades. They form a joint consortium with a local fire training program.

D.6.1 The leaders of the consortium, representing the management of the individual fire brigades, worked to establish a common fire brigade organizational statement, reviewed the respective site hazards and the site-specific requirements and included the following assessment documentation as required in Section 6.3.

The assessment that was made was consistent with the guidance in NFPA 600, *Standard on Industrial Fire Brigades.* It determined what type of fire brigade would be used by the members of the trade association or mutual aid group. It was decided that a common training and certification program would be presented at the local university fire training program, with the graduates being certified as advanced exterior and interior fire brigade members by the consortium.

The following JPRs are required for the oil refinery fire brigade:

(1) "Gain access to facility locations" — This is a required site-specific requirement, since the advanced exterior fire brigade is expected to gain access to fenced storage yards, elevators, and similar areas in the refinery *(see 6.3.2).*
(2) "Utilize master stream appliances" — This is a required site-specific requirement, since each of the mutual aid companies has at least one foam engine that carries one 3785 L/min (1000 gpm) portable monitor for the brigade to use *(see 6.3.3).*
(3) "Extinguish an ignitible liquid fire"— This is a required site-specific requirement, since it is one of the main hazards that the fire brigade handles in a refinery *(see 6.3.4).*
(4) "Control a flammable gas fire" — This is a required site-specific requirement, since it is one of the main hazards that the fire brigade handles in a refinery *(see 6.3.5).*
(5) "Extinguish an exterior fire using special extinguishing agents other than foam" — This is a required site-specific requirement, since the fire brigade is trained in the use of 63 kg (150 lb) and 136 kg (300 lb) dry chemical units to extinguish pressure fires under special situations *(see 6.3.6).*
(6) "Activate a fixed fire protection system" — This is a site-specific requirement, since the refinery has several fixed water and foam systems that the fire brigade members are expected to be able to operate *(see 6.3.8).*
(7) "Extinguish a Class C (electrical) fire" — This is a site-specific requirement, since the refinery has electrical switch gear and motors that the fire brigade is expected to be able to extinguish *(see 6.3.9).*
(8) "Utilize tools and equipment assigned to the industrial fire brigade" — This is a site-specific requirement for all of the tools carried on the apparatus and used in the JPRs *(see 6.3.10).*
(9) "Interface with outside mutual aid organizations" — this is a common site-specific requirement, since the interior fire brigade can work with the outside fire department during mutual aid operations *(see 7.3.9).*

D.6.2 The apparatus operator training requirements were evaluated as required by 4.3.9. All of the fire brigade members will not be apparatus operators and will not complete a training program that meets the JPRs outlined in NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications,* that apply to the facility's conditions and apparatus.

D.6.3 The first aid and medical training review was conducted as required by Section 4.2, and the consortium determined that all of the fire brigade members need to be trained in CPR and basic first aid, but that they would bring this documentation to the consortium school from other training programs.

D.7 Example 6. This example details the development process for the development of industry-specific JPRs for a fictitious, medium-size facility, referred to here as the ABC Electric Generating Facility. The ABC Electric Generating Facility is a multi-unit electric generating facility. The facility employs approximately 200 employees. Four 12-hour production shifts, each with approximately 30 employees, provide coverage 24/7/365, with employees on a traditional work week. There is an automatic fire alarm system and multiple fire detection and suppression systems. The facility has an advance exterior and interior structural industrial fire brigade.

D.7.1 In developing the site's industrial fire brigade organizational statement, management reviewed the site-specific requirements and included the following assessment documentation as required in Sections 6.3 and 7.3 *(see Figure D.7.1).*

(1) Perform a fire safety survey of a facility, given an assignment, survey forms, and procedures, so that fire and life safety hazards are identified, recommendations for their correction made, and unresolved issues are referred to the proper authority *(see 6.3.1).*
(2) Utilize master stream appliances, given an assignment, an extinguishing agent, and a master stream and supply hose, so that the appliance is set up correctly and the agent is applied as assigned *(see 6.3.3).*

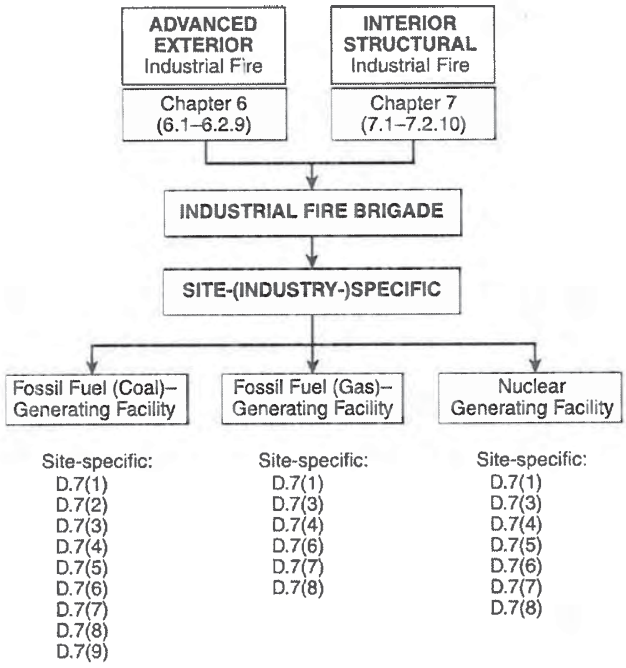

FIGURE D.7.1 Example of Site- (Industry) Specific JPRs.

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(3) Extinguish an ignitable liquid fire, operating as a member of a team, given an assignment, a handline, personal protective equipment, a foam proportioning device, a nozzle, foam concentrates, and a water supply, so that the correct type of foam concentrate is selected for the given fuel and conditions, a correctly proportioned foam stream is applied to the surface of the fuel to create and maintain a foam blanket, fire is extinguished, re-ignition is prevented, and team protection is maintained *(see 6.3.4)*.

(4) Control a flammable gas fire, operating as a member of a team, given an assignment, a handline, personal protective equipment, and tools, so that crew integrity is maintained, contents are identified, the flammable gas source is controlled or isolated, hazardous conditions are recognized and acted upon, and team safety is maintained *(see 6.3.5)*.

(5) Interpret alarm conditions, given an alarm signaling system, a procedure, and an assignment, so that the alarm condition is correctly interpreted and a response is initiated *(see 6.3.7)*.

(6) Activate a fixed fire protection system, given required personal protective equipment, a fixed fire protection system, a procedure, and an assignment, so that the correct steps are followed and the system operates *(see 6.3.8)*.

(7) Extinguish a fire involving Class C (electrical) equipment, operating as a member of a team, given an assignment, personal protective equipment, method to verify equipment has been de-energized or a Class C fire extinguishing agent, so that the equipment is verified de-energized or correct extinguishing agent is applied to the fuel, fire is extinguished, re-ignition is prevented, and team protection is maintained *(see 6.3.9)*.

(8) Interface with outside mutual aid organizations, given SOPs for mutual aid response and communication protocols, so that a unified command is established and maintained *(see 7.3.9)*.

(9) Extinguish a coal-related fire, operating as a member of a team, given an assignment, a handline, personal protective equipment, and a water supply, so that fire is extinguished and team protection is maintained *(see 7.2.1 and 6.2.3)*.

Annex E Informational References

E.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard, code and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

E.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2010 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2010 edition.

NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, 2008 edition.

NFPA 600, *Standard on Industrial Fire Brigades*, 2010 edition.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2008 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, 2009 edition.

NFPA 1403, *Standard on Live Fire Training Evolutions*, 2007 edition.

NFPA 1404, *Standard for Fire Service Respiratory Protection Training*, 2006 edition.

NFPA 1407, *Standard for Training Fire Service Rapid Intervention Crews*, 2010 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2007 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System*, 2008 edition.

NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, 2007 edition.

NFPA 1961, *Standard on Fire Hose*, 2007 edition.

NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose*, 2008 edition.

E.1.2 Other Publications.

E.1.2.1 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 29, Code of Federal Regulations, Part 1910.120, "Hazardous Waste and Emergency Response."

Title 29, Code of Federal Regulations, Part 1910.134, "Respiratory Protection Standard."

Title 29, Code of Federal Regulations, Part 1910.156, Subpart L, "Fire Brigades."

E.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.

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Hooton, J. 1990. *Job Performance = Tasks + Competency × Future Forces.* Unpublished manuscript, Vanderbilt University, Peabody College, Nashville, TN.

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Naisbitt, J. 1984. *Megatrends.* Chicago: Nightingale-Conant.

Spellman, B. P. 1987. "Future Competencies of the Educational Public Relations Specialist" (Doctoral dissertation, University of Houston). *Dissertation Abstracts International* 49:02A.

Springer, J. 1980. *Job Performance Standards and Measures.* A series of research presentations and discussions for the ASTD Second Annual Invitational Research Seminar, Savannah, GA (November 5–8, 1979). Madison, WI: American Society for Training and Development.

Tracey W. R. 1984. *Designing Training and Development Systems,* New York: AMACOM.

E.3 References for Extracts in Informational Sections. NFPA 600, *Standard on Industrial Fire Brigades*, 2010 edition.

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Index

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-A-

Administration ..... Chap. 1
Application 1.3
Limits of Actions and Responsibilities of the Industrial Fire Brigade 1.4, A.1.4
General 1.4.1
Incident Command 1.4.2, A.1.4.2
Limits for Industrial Fire Brigades Assigned Incipient Fire-Fighting Response Duties 1.4.3
Limits for Industrial Fire Brigades Assigned Only Advanced Exterior Fire-Fighting Response Duties 1.4.4
Limits for Industrial Fire Brigades Assigned Only Interior Structural Fire-Fighting Response Duties 1.4.5
Limits of Industrial Fire Brigades Assigned Both Advanced Exterior and Interior Structural Fire-Fighting Response Duties 1.4.6
Purpose 1.2
Scope 1.1, A.1.1
Advanced Exterior Industrial Fire Brigade Member ..... Chap. 6
General 6.1, A.6.1
Basic Advanced Exterior Industrial Fire Brigade Member JPRs 6.1.2
Qualification or Certification 6.1.1
Manual Fire Suppression 6.2
Site-Specific Requirements 6.3, A.6.3
Approved
Definition 3.2.1, A.3.2.1

-C-

Certification
Definition 3.3.1

-D-

Definitions ..... Chap. 3
Drill
Definition 3.3.2

-E-

Emergency Response Operations
Definition 3.3.3
Enclosed Structure
Definition 3.3.4
Entrance Requirements ..... Chap. 4
Emergency Medical Care 4.2, A.4.2
General 4.1, A.4.1
Job Performance Requirements (JPRs) 4.3
Incident Command Training 4.3.11
Explanatory Material ..... Annex A

-F-

Facility
Definition 3.3.5
Fire Fighting
Advanced Exterior Fire Fighting
Definition 3.3.6.1, A.3.3.6.1
Defensive Fire Fighting
Definition 3.3.6.2
Definition 3.3.6
Incipient Fire Fighting
Definition 3.3.6.3
Interior Structural Fire Fighting
Definition 3.3.6.4, A.3.3.6.4
Offensive Fire Fighting
Definition 3.3.6.5
Structural Fire Fighting
Definition 3.3.6.6

-I-

Incident Management System (IMS)
Definition 3.3.7
Incipient Industrial Fire Brigade Member ..... Chap. 5
General 5.1
Basic Incipient Industrial Fire Brigade Member JPRs 5.1.2
Qualification or Certification 5.1.1
Manual Fire Suppression 5.2
Site-Specific Requirements 5.3, A.5.3
Incipient Stage
Definition 3.3.8, A.3.3.8
Industrial Fire Brigade
Definition 3.3.9
Industrial Fire Brigade Apparatus
Definition 3.3.10
Industrial Fire Brigade Leader
Definition 3.3.11
Industrial Fire Brigade Leader ..... Chap. 8
General 8.1
General Prerequisite Skills 8.1.4
General Requisite Knowledge 8.1.3
Qualification or Certification 8.1.2
Supervisory Functions 8.2
Industrial Fire Brigade Management
Definition 3.3.12
Industrial Fire Brigade Support Member ..... Chap. 9
General 9.1
Basic Industrial Fire Brigade Support Member 9.1.6
Education, Training, and Drills 9.1.3
Medical 9.1.5, A.9.1.5
Protective Clothing and Protective Equipment 9.1.4
Qualification 9.1.2
Site-Specific Requirements 9.2
Building Evacuation 9.2.1
Electrical Power Control 9.2.3
Escort 9.2.9
Fire Pump/Fire Water System Operation 9.2.6
General Support Services 9.2.10
Process Control 9.2.5
Salvage 9.2.7
Sprinkler System Control 9.2.2
Traffic Control and Site Security Duties 9.2.8
Utility Control 9.2.4
Industrial Fire Brigade Support Member ..... Annex B
Industrial Fire Brigade Training Coordinator
Definition 3.3.13
Informational References ..... Annex E
Interior Structural Industrial Fire Brigade Member ..... Chap. 7
General 7.1
Basic Interior Structural Fire Brigade Member JPRs 7.1.2
Qualification or Certification 7.1.1
Manual Fire Suppression 7.2
Site-Specific Requirements 7.3, A.7.3

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-J-

Job Performance Requirement (JPR)
Definition 3.3.14
Job Performance Requirements ..... Annex C

-L-

Listed
Definition 3.2.2, A.3.2.2

-M-

Management Review of Site-Specific Job Requirement Process ..... Annex D

-P-

Personal Protective Equipment (PPE)
Definition 3.3.15
Pre-Incident Plan
Definition 3.3.16
Procedure
Definition 3.3.17

-R-

Rapid Intervention Crew/Company (RIC)
Definition 3.3.18
Referenced Publications ..... Chap. 2
General 2.1
NFPA Publications 2.2
Other Publications 2.3
References for Extracts in Mandatory Sections 2.4
Requisite Knowledge
Definition 3.3.19
Requisite Skills
Definition 3.3.20

-S-

Safely
Definition 3.3.21
Site
Definition 3.3.22
Site-Specific Hazard
Definition 3.3.23
Standard
Definition 3.2.3
Standard Operating Procedure (SOP)
Definition 3.3.24
Support Member
Definition 3.3.25, A.3.3.25

-T-

Task
Definition 3.3.26
Team
Definition 3.3.27
Thermal Protective Clothing
Definition 3.3.28, A.3.3.28

-Z-

Zone
Cold Zone
Definition 3.3.29.1
Definition 3.3.29
Hot Zone
Definition 3.3.29.2
Warm Zone
Definition 3.3.29.3

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3.3.78 Effective Ground-Fault Current Path. An intentionally constructed, permanent, low impedance electrically conductive path designed and intended to carry ~~underground~~ electric fault current ~~conditions~~ from the point of a ground fault on a wiring system to the electrical supply source.

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APPENDIX F
NFPA 1002
Standard for Fire Apparatus Driver/Operator Professional Qualifications

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NFPA® 1002

Standard for Fire Apparatus Driver/Operator Professional Qualifications

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NFPA® 1002

Standard for

Fire Apparatus Driver/Operator Professional Qualifications

2014 Edition

This edition of NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications,* was prepared by the Technical Committee on Fire Fighter Professional Qualifications and released by the Technical Correlating Committee on Professional Qualifications. It was issued by the Standards Council on May 28, 2013, with an effective date of June 17, 2013, and supersedes all previous editions.

This edition of NFPA 1002 was approved as an American National Standard on June 17, 2013.

Origin and Development of NFPA 1002

In 1972, the Joint Council of National Fire Service Organizations (JCNFSO) created the National Professional Qualifications Board (NPQB) for the fire service to facilitate the development of nationally applicable performance standards for uniformed fire service personnel. On December 14, 1972, the board established four technical committees to develop those standards, using the National Fire Protection Association (NFPA) standards-making system. The initial committees addressed the following career areas: fire fighter, fire officer, fire service instructor, and fire inspector and investigator. The Technical Committee on Fire Fighter Professional Qualifications met regularly after the adoption of NFPA 1001 to produce the first edition of this document, which was adopted by NFPA in 1976. NFPA 1002 was the second in the series of fire fighter professional qualifications standards.

Additional editions were adopted and issued by NFPA under the auspices of the NPQB in 1982 and 1988.

The original concept of the professional qualifications standards, as directed by the JCNFSO and the NPQB, was to develop an interrelated set of performance standards specifically for the uniformed fire service. The various levels of achievement in the standards were to build upon each other within a strictly defined career ladder. In the late 1980s, revisions of the standards recognized that the documents should stand on their own merit in terms of job performance requirements (JPRs) for a given field. Accordingly, the strict career ladder concept was revised, except for the progression from fire fighter to fire officer, in order to allow civilian entry into many of the fields. These revisions facilitated the use of the documents by other than the uniformed fire services.

In 1990, responsibility for the appointment of professional qualifications committees and the development of the professional qualifications standards were assumed by the NFPA. The Standards Council appointed the Correlating Committee on Professional Qualifications to assume responsibility for coordinating the requirements of all professional qualifications documents.

The JPR format of this document is consistent with the other standards in the professional qualifications project. Each JPR consists of the task to be performed; the tools, equipment, or materials that must be provided to successfully complete the task; evaluation parameters and/or performance outcomes; and lists of requisite knowledge and skills one must have to be able to perform the task. The intent of the Technical Committee on Fire Fighter Professional Qualifications is to provide clear and concise job performance requirements that can be used to determine that an individual, when measured to the standard, possesses the skills and knowledge to perform as a fire fighter.

In the 2003 edition of the document, the technical committee made changes to bring it into conformance with the new *Manual of Style for NFPA Technical Committee Documents* and several small additions.

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In the 2009 edition of the document, the technical committee made the following changes to meet the Technical Correlating Committee request to standardize the documents within the Professional Qualification Project. The Purpose and Scope statements were rewritten, the term "certification" was replaced with "qualifying," and a skills maintenance requirement was added to Chapter 1. The committee also accepted alternative general requirements for meeting Fire Fighter I with various specific requirements of NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications,* for fire brigade members for Chapters 5, 6, and 10.

The 2014 edition has two significant changes. The technical committee has recognized that not every authority having jurisdiction (AHJ) has the roadway feature capabilities to accomplish the various job requirement tasks to address the various apparatus maneuvers. It is the intent of the committee, when possible, to encourage that all skills be accomplished. The technical committee has also recognized the importance of donning passenger restraint devices to ensure crew safety as part of driver/operator responsibilities.

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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.

Committee Scope: This Committee shall have primary responsibility for the management of the NFPA Professional Qualifications Project and documents related to professional qualifications for fire service, public safety, and related personnel.

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Committee Scope: This Committee shall have primary responsibility for documents on professional qualifications required of fire fighters.

Contents

Chapter 1 Administration 1002– 6
1.1 Scope 1002– 6
1.2 Purpose 1002– 6
1.3 Exceeding Minimum Requirements 1002– 6
1.4 General 1002– 6

Chapter 2 Referenced Publications 1002– 6
2.1 General 1002– 6
2.2 NFPA Publications 1002– 6
2.3 Other Publications 1002– 7
2.4 References for Extracts in Mandatory Sections 1002– 7

Chapter 3 Definitions 1002– 7
3.1 General 1002– 7
3.2 NFPA Official Definitions 1002– 7
3.3 General Definitions 1002– 7

Chapter 4 General Requirements 1002– 8
4.1 General 1002– 8
4.2 Preventive Maintenance 1002– 8
4.3 Driving/Operating 1002– 8

Chapter 5 Apparatus Equipped with Fire Pump 1002– 9
5.1 General 1002– 9
5.2 Operations 1002– 9

Chapter 6 Apparatus Equipped with an Aerial Device 1002–10
6.1 General 1002–10
6.2 Operations 1002–10

Chapter 7 Apparatus Equipped with a Tiller 1002–11
7.1 General 1002–11
7.2 Operations 1002–11

Chapter 8 Wildland Fire Apparatus 1002–11
8.1 General 1002–11
8.2 Operations 1002–11

Chapter 9 Aircraft Rescue and Fire-Fighting Apparatus 1002–12
9.1 General 1002–12
9.2 Operations 1002–12

Chapter 10 Mobile Water Supply Apparatus 1002–13
10.1 General 1002–13
10.2 Operations 1002–13

Annex A Explanatory Material 1002–13

Annex B Job Performance Requirements 1002–17

Annex C Informational References 1002–20

Index 1002–21

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NFPA 1002

Standard for

Fire Apparatus Driver/Operator Professional Qualifications

2014 Edition

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Information on referenced publications can be found in Chapter 2 and Annex C.

Chapter 1 Administration

1.1 Scope. This standard identifies the minimum job performance requirements for career and volunteer fire fighters and Fire Brigade members who drive and operate fire apparatus.

1.2* Purpose. The purpose of this standard shall be to ensure that persons meeting the requirements of this standard who drive and operate fire apparatus are qualified.

1.3 Exceeding Minimum Requirements. It is not the intent of this standard to restrict any jurisdiction from exceeding these minimum requirements.

1.4 General.

1.4.1 The fire department vehicle driver/operators shall be licensed to drive all vehicles they are expected to operate.

1.4.2 The fire department driver/operator shall be subject to periodic medical evaluation, as required by NFPA 1500, Section 10.1, Medical Requirements, to determine that the driver/operator is medically fit to perform the duties of a fire department vehicle driver/operator.

1.4.3* All driver/operators who drive fire apparatus shall meet the objectives of Chapter 4 for each type of apparatus they will be expected to operate.

1.4.4 The fire apparatus driver who is required to operate an apparatus equipped with an attack or fire pump shall meet the requirements of Chapter 5.

1.4.5 The fire apparatus driver who is required to operate an apparatus equipped with an aerial device shall meet the requirements of Chapter 6.

1.4.6 The fire apparatus driver who is required to function in the tiller position shall meet the requirements of Chapter 7.

1.4.7 The fire apparatus driver who is required to operate wildland fire apparatus shall meet the requirements of Chapter 8.

1.4.8 The fire apparatus driver who is required to operate aircraft rescue and fire-fighting apparatus shall meet the requirements of Chapter 9.

1.4.9 The mobile water supply apparatus driver shall meet the requirements of Chapter 10.

1.4.10* Job performance requirements defined by this standard shall be evaluated by individuals approved by the authority having jurisdiction.

1.4.11 The job performance requirements need not be mastered in the order in which they appear. The local, state/provincial, or federal training programs shall establish the instructional priority and the training program content to prepare individuals to meet the job performance requirements of this standard.

1.4.12 The job performance requirements of Chapters 4 through 10 shall be performed utilizing vehicles of similar weight, wheelbase, and function as those expected to be operated in the performance of the driver/operator's normal duties.

1.4.13* Fire apparatus drivers who are expected to operate vehicles off-road shall meet the requirements of 8.1.2, in addition to the applicable requirements of Chapters 4 through 7.

1.4.14* The driver/operator shall remain current with apparatus technology, driving/operating practices, and applicable laws and standards by attending workshops and seminars, undergoing certification testing, and accessing professional publications.

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, Quincy, MA 02169-7471.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2013 edition.

NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, 2013 edition.

NFPA 13E, *Recommended Practice for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems*, 2010 edition.

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies*, 2013 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2013 edition.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2013 edition.

NFPA 1003, *Standard for Airport Fire Fighter Professional Qualifications*, 2010 edition.

NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications*, 2012 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2013 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 2009 edition.

2.3 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 1000, *Standard for Fire Service Professional Qualifications Accreditation and Certification Systems*, 2011 edition.

NFPA 1031, *Standard for Professional Qualifications for Fire Inspector and Plan Examiner*, 2014 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 2009 edition.

NFPA 1906, *Standard for Wildland Fire Apparatus*, 2012 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Shall. Indicates a mandatory requirement.

3.2.4 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 are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the *Manual of Style for NFPA Technical Committee Documents*.

3.3 General Definitions.

3.3.1 Aerial Apparatus. A piece of fire apparatus with a permanently mounted, power-operated elevating device, including aerial ladders, aerial ladder platforms, telescoping aerial platforms, articulating aerial platforms, and elevating water delivery systems.

3.3.2 Aerial Device. An aerial ladder, elevating platform, aerial ladder platform, or water tower that is designed to position personnel, handle materials, provide egress, and discharge water.

3.3.3 Aerial Operator. The fire apparatus driver who has met the requirements of Chapter 6 for the operation of apparatus equipped with aerial devices.

3.3.4 Aircraft Rescue and Fire-Fighting (ARFF) Vehicle. A vehicle intended to carry rescue and fire-fighting equipment for rescuing occupants and combating fires in aircraft at, or in the vicinity of, an airport.

3.3.5 Angle of Approach. The smallest angle made between the road surface and a line drawn from the front point of ground contact of the front tire to any projection of the apparatus in front of the front axle.

3.3.6 Angle of Departure. The smallest angle made between the road surface and the line drawn from the rear point of ground contact of the rear tire to any projection of the apparatus behind the rear axle.

3.3.7 Fire Apparatus. A vehicle designed to be used under emergency conditions to transport personnel and equipment, and to support the suppression of fires and mitigation of other hazardous situations. [**1901,** 2009.]

3.3.8 Fire Apparatus Driver. The fire fighter who has met the requirements defined in Chapter 4.

3.3.9 Fire Department. An organization providing rescue, fire suppression, and related activities, including any public, governmental, private, industrial, or military organization engaging in this type of activity.

3.3.10 Fire Department Pumper. A piece of fire apparatus with a permanently mounted fire pump that has a rated discharge capacity of 750 gpm (2850 L/min) or greater as defined in NFPA 1901.

3.3.11 Fire Department Vehicle. Any vehicle, including fire apparatus, operated by a fire department.

3.3.12 Fire Pump. A water pump with a rated capacity of 250 gpm (1000 L/min) through 3000 gpm (12,000 L/min) at 150 psi (1000 kPa) net pump pressure, or a water pump with rated capacity over 3000 gpm (12,000 L/min) at 100 psi (700 kPa) net pump pressure, that is mounted on a fire apparatus and used for fire fighting. [**1901,** 2009]

3.3.13 Foam System. A system provided on fire apparatus for the delivery of a proportioned foam and water mixture for use in fire extinguishment. The system includes a concentrate tank, a method for removing the concentrate from the tank, a foam-liquid proportioning system, and a method (e.g., hand lines or fixed turret nozzles) of delivering the proportioned foam to the fire.

3.3.14 Job Performance Requirement. A statement that describes a specific job task, lists the items necessary to complete the task, and defines measurable or observable outcomes and evaluation areas for the specific task. [**1000,** 2011]

3.3.15 Liquid Surge. The force imposed upon a fire apparatus by the contents of a partially filled water or foam concentrate tank when the vehicle is accelerated, decelerated, or turned.

3.3.16 Mobile Water Supply Apparatus (Tanker, Tender). A vehicle designed primarily for transporting (pickup, transporting, and delivering) water to fire emergency scenes to be applied by other vehicles or pumping equipment. [**1901,** 2009]

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3.3.17 Off-Road Use. Use of fire department vehicles in areas where there is a need to traverse steep terrain or to cross natural hazards on or protruding from the ground.

3.3.18 Pump Operator. The fire apparatus driver/operator who has met the requirements of Chapter 5 for the operation of apparatus equipped with an attack or fire pump.

3.3.19 Pumping System. A pump, the piping, and associated devices mounted permanently on a piece of fire apparatus for the purpose of delivering a fire stream.

3.3.20 Requisite Knowledge. Fundamental knowledge one must have in order to perform a specific task. [**1031,** 2014]

3.3.21 Requisite Skills. The essential skills one must have in order to perform a specific task. [**1031,** 2014]

3.3.22 Task. A specific job behavior or activity.

3.3.23 Tiller Aerial Apparatus. A tractor-trailer aerial apparatus with a steering wheel connected to the rear axle for maneuvering the rear portion of the apparatus.

3.3.24 Tiller Operator. The fire apparatus driver/operator who has met the requirements of Chapter 7.

3.3.25* Wildland Fire Apparatus. Fire apparatus designed for fighting wildland fires that is equipped with a pump having a capacity normally between 30 gpm and 500 gpm (115 L/min and 1900 L/min), a water tank, limited hose and equipment, and that has pump-and-roll capability. [**1906,** 2012]

Chapter 4 General Requirements

4.1 General. Prior to operating fire department vehicles, the fire apparatus driver/operator shall meet the job performance requirements defined in Sections 4.2 and 4.3.

4.2 Preventive Maintenance.

4.2.1* Perform routine tests, inspections, and servicing functions on the systems and components specified in the following list, given a fire department vehicle, its manufacturer's specifications, and policies and procedures of the jurisdiction, so that the operational status of the vehicle is verified:

(1) Battery(ies)
(2) Braking system
(3) Coolant system
(4) Electrical system
(5) Fuel
(6) Hydraulic fluids
(7) Oil
(8) Tires
(9) Steering system
(10) Belts
(11) Tools, appliances, and equipment

(A) Requisite Knowledge. Manufacturer specifications and requirements, policies, and procedures of the jurisdiction.

(B) Requisite Skills. The ability to use hand tools, recognize system problems, and correct any deficiency noted according to policies and procedures.

4.2.2 Document the routine tests, inspections, and servicing functions, given maintenance and inspection forms, so that all items are checked for operation and deficiencies are reported.

(A) Requisite Knowledge. Departmental requirements for documenting maintenance performed and the importance of keeping accurate records.

(B) Requisite Skills. The ability to use tools and equipment and complete all related departmental forms.

4.3 Driving/Operating.

4.3.1* Operate a fire apparatus, given a vehicle and a predetermined route on a public way that incorporates the maneuvers and features that the driver/operator is expected to encounter during normal operations, so that the vehicle is operated in compliance with all applicable state and local laws and departmental rules and regulations.

(A) Requisite Knowledge. The importance of donning passenger restraint devices and ensuring crew safety; the common causes of fire apparatus accidents and the recognition that drivers of fire apparatus are responsible for the safe and prudent operation of the vehicle under all conditions; the effects on vehicle control of liquid surge, braking reaction time, and load factors; effects of high center of gravity on roll-over potential, general steering reactions, speed, and centrifugal force; applicable laws and regulations; principles of skid avoidance, night driving, shifting, and gear patterns; negotiating intersections, railroad crossings, and bridges; weight and height limitations for both roads and bridges; identification and operation of automotive gauges; and operational limits.

(B) Requisite Skills. The ability to operate passenger restraint devices; maintain safe following distances; maintain control of the vehicle while accelerating, decelerating, and turning, given road, weather, and traffic conditions; operate under adverse environmental or driving surface conditions; and use automotive gauges and controls.

4.3.2* Back a vehicle from a roadway into restricted spaces on both the right and left sides of the vehicle, given a fire apparatus, a spotter, and restricted spaces 12 ft (3.7 m) in width, requiring 90-degree right-hand and left-hand turns from the roadway, so that the vehicle is parked within the restricted areas without having to stop and pull forward and without striking obstructions.

(A) Requisite Knowledge. Vehicle dimensions, turning characteristics, spotter signaling, and principles of safe vehicle operation.

(B) Requisite Skills. The ability to use mirrors and judge vehicle clearance.

4.3.3* Maneuver a vehicle around obstructions on a roadway while moving forward and in reverse, given a fire apparatus, a spotter for backing, and a roadway with obstructions, so that the vehicle is maneuvered through the obstructions without stopping to change the direction of travel and without striking the obstructions.

(A) Requisite Knowledge. Vehicle dimensions, turning characteristics, the effects of liquid surge, spotter signaling, and principles of safe vehicle operation.

(B) Requisite Skills. The ability to use mirrors and judge vehicle clearance.

4.3.4* Turn a fire apparatus 180 degrees within a confined space, given a fire apparatus, a spotter for backing up, and an area in which the vehicle cannot perform a U-turn without stopping and backing up, so that the vehicle is turned 180 degrees without striking obstructions within the given space.

(A) Requisite Knowledge. Vehicle dimensions, turning characteristics, the effects of liquid surge, spotter signaling, and principles of safe vehicle operation.

(B) Requisite Skills. The ability to use mirrors and judge vehicle clearance.

4.3.5* Maneuver a fire apparatus in areas with restricted horizontal and vertical clearances, given a fire apparatus and a course that requires the operator to move through areas of restricted horizontal and vertical clearances, so that the operator accurately judges the ability of the vehicle to pass through the openings and so that no obstructions are struck.

(A) Requisite Knowledge. Vehicle dimensions, turning characteristics, the effects of liquid surge, spotter signaling, and principles of safe vehicle operation.

(B) Requisite Skills. The ability to use mirrors and judge vehicle clearance.

4.3.6* Operate a vehicle using defensive driving techniques, given an assignment and a fire apparatus, so that control of the vehicle is maintained.

(A) Requisite Knowledge. The importance of donning passenger restraint devices and ensuring crew safety; the common causes of fire apparatus accidents and the recognition that drivers of fire apparatus are responsible for the safe and prudent operation of the vehicle under all conditions; the effects on vehicle control of liquid surge, braking reaction time, and load factors; the effects of high center of gravity on rollover potential, general steering reactions, speed, and centrifugal force; applicable laws and regulations; principles of skid avoidance, night driving, shifting, gear patterns; and automatic braking systems in wet and dry conditions; negotiation of intersections, railroad crossings, and bridges; weight and height limitations for both roads and bridges; identification and operation of automotive gauges; and operational limits.

(B) Requisite Skills. The ability to operate passenger restraint devices; maintain safe following distances; maintain control of the vehicle while accelerating, decelerating, and turning, given road, weather, and traffic conditions; operate under adverse environmental or driving surface conditions; and use automotive gauges and controls.

4.3.7* Operate all fixed systems and equipment on the vehicle not specifically addressed elsewhere in this standard, given systems and equipment, manufacturer's specifications and instructions, and departmental policies and procedures for the systems and equipment, so that each system or piece of equipment is operated in accordance with the applicable instructions and policies.

(A) Requisite Knowledge. Manufacturer's specifications and operating procedures, and policies and procedures of the jurisdiction.

(B) Requisite Skills. The ability to deploy, energize, and monitor the system or equipment and to recognize and correct system problems.

Chapter 5 Apparatus Equipped with Fire Pump

5.1* General. The requirements of Fire Fighter 1 as specified in NFPA 1001 (or the requirements of Advanced Exterior Industrial Fire Brigade Member or Interior Structural Fire Brigade Member as specified in NFPA 1081) and the job performance requirements defined in Sections 5.1 and 5.2 shall be met prior to qualifying as a fire department driver/operator — pumper.

5.1.1 Perform the routine tests, inspections, and servicing functions specified in the following list in addition to those in 4.2.1, given a fire department pumper, its manufacturer's specifications, and policies and procedures of the jurisdiction, so that the operational status of the pumper is verified:

(1) Water tank and other extinguishing agent levels (if applicable)
(2) Pumping systems
(3) Foam systems

(A) Requisite Knowledge. Manufacturer's specifications and requirements, and policies and procedures of the jurisdiction.

(B) Requisite Skills. The ability to use hand tools, recognize system problems, and correct any deficiency noted according to policies and procedures.

5.2 Operations.

5.2.1 Produce effective hand or master streams, given the sources specified in the following list, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is continuously monitored for potential problems:

(1) Internal tank
(2)*Pressurized source
(3) Static source
(4) Transfer from internal tank to external source

(A) Requisite Knowledge. Hydraulic calculations for friction loss and flow using both written formulas and estimation methods, safe operation of the pump, problems related to small-diameter or dead-end mains, low-pressure and private water supply systems, hydrant coding systems, and reliability of static sources.

(B) Requisite Skills. The ability to position a fire department pumper to operate at a fire hydrant and at a static water source, power transfer from vehicle engine to pump, draft, operate pumper pressure control systems, operate the volume/pressure transfer valve (multistage pumps only), operate auxiliary cooling systems, make the transition between internal and external water sources, and assemble hose lines, nozzles, valves, and appliances.

5.2.2 Pump a supply line of 2½ in. (65 mm) or larger, given a relay pumping evolution the length and size of the line and the desired flow and intake pressure, so that the correct pressure and flow are provided to the next pumper in the relay.

(A) Requisite Knowledge. Hydraulic calculations for friction loss and flow using both written formulas and estimation methods, safe operation of the pump, problems related to small-diameter or dead-end mains, low-pressure and private water supply systems, hydrant coding systems, and reliability of static sources.

(B) Requisite Skills. The ability to position a fire department pumper to operate at a fire hydrant and at a static water source, power transfer from vehicle engine to pump, draft, operate pumper pressure control systems, operate the volume/pressure transfer valve (multistage pumps only), operate auxiliary cooling systems, make the transition between internal and external water sources, and assemble hose lines, nozzles, valves, and appliances.

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5.2.3 Produce a foam fire stream, given foam-producing equipment, so that properly proportioned foam is provided.

(A) Requisite Knowledge. Proportioning rates and concentrations, equipment assembly procedures, foam system limitations, and manufacturer's specifications.

(B) Requisite Skills. The ability to operate foam proportioning equipment and connect foam stream equipment.

5.2.4 Supply water to fire sprinkler and standpipe systems, given specific system information and a fire department pumper, so that water is supplied to the system at the correct volume and pressure.

(A) Requisite Knowledge. Calculation of pump discharge pressure; hose layouts; location of fire department connection; alternative supply procedures if fire department connection is not usable; operating principles of sprinkler systems as defined in NFPA 13, NFPA 13D, and NFPA 13R; fire department operations in sprinklered properties as defined in NFPA 13E; and operating principles of standpipe systems as defined in NFPA 14.

(B) Requisite Skills. The ability to position a fire department pumper to operate at a fire hydrant and at a static water source, power transfer from vehicle engine to pump, draft, operate pumper pressure control systems, operate the volume/pressure transfer valve (multistage pumps only), operate auxiliary cooling systems, make the transition between internal and external water sources, and assemble hose lines, nozzles, valves, and appliances.

Chapter 6 Apparatus Equipped with an Aerial Device

6.1* General. The requirements of Fire Fighter I as specified in NFPA 1001 (or the requirements of Advanced Exterior Industrial Fire Brigade Member or Interior Structural Fire Brigade Member as specified in NFPA 1081) and the job performance requirements defined in Sections 6.1 and 6.2 shall be met prior to qualifying as a fire department driver/operator — aerial.

6.1.1 Perform the routine tests, inspections, and servicing functions specified in the following list in addition to those specified in 4.2.1, given a fire department aerial apparatus, and policies and procedures of the jurisdiction, so that the operational readiness of the aerial apparatus is verified:

(1) Cable systems (if applicable)
(2) Aerial device hydraulic systems
(3) Slides and rollers
(4) Stabilizing systems
(5) Aerial device safety systems
(6) Breathing air systems
(7) Communication systems

(A) Requisite Knowledge. Manufacturer's specifications and requirements, and policies and procedures of the jurisdiction.

(B) Requisite Skills. The ability to use hand tools, recognize system problems, and correct any deficiency noted according to policies and procedures.

6.2 Operations.

6.2.1 Maneuver and position an aerial apparatus, given an aerial apparatus, an incident location, a situation description, and an assignment, so that the apparatus is positioned for correct aerial device deployment.

(A) Requisite Knowledge. Capabilities and limitations of aerial devices related to reach, tip load, angle of inclination, and angle from chassis axis; effects of topography, ground, and weather conditions on deployment; and use of the aerial device.

(B) Requisite Skills. The ability to determine a correct position for the apparatus, maneuver apparatus into that position, and avoid obstacles to operations.

6.2.2 Stabilize an aerial apparatus, given a positioned vehicle and the manufacturer's recommendations, so that power can be transferred to the aerial device hydraulic system and the device can be deployed.

(A) Requisite Knowledge. Aerial apparatus hydraulic systems, manufacturer's specifications for stabilization, stabilization requirements, and effects of topography and ground conditions on stabilization.

(B) Requisite Skills. The ability to transfer power from the vehicle's engine to the hydraulic system and operate vehicle stabilization devices.

6.2.3 Maneuver and position the aerial device from each control station, given an incident location, a situation description, and an assignment, so that the aerial device is positioned to accomplish the assignment.

(A) Requisite Knowledge. Aerial device hydraulic systems, hydraulic pressure relief systems, gauges and controls, cable systems, communications systems, electrical systems, emergency operating systems, locking systems, manual rotation and lowering systems, stabilizing systems, aerial device safety systems, system overrides and the hazards of using overrides, safe operational limitations of the given aerial device, safety procedures specific to the device, and operations near electrical hazards and overhead obstructions.

(B) Requisite Skills. The ability to raise, rotate, extend, and position to a specified location, as well as lock, unlock, retract, lower, and bed the aerial device.

6.2.4 Lower an aerial device using the emergency operating system, given an aerial device, so that the aerial device is lowered to its bedded position.

(A) Requisite Knowledge. Aerial device hydraulic systems, hydraulic pressure relief systems, gauges and controls, cable systems, communications systems, electrical systems, emergency operating systems, locking systems, manual rotation and lowering systems, stabilizing systems, aerial device safety systems, system overrides and the hazards of using overrides, safe operational limitations of the given aerial device, safety procedures specific to the device, and operations near electrical hazards and overhead obstructions.

(B) Requisite Skills. The ability to rotate and position to center, unlock, retract, lower, and bed the aerial device using the emergency operating system.

6.2.5 Deploy and operate an elevated master stream, given an aerial device, a master stream device, and a desired flow so that the stream is effective and the aerial and master stream devices are operated correctly.

(A) Requisite Knowledge. Nozzle reaction, range of operation, and weight limitations.

(B) Requisite Skills. The ability to connect a water supply to a master stream device and control an elevated nozzle manually or remotely.

Chapter 7 Apparatus Equipped with a Tiller

7.1* General. The requirements of Fire Fighter I as specified in NFPA 1001 and the job performance requirements defined in Chapter 6 and Section 7.2 shall be met prior to qualifying as a fire department driver/operator — tiller.

7.2 Operations.

7.2.1* Perform the practical driving exercises specified in 4.3.2 through 4.3.5 from the tiller position, given a qualified driver, a fire department aerial apparatus equipped with a tiller, and a spotter for backing up, so that each exercise is performed without striking the vehicle or obstructions.

(A) Requisite Knowledge. Capabilities and limitations of tiller aerial devices related to reach, tip load, angle of inclination, and angle from chassis axis; effects of topography, ground, and weather conditions on safe deployment; and use of a tiller aerial device.

(B) Requisite Skills. The ability to determine a correct position for the tiller, maneuver the tiller into that position, and avoid obstacles to operations.

7.2.2 Operate a fire department aerial apparatus equipped with a tiller from the tiller position over a predetermined route on a public way, using the maneuvers specified in 4.3.1, given a qualified driver, a fire department aerial apparatus equipped with a tiller, and a spotter for backing up, so that the vehicle is operated in compliance with all applicable state and local laws, departmental rules and regulations, and the requirements of NFPA 1500, Section 4.2.

(A) Requisite Knowledge. Principles of tiller operation, methods of communication with the driver, the effects on vehicle control of general steering reactions, night driving, negotiating intersections, and manufacturer operation limitations.

(B) Requisite Skills. The ability to operate the communication system between the tiller operator's position and the driver's compartment; operate passenger restraint devices; maintain control of the tiller while accelerating, decelerating, and turning; operate the vehicle during nonemergency conditions; and operate under adverse environmental or driving surface conditions.

7.2.3 Position a fire department aerial apparatus equipped with a tiller from the tiller position, given the apparatus operating instructions, an incident location, a situation description, and an assignment, so that the aerial device is positioned and stabilized to accomplish the assignment.

(A) Requisite Knowledge. Principles of positioning and stabilizing the aerial apparatus from the tiller position.

(B) Requisite Skills. The ability to determine a correct position for the tiller, maneuver the tiller into that position, and avoid obstacles to operations.

Chapter 8 Wildland Fire Apparatus

8.1 General. The job performance requirements defined in Sections 8.1 and 8.2 shall be met prior to qualifying as a driver/operator — wildland fire apparatus.

8.1.1 Perform the routine tests, inspections, and servicing functions specified in the following list, in addition to those in 4.2.1, given a wildland fire apparatus, its manufacturer's specifications, and policies and procedures of the jurisdiction, so that the operational status is verified:

(1) Water tank and/or other extinguishing agent levels (if applicable)
(2) Pumping systems
(3) Foam systems

(A) Requisite Knowledge. Manufacturer's specifications and requirements, and policies and procedures of the jurisdiction.

(B) Requisite Skills. The ability to use hand tools, recognize system problems, and correct any deficiency noted according to policies and procedures.

8.1.2* Operate a wildland fire apparatus, given a predetermined route off of a public way that incorporates the maneuvers and features that the driver/operator is expected to encounter during normal operations, so that the vehicle is operated in compliance with all applicable departmental rules and regulations and the design limitations of the vehicle.

(A) Requisite Knowledge. The effects on vehicle control of braking reaction time and load factors; effects of high center of gravity on roll-over potential, general steering reactions, speed, and centrifugal force; applicable laws and regulations; principles of skid avoidance, night driving, shifting, and gear patterns; negotiating intersections, railroad crossings, and bridges; weight and height limitations for both roads and bridges; identification and operation of automotive gauges; and operational limits.

(B) Requisite Skills. The ability to operate passenger restraint devices; maintain safe following distances; maintain control of the vehicle while accelerating, decelerating, and turning, given road, weather, and traffic conditions; operate during nonemergency conditions; operate under adverse environmental or driving surface conditions; and use automotive gauges and controls.

8.2 Operations.

8.2.1 Produce effective fire streams, given the sources specified in the following list, so that the pump is engaged, all pressure-control and vehicle safety devices are set, the rated flow of the nozzle is achieved, and the apparatus is continuously monitored for potential problems:

(1) Water tank
(2)*Pressurized source
(3) Static source

(A) Requisite Knowledge. Hydraulic calculations for friction loss and flow using both written formulas and estimation methods, safe operation of the pump, correct apparatus placement, personal safety considerations, problems related to small-diameter or dead-end mains and low-pressure and private water supply systems, hydrant cooling systems, and reliability of static sources.

(B) Requisite Skills. The ability to position a wildland fire apparatus to operate at a fire hydrant and at a static water source, correctly place apparatus for fire attack, transfer power from vehicle engine to pump, draft, operate pumper pressure control systems, operate the volume/pressure transfer valve (multistage pumps only), operate auxiliary cooling systems, make the transition between internal and external water sources, and assemble hose lines, nozzles, valves, and appliances.

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8.2.2 Pump a supply line, given a relay pumping evolution the length and size of the line and pumping flow and desired intake pressure, so that correct intake pressures and flow are provided to the next pumper in the relay.

(A) Requisite Knowledge. Hydraulic calculations for friction loss and flow using both written formulas and estimation methods, safe operation of the pump, problems related to small-diameter or dead-end main and low-pressure and private water supply systems, hydrant cooling systems, and reliability of static sources.

(B) Requisite Skills. The ability to position a wildland apparatus to operate at a fire hydrant and at a static water source, transfer power from vehicle engine to pump, draft, operate pumper pressure control systems, operate the volume/pressure transfer valve (multistage pumps only), operate auxiliary cooling systems, make the transition between internal and external water sources, and assemble hose lines, nozzles, valves, and appliances.

8.2.3 Produce a foam fire stream, given foam-producing equipment, so that the correct proportion of foam is provided.

(A) Requisite Knowledge. Proportioning rates and concentrations, equipment assembly procedures, foam systems limitations, and manufacturer's specifications.

(B) Requisite Skills. The ability to operate foam proportioning equipment and connect foam stream equipment.

Chapter 9 Aircraft Rescue and Fire-Fighting Apparatus

9.1* General. The requirements of Fire Fighter II as specified in NFPA 1001, the requirements of Airport Fire Fighter as specified in NFPA 1003, and the job performance requirements defined in Sections 9.1 and 9.2 shall be met prior to qualifying as a fire department driver/operator — aircraft rescue and fire-fighting (ARFF) apparatus.

9.1.1 Perform the routine tests, inspections, and servicing functions specified in the following list in addition to those in 4.2.1, given an ARFF vehicle and the manufacturer's servicing, testing, and inspection criteria, and policies and procedures of the jurisdiction, so that the operational status of the vehicle is verified:

(1)*Agent dispensing systems
(2)*Secondary extinguishing systems
(3) Vehicle-mounted breathing air systems

(A) Requisite Knowledge. Manufacturer's specifications and requirements, and policies and procedures of the jurisdiction.

(B) Requisite Skills. The ability to use hand tools, recognize system problems, and correct any deficiency noted according to policies and procedures.

9.1.2 Operate an ARFF vehicle, given a predetermined route on an airport that includes the maneuvers listed in 4.3.1, and operation in all aircraft movement areas, so that the vehicle is operated in compliance with all applicable federal, state/provincial, and local laws and departmental rules and regulations.

(A) Requisite Knowledge. The effects on vehicle control of liquid surge, braking reaction time, and load factors; effects of high center of gravity on roll-over potential, general steering reactions, speed, and centrifugal force; applicable laws and regulations; principles of skid avoidance, night driving, shifting, and gear patterns; negotiating intersections, railroad crossings, and bridges; weight and height limitations for both roads and bridges; identification and operation of automotive gauges; operational limits; hazards of driving through smoke; control tower light signals; airfield markings; runway and taxiway designations; air and vehicle traffic patterns; and all aircraft movements areas.

(B) Requisite Skills. The ability to operate passenger restraint devices; maintain safe following distances; maintain control of the vehicle while accelerating, decelerating, and turning, given road, weather, and traffic conditions; operate under adverse environmental or driving surface conditions; and use automotive gauges and controls.

9.1.3* Operate an ARFF apparatus, given a predetermined route, off of an improved surface that incorporates the maneuvers and features that the driver/operator is expected to encounter during normal operations, so that the vehicle is operated in compliance with all applicable departmental rules and regulations and the design limitations of the vehicle.

(A) Requisite Knowledge. The effects on vehicle control of braking reaction time and load factors; effects of high center of gravity on roll-over potential, general steering reactions, speed, and centrifugal force; applicable laws and regulations; principles of skid avoidance, night driving, shifting, and gear patterns; negotiating intersections, railroad crossings, and bridges; weight and height limitations for both roads and bridges; identification and operation of automotive gauges; and operational limits.

(B) Requisite Skills. The ability to operate passenger restraint devices; maintain safe following distances; maintain control of the vehicle while accelerating, decelerating, and turning, given road, weather, and traffic conditions; operate during nonemergency conditions; operate under adverse environmental or driving surface conditions; and use automotive gauges and controls.

9.2 Operations.

9.2.1 Maneuver and position an ARFF vehicle, given an incident location and description that involves the largest aircraft that routinely uses the airport, so that the vehicle is positioned for correct operation at each operational position for the aircraft.

(A) Requisite Knowledge. Vehicle positioning for fire-fighting and rescue operations; tower light signals, aircraft recognition, airport markings, and capabilities and limitations of turret devices; and effects of topography, ground, and weather conditions on agent application, distribution rates, and density.

(B) Requisite Skills. The ability to determine a correct position for the apparatus, maneuver apparatus into that position, and avoid obstacles to operations.

9.2.2 Produce a fire stream while the vehicle is in both forward and reverse power modulation, given a discharge rate and intended target, so that the pump is engaged, the turrets are deployed, the agent is delivered to the intended target at the correct rate, and the apparatus is moved and continuously monitored for potential problems.

(A) Requisite Knowledge. Principles of agent management and application, effects of terrain and wind on agent application, turret capabilities and limitations, aircraft danger areas, theoretical critical fire area and practical critical fire area, aircraft entry and egress points, and correct apparatus placement.

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(B) Requisite Skills. The ability to provide power to the pump, determine a correct position for the apparatus, maneuver apparatus into that position, avoid obstacles to operations, apply agent, and determine the length of time an extinguishing agent will be available.

9.2.3 Produce a fire stream, given a rate of discharge and water supplied from the sources specified in the following list, so that the pump is engaged, the turrets are deployed, the agent is delivered to the intended target at the correct rate, and the apparatus is continuously monitored for potential problems:

(1) The internal tank
(2)*Pressurized source
(3) Static source in fire apparatus equipped with drafting capabilities

(A) Requisite Knowledge. Principles of agent management and application, effects of terrain and wind on agent application, turret capabilities and limitations, tower light signals, airport markings, aircraft recognition, aircraft danger areas, theoretical critical fire area and practical critical fire area, aircraft entry and egress points, and correct apparatus placement.

(B) Requisite Skills. The ability to provide power to the pump, determine a correct position for the apparatus, maneuver apparatus into that position, avoid obstacles to operations, apply agent, and determine the length of time an extinguishing agent will be available.

Chapter 10 Mobile Water Supply Apparatus

10.1 General. The job performance requirements defined in Sections 10.1 and 10.2 shall be met prior to qualifying as a fire department driver/operator — mobile water supply apparatus.

10.1.1 Perform routine tests, inspections, and servicing functions specified in the following list, in addition to those specified in 4.2.1, given a fire department mobile water supply apparatus, and policies and procedures of the jurisdiction, so that the operational readiness of the mobile water supply apparatus is verified:

(1) Water tank and other extinguishing agent levels (if applicable)
(2) Pumping system (if applicable)
(3) Rapid dump system (if applicable)
(4) Foam system (if applicable)

(A) Requisite Knowledge. Manufacturer's specifications and requirements, and policies and procedures of the jurisdiction.

(B) Requisite Skills. The ability to use hand tools, recognize system problems, and correct any deficiency noted according to policies and procedures.

10.2 Operations.

10.2.1* Maneuver and position a mobile water supply apparatus at a water shuttle fill site, given a fill site location and one or more supply hose, so that the apparatus is correctly positioned, supply hose are attached to the intake connections without having to stretch additional hose, and no objects are struck at the fill site.

(A) Requisite Knowledge. Local procedures for establishing a water shuttle fill site, method for marking the stopping position of the apparatus, and location of the water tank intakes on the apparatus.

(B) Requisite Skills. The ability to determine a correct position for the apparatus, maneuver apparatus into that position, and avoid obstacles to operations.

10.2.2* Maneuver and position a mobile water supply apparatus at a water shuttle dump site, given a dump site and a portable water tank, so that all of the water being discharged from the apparatus enters the portable tank and no objects are struck at the dump site.

(A) Requisite Knowledge. Local procedures for operating a water shuttle dump site and location of the water tank discharges on the apparatus.

(B) Requisite Skills. The ability to determine a correct position for the apparatus, maneuver apparatus into that position, avoid obstacles to operations, and operate the fire pump or rapid water dump system.

10.2.3* Establish a water shuttle dump site, given two or more portable water tanks, low-level strainers, water transfer equipment, fire hose, and a fire apparatus equipped with a fire pump, so that the tank being drafted from is kept full at all times, the tank being dumped into is emptied first, and the water is transferred efficiently from one tank to the next.

(A) Requisite Knowledge. Local procedures for establishing a water shuttle dump site and principles of water transfer between multiple portable water tanks.

(B) Requisite Skills. The ability to deploy portable water tanks, connect and operate water transfer equipment, and connect a strainer and suction hose to the fire pump.

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 The purpose of this standard is not to mandate that all fire apparatus driver/operators meet the requirements of all chapters of this standard. Personnel should meet only those provisions that pertain to the types of apparatus they will be expected to drive and operate.

A.1.4.3 It is the committee's intent that this standard be applied to all fire department vehicles. Drivers of vehicles not specifically addressed in Chapters 5 through 10 (e.g., staff or command vehicles, rescue or utility vehicles, and buses) are expected to meet the requirements of Chapter 4. Agencies operating unique or special vehicles (e.g., tractors, bulldozers, cranes, and graders) should develop job performance requirements and training programs for those vehicles.

A.1.4.10 It is recommended that evaluators be individuals who were not directly involved as instructors for the requirement being evaluated.

A.1.4.13 The maneuvers and features specified for this job performance requirement include driving situations that the committee has determined to be essential. The committee recognizes that each of these situations might not exist in all areas. Where this occurs, those specific requirements can be omitted. It should not be assumed that all these vehicles are wheel drive.

A.1.4.14 Continuing education or training is necessary to ensure that driver/operators remain current and update their knowledge and skills of fire apparatus operations. Nationally recognized certification is one means of demonstrating proficiency in current practices.

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.3.3.25 Wildland Fire Apparatus. These vehicles are expected to operate on a wide variety of surfaces, including off-road. They are equipped with fixed or portable pumps used to supply attack lines; however, these pumps are generally of a capacity that does not put the vehicle into the classification of attack or fire pump.

A.4.2.1 Routine tests, inspections, and servicing functions should be performed on a daily, weekly, monthly, or other periodic basis as determined by departmental policy. The specifications provided by the manufacturer for these functions should be followed.

A.4.3.1 The committee's intent is to have the following maneuvers and features accomplished by the driver/operator. The committee recognizes that each of these situations might not exist within the authority having jurisdiction. The committee considers the following driving situations essential to driver/operator skills:

(1) Four left turns and four right turns
(2) A straight section of urban business street or a two-lane rural road at least 1 mi (1.6 km) in length
(3) One through-intersection and two intersections where a stop has to be made
(4) One railroad crossing
(5) One curve, either left or right
(6) A section of limited-access highway that includes a conventional ramp entrance and exit and a section of road long enough to allow two lane changes
(7) A downgrade steep enough and long enough to require down-shifting and braking
(8) An upgrade steep enough and long enough to require gear changing to maintain speed
(9) One underpass or a low clearance or bridge

A.4.3.2 The alley dock exercise can be used as practice for meeting or in the evaluation of this requirement. This exercise measures a driver's ability to drive past a simulated dock or stall, back the apparatus into the space provided, and stop smoothly. A dock or stall can be simulated by arranging barricades 40 ft (12.2 m) from a boundary line. These barricades should be 12 ft (3.7 m) apart, and the length should be approximately 20 ft (6.1 m). The driver should pass the barricades with the dock on the left and then back the apparatus, using a left turn, into the stall. The exercise should then be repeated with the dock on the right side, using a right turn. *[See Figure A.4.3.2(a).]*

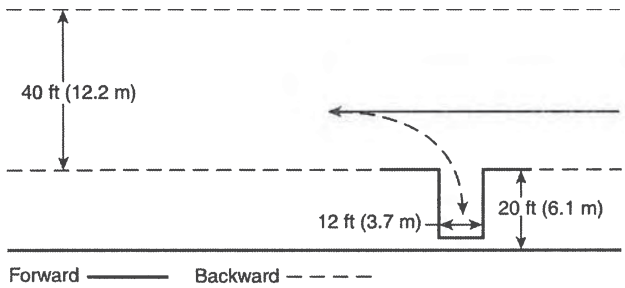


FIGURE A.4.3.2(a) Alley Dock Exercise.

The apparatus station parking maneuver can also be used as practice for meeting or in the evaluation of this requirement. This exercise measures the driver's ability to back the apparatus into a fire station to park or to back the apparatus down a street to reverse the direction of travel. An engine bay can be simulated by allowing for a 20 ft (6.1 m) minimum setback from a street 30 ft (9 m) wide, with a set of barricades at the end of the setback, spaced 12 ft (3.7 m) apart to simulate the garage door. The setback from the street should be determined by the testing agency to ensure that the distances reflect those encountered by the apparatus driver during the normal course of duties. A marker placed on the ground should indicate to the operator the proper position of the left front tire of the vehicle once stopped and parked. A straight line can be provided to assist the operator while backing the apparatus, facilitating the use of vehicle mirrors. The minimum depth distance is determined by the total length of the vehicle. *[See Figure A.4.3.2(b).]*

Note that for large vehicles, such as ARFF apparatus, this course might need to be modified.

A.4.3.3 The serpentine exercise can be used as practice for meeting or in the evaluation of this requirement. This exercise measures a driver's ability to steer the apparatus in close limits without stopping. The exercise should be conducted with the apparatus moving first backward, then forward. The course or path of travel for this exercise can be established by placing a minimum of three markers, each spaced between 30 ft (9 m) and 38 ft (12 m) apart, in a line. The spacing of the markers should be based on the wheel base of the vehicle used. Adequate space must be provided on each side of the markers for the apparatus to move freely. The driver should

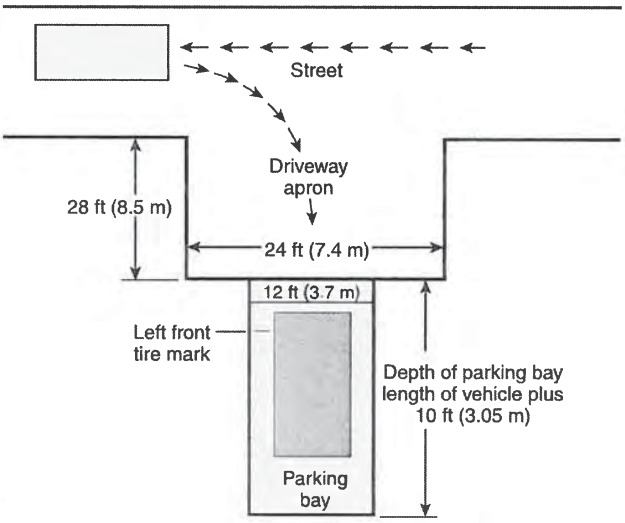
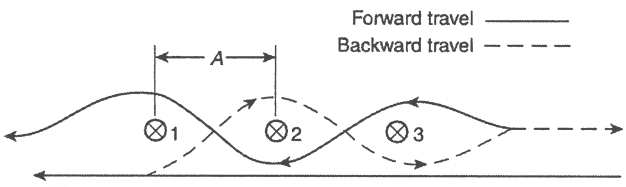


FIGURE A.4.3.2(b) Station Parking Procedure Drill.

drive the apparatus along the left side of the markers in a straight line and stop just beyond the last marker. The driver then should begin the exercise by backing the apparatus between the markers by passing to the left of marker No. 1, to the right of marker No. 2, and to the left of marker No. 3. At this point, the driver should stop the vehicle and then drive it forward between the markers by passing to the right of marker No. 3, to the left of marker No. 2, and to the right of marker No. 1. *(See Figure A.4.3.3.)*

Note that for large vehicles, such as ARFF apparatus, this course might need to be modified.



A: 30 ft to 38 ft (9 m to 12 m) based on vehicle wheel base

FIGURE A.4.3.3 Serpentine Exercise.

A.4.3.4 The confined space turnaround can be used as practice for meeting or in the evaluation of this requirement. This exercise measures the driver's ability to turn the vehicle around in a confined space without striking obstacles. The turn is accomplished within an area 50 ft × 100 ft (15.24 m × 30.5 m). The driver moves into the area from a 12 ft (3.7 m) opening in the center of one of the 50 ft (15.24 m) legs, turns the vehicle 180 degrees, and returns through the opening. There is no limitation on the number of times the driver has to maneuver the vehicle to accomplish this exercise, but no portion of the vehicle should extend over the boundary lines of the space. *(See Figure A.4.3.4.)*

Note that for large vehicles, such as ARFF apparatus, this course might need to be modified.

A.4.3.5 The diminishing clearance exercise can be used as practice for meeting or in the evaluation of this requirement.

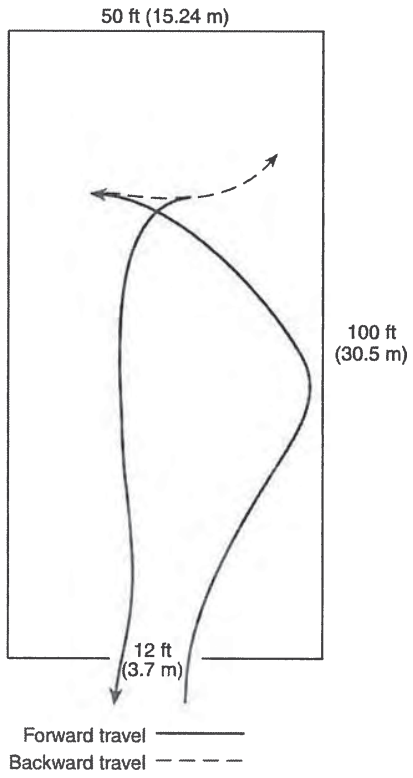


FIGURE A.4.3.4 Confined Space Turnaround.

This exercise measures a driver's ability to steer the apparatus in a straight line, to judge distances from wheel to object, and to stop at a finish line. The speed at which a driver should operate the apparatus is optional, but it should be great enough to necessitate quick judgment. This exercise is to be performed both forward and in reverse with a spotter. The course for this exercise is created by arranging two rows of markers to form a lane 75 ft (22.9 m) long. The lane varies in width from 9 ft 6 in. (2.9 m) to a diminishing clearance of 8 ft 2 in. (2.5 m). The driver should maneuver the apparatus through this lane without touching the markers. The vehicle should be stopped at a finish line 50 ft (15.24 m) beyond the last marker. No portion of the vehicle should protrude beyond this line. Vertical clearance judgment should be evaluated using a prop with a crossbar that is adjustable, based on the vehicle height. During the evaluation, the driver should drive forward and back through the prop with the crossbar at several differing heights, including one that is lower than the top of the vehicle. The prop should not be struck. The intent of the vertical clearance judgment is for proper identification of the furthermost point in the form of the apparatus. In situations where the apparatus is gaining entry to roadways or limited-height areas, the driver/operator must allow appropriate space ahead of the apparatus in order to avoid striking objects or to avoid extending apparatus into traffic lanes. *(See Figure A.4.3.5.)*

Note that for large vehicles, such as ARFF apparatus, this course might need to be modified.

A.4.3.6 Simulated emergency driving conditions should be restricted to a controlled area. Public ways should not be used for these activities.

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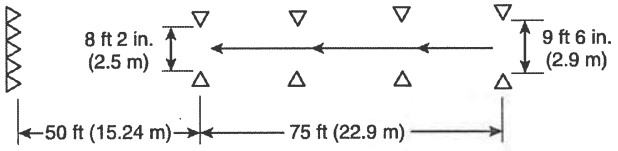

FIGURE A.4.3.5 Diminishing Clearance Exercise.

A.4.3.7 The committee's intent for this job performance requirement is for the driver/operator to be able to operate all major equipment and mechanical systems that are attached to the apparatus, other than those specifically covered in Chapters 5 through 10 of this standard. These types of equipment and systems include, but are not limited to, electric generation equipment, floodlighting systems, air compressors, air cascade systems, hydraulic rescue tool systems, power reels for air or hydraulic hose, cranes and stabilizers, and A-frames or other lifting equipment.

A.5.1 The requirements of Chapter 5 specify that the candidate shall meet the requirements of Fire Fighter I as specified in NFPA 1001 before qualification as a fire apparatus driver/operator. This means that the individual applying for qualification as a fire apparatus driver/operator has met all of the objectives in Chapters 1, 4, and 5 of NFPA 1001. These objectives include further requirements in areas such as fire hose, nozzles, and appliances; fire streams; water supplies; and sprinklers.

These requirements are in addition to the requirements of this standard. Any fire fighter who has already been qualified as a Fire Fighter I should review the requirements of the referenced chapters of NFPA 1001, as the candidate can be tested on the requirements included therein.

A.5.2.1(2) Pressurized sources include the following:

(1) Connection to a hydrant
(2) Supply line from another pumping source

A.6.1 The requirements of Chapter 6 specify that the candidate shall meet the requirements of Fire Fighter I as specified in NFPA 1001 before qualification as a fire apparatus driver/operator. This means that the individual applying for qualification as a fire apparatus driver/operator has met all of the objectives in Chapters 1, 4, and 5 of NFPA 1001. These objectives include further requirements in areas such as fire hose, nozzles, and appliances; fire streams; water supplies; and sprinklers. These requirements are in addition to the requirements of this standard. Any fire fighter who has already been qualified as a Fire Fighter I should review the requirements of the referenced chapters of NFPA 1001, as the candidate can be tested on the requirements included therein.

A.7.1 The requirements of Chapter 7 specify that the candidate shall meet the requirements of Fire Fighter I as specified in NFPA 1001 before qualification as a fire apparatus driver/operator. This means that the individual applying for qualification as a fire apparatus driver/operator has met all of the objectives in Chapters 1, 4, and 5 of NFPA 1001. These objectives include further requirements in areas such as fire hose, nozzles, and appliances; fire streams; water supplies; and sprinklers. These requirements are in addition to the requirements of this standard. Any fire fighter who has already been qualified as a Fire Fighter I should review the requirements of the referenced chapters of NFPA 1001, as the candidate can be tested on the requirements included therein.

Some fire departments operate fire apparatus that are equipped with a tiller (i.e., tillered rescue apparatus), but not an aerial device. The applicable portions of this chapter should be used as the basis for training personnel to drive those types of apparatus.

A.7.2.1 See A.4.3.3 through A.4.3.5.

A.8.1.2 The committee's intent is to have the following maneuvers and features accomplished by the driver/operator. The committee recognizes that each of these situations might not exist within the authority having jurisdiction. The committee considers the following driving situations essential to driver/operator skills:

(1) Loose or wet soil
(2) Steep grades (30 percent fore and aft)
(3) Limited sight distance
(4) Blind curve
(5) Vehicle clearance obstacles (height, width, undercarriage, angle of approach, angle of departure)
(6) Limited space for turnaround
(7) Side slopes (20 percent side to side)

A.8.2.1(2) Pressurized sources include the following:

(1) Connection to a hydrant
(2) Supply line from another pumping source

A.9.1 The requirements of Chapter 9 specify that the candidate shall meet the requirements of Fire Fighter II as specified in NFPA 1001 before qualification as a fire apparatus driver/operator. This means that the individual applying for qualification as a fire apparatus driver/operator has met all of the objectives in Chapters 1, 4, and 5 of NFPA 1001. These objectives include further requirements in areas such as fire hose, nozzles, and appliances; fire streams; water supplies; and sprinklers. These requirements are in addition to the requirements of this standard. Any fire fighter who has already been qualified as a Fire Fighter II should review the requirements of the referenced chapters of NFPA 1001, as the candidate can be tested on the requirements included therein.

A.9.1.1(1) An agent dispensing system is the primary fire suppression agent carried on ARFF vehicles and usually is aqueous film-forming foam (AFFF).

A.9.1.1(2) A secondary extinguishing system is a separate system, totally independent of the primary system. It includes Halon 1211 (its future replacement), dry chemical, and other such systems used for specific types of aircraft-associated fires.

A.9.1.3 The committee's intent is to have the following maneuvers and features accomplished by the driver/operator. The committee recognizes that each of these situations might not exist within the authority having jurisdiction. The committee considers the following driving situations essential to driver/operator skills:

(1) Loose or wet soil
(2) Steep grades (30 percent fore and aft)
(3) Limited sight distance
(4) Vehicle clearance obstacles (height, width, undercarriage)
(5) Limited space for turnaround
(6) Side slopes (20 percent side to side)

A.9.2.3(2) Pressurized sources include the following:

(1) Connection to a hydrant
(2) Supply line from another pumping source

A.10.2.1 The intent of this requirement is for the driver/operator to be able to quickly and efficiently position the vehicle at a water shuttle fill site that has been established prior to the vehicle's arrival. Most commonly a fire department pumper will connect to a water supply source and lay hose out that can be quickly attached to the mobile water supply apparatus once it arrives at the fill site. If the jurisdiction operates its fill site operations in a different manner, this requirement might need to be adjusted accordingly.

A.10.2.2 The intent of this requirement is for the driver/operator to be able to quickly and efficiently position the vehicle at a water shuttle dump site that has been established prior to the vehicle's arrival. The dump site will typically consist of one or more portable tanks that have been deployed on the ground. A fire department pumper drafts water from the portable tanks for use on the incident. The mobile water supply apparatus' function is to quickly dump their load into the portable tank and return to the fill site for another load. Depending on the design of the mobile water supply apparatus, one of three methods can be used to discharge water into the portable water tank. These methods include pumping the water off, using a gravity dump, or using a jet-assisted gravity dump. Depending on the design of the apparatus, water can be discharged from the front, rear, or either side of the vehicle.

A.10.2.3 A proper dump site involves the use of two or more portable tanks that are connected by a series of water transfer equipment. The water transfer equipment can be supplied by hoselines from the pumper that is supplying the fire scene or a second pumper placed at the drafting tank for the sole purpose of transferring water between the tanks. The goal is to keep the tank from which water is being drafted full at all times and the tank from which water is being dumped empty. This will ensure that mobile water supply apparatus that arrive at the dump site can unload their water and return for more in the shortest time possible.

Annex B Job Performance Requirements

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Explanation of the Standard and Concepts of Job Performance Requirements (JPRs). The primary benefit of establishing national professional qualification standards is to provide both public and private sectors with a framework of the job requirements for the fire service. Other benefits include enhancement of the profession, individual as well as organizational growth and development, and standardization of practices.

NFPA professional qualification standards identify the minimum JPRs for specific fire service positions. The standards can be used for training design and evaluation, certification, measuring and critiquing on-the-job performance, defining hiring practices, and setting organizational policies, procedures, and goals. (Other applications are encouraged.)

Professional qualification standards for a specific job are organized by major areas of responsibility defined as duties. For example, the fire fighter's duties might include fire suppression, rescue, and water supply; the public fire educator's duties might include education, planning and development, and administration. Duties are major functional areas of responsibility within a job.

The professional qualifications standards are written as JPRs. JPRs describe the performance required for a specific job. JPRs are grouped according to the duties of a job. The complete list of JPRs for each duty defines what an individual must be able to do in order to successfully perform that duty. Together, the duties and their JPRs define the job parameters; that is, the standard as a whole is a job description.

B.2 Breaking Down the Components of a JPR. The JPR is the assembly of three critical components. *(See Table B.2.)* These components are as follows:

(1) Task that is to be performed
(2) Tools, equipment, or materials that must be provided to successfully complete the task
(3) Evaluation parameters and/or performance outcomes

Table B.2 Example of a JPR

(1) Task	(1) Establish a water shuttle dump site
(2) Tools, equipment, or materials	(2) Given two or more portable water tanks, low-level strainers, water transfer equipment, fire hose, and a fire apparatus equipped with a water pump
(3) Evaluation parameters and performance outcomes	(3) So that the tank being drafted from is kept full at all times, the tank being dumped into is emptied first, and water is transferred efficiently from one tank to the next

B.2.1 The Task to Be Performed. The first component is a concise, brief statement of what the person is supposed to do.

B.2.2 Tools, Equipment, or Materials that Must Be Provided to Successfully Complete the Task. This component ensures that all individuals completing the task are given the same minimal tools, equipment, or materials when being evaluated. By listing these items, the performer and evaluator know what must be provided in order to complete the task.

B.2.3 Evaluation Parameters and/or Performance Outcomes. This component defines how well one must perform each task — for both the performer and the evaluator. The JPR guides performance toward successful completion by identifying evaluation parameters and/or performance outcomes. This portion of the JPR promotes consistency in evaluation by reducing the variables used to gauge performance.

In addition to these three components, the JPR contains requisite knowledge and skills. Just as the term *requisite* suggests, these are the necessary knowledge and skills one must have to be able to perform the task. Requisite knowledge and skills are the foundation for task performance.

Once the components and requisites are put together, the JPR might read as follows.

B.2.3.1 Example. Establish a water shuttle dump site, given two or more portable water tanks, low-level strainers, water

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transfer equipment, fire hose, and a fire apparatus equipped with a fire pump, so that the tank being drafted from is kept full at all times, the tank being dumped into is emptied first, and water is transferred efficiently from one tank to the next.

(A) Requisite Knowledge. Local procedures for establishing a water shuttle dump site and principles of water transfer between multiple portable water tanks.

(B) Requisite Skills. The ability to deploy portable water tanks, connect and operate water transfer equipment, and connect a strainer and suction hose to the fire pump.

B.3 Examples of Potential Uses.

B.3.1 Certification. JPRs can be used to establish the evaluation criteria for certification at a specific job level. When used for certification, evaluation must be based on the successful completion of JPRs.

First, the evaluator would verify the attainment of requisite knowledge and skills prior to JPR evaluation. This might be through documentation review or testing.

Next, the candidate would be evaluated on completing the JPRs. The candidate would perform the task and be evaluated based on the evaluation parameters and/or performance outcomes. This performance-based evaluation can be either practical (for psychomotor skills such as "ventilate a roof") or written (for cognitive skills such as "interpret burn patterns").

Note that psychomotor skills are those physical skills that can be demonstrated or observed. Cognitive skills (or mental skills) cannot be observed but are evaluated on how one completes the task (process-oriented) or on the task outcome (product-oriented).

Using the previous example, a practical performance-based evaluation would measure the ability to "establish a water shuttle dump site." The candidate passes this particular evaluation if the standard was met — that is, the tank being drafted from is kept full at all times, the tank being dumped into is emptied first, and water is transferred efficiently from one tank to another.

It is important to remember that when a candidate is being evaluated, he or she must be given the tools, equipment, or materials listed in the JPRs (e.g., a portable tank, a low-level strainer, fire hose, and a fire apparatus equipped with a water pump) before he or she can be properly evaluated.

B.3.2 Curriculum Development/Training Design and Evaluation. The statements contained in this document that refer to job performance were designed and written as JPRs. While a resemblance to instructional objectives might be present, these statements should not be used in a teaching situation until after they have been modified for instructional use.

JPRs state the behaviors required to perform specific skill(s) on the job as opposed to a learning situation. These statements should be converted into instructional objectives with behaviors, conditions, and standards that can be measured within the teaching/learning environment. A JPR that requires a driver/operator to "establish a water shuttle dump site" should be converted into a measurable instructional objective for use when teaching the skill. *[See Figure B.3.2(a).]*

In the previous example, the JPR requiring a driver/operator to establish a water shuttle dump site should be converted into a measurable instructional objective for use when teaching the task. Using the example, a terminal instructional objective might read as follows.

The candidate will establish a water shuttle dump site, given two or more portable water tanks, low-level strainers, water transfer equipment, fire hose, and a fire apparatus equipped with a fire pump, so that 100 percent accuracy is attained on a skills checklist. (At a minimum, the skills checklist should include each of the measurement criteria from the JPR.)

Figure B.3.2(b) is a sample checklist for use in evaluating this objective.

While the differences between job performance requirements and instructional objectives are subtle in appearance, the purpose of each statement differs greatly. JPRs state what is necessary to perform the job in the "real world." Instructional objectives, however, are used to identify what students must do at the end of a training session and are stated in behavioral terms that are measurable in the training environment.

By converting JPRs into instructional objectives, instructors will be able to clarify performance expectations and avoid confusion related to using statements designed for purposes other than teaching. Additionally, instructors will be able to add local/state/regional elements of performance into the standards as intended by the developers.

Requisite skills and knowledge should be converted into enabling objectives. The enabling objectives help to define the course content. The course content should include the requisite knowledge and skills. Using Figure B.3.2(b) as an example, the enabling objectives are local procedures for establishing a water shuttle dump site, principles of water transfer between multiple portable water tanks, connection and operation of water transfer equipment, and so forth. These enabling objectives ensure that the course content supports the terminal objective.

Note that it is assumed that the reader is familiar with curriculum development or training design and evaluation.

B.4 Other Uses. While the professional qualifications standards are principally used to guide the development of training and certification programs, there are a number of other potential uses for the documents. Because the documents are written using JPR terms, they lend themselves well to any area of the profession where a level of performance or expertise must be determined.

These areas might include the following:

(1) *Employee Evaluation/Performance Critiquing.* The JPRs can be used as a guide by both the supervisor and the employee during an evaluation. The JPRs for a specific job define tasks that are essential to perform on the job as well as the evaluation criteria to measure when those tasks are completed.
(2) *Establishing Hiring Criteria.* The professional qualifications standards can be used in a number of ways to further the establishment of hiring criteria. The AHJ could simply require certification at a specific job level (e.g., driver/operator — pumps). The JPRs could also be used as the basis for pre-employment screening by establishing essential minimal tasks and the related evaluation criteria. An added benefit is that individuals interested in employment can work toward the minimal hiring criteria at local colleges.
(3) *Employee Development.* The professional qualifications standards can be useful to both the employee and the employer in developing a plan for an individual's growth within an organization. The JPRs and the associated requisite knowledge and skills can be used as a guide to determine additional training and education required for the employee to master the job or profession.

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The JPR, requisite knowledge, and requisite skills are all used as information from which instructional objectives can be written.

JPR

The driver/operator shall establish a water shuttle dump site, given two or more portable water tanks, low-level strainers, water transfer equipment, fire hose, and a fire apparatus equipped with a water pump, so that the tank being drafted from is kept full at all times, the tank being dumped into is emptied first, and water is transferred efficiently from one tank to the next.

Requisite Knowledge: Local procedures for establishing a water shuttle dump site and principles of water transfer between multiple portable water tanks.

Requisite Skills: The ability to deploy portable water tanks, connect and operate water transfer equipment, and connect a strainer and suction hose to the fire pump.

JPRs can be converted into any instructional objective format. For demonstration purposes, these examples have been written as terminal and enabling objectives.

EXAMPLE TERMINAL OBJECTIVES

Cognitive/Knowledge Domain

The driver/operator shall describe the procedures and safety precautions for establishing an efficient water shuttle dump site.

EXAMPLE ENABLING OBJECTIVES

(Cognitive)

The driver/operator shall list the procedures for determining the location of the water shuttle dump site, as stated in the "XYZ" water supply manual, with "X" percent accuracy on a written evaluation.

The driver/operator shall list the procedures for arranging the water shuttle dump site at the chosen location, as stated in the "XYZ" water supply manual, with "X" percent accuracy on a written evaluation.

The driver/operator shall list the potential hazards associated with water shuttle dump site operation, as stated in the "XYZ" water supply manual, with "X" percent accuracy on a written evaluation.

Psychomotor/Skills Domain
(See example skills checklist.)

The driver/operator shall demonstrate the deployment of a portable water tank, from its storage point on the apparatus to its position of use, within 2 minutes and with 100 percent accuracy on the skills checklist.

EXAMPLE ENABLING OBJECTIVES

(Psychomotor)

The driver/operator shall demonstrate removing the portable tank from the apparatus with the help of another fire fighter with 100 percent accuracy on the skills checklist.

The driver/operator, with the assistance of another fire fighter, shall demonstrate the proper carrying technique for moving the portable tank to its position of use, with 100 percent accuracy on the skills checklist.

The driver/operator, with the assistance of another fire fighter, shall demonstrate the deployment of the portable tank at the chosen location, with 100 percent accuracy on the skills checklist.

FIGURE B.3.2(a) Converting JPRs into Instructional Objectives.

(4) *Succession Planning.* Succession planning or career pathing addresses the efficient placement of people into jobs in response to current needs and anticipated future needs. A career development path can be established for targeted individuals to prepare them for growth within an organization. The JPRs and requisite knowledge and skills could then be used to develop an educational path to aid in the individual's advancement within the organization or profession.

(5) *Establishing Organizational Policies, Procedures, and Goals.* The JPRs can be incorporated into organizational policies, procedures, and goals where employee performance is addressed.

OBJECTIVE: The driver/operator shall demonstrate the deployment of a portable water tank, from its storage point on the apparatus to its position of use, within 2 minutes and with 100 percent accuracy on the skills checklist.

YES	NO	
❑	❑	1. The tank was swiftly removed from its mounting on the apparatus.
❑	❑	2. Proper lifting and carrying techniques were used to remove and carry the portable tank.
❑	❑	3. The tank was placed at the proper location for deployment.
❑	❑	4. A tarp or salvage cover was spread on the ground before the tank was opened.
❑	❑	5. The tank cover was open and facing the proper direction.
❑	❑	6. The task was completed within 2 minutes.

FIGURE B.3.2(b) Skills Checklist.

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Annex C Informational References

C.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

C.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2013 edition.

C.1.2 Other Publications. (Reserved)

C.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. The following is a bibliography for Annex B.

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C.3 References for Extracts in Informational Sections. (Reserved)

Index

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-A-

Administration ..... Chap. 1
Exceeding Minimum Requirements 1.3
General 1.4
Purpose 1.2, A.1.2
Scope 1.1
Aerial Apparatus
Definition 3.3.1
Aerial Device
Definition 3.3.2
Aerial Operator
Definition 3.3.3
Aircraft Rescue and Fire-Fighting (ARFF) Vehicle
Definition 3.3.4
Aircraft Rescue and Fire-Fighting Apparatus ..... Chap. 9
General 9.1, A.9.1
Operations 9.2
Angle of Approach
Definition 3.3.5
Angle of Departure
Definition 3.3.6
Apparatus Equipped with a Tiller ..... Chap. 7
General 7.1, A.7.1
Operations 7.2
Apparatus Equipped with an Aerial Device ..... Chap. 6
General 6.1, A.6.1
Operations 6.2
Apparatus Equipped with Fire Pump ..... Chap. 5
General 5.1, A.5.1
Operations 5.2
Approved
Definition 3.2.1, A.3.2.1
Authority Having Jurisdiction (AHJ)
Definition 3.2.2, A.3.2.2

-D-

Definitions ..... Chap. 3

-E-

Explanatory Material ..... Annex A

-F-

Fire Apparatus
Definition 3.3.7
Fire Apparatus Driver
Definition 3.3.8
Fire Department
Definition 3.3.9
Fire Department Pumper
Definition 3.3.10
Fire Department Vehicle
Definition 3.3.11
Fire Pump
Definition 3.3.12
Foam System
Definition 3.3.13

-G-

General Requirements ..... Chap. 4
Driving/Operating 4.3
General 4.1
Preventive Maintenance 4.2

-I-

Informational References ..... Annex C

-J-

Job Performance Requirement
Definition 3.3.14
Job Performance Requirements ..... Annex B

-L-

Liquid Surge
Definition 3.3.15

-M-

Mobile Water Supply Apparatus ..... Chap. 10
General 10.1
Operations 10.2
Mobile Water Supply Apparatus (Tanker, Tender)
Definition 3.3.16

-O-

Off-Road Use
Definition 3.3.17

-P-

Pump Operator
Definition 3.3.18
Pumping System
Definition 3.3.19

-R-

Referenced Publications ..... Chap. 2
General 2.1
NFPA Publications 2.2
Other Publications 2.3
References for Extracts in Mandatory Sections 2.4
Requisite Knowledge
Definition 3.3.20
Requisite Skills
Definition 3.3.21

-S-

Shall
Definition 3.2.3
Standard
Definition 3.2.4

-T-

Task
Definition 3.3.22
Tiller Aerial Apparatus
Definition 3.3.23
Tiller Operator
Definition 3.3.24

-W-

Wildland Fire Apparatus
Definition 3.3.25, A.3.3.25
Wildland Fire Apparatus ..... Chap. 8
General 8.1
Operations 8.2

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Sequence of Events Leading to Issuance of This NFPA Committee Document

Step 1: Call for Proposals

- Proposed new Document or new edition of an existing Document is entered into one of two yearly revision cycles, and a Call for Proposals is published.

Step 2: Report on Proposals (ROP)

- Committee meets to act on Proposals, to develop its own Proposals, and to prepare its Report.
- Committee votes by written ballot on Proposals. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Proposals (ROP) is published for public review and comment.

Step 3: Report on Comments (ROC)

- Committee meets to act on Public Comments to develop its own Comments, and to prepare its report.
- Committee votes by written ballot on Comments. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Comments (ROC) is published for public review.

Step 4: Technical Report Session

- "*Notices of intent to make a motion*" are filed, are reviewed, and valid motions are certified for presentation at the Technical Report Session. ("Consent Documents" that have no certified motions bypass the Technical Report Session and proceed to the Standards Council for issuance.)
- NFPA membership meets each June at the Annual Meeting Technical Report Session and acts on Technical Committee Reports (ROP and ROC) for Documents with "certified amending motions."
- Committee(s) vote on any amendments to Report approved at NFPA Annual Membership Meeting.

Step 5: Standards Council Issuance

- Notification of intent to file an appeal to the Standards Council on Association action must be filed within 20 days of the NFPA Annual Membership Meeting.
- Standards Council decides, based on all evidence, whether or not to issue Document or to take other action, including hearing any appeals.

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The following classifications apply to Technical Committee members and represent their principal interest in the activity of the committee.

M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.

U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.

I/M *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.

L *Labor:* A labor representative or employee concerned with safety in the workplace.

R/T *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.

E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.

I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.

C *Consumer:* A person who is, or represents, the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in the *User* classification.

SE *Special Expert:* A person not representing any of the previous classifications, but who has a special expertise in the scope of the standard or portion thereof.

NOTES:
1. "Standard" connotes code, standard, recommended practice, or guide.
2. A representative includes an employee.
3. While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of members or unique interests need representation in order to foster the best possible committee deliberations on any project. In this connection, the Standards Council may make appointments as it deems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.
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Information on the NFPA Standards Development Process

I. Applicable Regulations. The primary rules governing the processing of NFPA standards (codes, standards, recommended practices, and guides) are the NFPA *Regulations Governing the Development of NFPA Standards (Regs)*. Other applicable rules include NFPA *Bylaws*, NFPA *Technical Meeting Convention Rules*, NFPA *Guide for the Conduct of Participants in the NFPA Standards Development Process*, and the NFPA *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council*. Most of these rules and regulations are contained in the *NFPA Standards Directory*. For copies of the *Directory*, contact Codes and Standards Administration at NFPA Headquarters; all these documents are also available on the NFPA website at "www.nfpa.org."

The following is general information on the NFPA process. All participants, however, should refer to the actual rules and regulations for a full understanding of this process and for the criteria that govern participation.

II. Technical Committee Report. The Technical Committee Report is defined as "the Report of the responsible Committee(s), in accordance with the Regulations, in preparation of a new or revised NFPA Standard." The Technical Committee Report is in two parts and consists of the First Draft Report and the Second Draft Report. (See *Regs* at 1.4)

III. Step 1: First Draft Report. The First Draft Report is defined as "Part one of the Technical Committee Report, which documents the Input Stage." The First Draft Report consists of the First Draft, Public Input, Committee Input, Committee and Correlating Committee Statements, Correlating Input, Correlating Notes, and Ballot Statements. (See *Regs* at 4.2.5.2 and Section 4.3) Any objection to an action in the First Draft Report must be raised through the filing of an appropriate Comment for consideration in the Second Draft Report or the objection will be considered resolved. [See *Regs* at 4.3.1(b)]

IV. Step 2: Second Draft Report. The Second Draft Report is defined as "Part two of the Technical Committee Report, which documents the Comment Stage." The Second Draft Report consists of the Second Draft, Public Comments with corresponding Committee Actions and Committee Statements, Correlating Notes and their respective Committee Statements, Committee Comments, Correlating Revisions, and Ballot Statements. (See *Regs* at Section 4.2.5.2 and 4.4) The First Draft Report and the Second Draft Report together constitute the Technical Committee Report. Any outstanding objection following the Second Draft Report must be raised through an appropriate Amending Motion at the Association Technical Meeting or the objection will be considered resolved. [See *Regs* at 4.4.1(b)]

V. Step 3a: Action at Association Technical Meeting. Following the publication of the Second Draft Report, there is a period during which those wishing to make proper Amending Motions on the Technical Committee Reports must signal their intention by submitting a Notice of Intent to Make a Motion. (See *Regs* at 4.5.2) Standards that receive notice of proper Amending Motions (Certified Amending Motions) will be presented for action at the annual June Association Technical Meeting. At the meeting, the NFPA membership can consider and act on these Certified Amending Motions as well as Follow-up Amending Motions, that is, motions that become necessary as a result of a previous successful Amending Motion. (See 4.5.3.2 through 4.5.3.6 and Table1, Columns 1-3 of *Regs* for a summary of the available Amending Motions and who may make them.) Any outstanding objection following action at an Association Technical Meeting (and any further Technical Committee consideration following successful Amending Motions, see *Regs* at 4.5.3.7 through 4.6.5.3) must be raised through an appeal to the Standards Council or it will be considered to be resolved.

VI. Step 3b: Documents Forwarded Directly to the Council. Where no Notice of Intent to Make a Motion (NITMAM) is received and certified in accordance with the Technical Meeting Convention Rules, the standard is forwarded directly to the Standards Council for action on issuance. Objections are deemed to be resolved for these documents. (See *Regs* at 4.5.2.5)

VII. Step 4a: Council Appeals. Anyone can appeal to the Standards Council concerning procedural or substantive matters related to the development, content, or issuance of any document of the Association or on matters within the purview of the authority of the Council, as established by the *Bylaws* and as determined by the Board of Directors. Such appeals must be in written form and filed with the Secretary of the Standards Council (See *Regs* at 1.6). Time constraints for filing an appeal must be in accordance with 1.6.2 of the *Regs*. Objections are deemed to be resolved if not pursued at this level.

VIII. Step 4b: Document Issuance. The Standards Council is the issuer of all documents (see Article 8 of *Bylaws*). The Council acts on the issuance of a document presented for action at an Association Technical Meeting within 75 days from the date of the recommendation from the Association Technical Meeting, unless this period is extended by the Council (See *Regs at* 4.7.2). For documents forwarded directly to the Standards Council, the Council acts on the issuance of the document at its next scheduled meeting, or at such other meeting as the Council may determine (See *Regs* at 4.5.2.5 and 4.7.4).

IX. Petitions to the Board of Directors. The Standards Council has been delegated the responsibility for the administration of the codes and standards development process and the issuance of documents. However, where extraordinary circumstances requiring the intervention of the Board of Directors exist, the Board of Directors may take any action necessary to fulfill its obligations to preserve the integrity of the codes and standards development process and to protect the interests of the Association. The rules for petitioning the Board of Directors can be found in the *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council* and in 1.7 of the *Regs*.

X. For More Information. The program for the Association Technical Meeting (as well as the NFPA website as information becomes available) should be consulted for the date on which each report scheduled for consideration at the meeting will be presented. For copies of the First Draft Report and Second Draft Report as well as more information on NFPA rules and for up-to-date information on schedules and deadlines for processing NFPA documents, check the NFPA website (www.nfpa.org/aboutthecodes) or contact NFPA Codes & Standards Administration at (617) 984-7246.

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Recommended Practice for Fire Service Training Reports and Record

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NFPA® 1401

Recommended Practice for

Fire Service Training Reports and Records

2012 Edition

This edition of NFPA 1401, *Recommended Practice for Fire Service Training Reports and Records*, was prepared by the Technical Committee on Fire Service Training. It was issued by the Standards Council on December 13, 2011, with an effective date of January 2, 2012, and supersedes all previous editions.

This edition of NFPA 1401 was approved as an American National Standard on January 2, 2012.

Origin and Development of NFPA 1401

The 1970 edition of NFPA 9, *Recommended Practice for Training Records and Reports*, was tentatively adopted at the 1969 NFPA Annual Meeting. The tentative recommended practice with amendments was officially adopted at the 1970 NFPA Annual Meeting.

This text was developed by the Technical Committee on Fire Service Training and processed in accordance with NFPA Regulations Governing Technical Committees. It is a recommended fire training records system for use by fire chiefs and fire training officers. The publication presents a systematic approach for those officers whose responsibility is to manage the training activities of a fire department.

The 1989 edition contained a new chapter dealing with the legal aspects of record keeping and the title was changed to *Recommended Practice for Fire Service Training Reports and Records.*

The committee provided a complete rewrite for the 1996 edition to make the document more user friendly.

Additional minor revisions were included in the 2001 edition, and the 2006 edition included minor editorial revisions.

The 2012 edition updates text to include current terminology and techniques. Forms have also been updated to current standards.

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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.

Committee Scope: This Committee shall have primary responsibility for all fire service training techniques, operations, and procedures to develop maximum efficiency and proper utilization of available personnel. Such activities can include training guides for fire prevention, fire suppression, and other missions for which the fire service has responsibility.

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Contents

Chapter 1 Administration 1401– 4
1.1 Scope 1401– 4
1.2 Purpose 1401– 4
1.3 General 1401– 4

Chapter 2 Referenced Publications 1401– 4
2.1 General 1401– 4
2.2 NFPA Publications (Reserved) 1401– 4
2.3 Other Publications 1401– 4
2.4 References for Extracts in Recommendations Sections 1401– 4

Chapter 3 Definitions 1401– 5
3.1 General 1401– 5
3.2 NFPA Official Definitions 1401– 5
3.3 General Definitions 1401– 5

Chapter 4 Elements of Training Documents 1401– 5
4.1 General 1401– 5
4.2 Elements of Information 1401– 5
4.3 Additional Information 1401– 6

Chapter 5 Types of Training Documents 1401– 6
5.1 Training Schedules 1401– 6
5.2 Training Reports 1401– 6
5.3 Training Records 1401– 7
5.4 State Certification Records 1401– 7

Chapter 6 Evaluating the Effectiveness of Training Records Systems 1401– 7
6.1 Evaluating Records of Individuals 1401– 7
6.2 Evaluating the Record-Keeping System 1401– 7

Chapter 7 Legal Aspects of Record Keeping 1401– 7
7.1 Privacy of Personal Information 1401– 7
7.2 Record Keeping and Risk Management 1401– 8

Annex A Explanatory Material 1401– 8

Annex B Examples of Reports and Records 1401–10

Annex C Informational References 1401–10

Index 1401–24

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NFPA 1401

Recommended Practice for

Fire Service Training Reports and Records

2012 Edition

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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.

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

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, the complete title and edition of the source documents for extracts in the recommendations sections of this document are given in Chapter 2 and those for extracts in the informational sections are given in Annex C. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text should be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex C.

Chapter 1 Administration

1.1 Scope.

1.1.1 It is the intent of this document that *fire service organizations* be considered an all-inclusive term used to describe those local, municipal, state, federal, military, industrial, and private organizations with fire protection responsibilities and institutions that provide training for such organizations.

1.1.2 Fire service organizations utilizing this document for the establishment, upgrade, or evaluation of their training records and report systems should be able to document clearly the performance and ability of individual and group activities related to the following:

(1) Compliance with personnel performance standards
(2) Documentation of both internally and externally obtained career development training and education
(3) Documentation for the purposes of certification and recertification
(4) Documentation for the purposes of accreditation through such agencies as the Commission on Fire Accreditation International (CFAI) and other such organizations
(5) Cooperation with other agencies with which the organization executes joint specialty operations (e.g., emergency medical services)
(6) Training required by regulatory and/or other agencies [e.g., Occupational Safety and Health Administration (OSHA), International Standards Organization (ISO) and Insurance Services Office]
(7) Training required to provide emergency medical care (e.g., first responder, emergency medical technician, first aid, cardiopulmonary resuscitation, automatic external defibrillations)
(8) Training and certifications for participations in regional, state, and national response teams (e.g., urban search and rescue teams, disaster medical assistance teams, disaster mortuary operational teams, incident management teams, and National Wildfire Coordination Group teams)
(9) Equivalent training or experiential learning used to provide an alternative credit for department, local, state, or national training requirements, specifically comparing the experiences being accepted to the training requirements being set aside

1.2* Purpose. This document presents a systematic approach to providing essential information for managing the training function of the fire service organization.

1.2.1 Information for managing the training function of the fire service organization includes those types of records, reports, and forms that can serve as basic information tools for effective training administration.

1.2.2 Training programs established and implemented within the organization should be people-oriented and action-minded, and the records and reporting system used in conjunction with the program should reflect these concepts.

1.3 General.

1.3.1 Training records have an important function in the administration of a fire service organization. As with any other community business, records and reports are an integral part of business management. Fire training records and reports are often only part of the documentation that is necessary to meet legal and statutory requirements. When properly compiled and evaluated, these records enable management to make effective decisions for planning, programming, and budgeting operations.

1.3.2 Computer programs are now available that provide the ability to analyze and systematize training records and quickly compile reports that can aid in justifying the resources that a fire service organization chief expends on training activities.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this recommended practice and should be considered part of the recommendations of this document.

2.2 NFPA Publications. (Reserved)

2.3 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Recommendations Sections.

NFPA 600, *Standard on Industrial Fire Brigades*, 2010 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter apply to the terms used in this recommended practice. Where terms are not defined in this chapter or within another chapter, they should be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, is the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.2 Recommended Practice. A document that is similar in content and structure to a code or standard but that contains only nonmandatory provisions using the word "should" to indicate recommendations in the body of the text.

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

3.3 General Definitions.

3.3.1 Education. The process of imparting knowledge or skill through systematic instruction. [**600,** 2010]

3.3.2 Feedback. Comments and opinions regarding the system to be reviewed for appropriate changes or modifications.

3.3.3 Fire Chief. The administrative head of the organization. The individual assigned the responsibility for management and control of all matters and concerns pertaining to the fire service organization.

3.3.4 Flow Chart. A diagram consisting of a set of symbols and connecting lines that shows a step-by-step progression through a procedure or system.

3.3.5 Functions. One of a group of related actions contributing to the overall goals of the organization.

3.3.6 Management. The collective body of those who direct the operations of the organization.

3.3.7 Periodic. Occurring or recurring at regular intervals, as determined by the individual organization (e.g., weekly, monthly, quarterly, semiannually, yearly).

3.3.8 Record. A permanent account of known or recorded facts that is utilized to recall or relate past events or acts of an organization or the individuals therein.

3.3.9 Report. The act of providing an account of facts relating to past events or the acts of an organization or its individuals.

3.3.10 Seasonal Needs. The periodic operating contingencies of a particular geographic region that are established to overcome a specific set of circumstances (e.g., crop harvest, rainy season).

3.3.11 System. An organized or established procedure intended to form a network arranged to achieve specific goals.

3.3.12 Training. The process of achieving proficiency through instruction and hands-on practice in the operation of equipment and systems that are expected to be used in the performance of assigned response duties. [**600,** 2010]

3.3.13 Training Officer. The person designated by the fire chief with authority for overall management and control of the organization's training program.

Chapter 4 Elements of Training Documents

4.1 General.

4.1.1 Training records and reports should be utilized by the training officer and line officers for analysis of the effectiveness of the training program in terms of time, staffing, individual performance rating, and financing.

4.1.2* Training records and reports should be utilized to develop specific training objectives and to evaluate compliance with, or deficiencies in, the training program.

4.1.3 Compliance with mandated training requirements should be documented.

4.1.4 The management of training functions should be performed in a closed-feedback loop.

4.1.5 The training functions should not operate as an open-ended cycle.

4.1.6 The closed-feedback loop should consist of the following:

(1) Planning
(2) Organization
(3) Implementation
(4) Operation
(5) Review
(6) Feedback/alteration

4.1.7* In each phase of the cycle, information should be provided for management to perform effectively.

4.1.7.1 The information is provided through various types of records, reports, and studies; therefore, records should be designed to fit into the overall training management cycle.

4.1.8 In order to be most effective, these records should contribute to the overall organization information cycle.

4.2 Elements of Information.

4.2.1 Training documents, regardless of their intent or level of sophistication, should focus on content, accuracy, and clarity.

4.2.2 These documents should relay to the reader at least five specific elements of information as follows *(see Annex B for examples of training record forms)*:

(1) Who
  (a) Who was the instructor?
  (b) Who participated?
  (c) Who was in attendance?
  (d) Who is affected by the documents?
  (e) Who was included in the training (individuals, company, multi-company, or organization)?

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(2) What
  (a) What was the subject covered?
  (b) What equipment was utilized?
  (c) What operation was evaluated or affected?
  (d) What was the stated objective, and was it met?
(3) When
  (a) When will the training take place? or
  (b) When did the training take place?
(4) Where
  (a) Where will the training take place? or
  (b) Where did the training take place?
(5) Why
  (a) Why is the training necessary? or
  (b) Why did the training occur?

4.3 Additional Information. Additional information or detail, which should include but not be limited to the following, should be included to explain or clarify the document as necessary:

(1) Source of the information used as a basis for the training
  (a) Textbook title and edition
  (b) Lesson plan title and edition
  (c) Policy name and reference number
  (d) Videotapes, CDs, and DVDs
  (e) Distance learning sources
  (f) Internet address
  (g) Industry best practices
  (h) Post-incident analysis (PIA)
  (i) Other
(2) Method of training used for delivery
  (a) Lecture
  (b) Demonstration
  (c) Skills training
  (d) Self-study
  (e) Video presentation
  (f) Mentoring
  (g) Drill(s)
  (h) Other
(3) Evaluation of training objectives
  (a) Written test
  (b) Skills examination
  (c) Other

Chapter 5 Types of Training Documents

5.1 Training Schedules.

5.1.1 Need for Training Schedules.

5.1.1.1 All members of a fire department should receive standardized instruction and training.

5.1.1.2 Standardized training should include considerable planning; however, standardization can be improved through the preparation of training schedules for use by department personnel.

5.1.1.3 Standardized training schedules should be prepared and published for both short-term scheduling (considerable detail), intermediate-term scheduling (less detail), and long-term scheduling (little detail) to facilitate long-term planning by the training staff, instructional staff, company officers, and personnel.

5.1.2* Types of Training Schedules. Training schedules should be prepared for all training ground and classroom sessions.

5.1.2.1 Periodic Training Schedule — Station Training. The station training schedule, which is prepared by the training officer, should designate specific subjects that are to be covered by company or station officers in conducting their station training.

5.1.2.1.1 The company officers should use this schedule to set their own in-station training schedule.

5.1.2.1.2 A balance between manipulative skills training and classroom sessions should be considered in the preparation of training schedules.

5.1.2.1.3 Such training schedules should include all of the topics necessary to satisfy job knowledge requirements and to maintain skills already learned.

5.1.2.2* Periodic Training Schedule — Training Facility Activities. The training facility activities schedule details when companies should report to the training facility for evolutions or classes.

5.1.2.2.1 Days also should be set aside for make-up sessions.

5.1.2.2.2 Training activities conducted outside the training facility or by outside agencies also should be shown on this schedule.

5.1.3* All Other Training. Schedules should be prepared for all training, including, but not limited to, the following:

(1) Recruit or entry-level training
(2) In-service training
(3) Special training
(4) Officer training
(5) Advanced training
(6) Mandated training
(7) Medical training
(8) Safety training

5.2* Training Reports.

5.2.1* Logical Sequence. A training report should be complete and should follow a logical sequence.

5.2.1.1 A report should clearly and concisely present the essentials so those conclusions can be grasped with a minimum of effort and delay.

5.2.1.2 Furthermore, a report should provide sufficient discussion to ensure the correct interpretation of the findings, which should indicate the nature of the analysis and the process of reasoning that leads to those findings.

5.2.2 Purpose. Each item of a report should serve a definite purpose.

5.2.2.1 Each table and chart in a report should be within the scope of the report.

5.2.2.2 The tables and charts should enhance the information stated or shown elsewhere, and they should be accurate and free of the possibility of misunderstanding, within reason.

5.2.3 Organization.

5.2.3.1* The process of writing reports should include five steps that are generally used in identifying, investigating, evaluating, and solving a problem.

5.2.3.2 These five steps, which should be accomplished before the report is written, are as follows:

(1) The purpose and scope of the report should be obtained.
(2) The method or procedure should be outlined.

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(3) The essential facts should be collected.
(4) These facts should be analyzed and categorized.
(5) The correct conclusions should be arrived at and the proper recommendations should be made.

5.2.4* While there are differing needs among fire departments, certain reports should be common to most departments.

5.2.4.1 Typical recommended training reports should include the following:

(1) A complete inventory of apparatus and equipment assigned to the training division
(2) Detailed plans for training improvements that include all equipment and facility needs and cost figures
(3) A detailed periodic report on and evaluation of the training of all probationary fire fighters
(4) A monthly summary of all activities of the training division
(5) An annual report of all activities of the training division
(6) A complete inventory of training aids and reference materials available to be used for department training

5.2.4.2 The annual report should describe the accomplishments during the year, restate the goals and objectives of the training
division, and describe the projected plans for the upcoming year.

5.2.5 Narrative Report. There are times when a narrative report should be necessary.

5.2.5.1 Before writing a narrative report, the writer should consider the audience for the report.

5.2.5.2 The comprehensiveness of the report should be determined by the recipients' knowledge of the subject.

5.3* Training Records.

5.3.1 Training records should be kept to document department training and should assist in determining the program's effectiveness. Information derived from such records should, for example, provide the supporting data needed to justify additional training personnel and equipment.

5.3.1.1 Training records can include paper or electronic media.

5.3.2 Performance tests, examinations, and personnel evaluations should contribute to the development of the training program if the results are analyzed, filed, and properly applied.

5.3.2.1 Training records should be kept current and should provide the status and progress of all personnel receiving training.

5.3.2.2 Frequent review of training records should provide a clear picture of the success of the training program and document lessons learned.

5.3.3 Properly designed training records should be developed to meet the specific needs of each fire department.

5.3.3.1 Training records should be detailed enough to enable factual reporting while remaining as simple as possible.

5.3.3.2 The number of records should be kept at a minimum to avoid confusion and duplication of effort.

5.3.4 Typical training records should include an evaluation of the competency of the student, as well as hours attended.

5.4* State Certification Records.

5.4.1 Minimum Information.

5.4.1.1 Information and documentation that should serve as a foundation for submission to state certification programs should include, as a minimum, the following:

(1) A single file that includes all training accomplished by the individual fire fighter during his/her career
(2) Dates, hours, locations, and instructors of all special courses or seminars attended
(3) Monthly summaries of all departmental training

5.4.1.2 These records should require the signatures of the instructor and the person instructed as a valid record of an individual's participation in the training.

5.4.2 The format used for state certification should be different from that utilized by an individual department. Otherwise, this is likely to cause considerable problems with accurate record submission and should be addressed on the state level by all parties concerned. Various state certification forms are contained in Annex B.

Chapter 6 Evaluating the Effectiveness of Training Records Systems

6.1 Evaluating Records of Individuals.

6.1.1 The evaluation of training records should be done at specified intervals by the local department training officer or training committee.

6.1.2 Each training record should be evaluated to determine the following:

(1) Has the individual taken all the required training?
(2) If not, has the individual been scheduled for missed classes?
(3) Do performance deficiencies show up on the individual's training record?
(4) If performance deficiencies exist, what kind of program is being developed to overcome them?
(5) Have companies met all the required job performance standards established by the department?
(6) If job performance standards have not been met, have the problems been identified and a program developed to overcome them?
(7) Are there areas of training that are being overlooked completely?
(8) Is the cycle of training sufficient to maintain skill levels?

6.2 Evaluating the Record-Keeping System.

6.2.1 All training records and the record-keeping system should be evaluated at least annually.

6.2.2 During the evaluation process, the following questions should be applied to each record:

(1) What is the purpose of the record?
(2) Who uses the information compiled?
(3) Is the record providing the necessary information?
(4) Do other records duplicate the material being compiled?
(5) How long should records be retained?
(6) Can training trends be determined from a compilation of the records?
(7) Is there a simpler and more efficient way of recording the information?

Chapter 7 Legal Aspects of Record Keeping

7.1 Privacy of Personal Information.

7.1.1* Employee training and educational records and other examination data included in an individual's training file

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should be disclosed only with written permission of the employee, unless required by law or statute, or by a court order.

7.1.2 The fire chief and the training officer should verify with legal counsel the federal, state, provincial, and local laws and ordinances regulating the disclosure of confidential information, and ensure adequate control measures are in place for the privacy of personal information.

7.1.2.1 Training records should not use the student's Social Security number for identification purposes.

7.1.2.2 The fire chief or training officer should ensure that training records do not include any confidential medical information.

7.1.2.3 All medical records should be kept in a completely separate file and not mixed with any other records or personnel files.

7.1.2.4 Access to any personally identifiable or proprietary information should be restricted.

7.1.3 Length of Time for Keeping Records or Reports.

7.1.3.1* Legal counsel should be contacted concerning the length of time records or reports, or both, need to be kept available and documented in a records retention schedule. *[See Figure B.1(m) for a sample schedule.]*

7.1.3.2 Documents should be maintained for a period of time as specified by law or as required by certain agencies and organizations.

7.1.4 Most training records should be maintained in their entirety in a computerized form, thus greatly reducing the amount of paper that needs to be stored.

7.1.4.1* Some training records should be maintained in their original hard-copy form, as required by certain agencies and organizations.

7.1.4.2* Computerized records should be backed up periodically and stored in an off-site location to avoid destruction.

7.2* Record Keeping and Risk Management. Agencies that conduct multijurisdictional training should have a signed release form for those individuals who participate in certain training activities.

Annex A Explanatory Material

Annex A is not a part of the recommendations 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 Record keeping is not an end in itself. Training reporting systems are a process of providing management information for use in the decision-making process. Records are the tools for administering the human resource development of the fire service organization. The objective of the training process is to improve the performance of the individual and the overall performance of the organization.

A.3.2.1 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.4.1.2 Training records and reports also are becoming more important for use as evidence in public liability suits brought against the organization's fireground activities.

A.4.1.7 No published manual or reference document can be applied as a nationally recognized system that universally fits the needs of all branches of the fire service. Therefore, knowledge of a fire service organization's information system is fundamental to preparing any type of report form or any system of reporting. Although the responsibility for information reporting is usually that of the fire chief, the information contained in the report generally originates from the supervisors of a company, unit, division, or bureau. Record-keeping and reporting effectiveness is directly related to the design, use, and application of an adequate information system. A clear analysis of the information needs for the specific system is necessary. A good system of record keeping and reporting necessitates as much research effort as any other system in the organization if it is to be effective and meaningful.

A.5.1.2 It is important that consideration be given to the availability of training to all personnel when schedules are prepared. For example, training sessions might have to be scheduled on consecutive days to accommodate career personnel or repeated on weekdays and on weekends for volunteers. Scheduling training for industrial fire brigade members involves some additional considerations. Such factors as the amount of time personnel are allowed to be away from their work stations or the provision of replacement personnel to cover for fire brigade members who are involved in critical plant operations are to be considered when preparing training schedules. Typical recommended training schedules are described in 5.1.2.1 and 5.1.2.2.

A.5.1.2.2 The scheduling of training also is influenced by the time of year, with regard to weather conditions, seasonal needs, new equipment, and specific personnel needs.

A.5.1.3 The categories of training listed in 5.1.3 are examples and suggestions only. The AHJ should decide what categories are to be used. This decision should be based primarily on what information will most likely need to be extracted from the scheduling and data collected. Assuming that proof of training schedules and data are likely to be needed during an Insurance Services Organization (ISO) grading process, scheduling and recording training consistent with the categories required by ISO should be considered by the AHJ. Constructing schedules and training records around such requirements will make it easier to produce periodic reports to monitor progress and make the reporting easier during an ISO grading.

A.5.2 Data processing by computer is widely used by fire departments, and the full potential of computer use in the fire service has yet to be realized. Many of those departments that, in the past, utilized a computer only for dispatching and fire incident reporting have found the advantages of applying the power and speed of the computer to other tasks. The use of relatively inexpensive computer systems and fire training

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records software has expanded in fire department applications. Programs also can be used for reports and records.

The computer has the potential for eliminating many, if not all, problems associated with a manual record-keeping system. Large, manually maintained records such as tracking personnel moving from station to station, vacations, and sick time are prone to inaccuracies. Without computer assistance, comparing or summarizing data can therefore become cumbersome and inaccurate.

Computerized information systems can provide a cost-effective method of processing comprehensive data and generating reports in a form that is conducive to the decision-making process. In addition, the computerization of training records often can be simplified by using state-of-the-art user language programming, which does not require a highly trained programmer to develop a computer-based system.

Software programs or remote record-keeping services also are available from a variety of sources to accomplish the record-keeping requirements of the user with little or no modification. Before expending the time, effort, and money needed to develop a program, these commercially available alternatives should be evaluated.

Public domain software is available to the fire service from a variety of sources, including the National Fire Academy.

The department should thoroughly evaluate record-keeping software to ensure that it provides the necessary record-keeping as recommended in this document.

Duplicate or backup records should be considered to protect data. These should be stored at a site separate from the primary records. The use of a computer makes this duplication or backup simple.

A.5.2.1 No general outline can be applied to the arrangement of a report, since each report is to be constructed according to its individual requirements.

A.5.2.3.1 Accuracy and clarity are essential in any report or form. If the reader or recipient detects inaccuracy, then the veracity of the represented writer or division, as well as the value of the report, is suspect. Details, without the inclusion of unnecessary information, are necessary to show progress or accomplishment. Care should be exercised to ensure that the point or summary is reached and that information in other forms or reports is not duplicated.

Accurate and complete training records also are required by a number of different laws and standards. Federal and state regulations require specific amounts and types of training. An example is 29 CFR 1910.134, "Respiratory Protection." NFPA 1403, *Standard on Live Fire Training Evolutions*, and NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, also require the documentation of specific training.

A.5.2.4 The number and types of training reports that need to be prepared vary from department to department.

A.5.3 The following are recommended types of training records:

(1) *Departmental Training Record.* A report that serves as a permanent record showing all the training fire personnel receive. These reports usually are completed on a yearly basis. Company officers usually make entries on this form; however, training officers in small departments might take on this responsibility.

(2) *Individual Special Course Record.* Special schools or courses made available to fire fighters. Their attendance and certification should be recorded.

(3) *Individual Training Record.* A record containing a chronological history of an individual's progress from the time of entry into the organization until separation.

(4) *Progress Chart.* A record form that provides an accurate and complete picture of all class activities and work accomplished by both the instructor and the students. The chart also shows, at a glance, how the class or program is progressing with respect to calendar or time schedules.

(5) *Certification Training Record (Fire Fighter).* A worksheet that maintains a record of each fire fighter's progress during the pursuit of certification.

(6) *Educational Courses.* A documentation of courses taken outside the department, such as at institutions for higher education.

(7) *Vocational Courses.* A documentation of courses, most of which are provided by state or regional programs in the form of workshops or demonstrations outside the department.

(8) *Seminars and Other Training.* A documentation of all seminars, short courses, and other individual or group development meetings attended. A certificate of achievement or certificate of completion obtained in this area of training should be made a part of the individual's training file.

(9) *Periodic Company Summary.* A report showing all other training conducted or attended by the company. The number of hours spent by each individual on each subject should be recorded, and this report should be submitted through proper channels to the officer in charge of training. Such reports should be submitted monthly.

(10) *Chief Officers' Periodic Training Summary.* A report showing all training conducted by fire companies within a division, battalion, or district. This report serves as confirmation for chief officers that company officers are properly conducting company training, and it can be submitted to the officer in charge of training for inclusion in monthly and annual summaries.

(11) *Group Training Records and Evaluation.* Because most fireground operations are accomplished by more than one fire fighter, group performance of basic evolutions should be an important part of any training system. A means or method of measuring the effectiveness of the organization's evolutions and how well they prepare the fire fighters to make an attack on a fire should be established. The group or company performance standard evaluation report form should be designed to allow for quick and accurate determination of the group's ability to meet minimum basic requirements. The report also should enable the individual group or company to check on the progress of its abilities in carrying out standard evolutions and following established standard operating procedures, and it should recommend areas in which additional training is needed.

A.5.4 Since the establishment of the NFPA professional qualifications series of standards, a number of states have developed and implemented state fire service training certification systems to establish and recognize compliance with these minimum requirements for various fire service professional levels.

A.7.1.1 Federal and state laws recognize the right of access to records maintained in the public domain. However, some areas are exempted from access, and clear-cut guidelines should be developed by the AHJ to prevent the unnecessary and illegal disclosure of confidential information.

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A.7.1.3.1 The retention of training records can be a complicated and confusing subject since there are a variety of laws, regulations, ordinances, and standards that are applicable. These requirements will likely change from state to state or jurisdiction to jurisdiction. In addition, records retention for medical training or fire training may be different from that for safety training. States or local jurisdictions require a records retention schedule that may or may not have to be filed with a local or state archives department. Legal counsel that has expertise in records retention, labor law, or public safety services should be consulted. A comprehensive records retention schedule should be adopted and then followed by the AHJ to avoid the image of impropriety should records be retained or destroyed inappropriately. Figure B.1(m) is an example of a records retention schedule.

A.7.1.4.1 In various appeal proceedings, OSHA has held that original records are required to be maintained for training activities that are conducted specifically to comply with an OSHA-mandated training requirement. Examples of this type of training are found in 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response (HAZWOPER)"; 29 CFR 1910.134, "Respiratory Protection"; 29 CFR 1910.146, "Permit Required Confined Spaces"; and 29 CFR 1910.147, "Control of Hazardous Energy."

A.7.1.4.2 The process of backing up computerized records should be determined by the AHJ. The number of records routinely created in any given period should dictate the frequency of backups. Generally speaking, the more records created in a shorter period of time, the more often they should be backed up, which will reduce the number of records lost if a failure occurs between backups. It is also prudent to keep the backup files off site from the computer hosting the files. This will help avoid losing the computer files and the backup files in the event of a fire or other disaster.

A.7.2 A concern of the fire service is the threat of litigation. The maintenance of accurate and complete training records in accordance with this document is one of the ways fire departments can limit their liability.

Accurate and complete training records also are required by a number of different laws and standards. Federal and state regulations require specific amounts and types of training. An example is 29 CFR 1910.134, "Respiratory Protection." NFPA 1403, *Standard on Live Fire Training Evolutions*, and NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, also require the documentation of specific training.

Annex B Examples of Reports and Records

This annex is not a part of the recommendations of this NFPA document but is included for informational purposes only.

B.1 Figure B.1(a) through Figure B.1(m) are examples of reports and records as recommended by this document.

NOTE: The subjects and time frames shown can be changed to meet the training needs of a particular department.

Annex C Informational References

C.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this recommended practice and are not part of the recommendations of this document unless also listed in Chapter 2 for other reasons.

C.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1403, *Standard on Live Fire Training Evolutions*, 2012 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2007 edition.

C.1.2 Other Publications.

C.1.2.1 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 29, Code of Federal Regulations, Part 1910.120, "Hazardous Waste Operations and Emergency Response (HAZWOPER)."

Title 29, Code of Federal Regulations, Part 1910.134, "Respiratory Protection."

Title 29, Code of Federal Regulations, Part 1910.146, "Permit Required Confined Spaces."

Title 29, Code of Federal Regulations, Part 1910.147, "Control of Hazardous Energy."

C.2 Informational References. (Reserved)

C.3 References for Extracts in Informational Sections. (Reserved)

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RECORD OF INDIVIDUAL TRAINING PROGRESS

NAME OF TRAINEE	SIGNATURE OF TRAINEE	INITIALS	SIGNATURE OF CERTIFIED INSTRUCTOR	INITIALS

SUBJECT			#	FIRE FIGHTER I				#	FIRE FIGHTER II				#
COURSE OUTLINE	F.F. LEVEL	1001 SECTION #		DATE	GRADE	INSTR. INIT.	TRAINEE INIT.		DATE	GRADE	INSTR. INIT.	TRAINEE INIT.	
I. ORIENTATION 1. OUTLINE OF TRAINING PROGRAM	FF I II K 1 2 S 0 0												
Material To Be Covered K-1. Needs, objectives, purpose, and scope of course • course content, schedule, instructors, expectations, and materials.													
K-2. Class scheduling and process for all levels • definitions of: identify, demonstrate, cognitive and psychomotor behavioral objectives • concurrent work training activities credit.													
K-3. Program curricula, training aids, development, and evaluation.													
2. DUTIES AND RESPONSIBILITIES–REFERENCE SECTION 1, 9 FOR FIRE FIGHTER RESPONSIBILITIES	FF I II K 1 2 S 0 0												
Material To Be Covered K-1. Fire department rules, regulations, and procedures.													
K-2. Student responsibilities as established by the local authority having jurisdiction.													
K-3. Performance observation, appraisal, and counseling as required and administered by the local department or school authorities.													
3. TESTING PROCEDURES	FF I II K 1 2 S 0 0												

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FIGURE B.1(a) Sample Record of Individual Training Progress.

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INDIVIDUAL FIRE DEPARTMENT TRAINING RECORD

			SHIFT
			COMPANY
NAME	RANK/POSITION	DATE EMPLOYED	STATION

DATE	SUBJECT	LOCATION	ACADEMIC	PRACTICAL	HOURS	INSTRUCTOR	EVALU-ATION	EXAM			NORM			
								WRITTEN	ORAL	PRACT'L	CLASS	DEPT.	STATE	NAT'L

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FIGURE B.1(b) Individual Training Summary Record.

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FIRE DEPARTMENT _____

INDIVIDUAL TRAINING PROGRESS RECORD

Daily

NAME OF TRAINEE	SIGNATURE OF TRAINEE	INITIALS	SIGNATURE OF CERTIFIED INSTRUCTOR	INITIALS

CERTIFIED FIRE FIGHTER/CERTIFIED ADVANCED FIRE FIGHTER For Month of

SUBJECT ⁄ ½ HOUR ╳ 1½ HOURS ⁄ 1 HOUR ╳ 2 HOURS	DAYS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL HOURS FOR MONTH
1. Apparatus driving/operation																																
2. ARFF																																
3. Breathing equipment																																
4. Communications																																
5. Extinguishers and extinguishing agents																																
6. Fire behavior																																
7. Fire cause determination																																
8. Fire fighter's law																																
9. Fire prevention and inspection practices																																
10. Fire service records and reports																																
11. Fire streams																																
12. Fire suppression tactics/strategy																																
13. Forcible entry																																
14. Haz Mat																																
15. Hose																																
16. Installed fire detection, alarm, and ext. systems																																
17. Ladders																																
18. Mathematics																																
19. Medical training																																
20. Orientation																																
21. Personal safety and hazards																																
22. Pre-fire planning																																
23. Rescue																																
24. Ropes and knots																																
25. Salvage and overhaul																																
26. Small tools and equipment																																
27. Specialized equipment and techniques																																
28. Terrorism																																
29. Ventilation																																
30. Water supply																																

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FIGURE B.1(c) Individual Daily Training Record by Subject Area and Hours.

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Monthly

INDIVIDUAL TRAINING RECORD

			RANK
YEAR	NAME		DEPARTMENT
SHIFT	COMPANY	SUPERVISOR	INSTRUCTOR

SUBJECT REQUIRED BY THE ILL. FIRE COMMISSION	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	TOTAL HOURS FOR YEAR
1. Apparatus driving/operation													
2. ARFF													
3. Breathing equipment													
4. Communications													
5. Extinguishers and extinguishing agents													
6. Fire behavior													
7. Fire cause determination													
8. Fire fighter's law													
9. Fire prevention and inspection practices													
10. Fire service records and reports													
11. Fire streams													
12. Fire suppression tactics/strategy													
13. Forcible entry													
14. Haz Mat													
15. Hose													
16. Installed fire detection, alarm, and ext. systems													
17. Ladders													
18. Mathematics													
19. Medical training													
20. Orientation													
21. Personal safety and hazards													
22. Pre-fire planning													
23. Rescue													
24. Ropes and knots													
25. Salvage and overhaul													
26. Small tools and equipment													
27. Specialized equipment and techniques													
28. Terrorism													
29. Ventilation													
30. Water supply													

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FIGURE B.1(d) Individual Monthly Training Record by Subject Area and Hours.

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IDENTIFICATION DATA AND PROGRESS RECORD

Last name	First name	Middle initial	Rank, grade, or title	Date entered fire service	Current assignment & location

Entry examination, scores, or evaluation	Yrs. formal educ.	Physical condition or restrictions	Date achieved current	Entered training for	Est. completion date

FIRE SERVICE TRAINING PROGRESS RECORD

TITLE	ENTERED	COMPLETED	RESULTS	TRAINING OFFICER'S SIG.
Fire fighter I				
Fire fighter II				
Fire officer I				
Fire officer II				
Fire officer III				
Fire officer IV				
Fire instructor I				
Fire instructor II				
Fire instructor III				
Emergency medical technician—Basic				
Emergency medical technician—Paramedic				
Fire apparatus driver/operator				
Airport fire fighter				
Fire inspector I				
Fire inspector II				
Fire inspector III				
Fire investigator				
Plans examiner I				
Plans examiner II				
Fire marshal				
Marine fire fighter I				
Marine fire fighter II				
Technical rescuer				
Incident management				
Public fire and life safety educator I				
Public fire and life safety educator II				
Public fire and life safety educator III				
Juvenile firesetter intervention specialist I				
Juvenile firesetter intervention specialist II				
Public information officer				
Wildland fire fighter I				
Wildland fire fighter II				
Wildland fire officer I				
Wildland fire officer II				
Public safety telecommunicator I				
Public safety telecommunicator II				
Public safety telecommunicator III				

FIRE SERVICE-RELATED COLLEGE COURSES COMPLETED

COURSE, TITLE, SUBJECT	DATE COMPLETED	NAME OF COLLEGE	GRADE

TECHNICAL TRAINING, SHORT COURSES, SEMINARS, ETC.

SPECIAL QUALIFICATIONS AND REQUIREMENTS IN ADDITION TO TRAINING

Significant additional duties, license to operate, other positions held, outstanding accomplishments

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FIGURE B.1(e) Individual Professional Qualifications Record.

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COMPARATIVE INDIVIDUAL PROGRESS RECORD

PROJECT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
NAME OF PROJECT																														
STUDENTS																														
1																														
2																														
3																														
4																														
5																														
6																														
7																														
8																														
9																														
10																														
11																														
12																														
13																														
14																														
15																														
16																														
17																														
18																														
19																														
20																														
21																														
22																														
23																														
24																														
25																														

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FIGURE B.1(f) Comparative Individual Progress Record.

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NAME _____

SPECIAL COURSES

DATE	SCHOOL & LOCATION	SUBJECT	HOURS
21–22 Nov. 70	Community college	Supervisory practices	12
3–4 Apr. 71	Civil defense – State Capitol	Radiological monitoring	16
6–8 Aug. 71	City police academy	Defensive driving	10

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FIGURE B.1(g) Individual Special Courses Record.

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SCHEDULE OF TRAINING

TRAINING DIVISION

SS – Station School
TC – Training Center

COMPANY	DATE	TIME	LOCATION	SUBJECT
102–103A	9 Nov	0900	SS	Portable fire extinguishers
402A	9 Nov	1330	SS	" " "
302B	10 Nov	0900	SS	" " "
402B	10 Nov	1330	SS	" " "
201–202A	11 Nov	0900	SS	" " "
101A	11 Nov	1330	TC	Hose lays
102A	11 Nov	1500	TC	" "
102–103B	12 Nov	0900	SS	Portable fire extinguishers
201–202B	12 Nov	1330	SS	" " "
202A	13 Nov	0900	TC	LPO T201, Ground ladders
302A	13 Nov	1330	SS	Portable fire extinguishers

REMARKS

1) LPO – Ladder Pipe Operations 2) Work clothes should be worn for classes at the Training Center. 3) All personnel scheduled for Ground Ladders should review pages TM–4 through TM–17 in the Training Manual.

The above schedule is subject to change by the Fire Chief.

Date

Training Officer

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FIGURE B.1(h) Periodic (Weekly) Schedule of Training.

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QUARTERLY TRAINING SCHEDULE

For fire companies to report to the training center during the first quarter of 20____

DATE	TIME	COMPANY	SUBJECT
Jan. 7	AM	E1,L2	Arson detection
	PM	E3,F5	Arson detection
Jan. 8	AM	E1,L2	Arson detection
	PM	E3,L5	Arson detection
Jan. 9	AM	E1,L2	Arson detection
	PM	E3,L5	Arson detection
Jan. 10	AM	E2,S1	Arson detection
	PM	E4,L1	Arson detection
Jan. 11	AM	E2,S1	Arson detection
	PM	E4,L1	Arson detection
Jan. 14	AM	E2,S1	Arson detection
	PM	E4,L1	Arson detection
Jan. 15	AM	E6,E7	Arson detection
	PM	E1,E3	Salvage
Jan. 16	AM	E6,E7	Arson detection
	PM	E1,E3	Salvage
Jan. 17	AM	E6,E7	Arson detection
	PM	E1,E3	Salvage
Jan. 18	AM	E2,L1	Salvage
	PM	E4,L2	Salvage
Jan. 21	AM	E2,L1	Salvage
	PM	E4,L2	Salvage
Jan. 22	AM	E2,L1	Salvage
	PM	E4,L2	Salvage
Jan. 23	AM	E5,E7	Salvage
	PM	E6,S1	Salvage
Jan. 24	AM	E5,E7	Salvage
	PM	E6,S1	Salvage
Jan. 25	AM	E5,E7	Salvage
	PM	E6,S1	Salvage
Jan. 28	AM	E1,S1	Sprinklers
	PM	E4,E2	Sprinklers
Jan. 29	AM	E3,L2	Sprinklers
	PM	E7,L1	Sprinklers
Jan. 30	AM	E3,L2	Sprinklers
	PM	E7,L1	Sprinklers
Jan. 31	AM	E3,L2	Sprinklers
	PM	E7,L1	Sprinklers
Feb. 1	AM	E3,L2	Sprinklers
	PM	E7,L1	Sprinklers
Feb. 4	AM	E3,L2	Sprinklers
	PM	E7,L1	Sprinklers
Feb. 5	AM	E3,L2	Sprinklers
	PM	E7,L1	Sprinklers
Feb. 6	AM	E3,L2	Sprinklers
	PM	E7,L1	Sprinklers
Feb. 7	AM	E5,E6	Sprinklers
	PM	E1,E4	Sprinklers
Feb. 8	AM	E1,E4	Power tools
	PM	E1,E4	Power tools
Feb. 11	AM	E5,E6	Sprinklers
	PM	E1,E4	Power tools
Feb. 12	AM	E6,E7	Power tools
	PM	E1,E4	Power tools
Feb. 13	AM	E2,E7	Power tools
	PM	E3,S1	Power tools
Feb. 14	AM	E2,E7	Power tools
	PM	E3,S1	Power tools
Feb. 15	AM	E2,E7	Power tools
	PM	E3,S1	Power tools
Feb. 18	AM	E2,E7	Power tools
	PM	E3,S1	Power tools
Feb. 19	AM	E2,E7	Power tools
	PM	E3,S1	Power tools
Feb. 20	AM	E5,L1	Power tools
	PM	E6,L2	Power tools
Feb. 21	AM	E5,L1	Power tools
	PM	E6,L2	Power tools
Feb. 22	AM	E5,L1	Power tools
	PM	E6,L2	Power tools
Feb. 25	AM	E1,E2	Ground ladder
	PM	E3,L1	Ground ladder
Feb. 26	AM	E4,E6	Ground ladder
	PM	E7,S1	Ground ladder
Feb. 27	AM	E1,S1	Ground ladder
	PM	E4,E2	Ground ladder
Feb. 28	AM	E1,S1	Ground ladder
	PM	E4,E2	Ground ladder
Mar. 1	AM	E1,S1	Ground ladder
	PM	E4,E2	Ground ladder
Mar. 4	AM	E4,E6	Ground ladder
	PM	E7,S1	Ground ladder
Mar. 5	AM	E4,E6	Ground ladder
	PM	E7,S1	Ground ladder
Mar. 6	AM	HOSE TESTS	
	PM	PLATOON A	
Mar. 7	AM	HOSE TESTS	NOTE A
	PM	PLATOON B	
Mar. 8	AM	HOSE TESTS	
	PM	PLATOON C	
Mar. 11	AM	E5,L2	Turrets and ladder
	PM	E2,E6	Pipes (NOTE B)
Mar. 12	AM	E5,L2	Turrets and ladder
	PM	E2,E6	Pipes (NOTE B)
Mar. 13	AM	E5,L2	Turrets and ladder
	PM	E2,E6	Pipes (NOTE B)
Mar. 14	AM	E7,L2	Turrets and ladder
	PM	E1,E5	Pipes (NOTE B)
Mar. 15	AM	E7,L2	Turrets and ladder
	PM	E1,E5	Pipes (NOTE B)
Mar. 18	AM	E7,L2	Turrets and ladder
	PM	E1,E5	Pipes (NOTE B)
Mar. 19	AM	E7,L2	Turrets and ladder
	PM	E1,E5	Pipes (NOTE B)
Mar. 20	AM	E7,L2	Turrets and ladder
	PM	E1,E5	Pipes (NOTE B)
Mar. 21	AM	E7,L2	Turrets and ladder
	PM	E1,E5	Pipes (NOTE B)
Mar. 22	AM	E7,L2	Turrets and ladder
	PM	E1,E5	Pipes (NOTE B)
Mar. 25	AM	E7,L2	Turrets and ladder
	PM	E1,E5	Pipes (NOTE B)
Mar. 26	AM	E4,E3	Turrets and ladder
	PM	S1,L1	Pipes (NOTE B)
Mar. 27	AM	E7,L2	Turrets and ladder
	PM	E1,E5	Pipes (NOTE B)
Mar. 28	AM	E4,E3	Turrets and ladder
	PM	S1,L1	Pipes (NOTE B)
Mar. 29	AM	E4,E3	Turrets and ladder
	PM	S1,L1	Pipes (NOTE B)

NOTE A: At company quarters.
NOTE B: Drills to be held at Memorial Park.

Approved _____
Chief of Fire Department

_____
Chief Training Officer

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FIGURE B.1(i) Periodic (Quarterly) Schedule of Training.

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CITY OF NAPA
FIRE DEPARTMENT
DIVISION OF TRAINING

Code No. _____

DRILL REPORT

SHIFT _____ STATION NO. _____ DATE _____, 20 _____

TIME _____ M. to _____ M. TOTAL TIME DRILLED _____ Hrs. _____ Min.

DESCRIPTION OF DRILL	TIME HOURS	TIME MIN.

NAMES OF FIRE FIGHTERS DRILLED

REMARKS OR SUGGESTIONS

EQUIPMENT USED

Feet of Booster Hose	Feet of 1¾" Hose	Feet of 3" Hose	Feet of Other Hose	Feet of Ladders	Number of Salvage Covers	Gallons of Water

Signature of Reporting Officer

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FIGURE B.1(j) Sample Drill Report.

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WAUKEGAN FIRE DEPARTMENT

STANDARD ENGINE AND TRUCK COMPANY EVOLUTIONS

DATE _____ TIME OF DAY _____ DUTY SHIFT _____

ENGINE CO.# _____ EVOLUTION # _____ TIME STANDARD _____

TRUCK CO.# _____ EVOLUTION # _____ ACTUAL TIME _____

DATE OFFICER _____

PUMP OPERATOR _____

FIRE FIGHTER _____

FIRE FIGHTER _____

FIRE FIGHTER _____

1. Was the evolution conducted in a safe manner? YES _____ NO _____
2. Was the evolution completed within the required time? YES _____ NO _____
3. Were nozzle pressures correct? YES _____ NO _____
4. Were streams, once started, operated without interruption? YES _____ NO _____

LIST AREAS OF DIFFICULTY OR WHERE IMPROVEMENT IS NEEDED:

_____

_____

_____

_____

_____

ADDITIONAL REMARKS

_____

_____

_____
Evaluator's Signature

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FIGURE B.1(k) Sample Group Evaluation Record.

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FIRE DEPARTMENT TRAINING RECORD

SUBJECT TAUGHT:	DATE / HOURS
OBJECTIVES MET: (from Instructor Reference Manual)	TESTS ON SUBJECT (indicate written/practical or oral) ❑ Written _____ ❑ Practical _____ ❑ Oral _____
LOCATION OF TRAINING:	MILEAGE TO TRAINING LOCATION (optional)

REQUIRED SIGNATURES

(All training should be verified by the instructor who taught the course and the students in the class who took the training. If this training form is computerized, signatures are still required and a printed copy of this form should be available for review by the Division of Personnel Standards and Education.)

By signing below, I attest that I have given/received the training on the above subject.

_____
Student's Name (legibly printed)

_____
Student's Original Signature

_____
Instructor's Original Signature or Initials

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FIGURE B.1(l) Typical Fire Department Training Record.

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RECORDS RETENTION SCHEDULE

Record Series	Classification Number	Schedule Number	Retention Period
FIRE AND RESCUE DIVISION			
ADMINISTRATION			
Annual Report to State Fire Marshal	FRA-01	12-606.1	Permanent
Incident Report	FRA-02	12-606.2	10 years
DHEC Patient Care Forms (DHEC Reports)	FRA-03	HH-07787	13 years
MAINTENANCE			
Vehicle Maintenance Report	FRM-01	12-609.6	Until superseded
Vehicle Service File	FRM-02	12-609.7	Until superseded
OPERATIONS			
Equipment Files	FRO-01	12-606.5	See schedule
Fire Hose Record	FRO-02	12-606.3	3 years
Fire Hydrant Testing Report	FRO-03	12-606.4	3 years
TRAINING			
Attendance Report	FRT-01	HH-11153	3 years
Class Registration Information	FRT-02	HH-11149	1 year
Competency-Based Training Evolutions	FRT-03	HH-11154	See schedule
CPR Training Roster	FRT-04	HH-11150	2 years
In-Service Training Detail Record	FRT-05	HH-11151	See schedule
Public Education Activity	FRT-06	HH-11152	2 years
Training Classroom Schedule	FRT-07	HH-11148	3 years
Training Records	FRT-08	HH-11147	See schedule
ALL DEPARTMENTS			
Budget Files	ALD-01	12-605.2	3 years
Policy and Program Records	ALD-02.1	12-601.13.1	Permanent
General Administrative Files	ALD-02.2	12-601.13.2	5 years
General Housekeeping Files	ALD-02.3	12-601.13.3	See schedule
Public Notices	ALD-03	HH-11117	3 years

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FIGURE B.1(m) Typical Records Retention Schedule.

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Index

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-A-

Administration ..... Chap. 1
General 1.3
Purpose 1.2, A.1.2
Scope 1.1
Authority Having Jurisdiction (AHJ)
Definition 3.2.1, A.3.2.1

-D-

Definitions ..... Chap. 3

-E-

Education
Definition 3.3.1
Elements of Training Documents ..... Chap. 4
Additional Information 4.3
Elements of Information 4.2
General 4.1
Evaluating the Effectiveness of Training Records Systems ..... Chap. 6
Evaluating Records of Individuals 6.1
Evaluating the Record-Keeping System 6.2
Examples of Reports and Records ..... Annex B
Explanatory Material ..... Annex A

-F-

Feedback
Definition 3.3.2
Fire Chief
Definition 3.3.3
Flow Chart
Definition 3.3.4
Functions
Definition 3.3.5

-I-

Informational References ..... Annex C

-L-

Legal Aspects of Record Keeping ..... Chap. 7
Privacy of Personal Information 7.1
Length of Time for Keeping Records or Reports 7.1.3
Record Keeping and Risk Management 7.2, A.7.2

-M-

Management
Definition 3.3.6

-P-

Periodic
Definition 3.3.7

-R-

Recommended Practice
Definition 3.2.2
Record
Definition 3.3.8
Referenced Publications ..... Chap. 2
General 2.1
NFPA Publications (Reserved) 2.2
Other Publications 2.3
References for Extracts in Recommendations Sections 2.4
Report
Definition 3.3.9

-S-

Seasonal Needs
Definition 3.3.10
Should
Definition 3.2.3
System
Definition 3.3.11

-T-

Training
Definition 3.3.12
Training Officer
Definition 3.3.13
Types of Training Documents ..... Chap. 5
State Certification Records 5.4, A.5.4
Minimum Information 5.4.1
Training Records 5.3, A.5.3
Training Reports 5.2, A.5.2
Logical Sequence 5.2.1, A.5.2.1
Narrative Report 5.2.5
Organization 5.2.3
Purpose 5.2.2
Training Schedules 5.1
All Other Training 5.1.3, A.5.1.3
Need for Training Schedules 5.1.1
Types of Training Schedules 5.1.2, A.5.1.2
Periodic Training Schedule — Station Training 5.1.2.1
Periodic Training Schedule — Training Facility Activities 5.1.2.2, A.5.1.2.2

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Step 1: Call for Proposals

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Step 2: Report on Proposals (ROP)

- Committee meets to act on Proposals, to develop its own Proposals, and to prepare its Report.
- Committee votes by written ballot on Proposals. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Proposals (ROP) is published for public review and comment.

Step 3: Report on Comments (ROC)

- Committee meets to act on Public Comments to develop its own Comments, and to prepare its report.
- Committee votes by written ballot on Comments. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Comments (ROC) is published for public review.

Step 4: Technical Report Session

- "*Notices of intent to make a motion*" are filed, are reviewed, and valid motions are certified for presentation at the Technical Report Session. ("Consent Documents" that have no certified motions bypass the Technical Report Session and proceed to the Standards Council for issuance.)
- NFPA membership meets each June at the Annual Meeting Technical Report Session and acts on Technical Committee Reports (ROP and ROC) for Documents with "certified amending motions."
- Committee(s) vote on any amendments to Report approved at NFPA Annual Membership Meeting.

Step 5: Standards Council Issuance

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M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.

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R/T *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.

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C *Consumer:* A person who is, or represents, the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in the *User* classification.

SE *Special Expert:* A person not representing any of the previous classifications, but who has a special expertise in the scope of the standard or portion thereof.

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3. Proposal (include proposed new or revised wording, or identification of wording to be deleted): [Note: Proposed text should be in legislative format; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).]

Revise definition of effective ground-fault current path to read:

3.3.78 Effective Ground-Fault Current Path. An intentionally constructed, permanent, low impedance electrically conductive path designed and intended to carry ~~underground~~ electric fault current ~~conditions~~ from the point of a ground fault on a wiring system to the electrical supply source.

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APPENDIX H
NFPA 1403
Standard on Live Fire Training Evolutions

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NFPA® 1403

Standard on

Live Fire Training Evolutions

2012 Edition

This edition of NFPA 1403, *Standard on Live Fire Training Evolutions*, was prepared by the Technical Committee on Fire Service Training. It was issued by the Standards Council on December 13, 2011, with an effective date of January 2, 2012, and supersedes all previous editions.

This edition of NFPA 1403 was approved as an American National Standard on January 2, 2012.

Origin and Development of NFPA 1403

The ongoing training of fire fighters is the cornerstone of good fire protection in today's world. However, the benefits derived from live fire training can be negated by the injuries and deaths suffered by fire fighters under unsafe and poorly supervised training conditions.

Following a tragic training accident in 1982, which resulted in the deaths of two fire fighters, the Committee on Fire Service Training was urged to address the issue of live fire training evolutions in structures. The committee proceeded to develop NFPA 1403 in order to provide recognized safe practices for conducting such training evolutions.

The first edition, titled *Live Fire Training Evolutions in Structures*, was issued in 1986. It was well received and served as the basis for live fire training evolutions throughout the United States. The document was updated in a 1992 edition. In the 1997 revision, the committee combined NFPA 1403 and NFPA 1406, *Outside Live Fire Training Evolutions*, into a single document.

The committee appointed a task group to review the functionality of the 1997 edition in preparation for the 2002 revision. The task group recommended a general updating of the standard. Changes were made to reflect increased experience with live fire training evolutions. The previous numbering of chapters and paragraphs was changed to reflect requirements in the 2000 edition of the *Manual of Style for NFPA Technical Committee Documents*.

The 2007 edition updated training requirements for live fire training structures, exterior props, and Class B fires. This edition also contained several editorial changes.

For the 2012 edition, the committee has added a new Chapter 4, to address general requirements to which all live fire training evolutions must adhere for safety, and that were previously located in individual chapters. The committee has also further clarified the requirements for emergency medical services, allowable types of Class A products, instructor duties, and the role of the fire control team. A new requirement has been added that mandates that each burn room have a burn plan in place to limit building damage and injuries to fire fighters. The inspection and maintenance requirements for live fire training structures have also been revised.

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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.

Committee Scope: This Committee shall have primary responsibility for all fire service training techniques, operations, and procedures to develop maximum efficiency and proper utilization of available personnel. Such activities can include training guides for fire prevention, fire suppression, and other missions for which the fire service has responsibility.

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Contents

Chapter 1 Administration 1403– 4
1.1 Scope 1403– 4
1.2 Purpose 1403– 4
1.3 Application 1403– 4

Chapter 2 Referenced Publications 1403– 4
2.1 General 1403– 4
2.2 NFPA Publications 1403– 4
2.3 Other Publications 1403– 4
2.4 References for Extracts in Mandatory Sections 1403– 4

Chapter 3 Definitions 1403– 4
3.1 General 1403– 4
3.2 NFPA Official Definitions 1403– 5
3.3 General Definitions 1403– 5

Chapter 4 General 1403– 5
4.1 Application 1403– 5
4.2 Permits 1403– 5
4.3 Student Prerequisites 1403– 6
4.4 Safety Officer 1403– 6
4.5 Extreme Weather 1403– 6
4.6 Instructor in Charge and Instructors 1403– 6
4.7 Fire Control Team 1403– 6
4.8 Personal Protective Clothing 1403– 7
4.9 Communication 1403– 7
4.10 Emergency Medical Services (EMS) 1403– 7
4.11 Water Supply 1403– 7
4.12 Fuel Materials 1403– 7
4.13 Parking/Staging 1403– 8
4.14 Visitors and Spectators 1403– 8
4.15 Preburn Plan/Briefing 1403– 8

Chapter 5 Acquired Structures 1403– 9
5.1 Structures and Facilities 1403– 9
5.2 Hazards 1403– 9
5.3 Utilities 1403–10
5.4 Exits 1403–10
5.5 Rapid Intervention Crew (RIC) 1403–10

Chapter 6 Gas-Fired Live Fire Training Structures 1403–10
6.1 Structures and Facilities 1403–10
6.2 Inspection and Testing 1403–10

Chapter 7 Non-Gas-Fired Live Fire Training Structures 1403–10
7.1 Structures and Facilities 1403–10
7.2 Inspection and Testing 1403–10
7.3 Sequential Live Fire Burn Evolutions 1403–11

Chapter 8 Exterior Live Fire Training Props 1403–11
8.1 Props, Structures, and Facilities 1403–11
8.2 Inspection and Maintenance 1403–11

Chapter 9 Reports and Records 1403–11
9.1 General 1403–11

Annex A Explanatory Material 1403–12

Annex B Live Fire Evolution Sample Checklist 1403–20

Annex C Responsibilities of Personnel 1403–20

Annex D Heat Exhaustion and Heat Stroke in Training 1403–20

Annex E Informational References 1403–24

Index 1403–25

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NFPA 1403

Standard on

Live Fire Training Evolutions

2012 Edition

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Information on referenced publications can be found in Chapter 2 and Annex E.

Chapter 1 Administration

1.1* Scope.

1.1.1 This standard shall contain the minimum requirements for training all fire suppression personnel engaged in firefighting operations under live fire conditions.

1.1.2 The minimum requirements for training shall comprise a basic system that can be adapted to local conditions to serve as a standard mechanism for live fire training.

1.2* Purpose.

1.2.1 The purpose of this standard shall be to provide a process for conducting live fire training evolutions to ensure that they are conducted in safe facilities and that the exposure to health and safety hazards for the fire fighters receiving the training is minimized.

1.2.2 Live fire training is intended to provide the safest and best experience possible under both realistic and controlled circumstances.

1.3 Application.

1.3.1 All live fire training shall be conducted in compliance with the current edition of this standard.

1.3.2 Procedures for live fire training evolutions that involve ground cover or wildland fires shall not be covered in this standard.

1.3.3* Procedures for suppression of fires set for the sole purpose of training individuals for fire cause and origin investigation shall not be covered in this standard.

1.3.4 Live fire training shall only be conducted using standard operating procedures (SOPs) developed by the authority having jurisdiction in compliance with this standard.

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, Quincy, MA 02169-7471.

NFPA 30, *Flammable and Combustible Liquids Code,* 2012 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* 2011 edition.

NFPA 59, *Utility LP-Gas Plant Code,* 2012 edition.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications,* 2008 edition.

NFPA 1041, *Standard for Fire Service Instructor Professional Qualifications,* 2012 edition.

NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting,* 2012 edition.

NFPA 1407, *Standard for Training Fire Service Rapid Intervention Crews,* 2010 edition.

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting,* 2007 edition.

NFPA 1975, *Standard on Station/Work Uniforms for Emergency Services,* 2009 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* 2007 edition.

NFPA 1982, *Standard on Personal Alert Safety Systems (PASS),* 2007 edition.

2.3 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications,* 2008 edition.

NFPA 1410, *Standard on Training for Initial Emergency Scene Operations,* 2010 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* 2007 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary,* 11th edition, shall be the source for the ordinarily accepted meaning.

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3.2 NFPA Official Definitions.

3.2.1* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.2 Shall. Indicates a mandatory requirement.

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

3.2.4 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 Acquired Prop. A piece of equipment such as an automobile that was not designed for burning but is used for live fire training evolutions.

3.3.2 Backdraft. A deflagration resulting from the sudden introduction of air into a confined space containing oxygen-deficient products of incomplete combustion.

3.3.3 Combustible. Capable of burning, generally in air under normal conditions of ambient temperature and pressure, unless otherwise specified. Combustion can occur in cases where an oxidizer other than oxygen in air is present (e.g., chlorine, fluorine, or chemicals containing oxygen in their structure).

3.3.4 Conduction. Heat transfer to another body or within a body by direct contact.

3.3.5 Convection. Heat transfer by circulation within a medium such as a gas or a liquid.

3.3.6 Deflagration. Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium.

3.3.7 Demonstration. The act of showing a skill.

3.3.8 Emergency Medical Services. The provision of treatment, such as first aid, cardiopulmonary resuscitation, basic life support, advanced life support, and other pre-hospital procedures, including ambulance transportation, to patients. [**1500,** 2007]

3.3.9 Evolution. A set of prescribed actions that result in an effective fireground activity. [**1410,** 2010]

3.3.10 Flameover (Rollover.) The condition in which unburned fuel (pyrolysate) from the originating fire has accumulated in the ceiling layer to a sufficient concentration (i.e., at or above the lower flammable limit) that it ignites and burns. Flameover can occur without ignition of or prior to the ignition of other fuels separate from the origin.

3.3.11 Flashover. A transition phase in the development of a compartment fire in which surfaces exposed to thermal radiation reach ignition temperature more or less simultaneously and fire spreads rapidly throughout the space, resulting in full room involvement or total involvement of the compartment or enclosed space.

3.3.12 Fuel Load. The total quantity of combustible contents of a building, space, or fire area, including interior finish and trim, expressed in heat units or the equivalent weight in wood.

3.3.13 Instructor. An individual qualified by the authority having jurisdiction to deliver fire-fighter training, who has the training and experience to supervise students during live fire training evolutions.

3.3.14 Instructor-in-Charge. An individual qualified as an instructor and designated by the authority having jurisdiction to be in charge of the live fire training evolution.

3.3.15 Live Fire. Any unconfined open flame or device that can propagate fire to the building, structure, or other combustible materials.

3.3.16 Participant. Any student, instructor, safety officer, visitor, or other person who is involved in the live fire training evolution within the operations area.

3.3.17 Personal Accountability Report (PAR). A report requested by and communicated to the incident commander from fire crews operating at a scene as to their location and situation.

3.3.18 Personal Protective Clothing. The full complement of garments fire fighters are normally required to wear while on emergency scene, including turnout coat, protective trousers, fire-fighting boots, fire-fighting gloves, a protective hood, and a helmet with eye protection. [**1001,** 2008]

3.3.19 Personal Protective Equipment. Consists of full personal protective clothing, plus a self-contained breathing apparatus (SCBA) and a personal alert safety system (PASS) device. [**1001,** 2008]

3.3.20 Pyrolysate. Product of decomposition through heat; a product of a chemical change caused by heating.

3.3.21 Radiation. Heat transfer by way of electromagnetic energy.

3.3.22 Safety Officer. An individual appointed by the authority having jurisdiction as qualified to maintain a safe working environment at all live fire training evolutions.

3.3.23 Student. Any person who is present at the live fire training evolution for the purpose of receiving training.

3.3.24 Training Structure.

3.3.24.1 ***Acquired Structure.*** A building or structure acquired by the authority having jurisdiction from a property owner for the purpose of conducting live fire training evolutions.

3.3.24.2* ***Live Fire Training Structure.*** A structure specifically designed for conducting live fire training evolutions on a repetitive basis.

3.3.25 Ventilation-Controlled Fire. A fire in which the heat release rate or growth is controlled by the amount of air available to the fire.

Chapter 4 General

4.1 Application. All live fire training evolutions shall comply with this chapter and the appropriate chapter for the type of training being performed.

4.1.1 Strict safety practices shall be applied to all structures selected for live fire training evolutions.

4.2 Permits.

4.2.1 All required permits to conduct live fire training evolutions shall be obtained.

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4.2.2 The permits specified in this chapter shall be provided to outside, contract, or other separate training agencies by the authority having jurisdiction (AHJ) upon the request of those agencies.

4.2.3 The runoff from live fire shall comply with the requirements of the AHJ.

4.3 Student Prerequisites.

4.3.1* Prior to being permitted to participate in live fire training evolutions, the student shall have received training to meet the minimum job performance requirements for Fire Fighter I in NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, related to the following subjects:

(1) Safety
(2) Fire behavior
(3) Portable extinguishers
(4) Personal protective equipment
(5) Ladders
(6) Fire hose, appliances, and streams
(7) Overhaul
(8) Water supply
(9) Ventilation
(10) Forcible entry
(11) Building construction

4.3.2* Students participating in a live fire training evolution who have received the required minimum training from other than the AHJ shall not be permitted to participate in any live fire training evolution without first presenting prior written evidence of having successfully completed the prescribed minimum training to the levels specified in 4.3.1.

4.4 Safety Officer.

4.4.1 A safety officer shall be appointed for all live fire training evolutions.

4.4.2* All live fire training instructors and safety officers shall be trained on the application of the requirements contained in this standard.

4.4.3 The safety officer shall have the authority, regardless of rank, to intervene and control any aspect of the operations when, in his or her judgment, a potential or actual danger, potential for accident, or unsafe condition exists.

4.4.4 The responsibilities of the safety officer shall include, but not be limited to, the following:

(1) Prevention of unsafe acts
(2) Elimination of unsafe conditions

4.4.5 The safety officer shall provide for the safety of all persons on the scene, including students, instructors, visitors, and spectators.

4.4.6 The safety officer shall not be assigned other duties that interfere with safety responsibilities.

4.4.7 The safety officer shall be knowledgeable in the operation and location of safety features available for the live fire training structure or prop, such as emergency shutoff switches, gas shutoff valves, and evacuation alarms.

4.4.8* Additional safety personnel, as deemed necessary by the safety officer, shall be located to react to any unsafe or threatening situation or condition.

4.5* Extreme Weather. The training session shall be curtailed, postponed, or canceled, as necessary, to reduce the risk of injury or illness caused by extreme weather conditions.

4.6 Instructor in Charge and Instructors.

4.6.1 The instructor-in-charge shall have received training to meet the minimum job performance requirements for Fire Instructor I in NFPA 1041, *Standard for Fire Service Instructor Professional Qualifications.*

4.6.2 The instructor-in-charge shall be responsible for full compliance with this standard.

4.6.3 It shall be the responsibility of the instructor-in-charge to coordinate overall fireground activities to ensure correct levels of safety.

4.6.4 The instructor-in-charge shall assign the following personnel:

(1) One instructor to each functional crew, each of which shall not exceed five students
(2) One instructor to each backup line
(3) One additional instructor for each additional functional assignment

4.6.5 The instructor-in-charge shall provide for rest and rehabilitation of participants operating at the scene, including any necessary medical evaluation and treatment, food and fluid replenishment, and relief from climatic conditions. *(See Annex D.)*

4.6.5.1* Instructors shall be rotated through duty assignments.

4.6.6 All instructors shall be qualified by the AHJ to deliver live fire training.

4.6.7 Additional instructors shall be designated when factors such as extreme temperatures or large groups are present, and classes of long duration are planned.

4.6.8 Prior to the ignition of any fire, instructors shall ensure that all protective clothing and equipment specified in this chapter are being worn according to manufacturer's instructions.

4.6.9 Instructors shall take a personal accountability report (PAR) when entering and exiting the structure or prop during an actual attack evolution conducted in accordance with this standard.

4.6.10 Instructors shall monitor and supervise all assigned students during the live fire training evolution.

4.6.11 Awareness of weather conditions, wind velocity, and wind direction shall be maintained, including a final check for possible changes in weather conditions immediately before actual ignition.

4.6.12 Training Instructors on How to Use Specialty Props.

4.6.12.1 The instructors and the safety officer responsible for conducting live fire training evolutions with a gas-fueled training system or with other specialty props (such as flashover simulator) shall be trained in the complete operation of the system and the props.

4.6.12.2 The training of instructors and the safety officer shall be performed by an individual authorized by the gas-fueled training system and specialty prop manufacturer or by others qualified to perform this type of training.

4.7 Fire Control Team

4.7.1 A fire control team shall consist of a minimum of two personnel.

4.7.1.1 One person who is not a student or safety officer shall be designated as the "ignition officer" to ignite, maintain, and control the materials being burned.

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4.7.1.1.1 The ignition officer shall be a member of the fire control team.

4.7.1.2* One member of the fire control team shall be in the area to observe the ignition officer ignite and maintain the fire, and to recognize, report, and respond to any adverse conditions.

4.7.2 The decision to ignite the training fire shall be made by the instructor-in-charge in coordination with the safety officer.

4.7.3 The fire shall be ignited by the ignition officer.

4.7.4 The fire control team shall wear full personal protective clothing, including SCBA, when performing this control function.

4.7.5 A charged hose line shall be available when the fire control team is igniting or tending to any fire.

4.7.6 Fires shall not be ignited without an instructor visually confirming that the flame area is clear of personnel being trained.

4.8 Personal Protective Clothing.

4.8.1 All students, instructors, safety personnel, and other personnel shall wear all protective clothing and equipment specified in this chapter according to manufacturer's instructions whenever they are involved in any evolution or fire suppression operation during the live fire training evolution.

4.8.2* All participants shall be inspected by the safety officer prior to entry into a live fire training evolution to ensure that the protective clothing and SCBA are being worn correctly and are in serviceable condition.

4.8.3 Protective coats, trousers, hoods, footwear, helmets, and gloves shall have been manufactured to meet the requirements of NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

4.8.4 SCBA shall have been manufactured to meet the requirements of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services.*

4.8.5* Where station or work uniforms are worn by any participant, the station or work uniform shall have been manufactured to meet the requirements of NFPA 1975, *Standard on Station/Work Uniforms for Emergency Services.*

4.8.6 Personal alarm devices shall have been manufactured to meet the requirements of NFPA 1982, *Standard on Personal Alert Safety Systems (PASS).*

4.8.7* All students, instructors, safety personnel, and other personnel participating in any evolution or operation of fire suppression during the live fire training evolution shall breathe from an SCBA air supply whenever they operate under one or more of the following conditions:

(1) In an atmosphere that is oxygen deficient or contaminated by products of combustion, or both
(2) In an atmosphere that is suspected of being oxygen deficient or contaminated by products of combustion, or both
(3) In any atmosphere that can become oxygen deficient, contaminated, or both
(4) Below ground level

4.9 Communication.

4.9.1 A method of fireground communications shall be established to enable coordination among the incident commander, the interior and exterior sectors, the safety officer, and external requests for assistance.

4.9.2* A building evacuation plan shall be established, including an evacuation signal to be demonstrated to all participants in an interior live fire training evolution.

4.10 Emergency Medical Services (EMS).

4.10.1 Basic life support (BLS) emergency medical services shall be available on site to handle injuries.

4.10.1.1 For acquired structures, BLS emergency medical services with transport capabilities shall be available on site to handle injuries.

4.10.2 A parking area for an ambulance or an emergency medical services vehicle shall be designated and located where it will facilitate a prompt response in the event of personal injury to participants in the evolution.

4.10.3 Written reports shall be completed and submitted on all injuries and on all medical aid rendered.

4.11* Water Supply.

4.11.1 The instructor-in-charge and the safety officer shall determine the rate and duration of waterflow necessary for each individual live fire training evolution, including the water necessary for control and extinguishment of the training fire, the water supply necessary for backup line(s) to protect personnel, and any water needed to protect exposed property.

4.11.2 Each hose line and backup line(s) shall be capable of delivering a minimum of 95 gpm (360 L/min).

4.11.3 Backup line(s) shall be provided to ensure protection for personnel on training attack lines.

4.11.4 The minimum water supply and delivery for the live fire training evolutions shall meet the criteria identified in NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting.*

4.11.5 A minimum reserve of additional water in the amount of 50 percent of the fire flow demand, determined in accordance with 4.11.1, shall be available to handle exposure protection or unforeseen situations.

4.11.5.1 The requirements of 4.11.5 do not apply to permanently sited gas-fueled training systems.

4.11.6* Except under the conditions of 4.11.6.1, separate water sources shall be utilized for the supply of attack lines and backup lines in order to preclude the loss of both water supply sources at the same time.

4.11.6.1* A single water source shall be sufficient at a training center facility where the water system has been engineered to provide adequate volume for the evolutions conducted and a backup power source or backup pumps, or both, are in place to ensure an uninterrupted supply in the event of a power failure or malfunction.

4.11.7 There shall be room provided around all props so that there is space for all attack line(s) as well as backup line(s) to operate freely.

4.12 Fuel Materials.

4.12.1* The fuels that are utilized in live fire training evolutions shall only be wood products.

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4.12.1.1 Fuel-fired buildings and props are permitted to use the appropriate fuels for the design of the building or prop.

4.12.2 Pressure-treated wood, rubber, plastic, polyurethane foam, upholstered furniture, and chemically treated or pesticide-treated straw or hay shall not be used.

4.12.3 Flammable or combustible liquids, as defined in NFPA 30, *Flammable and Combustible Liquids Code*, shall not be used in live fire training evolutions.

4.12.3.1 Combustible liquid with a flash point above 100°F (38°C) shall be permitted to be used in a live fire training structure or prop that has been specifically engineered to accommodate a defined quantity of the fuel.

4.12.4 Unidentified materials, such as debris found in or around the structure or prop that could burn in unanticipated ways, react violently, or create environmental or health hazards, shall not be used.

4.12.5 Propane lighters, butane lighters, fusees (safety flares), kitchen-type matches, and similar devices are permitted to be used to ignite training fires if the device is removed immediately after ignition of the training fire.

4.12.6* Fuel materials shall be used only in the amounts necessary to create the desired fire size.

4.12.7 The fuel load shall be limited to avoid conditions that could cause an uncontrolled flashover or backdraft.

4.12.8* The instructor-in-charge and the safety officer shall assess the selected fire room environment for factors that can affect the growth, development, and spread of fire.

4.12.9* The instructor-in-charge and the safety officer shall document fuel loading, including all of the following:

(1) Fuel material
(2) Wall and floor coverings and ceiling materials
(3) Type of construction of the structure, including type of roof and combustible void spaces
(4) Dimensions of the room

4.12.10* The training exercise shall be stopped immediately when the instructor-in-charge or the safety officer determines through ongoing assessment that the combustible nature of the environment represents a potential hazard.

4.12.10.1 An exercise stopped as a result of an assessed hazard according to 4.12.10 shall continue only when actions have been taken to reduce the hazard.

4.12.11* The use of flammable gas, such as propane and natural gas, shall be permitted only in live fire training structures specifically designed for their use.

4.12.11.1 Liquefied versions of the gases specified in 4.12.11 shall not be permitted inside the live fire training structure.

4.12.11.2* All props that use pressure to move fuel to the fire shall be equipped with remote fuel shutoffs outside of the safety perimeter but within sight of the prop and the entire field of attack for the prop.

4.12.11.3 During the entire time the prop is in use, the remote shutoff shall be continuously attended by safety personnel who are trained in its operation and who have direct communications with the safety officer and instructors.

4.12.11.4 Liquefied petroleum gas props shall be equipped with all safety features as described in NFPA 58, *Liquefied Petroleum Gas Code*, and NFPA 59, *Utility LP-Gas Plant Code*.

4.12.11.5 Where the evolution involves the failure of a safety feature, the failed part shall be located downstream from the correctly functioning safety feature.

4.12.11.6 Where flammable or combustible liquids are used, measures shall be taken to prevent runoff from contaminating the surrounding area.

4.12.11.6.1 There shall be oil separators for cleaning the runoff water.

4.12.11.7* Vehicles used as props for live fire training shall have all fluid reservoirs, tanks, shock absorbers, drive shafts, and other gas-filled closed containers removed, vented, or drained prior to any ignition.

4.12.11.8 For flammable metal fires, there shall be a sufficient quantity of the proper extinguishing agent available so that all attack crews have the required supply as well as a 150 percent reserve for use by the backup crews.

4.12.11.9 All possible sources of ignition, other than those that are under the direct supervision of the ignition officer, shall be removed from the operations area.

4.13 Parking/Staging.

4.13.1 Areas for the staging, operating, and parking of fire apparatus that are used in the live fire training evolution shall be designated.

4.13.2 An area for parking fire apparatus and vehicles that are not a part of the evolution shall be designated so as not to interfere with fireground operations.

4.13.3 If any of the apparatus described in 4.13.2 is in service to respond to an emergency, it shall be located in an area that will facilitate a prompt response.

4.13.4 Where required or necessary, parking areas for police vehicles or for the press shall be designated.

4.13.5 Ingress and egress routes shall be designated, identified, and monitored during the training evolutions to ensure their availability in the event of an emergency.

4.14 Visitors and Spectators.

4.14.1 All spectators shall be restricted to an area outside the operations area perimeter established by the safety officer.

4.14.2 Control measures shall be posted to indicate the perimeter of the operations area.

4.14.3 Visitors who are allowed within the operations area perimeter shall be escorted at all times.

4.14.4 Visitors who are allowed within the operations area perimeter shall be equipped with and shall wear appropriate protective clothing.

4.14.5 Control measures shall be established to keep pedestrian traffic in the vicinity of the training site clear of the operations area of the live burn.

4.15 Preburn Plan/Briefing.

4.15.1 A preburn plan shall be prepared and shall be utilized during the preburn briefing sessions.

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4.15.1.1 All features of the training areas shall be indicated on the preburn plan.

4.15.2 Prior to conducting actual live fire training evolutions, a preburn briefing session shall be conducted by the instructor-in-charge with the safety officer for all participants.

4.15.3 All facets of each evolution to be conducted shall be discussed.

4.15.4 Assignments shall be made for all crews participating in the training session.

4.15.5 The location of the manikin shall not be required to be disclosed, provided that the possibility of victims is discussed in the preburn briefing.

4.15.6 Prior to conducting any live fire training, all participants shall have a knowledge of and familiarity with the prop or props being used for the evolution.

4.15.7 Prior to conducting any live fire training, all participants shall be required to conduct a walk-through of the acquired structure, burn building, or prop in order to have a knowledge of and familiarity with the layout of the acquired structure, building, or prop and to facilitate any necessary evacuation.

4.15.8 Property adjacent to the training site that could be affected by the smoke from the live fire training evolution, such as railroads, airports or heliports, and nursing homes, hospitals, or other similar facilities, shall be identified.

4.15.8.1 The persons in charge of the properties described in 4.15.8 shall be informed of the date and time of the evolution.

4.15.9 Streets or highways in the vicinity of the training site shall be surveyed for potential effects from live fire training evolutions.

4.15.9.1* Safeguards shall be taken to eliminate possible hazards to motorists.

Chapter 5 Acquired Structures

5.1 Structures and Facilities.

5.1.1* Any acquired structure that is considered for a structural fire training exercise shall be prepared for the live fire training evolution.

5.1.1.1 Buildings that cannot be made safe as required by this chapter shall not be utilized for interior live fire training evolutions.

5.1.2 Adjacent buildings or property that might become involved shall be protected or removed.

5.1.3* Preparation shall include application for and receipt of required permits and permissions.

5.1.4* Ownership of the acquired structure shall be determined prior to its acceptance by the AHJ.

5.1.5 Evidence of clear title shall be required for all structures acquired for live fire training evolutions.

5.1.6* Written permission shall be secured from the owner of the structure in order for the fire department to conduct live fire training evolutions within the acquired structure.

5.1.7 A clear description of the anticipated condition of the acquired structure at the completion of the evolution(s) and the method of returning the property to the owner shall be put in writing and shall be acknowledged by the owner of the structure.

5.1.8* Proof of insurance cancellation or a signed statement of nonexistence of insurance shall be provided by the owner of the structure prior to acceptance for use of the acquired structure by the AHJ.

5.1.9 The permits specified in this chapter shall be provided to outside, contract, or other separate training agencies by the AHJ upon the request of those agencies.

5.1.10 A search of the acquired structure shall be conducted to ensure that no unauthorized persons, animals, or objects are in the acquired structure immediately prior to ignition.

5.1.11 No person(s) shall play the role of a victim inside the acquired structure.

5.1.12 Only one fire at a time shall be permitted within an acquired structure.

5.2 Hazards.

5.2.1 In preparation for live fire training, an inspection of the structure shall be made to determine that the floors, walls, stairs, and other structural components are capable of withstanding the weight of contents, participants, and accumulated water.

5.2.2* All hazardous storage conditions shall be removed from the structure or neutralized in such a manner as to not present a safety problem during use of the structure for live fire training evolutions.

5.2.3 Closed containers and highly combustible materials shall be removed from the structure.

5.2.3.1 Oil tanks and similar closed vessels that cannot be removed shall be vented to prevent an explosion or overpressure rupture.

5.2.3.2 Any hazardous or combustible atmosphere within the tank or vessel shall be rendered inert.

5.2.4 All hazardous structural conditions shall be removed or repaired so as to not present a safety problem during use of the structure for live fire training evolutions.

5.2.4.1 Floor openings shall be covered to be made structurally sound.

5.2.4.2 Missing stair treads and rails shall be repaired or replaced.

5.2.4.3 Dangerous portions of any chimney shall be removed.

5.2.4.4 Holes in walls and ceilings shall be patched.

5.2.4.5* Roof ventilation openings that are normally closed but can be opened in the event of an emergency shall be permitted to be utilized.

5.2.4.6* Low-density combustible fiberboard and other highly combustible interior finishes shall be removed.

5.2.4.7* Extraordinary weight above the training area shall be removed.

5.2.5* All hazardous environmental conditions shall be removed before live fire training evolutions are conducted in the structure.

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5.2.5.1 All forms of asbestos deemed hazardous shall be removed by an approved manner and documentation provided to the AHJ.

5.2.6 Debris creating or contributing to unsafe conditions shall be removed.

5.2.7 Any toxic weeds, insect hives, or vermin that could present a potential hazard shall be removed.

5.2.8 Trees, brush, and surrounding vegetation that create a hazard to participants shall be removed.

5.2.9 Combustible materials, other than those intended for the live fire training evolution, shall be removed or stored in a protected area to preclude accidental ignition.

5.3 Utilities.

5.3.1 Utilities shall be disconnected.

5.3.2 Utility services adjacent to the live burn site shall be removed or protected.

5.4 Exits.

5.4.1 Exits from the acquired structure shall be identified and evaluated prior to each training burn.

5.4.2 Participants of the live fire training shall be made aware of exits from the acquired structure prior to each training burn.

5.4.3 Fires shall not be located in any designated exit paths.

5.5 Rapid Intervention Crew (RIC). A RIC trained in accordance with NFPA 1407, *Standard for Training Fire Service Rapid Intervention Crews*, shall be provided during a live fire training evolution.

Chapter 6 Gas-Fired Live Fire Training Structures

6.1 Structures and Facilities.

6.1.1 This section pertains to all interior spaces where gas-fired live fire training exercises occur.

6.1.2 Live fire training structures shall be left in a safe condition upon completion of live fire training evolutions.

6.1.3 Debris hindering the access or egress of fire fighters shall be removed prior to the beginning of the training exercises.

6.1.4 Flammable gas fires shall not be ignited manually.

6.2 Inspection and Testing.

6.2.1* Live fire training structures shall be inspected visually for damage prior to live fire training evolutions.

6.2.1.1* Damage shall be documented and the building owner or AHJ shall be notified.

6.2.2 Where the live fire training structure damage is severe enough to affect the safety of the participants, training shall not be permitted.

6.2.3 All doors, windows and window shutters, railings, roof scuttles and automatic ventilators, mechanical equipment, lighting, manual or automatic sprinklers, and standpipes necessary for the live fire training evolution shall be checked and operated prior to any live fire training evolution to ensure they operate correctly.

6.2.4 All safety devices, such as thermal sensors, combustible gas monitors, evacuation alarms, and emergency shutdown switches, shall be checked prior to any live fire training evolutions to ensure they operate correctly.

6.2.5 The instructors shall run the training system prior to exposing students to live flames in order to ensure the correct operation of devices such as the gas valves, flame safeguard units, agent sensors, combustion fans, and ventilation fans.

6.2.6* The structural integrity of the live fire training structure shall be evaluated and documented annually by the building owner or AHJ.

6.2.6.1 If visible structural defects are found, such as cracks, rust, spalls, or warps in structural floors, columns, beams, walls, or metal panels, the building owner shall have a follow-up evaluation conducted by a licensed professional engineer with live fire training structure experience and expertise, or by another competent professional as determined by the building owner or AHJ.

6.2.7* The structural integrity of the live fire training structure shall be evaluated and documented by a licensed professional engineer with live fire training structure experience and expertise, or by another competent professional as determined by the AHJ, at least once every 10 years, or more frequently if determined to be required by the evaluator.

6.2.8* All structures constructed with calcium aluminate refractory structural concrete shall be inspected by a structural engineer with expertise in live fire training structures every 3 years.

6.2.8.1 The structural inspection shall include removal of concrete core samples from the structure to check for delaminations within the concrete.

6.2.9* Part of the live fire training structure evaluation shall include, at least once every 10 years, the removal and reinstallation of a representative area of thermal linings (if any) to inspect the hidden conditions behind the linings.

Chapter 7 Non-Gas-Fired Live Fire Training Structures

7.1 Structures and Facilities.

7.1.1 This section pertains to all interior spaces where non-gas-fired live fire training exercises occur.

7.1.2 Live fire training structures shall be left in a safe condition upon completion of live fire training evolutions.

7.1.3 Debris hindering the access or egress of fire fighters shall be removed prior to the beginning of the training exercises.

7.2 Inspection and Testing.

7.2.1* Live fire training structures shall be inspected visually for damage prior to live fire training evolutions.

7.2.1.1* Damage shall be documented, and the building owner or AHJ shall be notified.

7.2.2 Where the live fire training structure damage is severe enough to affect the safety of the participants, training shall not be permitted.

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7.2.3 All doors, windows and window shutters, railings, roof scuttles and automatic ventilators, mechanical equipment, lighting, manual or automatic sprinklers, and standpipes necessary for the live fire training evolution shall be checked and operated prior to any live fire training evolution to ensure they operate correctly.

7.2.4 All safety devices, such as thermal sensors, oxygen and toxic and combustible gas monitors, evacuation alarms, and emergency shutdown switches, shall be checked prior to any live fire training evolutions to ensure they operate correctly.

7.2.5* The structural integrity of the live fire training structure shall be evaluated and documented annually by the building owner or AHJ.

7.2.5.1 If visible structural defects are found, such as cracks, rust, spalls, or warps in structural floors, columns, beams, walls, or metal panels, the building owner shall have a follow-up evaluation conducted by a licensed professional engineer with live fire training structure experience and expertise or by another competent professional as determined by the AHJ.

7.2.6* The structural integrity of the live fire training structure shall be evaluated and documented by a licensed professional engineer with live fire training structure experience and expertise or by another competent professional as determined by the AHJ at least once every 5 years or more frequently if determined to be required by the evaluator.

7.2.7* All structures constructed with calcium aluminate refractory structural concrete shall be inspected by a structural engineer with expertise in live fire training structures every 3 years.

7.2.7.1 The structural inspection shall include removal of concrete core samples from the structure to check for delaminations within the concrete.

7.2.8* Part of the live fire training structure evaluation shall include, once every five years, the removal and reinstallation of a representative area of thermal linings (if any) to allow inspections of the conditions hidden behind the linings.

7.3 Sequential Live Fire Burn Evolutions.

7.3.1 The AHJ shall develop and utilize a safe live fire training action plan when multiple sequential burn evolutions are to be conducted per day in each burn room.

7.3.2 A burn sequence matrix chart shall be developed for the burn rooms in a live fire training structure.

7.3.2.1 The burn sequence matrix chart shall include the maximum fuel loading per evolution and maximum number of sequential live fire evolutions that can be conducted per day in each burn room.

7.3.3* The burn sequence for each room shall define the maximum fuel load that can be used for the first burn and each successive burn.

7.3.4* The burn sequence matrix for each room shall also specify the maximum number of evolutions that can be safely conducted during a given training period before the room is allowed to cool.

7.3.5 The fuel loads per evolution and the maximum number of sequential evolutions in each burn room shall not be exceeded under any circumstances.

Chapter 8 Exterior Live Fire Training Props

8.1 Props, Structures, and Facilities.

8.1.1 This section pertains to all exterior props where live fire training exercises occur.

8.1.2 Props used for outside live fire training shall be designed specifically for the evolution to be performed.

8.1.3 Exterior props shall be left in a safe condition upon completion of live fire training evolutions.

8.1.4 For outside training, care shall be taken to select areas that limit the hazards to both personal safety and the environment.

8.1.5 The training site shall be without obstructions that can interfere with fire-fighting operations.

8.1.6 Where live training fires are used outside, the ground cover shall be such that it does not contribute to the fire.

8.1.7 Debris hindering the access of fire fighters shall be removed prior to the beginning of the training exercise.

8.2 Inspection and Maintenance.

8.2.1 Exterior props shall be inspected visually for damage prior to live fire training evolutions.

8.2.1.1 Damage to exterior props shall be documented and the owner or AHJ shall be notified.

8.2.2 All safety devices and emergency shutdown switches, plus doors, shutters, vents, and other operable devices, shall be checked prior to any live fire training evolutions to ensure they operate correctly.

8.2.3 The structural integrity of the props shall be evaluated and documented annually.

Chapter 9 Reports and Records

9.1 General.

9.1.1* The following records and reports shall be maintained on all live fire training evolutions in accordance with the requirements of this standard:

(1) An accounting of the activities conducted
(2) A listing of instructors present and their assignments
(3) A listing of all other participants
(4) Documentation of unusual conditions encountered
(5) Any injuries incurred and treatment rendered
(6) Any changes or deterioration of the structure
(7) Documentation of the condition of the premises and adjacent area at the conclusion of the training exercise

9.1.2* For acquired structures, records pertaining to the structure shall be completed.

9.1.3 Upon completion of the training session, an acquired structure shall be formally turned over to the control of the property owner.

9.1.3.1 The turnover process shall include the completion of a standard form indicating the transfer of authority for the acquired structure.

9.1.4 A post-training critique session, complete with documentation, shall be conducted to evaluate student performance and to reinforce the training that was covered.

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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.1.1 Live fire training of entry level and experienced fire suppression personnel are high-risk activities. This risk can be effectively managed through compliance with this standard.

A.1.2 Drills conducted to familiarize fire fighters with the proper use of self-contained breathing apparatus (SCBA) in a smoke environment should not be conducted under live fire conditions.

A.1.3.3 While this standard does not deal with the suppression of fires set to train individuals on fire cause and origin, this standard does contain procedures that can be adapted to ensure maximum safety during those types of operations. For fire scenarios set with flammable or combustible liquids, fire suppression should be achieved by fixed-fire suppression systems or by exterior application of hose streams. Interior fire suppression operations in scenarios that do not involve the use of flammable or combustible liquids should be conducted in compliance with the requirements of this standard.

A.3.2.1 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.3.3.24.2 Live Fire Training Structure. Live fire training structures include structures built of conventional building materials, such as concrete, masonry, and steel, as well as structures built of containers, in which live fire training evolutions are conducted. This includes fixed structures that are marketed as "mobile props," such as the following:

(1) Pre-engineered metal structures that can be disassembled and transported to a new site
(2) Containerized structures in which one or more containers are assembled, whether single story or multi-story, for purposes of interior live fire training evolutions

Live fire training structures also include fire behavior labs (also known as "flashover" containers) and mobile live fire training props.

Live fire training structures do not include structures that are used for training in the use of SCBA where only smoke conditions are created, without a live fire, and the participants are not subjected to risk of the effects of fire other than the smoke produced.

A.4.3.1 The following job performance requirements from NFPA 1001, *Standard for Fire Fighter Professional Qualifications,* should be used as guidance related to the list of subjects in 4.3.1:

(1) 5.2.3 Radio use
(2) 5.3.1 SCBA
(3) 5.3.4 Forcible entry
(4) 5.3.2 Vehicle safety
(5) 5.3.6 Ground ladders
(6) 5.3.7, 5.3.8 Fire extinguishment
(7) 5.3.9 Search and rescue
(8) 5.3.10 Structural fire fighting
(9) 5.3.11 Horizontal ventilation
(10) 5.3.12 Vertical ventilation
(11) 5.3.13 Overhaul
(12) 5.3.15 Water supply
(13) 5.3.16 Fire extinguishers
(14) 5.3.17 Scene illumination
(15) 5.5.3 Tool maintenance
(16) 5.5.4 Fire hose care and maintenance

Industrial fire brigade members should meet the requirements of NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications.*

A.4.3.2 The type of written documentation required can vary, depending upon the instructor's familiarity with the student participants' level of training from outside agencies. All student participants from outside agencies should be allowed to participate only as official representatives of an established organization. Prior documentation should be required in order to facilitate planning of the training session.

A.4.4.2 NFPA 1403 must be applied with the understanding that every training structure, whether an acquired structure or a training center burn building, is unique. The following are just some of the factors that would affect how NFPA 1403 is applied to a specific structure:

(1) Number of stories.
(2) Construction (concrete, concrete block, metal building).
(3) Type and quantity of structural protective lining system (SPLS).
(4) Type of temperature monitoring system (TMS), if any.
(5) Size of burn rooms.
(6) Number of burn rooms.
(7) Type, size, and number of windows/doors.
(8) Type, size, and number of passive ventilation openings/chop outs.
(9) Fuel utilized in live fire evolutions (straw, excelsior, pallets, propane gas, natural gas, or a combination).
(10) Type of interior finish materials on the ceiling, walls, and floors. If combustible, they need to be accounted for in the fuel load evaluation, or they need to be removed. Combustible materials on the ceiling, wall, or floor surfaces can lead to a rapid transition to flashover.
(11) Type and number of means of egress and means of escape
(12) Prevailing winds
(13) Altitude

A.4.4.8 The additional safety personnel can be necessary to watch for signs of fire in voids, concealed spaces, and exit paths, or combinations thereof, at acquired structures. Where fire is discovered in any of these areas, the operation should cease as a training exercise and should be treated as a working structure fire.

A.4.5 Severe weather could require the participants to respond to other incidents, or could expose trainees to danger if training takes place during severe weather. Wind velocity can contribute to spreading the fire within the training structure

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or throughout a neighborhood, or wind direction could cause smoke problems in the neighborhood. Severe weather presents the potential for health and safety hazards to all persons attending and participating in an exercise. Extreme heat can cause heat exhaustion or heat stroke, and extreme cold can cause frostbite, hypothermia, or slippery surfaces. An impending severe storm can bring lightning or high winds. Such situations warrant the careful consideration of limiting activity, waiting for a storm to pass, or postponing the exercise.

A.4.6.5.1 Assignment rotation, rest, and rehabilitation of instructors shall be provided. Instructors should be provided rest and rehabilitation as required in 4.6.5.1. Instructors should remove their personal protective clothing to reduce thermal saturation of the PPE.

A.4.7.1.2 The purpose and principal function is to observe the ignition officer while igniting or maintaining the fire. Members of the fire control team should rotate duties to prevent overheating and thermal saturation.

A.4.8.2 Guidance is provided in NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, and NFPA 1852, *Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA)*, to assist the instructor and department in determining if personal protective clothing and breathing apparatus are in serviceable condition.

A.4.8.5 Clothing worn under personal protective clothing can degrade and cause injury to the wearer, even without damaging the protective clothing. All wearers of personal protective clothing should be aware of the dangers of clothing made from certain all-synthetic materials that can melt and then adhere to and burn the wearer even if protective clothing that meets NFPA standards is worn. Any clothing, such as shirts, pants, underwear, and sweatshirts, worn under personal protective clothing should meet the requirements of NFPA 1975, *Standard on Station/Work Uniforms for Emergency Services*, whenever possible, or clothing should be selected, at a minimum, for the fabric's ability to resist ignition. Fire-retardant fabrics and all-natural fibers should be considered.

A.4.8.7 No person should be allowed to breathe smoke, toxic vapors or fumes, products of combustion, or other contaminated atmospheres or be exposed to an oxygen-deficient atmosphere.

A.4.9.2 Participants involved in the live fire training evolutions should be instructed to report to a predetermined location for a roll call if evacuation of the acquired structure is signaled. Instructors should immediately report any personnel not accounted for to the instructor-in-charge. Examples of an evacuation signal that could be used include a whistle, apparatus air horn, or high–low electronic siren.

A.4.11 A minimum flow rate of 95 gpm (360 L/min) is necessary in order to provide adequate quantities of water to cover the planned evolution, plus a reserve for unanticipated emergencies. The appropriate quantity and exact flow rates that are needed for fire control and extinguishment should be calculated in advance, and certain factors such as equipment, manpower, fire area, and topography should be taken into consideration. Knowledge of the hose line sizes, types of nozzles, type of fire stream to be utilized, and principles of fire attack and deployment aid in determining the exact flow rates that are necessary.

A.4.11.6 Reliability should be considered when determining what constitutes valid separate sources. The intent of this paragraph is to prevent the simultaneous loss of both attack lines and backup lines in the event of a pump or water supply failure. Where a public water supply system is used, two pumpers on two different hydrants should be used. Two pumpers drafting from the same pond or river also are appropriate, provided the source contains sufficient usable water. Where tankers or folding tanks, or both, are used, two separate pumpers should be used to supply the attack and backup lines.

A.4.11.6.1 See A.4.11.6.

A.4.12.1 Acceptable fuels include pine excelsior, wooden pallets, straw, hay, and other wood-based products.

A.4.12.6 An excessive fuel load can contribute to conditions that create unusually dangerous fire behavior. This can jeopardize structural stability, egress, and the safety of participants.

Excess fuel load can result in a ventilation-controlled fire, which can result in flameover (rollover) or flashover. These fire conditions increase the amount of thermal energy (the heat release rate of the fire) that is being transferred by conduction, convection, and radiation to any fire fighters in the compartment, which can lead to the degradation of protective equipment and injury or death. Venting a ventilation-controlled fire can result in an increase in heat release rate in the fire structure.

A.4.12.8 The instructor-in-charge is concerned with the safety of participants and the assessment of conditions that can lead to rapid, uncontrolled burning, commonly referred to as *flashover*. Flashover can trap, injure, and kill fire fighters. Conditions known to be variables affecting the attainment of flashover are as follows:

(1) The heat release characteristics of materials used as primary fuels
(2) The preheating of combustibles
(3) The combustibility of wall and ceiling materials
(4) The room geometry (e.g., ceiling height, openings to rooms)

In addition, the arrangement of the initial materials to be ignited, particularly the proximity to walls and ceilings, and the ventilation openings are important factors to be considered when assessing the potential fire growth.

A.4.12.9 Plotting the expected avenues of firespread and the time factors for expected buildup of the fire provides an extra degree of safety for the participants of the exercise. Voids can result in sudden and unexpected vertical spread of the fire and trap participants by cutting off exit routes, or can result in unexpected weakening of the structural members, leading to collapse. To compensate for this potential hazard, the instructor-in-charge should prescribe primary and secondary exit paths for participants in the exercises.

A.4.12.10 Incidents of injuries and deaths during live fire training exercises indicate that fire growth dynamics were not considered or were inaccurately assessed prior to the beginning of the exercises. Fire growth is typically linear until the flame height reaches the ceiling; thereafter, rapid acceleration can be expected. It might be necessary to remove combustible wall and ceiling materials, reduce the amount of furnishings, or take other similar measures to reduce rapid fire growth. Careful consideration should be given to the presence of combustible void spaces, and steps should be taken to ensure that the fire is not able to gain unexpected growth in such areas.

A.4.12.11 Propane and liquefied natural gas remain in the liquid state only when they are stored and distributed under pressure. When either of these gases is released, the difference in the storage and atmospheric pressures can cause the liquid to convert quickly to a gas. During this conversion, liquid propane, for example, can expand to 270 times

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its volume. With such a high expansion rate, a leaking liquid propane pipe has the potential to cause the space to reach an explosive level.

A.4.12.11.2 The safety person at the remote shutoff should have the authority to shut off the fuel supply to the prop when, in the safety person's judgment, the prop has malfunctioned, the fire has gone dangerously out of control, or the extinguishment team is in jeopardy.

A.4.12.11.7 The list of the items to be removed prior to a vehicle burn evolution should consist of, but should not be limited to, bumper compression cylinders, shock absorbers, fuel tanks, drive shafts, batteries, air bags and igniters, and brake shoes (asbestos). The oil pan, transmission, and differential drain plugs should be removed, and the fluids should be drained and disposed of properly.

A.4.15.9.1 Such safeguards can include street closings, traffic rerouting, signs, and police traffic control.

A.5.1.1 Where live fire training structures are available, they should be used instead of acquired structures.

A.5.1.3 The permits required for the exercise could include the following:

(1) Air quality
(2) Water runoff
(3) Water usage
(4) Burning
(5) Traffic

Other permits could be required and thorough research of required permits should be completed prior to acceptance of the building for use for training.

A.5.1.4 Information pertaining to building ownership should be reviewed by the legal counsel of the AHJ prior to acceptance of the structure.

A.5.1.6 Information regarding the written permission of the building owner should be reviewed by the legal counsel of the AHJ prior to acceptance of the structure.

A.5.1.8 Information regarding cancellation of insurance by the building owner should be reviewed by the legal counsel of the AHJ prior to acceptance of the structure.

A.5.2.2 Care should be exercised in the neutralization of hazards posed by closed tanks and vessels. The vessel or its contents can pose a hazard that should be eliminated. Appropriate references should be consulted or assistance should be obtained based on the specific circumstances encountered. The area within the tank should be filled with dry sand as a preferred means of rendering the internal atmosphere inert. Under no circumstances should water or other liquids be utilized as a means of inerting a tank or other closed vessel.

A.5.2.4.5 Roof ventilation openings can consist of precut panels or hinged covers.

A.5.2.4.6 Low-density combustible fiberboard has been implicated as a major factor in the following rapidly spreading fires that resulted in fatalities:

(1) Our Lady of the Angels School (Chicago, IL, 1958)
(2) Hartford Hospital (Hartford, CT, 1961)
(3) Opemiska Social Club (Chapais, Quebec, 1980)
(4) Boulder Fire Department training fire (Boulder, CO, 1982)

Unconventional interior finishes include burlap, carpeting, and artificial turf.

A.5.2.4.7 The collapse of overhead structural members can result from the combined effect of the weight of both live and dead overhead loads as well as the loss of structural integrity caused by fire. Linoleum is a potential fuel source, particularly after being preheated by repeated fire exposure, and thus can contribute to an unanticipated increase in fire intensity.

A.5.2.5 Figure A.5.2.5 provides a sample form for the inspection of acquired structure and to identify hazards.

A.6.2.1 There should be ongoing concern for the progressive damage to live fire training structures associated with fire intensity during live fire training evolutions. Excessive fire intensity can result in accelerated destruction of the live fire training structure and can increase the risk to personnel to an unacceptable level.

Examples of common damage to check for include the following:

(1) Visible structural defects such as cracks, spalls, or warps in structural floors, columns, beams, and walls.
(2) Thermal linings. Thermal linings are intended to protect the structural components. Exposure to live fire training can cause the thermal linings to wear out over time. Portions of it can loosen and fall out, anchoring devices can loosen, and reinforcing and supporting pieces can corrode, creating a safety concern for occupants. In addition, cracks, holes, openings, gaps, or penetrations in the thermal lining can lead to damage to the structure behind the lining.
(3) Doors. Doors in live fire training structures at times do not operate properly, sticking shut during training and creating safety problems relating to emergency egress.
(4) Hinges. A rusted hinge at a second-floor window shutter could cause the shutter to fall to the ground below.
(5) Loose, rusted, or damaged handrails and guardrails.
(6) Loose or missing stair nosings, or damage to stair treads.

A.6.2.1.1 Figure A.6.2.1.1 is an example of a live fire training facility inspection form.

A.6.2.6 Personnel making the annual structural integrity evaluation should understand the structural system that is being evaluated and where damage is most likely to occur, given the unique design of that live fire training structure. For example, live fire training structures constructed of hollow core plank roofs and floors supported on masonry bearing walls tend to exhibit several problems, such as the following, listed below, which would be helpful to know when conducting the evaluation:

(1) Cracks occur in the topping slabs directly over the joints between the planks, causing leaks into the structure and onto thermal linings below.
(2) Cracks occur in the ends of the planks and at the two courses of masonry block below the plank bearing points.
(3) Vertical cracks occur in masonry bearing walls at building corners.
(4) Cracks in the bottoms of the planks occur below the hollow cells and at the bottom corners of the planks.
(5) Topping slabs separate from the tops of the planks, reducing the structural capacity of the structural system.
(6) Cracks in the topping slabs near guardrail anchor points could cause guardrails to loosen.

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SITE INSPECTION WORKSHEET — RESIDENTIAL PROPERTIES

Instructors' Names: _____ Date: _____

_____ Construction Date: _____

Site Address: _____ Parcel # / PIN: _____

Comments: _____

_____

_____

Category	Items	Description/Location/Notes	Quantity
Universal Wastes	Fluorescent/HID Fixtures		
	Batteries		
	Mercury Devices		
Building Materials	Exterior Siding		
	Roofing		
	Paint Condition		
	Mold Condition		
	Septic System		
	Wells		
	Treated Wood		
Refrigerants	Air Conditioner		
	Refrigerator/Ice Box		
	Other		
Household Wastes	Waste Oil		
	Fuel		
	Paints/Solvents		
	Household Cleaners		
	Yard Care Products		
	Other		
Building Structures	Basement/Crawl Space		
	Garage		
	Shed		
	Other		

Other Potential Issues:

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FIGURE A.5.2.5 Example of a Site Inspection Worksheet.

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LIVE STRUCTURAL FIRE TRAINING FACILITY INSPECTION

Region: _____

Facility: _____

Date: _____

Inspected by: _____

Legend: ✓ = OK N = Noteworthy D = Requires Attention

GENERAL

1) ____ Floors, walls, stairs, and other structural components appear capable of withstanding the weight of the contents, participants, and accumulated water.

EXTERIOR

2) ____ Perimeter lighting
3) ____ General appearance
4) ____ Exterior of structure
5) ____ Windows
6) ____ Doors
7) ____ Railings
8) ____ Stairs

INTERIOR

9) ____ Housekeeping (swept clean, no fuel storage on fire floor)
10) ____ Windows/shutters
11) ____ Functional doors
12) ____ Lined ceilings/walls (crazing, cracking, delamination, metal mesh visible)
13) ____ High temperature linings (loose/damaged tile, exposed bolts)
14) ____ Burn racks
15) ____ Fuel inventory/storage

OTHER

16) ____ _____
17) ____ _____

Documentation of Issues:

Item #	Description

Note: If damage is present in approved burn rooms, utilize the form on the reverse side to specify the details of the damage.

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FIGURE A.6.2.1.1 Example of a Live Structural Fire Training Facility Inspection Form.

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LIVE STRUCTURAL FIRE TRAINING FACILITY INSPECTION *(continued)*

Describe in detail of any damage below and attach photos.

Floor: _____ Room: _____

Wall or ceiling: _____ Area involved (ft or in.): _____

Damage description: _____

_____

_____

Distance in Feet of the Entire Burn Room	Distance in Feet of the Entire Burn Room																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				

Indicate the entire size of the burn room and the exact area that is damaged.

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FIGURE A.6.2.1.1 *Continued*

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Ideally, the architect/engineer that designed the live fire training structure would have provided a description of what to look for during the periodic evaluations. If no such description was obtained when the live fire training structure was first built, then the AHJ should retain a licensed professional engineer with live fire training structure experience and expertise or other competent professional as determined by the building owner or AHJ to help create such a description.

A.6.2.7 Routine maintenance is important to providing a safe, durable live fire training structure for live fire training. Periodic engineering evaluations are one step in that process. Live fire training structures present unique engineering problems that are not taught to engineers in college or in their daily practice of engineering office buildings, schools, and fire stations. Before a registered (licensed) Professional Engineer (P.E.) understands live fire training structure engineering, it takes significant efforts on the part of the P.E. to learn how live fire training structures are used, how repetitive live fire training affects structural and nonstructural elements within the live fire training structure, and what materials have been proven to work (or not work) within such a harsh environment. This effort typically requires research and educational efforts and experience with live fire training structure projects.

Because the required evaluation is for structural integrity, the P.E. performing the evaluation should be a structural engineer or teamed with a structural engineer to perform the evaluation. Many states do not license P.E.s by discipline; "P.E." could refer to a structural engineer or to some other engineering discipline, such as electrical, mechanical, fire protection, or aeronautical. State laws require P.E.s to offer engineering services for only those branches of engineering for which they are qualified. Therefore, a P.E. who is an electrical engineer or fire protection engineer with no structural qualifications would not be allowed, under law, to evaluate the structural integrity of a live fire training structure.

Note that a P.E. with refractive materials experience and expertise, but not live fire training structure experience and expertise, might not have sufficient understanding of how refractory concrete performs in a live fire training structure environment. Many P.E.s with refractive materials experience have gained that experience working with industrial applications in which furnaces are heated and cooled slowly. Certain applications of refractory concrete work well under those furnace conditions. However, the same applications of refractory concrete at times work poorly in the live fire training structure environment, where rapid heating, rapid cooling, and thermal shock deteriorate refractory concrete differently than a furnace application would. Many P.E.s with only refractive materials experience, but no live fire training structure experience, do not know this. As a result, the requirement for live fire training structure experience and expertise has been added to the standard. In many cases, the P.E. retained to evaluate the integrity can also, under the same contract, be required to make recommendations for how to repair, maintain, or improve the live fire training structure.

The phrase "with live fire training structure experience and expertise" must be interpreted by each entity following its own local and state laws and guidelines. The intent is for the P.E. to have performed at least one live fire training structure project previously, so that the entity hiring the P.E. will benefit from the educational and research efforts performed, and experience gained, by the P.E. for the previous live fire training structure project(s). This experience could include a previous live fire training structure evaluation, the repair or renovation to an existing live fire training structure, or the design of a new live fire training structure. In many cases, it would be acceptable for a P.E. without live fire training structure experience or expertise to perform the evaluation as long as he or she has teamed with a P.E. with live fire training structure experience or expertise.

A.6.2.8 Refractory concrete should not be used as a structural element. Structural calcium aluminate refractory concrete has been found to delaminate (crack and lose bond) along the lines of reinforcing within walls and suspended slabs, presenting serious structural deficiencies that threaten the life and safety of training personnel.

A.6.2.9 Heat can soak through thermal linings and reach the protected structure, especially if the linings are cracked or otherwise require maintenance when live fire training occurs. This heat could damage the structure, a hidden condition that would otherwise go undetected if the panels are not occasionally removed to expose the hidden conditions.

A.7.2.1 See A.6.2.1.

A.7.2.1.1 See A.6.2.1.1.

A.7.2.5 See A.6.2.6.

A.7.2.6 See A.6.2.7.

A.7.2.7 See A.6.2.8.

A.7.2.8 See A.6.2.9.

A.7.3.3 Reducing fuel loads for successive evolutions to maintain a safe environment should be considered.

A.7.3.4 The following facts will affect conditions encountered in a burn room during a live fire evolution:

(1) Larger burn rooms and rooms with higher ceilings will have more cubic feet of air than smaller burn rooms.
(2) Generally, with a given quantity of fuel, the lower the cubic footage in a room, the higher the temperatures and more rigorous the environment will be.
(3) As the number of openings in a burn room increase, the available ventilation area increases, resulting in typically lower temperatures and less severe environments.
(4) The construction of the burn room will affect how much energy the room will retain with each successive evolution. All burn rooms will retain a level of heat with each burn. The temperature and radiant heat in the burn room will increase with each additional evolution. At some point, every room will become too hot to safely conduct further training. Outside environmental conditions might also affect this.

A.9.1.1 See NFPA 1401, *Recommended Practice for Fire Service Training Reports and Records*, for additional guidance on training records.

A.9.1.2 Figure A.9.1.2(a) shows a standard notice of cancellation or nonrenewal of insurance. Figure A.9.1.2(b) shows a sample release form that can be used with acquired structures. The exact form should be approved by local officials.

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NOTICE OF CANCELLATION OR NONRENEWAL

of _____
KIND OF POLICY

POLICY NO.	ISSUED THROUGH AGENCY OR OFFICE AT:	CANCELLATION OR TERMINATION WILL TAKE EFFECT AT: (DATE) (HOUR–STANDARD TIME)	DATE OF NOTICE

INSURANCE COMPANY:

NAME AND ADDRESS OF INSURED:

(Applicable item is marked ☒)

CANCELLATION

☐ You are hereby notified in accordance with the terms and conditions of the above-mentioned policy that your insurance will cease at and from the hour and date mentioned above.
If the premium has been paid, premium adjustment will be made as soon as practicable after cancellation becomes effective.
If the premium has not been paid, a bill for the premium earned to the time of cancellation will be forwarded in due course.

☐ You are hereby notified in accordance with the terms and conditions of the above-mentioned policy that your insurance will cease at and from the hour and date mentioned above due to nonpayment of premium.
A bill for the premium earned to the time of cancellation will be forwarded in due course.

NONRENEWAL

☐ You are hereby notified in accordance with the terms and conditions of the above-mentioned policy that the above-mentioned policy will expire effective at and from the hour and date mentioned above and the policy will NOT be renewed.

IMPORTANT NOTICE

☐ In compliance with the Fair Credit Reporting Act (Public Law 91-508), you are hereby informed that the action taken above is being taken wholly or partly because of information contained in a consumer report from the following consumer reporting agency:

_____
NAME

_____
ADDRESS

GU 8811b (Ed. 3-73) Uniform Printing & Supply Div. **INSURED'S COPY** Authorized Representative

FIGURE A.9.1.2(a) Standard Notice of Cancellation or Nonrenewal of Insurance Form.

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Release Form

_____ Fire Department

Address _____

City _____ State _____

Date _____

Having agreed with the Building Official, City of

_____,

that a structure owned by me and located at _____

_____ is unfit for human habitation

and is beyond rehabilitation, I further agree that the structure should be demolished. In order that demolition may be accomplished, I give my consent to the

City of _____

to demolish, by burning or other means, the said structure.

I further release the City of _____

_____ from any claim for loss resulting from

such demolition.

_____
Owner/Agent

_____
Owner/Agent

_____
Witness

FIGURE A.9.1.2(b) Sample Release Form.

Annex B Live Fire Evolution Sample Checklist

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Sample Checklist. Figure B.1 provides a checklist for a live fire evolution.

Annex C Responsibilities of Personnel

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 Responsibilities. The lists in Figure C.1 outline the responsibilities of participants in a live fire training evolution.

Annex D Heat Exhaustion and Heat Stroke in Training

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1 Heat-Related Illnesses. The two most serious heat-related illnesses are heat exhaustion and heat stroke. The following material is excerpted from the NIOSH document *Occupational Exposure to Hot Environments, Revised Criteria.*

Symptoms of heat exhaustion include fatigue, nausea, headache, dizziness, pallor, weakness, and thirst. Factors that predispose a person to heat exhaustion include sustained exertion in the heat, failure to replace the water lost in sweat, and lack of acclimatization. Heat exhaustion responds readily to prompt treatments such as moving to a cooler environment, resting in a recumbent position, and taking fluids by mouth.

Heat stroke is the more serious of the heat-related illnesses and is considered a medical emergency. Symptoms of heat stroke include hot, red, dry skin, a rectal temperature of 104°F (40°C) or above, confusion, possible convulsions or loss of consciousness, or any combination of these symptoms. Factors that predispose a person to heat stroke include sustained exertion in the heat by unacclimatized workers, lack of physical fitness, obesity, recent alcohol intake, dehydration, individual susceptibility, and chronic cardiovascular disease. Heat stroke should be treated immediately. Treatments to reduce body temperature rapidly include immersing in chilled water, rinsing with alcohol, wrapping in a wet sheet, or fanning with cool, dry air, or any combination of these treatments. A physician's care is necessary to treat possible secondary disorders such as shock or kidney failure. While heat exhaustion cases greatly outnumber heat stroke cases, every case of heat exhaustion should be treated as having the potential to develop into heat stroke.

Acclimatization is a physiological adaptation to heat stress that occurs over a short period of time. After acclimatization has occurred, the body sweats more while losing less salt and can maintain a lower core temperature and lower cardiovascular demands. A person becomes acclimatized to a certain work intensity and temperature with repeated exposures to that work load and temperature. Formal acclimatization procedures might not be necessary for all fire fighters; however, training drills should be held outdoors regularly so that seasonal acclimatization can occur. For additional protection against heat stress, fire fighters might want to perform their regular aerobic training activities outdoors, especially during the spring and summer.

The metabolic demands of fire fighting range from 60 percent to 100 percent of maximum aerobic capacity. Tasks such as stair climbing, roof venting, and rescue operations, when performed in full gear, have an energy cost of 85 percent to 100 percent of maximum capacity and lead to near maximum heart rates.

It is clear from these estimates that a high level of cardiovascular fitness is an advantage in performing fire-fighting tasks. The higher level of fitness allows a longer work period and provides a greater reserve in case of an unexpected increase in work demands or in extreme environmental conditions.

There are fire incidents during which even the fittest, most acclimatized fire fighter is exposed to significant heat stress. For this reason, many fire departments have adopted formal

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LIVE FIRE EVOLUTION SAMPLE CHECKLIST

PERMITS, DOCUMENTS, NOTIFICATIONS, INSURANCE.

____ 1. Written documentation received from owner:
- ❑ Permission to burn structure
- ❑ Proof of clear title
- ❑ Certificate of insurance cancellation
- ❑ Acknowledgment of post-burn property condition

____ 2. Local burn permit received

____ 3. Permission obtained to utilize fire hydrants

____ 4. Notification made to appropriate dispatch office of date, time, and location of burn

____ 5. Notification made to all affected police agencies:
- ❑ Received authority to block off roads
- ❑ Received assistance in traffic control

____ 6. Notification made to owners and users of adjacent property of date, time, and location of burn

____ 7. Liability insurance obtained covering damage to other property

____ 8. Written evidence of prerequisite training obtained from participating students from outside agencies

PREBURN PLANNING.

____ 1. Preburn plans made, showing the following:
- ❑ Site plan drawing, including all exposures
- ❑ Floor plan detailing all rooms, hallways, and exterior openings
- ❑ Location of command post
- ❑ Position of all apparatus
- ❑ Position of all hoses, including backup lines
- ❑ Location of emergency escape routes
- ❑ Location of emergency evacuation assembly area
- ❑ Location of ingress and egress routes for emergency vehicles

____ 2. Available water supply determined

____ 3. Required fire flow determined for the acquired structure/live fire training structure/burn prop and exposure buildings

____ 4. Required reserve flow determined (50 percent of fire flow)

____ 5. Apparatus pumps obtained that meet or exceed the required fire flow for the building and exposures

____ 6. Separate water sources established for attack and backup hose lines

____ 7. Periodic weather reports obtained

____ 8. Parking areas designated and marked:
- ❑ Apparatus staging
- ❑ Ambulances
- ❑ Police vehicles
- ❑ Press vehicles
- ❑ Private vehicles

____ 9. Operations area established and perimeter marked

____ 10. Communications frequencies established, equipment obtained

TRAINING STRUCTURE PREPARATION.

____ 1. Training structure inspected to determine structural integrity

____ 2. All utilities disconnected (acquired structures only)

____ 3. Highly combustible interior wall and ceiling coverings removed

____ 4. All holes in walls and ceilings patched

____ 5. Materials of exceptional weight removed from above training area (or area sealed from activity)

____ 6. Ventilation openings of adequate size precut for each separate roof area

____ 7. Windows checked and operated, openings closed

____ 8. Doors checked and operated, opened or closed, as needed

____ 9. Training structure components checked and operated:
- ❑ Roof scuttles
- ❑ Automatic ventilators
- ❑ Mechanical equipment
- ❑ Lighting equipment
- ❑ Manual or automatic sprinklers
- ❑ Standpipes

____ 10. Stairways made safe with railings in place

____ 11. Chimney checked for stability

____ 12. Fuel tanks and closed vessels removed or adequately vented

____ 13. Unnecessary inside and outside debris removed

____ 14. Porches and outside steps made safe

____ 15. Cisterns, wells, cesspools, and other ground openings fenced or filled

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FIGURE B.1 Sample Checklist for Procedures for a Live Fire Evolution.

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LIVE FIRE EVOLUTION SAMPLE CHECKLIST *(continued)*

____ 16. Hazards from toxic weeds, hives, and vermin eliminated

____ 17. Hazardous trees, brush, and surrounding vegetation removed

____ 18. Exposures such as buildings, trees, and utilities removed or protected

____ 19. All extraordinary exterior and interior hazards remedied

____ 20. Fire "sets" prepared:
- ❑ Class A materials only
- ❑ No flammable or combustible liquids
- ❑ No contaminated materials

PREBURN PROCEDURES.

____ 1. All participants briefed:
- ❑ Training structure layout
- ❑ Crew and instructor assignments
- ❑ Safety rules
- ❑ Training structure evacuation procedure
- ❑ Evacuation signal (demonstrate)

____ 2. All hose lines checked:
- ❑ Sufficient size for the area of fire involvement
- ❑ Charged and test flowed
- ❑ Supervised by qualified instructors
- ❑ Adequate number of personnel

____ 3. Necessary tools and equipment positioned

____ 4. Participants checked:
- ❑ Approved full protective clothing
- ❑ Self-contained breathing apparatus (SCBA)
- ❑ Adequate SCBA air volume
- ❑ All equipment properly donned

POSTBURN PROCEDURES.

____ 1. All personnel accounted for

____ 2. Remaining fires overhauled, as needed

____ 3. Training structure inspected for stability and hazards where more training is to follow *(see Training Structure Preparation)*

____ 4. Training critique conducted

____ 5. Records and reports prepared, as required:
- ❑ Account of activities conducted
- ❑ List of instructors and assignments
- ❑ List of other participants
- ❑ Documentation of unusual conditions or events
- ❑ Documentation of injuries incurred and treatment rendered
- ❑ Documentation of changes or deterioration of live fire training structure
- ❑ Acquired structure release
- ❑ Student training records
- ❑ Certificates of completion

____ 6. Building and property released to owner, release document signed

---

RELEASE FORM

Having agreed with the Building Official, City of _____, that a structure owned by me and located at _____ is unfit for human habitation and is beyond rehabilitation, I further agree that the structure should be demolished. In order that demolition may be accomplished, I give my consent to the City of _____ to demolish, by burning or other means, the said structure.

I further release the City of _____ from any claim for loss resulting from such demolition.

Fire Department _____

Address _____

City, State _____

Date _____

Owner/Agent _____

Owner/Agent _____

Witness _____

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FIGURE B.1 *Continued*

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RESPONSIBILITIES OF PERSONNEL

INSTRUCTOR-IN-CHARGE

____ 1. Plan and coordinate all training activities

____ 2. Monitor activities to ensure safe practices

____ 3. Inspect training structure integrity prior to each fire

____ 4. Assign instructors:
- ❑ Attack hose lines
- ❑ Backup hose lines
- ❑ Functional assignments
- ❑ Teaching assignments

____ 5. Brief instructors on responsibilities:
- ❑ Accounting for assigned students
- ❑ Assessing student performance
- ❑ Clothing and equipment inspection
- ❑ Monitoring safety
- ❑ Achieving tactical and training objectives

____ 6. Assign coordinating personnel, as needed:
- ❑ Emergency Medical Services
- ❑ Communications
- ❑ Water supply
- ❑ Apparatus staging
- ❑ Equipment staging
- ❑ Breathing apparatus
- ❑ Personnel welfare
- ❑ Public relations

____ 7. Ensure adherence to this standard by all persons within the training area

INSTRUCTOR

____ 1. Monitor and supervise assigned students (no more than five per instructor)

____ 2. Inspect students' protective clothing and equipment

____ 3. Account for assigned students, both before and after evolutions

SAFETY OFFICER

____ 1. Prevent unsafe acts

____ 2. Eliminate unsafe conditions

____ 3. Intervene and terminate unsafe acts

____ 4. Supervise additional safety personnel, as needed

____ 5. Coordinate lighting of fires with instructor-in-charge

____ 6. Ensure compliance of participants' personal equipment with applicable standards:
- ❑ Protective clothing
- ❑ Self-contained breathing apparatus (SCBA)
- ❑ Personal alarm devices, where used

____ 7. Ensure that all participants are accounted for, both before and after each evolution

STUDENT

____ 1. Acquire prerequisite training

____ 2. Become familiar with building layout

____ 3. Wear approved full protective clothing

____ 4. Wear approved SCBA

____ 5. Obey all instructions and safety rules

____ 6. Provide documentation of prerequisite training, where from an outside agency

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FIGURE C.1 Checklist for Responsibilities of Personnel.

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procedures for on-scene rehabilitation and have incorporated them into their manuals for standard operating procedures. The general goals of rehabilitation are as follows:

(1) To provide physical and mental rest, allowing the fire fighter to recuperate from demands of emergency operations and adverse environmental conditions
(2) To revitalize fire fighters by providing fluid replacement and food as needed
(3) To provide medical monitoring, including treatment of injuries, to determine if and when fire fighters are able to return to action

Annex E Informational References

E.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

E.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2008 edition.

NFPA 1081, *Standard for Industrial Fire Brigade Member Professional Qualifications*, 2012 edition.

NFPA 1401, *Recommended Practice for Fire Service Training Reports and Records*, 2012 edition.

NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, 2008 edition.

NFPA 1852, *Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA)*, 2008 edition.

NFPA 1975, *Standard on Station/Work Uniforms for Emergency Services*, 2009 edition.

E.1.2 Other Publications.

E.1.2.1 NIOSH Publications. National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, 1600 Clifton Road, Atlanta, GA 30333.

Occupational Exposure to Hot Environments, Revised Criteria.

E.2 Informational References. (Reserved)

E.3 References for Extracts in Informational Sections. (Reserved)

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Index

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-A-

Acquired Prop
Definition 3.3.1
Acquired Structures ..... Chap. 5
Exits 5.4
Hazards 5.2
Rapid Intervention Crew (RIC) 5.5
Structures and Facilities 5.1
Utilities 5.3
Administration ..... Chap. 1
Application 1.3
Purpose 1.2, A.1.2
Scope 1.1, A.1.1
Authority Having Jurisdiction (AHJ)
Definition 3.2.1, A.3.2.1

-B-

Backdraft
Definition 3.3.2

-C-

Combustible
Definition 3.3.3
Conduction
Definition 3.3.4
Convection
Definition 3.3.5

-D-

Definitions ..... Chap. 3
Deflagration
Definition 3.3.6
Demonstration
Definition 3.3.7

-E-

Emergency Medical Services
Definition 3.3.8
Evolution
Definition 3.3.9
Explanatory Material ..... Annex A
Exterior Live Fire Training Props ..... Chap. 8
Inspection and Maintenance 8.2
Props, Structures, and Facilities 8.1

-F-

Flameover (Rollover.)
Definition 3.3.10
Flashover
Definition 3.3.11
Fuel Load
Definition 3.3.12

-G-

Gas-Fired Live Fire Training Structures ..... Chap. 6
Inspection and Testing 6.2
Structures and Facilities 6.1
General ..... Chap. 4
Application 4.1
Communication 4.9
Emergency Medical Services (EMS) 4.10
Extreme Weather 4.5, A.4.5
Fire Control Team 4.7
Fuel Materials 4.12
Instructor in Charge and Instructors 4.6
Training Instructors on How to Use Specialty Props 4.6.12
Parking/Staging 4.13
Permits 4.2
Personal Protective Clothing 4.8
Preburn Plan/Briefing 4.15
Safety Officer 4.4
Student Prerequisites 4.3
Visitors and Spectators 4.14
Water Supply 4.11, A.4.11

-H-

Heat Exhaustion and Heat Stroke in Training ..... Annex D

-I-

Informational References ..... Annex E
Instructor
Definition 3.3.13
Instructor-in-Charge
Definition 3.3.14

-L-

Live Fire
Definition 3.3.15
Live Fire Evolution Sample Checklist ..... Annex B

-N-

Non-Gas-Fired Live Fire Training Structures ..... Chap. 7
Inspection and Testing 7.2
Sequential Live Fire Burn Evolutions 7.3
Structures and Facilities 7.1

-P-

Participant
Definition 3.3.16
Personal Accountability Report (PAR)
Definition 3.3.17
Personal Protective Clothing
Definition 3.3.18
Personal Protective Equipment
Definition 3.3.19
Pyrolysate
Definition 3.3.20

-R-

Radiation
Definition 3.3.21
Referenced Publications ..... Chap. 2
General 2.1
NFPA Publications 2.2
Other Publications 2.3
References for Extracts in Mandatory Sections 2.4
Reports and Records ..... Chap. 9
General 9.1
Responsibilities of Personnel ..... Annex C

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-S-

Safety Officer
Definition 3.3.22
Shall
Definition 3.2.2
Should
Definition 3.2.3
Standard
Definition 3.2.4
Student
Definition 3.3.23

-T-

Training Structure
Acquired Structure
Definition 3.3.24.1
Definition 3.3.24
Live Fire Training Structure
Definition 3.3.24.2, A.3.3.24.2

-V-

Ventilation-Controlled Fire
Definition 3.3.25

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Tentative Interim Amendment

NFPA® 1403

Standard on Live Fire Training Evolutions

2012 Edition

Reference: 4.16
TIA 12-1
(SC 13-10-9/TIA Log #1107)

Pursuant to Section 5 of the NFPA *Regulations Governing the Development of NFPA Standards*, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 1403, *Standard on Live Fire Training Evolutions,* 2012 edition. The TIA was processed by the Technical Committee on Fire Service Training, and was issued by the Standards Council on October 22, 2013, with an effective date of November 11, 2013.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a public input of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. Add a new Section 4.16 to read as follows:

4.16 Victim(s).

4.16.1 No person(s) shall play the role of a victim inside any live fire training structure or acquired structure.

4.16.2 Victims (rescue mannequins) shall not be dressed in fire fighting personal protective clothing.

Issue Date: October 22, 2013

Effective Date: November 11, 2013

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Sequence of Events Leading to Issuance of an NFPA Committee Document

Step 1: Call for Proposals

- Proposed new Document or new edition of an existing Document is entered into one of two yearly revision cycles, and a Call for Proposals is published.

Step 2: Report on Proposals (ROP)

- Committee meets to act on Proposals, to develop its own Proposals, and to prepare its Report.
- Committee votes by written ballot on Proposals. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Proposals (ROP) is published for public review and comment.

Step 3: Report on Comments (ROC)

- Committee meets to act on Public Comments to develop its own Comments, and to prepare its report.
- Committee votes by written ballot on Comments. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Comments (ROC) is published for public review.

Step 4: Technical Report Session

- "*Notices of intent to make a motion*" are filed, are reviewed, and valid motions are certified for presentation at the Technical Report Session. ("Consent Documents" that have no certified motions bypass the Technical Report Session and proceed to the Standards Council for issuance.)
- NFPA membership meets each June at the Annual Meeting Technical Report Session and acts on Technical Committee Reports (ROP and ROC) for Documents with "certified amending motions."
- Committee(s) vote on any amendments to Report approved at NFPA Annual Membership Meeting.

Step 5: Standards Council Issuance

- Notification of intent to file an appeal to the Standards Council on Association action must be filed within 20 days of the NFPA Annual Membership Meeting.
- Standards Council decides, based on all evidence, whether or not to issue Document or to take other action, including hearing any appeals.

Committee Membership Classifications

The following classifications apply to Technical Committee members and represent their principal interest in the activity of the committee.

M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.

U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.

I/M *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.

L *Labor:* A labor representative or employee concerned with safety in the workplace.

R/T *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.

E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.

I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.

C *Consumer:* A person who is, or represents, the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in the *User* classification.

SE *Special Expert:* A person not representing any of the previous classifications, but who has a special expertise in the scope of the standard or portion thereof.

NOTES:
1. "Standard" connotes code, standard, recommended practice, or guide.
2. A representative includes an employee.
3. While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of members or unique interests need representation in order to foster the best possible committee deliberations on any project. In this connection, the Standards Council may make appointments as it deems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.
4. Representatives of subsidiaries of any group are generally considered to have the same classification as the parent organization.

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NFPA Document Proposal Form

NOTE: All Proposals must be received by 5:00 pm EST/EDST on the published Proposal Closing Date.

For further information on the standards-making process, please contact the Codes and Standards Administration at 617-984-7249 or visit www.nfpa.org/codes.

For technical assistance, please call NFPA at 1-800-344-3555.

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Date Rec'd:

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(Note: If choosing the download option, you must view the ROP/ROC from our website; no copy will be sent to you.)

Date April 1, 200X Name John J. Doe Tel. No. 716-555-1234

Company Air Canada Pilot's Association Email

Street Address 123 Summer Street Lane City Lewiston State NY Zip 14092

****If you wish to receive a hard copy, a street address MUST be provided. Deliveries cannot be made to PO boxes.*

Please indicate organization represented (if any)

1. (a) NFPA Document Title National Fuel Gas Code NFPA No. & Year 54, 200X Edition

(b) Section/Paragraph 3.3

2. Proposal Recommends (check one): ☐ new text ☒ revised text ☐ deleted text

3. Proposal (include proposed new or revised wording, or identification of wording to be deleted): [Note: Proposed text should be in legislative format; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).]

Revise definition of effective ground-fault current path to read:

3.3.78 Effective Ground-Fault Current Path. An intentionally constructed, permanent, low impedance electrically conductive path designed and intended to carry ~~underground~~ electric fault current ~~conditions~~ from the point of a ground fault on a wiring system to the electrical supply source.

4. Statement of Problem and Substantiation for Proposal: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Proposal, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

Change uses proper electrical terms.

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(b) ☒ Some or all of the text or other material proposed in this Proposal was not authored by me. Its source is as follows: (please identify which material and provide complete information on its source)

ABC Co.

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Signature (Required) John J. Doe

PLEASE USE SEPARATE FORM FOR EACH PROPOSAL

Mail to: Secretary, Standards Council · National Fire Protection Association
1 Batterymarch Park · Quincy, MA 02169-7471 OR
Fax to: (617) 770-3500 OR Email to: proposals_comments@nfpa.org

APPENDIX I
NFPA 1500
Standard on Fire Department Occupational Safety and Health Program

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NFPA® 1500

Standard on Fire Department Occupational Safety and Health Program

2013 Edition

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8/12

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NFPA® 1500

Standard on

Fire Department Occupational Safety and Health Program

2013 Edition

This edition of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, was prepared by the Technical Committee on Fire Service Occupational Safety and Health, and acted on by NFPA at its June Association Technical Meeting held June 11–14, 2012, in Las Vegas, NV. It was issued by the Standards Council on August 9, 2012, with an effective date of August 29, 2012, and supersedes all previous editions.

This edition of NFPA 1500 was approved as an American National Standard on August 29, 2012.

Origin and Development of NFPA 1500

This is the fifth edition of NFPA 1500. The first edition was published in 1987 as there was no consensus standard for an occupational safety and health program for the fire service. Fire service organizations were being increasingly subject to regulations that were developed for general industry and that did not provide for many of the specific needs and concerns of an organization involved in the delivery of emergency services. The direct line-of-duty deaths were being documented and reported, but there was also a growing concern with the number of fire fighters who were suffering disabling injuries or developing occupational diseases that often had debilitating or fatal consequences. Following the first edition, revised editions were published in 1992, 1997, and 2002.

The technical committee, working from data provided from NFPA's Data Analysis and Research Division and NIOSH Fire Fighter Investigation reports, has carefully reviewed the entire document including the associated annex material, and updated many areas to reflect current best practices. Requirements were reorganized in some areas to make the document more user friendly.

Among the changes made were revising the section on risk management and adding additional explanation in the annex. A new section on appointment of a health and safety officer was added, and sections that duplicated the responsibilities of the health and safety officer in NFPA 1521 were removed.

Chapter 5 was reorganized and revised to reflect not only the need of members to have skill and knowledge in performing their day-to-day tasks but also the need for ongoing professional development.

In Chapter 6, requirements and annex material were added to support improved vehicle response operations with an emphasis on safe arrival at the scene.

Requirements for providing and using protective ensembles appropriate for technical rescue operations and chemical and biological terrorism incidents that went into the 2002 edition as a TIA were updated and incorporated, as were other requirements for personal protective ensembles.

New sections on traffic incidents, establishing control zones, and fitness for duty evaluations were added.

Fire fighting and the delivery of other emergency services continues to be a hazardous job. However, the poor medical condition or physical fitness of some members, as well as problems with vehicle operator training and operation, use of an incident management system, and communication capability continue to further erode the safe delivery of emergency services. This edition of the standard continues to emphasize a holistic approach to health and safety in the fire service.

For the 2013 edition, the committee has updated many of the references and referenced materials within this document to ensure consistency between this document and other projects. Some of those other projects are PPE, fire department apparatus, and respiratory

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protection. The committee has included new requirements for the training, use, and limitations of PPE. The committee has also developed new requirements to include not only the ensemble but also ensemble elements, which would include anything that has been added to the ensemble as part of the requirements. The cleaning and care of PPE as well as station/work uniforms has also been addressed with new or updated requirements. When it comes to fire department apparatus, the committee has brought the related requirements within this document in line with those requirements contained within the respective projects. Some issues that have been addressed are the inclusion of a vehicle data recorder (VDR) and a driver training program and requirements, as well as requirements for the wearing of helmets within an enclosed cab. Another issue that has been cropping up due to some recent events was that of unintentional hose deployments while the fire department apparatus was driving on roadways. The committee has developed text to ensure that the fire department takes the steps to ensure that this will not happen. The committee has also looked at the issue of buddy breathing as it relates to SCBS use and has developed cleaner text around the use of a buddy breathing system. The committee has also included new requirements stressing the need for a risk assessment to be conducted at each and every incident based on the nature of the incident and to also recognize the need for specialized crew members based on that incident. Another important update made in this edition is the use of the term "mayday" as a requirement when a fire department member finds him- or herself in an emergency situation requiring immediate assistance. Lastly, the committee has rewritten Chapters 11 and 12, both of which revolve around fire fighter health and wellness and exposure to atypical stressful events.

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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.

Committee Scope: This Committee shall have primary responsibility for documents on occupational safety and health in the working environment of the fire service. The Committee shall also have responsibility for documents related to medical requirements for fire fighters, and the professional qualifications for Fire Department Safety Officer.

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Contents

Chapter 1 Administration 1500– 6
- 1.1 Scope 1500– 6
- 1.2 Purpose 1500– 6
- 1.3 Application 1500– 6
- 1.4 Equivalency 1500– 6
- 1.5 Adoption Requirements 1500– 6

Chapter 2 Referenced Publications 1500– 6
- 2.1 General 1500– 6
- 2.2 NFPA Publications 1500– 6
- 2.3 Other Publications 1500– 7
- 2.4 References for Extracts in Mandatory Sections 1500– 7

Chapter 3 Definitions 1500– 8
- 3.1 General 1500– 8
- 3.2 Official NFPA Definitions 1500– 8
- 3.3 General Definitions 1500– 8

Chapter 4 Fire Department Administration 1500–11
- 4.1 Fire Department Organizational Statement 1500–11
- 4.2 Risk Management Plan 1500–11
- 4.3 Safety and Health Policy 1500–12
- 4.4 Roles and Responsibilities 1500–12
- 4.5 Occupational Safety and Health Committee 1500–12
- 4.6 Records 1500–12
- 4.7 Appointment of the Health and Safety Officer 1500–13

Chapter 5 Training, Education, and Professional Development 1500–13
- 5.1 General Requirements 1500–13
- 5.2 Member Qualifications 1500–13
- 5.3 Training Requirements 1500–14
- 5.4 Special Operations Training 1500–14
- 5.5 Member Proficiency 1500–14

Chapter 6 Fire Apparatus, Equipment, and Drivers/Operators 1500–14
- 6.1 Fire Department Apparatus 1500–14
- 6.2 Drivers/Operators of Fire Department Apparatus 1500–15
- 6.3 Riding in Fire Apparatus 1500–16
- 6.4 Inspection, Maintenance, and Repair of Fire Apparatus 1500–16
- 6.5 Tools and Equipment 1500–16

Chapter 7 Protective Clothing and Protective Equipment 1500–16
- 7.1 General 1500–16
- 7.2 Protective Clothing for Structural Fire Fighting 1500–17
- 7.3 Protective Clothing for Proximity Fire-Fighting Operations 1500–17
- 7.4 Protective Clothing for Emergency Medical Operations 1500–18
- 7.5 Chemical-Protective Clothing for Hazardous Materials Emergency Operations 1500–18
- 7.6 Inspection, Maintenance, and Disposal of Chemical-Protective Clothing 1500–20
- 7.7 Protective Clothing and Equipment for Wildland Fire Fighting 1500–20
- 7.8 Protective Ensembles for Technical Rescue Operations 1500–20
- 7.9 Protective Clothing and Equipment for Surface Water Operations 1500–21
- 7.10 Respiratory Protection Program 1500–21
- 7.11 Breathing Air 1500–21
- 7.12 Respiratory Protection Equipment 1500–21
- 7.13 Fit Testing 1500–22
- 7.14 Using Respiratory Protection 1500–22
- 7.15 SCBA Cylinders 1500–22
- 7.16 Personal Alert Safety System (PASS) 1500–23
- 7.17 Life Safety Rope and System Components 1500–23
- 7.18 Face and Eye Protection 1500–23
- 7.19 Hearing Protection 1500–23
- 7.20 New and Existing Protective Clothing and Protective Equipment 1500–24

Chapter 8 Emergency Operations 1500–24
- 8.1 Incident Management 1500–24
- 8.2 Communications 1500–24
- 8.3 Risk Management During Emergency Operations 1500–25
- 8.4 Personnel Accountability During Emergency Operations 1500–25
- 8.5 Members Operating at Emergency Incidents 1500–25
- 8.6 Hazard Control Zones 1500–26
- 8.7 Traffic Incidents 1500–26
- 8.8 Rapid Intervention for Rescue of Members 1500–27
- 8.9 Rehabilitation During Emergency Operations 1500–28
- 8.10 Scenes of Violence, Civil Unrest, or Terrorism 1500–28
- 8.11 Post-Incident Analysis 1500–29

Chapter 9 Facility Safety 1500–29
- 9.1 Safety Standards 1500–29
- 9.2 Inspections 1500–29
- 9.3 Maintenance and Repairs 1500–29

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Chapter 10 Medical and Physical Requirements . 1500–29
10.1 Medical Requirements 1500–29
10.2 Physical Performance Requirements 1500–29
10.3 Health and Fitness 1500–30
10.4 Confidential Health Data Base 1500–30
10.5 Infection Control 1500–30
10.6 Fire Department Physician 1500–30
10.7 Fitness for Duty Evaluations 1500–30

Chapter 11 Behavioral Health and Wellness Programs 1500–30
11.1 Behavioral Health Program. 1500–30
11.2 Wellness Program 1500–31

Chapter 12 Occupational Exposure to Atypically Stressful Events 1500–31
12.1 General 1500–31

Annex A Explanatory Material 1500–31

Annex B Monitoring Compliance with a Fire Service Occupational Safety and Health Program 1500–53

Annex C Building Hazard Assessment 1500–72

Annex D Risk Management Plan Factors 1500–72

Annex E Hazardous Materials PPE Information . 1500–74

Annex F Sample Facility Inspector Checklists 1500–75

Annex G Informational References 1500–80

Index 1500–82

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NFPA 1500

Standard on

Fire Department Occupational Safety and Health Program

2013 Edition

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Information on referenced publications can be found in Chapter 2 and Annex G.

Chapter 1 Administration

1.1 Scope. This standard shall contain minimum requirements for a fire service–related occupational safety and health program.

1.2 Purpose.

1.2.1 The purpose of this standard shall be to specify the minimum requirements for an occupational safety and health program for a fire department.

1.2.2 This standard shall specify safety requirements for those members involved in rescue, fire suppression, emergency medical services, hazardous materials operations, special operations, and related activities.

1.2.3* The authority having jurisdiction shall identify which performance objectives of this standard existing programs or policies meet.

1.2.4 Nothing herein shall be intended to restrict any jurisdiction from exceeding these minimum requirements.

1.3 Application.

1.3.1 The requirements of this standard shall be applicable to organizations providing rescue, fire suppression, emergency medical services, hazardous materials mitigation, special operations, and other emergency services, including public, military, private, and industrial fire departments.

1.3.2 This standard shall not apply to industrial fire brigades that might also be known as emergency brigades, emergency response teams, fire teams, plant emergency organizations, or mine emergency response teams.

1.4 Equivalency.

1.4.1* The authority having jurisdiction shall be permitted to approve an equivalent level of qualifications for the requirements specified in Chapter 5 of this standard.

1.4.2 The fire department shall provide technical documentation to demonstrate equivalency.

1.5 Adoption Requirements.

1.5.1* When this standard is adopted by a jurisdiction, the authority having jurisdiction (AHJ) shall set a date or dates for achieving compliance with the requirements of this standard.

1.5.2* The AHJ shall be permitted to establish a phase-in schedule for compliance with specific requirements of this standard.

1.5.3 The fire department shall adopt a risk management plan as specified in Section 4.2 of this standard.

1.5.3.1 This risk management plan shall include a written plan for compliance with this standard.

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, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers,* 2010 edition.

NFPA *101®*, *Life Safety Code®*, 2012 edition.

NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents,* 2013 edition.

NFPA 473, *Standard for Competencies for EMS Personnel Responding to Hazardous Materials/Weapons of Mass Destruction Incidents,* 2013 edition.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications,* 2013 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications,* 2009 edition.

NFPA 1003, *Standard for Airport Fire Fighter Professional Qualifications,* 2010 edition.

NFPA 1006, *Standard for Technical Rescuer Professional Qualifications,* 2008 edition.

NFPA 1021, *Standard for Fire Officer Professional Qualifications,* 2009 edition.

NFPA 1051, *Standard for Wildland Fire Fighter Professional Qualifications,* 2012 edition.

NFPA 1071, *Standard for Emergency Vehicle Technician Professional Qualifications,* 2011 edition.

NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems,* 2013 edition.

NFPA 1403, *Standard on Live Fire Training Evolutions,* 2012 edition.

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NFPA 1404, *Standard for Fire Service Respiratory Protection Training,* 2006 edition.

NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program,* 2007 edition.

NFPA 1521, *Standard for Fire Department Safety Officer,* 2008 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System,* 2008 edition.

NFPA 1581, *Standard on Fire Department Infection Control Program,* 2010 edition.

NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments,* 2013 edition.

NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Department Members,* 2008 edition.

NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents,* 2009 edition.

NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting,* 2008 edition.

NFPA 1852, *Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA),* 2008 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus,* 2009 edition.

NFPA 1906, *Standard for Wildland Fire Apparatus,* 2012 edition.

NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus,* 2012 edition.

NFPA 1912, *Standard for Fire Apparatus Refurbishing,* 2011 edition.

NFPA 1925, *Standard on Marine Fire-Fighting Vessels,* 2008 edition.

NFPA 1931, *Standard for Manufacturer's Design of Fire Department Ground Ladders,* 2010 edition.

NFPA 1932, *Standard on Use, Maintenance, and Service Testing of In-Service Fire Department Ground Ladders,* 2010 edition.

NFPA 1936, *Standard on Powered Rescue Tools,* 2010 edition.

NFPA 1951, *Standard on Protective Ensembles for Technical Rescue Incidents,* 2013 edition.

NFPA 1952, *Standard on Surface Water Operations Protective Clothing and Equipment,* 2010 edition.

NFPA 1961, *Standard on Fire Hose,* 2013 edition.

NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose,* 2008 edition.

NFPA 1964, *Standard for Spray Nozzles,* 2008 edition.

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting,* 2013 edition.

NFPA 1975, *Standard on Station/Work Uniforms for Emergency Services,* 2009 edition.

NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting,* 2011 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* 2007 edition.

NFPA 1982, *Standard on Personal Alert Safety Systems (PASS),* 2007 edition.

NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services,* 2012 edition.

NFPA 1984, *Standard on Respirators for Wildland Fire-Fighting Operations,* 2011 edition.

NFPA 1989, *Standard on Breathing Air Quality for Emergency Services Respiratory Protection,* 2008 edition.

NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies,* 2005 edition.

NFPA 1992, *Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies,* 2012 edition.

NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents,* 2012 edition.

NFPA 1999, *Standard on Protective Clothing for Emergency Medical Operations,* 2008 edition.

2.3 Other Publications.

2.3.1 ACGIH Publications. American Conference of Governmental Industrial Hygienists, 1330 Kemper Meadow Drive, Cincinnati, OH 45240-1634.

TLVs® and BEIs®, 2005.

2.3.2 ANSI Publications. American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI Z87.1, *Practice for Occupational and Educational Eye and Face Protection,* 2003.

ANSI Z88.2, *Practices for Respiratory Protection,* 1992.

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

NIOSH *Pocket Guide to Chemical Hazards,* U.S. Department of Health and Human Services, Center for Disease Control and Prevention. NIOSH Publication 97-140, February 2004.

NIOSH *Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Full Facepiece Air Purifying Respirator (APR),* March 2003.

NIOSH *Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Open Circuit Self-Contained Breathing Apparatus (SCBA),* December 2001.

Title 29, Code of Federal Regulations, Part 1910.134, *Respiratory Protection,* 1998.

Title 42, Code of Federal Regulations, Part 84, *Approval of respiratory protective devices,* 2004.

2.3.4 Other Publications.

Lewis, Richard J., Sr., *Sax's Dangerous Properties of Industrial Materials,* 11th ed., John Wiley & Sons, 2004.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 1, *Fire Code,* 2012 edition.

NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents,* 2013 edition.

NFPA 600, *Standard on Industrial Fire Brigades,* 2010 edition.

NFPA 921, *Guide for Fire and Explosion Investigations,* 2011 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications,* 2009 edition.

NFPA 1006, *Standard for Technical Rescuer Professional Qualifications,* 2008 edition.

NFPA 1250, *Recommended Practice in Fire and Emergency Services Organization Risk Management,* 2010 edition.

NFPA 1404, *Standard for Fire Service Respiratory Protection Training,* 2006 edition.

NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program,* 2007 edition.

NFPA 1521, *Standard for Fire Department Safety Officer,* 2008 edition.

NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents,* 2009 edition.

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NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments,* 2010 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus,* 2009 edition.

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting,* 2013 edition.

NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting,* 2011 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* 2007 edition.

NFPA 1982, *Standard on Personal Alert Safety Systems (PASS),* 2007 edition.

NFPA 1984, *Standard on Respirators for Wildland Fire-Fighting Operations,* 2011 edition.

NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies,* 2005 edition.

NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents,* 2012 edition.

NFPA 5000®, Building Construction and Safety Code®, 2012 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary,* 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 Official NFPA Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Shall. Indicates a mandatory requirement.

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

3.3 General Definitions.

3.3.1 Advanced Life Support (ALS). See 3.3.62.1.

3.3.2 Aerial Device. An aerial ladder, elevating platform, or water tower that is designed to position personnel, handle materials, provide continuous egress, or discharge water. [**1901,** 2009]

3.3.3* Air Transfer. The process of transferring air from one SCBA cylinder to another SCBA cylinder of the same rated pressure capacity by connecting them together with properly designed fittings and a high-pressure transfer line.

3.3.4* Aircraft Rescue and Fire Fighting. The fire-fighting actions taken to rescue persons and to control or extinguish fire involving or adjacent to aircraft on the ground.

3.3.5 Atmosphere.

3.3.5.1* *Hazardous Atmosphere.* Any atmosphere that is oxygen deficient or that contains a toxic or disease-producing contaminant.

3.3.5.2 *Oxygen-Deficient Atmosphere.* Air atmospheres containing less than 19.5 percent oxygen by volume at one standard atmosphere pressure.

3.3.6 Basic Life Support (BLS). See 3.3.62.2.

3.3.7 Biological Terrorism Agents. Liquid or particulate agents that can consist of a biologically derived toxin or pathogen to inflict lethal or incapacitating casualties, generally on a civilian population as a result of a terrorist attack. [**1994,** 2012]

3.3.8* Candidate. A person who has submitted an application to become a member of the fire department.

3.3.9 CBRN. An abbreviation for chemicals, biological agents, and radiological particulate hazards.

3.3.10* Chemical Flash Fire. The ignition of a flammable and ignitible vapor or gas that produces an outward expanding flame front as those vapors or gases burn. This burning and expanding flame front, a fireball, will release both thermal and kinetic energy to the environment. [**1991,** 2005]

3.3.11 Chemical Terrorism Agents. Liquid, solid, gaseous, and vapor chemical warfare agents and toxic industrial chemicals used to inflict lethal or incapacitating casualties, generally on a civilian population as a result of a terrorist attack. [**1994,** 2012]

3.3.12* Clear Text. The use of plain language in radio communications transmissions.

3.3.13 Closed-Circuit SCBA. See 3.3.89.1.

3.3.14 Cold Zone. See 3.3.19.1.

3.3.15 Communicable Disease. See 3.3.24.1.

3.3.16* Company. A group of members (1) under the direct supervision of an officer; (2) trained and equipped to perform assigned tasks; (3) usually organized and identified as engine companies, ladder companies, rescue companies, squad companies, or multi-functional companies; (4) operating with one piece of fire apparatus (pumper, aerial fire apparatus, elevating platform, quint, rescue, squad, ambulance) except where multiple apparatus are assigned that are dispatched and arrive together, continuously operate together, and are managed by a single company officer; (5) arriving at the incident scene on fire apparatus.

3.3.17* Confined Space. An area large enough and so configured that a member can bodily enter and perform assigned work but which has limited or restricted means for entry and exit and is not designed for continuous human occupancy.

3.3.18 Contaminant. A harmful, irritating, or nuisance material foreign to the normal atmosphere.

3.3.19 Control Zones. The areas at an incident that are designated based upon safety and the degree of hazard.

3.3.19.1 *Cold Zone.* The control zone of an incident that contains the command post and such other support functions as are deemed necessary to control the incident.

3.3.19.2 *Hot Zone.* The control zone immediately surrounding a hazardous area, which extends far enough to prevent adverse effects to personnel outside the zone.

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3.3.19.3 *Warm Zone.* The control zone outside the hot zone where personnel and equipment decontamination and hot zone support takes place.

3.3.20 Crew. A team of two or more fire fighters.

3.3.21* Cryogenic Liquid. A fluid produced or stored at very low temperatures.

3.3.22 Debilitating Illness or Injury. A condition that temporarily or permanently prevents a member of the fire department from engaging in normal duties and activities as a result of illness or injury.

3.3.23 Defensive Operations. See 3.3.71.1.

3.3.24 Disease.

3.3.24.1* *Communicable Disease.* A disease that can be transmitted from one person to another.

3.3.24.2 *Infectious Disease.* An illness or disease resulting from invasion of a host by disease-producing organisms such as bacteria, viruses, fungi, or parasites.

3.3.25 Drug. Any substance, chemical, over-the-counter medication, or prescribed medication that can affect the performance of the fire fighter.

3.3.26 Emergency Incident. See 3.3.52.1.

3.3.27 Emergency Medical Services. The provision of treatment, such as first aid, cardiopulmonary resuscitation, basic life support, advanced life support, and other pre-hospital procedures including ambulance transportation, to patients.

3.3.28 Emergency Operations. See 3.3.71.2.

3.3.29 Eye Protection. See 3.3.75, Primary Eye Protection.

3.3.30* Faceshield. A protective device commonly intended to shield the wearer's face, or portions thereof, in addition to the eyes from certain hazards, depending on faceshield type.

3.3.31 Facility. See 3.3.35, Fire Department Facility.

3.3.32 Fire Apparatus. A vehicle designed to be used under emergency conditions to transport personnel and equipment, and to support the suppression of fires and mitigation of other hazardous situations. [**1901,** 2009]

3.3.33 Fire Chief. The highest ranking officer in charge of a fire department.

3.3.34* Fire Department. An organization providing rescue, fire suppression, and related activities, including any public, governmental, private, industrial, or military organization engaging in this type of activity. [**1002,** 2009]

3.3.35* Fire Department Facility. Any building or area owned, operated, occupied, or used by a fire department on a routine basis.

3.3.36 Fire Department Member. See 3.3.64, Member.

3.3.37 Fire Fighting.

3.3.37.1* *Proximity Fire Fighting.* Specialized fire fighting operations that can include the activities of rescue, fire suppression, and property conservation at incidents involving fires producing high levels of radiant heat as well as conductive and convective heat. [**1971,** 2013]

3.3.37.2 *Structural Fire Fighting.* The activities of rescue, fire suppression, and property conservation in buildings or other structures structures, vehicles, rail cars, marine vessels, aircraft, or like properties. [**1710,** 2010]

3.3.37.3 *Wildland Fire Fighting.* The activities of fire suppression and property conservation in woodlands, forests, grasslands, brush, prairies, and other such vegetation, or any combination of vegetation, that is involved in a fire situation but is not within buildings or structures. [**1977,** 2011]

3.3.38 Fire Shelter. An item of protective equipment configured as an aluminized tent utilized for protection, by means of reflecting radiant heat, in a fire entrapment situation.

3.3.39* Fire Suppression. The activities involved in controlling and extinguishing fires.

3.3.40* Flame Resistance (Protective Apparel). The property of a material whereby combustion is prevented, terminated, or inhibited following application of a flaming or non-flaming source of ignition, with or without subsequent removal of the ignition source.

3.3.41 Goggle. A protective device intended to fit the face surrounding the eyes in order to shield the eyes from certain hazards, depending on goggle type.

3.3.42* Hazard. Any arrangement of materials that presents the potential for harm. [**921,** 2011]

3.3.43 Hazardous Area. An area of a structure or building that poses a degree of hazard greater than that normal to the general occupancy of the building or structure. [**5000,** 2012]

3.3.44 Hazardous Atmosphere. See 3.3.5.1.

3.3.45 Hazardous Material. A substance (either matter — solid, liquid, or gas — or energy) that when released is capable of creating harm to people, the environment, and property, including weapons of mass destruction (WMD) as defined in 18 U.S. Code, Section 2332a, as well as any other criminal use of hazardous materials, such as illicit labs, environmental crimes, or industrial sabotage. [**472,** 2013]

3.3.46 Hazardous Materials Operations. See 3.3.71.3.

3.3.47 Health and Fitness Coordinator. The person who, under the supervision of the fire department physician, has been designated by the department to coordinate and be responsible for the health and fitness programs of the department.

3.3.48* Health and Safety Officer. The member of the fire department assigned and authorized by the fire chief as the manager of the safety and health program.

3.3.49 Health Data Base. A compilation of records and data that relates to the health experience of a group of individuals and is maintained in a manner such that it is retrievable for study and analysis over a period of time.

3.3.50 Hot Zone. See 3.3.19.2.

3.3.51 Immediately Dangerous to Life or Health (IDLH). Any condition that would pose an immediate or delayed threat to life, cause irreversible adverse health effects, or interfere with an individual's ability to escape unaided from a hazardous environment. [**1670,** 2009]

3.3.52 Incident.

3.3.52.1 *Emergency Incident.* Any situation to which an emergency services organization responds to deliver emergency services, including rescue, fire suppression, emergency medical care, special operations, law enforcement, and other forms of hazard control and mitigation. [**1561,** 2008]

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3.3.52.2 ***Rescue Incident.*** An emergency incident that primarily involves the rescue of persons subject to physical danger and that can include the provision of emergency medical services.

3.3.52.3 ***Traffic Incident.*** An emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic.

3.3.53 Incident Action Plan. The objectives reflecting the overall incident strategy, tactics, risk management, and member safety that are developed by the incident commander. Incident action plans are updated throughout the incident.

3.3.54 Incident Commander (IC). The individual responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources. [**472,** 2013]

3.3.55* Incident Management System (IMS). A system that defines the roles and responsibilities to be assumed by responders and the standard operating procedures to be used in the management and direction of emergency incidents and other functions.

3.3.56* Incident Safety Officer. A member of the command staff responsible for monitoring and assessing safety hazards and unsafe situations, and for developing measures for ensuring personnel safety.

3.3.57 Industrial Fire Brigade. An organized group of employees within an industrial occupancy who are knowledgeable, trained, and skilled in at least basic fire-fighting operations, and whose full-time occupation might or might not be the provision of fire suppression and related activities for their employer. [**600,** 2010]

3.3.58* Infection Control Program. The fire department's formal policy and implementation of procedures relating to the control of infectious and communicable disease hazards where employees, patients, or the general public could be exposed to blood, body fluids, or other potentially infectious materials in the fire department work environment.

3.3.59 Infectious Disease. See 3.3.24.2.

3.3.60 Interface Component. Any material, part, or subassembly used in the construction of the compliant product that provides limited protection to interface areas.

3.3.61 Life Safety Rope. Rope dedicated solely for the purpose of supporting people during rescue, fire-fighting, other emergency operations, or during training evolutions.

3.3.62 Life Support.

3.3.62.1 ***Advanced Life Support (ALS).*** Emergency medical treatment beyond basic life support level as defined by the medical authority having jurisdiction.

3.3.62.2 ***Basic Life Support (BLS).*** Emergency medical treatment at a level as defined by the medical authority having jurisdiction.

3.3.63* Liquefied Gas. A gas that, under its charged pressure, is partially liquid at 70°F (21°C).

3.3.64* Member. A person involved in performing the duties and responsibilities of a fire department, under the auspices of the organization.

3.3.65 Member Assistance Program (MAP). A generic term used to describe the various methods used in the fire department for the control of alcohol and other substance abuse, stress, and personal problems that adversely affect member performance.

3.3.66 Member Organization. An organization formed to represent the collective and individual rights and interests of the members of the fire department, such as a labor union or fire fighters' association.

3.3.67 No-Entry Zone. Those areas at an incident scene that no person(s) are allowed to enter, regardless of what personal protective equipment (PPE) they are wearing due to dangerous conditions. [**1521,** 2008]

3.3.68 Occupational Illness. An illness or disease contracted through or aggravated by the performance of the duties, responsibilities, and functions of a fire department member.

3.3.69 Occupational Injury. An injury sustained during the performance of the duties, responsibilities, and functions of a fire department member.

3.3.70 Offensive Operations. See 3.3.71.4.

3.3.71 Operations.

3.3.71.1* ***Defensive Operations.*** Actions that are intended to control a fire by limiting its spread to a defined area, avoiding the commitment of personnel and equipment to dangerous areas.

3.3.71.2 ***Emergency Operations.*** Activities of the fire department relating to rescue, fire suppression, emergency medical care, and special operations, including response to the scene of the incident and all functions performed at the scene.

3.3.71.3 ***Hazardous Materials Operations.*** All activities performed at the scene of a hazardous materials incident that expose fire department members to the dangers of hazardous materials.

3.3.71.4 ***Offensive Operations.*** Actions generally performed in the interior of involved structures that involve a direct attack on a fire to directly control and extinguish the fire.

3.3.71.5* ***Special Operations.*** Those emergency incidents to which the fire department responds that require specific and advanced training and specialized tools and equipment.

3.3.72 Oxygen-Deficient Atmosphere. See 3.3.5.2.

3.3.73* Particulates. Solid matter that is dispersed in air as a mixture.

3.3.74 Personnel Accountability System. A system that readily identifies both the location and function of all members operating at an incident scene.

3.3.75 Primary Eye Protection. A protective device specifically intended to shield the eyes from certain hazards while permitting vision. *(See also 3.3.30, Faceshield; 3.3.41, Goggle; and 3.3.92, Spectacles.)*

3.3.76 Procedure. An organizational directive issued by the authority having jurisdiction or by the department that establishes a specific policy that must be followed. [**1561,** 2008]

3.3.77* Protective Ensemble. Multiple elements of compliant protective clothing and equipment that when worn together provide protection from some risks, but not all risks, of emergency incident operations.

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3.3.78 Proximity Fire Fighting. See 3.3.37.1.

3.3.79 Qualified Person. A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with problems related to a particular subject matter, work, or project. [**1451,** 2007]

3.3.80* Rapid Intervention Crew/Company (RIC). A minimum of two fully equipped personnel on site, in a ready state, for immediate rescue of disoriented, injured, lost, or trapped rescue personnel. [**1006,** 2008]

3.3.81 Related Activities. Any and all functions that fire department members can be called upon to perform in the execution of their duties.

3.3.82 Rescue. Those activities directed at locating endangered persons at an emergency incident, removing those persons from danger, treating the injured, and providing for transport to an appropriate health care facility. *(See also 3.3.95, Technical Rescue.)*

3.3.83 Rescue Incident. See 3.3.52.2.

3.3.84* Respiratory Protection Equipment (RPE). Devices that are designed to protect the respiratory system against exposure to gases, vapors, or particulates. [**1404,** 2006]

3.3.85 Risk. A measure of the probability and severity of adverse effects that result from an exposure to a hazard. [**1451,** 2007]

3.3.86 Risk Management. The process of planning, organizing, directing, and controlling the resources and activities of an organization in order to minimize detrimental effects on that organization. [**1250,** 2010]

3.3.87 SCBA. Abbreviation for self-contained breathing apparatus. [**1981,** 2007]

3.3.88 Seat Belt. A two-point lap belt, a three-point lap/shoulder belt, or a four-point lap/shoulder harness for vehicle occupants designed to limit their movement in the event of an accident, rapid acceleration, or rapid deceleration by securing individuals safely to a vehicle in a seated position. *(See also 3.3.97, Vehicle Safety Harness.)*

3.3.89 Self-Contained Breathing Apparatus (SCBA). An atmosphere-supplying respirator that supplies a respirable air atmosphere to the user from a breathing air source that is independent of the ambient environment and designed to be carried by the user. [**1981,** 2007]

3.3.89.1 *Closed-Circuit SCBA.* A recirculation-type SCBA in which the exhaled gas is rebreathed by the wearer after the carbon dioxide has been removed from the exhalation gas and the oxygen content within the system has been restored from sources such as compressed breathing air, chemical oxygen, and liquid oxygen, or compressed gaseous oxygen. [**1981,** 2007]

3.3.90 Service Test. The regular, periodic inspection and testing of apparatus and equipment, according to an established schedule and guideline, to ensure that they are in safe and functional operating condition.

3.3.91 Special Operations. See 3.3.71.5.

3.3.92* Spectacles. A protective device intended to shield the wearer's eyes from certain hazards depending on the spectacle type.

3.3.93 Structural Fire Fighting. See 3.3.37.2.

3.3.94 Tactical Level Management Component (TLMC). A management unit identified in the incident management system commonly known as "division," "group," or "sector." [**1561,** 2005]

3.3.95 Technical Rescue. The application of special knowledge, skills, and equipment to safely resolve unique and/or complex rescue situations. [**1670,** 2009]

3.3.96 Traffic Incident. See 3.3.52.3.

3.3.97 Vehicle Safety Harness. A restraint device for vehicle occupants designed to limit their movement in the event of an accident, rapid acceleration, or rapid deceleration by securing individuals safely to a vehicle either in a seated position or tethered to the vehicle. *(See also 3.3.88, Seat Belt.)*

3.3.98 Warm Zone. See 3.3.19.3.

3.3.99 Wildland Fire Fighting. See 3.3.37.3.

3.3.100 Wildland Fire Fighting Respirator. A respirator that has been certified for providing respiratory protection during wildland fire-fighting operations by NIOSH under 42 CFR 84, and certified as compliant with NFPA 1984, *Standard on Respirators for Wildland Fire-Fighting Operations.* [**1984,** 2011]

Chapter 4 Fire Department Administration

4.1 Fire Department Organizational Statement.

4.1.1* The fire department shall prepare and maintain a written statement or policy that establishes the existence of the fire department, the services the fire department is authorized and expected to perform, and the basic organizational structure.

4.1.2* The fire department shall prepare and maintain written policies and standard operating procedures that document the organization structure, membership, roles and responsibilities, expected functions, and training requirements, including the following:

(1) The types of standard evolutions that are expected to be performed and the evolutions that must be performed simultaneously or in sequence for different types of situations
(2) The minimum number of members who are required to perform each function or evolution and the manner in which the function is to be performed
(3) The number and types of apparatus and the number of personnel that will be dispatched to different types of incidents
(4) The procedures that will be employed to initiate and manage operations at the scene of an emergency incident

4.1.3 The organizational statement and procedures shall be available for inspection by members or their designated representative.

4.1.4* Fire departments shall develop pre-incident plans as determined by the AHJ.

4.1.4.1* Fire departments shall develop a construction or demolition fire safety program(s) as determined by the AHJ.

4.2 Risk Management Plan.

4.2.1* The fire department shall develop and adopt a comprehensive written risk management plan.

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4.2.2 The risk management plan shall at least cover the risks associated with the following:

(1) Administration
(2) Facilities
(3) Training
(4) Vehicle operations, both emergency and non-emergency
(5) Protective clothing and equipment
(6) Operations at emergency incidents *(see Annex C)*
(7) Operations at non-emergency incidents
(8) Other related activities

4.2.3* The risk management plan shall include at least the following components *(see Annex D)*:

(1) Risk identification — actual and potential hazards
(2) Risk evaluation — likelihood of occurrence of a given hazard and severity of its consequences
(3) Establishment of priorities for action — the degree of a hazard based upon the frequency and risk of occurrence
(4) Risk control techniques — solutions for elimination or mitigation of potential hazards; implementation of best solution
(5) Risk management monitoring — evaluation of effectiveness of risk control techniques

4.3 Safety and Health Policy.

4.3.1* The fire department shall adopt an official written departmental occupational safety and health policy that identifies specific goals and objectives for the prevention and elimination of accidents and occupational injuries, exposures to communicable disease, illnesses, and fatalities.

4.3.2 It shall be the policy of the fire department to seek and to provide for its members an occupational safety and health program that complies with this standard.

4.3.3* The fire department shall evaluate the effectiveness of the occupational safety and health program at least once every 3 years.

4.3.3.1 An audit report of the findings shall be submitted to the fire chief and to the members of the occupational safety and health committee.

4.4 Roles and Responsibilities.

4.4.1 It shall be the responsibility of the fire department to research, develop, implement, and enforce an occupational safety and health program that recognizes and reduces the inherent risks involved in the operations of a fire department.

4.4.2 The fire department shall be responsible for compliance with all applicable laws and legal requirements with respect to member safety and health.

4.4.3* The fire department shall establish and enforce rules, regulations, and standard operating procedures to meet the objectives of this standard.

4.4.4 The fire department shall be responsible for developing and implementing an accident investigation procedure.

4.4.5* All accidents, near misses, injuries, fatalities, occupational illnesses, and exposures involving members shall be investigated.

4.4.5.1 All accidents involving fire department vehicles, equipment, or fire department facilities shall be investigated.

4.4.5.2 The fire department shall take the corrective action necessary to avoid repetitive occurrences of accidents and exposure to communicable diseases.

4.4.5.3 Records of such investigations shall be kept in accordance with the applicable provisions of 4.6.1.

4.4.5.4* The fire department shall develop, adopt, and maintain a written policy related to the documentation and dissemination of information related to internal near-miss investigations and provide information to members.

4.4.6 Each individual member of the fire department shall cooperate, participate, and comply with the provisions of the occupational safety and health program.

4.4.7 It shall be the right of each member to be protected by an effective occupational safety and health program and to participate or be represented in the research, development, implementation, evaluation, and enforcement of the program.

4.4.8 The member organization, where such an organization exists, shall cooperate with the fire department by representing the interests and the welfare of the members in the research, development, implementation, and evaluation of the occupational safety and health program.

4.4.8.1 The member organization shall have the right to represent the individual and collective rights of its members in the occupational safety and health program.

4.5 Occupational Safety and Health Committee.

4.5.1* An occupational safety and health committee shall be established and shall serve the fire chief in an advisory capacity.

4.5.1.1 The committee shall include the following members:

(1) The designated fire department health and safety officer
(2) Representatives of fire department management
(3) Individual members or representatives of member organizations

4.5.1.2 The committee shall also be permitted to include other persons.

4.5.1.3 Representatives of member organizations shall be selected by their respective organizations, but other committee members shall be appointed to the committee by the fire chief.

4.5.2 The purpose of this committee shall be to conduct research, develop recommendations, and study and review matters pertaining to occupational safety and health within the fire department.

4.5.3* The committee shall hold regularly scheduled meetings and shall be permitted to hold special meetings whenever necessary.

4.5.3.1 Regular meetings shall be held at least once every 6 months.

4.5.3.2 Written minutes of each meeting shall be retained and shall be made available to all members.

4.6 Records.

4.6.1* The fire department shall establish a data collection system and maintain permanent records of all accidents, injuries, illnesses, exposures to infectious agents and communicable diseases, or deaths that are job related.

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4.6.2 The data collection system shall also maintain individual records of any occupational exposure to known or suspected toxic products or infectious or communicable diseases.

4.6.3 The fire department shall ensure that a confidential health record for each member and a health data base are maintained.

4.6.4* The fire department shall maintain training records for each member indicating dates, subjects covered, satisfactory completion, and, if any, certifications achieved.

4.6.5 The fire department shall ensure that inspection, maintenance, repair, and service records are maintained for all vehicles and equipment used for emergency operations and training.

4.7 Appointment of the Health and Safety Officer.

4.7.1 The fire chief shall appoint a designated fire department health and safety officer.

4.7.2 The health and safety officer shall meet the qualifications defined in NFPA 1521, *Standard for Fire Department Safety Officer.*

4.7.3 The fire chief shall ensure that the fire department health and safety officer is given the authority to administer the health and safety program.

4.7.4 The health and safety officer shall perform the functions defined in NFPA 1521.

4.7.5 The fire department health and safety officer shall be responsible for the management of the occupational safety and health program.

4.7.6 The fire chief shall make available such additional safety officers and resources as required to fulfill the requirements of the occupational safety and health program to meet the requirements of NFPA 1521.

Chapter 5 Training, Education, and Professional Development

5.1 General Requirements.

5.1.1* The fire department shall establish and maintain a training, education, and professional development program with a goal of preventing occupational deaths, injuries, and illnesses.

5.1.2 The fire department shall provide training, education, and professional development for all department members commensurate with the duties and functions that they are expected to perform.

5.1.3 The fire department shall establish training and education programs that provide new members initial training, proficiency opportunities, and a method of skill and knowledge evaluation for duties assigned to the member prior to engaging in emergency operations.

5.1.4* The fire department shall restrict the activities of new members during emergency operations until the member has demonstrated the skills and abilities to complete the tasks expected.

5.1.5 The fire department shall provide all members with training and education on the department's risk management plan.

5.1.6 The fire department shall provide all members with training and education on the department's written procedures.

5.1.7 The fire department shall provide all members with a training, education, and professional development program commensurate with the emergency medical services that are provided by the department.

5.1.8* The fire department shall provide all members with a documented training and education program that covers the selection, use, maintenance, retirement, and special incidents procedures operation, limitation, maintenance, and retirement criteria for all assigned personal protective equipment (PPE).

5.1.8.1 Training shall comply with applicable governing standards and follow the manufacturer's instructions and guidelines to include the following topics:

(1) The organization's overall program for the selection and use of protective ensembles, ensemble elements, and SCBAs
(2) Technical data package (TDP) where applicable
(3) Proper overlap and fit
(4) Proper donning and doffing (including emergency doffing)
(5) Construction features and function
(6) Performance limitations (including physiological effects on user and effects of heat transfer on the protective ensemble)
(7) Recognizing and responding to indications of protective ensemble and SCBA failure
(8) Routine inspection
(9) Routine cleaning
(10) Proper storage

5.1.8.2 For maintenance of structural and proximity protective ensembles and ensemble elements, refer to NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

5.1.8.3 For maintenance of SCBA, refer to NFPA 1852, *Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA).*

5.1.8.4 For maintenance of protective ensemble for technical rescue incidents, refer to NFPA 1855, *Standard for Selection, Care, and Maintenance of Protective Ensembles for Technical Rescue Incidents.*

5.1.9 As a duty function, members shall be responsible to maintain proficiency in their skills and knowledge, and to avail themselves of the professional development provided to the members through department training and education programs.

5.1.10 Training programs for all members engaged in emergency operations shall include procedures for the safe exit and accountability of members during rapid evacuation, equipment failure, or other dangerous situations and events.

5.1.11 All members who are likely to be involved in emergency operations shall be trained in the incident management and accountability system used by the fire department.

5.2 Member Qualifications.

5.2.1 All members who engage in structural fire fighting shall meet the requirements of NFPA 1001, *Standard for Fire Fighter Professional Qualifications.*

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5.2.2* All driver/operators shall meet the requirements of NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications.*

5.2.3 All aircraft rescue fire fighters (ARFF) shall meet the requirements of NFPA 1003, *Standard for Airport Fire Fighter Professional Qualifications.*

5.2.4 All fire officers shall meet the requirements of NFPA 1021, *Standard for Fire Officer Professional Qualifications.*

5.2.5 All wildland fire fighters shall meet the requirements of NFPA 1051, *Standard for Wildland Fire Fighter Professional Qualifications.*

5.2.6* All members responding to hazardous materials incidents shall meet the operations level as required in NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents.*

5.3 Training Requirements.

5.3.1* The fire department shall adopt or develop training and education curriculums that meet the minimum requirements outlined in professional qualification standards covering a member's assigned function.

5.3.2 The fire department shall provide training, education, and professional development programs as required to support the minimum qualifications and certifications expected of its members.

5.3.3 Members shall practice assigned skill sets on a regular basis but not less than annually.

5.3.4 The fire department shall provide specific training to members when written policies, practices, procedures, or guidelines are changed and/or updated.

5.3.5* The respiratory protection training program shall meet the requirements of NFPA 1404, *Standard for Fire Service Respiratory Protection Training.*

5.3.6 Members who perform wildland fire fighting shall be trained at least annually in the proper deployment of an approved fire shelter.

5.3.7* All live fire training and exercises shall be conducted in accordance with NFPA 1403, *Standard on Live Fire Training Evolutions.*

5.3.8* All training and exercises shall be conducted under the direct supervision of a qualified instructor.

5.3.9* All members who are likely to be involved in emergency medical services shall meet the training requirements of the AHJ.

5.3.10* Members shall be fully trained in the use, limitations, care, and maintenance of the protective ensembles and ensemble elements assigned to them or available for their use.

5.3.11 All members shall meet the training requirements as outlined in NFPA 1561, *Standard on Emergency Services Incident Management System.*

5.3.12 All members shall meet the training requirements as outlined in NFPA 1581, *Standard on Fire Department Infection Control Program.*

5.4 Special Operations Training.

5.4.1 The fire department shall provide specific and advanced training to members who engage in special operations as a technician.

5.4.2 The fire department shall provide specific training to members who are likely to respond to special operations incidents in a support role to special operations technicians.

5.4.3 Members expected to perform hazardous materials mitigation activities shall meet the training requirements of a technician as outlined in NFPA 472.

5.4.4 Members expected to perform technical operations at the technician level as defined in NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents,* shall meet the training requirements specified in NFPA 1006, *Standard for Technical Rescuer Professional Qualifications.*

5.5 Member Proficiency.

5.5.1 The fire department shall develop a recurring proficiency cycle with the goal of preventing skill degradation and potential for injury and death of members.

5.5.2 The fire department shall develop and maintain a system to monitor and measure training progress and activities of its members.

5.5.3* The fire department shall provide an annual skills check to verify minimum professional qualifications of its members.

Chapter 6 Fire Apparatus, Equipment, and Drivers/Operators

6.1 Fire Department Apparatus.

6.1.1* The fire department shall consider safety and health as primary concerns in the specification, design, construction, acquisition, operation, maintenance, inspection, and repair of all fire department apparatus.

6.1.1.1* The fire department shall specify restraint devices for fire apparatus, including those restraint devices for emergency medical service (EMS) members operating in the patient compartment of the ambulance.

6.1.2 All new fire apparatus shall be specified and ordered to meet the applicable requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.*

6.1.2.1 If the fire apparatus is equipped with a vehicle data recorder, the AHJ shall develop operating procedures for uploading, monitoring, and reviewing the data.

6.1.3 All new wildland fire apparatus shall be specified and ordered to meet the requirements of NFPA 1906, *Standard for Wildland Fire Apparatus.*

6.1.3.1 If the fire apparatus is equipped with a vehicle data recorder, the AHJ shall develop operating procedures for uploading, monitoring, and reviewing the data.

6.1.4 All marine fire-fighting vessels shall be specified and ordered to meet the requirements of NFPA 1925, *Standard on Marine Fire-Fighting Vessels.*

6.1.5* Where tools, equipment, or respiratory protection are carried within enclosed seating areas of fire apparatus or the patient compartment of an ambulance, such items shall be secured by either a positive mechanical means of holding the item in its stowed position or by placement in a compartment with a positive latching door.

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6.1.6 When fire apparatus is refurbished, it shall be specified and ordered to meet the applicable requirements of NFPA 1912, *Standard for Fire Apparatus Refurbishing.*

6.1.7 Fire departments that operate their own fixed-wing or rotary aircraft for fire department operations shall provide four-point restraints for all pilots and passengers, not including any EMS patients.

6.1.7.1 Members performing hoist rescue in the passenger area of the aircraft shall be secured by a vehicle safety harness or seat belt system.

6.1.8 All apparatus shall have hose storage areas that are equipped with a positive means to prevent unintentional deployment of the hose from the top, sides, front, and rear of the hose storage area while the apparatus is under way in normal operations.

6.2 Drivers/Operators of Fire Department Apparatus.

6.2.1* Fire apparatus shall be operated only by members who have successfully completed an approved driver training program commensurate with the type of apparatus the member will operate or by trainee drivers who are under the supervision of a qualified driver.

6.2.1.1 The AHJ shall be responsible for providing driver training instruction that complies with NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program,* to members on the operation of specific fire department owned pumpers and mobile water supply apparatus that hold greater than 999 gal (3782 L) of on-board water supply.

6.2.1.2 The AHJ shall establish the maximum speed that the apparatus shall operate at and post that speed on a placard mounted on the dash within view of the driver, stating "Maximum apparatus speed warning: Do not exceed XX mph."

6.2.2* The driver of a fire department vehicle shall be required to possess a valid driver's license for the class of vehicle, as specified by the AHJ.

6.2.2.1 Fire department vehicles shall be operated in compliance with all applicable traffic laws, including special provisions pertaining to emergency vehicles as established by the AHJ, as well as specific rules, regulations, and procedures adopted by the fire department.

6.2.2.2 Pumpers and mobile water supply apparatus that do not have anti-lock brake systems (ABS) and carry over 999 gal (3782 L) of on-board water supply shall be operated in non-emergency mode at all times.

6.2.3* The fire department shall establish specific rules, regulations, and procedures relating to the operation of fire department vehicles in an emergency mode, including guidelines to establish when emergency response is authorized and when emergency response is not authorized.

6.2.4* Drivers of fire apparatus shall be directly responsible for the safe and prudent operation of the vehicles under all conditions.

6.2.4.1 When the driver is under the direct supervision of an officer, that officer shall also assume responsibility for the driver's actions.

6.2.5 Drivers shall not move fire apparatus until all persons on the vehicle are seated and secured with seat belts in approved riding positions, other than as specifically allowed in this chapter.

6.2.6 Drivers of fire apparatus shall obey all traffic control signals and signs and all laws and rules of the road of the jurisdiction for the operation of motor vehicles.

6.2.7* The fire department shall develop standard operating procedures for safely driving fire apparatus during non-emergency travel and emergency response and shall include specific criteria for vehicle speed, crossing intersections, traversing railroad grade crossings, the use of emergency warning devices, and the backing of fire apparatus.

6.2.7.1* Procedures for all responses shall emphasize that the safe arrival of fire apparatus to the incident scene is the first priority.

6.2.8* During emergency response, drivers of fire apparatus shall bring the vehicle to a complete stop under any of the following circumstances:

(1) When directed by a law enforcement officer
(2) At red traffic lights
(3) At stop signs
(4) At negative right-of-way intersections
(5) At blind intersections
(6) When the driver cannot account for all lanes of traffic in an intersection
(7) When other intersection hazards are present
(8) When encountering a stopped school bus with flashing warning lights

6.2.9 Drivers shall proceed through intersections only when the driver can account for all lanes of traffic in the intersection.

6.2.10* During emergency response or non-emergency travel, drivers of fire apparatus shall come to a complete stop at all unguarded railroad grade crossings and ensure that it is safe to proceed before crossing the railroad track(s).

6.2.11 Drivers shall use caution when approaching and crossing any guarded railroad grade crossing.

6.2.12 The fire department shall include information on the potential hazards of retarders, such as engine, transmission, and driveline retarders, in the driver training program and shall develop written procedures pertaining to the use of such retarders.

6.2.13 The fire department shall develop written procedures requiring drivers to discontinue the use of manual brake limiting valves, frequently labeled as a "wet road/dry road" switch, and requiring that the valve/switch remains in the "dry road" position.

6.2.14* Where members are authorized to respond to incidents or to fire stations in private vehicles, the fire department shall establish specific rules, regulations, and procedures relating to the operation of private vehicles in an emergency mode.

6.2.14.1 These rules and regulations shall be at least equal to the provisions regulating the operation of fire department vehicles.

6.2.14.2* These rules and regulations shall also apply to the use of emergency lighting equipment, audible warning devices, or both on private vehicles.

6.2.14.2.1 The rules and regulations shall specify the procedures for use of emergency lighting equipment and audible warning devices and shall be in compliance with the motor vehicle laws of the jurisdiction.

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6.2.14.2.2 Emergency lighting equipment and audible warning devices shall not be installed without the fire department's approval.

6.3 Riding in Fire Apparatus.

6.3.1* All persons riding in fire apparatus shall be seated and belted securely by seat belts in approved riding positions at any time the vehicle is in motion other than as allowed in 6.3.4 and 6.3.5. Standing or riding on tail steps, sidesteps, running boards, or in any other exposed position shall be specifically prohibited.

6.3.2 Seat belts shall not be released or loosened for any purpose while the vehicle is in motion, including the donning of respiratory protection equipment or protective clothing.

6.3.3* Members actively performing necessary emergency medical care while the vehicle is in motion shall be secured to the vehicle by a seat belt, or by a vehicle safety harness designed for occupant restraint, to the extent consistent with the effective provision of such emergency medical care.

6.3.3.1 All other persons in the vehicle shall be seated and belted in approved riding positions while the vehicle is in motion.

6.3.4* Fire departments permitting hose loading operations while the vehicle is in motion shall develop written standard operating procedures addressing all safety aspects.

6.3.5* Fire departments permitting tiller training, where both the instructor and the trainee are at the tiller position, shall develop written standard operating procedures addressing all safety aspects.

6.3.6* Helmets shall be provided for and used by members riding in open cab apparatus or open tiller seats.

6.3.6.1 Helmets shall not be worn by persons riding in an enclosed cab.

6.3.7* Eye protection shall be provided for members riding in open cab apparatus or open tiller seats.

6.3.8* On existing fire apparatus where there is an insufficient number of seats available for the number of members assigned to or expected to ride on that piece of apparatus, alternate means of transportation that provide seated and belted positions shall be used.

6.4 Inspection, Maintenance, and Repair of Fire Apparatus.

6.4.1* All fire apparatus shall be inspected, maintained, and tested in accordance with the applicable requirements of NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus.*

6.4.2 Fire pumps on apparatus shall be service tested in accordance with the applicable requirements of NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus.*

6.4.3 All aerial devices shall be inspected and service tested in accordance with the applicable requirements of NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus.*

6.4.4 All fire apparatus shall be cleaned and disinfected in accordance with NFPA 1581, *Standard on Fire Department Infection Control Program.*

6.5 Tools and Equipment.

6.5.1 The fire department shall consider safety and health as primary concerns in the specification, design, construction, acquisition, operation, maintenance, inspection, and repair of all tools and equipment.

6.5.2 The hearing conservation objectives of this standard shall be taken into account in the acquisition of new power tools and power equipment.

6.5.3 All new fire department ground ladders shall be specified and ordered to meet the applicable requirements of NFPA 1931, *Standard for Manufacturer's Design of Fire Department Ground Ladders.*

6.5.4 All new fire hose shall be specified and ordered to meet the applicable requirements of NFPA 1961, *Standard on Fire Hose.*

6.5.5 All new fire department spray nozzles shall be specified and ordered to meet the applicable requirements of NFPA 1964, *Standard for Spray Nozzles.*

6.5.6* All equipment carried on fire apparatus or designated for training shall be inspected at least weekly and within 24 hours after any use.

6.5.7 Inventory records shall be maintained for the equipment carried on each vehicle and for equipment designated for training.

6.5.8 All equipment carried on fire apparatus or designated for training shall be tested at least annually in accordance with manufacturers' instructions and applicable standards.

6.5.9 Fire-fighting equipment found to be defective or in unserviceable condition shall be removed from service and repaired or replaced.

6.5.10 All fire department equipment and tools shall be cleaned and disinfected in accordance with NFPA 1581.

6.5.11 All ground ladders shall be inspected and service tested in accordance with the applicable requirements of NFPA 1932, *Standard on Use, Maintenance, and Service Testing of In-Service Fire Department Ground Ladders.*

6.5.12 All fire hose shall be inspected and service tested in accordance with the applicable requirements of NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose.*

6.5.13 All fire extinguishers shall be inspected and tested in accordance with the applicable requirements of NFPA 10, *Standard for Portable Fire Extinguishers.*

6.5.14 All fire department powered rescue tools shall meet the requirements of NFPA 1936, *Standard on Powered Rescue Tools.*

Chapter 7 Protective Clothing and Protective Equipment

7.1 General.

7.1.1* The fire department shall provide each member with protective ensembles, ensemble elements, and protective equipment designed to provide protection from hazards to which the member is likely to be exposed and that is suitable for the tasks the member is expected to perform.

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7.1.1.1 A risk assessment on the selection of protective ensemble, ensemble element, and protective equipment shall be conducted in accordance with the appropriate applicable NFPA standards.

7.1.1.2 The selection of suitable and appropriate protective ensembles, ensemble elements, and other protective equipment shall be based on a Selection program containing an effective risk assessment as specified in NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

7.1.2* Protective ensembles, ensemble elements, and other protective equipment shall be used whenever the member is exposed or potentially exposed to the hazards for which it is provided.

7.1.3 Structural fire-fighting and proximity fire-fighting protective ensembles and ensemble elements shall be cleaned as specified in NFPA 1851, *Standard on Selection, Care, and Maintenance of Structural Fire Fighting Protective Ensembles.*

7.1.4* Where station/work uniforms are worn by members, such station/work uniforms shall meet the requirements of NFPA 1975, *Standard on Station/Work Uniforms for Emergency Services.*

7.1.5 While on duty, members shall not wear personal clothing, accessories, or personal equipment that might not be suitable and appropriate to protect the member from the hazards to which the member could be exposed.

7.1.6 The fire department shall provide for care and maintenance of protective ensembles, ensemble elements, and station/work uniforms as specified in NFPA 1581, *Standard on Fire Department Infection Control Program,* and NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

7.1.6.1* Where the organization implements an on-site care and maintenance operation, the organization shall follow applicable governing standards that provide for exposure control and protection of members performing the tasks associated with care and maintenance.

7.1.6.2 Where such cleaning is conducted in fire stations, the fire department shall provide at least one washing machine for this purpose in the designated cleaning area specified in NFPA 1581, *Standard on Fire Department Infection Control Program.*

7.1.6.3* Where the fire department implements an on-site care and maintenance operation, the fire department shall acquire the proper type and amount of equipment, materials, and supplies to properly perform cleaning, drying, inspections, and maintenance of protective ensembles and ensemble elements.

7.2 Protective Clothing for Structural Fire Fighting.

7.2.1* Members who engage in or are exposed to the hazards of structural fire fighting shall be provided with and shall use a protective ensemble that shall meet the applicable requirements of NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

7.2.2* The protective coat and the protective trousers shall have at least a 2 in. (50 mm) overlap of all layers so there is no gaping of the total thermal protection when the protective garments are worn.

7.2.2.1 The minimum overlap shall be determined by measuring the garments on the wearer, without SCBA, in both of the following positions:

(1) Position A — standing, hands together reaching overhead as high as possible
(2) Position B — standing, hands together reaching overhead, with body bent forward at a 90-degree angle, to the side (either left or right), and to the back

7.2.3 Single-piece protective coveralls shall not be required to have an overlap of all layers, provided there is continuous composite protection.

7.2.4 Gloves.

7.2.4.1 Fire departments that provide protective coats with protective resilient wristlets secured through a thumb opening shall be permitted to provide gloves of the gauntlet type for use with these protective coats.

7.2.4.2* Fire departments that do not provide such wristlets attached to all protective coats shall provide gloves of the wristlet type or other interface component for use with these protective coats.

7.2.5 The fire department shall adopt and maintain a protective clothing and protective equipment program that addresses the selection, care, maintenance, and use of structural fire-fighting protective ensembles, and training in its use.

7.2.5.1 The selection, care, and maintenance of protective ensembles for structural fire fighting shall be as specified in NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

7.2.5.2 Specific roles, responsibilities, and authorities shall be assigned for inspection and maintenance.

7.2.6 The fire department shall require all members to wear all protective ensemble components specific to the operation.

7.3 Protective Clothing for Proximity Fire-Fighting Operations.

7.3.1* When determining the need for proximity ensembles, the organization shall perform a risk assessment as required by Chapter 5 of NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

7.3.2 When it is determined proximity protective ensembles and ensemble elements are required, members shall be provided with and shall use proximity fire-fighting protective ensembles and ensemble elements that are compliant with NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

7.3.2.1 The minimum overlap shall be determined by measuring the garments on the wearer, without SCBA, in both of the following positions:

(1) Position A — standing, hands together reaching overhead as high as possible
(2) Position B — standing, hands together reaching overhead, with body bent forward at a 90-degree angle, to the side (either left or right), and to the back

7.3.3 Single-piece proximity protective coveralls shall not be required to have an overlap of all layers, provided there is continuous full thermal and radiant heat protection.

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7.3.4 Where SCBA is worn over or outside the proximity protective garment, the fire department shall inform the member of the potential high levels of radiant heat that can result in the failure of the SCBA.

7.3.4.1 The fire department shall require additional approved radiant reflective criteria, including but not limited to a protective cover, for the expected proximity fire-fighting exposures when the SCBA is worn over or outside the proximity protective garment.

7.4* Protective Clothing for Emergency Medical Operations.

7.4.1 The fire department shall develop standard operating procedures outlining the minimum required levels of protection based on a risk assessment of the medical care activities involved.

7.4.1.1 Members who perform emergency medical care or are otherwise likely to be exposed to blood or other body fluids shall be provided with emergency medical garments, emergency medical face protection devices, emergency medical examination gloves, emergency medical work gloves, and emergency medical footwear or emergency medical footwear covers that are compliant with NFPA 1999, *Standard on Protective Clothing for Emergency Medical Operations.*

7.4.2* Members shall wear emergency medical examination gloves when providing emergency medical care.

7.4.2.1 Patient care shall not be initiated before the gloves are in place.

7.4.2.2 Emergency medical work gloves shall be permitted to be used in place of emergency medical examination gloves in situations involving physical hazards.

7.4.3 Each member shall use emergency medical garments and emergency medical face protection devices, including particulate filtering masks, prior to any patient care during which large splashes of body fluids can occur, such as childbirth or situations involving spurting blood.

7.4.4 Contaminated emergency medical protective clothing shall be cleaned and disinfected or disposed of as specified in NFPA 1581, *Standard on Fire Department Infection Control Program.*

7.4.4.1 Emergency medical examination gloves and emergency medical footwear covers shall not be reused and shall be disposed of after use.

7.4.4.2 Any item of emergency medical protective clothing that is not designated for "multiple use" shall not be reused and shall be disposed of after use.

7.5* Chemical-Protective Clothing for Hazardous Materials Emergency Operations.

7.5.1* Vapor-Protective Ensembles.

7.5.1.1 Members who engage in operations during hazardous materials emergencies where there is the potential for exposure to known chemicals in gaseous or vapor form that pose skin hazards, to chemicals that have not been identified, or to chemical environments that are classified as immediately dangerous to life or health (IDLH) shall be provided with and shall use vapor-protective ensembles that meet the applicable requirements of NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies.*

7.5.1.2 Prior to use of the ensemble, members who engage in hazardous materials operations shall consult the technical data package, manufacturers' instructions, and manufacturers' recommendations as provided and required by NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies,* to ensure that the ensemble is designed to provide the member protection for the specific hazardous materials emergency.

7.5.1.3 All members who engage in operations during hazardous materials emergencies where there is potential for exposure to known chemicals in gaseous or vapor form that pose skin hazards, to chemicals that have not been identified, or to chemical environments that are classified as IDLH shall be provided with and shall use SCBA that meet the applicable requirements of Section 7.12.

7.5.1.3.1 Additional outside air supplies shall be permitted to be utilized in conjunction with SCBA, provided such systems are positive pressure and have been certified by NIOSH under 42 CFR 84, *Approval of respiratory protective devices.*

7.5.1.4 Vapor-protective ensembles, certified to the 2005 edition of NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies,* shall be permitted to be used for protection from chemical agents, biological agents, and radioactive particulate encountered during terrorism incidents.

7.5.1.5 Where the risk assessment shows that members will also be exposed to liquefied gases, members shall be provided with and shall use vapor-protective ensembles that meet the additional optional requirements for liquefied gas protection in NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies.*

7.5.1.6 Where the risk assessment shows that members will also be exposed to potential chemical flash fires, members shall be provided with and shall use vapor-protective ensembles that meet the additional optional requirements for chemical flash fire protection in NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies.*

7.5.1.7* Vapor-protective ensembles shall not be used alone for any fire-fighting applications or for protection from ionizing radiation, cryogenic liquid hazards, or explosive atmospheres.

7.5.1.8 Vapor-protective ensembles shall be permitted to be used for protection from liquid splashes or solid chemicals and particulates.

7.5.2* Liquid Splash-Protective Ensembles and Clothing.

7.5.2.1 Members who engage in operations during hazardous materials emergencies that will expose them to known chemicals in liquid-splash form shall be provided with and shall use liquid splash-protective ensembles or clothing that meet the applicable requirements of NFPA 1992, *Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies.*

7.5.2.2 Prior to use of the ensemble or clothing, members who engage in hazardous materials operations shall consult the technical data package, manufacturers' instructions, and manufacturers' recommendations as provided and required by NFPA 1992, to ensure that the ensemble or clothing is designed to provide the member protection for the specific hazardous chemical emergency.

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7.5.2.3 All members who engage in operations during hazardous materials emergencies that will expose them to known chemicals in liquid-splash form shall be provided with and shall use either SCBA that meet the applicable requirements of 7.12.1, or other respiratory protective devices that are certified by NIOSH under 42 CFR 84 as suitable for the specific chemical environment.

7.5.2.3.1 Additional outside air supplies shall be permitted to be utilized in conjunction with SCBA, provided such systems are positive pressure and have been certified by NIOSH under 42 CFR 84.

7.5.2.4 Liquid splash-protective ensembles or clothing shall not be used for protection from chemicals in vapor form or from unknown liquid chemicals or chemical mixtures.

7.5.2.4.1 Only vapor-protective ensembles specified in 7.5.1 and SCBA specified in 7.12.1 shall be considered for use.

7.5.2.5 Liquid splash-protective ensembles or clothing shall not be used for protection from chemicals or specific chemical mixtures that have a vapor pressure greater than 5 mm Hg at 77°F (25°C) and have known or suspected carcinogenicity as indicated by one of the following documents:

(1) *Sax's Dangerous Properties of Industrial Materials*
(2) NIOSH *Pocket Guide to Chemical Hazards*

7.5.2.6 Liquid splash-protective suits shall not be used for protection from chemicals or specific chemical mixtures with skin toxicity notations as indicated by the American Conference of Governmental Industrial Hygienists, *TVLs® and BEIs®*, and that have a vapor pressure greater than 5 mm Hg at 77°F (25°C).

7.5.2.7 Where the risk assessment shows that members will also be exposed to potential chemical flash fires, members shall be provided with and shall use liquid splash-protective ensembles and clothing that meet the additional optional requirements for chemical flash fire protection in NFPA 1992, *Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies.*

7.5.2.8* Liquid splash-protective suits shall not be used alone for any fire-fighting applications or for protection from ionizing radiation, biological, liquefied gas or cryogenic liquid hazards, or from flammable or explosive atmospheres, or from hazardous chemical vapor atmospheres.

7.5.2.9 Liquid splash-protective suits shall be permitted to be used for protection from solid chemicals and particulates.

7.5.3* Protective Ensembles for CBRN Terrorism Incidents.

7.5.3.1 Members who engage in assessment, extrication, rescue, triage, treatment decontamination, and support function operations for incidents involving CBRN terrorism agents shall be provided with the protective ensembles and protective equipment specified in 7.5.3.3 through 7.5.3.6.

7.5.3.2* The approach to any potentially hazardous atmosphere, including biological hazards, shall be made with a plan that includes an assessment of the hazard and exposure potential, respiratory protection needs, entry conditions, exit routes, and decontamination strategies.

7.5.3.2.1 Before emergency response personnel are assigned to operations involving CBRN terrorism agents, the incident commander shall perform a risk assessment of the incident to determine the type of protective ensembles and other protective equipment that is needed.

7.5.3.3 Where the risk assessment indicates one or more of the following, all members who will be performing the operations shall be provided with and shall use at least ensembles certified as compliant with NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*:

(1) There is an ongoing release of the agent with likely gas/vapor exposure.
(2) The identity or concentration of the vapor or liquid agent is unknown.
(3) Liquid contact is expected, and no direct skin contact can be permitted.
(4) Exposure of members could be at levels that would result in substantial possibility of immediate death, immediate serious incapacitation, or a severely impaired ability to escape.
(5) Most victims in the area appear to be unconscious or dead.
(6) Members will be close to the point of release.

7.5.3.3.1 All members who engage in operations for incidents involving CBRN terrorism agents and who are required to wear vapor-protective ensembles that meet NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*, shall be provided with and shall use either of the following respiratory protection:

(1) SCBA that meet the applicable requirements of 7.12.1, provided that the SCBA is fully encapsulated by the protective ensemble
(2) Open-circuit SCBA that are certified by NIOSH as compliant with NIOSH *Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Open Circuit Self-Contained Breathing Apparatus (SCBA)*

7.5.3.4 Where the risk assessment indicates one or more of the following, all members who will be performing the operations for incidents involving CBRN terrorism agents shall be provided with and shall use at least Class 2 ensembles certified as compliant with NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents*:

(1) Exposure is at IDLH conditions.
(2) The agent or threat has generally been identified.
(3) The actual release has subsided except for where the potential for direct contact with residual vapor or gas is probable.
(4) Surfaces at the emergency scene are highly contaminated.
(5) Victims in the area are symptomatic, not ambulatory, but showing signs of movement.

7.5.3.4.1 All members who engage in operations for incidents involving CBRN terrorism agents and who are required to wear NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents*, Class 2 ensembles shall use open-circuit SCBA that are certified by NIOSH as compliant with NIOSH *Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Open Circuit Self-Contained Breathing Apparatus (SCBA).*

7.5.3.5 Where the risk assessment indicates one or more of the following, all members who will be performing the operations for incidents involving CBRN terrorism agents shall be provided with and shall use at least Class 3 ensembles certified as compliant with NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents*:

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(1) Exposure is at levels below IDLH conditions.
(2) Exposure to liquids is expected to be incidental through contact with contaminated surfaces or victims well after the release has occurred.
(3) Victims are symptomatic but ambulatory.

7.5.3.5.1 All members who engage in operations for incidents involving CBRN terrorism agents and who are required to wear NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents*, Class 3 ensembles shall use one of the following types of respirators:

(1) Open-circuit SCBA that are certified by NIOSH as compliant with NIOSH *Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Open Circuit Self-Contained Breathing Apparatus (SCBA)*
(2) Air-purifying respirators (APRs) with a minimum rated service life of at least 30 minutes that are certified by NIOSH as compliant with NIOSH *Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Full Facepiece Air Purifying Respirator (APR)*

7.5.3.6* Where the risk assessment indicates the potential presence of biological or radiological particulates only, all members who will be performing the operations for incidents involving CBRN terrorism agents shall be provided with and shall use at least Class 4 ensembles certified as compliant with NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents.*

7.5.3.6.1 All members who engage in operations during chemical and biological terrorism incidents and who are required to wear NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents*, Class 4 ensembles shall use one of the following types of respirators:

(1) Open-circuit SCBA that are certified by NIOSH as compliant with NIOSH *Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Open Circuit Self-Contained Breathing Apparatus (SCBA)*
(2) APR with a minimum rated service life of at least 30 minutes that are certified by NIOSH as compliant with NIOSH *Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Full Facepiece Air Purifying Respirator (APR)*

7.5.3.7 Vapor-protective ensembles, certified as compliant with NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*, that are used in operations involving any exposure to CBRN terrorism agents, shall be decontaminated following that use or shall be disposed of where decontamination will not stop the chemical or biological assault on the ensemble and the protective qualities would be diminished or nullified.

7.5.3.8 All NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents*, Class 2, Class 3, and Class 4 protective ensembles and NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, protective ensembles with the CBRN option that are used in operations involving any exposure to chemical or biological terrorism agents shall be disposed of following that use.

7.5.3.9 Disposal shall be in accordance with applicable local, state/provincial, and federal regulations.

7.5.3.10 All protective ensembles that are to be used for incidents involving CBRN terrorism agents shall be inspected and maintained as required by the technical data package and the manufacturer's instructions.

7.6 Inspection, Maintenance, and Disposal of Chemical-Protective Clothing.

7.6.1 All chemical-protective clothing shall be inspected and maintained as required by the technical data package, manufacturers' instructions, and manufacturers' recommendations.

7.6.2 All chemical-protective clothing that receives an exposure to a chemical or a chemical mixture shall be disposed of if decontamination will not stop the chemical assault on the garment and the protective qualities will be diminished or nullified.

7.6.2.1 Disposal shall be in accordance with applicable state or federal regulations.

7.7 Protective Clothing and Equipment for Wildland Fire Fighting.

7.7.1* The fire department shall establish standard operating procedures for the use of wildland protective clothing and equipment.

7.7.2 Members who engage in or are exposed to the hazards of wildland fire-fighting operations shall be provided with and use protective garments and protective equipment that meet the requirements of NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting.*

7.7.3* Members who engage in or are exposed to the hazards of wildland fire-fighting operations shall be provided with a fire shelter, in a crush-resistive case, and wear it in such a way as to allow for rapid deployment.

7.8 Protective Ensembles for Technical Rescue Operations.

7.8.1 Members of special teams whose primary function is search, rescue, recovery, and site stabilization operations for technical rescue incidents other than wilderness or water rescue incidents shall be provided with and shall use a protective ensemble that is certified as compliant with NFPA 1951, *Standard on Protective Ensembles for Technical Rescue Incidents.*

7.8.1.1 Before emergency response personnel are assigned to technical rescue incidents, the incident commander shall perform a risk assessment of the expected hazards to determine the type of protective ensembles and other protective equipment that is needed.

7.8.1.2 Where the risk assessment indicates exposure to physical and thermal hazards are expected, utility technical rescue protective ensembles and ensemble elements shall be used.

7.8.1.3 Where the risk assessment indicates exposure to physical, thermal, liquid, and body fluid-borne pathogen hazards are expected, rescue and recovery technical rescue protective ensembles and ensemble elements shall be used.

7.8.1.4 Where the risk assessment indicates exposure to physical, thermal, liquid, and body fluid-borne pathogen hazards and CBRN agents is vapor, liquid splash, and particulate forms are expected during terrorism incident operations, CBRN technical rescue protective ensemble and ensemble elements requirements shall be used.

7.8.2 The protective coat and protective trousers shall have at least a 2 in. (50 mm) overlap of all layers so there is no gaping of the total thermal and barrier protection when the protective garments are worn.

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7.8.2.1 The minimum overlap shall be determined by measuring the garments on the wearer, without respiratory protection, in both of the following conditions:

(1) Position A — standing, hands together reaching overhead as high as possible
(2) Position B — standing, hands together reaching overhead, with the body bent forward at a 90-degree angle, to the side (either left or right), and to the back

7.8.2.2 Single-piece protective coveralls shall not be required to have an overlap of all layers, provided there is continuous composite protection.

7.8.3 Members engaged in technical rescue operations that require respiratory protection shall be provided with and shall use respirators that are certified by NIOSH to 42 CFR Part 84.

7.8.3.1* Where air-purifying respirators (APRs) and powered air-purifying respirators (PAPRs) are selected to provide the respiratory protection, the APRs and PAPRs shall be provided with the chemical or particulate filter elements that provide protection against the specific contaminants based upon the anticipated level of exposure risk associated with different response situations.

7.8.3.2* Where it cannot be determined that an APR or PAPR will provide effective protection against the contaminant, or if the identity of the contaminant is not known, SCBA shall be worn until it can be determined that other respiratory protection can be used.

7.8.3.3 Where SCBA are selected to provide the respiratory protection, the SCBA shall meet the applicable requirements of 7.12.1.

7.8.4 Members who engage in or are exposed to the hazards of search, rescue, recovery, and site stabilization for technical rescue shall be provided with and shall use primary eye protection that meets the requirements of NFPA 1951.

7.8.5 Technical rescue protective clothing and protective equipment shall be used and maintained in accordance with the manufacturer's instructions.

7.8.5.1 The fire department shall establish a maintenance and inspection program for technical rescue protective clothing and equipment.

7.8.5.2 Proper decontamination procedures for all technical rescue protective clothing and equipment shall be followed to prevent contamination of the user or support personnel.

7.9* Protective Clothing and Equipment for Surface Water Operations.

7.9.1 Members of special teams whose primary function is surface water search and rescue operations or other surface water incident operations, including operations in surface water, swift water, tidal water, surf, and ice, shall be provided with and shall use a protective ensemble that is certified as compliant with NFPA 1952, *Standard on Surface Water Operations Protective Clothing and Equipment.*

7.9.2 Surface water operations protective clothing and protective equipment shall be used and maintained in accordance with the manufacturer's instructions.

7.9.3 The fire department shall establish a maintenance and inspection program for surface water operations protective clothing and equipment.

7.9.4 Proper decontamination procedures for all surface water protective clothing and equipment shall be followed to prevent contamination of the user or support personnel.

7.10 Respiratory Protection Program.

7.10.1 The fire department shall adopt and maintain a respiratory protection program that addresses the selection, care, maintenance, and use of respiratory protection equipment (RPE), medical surveillance, training in respirator use, and the assurance of air quality.

7.10.1.1* The selection, care, and maintenance of open-circuit SCBA shall be as specified in NFPA 1852, *Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA).*

7.10.1.2 Training in respirator use shall include knowledge of hazards, hazard assessment, selection of RPE based on hazard exposure levels, fit testing of respirators, and respirator inspection.

7.10.2 The fire department shall develop and maintain standard operating procedures that are compliant with this standard and that address the use of respiratory protection.

7.10.3 Members shall be qualified at least annually in the use of RPE that they are authorized to use.

7.10.4* Reserve SCBA shall be provided to maintain the required number in service when maintenance or repairs are being conducted.

7.10.5 A reserve air supply shall be provided by use of reserve cylinders or by an on-scene refill capability, or both.

7.10.6 RPE shall be stored in a ready-for-use condition and shall be protected from damage or exposure to rough handling, excessive heat or cold, moisture, or other elements.

7.10.7* When engaged in any operation where they could encounter atmospheres that are IDLH or potentially IDLH, or where the atmosphere is unknown, the fire department shall provide and require all members to use SCBA that has been certified as being compliant with NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services.*

7.10.8* Members using SCBA shall not compromise the protective integrity of the SCBA for any reason when operating in IDLH, potentially IDLH, or unknown atmospheres by removing the facepiece or disconnecting any portion of the SCBA that would allow the ambient atmosphere to be breathed.

7.11 Breathing Air. Breathing air used to fill SCBA cylinders shall meet the requirements specified in NFPA 1989, *Standard on Breathing Air Quality for Emergency Services Respiratory Protection.*

7.12 Respiratory Protection Equipment.

7.12.1 SCBA.

7.12.1.1 All open-circuit SCBA that is purchased new shall be certified as compliant with NFPA 1981 and shall also be certified by NIOSH as compliant with NIOSH *Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Open Circuit Self-Contained Breathing Apparatus (SCBA).*

7.12.1.2 Open-circuit SCBA that does not meet the 1997 or later editions of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* shall be removed from fire service use.

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7.12.1.3* Closed-circuit SCBA shall be permitted when long-duration SCBA is required.

7.12.1.4 Closed-circuit SCBA shall be NIOSH certified with a minimum rated service life of at least 2 hours and shall operate in the positive-pressure mode only.

7.12.2 Supplied-Air Respirators.

7.12.2.1 Supplied-air respirator units used shall be of the type and manufacture employed by the AHJ.

7.12.2.2 Supplied-air respirators other than SCBA shall not be used in IDLH atmospheres unless equipped with a NIOSH-certified emergency escape air cylinder and a pressure-demand facepiece.

7.12.2.3 Supplied-air respirators, Type C Pressure-Demand Class, shall not be used in IDLH atmospheres unless they meet manufacturers' specifications for that purpose.

7.12.3 Air-Purifying Respirators.

7.12.3.1 Air-purifying respirators (APRs) shall be used only in non-IDLH atmospheres for those contaminants that NIOSH certifies them against.

7.12.3.2 The AHJ shall provide NIOSH-certified respirators that protect the user and ensure compliance with all other OSHA requirements.

7.12.3.3* The AHJ shall establish a policy to ensure canisters and cartridges are changed before the end of their service life.

7.12.3.4 Wildland fire fighting respirators shall be compliant with NFPA 1984, *Standard on Respirators for Wildland Fire-Fighting Operations.*

7.13 Fit Testing.

7.13.1* The facepiece seal capability of each member qualified to use RPE shall be verified by quantitative fit testing following procedures set forth in 29 CFR 1910.134, *Respiratory protection*, and ANSI Z88.2, *Practices for Respiratory Protection*, on an annual basis and whenever new types of RPE or facepieces are issued.

7.13.2 The fit of the RPE of each new member shall be tested before the members are permitted to use RPE in a hazardous atmosphere.

7.13.2.1 Only members with a properly fitting facepiece shall be permitted by the fire department to function in a hazardous atmosphere with RPE.

7.13.3 Fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators shall be accomplished by performing quantitative fit testing in the negative-pressure mode, regardless of the mode of operation (negative or positive pressure) that is used for respiratory protection.

7.13.4 Records of facepiece fitting tests shall include at least the following information:

(1) Name of the member tested
(2) Type of fitting test performed
(3) Specific make and model of facepieces tested
(4) Pass/fail results of the tests

7.13.5* The protection factor produced shall be at least 500 for negative-pressure facepieces for the person to pass the fitting test with that make of full facepiece.

7.13.6* If a satisfactory fit cannot be achieved for an individual with one design of facepiece, the fire department shall work with the manufacturer of the respiratory protection equipment (RPE) to find a facepiece design that fits satisfactorily for that member.

7.14 Using Respiratory Protection.

7.14.1 Respirators shall not be worn when a member has any conditions that prevent a good face seal.

7.14.2 Nothing shall be allowed to enter or pass through the area where the respiratory protection facepiece is designed to seal with the face, regardless of the specific fitting test measurement that can be obtained.

7.14.3* Members who have a beard or facial hair at any point where the facepiece is designed to seal with the face or whose hair could interfere with the operation of the unit shall not be permitted to use respiratory protection at emergency incidents or in hazardous or potentially hazardous atmospheres.

7.14.3.1 These restrictions shall apply regardless of the specific fitting test measurement that can be obtained under test conditions.

7.14.4 When a member must wear spectacles while using full facepiece respiratory protection, the facepiece shall be fitted with spectacles in such a manner that they shall not interfere with the facepiece-to-face seal.

7.14.5 Spectacles with any strap or temple bars that pass through the facepiece-to-face seal area shall be prohibited.

7.14.6* Use of contact lenses shall be permitted during full facepiece respiratory protection use, provided that the member has previously demonstrated successful long-term contact lens use.

7.14.7 Any head covering that passes between the sealing surface of the respiratory protection facepiece and the member's face shall be prohibited.

7.14.8 The respiratory protection facepiece and head harness with straps shall be worn under the protective hoods.

7.14.9 The respiratory protection facepiece and head harness with straps shall be worn under the head protection of any hazardous chemical-protective clothing.

7.14.10 Helmets shall not interfere with the respiratory protection facepiece-to-face seal.

7.15 SCBA Cylinders.

7.15.1* SCBA cylinders made of aluminum alloy 6351-T6 shall be inspected annually, both externally and internally, by a qualified person.

7.15.2 SCBA cylinders shall be hydrostatically tested as required by the manufacturers and applicable governmental agencies.

7.15.3 In-service SCBA cylinders shall be stored fully charged.

7.15.4 In-service SCBA cylinders shall be inspected weekly, monthly, and prior to filling, according to NIOSH requirements, CGA standards, and manufacturers' recommendations.

7.15.5* During filling of SCBA cylinders, all personnel and operators shall be protected from catastrophic failure of the cylinder, except as provided in 7.15.8.

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7.15.6* Fire departments utilizing rapid filling of SCBA cylinders shall identify those unique emergency situations where rapid filling shall be permitted to occur.

7.15.7 The fire department risk assessment process shall incorporate standard operating procedures to identify those situations in 7.15.6.

7.15.8 Rapid refilling of SCBA while being worn by the user shall only be used under the following conditions:

(1) Manufacturer permitted, NIOSH-approved fill options are used.
(2) The risk assessment process has identified procedures for limiting personnel exposure during the refill process and has provided for adequate equipment inspection and member safety.
(3) An imminent life-threatening situation occurs that requires immediate action to prevent the loss of life or serious injury.
(4) Prior to a life-threatening situation occurring that could require immediate action to prevent the loss of life or serious injury.

7.15.9 An emergency escape breathing support system (EEBSS), also known as buddy breathing, shall be utilized where it is accomplished through the use of a NIOSH-approved connection that does not compromise the system integrity of either of the users giving or receiving air.

7.15.9.1 An EEBSS shall not be initiated if the "donors" cylinder has less than 600 L of air remaining.

7.15.10 If a supplied source is not immediately available, transfilling of cylinders shall be done in accordance with the manufacturers' instructions.

7.15.11* Standardized IDLH exiting shall require that an exit strategy will be practiced when the SCBA cylinder reaches a level of 600 L or more.

7.16 Personal Alert Safety System (PASS).

7.16.1* PASS devices shall meet the requirements of NFPA 1982, *Standard on Personal Alert Safety Systems (PASS).*

7.16.2* Each member shall be provided with, use, and activate his or her PASS devices in all emergency situations that could jeopardize that person's safety due to atmospheres that could be IDLH, in incidents that could result in entrapment, in structural collapse of any type, or as directed by the incident commander or incident safety officer.

7.16.3 Each PASS device shall be tested at least weekly and prior to each use and shall be maintained in accordance with the manufacturers' instructions.

7.17 Life Safety Rope and System Components.

7.17.1 All life safety ropes, harnesses, and hardware used by fire departments shall meet the applicable requirements of NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services.*

7.17.2 Rope used to support the weight of members or other persons during rescue, fire fighting, other emergency operations, or training evolutions shall be life safety rope and shall meet the requirements of NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services.*

7.17.2.1 Life safety rope used for any other purpose shall be removed from service and destroyed.

7.17.3* Life safety rope used for rescue at fires or other emergency incidents or for training shall be permitted to be reused if inspected before and after each such use in accordance with the manufacturers' instructions and provided that the following criteria are met:

(1) The rope has not been visually damaged by exposure to heat, direct flame impingement, chemical exposure, or abrasion.
(2) The rope has not been subjected to any impact load.
(3) The rope has not been exposed to chemical liquids, solids, gases, mists, or vapors of any material known to deteriorate rope.

7.17.3.1 If the rope used for rescue at fires or other emergency incidents or for training does not meet the criteria set forth in 7.17.3(1), 7.17.3(2), or 7.17.3(3) or fails the visual inspection, it shall be destroyed.

7.17.3.2 If there is any question regarding the serviceability of the rope after consideration of the criteria listed in 7.17.3, the rope shall be taken out of service.

7.17.4 Rope inspection shall be conducted by qualified inspectors in accordance with rope inspection procedures established and recommended by the rope manufacturer to assure rope is appropriate for reuse.

7.17.5 Records shall be maintained to document the use of each life safety rope used at fires and other emergency incidents or for training.

7.18 Face and Eye Protection.

7.18.1 Primary eye protection appropriate for a given specific hazard shall be provided for and used by members exposed to that specific hazard.

7.18.1.1* Primary eye protection shall meet the requirements of ANSI Z87.1, *Practice for Occupational and Educational Eye and Face Protection.*

7.18.1.2 Face protection shall be in addition to primary eye protection unless SCBA is being used.

7.18.1.3 The helmet faceshield alone shall not be considered and shall not be used as primary eye protection.

7.18.2 The full facepiece of SCBA shall constitute face and eye protection when worn.

7.18.2.1 SCBA that has a facepiece-mounted regulator that when disconnected provides a direct path for flying objects to strike the face or eyes shall have the regulator attached in order to be considered face and eye protection.

7.18.3 When operating in the hazardous area at an emergency scene without the full facepiece of respiratory protection being worn, members shall wear primary eye protection that is designed to protect the member's eyes from the expected hazards.

7.19 Hearing Protection.

7.19.1* Hearing protection shall be provided for and used by all members operating or riding on fire apparatus when subject to noise in excess of 90 dBA.

7.19.2* Hearing protection shall be provided for and used by all members when exposed to noise in excess of 90 dBA caused by power tools or equipment, other than in situations where the use of such protective equipment would create an additional hazard to the user.

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7.19.3* The fire department shall engage in a hearing conservation program to identify and reduce or eliminate potentially harmful sources of noise in the work environment.

7.20 New and Existing Protective Clothing and Protective Equipment.

7.20.1 All new protective clothing and protective equipment shall meet the requirements of the current edition of the respective NFPA standard for that protective clothing or protective equipment.

7.20.2 Existing protective clothing and protective equipment shall have been in compliance with the edition of the respective NFPA standard that was current when the protective clothing or protective equipment was manufactured.

7.20.3 Members' protective ensembles for structural fire fighting and protective ensembles for proximity fire fighting shall be retired in accordance with NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.*

Chapter 8 Emergency Operations

8.1 Incident Management.

8.1.1* Emergency operations and other situations that pose similar hazards, including but not limited to training exercises, shall be conducted in a manner that recognizes hazards and prevents accidents and injuries.

8.1.2 An incident management system that meets the requirements of NFPA 1561, *Standard on Emergency Services Incident Management System,* shall be established with written standard operating procedures applying to all members involved in emergency operations.

8.1.3 The incident management system shall be utilized at all emergency incidents.

8.1.4 The incident management system shall be applied to drills, exercises, and other situations that involve hazards similar to those encountered at actual emergency incidents and to simulated incidents that are conducted for training and familiarization purposes.

8.1.5* At an emergency incident, the incident commander shall be responsible for the overall management of the incident and the safety of all members involved at the scene.

8.1.6 As incidents escalate in size and complexity, the incident commander shall divide the incident into tactical-level management components and assign an incident safety officer to assess the incident scene for hazards or potential hazards.

8.1.7* At an emergency incident, the incident commander shall establish an organization with sufficient supervisory personnel to control the position and function of all members operating at the scene and to ensure that safety requirements are satisfied.

8.1.8* At an emergency incident, the incident commander shall have the responsibility for the following:

(1) Arrive on-scene before assuming command
(2) Assume and confirm command of an incident and take an effective command position
(3) Perform situation evaluation that includes risk assessment
(4) Initiate, maintain, and control incident communications
(5) Develop an overall strategy and an incident action plan and assign companies and members consistent with the standard operating procedures
(6) Initiate an accountability and inventory worksheet
(7) Develop an effective incident organization by managing resources, maintaining an effective span of control, and maintaining direct supervision over the entire incident, and designate supervisors in charge of specific areas or functions
(8) Review, evaluate, and revise the incident action plan as required
(9) Continue, transfer, and terminate command
(10) On incidents under the command authority of the fire department, provide for liaison and coordination with all other cooperating agencies
(11) On incidents where other agencies have jurisdiction, implement a plan that designates one incident commander or that provides for unified command

8.1.8.1 Interagency coordination shall meet the requirements of NFPA 1561, *Standard on Emergency Services Incident Management System.*

8.2 Communications.

8.2.1 The fire department shall establish and ensure the maintenance of a fire dispatch and incident communications system that meets the requirements of NFPA 1561 and NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems.*

8.2.2* The fire department standard operating procedures shall provide direction in the use of clear text radio messages for emergency incidents.

8.2.2.1 The standard operating procedures shall use "emergency traffic" as a designator to clear the radio traffic for an emergency affecting the incident.

8.2.2.2 This "emergency traffic" shall be permitted to be declared by any member who becomes aware of an emergency affecting the incident.

8.2.3* When a member has declared "emergency traffic," that person shall use clear text to identify the type of emergency, change in conditions, or tactical operations.

8.2.3.1 The member who has declared the "emergency traffic" shall conclude the "emergency traffic" message by transmitting "all clear, resume radio traffic" to end the emergency situation or to re-open the radio channels to communication after announcing the emergency message.

8.2.3.2 The standard operating procedures shall use "mayday" as a designator to identify when a member is in a life-threatening situation and in need of immediate assistance.

8.2.3.3 This "mayday" shall be permitted to be declared by any member who is in or who becomes aware of a member who is in a life-threatening situation and in need of immediate assistance.

8.2.3.4 The incident commander shall conclude the "mayday" by transmitting "Mayday cleared, resume normal radio traffic."

8.2.4* The fire department communications center shall start an incident clock when the first arriving unit is on-scene of a working structure fire or hazardous materials incident, or when other conditions appear to be time sensitive or dangerous.

8.2.4.1* The dispatch center shall notify the incident commander at every 10-minute increment with the time that re-

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sources have been on the incident until the fire is knocked down or the incident becomes static.

8.2.4.2 The incident commander shall be permitted to cancel the incident clock notification through the fire department communications center based on the incident conditions.

8.3 Risk Management During Emergency Operations.

8.3.1* The incident commander shall integrate risk management into the regular functions of incident command.

8.3.2* The concept of risk management shall be utilized on the basis of the following principles:

(1) Activities that present a significant risk to the safety of members shall be limited to situations where there is a potential to save endangered lives.
(2) Activities that are routinely employed to protect property shall be recognized as inherent risks to the safety of members, and actions shall be taken to reduce or avoid these risks.
(3) No risk to the safety of members shall be acceptable when there is no possibility to save lives or property.
(4) In situations where the risk to fire department members is excessive, activities shall be limited to defensive operations.

8.3.3* The incident commander shall evaluate the risk to members with respect to the purpose and potential results of their actions in each situation.

8.3.4 Risk management principles shall be routinely employed by supervisory personnel at all levels of the incident management system to define the limits of acceptable and unacceptable positions and functions for all members at the incident scene.

8.3.5* At significant incidents and special operations incidents, the incident commander shall assign an incident safety officer who has the expertise to evaluate hazards and provide direction with respect to the overall safety of personnel.

8.3.6 At terrorist incidents or other incidents involving potential CBRN exposure, the incident commander shall assess the risk to members and ensure that protective equipment appropriate for the risk is available for and used by members.

8.3.7* Because of the possibility of members being exposed to nerve agents during terrorist activities, fire departments shall consider providing atropine auto-injectors for members.

8.4 Personnel Accountability During Emergency Operations.

8.4.1* The fire department shall establish written standard operating procedures for a personnel accountability system that is in accordance with NFPA 1561, *Standard on Emergency Services Incident Management System.*

8.4.2 The fire department shall consider local conditions and characteristics in establishing the requirements of the personnel accountability system.

8.4.3 It shall be the responsibility of all members operating at an emergency incident to actively participate in the personnel accountability system.

8.4.4 The incident commander shall maintain an awareness of the location and function of all companies or crews at the scene of the incident.

8.4.5 Officers assigned the responsibility for a specific tactical level management component at an incident shall directly supervise and account for the companies and/or crews operating in their specific area of responsibility.

8.4.6 Company officers shall maintain an ongoing awareness of the location and condition of all company members.

8.4.7 Where assigned as a company, members shall be responsible to remain under the supervision of their assigned company officer.

8.4.8 Members shall be responsible for following personnel accountability system procedures.

8.4.9 The personnel accountability system shall be used at all incidents.

8.4.10* The fire department shall develop, implement, and utilize the system components required to make the personnel accountability system effective.

8.4.11* The standard operating procedures shall provide the use of additional accountability officers based on the size, complexity, or needs of the incident.

8.4.12 The incident commander and members who are assigned a supervisory responsibility for a tactical level management component that involves multiple companies or crews under their command shall have assigned a member(s) to facilitate the ongoing tracking and accountability of assigned companies and crews.

8.5 Members Operating at Emergency Incidents.

8.5.1 The fire department shall provide an adequate number of personnel to safely conduct emergency scene operations.

8.5.1.1* Operations shall be limited to those that can be safely performed by the personnel available at the scene.

8.5.2 No member or members shall commence or perform any fire-fighting function or evolution that is not within the established safety criteria of the organizational statement as specified in 4.1.1.

8.5.3 When inexperienced members are working at an incident, direct supervision shall be provided by more experienced officers or members.

8.5.3.1 The requirement of 8.5.3 shall not reduce the training requirements contained in 5.1.3 and 5.1.4.

8.5.4* Members operating in hazardous areas at emergency incidents shall operate in crews of two or more.

8.5.5 Crew members operating in hazardous areas shall be in communication with each other through visual, audible, or physical means or safety guide rope, in order to coordinate their activities.

8.5.6 Crew members shall be in proximity to each other to provide assistance in case of emergency.

8.5.7 In accordance with the requirements of 8.8.2, at least two members shall be present outside the hazardous area available for assistance or rescue at emergency operations where members are operating inside a hazardous area.

8.5.8* At aircraft rescue fire-fighting incidents, the initial IDLH shall be identified as the area within 75 ft (23 m) of the skin of the aircraft.

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8.5.8.1 After size-up, the incident commander shall adjust the IDLH designation as the situation dictates, to meet operational needs.

8.5.8.2 Aircraft rescue fire-fighting operations inside the area identified as the IDLH shall be in accordance with 8.5.4.

8.5.9* When members are performing special operations, the highest available level of emergency medical care shall be standing by at the scene with medical equipment and transportation capabilities. Basic life support (BLS) shall be the minimum level of emergency medical care.

8.5.10 Emergency medical care and medical monitoring at hazardous materials incidents shall be provided by or supervised by personnel who meet the minimum requirements of NFPA 473, *Standard for Competencies for EMS Personnel Responding to Hazardous Materials/Weapons of Mass Destruction Incidents.*

8.5.11 At all other emergency operations, the incident commander shall evaluate the risk to the members operating at the scene and, if necessary, request that at least BLS personnel and patient transportation be available.

8.5.12 When members are operating from aerial devices, they shall be secured to the aerial device with a system in compliance with NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services.*

8.5.13 The incident commander shall ensure fire investigators or other members that enter an IDLH atmosphere or hazardous area use the PPE, SCBA, or both, as appropriate for risks that might be encountered.

8.5.14* Members involved in water rescue shall be issued and wear personal flotation devices that meet U.S. Coast Guard requirements.

8.5.15 Fire departments shall develop a standard operating procedure for operating near energized lines or equipment.

8.5.15.1* Procedures shall be developed for isolating personnel from the energized conductor.

8.5.15.2 All fire fighters shall be made aware of the increased danger involving downed power lines when working, especially in limited visibility.

8.5.15.3 Fire department personnel shall not be permitted to move or cut electrical meters.

8.5.15.4 Fire fighters shall locate and isolate downed electrical wires and wait for utility company personnel to disconnect the power to those wires.

8.5.15.4.1 In cases of known immediate life-threatening situations, properly trained and equipped personnel shall be permitted to mitigate the hazard.

8.5.15.5 Fire fighters shall keep a minimum distance from an overhead or downed power line until the line is de-energized and always function under the premise that a line is hot.

8.5.15.6 The incident commander shall convey and continually re-evaluate strategic decisions related to fireground electrical hazards to all personnel on the scene.

8.5.15.7 All fire fighters shall be made aware of the hazards of applying a solid-stream water application around energized electrical conductors.

8.5.15.8 All fire fighters shall be repeatedly trained in safety-related practices for working around electrical energy.

8.6 Hazard Control Zones.

8.6.1 Hazard control zones shall be established at every emergency incident to identify the level of risk to emergency responders and the appropriate level of PPE.

8.6.2 The perimeters of the hazard control zones shall be designated by the incident commander.

8.6.3 If the perimeters change during the course of the incident, these changes shall be communicated to all members on the scene.

8.6.4* Hazard control zones shall be as follows:

(1) Designated as hot, warm, and cold (similar to hazardous materials incidents)
(2) Marked with the applicable colored hazard tape, signage, or other appropriate means wherever possible
(3) Communicated to all personnel attending the incident prior to being assigned to a hazard zone

8.6.4.1* Hot zone (red tape) is the area presenting the greatest risks to members, will often be classified as an IDLH atmosphere, and presents the highest risk of human injury and/or exposure; therefore all members shall wear all of the PPE appropriate for the risks that might be encountered while in the hot zone.

8.6.4.1.1* All members operating within the hot zone shall have an assigned task.

8.6.4.2* Warm zone (yellow tape) shall serve as a limited access area for members directly aiding or in support of operations in the hot zone where significant risk of human injury can still exist.

8.6.4.3 Cold zone (green tape) shall establish the public exclusion or clean zone where there are minimal risks for human injury or exposure, or both, in this zone.

8.6.4.4 Where a no-entry zone is designated, no personnel shall enter the no-entry zone due to imminent hazard(s) or the need to protect evidence.

8.6.5 The incident commander shall ensure that the designation of the appropriate protective clothing and equipment is commensurate with the hazard in the zone the member will be operating in.

8.6.6 All officers and members shall ensure the appropriate use of personnel protective equipment within that zone.

8.6.7 The process of utilizing hazard control zones shall continue until the incident hazards have been mitigated or the incident is over.

8.7* Traffic Incidents.

8.7.1 When members are operating at an emergency incident and their assignment places them in potential conflict with motor vehicle traffic, all efforts shall be made to protect the members.

8.7.2 Each department shall establish, implement, and enforce standard operating procedures regarding emergency operations for traffic incidents.

8.7.3 Apparatus and warning devices shall be placed to take advantage of topography and weather conditions (uphill / upwind) and to protect fire fighters from traffic.

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8.7.4* Apparatus shall be placed to the rear of the incident or the emergency in a manner that reduces the chance of a vehicle being struck by oncoming traffic.

8.7.4.1 When acting as a shield, apparatus warning lights shall remain on.

8.7.4.2 All additional responding vehicles, when arriving on the scene, shall be positioned beyond the traffic barrier unless their function requires placement before the barrier.

8.7.4.3* Apparatus shall be placed at an angle to the incident that maximizes safety.

8.7.4.4 The blocking apparatus shall be placed at least 50 ft (15.24 m) behind the first operating unit to create a safe working area.

8.7.5* One or more of the following warning devices shall be used to warn oncoming traffic of the emergency operations and the hazards to members operating at the incident:

(1) Fluorescent and retro-reflective warning devices such as traffic cones
(2) Federal Highway Administration (FHWA)-approved 48 in. by 48 in. retro-reflective signs stating "Emergency Scene Ahead" (with directional arrow overlay)
(3) Illuminated warning devices such as highway flares
(4) Other warning devices appropriate to warn oncoming traffic of the emergency operations

8.7.6 Warning devices shall be placed and utilized with proper considerations given to visual obstruction such as hills, curves, blind spots, or unusual localized weather conditions such as fog or rain.

8.7.7 The first arriving unit shall ensure that traffic is controlled before addressing the emergency operations.

8.7.8 Members shall position themselves and any victims in a secure area.

8.7.9 Members shall park or stage unneeded fire apparatus and personal vehicles off the roadway whenever possible.

8.7.10* When members are operating at a traffic incident and their assignment places them in potential conflict with motor vehicle traffic, they shall wear a garment that is constructed with high-visibility fluorescent and retro-reflective material visible from all directions.

8.7.11* Members used for traffic control purposes shall receive training that is commensurate with their duties and in accordance with any applicable state and local laws and regulations.

8.8 Rapid Intervention for Rescue of Members.

8.8.1 The fire department shall provide personnel for the rescue of members operating at emergency incidents.

8.8.2* In the initial stages of an incident where only one crew is operating in the hazardous area at a working structural fire, a minimum of four individuals shall be required, consisting of two members working as a crew in the hazardous area and two standby members present outside this hazardous area available for assistance or rescue at emergency operations where entry into the danger area is required.

8.8.2.1 The "initial stages" of an incident shall encompass the tasks undertaken by the first arriving company with only one crew assigned or operating in the hazardous area.

8.8.2.2 The standby members shall be responsible for maintaining a constant awareness of the number and identity of members operating in the hazardous area, their location and function, and time of entry.

8.8.2.3 The standby members shall remain in radio, visual, voice, or signal line communication with the crew.

8.8.2.4* One standby member shall be permitted to perform other duties outside of the hazardous area, such as apparatus operator, incident commander, or technician or aide, provided constant communication is maintained between the standby member and the members of the crew.

8.8.2.5 The assignment of any personnel, including the incident commander, the safety officer, or operators of fire apparatus, shall not be permitted as standby personnel if by abandoning their critical task(s) to assist or, if necessary, perform rescue, they clearly jeopardize the safety and health of any fire fighter working at the incident.

8.8.2.5.1 No one shall be permitted to serve as a standby member of the fire-fighting crew when the other activities in which the fire fighter is engaged inhibit the fire fighter's ability to assist in or perform rescue, if necessary, or are of such importance that they cannot be abandoned without placing other fire fighters in danger.

8.8.2.6 The standby member shall be provided with full protective clothing, protective equipment, and SCBA appropriate for the risk that might be encountered.

8.8.2.6.1 The full protective clothing, protective equipment, and SCBA shall be immediately accessible for use by the outside crew if the need for rescue activities inside the hazardous area occurs.

8.8.2.7 The standby members shall don full protective clothing, protective equipment, and SCBA prior to entering the hazardous area.

8.8.2.8 When only a single crew is operating in the hazardous area in the initial stages of the incident, this standby member shall be permitted to assist with, or if necessary perform, rescue for members of his or her crew, provided that abandoning his or her task does not jeopardize the safety or health of the crew.

8.8.2.9 Once a second crew is assigned or operating in the hazardous area, the incident shall no longer be considered in the "initial stage," and at least one rapid intervention crew shall be deployed that complies with the requirements of 8.8.2.

8.8.2.10 Initial attack operations shall be organized to ensure that if, on arrival at the emergency scene, initial attack personnel find an imminent life-threatening situation where immediate action could prevent the loss of life or serious injury, such action shall be permitted with less than four personnel.

8.8.2.10.1 No exception as permitted in 8.8.2.10 shall be allowed when there is no possibility to save lives.

8.8.2.10.2 Any such actions taken in accordance with 8.8.2.10 shall be thoroughly investigated by the fire department with a written report submitted to the fire chief.

8.8.3 As the incident expands in size or complexity, which includes an incident commander's requests for additional resources beyond a fire department's initial attack assignment,

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the dedicated rapid intervention crew (RIC) shall on arrival of these additional resources be either one of the following:

(1) On-scene members designated and dedicated as an RIC
(2) On-scene crew/company or crews/companies located for rapid deployment and dedicated as RICs

8.8.3.1 During fire fighter rescue operations each crew/company shall remain intact.

8.8.4 An RIC shall consist of at least two members and shall be available for immediate rescue of a member or a crew.

8.8.4.1 Each RIC shall be fully equipped with protective clothing, protective equipment, SCBA, and any specialized rescue equipment that could be needed given the specifics of the operation under way.

8.8.5 At incidents where any SCBA being used is equipped with an RIC universal air connection (UAC), the RIC shall have the specialized rescue equipment necessary to complete the RIC UAC connection to a supplied air source .

8.8.5.1 Where applicable, the breathing air source and any hoses and connections shall meet the requirements of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* and be NIOSH certified to 42 CFR 84.

8.8.5.2 The breathing air source shall have no less than 1200 L of breathing air before entering the hazard area.

8.8.6 The composition and structure of a RIC shall be permitted to be flexible based on the type of incident and the size and complexity of operations.

8.8.7* The incident commander shall evaluate the situation and the risks to operating crews and shall provide one or more RICs commensurate with the needs of the situation.

8.8.8 In the early stages of an incident, which includes the deployment of a fire department's initial attack assignment, the RIC shall be in compliance with 8.2.4.1 and 8.8.2.5 and be either one of the following:

(1) On-scene members designated and dedicated as an RIC
(2) On-scene members performing other functions but ready to redeploy to perform RIC functions

8.8.9 The assignment of any personnel shall not be permitted as members of the RIC if abandoning their critical task(s) to perform rescue clearly jeopardizes the safety and health of any member operating at the incident.

8.8.10 During fire fighter rescue operations each crew/company shall remain intact.

8.8.11 At least one dedicated RIC shall be standing by with equipment to provide for the rescue of members that are performing special operations or for members that are in positions that present an immediate danger of injury in the event of equipment failure or collapse.

8.9 Rehabilitation During Emergency Operations.

8.9.1* The fire department shall develop standard operating procedures that outline a systematic approach for the rehabilitation of members operating at incidents.

8.9.2* The incident commander shall consider the circumstances of each incident and initiate rehabilitation in accordance with the standard operating procedures and with NFPA 1561.

8.9.3* Such on-scene rehabilitation shall include at least rest, hydration, active cooling where required, basic life support care, food where required, and protection from extreme elements.

8.9.4 Each member operating at an incident shall be responsible to communicate rehabilitation needs to their supervisor.

8.9.5* Each member who engages in wildland fire-fighting operations shall be provided with 2 qt (2 L) of water.

8.9.5.1 A process shall be established for the rapid replenishment of water supplies.

8.10 Scenes of Violence, Civil Unrest, or Terrorism.

8.10.1* Fire department members shall not become involved in any activities at the scene of domestic disturbance, civil unrest, or similar situations where there is ongoing violence, without the confirmed presence of law enforcement personnel who have deemed the scene secure.

8.10.2 Under no circumstances shall fire department equipment or personnel be used for crowd control or dispersement purposes.

8.10.3* The fire department shall develop and maintain written standard operating procedures that establish a standardized approach to the safety of members at incidents that involve violence, unrest, or civil disturbance.

8.10.4 The fire department shall be responsible for developing an interagency agreement with its law enforcement agency counterpart to provide protection for fire department members at situations that involve violence.

8.10.5* The fire department shall develop a standard communication method that indicates that an incident crew is faced with a life-and-death situation requiring immediate law enforcement intervention.

8.10.6 Such violent situations shall be considered essentially a law enforcement event, and the fire department shall coordinate with the law enforcement incident commander throughout the incident.

8.10.7 The fire department incident commander shall identify and react to situations that do involve or are likely to involve violence.

8.10.8 In such violent situations, the fire department incident commander shall communicate directly with the law enforcement incident commander to ensure the safety of fire department members.

8.10.9 In such violent situations, the fire department incident commander shall stage all fire department resources in a safe area until the law enforcement agency has secured the scene.

8.10.10 When violence occurs after emergency operations have been initiated, the fire department incident commander shall either secure immediate law enforcement agency protection or shall withdraw all fire department members to a safe staging area.

8.10.11 At civil disturbances or similar incidents where protective equipment generally considered as law enforcement–related, such as body armor, shall be utilized only by members who are trained and qualified to use such equipment.

8.10.12 Fire department companies or crews that provide support to law enforcement agency special weapons and tactics (SWAT) operations shall receive special training.

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8.10.12.1 Special standard operating procedures shall be developed that describe the training and safety of these fire department crews for such operations.

8.10.12.2 These activities shall be considered as special operations for the purpose of this standard.

8.11 Post-Incident Analysis.

8.11.1 The fire department shall establish requirements and standard operating procedures for a standardized post-incident analysis of significant incidents or those that involve serious injury or death to a fire fighter.

8.11.2 The fire department incident safety officer shall be involved in the post-incident analysis as defined in NFPA 1521, *Standard for Fire Department Safety Officer.*

8.11.3 The analysis shall conduct a basic review of the conditions present, the actions taken, and the effect of the conditions and actions on the safety and health of members.

8.11.4 The analysis shall identify any action necessary to change or update any safety and health program elements to improve the welfare of members.

8.11.5 The analysis process shall include a standardized action plan for such necessary changes.

8.11.5.1 The action plan shall include the change needed and the responsibilities, dates, and details of such actions.

Chapter 9 Facility Safety

9.1 Safety Standards.

9.1.1* All fire department facilities shall comply with all legally applicable health, safety, building, and fire code requirements.

9.1.2 Fire departments shall provide facilities for disinfecting, cleaning, and storage in accordance with NFPA 1581, *Standard on Fire Department Infection Control Program.*

9.1.3* All fire stations and fire department facilities shall comply with NFPA *101, Life Safety Code.*

9.1.3.1 Approved smoke detectors shall be installed outside every sleeping area in the immediate vicinity of the bedrooms and on all levels of the station, including basements.

9.1.3.2 In buildings other than those protected throughout by an approved, supervised automatic sprinkler system installed in accordance with 30.3.5 of NFPA *101, Life Safety Code,* approved smoke detectors shall be installed in every sleeping room.

9.1.3.3 When smoke detectors activate, the general evacuation alarm signal shall operate throughout the entire building.

9.1.3.4 All existing and new fire department facilities shall have carbon monoxide detectors installed in locations in sleeping and living areas, such that any source of carbon monoxide would be detected before endangering the members.

9.1.3.5 Areas not subject to occupancy by persons who are hearing impaired shall not be required to comply with the provisions for visible signals.

9.1.4 New buildings housing emergency fire, rescue, or ambulance services shall be protected throughout by approved automatic sprinkler systems. [1:13:3.2.3]

9.1.5* The fire department shall prevent exposure to fire fighters and contamination of living and sleeping areas to exhaust emissions.

9.1.6 Any components of the protective ensemble that are contaminated shall not be allowed in sleeping and living areas.

9.1.7 All fire department facilities shall be designated smoke free.

9.1.8* Stations utilizing poles to provide rapid access to lower floors shall ensure that the area around the pole hole is secured by means of a cover, enclosure, or other means to prevent someone from accidentally falling through the pole hole.

9.2 Inspections.

9.2.1 All fire department facilities shall be inspected at least annually to provide for compliance with Section 9.1. *(See Annex F.)*

9.2.2 Inspections shall be documented and recorded.

9.2.3 All fire department facilities shall be inspected at least monthly to identify and provide correction of any safety or health hazards.

9.3* Maintenance and Repairs. The fire department shall have an established system to maintain all facilities and to provide prompt correction of any safety or health hazard or code violation.

Chapter 10 Medical and Physical Requirements

10.1 Medical Requirements.

10.1.1 Candidates shall be medically evaluated and qualified for duty by the fire department physician.

10.1.2 Medical evaluations shall take into account the risks and the functions associated with the individual's duties and responsibilities.

10.1.3 Candidates and members who will engage in fire suppression shall meet the medical requirements specified in NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments.*

10.1.4 Fire departments that operate their own fixed wing or rotary aircraft shall require fire department pilots who perform fire-fighting operations from the air to maintain a commercial Class 1 medical examination in conformance with Federal Aviation Agency (FAA) regulations for commercial pilots.

10.1.5* Members who are under the influence of alcohol or drugs shall not participate in any fire department operations or other duties.

10.2 Physical Performance Requirements.

10.2.1* The fire department shall develop physical performance requirements for candidates and members who engage in emergency operations.

10.2.2 Candidates shall be qualified as meeting the physical performance requirements established by the fire department prior to entering into a training program to become a fire fighter.

10.2.3 Members who engage in emergency operations shall be annually qualified as meeting the physical performance requirements established by the fire department.

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10.2.4 Members who do not meet the required level of physical performance shall not be permitted to engage in emergency operations.

10.2.5 Members who are unable to meet the physical performance requirements shall enter a physical performance rehabilitation program to facilitate progress in attaining a level of performance commensurate with the individual's assigned duties and responsibilities.

10.3 Health and Fitness.

10.3.1 The fire department shall establish and provide a health and fitness program that meets the requirements of NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Department Members*, to enable members to develop and maintain a level of fitness that allows them to safely perform their assigned functions.

10.3.2 The maintenance of fitness levels specified in the program shall be based on fitness standards determined by the fire department physician that reflect the individual's assigned functions and activities and that are intended to reduce the probability and severity of occupational injuries and illnesses.

10.3.3 The fire department health and fitness coordinator shall administer all aspects of the physical fitness and health enhancement program.

10.3.4 The health and fitness coordinator shall act as a direct liaison between the fire department physician and the fire department in accordance with NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments.*

10.4 Confidential Health Data Base.

10.4.1* The fire department shall ensure that a confidential, permanent health file is established and maintained on each individual member.

10.4.2 The individual health file shall record the results of regular medical evaluations and physical performance tests, any occupational illnesses or injuries, and any events that expose the individual to known or suspected hazardous materials, toxic products, or contagious diseases.

10.4.3* Health information shall be maintained as a confidential record for each individual member as well as a composite data base for the analysis of factors pertaining to the overall health and fitness of the member group.

10.4.4* If a member dies as a result of occupational injury or illness, autopsy results, if available, shall be recorded in the health data base.

10.5 Infection Control.

10.5.1* The fire department shall actively attempt to identify and limit or prevent the exposure of members to infectious and contagious diseases in the performance of their assigned duties.

10.5.2 The fire department shall operate an infection control program that meets the requirements of NFPA 1581, *Standard on Fire Department Infection Control Program.*

10.6 Fire Department Physician.

10.6.1 The fire department shall have an officially designated physician who shall be responsible for guiding, directing, and advising the members with regard to their health and fitness for various duties.

10.6.2 The fire department physician shall provide medical guidance in the management of the occupational safety and health program.

10.6.3* The fire department physician shall be a licensed medical doctor or osteopathic physician qualified to provide professional expertise in the areas of occupational safety and health as they relate to emergency services.

10.6.4* The fire department physician shall be readily available for consultation and to provide professional services on an urgent basis.

10.6.4.1 Availability shall be permitted to be accomplished by providing access to a number of qualified physicians.

10.6.5 The fire department shall require that the health and safety officer and the health fitness coordinator maintain a liaison with the fire department physician to ensure that the health maintenance process for the fire department is maintained.

10.7 Fitness for Duty Evaluations.

10.7.1 Fire departments shall establish a process to evaluate the ability of a member to perform essential job functions.

10.7.2 The process to evaluate the fitness of a member to perform essential job functions shall be conducted by a qualified person and confirmed by the fire department physician.

10.7.3 When a member is determined to be unable to perform the essential job functions, the member shall be provided assistance, treatment, or both that is intended to return the member to a condition that will allow him or her to perform the essential job functions.

10.7.4 A member who has been determined to be unable to perform the essential job functions will only be returned to duty when a qualified person has confirmed that the member can perform the essential job functions.

Chapter 11 Behavioral Health and Wellness Programs

11.1* Behavioral Health Program.

11.1.1* The fire department shall provide access to a behavioral health program for its members and their immediate families.

11.1.1.1 The behavioral health assistance program shall include the capability to provide assessment, basic counseling, stress crisis intervention assistance, and triage and assessment regarding, at a minimum, alcohol and substance abuse, stress and anxiety, depression, and personal problems that adversely affect fire department work performance.

11.1.2* The behavioral health program shall, when clinically indicated, refer members and their immediate families for appropriate clinical and specialty care from providers equipped to deliver evidence-based treatment consistent with current best practices and standards of care.

11.1.3* The fire department shall adopt and follow clear, written policies regarding alcoholism, substance abuse, and other behavioral conditions that can adversely affect performance or fitness for duty, or both.

11.1.3.1 When fitness for duty is in question, such fitness shall be evaluated and determined in accordance with Section 10.7.

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11.1.4* The fire department shall adopt and follow clear, written policies consistent with applicable statutes, regulations, and standards respecting records, confidentiality, data gathering and reporting, and protection and release of privileged information related to its behavioral health program.

11.1.4.1 These policies shall identify to whom and under what conditions information can be released and what use, if any, can be made of records for purposes of research, program evaluation, and quality assurance.

11.1.5 Member records maintained by a behavioral health program shall not become part of a member's personnel file.

11.1.6 The program shall be systematically reviewed on a regular basis to provide an objective evaluation of operation and performance.

11.2 Wellness Program.

11.2.1* The wellness program shall provide prevention strategies and health promotion activities related to identified risk factors for fire fighter health and safety.

11.2.2* The wellness program shall, wherever possible, employ prevention strategies and programs supported by peer-reviewed, published research for which published empirical research supports their safety and efficacy.

11.2.2.1 The fire department shall provide a smoking/tobacco use cessation program.

Chapter 12 Occupational Exposure to Atypically Stressful Events

12.1* General.

12.1.1 The fire department physician shall maintain medical oversight of all clinical aspects of the program.

12.1.2* The fire department shall adopt and utilize a written policy outlining its protocols to address occupational exposure to atypically stressful events.

12.1.3 Protocols shall clearly outline assistance and intervention available to affected members.

12.1.3.1 Participation in clinically related interventions shall be voluntary and at the member's election.

12.1.3.2 Assessment of potential for sustained clinical impact shall be available through the fire department's behavioral health program.

12.1.3.3* Where specialty treatment is indicated, referral shall be made to licensed and certified specialists competent to provide evidence-based treatment consistent with current best practices and standards of care as established by authoritative guidelines.

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.1.2.3 It is possible that an existing program or policy can satisfy the requirements of this standard; if so, it can be adopted in whole or in part in order to comply with this standard. Examples of such existing programs and policies can be a mandatory SCBA rule, seat belt rule, corporate safety program, or municipal employee assistance program. The achievement of these objectives is intended to help prevent accidents, injuries, and exposures and to reduce the severity of those accidents, injuries, and exposures that do occur. They will also help to prevent exposure to hazardous materials and contagious diseases and to reduce the probability of occupational fatalities, illnesses, and disabilities affecting fire service personnel.

A.1.4.1 In no case should the equivalency afford less competency of members or safety to members than that which, in the judgment of the authority having jurisdiction, would be provided by compliance with meeting the requirements of Chapter 5.

A.1.5.1 The specific determination of the authority having jurisdiction depends on the mechanism under which this standard is adopted and enforced. Where the standard is adopted voluntarily by a particular fire department for its own use, the authority having jurisdiction should be the fire chief or the political entity that is responsible for the operation of the fire department. Where the standard is legally adopted and enforced by a body having regulatory authority over a fire department, such as the federal, state, or local government or a political subdivision, this body is responsible for making those determinations as the authority having jurisdiction. The plan should take into account the services the fire department is required to provide, the financial resources available to the fire department, the availability of personnel, the availability of trainers, and such other factors as will affect the fire department's ability to achieve compliance.

A.1.5.2 For a fire department to evaluate its compliance with this standard, it must develop some type of logical process. The worksheet in Annex B (Figure B.2) illustrates one way that an action plan can be developed to determine code compliance.

This standard is intended to be implemented in a logical sequence, based upon a balanced evaluation of economic as well as public safety and personnel safety factors. The compliance schedule request assures that risk is objectively assessed and reasonable priorities set toward reaching compliance. Interim compensatory measures are intended to assure that safety action is being addressed until full compliance is reached and formally adopted into the fire department organization's policies and procedures. This can include, but is not limited to, increased inspections, testing, temporary suspension or restriction of use of specific equipment, specialized training, and administrative controls.

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 pub-

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lic 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.3.3.3 Air Transfer. Air is allowed to flow from the cylinder with a higher pressure to the cylinder with a lower pressure until the pressure equalizes, at which time the transfer line is disconnected between the two cylinders.

A.3.3.4 Aircraft Rescue and Fire Fighting. Such rescue and fire-fighting actions are performed both inside and outside of the aircraft.

A.3.3.5.1 Hazardous Atmosphere. A hazardous atmosphere can be immediately dangerous to life and health.

A.3.3.8 Candidate. In an employment context, the Americans with Disabilities Act (discussed in further detail in Annex B of NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*) requires that any medical examination to be conducted take place after an offer of employment is made and prior to the commencement of duties. Therefore, in the employment context, the definition of *candidate* should be applied so as to be consistent with that requirement. Volunteer fire fighters have been deemed to be "employees" in some states or jurisdictions. Volunteer fire departments should seek legal counsel as to their legal responsibilities in these matters.

A.3.3.10 Chemical Flash Fire. A policy of wearing protective clothing is needed that recognizes the significant threat to fire fighters who can be exposed to flash fires in either structural fire-fighting or hazardous materials environments. It is hoped that fire fighters utilize awareness training on burn injuries caused by the ignition of the environment. There is a distinct difference between chemical flash fires and flashovers occurring in structural fire-fighting environments.

Flashover is a phenomenon that generates temperatures in the range of 1200°F to 1500°F (650°C to 815°C). A chemical flash fire requires an ignition source and a chemical atmosphere that contains a concentration above the lower explosive limit (LEL) of the chemical. Chemical flash fires generate heat from 1000°F to 1900°F (540°C to 1040°C). As a rule, a structural fire flashover is confined to a designated area with walls as a boundary. The size of a chemical flash fire depends on the size of the gas or vapor cloud and, when ignited, the flame front expands outward in the form of a fireball. The resulting effect of the fireball's energy with respect to radiant heat significantly enlarges the hazard areas around the gas released. [**1991,** 2005]

A.3.3.12 Clear Text. Ten codes or agency-specific codes should not be used when using clear text.

A.3.3.16 Company. For fire suppression, jurisdictions exist where the response capability of the initial arriving company is configured with the response of two apparatus. In some jurisdictions, apparatus is not configured with seated and belted positions for four personnel and therefore would respond with an additional vehicle in consort with the initial arriving engine to carry additional personnel. This response would be to ensure that a minimum of four personnel are assigned to and deployed as a company. The intent of this definition and the requirements in the standard is to ensure that these two (or more) pieces of apparatus would always be dispatched and respond together as a single company. Some examples of this include the following:

(1) Engine and tanker/tender that would be responding outside a municipal water district
(2) Multiple-piece company assignment, specified in a fire department's response standard operating procedures, such as an engine company response with a pumper and a hose wagon
(3) Engine with a vehicle personnel carrier
(4) Engine with an ambulance or rescue unit

Company, as used in this standard, is synonymous with company unit, response team, crew, and response group, rather than a synonym for a fire department.

A.3.3.17 Confined Space. Additionally, a confined space is further defined as having one or more of the following characteristics:

(1) The area contains or has a potential to contain a hazardous atmosphere, including an oxygen-deficient atmosphere.
(2) The area contains a material with a potential to engulf a member.
(3) The area has an internal configuration such that a member could be trapped by inwardly converging walls or a floor that slopes downward and tapers to a small cross section.
(4) The area contains any other recognized serious hazard.

A.3.3.21 Cryogenic Liquid. Cryogenic liquids include, but are not limited to, helium, nitrogen, and oxygen. [**1991,** 2005]

A.3.3.24.1 Communicable Disease. Also known as contagious disease.

A.3.3.30 Faceshield. Faceshields should be used only in conjunction with spectacles and/or goggles.

A.3.3.34 Fire Department. The term *fire department* can include any public, governmental, private, industrial, or military organization engaging in this type of activity.

A.3.3.35 Fire Department Facility. This does not include locations where a fire department can be summoned to perform emergency operations or other duties, unless such premises are normally under the control of the fire department.

A.3.3.37.1 Proximity Fire Fighting. Specialized thermal protection from exposure to high levels of radiant heat, as well as thermal protection from conductive and convective heat, is necessary for persons involved in such operations due to the scope of these operations and the close distance to the fire at which these operations are conducted, although direct entry into flame is *not* made. These operations usually are exterior operations but could be combined with interior operations. Proximity fire fighting is not structural fire fighting but could be combined with structural fire-fighting operations.

A.3.3.39 Fire Suppression. Fire suppression includes all activities performed at the scene of a fire incident or training exercise that expose fire department members to the dangers of heat, flame, smoke, and other products of combustion, explosion, or structural collapse.

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A.3.3.40 Flame Resistance (Protective Apparel). Flame resistance can be an inherent property of the textile material, or it can be imparted by specific treatment.

A.3.3.42 Hazard. Hazards include the characteristics of facilities, equipment, systems, property, hardware, or other objects and the actions and inactions of people that create such hazards.

A.3.3.48 Health and Safety Officer. This individual can be the incident safety officer, or that can also be a separate function.

A.3.3.55 Incident Management System (IMS). The system is also referred to as an incident command system (ICS).

A.3.3.56 Incident Safety Officer. The incident safety officer can have assistants.

A.3.3.58 Infection Control Program. This program includes, but is not limited to, implementation of written policies and standard operating procedures regarding exposure follow-up measures, immunizations, members' health screening programs, and educational programs.

A.3.3.63 Liquefied Gas. Examples of liquefied gases include, but are not limited to, ammonia, 1,2-butadiene, chlorine, ethylene oxide, hydrogen chloride, liquefied petroleum gas, and methyl chloride. Testing in NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*, is only conducted for a limited number of liquefied gases. Users should consult the technical data package to determine which liquefied gases have been tested with the suit's primary materials. [**1991,** 2005]

A.3.3.64 Member. A fire department member can be a full-time or part-time employee or a paid or unpaid volunteer, can occupy any position or rank within the fire department, and can engage in emergency operations.

A.3.3.71.1 Defensive Operations. Defensive operations are generally performed from the exterior of structures and are based on a determination that the risk to personnel exceeds the potential benefits of offensive actions.

A.3.3.71.5 Special Operations. Special operations include water rescue, extrication, hazardous materials, confined space entry, high-angle rescue, aircraft rescue and fire fighting, and other operations requiring specialized training.

A.3.3.73 Particulates. Particulates do not include aerosols or suspended liquid droplets in air. Aerosols are considered liquids.

A.3.3.77 Protective Ensemble. The elements of the protective ensemble are coats, trousers, coveralls, helmets, gloves, footwear, and interface components.

A.3.3.80 Rapid Intervention Crew/Company (RIC). Emergency services personnel respond to many incidents that present a high risk to personnel safety. Departments in compliance with OSHA 29 CFR 1910.134, *Respiratory protection*, must have a minimum of two persons on-scene, fully equipped when members are operating in an IDLH or potentially IDLH atmosphere. The primary purpose is the rescue of injured, lost, or trapped fire fighters. Departments utilizing an incident management system in accordance with NFPA 1561, *Standard on Emergency Services Incident Management System*, or 29 CFR 1910.120, *Hazardous waste operations and emergency response*, along with a personnel accountability system have incorporated the RIC into their management system. Many departments have redefined their response plans to include the dispatch of an additional company (engine, rescue, or truck) to respond to incidents and stand by as the RIC. Incident commanders can assign additional RICs based on the size and complexity of the incident scene. In some departments they can also be known as a rapid intervention team. At wildland incidents this would be addressed through the planning process and contingency planning.

A.3.3.84 Respiratory Protection Equipment (RPE). Examples are filter respirators, chemical cartridge or canister respirators, air-line respirators, powered air-purifying respirators, and self-contained breathing apparatus.

A.3.3.92 Spectacles. Safety glasses are an example of spectacles.

A.4.1.1 The organizational statement is a very important basis for many of the provisions of this standard. The statement sets forth the legal basis for operating a fire department, the organizational structure of the fire department, number of members, training requirements, expected functions, and authorities and responsibilities of various members or defined positions.

A key point is to clearly set out the specific services the fire department is authorized and expected to perform. Most fire departments are responsible to a governing body. The governing body has the right and should assert its authority to set the specific services and the limits of the services the fire department will provide and has the responsibility to furnish the necessary resources for delivery of the designated services. The fire department should provide its governing body with a specific description of each service with options or alternatives and with an accurate analysis of the costs and resources needed for each service.

Such services could include structural fire fighting, wildland fire fighting, airport/aircraft fire fighting, emergency medical services, hazardous materials response, high-angle rescue, heavy rescue, and others.

Spelling out the specific parameters of services to be provided allows the fire department to plan, staff, equip, train, and deploy members to perform these duties. It also gives the governing body an accounting of the costs of services and allows it to select those services they can afford to provide. Likewise, the governing body should identify services it cannot afford to provide and cannot authorize the fire department to deliver, or it should assign those services to another agency.

The fire department should be no different from any other government agency that has the parameters of its authority and services clearly defined by the governing body.

Legal counsel should be used to assure that any statutory services and responsibilities are being met.

The majority of public fire departments are established under the charter provisions of their governing body or through the adoption of statutes. These acts define the legal basis for operating a fire department, the mission of the organization, the duties that are authorized and expected to be performed, and the authority and responsibilities that are assigned to certain individuals to direct the operations of the fire department.

The documents that officially establish the fire department as an identifiable organization are necessary to determine specific responsibilities and to determine the parties responsible for compliance with the provisions of this standard.

In many cases, these documents could be a part of state laws, a municipal charter, or an annual budget. In such cases, it would be appropriate to make these existing documents part of the organizational statement, if applicable.

In cases other than governmentally operated public fire departments, there is a need to formally establish the existence of the organization through the adoption of a charter, the approval of a constitution or articles of incorporation, or some equivalent official action of an authorized body. A fire

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department that operates entirely within the private sector, such as an industrial fire department, could legally establish and operate a fire protection organization by the adoption of a corporate policy as described in the organizational statement.

In addition to specifically defining the organization that is expected to comply with this standard, 4.1.1 requires that the organizational structure, membership, expected functions, and training requirements be contained in documents that are accessible for examination. These requirements are intended to reinforce the fact that the fire department is an identifiable organization that operates with known and specific expectations.

Where a fire department functions as a unit of a larger entity, such as one of several municipal departments or a particular unit of a private corporation, the larger organization is often able to provide some of the same elements that are required to be provided by the fire department. This would satisfy the requirements for the fire department to provide those elements.

A.4.1.2 Additional information on fire department organization and operations can be found in Section 7 of the NFPA *Fire Protection Handbook* and in Chapter 4 of *Managing Fire and Rescue Services*, published by the International City/County Management Association.

A.4.1.4 They should be done in accordance with NFPA 1620, *Standard for Pre-Incident Planning*, to provide assistance to responding personnel in effectively managing emergencies for the protection of occupants, responding personnel, property, and the environment.

A.4.1.4.1 They should be done in accordance with NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations.*

A.4.2.1 The risk management plan should consider all fire department operations, the duties and responsibilities of members (uniform and civilian), and policies and procedures. The risk management plan should include goals and objectives to ensure that the risks associated with the daily operations of the fire department are identified and effectively managed.

For additional guidance on the development of a risk management plan, see NFPA 1250, *Recommended Practice in Fire and Emergency Services Organization Risk Management.*

A.4.2.3 The entire risk management decision-making process can be summarized as follows:

(1) Identify or recognize
(2) Evaluate
(3) Establish priorities for action
(4) Act and control
(5) Monitor and re-evaluate

Discussions about frequency and risk arise in the evaluation phase. What are the real or potential risks in terms of frequency and severity to fire department members? How will the organization develop effective control measures to ensure a safe work environment for all members?

Since no two fire departments are alike, there is no standard scale to measure and evaluate frequency and risk. Some fire departments will have a greater or lesser degree of tolerance for risk than others. The intent of the risk management process is for a fire department to develop a standard level of safety. This standard level of safety defines the parameters of the acceptable degree of risk for which members perform their job functions.

By definition, frequency is how often something does, or might, happen. Risk is a measure of the consequences if an undesirable event occurs. There are many factors that enter into the risk discussion, including cost, time lost from work, loss of use of resources, inability to deliver services, and fewer services available. Each risk will have its own set of factors that will dictate how the fire department will try to determine how severe the consequences might be.

This scale is used to establish the degree of priority. Priority of the risk is in direct relation to inherent risks that have had a harmful effect on the department and its members.

A primary purpose of the risk management plan is to focus efforts on incidents that might not occur very often (low frequency) but that could have severe consequences associated with them (high risk). The reason for the focus on low frequency/high risk incidents is that since they do not occur on a frequent basis, responders might not be as prepared to deal with them, and the outcomes can be harmful or detrimental to fire fighters. Examples of low frequency/high risk events could include high rise fires, technical rescues, multi-alarm fires, or mass casualty incidents.

There are two factors that will ensure that a low frequency/high risk event will be successful. The first factor is an aggressive training program. Every day is a training day. With an aggressive training program, this will ensure the successful outcome of an incident. The second factor is rapid prime decision making. Personnel, through training and continuous retraining, have the necessary knowledge, skills, and abilities (KSA) to ensure the successful outcome of a low frequency/high risk incident.

Figure A.4.2.3 illustrates the relationship between frequency and risk, and emphasizes the importance of addressing low frequency/high risk incidents.

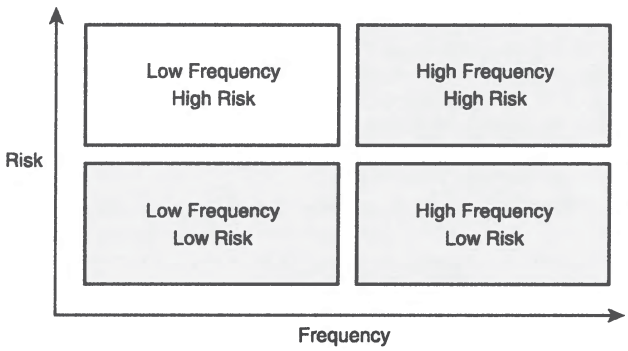

FIGURE A.4.2.3 Risk and Frequency Graph.

A.4.3.1 The following is an example of a safety policy statement:

It is the policy of the fire department to provide and to operate with the highest possible levels of safety and health for all members. The prevention and reduction of accidents, injuries, and occupational illnesses are goals of the fire department and shall be primary considerations at all times. This concern for safety and health applies to all members of the fire department and to any other persons who could be involved in fire department activities.

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A.4.3.3 Experience has shown that there is often a significant difference between a written occupational safety and health program and the actual program that has been implemented. Periodic evaluations are one method the fire chief can use to measure how the program is being conducted. This evaluation should be conducted by a qualified individual from outside of the fire department, because outside evaluators provide a different perspective, which can be constructive. Outside evaluators could include municipal risk managers, safety directors, consultants, insurance carrier representatives, fire chiefs, safety officers, or others having knowledge of fire department operations and occupational safety and health program implementation.

A.4.4.3 The responsibility for establishing and enforcing safety rules and regulations rests with the management of the fire department. Enforcement implies that appropriate action, including disciplinary measures if necessary, will be taken to ensure compliance. A standard approach to enforcement should address both sanctions and rewards. All fire department members should recognize and support the need for a standard regulatory approach to safety and health. In addition to the management responsibilities, an effective safety program requires commitment and support from all members and member organizations.

A.4.4.5 The importance of investigating accidents to personnel, equipment, or vehicles in relation to the prevention of reoccurring accidents is time-proven. However, the occurrence of an accident is, fortunately, relatively rare considering the amount of action carried out by fire service members. Relying solely on accident data to prescribe safety procedures is analogous with closing the birdcage after the bird has escaped.

Compared to the actual number of accidents reported, a host of incidents known as near-misses occur. The philosophy of investigating near-miss incidents deserves merit. There are countless "almost-accidents" that occur every day.

In an effort to truly prevent more accidents, and to effectively manage the safety of the personnel, near-miss incidents should be documented and quantified to truly determine the exposures to risk that people, equipment, and vehicles are exposed to each day. These incident investigations begin with a culture that readily accepts near-miss incident reports without penalty or ridicule. A system should also be in place to investigate the near-miss incident to determine the causal factors involved. Examples can include human error, lack of education or training, lack of familiarity with or operation of equipment, or equipment malfunctions or design shortcomings.

Managing the infinite possibilities of near-miss incidents and accidents is laborious and seems overwhelming. Attention to the risks measured in the workplace and investigation into the potential incidents and accidents is, arguably, the beginning of an effective safety process.

See also A.4.4.3.

A.4.4.5.4 The National Fire Fighter Near-Miss Reporting System is a voluntary, confidential, non-punitive, and secure reporting system with the goal of improving fire fighter safety. Submitted reports are available at www.firefighternearmiss.com and should be reviewed by members.

A.4.5.1 One of the most important provisions for improving the safety and health of the fire service is through an official organizational structure that has the support of the members and the fire department management. Without official recognition and support, safety and health committees could be ineffective showpieces, lack authority, or be dominated by particular interests. To avoid such situations, it is recommended that a safety and health committee be composed of equal numbers of fire department management representatives and member representatives. Specific areas of responsibility of the joint safety and health committee should be outlined in detail through written procedures or contractual negotiation.

A.4.5.3 The requirement in 4.5.3.1 for one regularly scheduled meeting every 6 months is intended as a minimum. Committee meetings should be held as often as necessary to deal with the issues confronting the group. The written minutes of each meeting should be distributed and posted in a conspicuous place in each fire station so that all members can be aware of issues under discussion and actions that have been taken.

A.4.6.1 The data collection system for accidents, injuries, illnesses, exposures, and deaths should provide both incident-specific information for future reference and information that can be processed in studies of morbidity, mortality, and causation. The use of standard coding as provided by NFPA 901, *Standard Classifications for Incident Reporting and Fire Protection Data*, will allow compatibility with national and regional reporting systems.

A.4.6.4 See NFPA 1401, *Recommended Practice for Fire Service Training Reports and Records*, for further information and guidance.

A.5.1.1 The primary goal of all training, education, and professional development programs is the reduction of occupational injuries, illnesses, and fatalities. As members progress through various job duties and responsibilities, the department should ensure the introduction of the necessary knowledge, skills, and abilities to members who are new in their job titles, as well as ongoing development of existing skills.

These programs should include information to ensure that members are trained prior to performing individual duties, as well as ongoing professional development to ensure competency.

Training programs should include but not be limited to the following:

(1) Community risk reduction (fire prevention, public education, investigation, etc.)
(2) Health and safety
(3) Fire suppression
(4) Emergency medical
(5) Human resources (leadership, supervision, interpersonal dynamics, equal employment opportunity, etc.)
(6) Incident management system
(7) Hazardous materials
(8) Technical rescue
(9) Information systems and computer technology
(10) Position-specific development (fire fighter, company officer, chief officer, telecommunicator, investigator, inspector, driver/operator, etc.)

A.5.1.4 The use of a structured on-the-job training (OJT) program with close supervision can assist fire departments to utilize new members in non-IDLH environments during emergency operations.

A.5.1.8 For maintenance of structural and proximity PPE refer to NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*. Departments should develop a training schedule that, at minimum, should include training for new fire fighters and for all members when there is a change in equipment.

A.5.2.2 Statistics presented by the National Fire Protection Association (NFPA) and the United States Fire Administration (USFA) indicate an alarming trend in the increased number

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of fire fighter fatalities and injuries associated with vehicle operations. Fire departments respond with a variety of apparatus, and the members operating this apparatus must have the appropriate knowledge, skills, and abilities to operate this apparatus.

The first step in this process is to properly train and educate members on the various types of apparatus they could be required to operate. NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program*, provides the curriculum for members to develop the necessary knowledge, skills, and abilities to meet the requirements of 5.2.2. The second step is to ensure that the fire department performs an annual proficiency evaluation of all drivers/operators as required by Section 5.5. Also, the training and education should address the standard operating procedures associated with vehicle operations, especially emergency response.

These are necessary components of the department's plan to reduce the risks associated with vehicle operations. This is a systems approach to ensure the safety and health of members and the citizens they serve.

A.5.2.6 In the United States, federal regulations require a minimum amount of training for fire service personnel who respond to hazardous materials incidents. These requirements can be found in 29 CFR 1910.120, *Hazardous waste operations and emergency response* (OSHA), and in 40 CFR 311, *Worker protection* (EPA). These regulations affect all fire departments in the United States whether full-time career, part-time, combination career and volunteer, or fully volunteer. These regulations apply in all states and not just in those states with federally approved state OSHA programs.

In the U.S. federal regulations, First Responder Operations Level is defined as follows:

"First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposure. First responders at the operational level shall have received at least 8 hours of training or have had sufficient experience to objectively demonstrate competency in the following areas in addition to those listed in the awareness level and the employer shall so certify:

(1) Knowledge of the basic hazard and risk assessment techniques
(2) Knowing how to properly select and use proper personal protective equipment provided to the First Responder Operations Level
(3) An understanding of basic hazardous materials terms
(4) Knowing how to perform basic control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit
(5) Knowing how to implement basic decontamination procedures
(6) An understanding of the relevant standard operating procedures and termination procedures"

The First Responder Operations Level in both the U.S. federal regulations and NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, is similar. Whereas the U.S. federal regulations (29 CFR 1910.120 or 40 CFR 311) govern the fire service in every state in the United States, the minimum level of training for all fire fighters must be the First Responder Operations Level.

A.5.3.1 In order to ensure compliance with the minimum requirements of NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, fire department training programs should be accredited by a training organization such as a state fire training agency. In addition, NFPA 1405, *Guide for Land-Based Fire Departments That Respond to Marine Vessel Fires*, provides recommended guidelines for those members who respond to marine vessel fires.

A.5.3.5 The essence of any successful respiratory protection training program is the establishment of written operational policies and the reinforcement of those policies through comprehensive training.

The AHJ should ensure that each member demonstrates knowledge of at least the following:

(1) Why respiratory protection equipment (RPE) is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator
(2) What the limitations and capabilities of the RPE are
(3) How to use the RPE effectively in emergency situations, including situations in which the RPE malfunctions
(4) How to inspect, put on and remove, use, and check the seals of the facepiece
(5) What the procedures are for maintenance and storage of the respiratory protection equipment
(6) How to recognize medical signs and symptoms that can limit or prevent the effective use of RPE
(7) The requirements of Section 7.10

A.5.3.7 Several accidents have occurred where smoke bombs or other smoke-generating devices that produce a toxic atmosphere have been used for training exercises. Where training exercises are intended to simulate emergency conditions, smoke-generating devices that do not create a hazard are required.

A.5.3.8 Fire departments can utilize instructors who are not necessarily trained and/or certified to the requirements of NFPA 1041, *Standard for Fire Service Instructor Professional Qualifications*. However, in using these instructors they should ensure that they are familiar with the fire department, its organization, and its operations and, in addition, are qualified in that particular area of expertise.

A.5.3.9 Members can be trained and/or certified at the local, state, or national level in basic life support (BLS) or advanced life support (ALS). Jurisdictions can require specialty skills within certain levels.

A.5.3.10 To reduce the risk of an injury or illness members should wear protective ensemble elements that are suitable and appropriate and maintained in a clean and serviceable condition. Members should exercise caution when wearing personal clothing, accessories, or personal equipment items that these items do not adversely affect the performance of the protective ensemble or ensemble element. It is recommended that clothing meeting the requirements of NFPA 1975, *Standard on Station/Work Uniforms for Emergency Services*, be worn whenever possible. Clothing that can melt, drip, burn, shrink, transmit heat, or ignite should not be worn. For care and maintenance of structural and proximity PPE, refer to NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*.

To avoid the possibility of injury or burns, members should wear clothing made of material that will provide the best protective levels available. It is recommended that Nomex or

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other fire-resistant clothing be worn whenever possible. Clothing that can melt, drip, burn, shrink, transmit heat, or ignite should not be worn.

A.5.5.3 An annual skills check should address the professional qualification specific to a member's assignment and duty expectation. As an example, a fire fighter is checked for skills required by NFPA 1001, *Standard for Fire Fighter Professional Qualifications.* A driver/operator would be checked for skills required by NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications.*

A.6.1.1 It is recommended that only apparatus that were designed and manufactured to meet the 1991 or later editions of the NFPA fire apparatus standards or that have been refurbished in accordance with NFPA 1912, *Standard for Fire Apparatus Refurbishing,* to meet the 1991 or later editions of the NFPA fire apparatus standards be permitted to operate in first-line service. This will ensure that, while the apparatus might not totally comply with the current edition of the automotive fire apparatus standards, many of the improvements and upgrades required by the standards since 1991 are available for the fire fighters who use the apparatus.

It is recommended that an apparatus manufactured prior to 1991 that is less than 25 years old, that has been properly maintained, and that is still in serviceable condition be placed in reserve status and upgraded to incorporate as many features of the post-1991 fire apparatus as possible. Apparatus not manufactured to NFPA fire apparatus standards or that is over 25 years old should be replaced.

See Annex D of NFPA 1901, *Standard for Automotive Fire Apparatus,* for more complete guidelines for first-line and reserve fire apparatus.

A.6.1.1.1 Information regarding ambulance specifications can be found in the current U.S. Federal Government General Services Administration's Federal Specification for the "Star-of-Life Ambulance," KKK-A-1822E.

A.6.1.5 The means of holding the item in place or the compartment should be designed to minimize injury to persons in the enclosed area of the fire apparatus or patient compartment of an ambulance. Loose equipment during the event of a crash, a rapid deceleration, or a rapid acceleration can be the cause of serious injury or the crash of the apparatus.

A.6.2.1 NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program,* can be used to meet the requirements of an "approved driver training program."

A.6.2.2 The determination of driver's license requirements is a function of a particular authority in each location. This agency can be a state or provincial Department of Transportation or an equivalent agency. Other authorities, such as military branches, have the authority to issue permits to operate their vehicles. It is a responsibility of the fire department to determine the requirements that apply in each situation and for each class of vehicle.

A.6.2.3 Policies should be enacted to limit unnecessary and inappropriate emergency response, as a means of reducing the risk of accidents involving emergency vehicles.

A.6.2.4 The driver of any vehicle has legal responsibility for its safe and prudent operation at all times. While the driver is responsible for the operation of the vehicle, the officer is responsible for the actions of the driver.

A.6.2.7 The development, implementation, and periodic review of standard operating procedures for driving any fire department vehicle is an important element in clearly identifying the fire department's policy on what is expected of drivers. Safe arrival is of prime importance. Standard operating procedures should include a "challenge and response" dialogue between the vehicle driver on an emergency response and the officer or other member in the driver compartment. The "challenge and response" dialogue should be instituted to determine the driver's intentions when approaching any perceived or identified hazard on the response route, to remind the driver of the presence of the hazard and the planned procedures for managing the hazard, and to ensure that the driver is coping with stressors encountered during the response and not focusing only on arriving at the site of the emergency.

The specific inclusion of railroad grade crossing is based upon recommendations made by the National Transportation Safety Board (NTSB) to NFPA following the 1989 investigation of a collision between a fire department pumper and a passenger train. The NTSB report states that "planning how to safely traverse grade crossings encountered en route is a necessary part of any fire company's response plan."

NTSB recommends that the following be considered when developing the plans:

If it is not practical to plan an emergency response route that avoids grade crossings, selection of crossings that are equipped with automatic warning devices is preferable to selection of those that are not. All planning should include identification of the location at the crossing from which a driver or other observer assigned to the apparatus can see the maximum available distance down the track(s) on both sides.

At crossings over a single straight track with no nearby obstructions, briefly stopping or slowing the apparatus to allow a proper scan both left and right can be sufficient. If the tracks are curved, vision is obstructed, or the crossing has more than one set of tracks where the presence of one train could hide the approach of another, sight distance can be optimized by having one or more members cross the tracks on foot and look for approaching trains.

Fire fighter fatality studies describe 10 incidents that occurred from 1984 to 2004 in which fire fighters were killed during the backing of fire apparatus. This is a significant issue that the fire service must address in terms of standard operating procedures, training programs, and implementation.

When fire apparatus is in the backing mode, standard operating procedures need to dictate that members assigned to back apparatus be in communication with the driver/operator. This can be accomplished by using the radio system, intercom system, or other means. Standard operating procedures should dictate that the apparatus not be moved until verbal and visual contact is made with the driver/operator and the backer. Also, standard operating procedures must dictate that the backer be in the line of sight with the driver/operator via the apparatus mirrors on either side of the apparatus. The intent is to ensure that the backing of fire apparatus is accomplished in a safe and effective manner.

A.6.2.7.1 Many incidents require the non-emergency response of fire apparatus. Each fire department must identify incidents that do not require the use of warning lights and sirens. Examples of non-emergency incidents can include lockouts, carbon monoxide detectors sounding, a fire reported out, assist law enforcement, backfills or move-ups, and other incidents as determined by the AHJ. The intent is to

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reduce the risk to fire department members and the citizens of the community from unnecessary harm. The response can always be upgraded to emergency response if the situation warrants based upon additional information.

Fire department water tankers (tenders) provide a mobile water supply to support fire fighting and other fire department operations. They are generally used in rural areas without fire hydrant coverage but can also be found in the fleets of many suburban and urban fire departments.

Although their number as a percent of the overall apparatus fleets is small, estimated at just 2 percent, they are involved in a disproportionate number of crashes that are fatal to fire fighters and others. A study of fire fighter fatalities from 1990 through 2000 found that fire tankers were the second most common vehicle type involved in crashes that killed fire fighters. Tankers/tenders were second only to personal vehicles in the number of fatal crashes.

The United States Fire Administration (USFA) produced a report entitled *Safe Operation of Fire Tankers* in 2003. The report (FA-248) is available free from the USFA in print and can be downloaded from the USFA web site at www.usfa.fema.gov. The report provides comprehensive information on the safe construction, use, and operation of fire department tankers/tenders. The report deals with fire apparatus with water tanks sizes of 1000 gal (3800 L) or more. The recommendations contained in the report, therefore, can apply to any piece of fire apparatus with a large water tank.

Attention to a small number of operational recommendations can make the operation of fire tankers/tenders safer for fire fighters and those that share the road with this type of apparatus.

The following recommendations should become part of standard operating procedures for departments operating tankers (tenders):

(1) Fire fighters should always wear seat belts when driving or as the passenger in any vehicle, including tankers/tenders. The fire fighter's best chance for survival is to remain with the vehicle during a crash and to be protected by the structure of the vehicle. During the period from 1990 to 2001, 82 percent of the fire fighters killed in tanker/tender crashes were not wearing seat belts.
(2) If the right-hand wheels of the apparatus leave the paved surface of the roadway for any reason, the apparatus should be slowed before attempting to return all wheels to the roadway. In 66 percent of the fatal tanker/tender crashes from 1990 to 2001, the right wheels of the apparatus left the roadway. If the vehicle is returned to the roadway surface at speed, the apparatus can veer violently to the left. Drivers then often overcompensate by steering to the right, and the apparatus either begins to roll or leaves the roadway and crashes. Slowing the vehicle prior to returning to the roadway will minimize the chances of such an event.
(3) *Slow down.* Speed was cited as a factor in 55 percent of fatal crashes of fire department tankers/tenders from 1990 to 2001. The weight of the water and the weight of the apparatus combine to make fire department tankers/tenders very heavy vehicles. They cannot stop quickly, and their handling characteristics are unlike other fire apparatus. The USFA *Safe Operation of Fire Tankers* report recommends that tankers/tenders never be operated over the posted speed limit and that they be controlled to speeds at or less than the cautionary speeds listed on yellow signs on curves.
(4) Make sure that the apparatus is up to the task. Fuel or milk tankers converted to fire department water tankers usually do not have the brake capacity or tank baffles that are needed to transport water — fuel and milk are lighter than water. The total weight of a tanker/tender should not exceed the rated capacity of the vehicle's braking system. In addition to weight concerns, tankers/tenders must be maintained in a ready state. Their mechanical systems must be checked and maintained on a regular basis.
(5) Ensure that drivers/operators have the necessary knowledge, skills, and abilities to specifically drive and operate tankers/tenders. Tankers/tenders do not operate or have the same driving characteristics as other fire apparatus. Drivers should be specifically trained on each vehicle, and untrained drivers should not be allowed to operate tankers/tenders.
(6) Drive with the tank completely full or completely empty. Even with proper baffling, a semi-full water tank will allow water to move more freely. This water movement can create control problems for the apparatus operator. If the full tank of water is not used, dump the rest of the load in a safe place and drive the tanker/tender empty until the entire tank can be filled.

A.6.2.8 Accidents at intersections contribute to both civilian and fire fighter deaths and injuries while fire department vehicles are responding to or returning from an emergency incident. Coming to a complete stop when there are any intersection hazards and proceeding only when the driver can do so safely will reduce accidents and the risk of injury or death. It is recommended that intersection control devices be installed that allow emergency vehicles to control traffic lights at intersections.

A.6.2.10 Vehicle accidents at railroad crossings have resulted in a number of deaths and injuries to fire department members. A study by NTSB concluded that a train's warning horn becomes an ineffective device for warning large vehicles or trucks unless the vehicle driver stops, idles the engine, turns off all radios, fans, wipers, and other noise-producing equipment in the cab, lowers the window, and listens for a train's horn before entering a grade crossing.

A.6.2.14 When members respond to incidents or to the fire station in their own vehicles, the operation of these vehicles is governed by all applicable traffic laws and codes as enacted by the AHJ. All members should be held strictly accountable for compliance with the applicable traffic laws and regulations as well as fire department rules, regulations, and procedures relating to emergency response. Where traffic laws and regulations allow for private vehicles to be operated as emergency vehicles, the fire department should only allow members who have met the requirements to drive fire department vehicles in an emergency mode to drive privately owned vehicles in an emergency mode.

A.6.2.14.2 For more information, see FA-220, *Firefighter Fatality Retrospective Study*, Federal Emergency Management Agency, United States Fire Administration, April 2002.

A.6.3.1 It is intended that the requirements of Section 6.3 apply to all situations when persons or members are riding on fire apparatus other than for the specific variances in 6.3.4 and 6.3.5. Included in the "seated and belted" requirement are any times the fire apparatus is traveling to, participating in, or returning from any funeral, parade, or public relations/education event. Fire fighters cannot be allowed to ride on the outside of apparatus in order to fight wildland fires. The Fire Line Safety Committee (FLSC) of the National Wildfire Coordinating Group (NWCG) represents the U.S. Forest Service, Bureau of Land

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Management, Bureau of Indian Affairs, Fish and Wildlife Agency, National Park Service, and National Association of State Foresters. Their position is that the practice of fire fighters riding on the outside of vehicles and fighting wildland fires from these positions is very dangerous, and they strongly recommend this not be allowed. One issue is the exposure to personnel in unprotected positions. Persons have been killed while performing this operation. Also, the vehicle driver's vision is impaired. The second issue is that this is not an effective way to extinguish the fire, as it can allow the vehicle to pass over or by areas not completely extinguished. Fire can then flare up underneath or behind the vehicle and could cut off escape routes. The FLSC and the NWCG strongly recommend that two fire fighters, each with a hose line, walk ahead and aside of the vehicle's path, both fire fighters on the same side of the vehicle (not one on each side), in clear view of the driver, with the vehicle being driven in uninvolved terrain. This allows the fire fighters to operate in an unhurried manner, with a clear view of fire conditions and the success of the extinguishment. Areas not extinguished should not be bypassed unless follow-up crews are operating behind the lead unit and there is no danger to escape routes or to personnel.

A.6.3.3 There are instances in which members need to provide emergency medical care while the vehicle is in motion. In some situations, the provision of such medical care would not allow the members to remain seated and secured to the vehicle. Such situations, while they occur infrequently, could include performing chest compressions during cardiopulmonary resuscitation (CPR). If a vehicle accident were to occur while an unsecured member was performing necessary emergency medical care, there would be substantial risk of injury to the member.

A.6.3.4 The following recommendations will assist the user in implementing 6.3.4:

(1) Hose loading procedures should be specified in a written standard operating procedure that includes at least the safety conditions listed in A.6.3.4(2) through A.6.3.4(7). All members involved in the hose loading should have been trained in these procedures.
(2) There should be a member, other than those members loading hose, assigned as a safety observer. The safety observer should have an unobstructed view of the hose loading operation and be in visual and voice contact with the apparatus operator.
(3) Non–fire department vehicular traffic should be excluded from the area or should be under the control of authorized traffic control persons.
(4) The fire apparatus can be driven only in a forward direction at a speed of 5 mph (8 kmph) or less.
(5) No members should be allowed to stand on the tailstep, sidesteps, running boards, or any other location on the apparatus while the apparatus is in motion.
(6) Members should be permitted to be in the hose bed but should not stand while the apparatus is in motion.
(7) Prior to the beginning of each hose loading operation, the situation should be evaluated to ensure compliance with all the provisions of the written procedures. If the written procedures cannot be complied with, or if there is any question as to the safety of the operation for the specific situation, then the hose should not be loaded on moving fire apparatus.

A.6.3.5 The following recommendations will assist the user in meeting the requirements of the standard:

(1) Tiller training procedures should be specified in a written standard operating procedure that includes at least the safety conditions listed in A.6.3.5(2) through A.6.3.5(6). All members involved in tiller training should have been trained in these procedures.
(2) The aerial apparatus should be equipped with seating positions for both the tiller instructor and the tiller trainee. Both seating positions should be equipped with seat belts for each individual. The tiller instructor should be permitted to take a position alongside the tiller trainee.
(3) The tiller instructor's seat should be permitted to be detachable. Where the instructor's seat is detachable, the detachable seat assembly should be structurally sufficient to support and secure the instructor. The detachable seat assembly should be attached and positioned in a safe manner immediately adjacent to the regular tiller seat. The detachable seat assembly should be equipped with a seat belt or vehicle safety harness. The detachable seat assembly should be attached and used only for training purposes.
(4) Both the tiller instructor and the tiller trainee should be seated and belted.
(5) The instructor and trainee should wear and use both helmet and eye protection if not seated in an enclosed area.
(6) In the event the aerial apparatus is needed for an emergency response during a tiller training session, the training session should be terminated, and all members should be seated and belted in the approved riding positions. There should be only one person at the tiller position. During the emergency response, the apparatus should be operated by a qualified driver/operator.

A.6.3.6 Helmets should be worn by all members in riding positions in an open cab that does not provide the protection of an enclosed cab.

A.6.3.7 Primary eye or face protection, or both, should be issued to members who might ride in either exposed positions in open cab apparatus or open tiller seats. Fire department standard operating procedures should outline the safety issues associated with wearing eye protection while driving.

A.6.3.8 Such alternate means of transportation could include, but not be limited to, other fire apparatus, automobiles, and/or other personnel carriers.

A.6.4.1 The purpose of this paragraph is to ensure that all vehicles are inspected on a regular basis and checked for the proper operation of all safety features. This inspection should include tires, brakes, warning lights and devices, headlights and clearance lights, windshield wipers, and mirrors. The apparatus should be started, and the operation of pumps and other equipment should be verified. Fluid levels should also be checked regularly.

Where apparatus is in regular daily use, these checks should be performed on a daily basis. Apparatus stored in unattended stations that might not be used for extended periods should be checked weekly. Any time such a vehicle is used, it should be checked before being placed back in service. The 24-hour reference provides for situations in which a vehicle can be used within the period preceding a scheduled inspection, although any deficiencies noted in use should be corrected without delay.

The safety equipment carried on fire department vehicles should be inspected in conjunction with the inspection of the vehicle.

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A.6.5.6 See A.6.4.1.

A.7.1.1 The provision and use of protective ensemble, ensemble elements, and protective equipment should include safety shoes, gloves, goggles, safety glasses, and any other items appropriate to the members' activities. This applies to all activities members are expected to perform, including non-emergency activities. The applicable regulations pertaining to industrial worker safety should be consulted to determine the need for protective equipment in non-emergency activities. For proper PPE selection, risk assessment as specified in NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, should be conducted.

A.7.1.2 The fire department should provide body armor for all members who operate in areas where a potential for violence or civil unrest exists.

A.7.1.4 Because it is impossible to ensure that every member — whether a volunteer, call, or off-duty career member — will respond to an incident in a station/work uniform or will change into station/work uniform clothing before donning protective garments, it is very important that members understand the hazards of some fabrics that more easily melt, drip, burn, shrink, or transmit heat rapidly and cause burns to the wearer.

Clothing made from 100 percent natural fibers or blends that are principally natural fibers should be selected over other fabrics that have poor thermal stability or that ignite easily.

The very fact that members are fire fighters indicates that all clothing that they wear should be flame resistant (as children's sleepwear is required to be) to give a degree of safety if unanticipated happenings occur that expose the clothing to flame, flash, sparks, or hot substances.

A.7.1.6.1 Fire departments need to be especially diligent in the handling of protective ensembles and ensemble elements that are or are suspected of being exposed to blood and body fluids. Fire departments are encouraged to review the criteria specified in NFPA 1581, *Standard on Fire Department Infection Control Program*, and 29 CFR 1910.1030, *Bloodborne Pathogen Standard*.

A.7.1.6.3 Examples of the proper type of safety equipment should include MSDSs, eye protection (safety glasses and goggles), nitrile gloves, rubber gloves, fluid-resistant suit or waterproof apron, optional dust mask, uniforms; sharp containers, and eyewash station.

A.7.2.1 The fire department should consider providing each member with two complete sets of structural fire-fighting protective clothing that meet the requirements of NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, whenever possible. It is not reasonable to expect that a fire department would have enough stock protective clothing available to all members in the event that the protective clothing became soiled, wet, or contaminated during daily activities. Fire fighters provided with two complete sets of structural fire-fighting protective clothing can change easily into proper-fitting garments and will not be unnecessarily exposed or expose the public to contaminants. Structural protective clothing that is cleaned and properly and completely dried before the next use will last longer and provide greater protection than soiled or damp garments.

A.7.2.2 Properly fitting protective clothing is important for the safety of the fire fighter. It is important to understand that all protective clothing should be correctly sized to allow for freedom of movement. Protective garments that are too small or too large and protective trouser legs that are too long or too short are safety hazards and should be avoided. Protective coat sleeves should be of sufficient length and design to protect the coat/glove interface area when reaching overhead or to the side. For proper fitting of a fire fighter, the protective clothing manufacturer should be contacted to provide sizing instructions.

A.7.2.4.2 Some protective coats, particularly those certified as part of a protective ensemble with the CBRN option, can include different interface components instead of wristlets to provide increased integrity against penetration of CBRN terrorism agents.

A.7.3.1 The technical committee's intent is that members utilize the appropriate protective clothing designed specifically for the type of emergency incident or fire-fighting activities for which the member is regularly engaged.

A.7.4 Fire department personnel involved in emergency medical operations should be protected against potential medical hazards. These hazards include exposure to blood or other body fluids contaminated with infectious agents such as hepatitis and human immunodeficiency viruses. The purpose of emergency medical protective clothing is to shield individuals from these medical hazards and conversely to protect patients from potential hazards from the emergency responder. Emergency medical gloves are to be used for all patient care. Emergency medical garments and face protection devices are to be used for any situation where the potential for contact with blood or other body fluids is high.

NFPA 1999, *Standard on Protective Clothing for Emergency Medical Operations*, covers garments, gloves, and face protection devices that are designed to prevent exposure to blood or other body fluids for those individuals engaged in emergency medical patient care and similar operations. NFPA 1999, *Standard on Protective Clothing for Emergency Medical Operations* specifies a series of requirements for each type of protective clothing. Garments can be full-body clothing or clothing items such as coveralls, aprons, or sleeve protectors. For the intended areas of body protection, the garment must allow no penetration of virus, offer "liquidtight" integrity, and have limited physical durability and hazard resistance. Gloves must allow no penetration of virus, offer "liquidtight" integrity, and meet other requirements for tear resistance, puncture resistance, heat aging, alcohol resistance, sizing, and dexterity. Face protection devices can be masks, hoods, visors, safety glasses, or goggles. Any combination of items can be used to provide protection to the wearer's face, principally the eyes, nose, and mouth. For the intended areas of face protection, these devices must allow no penetration of virus, offer "liquidtight" integrity, and provide adequate visibility for those portions of the device covering the wearer's eyes.

A.7.4.2 In order to avoid all potential exposure to infectious diseases, it is important that all members use medical gloves when providing patient care. All members who could come in contact with the patient should use medical gloves.

A.7.5 See Annex E, Hazardous Materials PPE Information.

A.7.5.1 NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*, covers vapor-protective ensembles that are designed to provide "gastight" integrity and are intended for response situations where no chemical con-

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tact is permissible. This type of suit is equivalent to the clothing required in EPA's Level A. The standard specifies a battery of 25 chemicals and 2 chemical warfare agents, which were selected because they are representative of the classes of chemicals that are encountered during hazardous materials emergencies and terrorism incidents involving chemical agents. Vapor-protective ensembles should resist permeation by the chemicals present during a response. Permeation is the movement of chemical through a material at a molecular level. The effects of permeation are often unobservable. Permeation resistance is measured in terms of breakthrough time and permeation rate or the amount of cumulative permeation in the case of chemical warfare agents. An acceptable material is one where the breakthrough time exceeds the expected period of garment use, and the measured permeation rate is below the minimum permeation rate used for determining breakthrough time. Chemical permeation resistance for 1 hour or more against each chemical in the NFPA 1991 battery is required for primary suit materials (garment, visor, gloves, footwear, and seams) for testing of industrial chemicals. Acceptable performance of materials against chemical warfare agents is determined by measuring the amount of permeating chemical that passes through the material within 1 hour. This cumulative permeation is compared against acceptable dose levels that have been established for safe use of protective clothing without effects to individual wearers. To be certified for any additional chemicals or specific chemical mixtures, an ensemble must meet the same permeation performance requirements.

Other performance requirements are included in NFPA 1991 in order to reflect simulated emergency hazardous materials response use conditions or conditions that might be encountered during a terrorism incident involving chemical agents, biological agents, or radiological particulates. To determine adequate suit component performance in hazardous chemical environments, the following tests are required by NFPA 1991:

(1) An ensemble pressurization test to check the airtight integrity of each protective suit
(2) An inward leakage test to demonstrate that the ensemble prevents the inward leakage of vapors or gases
(3) An overall suit water penetration test designed to ensure the suit provides full-body protection against liquid splashes
(4) Penetration resistance testing of closures
(5) Leak and cracking pressure tests for exhaust valves

To ensure that the materials used for vapor-protective suits will afford adequate protection in the environment where they will be used, material testing for burst strength, tear resistance, abrasion resistance, flammability resistance, cold temperature performance, and flexural fatigue are also required. Additional optional criteria based on additional tests are provided for demonstrating protection against liquefied gases or chemical flash fires.

A.7.5.1.7 Materials used in vapor-protective ensembles are tested for limited thermal resistance; however, this testing only prevents the use of inherently flammable materials. There are no performance criteria provided in NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*, to demonstrate protection of NFPA 1991-compliant vapor-protective ensembles during fire-fighting operations. There are no test requirements or performance criteria in NFPA 1991 addressing protection from ionizing radiation, cryogenic liquid hazards, or explosive atmospheres.

A.7.5.2 NFPA 1992, *Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies*, covers liquid splash-protective ensembles or clothing, which are designed to protect emergency responders against liquid chemicals in the form of splashes, but not against continuous liquid contact or chemical vapors and gases. Liquid splash-protective ensembles or clothing can be acceptable for some chemicals that do not present vapor hazards. Essentially, this type of clothing meets EPA Level B needs. It is important to note, however, that wearing liquid splash-protective ensembles or clothing does not protect the wearer from exposure to chemical vapors and gases, since this clothing does not offer gastight performance, even if duct tape is used to seal clothing interfaces. Therefore, where the environment is unknown or not quantified through monitoring, where exposures include carcinogens or skin-toxic chemicals involving chemicals with vapor pressures above 5 mm Hg at 25°C (77°F), or where the splash-protective ensemble or clothing has not been certified for the chemical exposure, an ensemble compliant with NFPA 1991 should be utilized.

NFPA 1992 specifies a battery of seven chemicals including liquid chemicals with low vapor pressures with no known skin absorption toxicity or no known or suspected human carcinogenicity, that are representative of the classes of chemicals likely to be encountered during hazardous materials emergencies. Chemical-penetration resistance against the NFPA 1992 battery of test chemicals is required. Any additional chemicals or specific chemical mixtures for which the manufacturer is certifying the suit should meet the same penetration performance requirements. Additional optional criteria are provided for demonstrating protection against chemical flash fires.

Other NFPA 1992 performance requirements include an overall suit water-penetration test to ensure the suit provides integrity of the ensemble or clothing against the inward leakage of liquids. The standard contains performance criteria to ensure that the materials used for liquid-splash suits afford adequate protection in the environment where they will be used. The test requirements include material testing for burst strength, tear resistance, flammability resistance, abrasion resistance, cold temperature performance, and flexural fatigue testing.

A.7.5.2.8 There are no performance criteria provided in NFPA 1992, *Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies*, to demonstrate protection of NFPA 1992-compliant liquid splash-protective suits during fire-fighting operations. There are no test requirements or performance criteria in NFPA 1992 addressing protection from ionizing radiation, biological, liquefied gas, or cryogenic liquid hazards, from flammable or explosive atmospheres, or from hazardous chemical vapor atmospheres.

A.7.5.3 CBRN protection is addressed in three standards, including NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*, NFPA 1994, *Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents*, and NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*. NFPA 1991 provides requirements for the highest level of CBRN protection, where hazards involving CBRN terrorism agents are most severe. These include the conditions where the agent has not been identified, the release is still occurring, and victims in the area of the release are apparently dead or unconscious. Testing of ensembles for NFPA 1991 requirements is described in A.7.5.1.

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NFPA 1994 sets requirements for different classes of protective ensembles for use at incidents involving CBRN terrorism agents as used by first responders. Class 2 ensembles provide the highest level of protection against CBRN terrorism agents, including vapors, liquids, and particulates, and have performance consistent with SCBA use for IDLH conditions. Class 3 ensembles also protect against CBRN terrorism agents that include vapors, liquids, or particulates, but are at conditions of exposure that are less than IDLH, which would permit the use of air-purifying respirators (APRs).

There are two primary areas of evaluation: tests for integrity of the ensemble against the hazardous environment, and tests of the material to demonstrate how it acts as a barrier against different CBRN terrorism agents. There are three different integrity tests. An inward leakage test is applied to Class 2 and Class 3 ensembles using the Man-in-Simulant test (MIST). This test measures the inward leakage of a surrogate agent into the clothing while worn by a test subject. The higher the MIST result or protection factor, the better the integrity. Class 2 performance has been set for levels that are consistent based on SCBA use while Class 3 performance is consistent with APR use. MIST does not apply to Class 4 because these ensembles are not intended to provide chemical protection. Class 4 protective ensembles provide only biological or radiological particulate protection. A liquid integrity test is applied to each ensemble. A longer test is used for Class 2 than for Class 3 and Class 4. The liquid integrity test is applied to Class 4 because this clothing could be subjected to wet decontamination. For Class 4, a particle integrity test is used where a test subject wears the ensemble inside a closed environment with fluorescent particles. Particle leakage is detected using ultraviolet light. This particle test is not applied to Class 2 and Class 3 because it is believed that successful MIST evaluations indicate particle holdout. For material tests, permeation testing as described in A.7.5.1 is used for Class 2 and Class 3 ensembles. For Class 2, permeation testing with gases is carried out at levels that are used for CBRN approvals of APRs. The liquid chemical permeation tests for Class 2 are performed using the more rigorous closed-top procedures compared to open-top procedures for Class 3. All ensemble materials are evaluated for viral-penetration resistance using a bloodborne pathogen surrogate.

The CBRN option for NFPA 1971 is based on Class 2 performance. The same integrity and material barrier requirements are applied; however, ensemble elements and materials are subjected to extensive conditioning involving laundering, heat exposures, repeated flexing, and abrasion prior to testing integrity and barrier characteristics. The tests are intended to simulate extensive use of the ensemble prior to encountering CBRN terrorism agents. *(See also A.7.5.3.6).*

A.7.5.3.2 Any response plan involving a biological or weapons of mass destruction (WMD) biological hazard should be based on relevant infectious disease or biological safety recommendations by the Centers for Disease Control and Prevention (CDC) and other expert bodies.

A.7.5.3.6 The CBRN option for structural and proximity firefighting protective ensembles in NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, can only be applied to complete ensembles of garments, helmet, gloves, footwear, and hood with a specified SCBA that has been certified by NIOSH as compliant with the NIOSH *Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Full Facepiece Air Purifying Respirator (APR)*. Non-CBRN elements cannot be used with the CBRN ensemble. CBRN ensembles are only intended to allow members escape and provide rescue during the escape when CBRN agents are encountered.

A.7.7.1 Fire departments that provide both wildland and structural fire-fighting services should establish guidelines for members on which ensemble to wear for a given fire-fighting or other emergency incident.

A.7.7.3 Fire shelters are no longer addressed in NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting*. Specifications for fire shelters are provided in USDA Forest Service Specification 5100-606, *Shelter Fire*.

A.7.8.3.1 NIOSH provides nine classes of particulate filters (three classes of filter efficiency — 95 percent, 99 percent, and 99.97 percent), each with three categories of resistance to filter efficiency degradation (N, R, and P). Additionally, performance against toxic industrial gases, vapors, and certain CBRN agents are also specified by NIOSH.

A.7.8.3.2 APRs and PAPRs do not supply oxygen. Use should be limited to known contaminants and known exposure levels and used only in adequately ventilated areas. APRs and PAPRs cannot be used when concentrations of contaminants are unknown, or when appropriate exposure limit is not known, or when cartridge or filter service life is unknown.

A.7.9 Fire department personnel involved in surface water operations should be protected against potential hazards. These hazards include exposure to physical, environmental, thermal, and certain common chemical and biological hazards.

NFPA 1952, *Standard on Surface Water Operations Protective Clothing and Equipment*, covers full body suits, helmets, gloves, footwear, and personal flotation devices for those individuals engaged in surface water operations and similar operations. NFPA 1952 specifies a series of requirements for each type of protective clothing. Requirements are established for dry suit environments, wet suit environments, and ice suit environments.

A.7.10.1.1 Selection of respiratory protection devices is an important function, particularly where resources are limited and respirators have to be used for different applications with different equipment. Urban search and rescue (USAR), CBRN, confined space, hazardous materials, and other operations can require different filter elements, SCBA breathing air cylinders, umbilical connections, and features that are easier to ascertain and coordinate with a selection stage.

A.7.10.4 At least one additional reserve SCBA should be available at the incident scene for each 10 SCBA in use, to provide for replacement if a failure occurs.

A.7.10.7 Hazardous atmospheres requiring SCBA can be found in, but are not limited to, the following operations: structural fire fighting, aircraft fire fighting, shipboard fire fighting, confined space rescue, and any incident involving hazardous materials.

A.7.10.8 The required use of SCBA means that the user should have the facepiece in place, breathing air from the SCBA only. Wearing SCBA without the facepiece in place does not satisfy this requirement and should be permitted only under conditions in which the immediate safety of the atmosphere is assured. All members working in proximity to areas where SCBA use is required should have SCBA on their backs or immediately available for donning. Areas where the atmosphere can rapidly become hazardous could include rooftop areas during ventilation operations and areas where an explosion or container rupture could be anticipated.

A hazardous atmosphere would be suspected in overhaul areas and above the fire floor in a building. Members working

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in these areas are required to use their SCBA unless the safety of the atmosphere is established by testing and maintained by effective ventilation. With effective ventilation in operation, facepieces could be removed under direct supervision, but SCBA should continue to be worn or immediately available.

A.7.12.1.3 The use of long-duration SCBA should be restricted to operations in tunnels and underground structures, on board ships, and in other situations where the need for this capability is demonstrated. Weight and stress reduction should be an objective in the acquisition of new SCBA and when upgrading currently used SCBA. Weight and other stress factors are major contributions to fire fighter fatigue and injury, and SCBA should be chosen accordingly.

A.7.12.3.3 Because of the cumulative hazards associated with the repeated use of filter canisters and cartridges under emergency response conditions, canisters and cartridges that have been placed in service should be removed, replaced, and discarded after training, regardless of exposure time.

A.7.13.1 In quantitative fit testing, the testing machine provides a numerical value of each test exercise and then a computed fit factor that can be used as a benchmark for future fit testing the following year. The test subject must obtain at least a fit factor of 500 for the person to pass the fit test with the full facepiece. The strip chart that the test machine provides becomes the written record, and a computer-generated record can be done at the same time. There is little judgment required by the operator of the fit test other than to make sure the test subject and the procedures are followed to the letter.

Proper respiratory protection programs include provisions for conducting a respirator fit testing to ensure that the respirator fits the user properly. APRs reduce the user's exposure by varying degrees, depending on the type of respirator used. An effective face-to-facepiece seal is extremely important when using respiratory protection SCBA. Even a minor leakage can allow contaminants to enter the facepiece, even with positive-pressure respiratory protection SCBA. Any outward leakage will increase the rate of air consumption, reducing the time available for use and safe exit. The facepiece should seal tightly against the skin, without penetration or interference by any protective clothing or other equipment. In those instances where members cannot meet the facepiece seal requirement with equipment currently used by the AHJ, individually fitted facepieces should be provided.

Fit testing is a procedure used to evaluate how well a given respirator fits a given person by assessing leakage around the face seal. Without fit testing, persons unknowingly can have poor face seals, allowing contaminants to leak around the mask and be inhaled. Poor face seals are due to certain facial characteristics (facial size, beards, large sideburns, scars, or other facial uniqueness) that prevent direct contact between the skin and the sealing surface of the respirator and result in leakage or inadequate respiratory protection.

Improper use of a respirator or improper fit testing of any respirator can lead to a false sense of security and possibly result in injury or death to the user.

A.7.13.5 A protection factor of at least 10,000 in the positive-pressure mode is recommended for positive-pressure SCBA. The quantitative test can be used to determine which facepieces fit an individual well and thus aids in selecting the facepiece that best conserves the amount of air in the cylinder.

A.7.13.6 WARNING: If a facepiece from one manufacturer is used on a unit from another manufacturer, the NIOSH approval will be voided.

A.7.14.3 The following is an excerpt from 29 CFR 1910.134(g):

"(g) *Use of respirators.* This paragraph requires employers to establish and implement procedures for the proper use of respirators. These requirements include prohibiting conditions that may result in facepiece seal leakage, preventing employees from removing respirators in hazardous environments, taking actions to ensure continued effective respirator operation throughout the work shift, and establishing procedures for the use of respirators in IDLH atmospheres or in interior structural firefighting situations.

(1) *Facepiece seal protection.* (i) The employer shall not permit respirators with tight-fitting facepieces to be worn by employees who have:

(A) Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function; or

(B) Any condition that interferes with the face-to-facepiece seal or valve function."

This prohibition applies to any negative- or positive-pressure personal respiratory protection device of a design relying on the principle of forming a face seal to perform at maximum effectiveness. A beard growing on the face at points where the seal with the respirator is to occur is a condition that has been shown to prevent a good face seal. This is so regardless of what fit test measurement can be obtained. However, if the beard is styled so no hair underlies the points where the SCBA facepiece is designed to seal with the face, then the employer may use the SCBA to protect the employee.

A.7.14.6 The user should be able to demonstrate the successful use of an SCBA with contact lenses in a nonhazardous training environment before being allowed to use them in an incident. Successful long-term soft contact lens use should be measured by the ability to wear soft contact lenses for at least 6 months without any problems.

A.7.15.1 Given the considerable amount of stored energy inside an SCBA cylinder, cylinders should always be filled using manufacturers' recommendations and following any existing NIOSH, CGA, or other regulatory agency guidelines.

Because of the failure during refilling of 11 cylinders using aluminum alloy 6351-T6, SCBA cylinders made of this alloy should be diligently inspected, both externally and internally, by properly trained inspectors at least annually.

Most of these failed cylinders had not been maintained properly. Some were being used beyond their DOT-defined hydrostatic test period. Some had not been retrofitted with a special neck-ring that the manufacturer had recommended to reduce the possibility of failure.

For additional information, refer to the United States Department of Transportation (DOT) Research and Special Programs Administration (RSPA) Safety Advisory Notice of 1994 (Federal Register Vol. 59, July 26, 1994), DOT Safety Advisory Notice of 1999 (Federal Register Vol. 64, October 18, 1999), and the NIOSH Respirator User Notice of December 7, 1999.

Several of the ruptured cylinders were made using aluminum alloy 6351-T6. This alloy has been identified as being susceptible to sustained load cracking (SLC) in the neck and shoulder area of the cylinder. The NIOSH Respirator User Notice of December 7, 1999, states: "It is important to note that only a small percentage of cylinders made from aluminum alloy 6351-T6 have actually been found to exhibit sustained load cracking. Moreover, out of several million cylinders manufactured from this alloy by several companies, NIOSH and the U.S. Department of Transporta-

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tion (DOT) are aware of only 12 ruptures within the United States. Eleven of the 12 ruptures occurred during refilling, six of these 12 ruptures involved SCBA cylinders. Forensic analysis has determined that most of these cylinders failed due to SLC failure. However, in some cases, evidence of other factors such as external mechanical damage was also present."

Changes have now been made in materials specification and design of cylinders. Since 1988, manufacturers have been using aluminum alloy 6061-T6 in the manufacture of all of their cylinders and cylinder liners. Alloy 6061-T6 has become the "standard of the industry" because it is not susceptible to sustained load cracking.

The failed cylinders belong to a relatively small population of a particular type of cylinder, and there has been no occurrence of cylinder failure during filling of any other type of SCBA cylinders. Full-wrapped composite cylinders, which are predominantly being purchased by the fire service at this time, have been used since 1988 without failure during refilling. There is, therefore, reason to believe that these other types of SCBA cylinders can continue to be used in the fire service without risk of failure during filling.

A.7.15.5 To facilitate this, it is recommended that industry develop an inexpensive, lightweight chamber, or other means, to provide protection at the fire scene during routine cylinder filling. There is no current commonly accepted standard or specifications for protective enclosures in which to fill SCBA cylinders. Until such a standard is defined, such equipment should comply with the standards defined for fragmentation tanks in NFPA 1901, *Standard for Automotive Fire Apparatus.*

A number of SCBA manufacturers have developed systems to quickly fill cylinders. They enable cylinders to be filled while the user is wearing the SCBA. Even though some of these systems have been in use without incident for many years, it is felt that fire fighter and support personnel safety are paramount. This standard therefore recommends that personnel be protected when routinely refilling SCBA cylinders.

Until a commonly accepted standard for providing protection during routine refilling of cylinders is defined, the AHJ should determine how best to provide protection for its personnel during routine cylinder filling.

Without a commonly accepted standard defining a concise method of protecting personnel during cylinder refilling, the AHJ can choose which method best applies to its personnel. Such protection can consist of refilling cylinders in an enclosure considered acceptable to the AHJ. The protection can consist of using a refill system with a safe record of operation, with no experience of failures or damage to cylinders, supported by sufficient data, or it can consist of an alternate practice considered as safe by the AHJ.

A.7.15.6 The possibility exists for catastrophic failure of SCBA cylinders during refilling.

A.7.15.11 Table Table A.7.15.11 shows the approximate pressures associated with the 600 L minimums when exiting procedures should have already begun to take place.

A.7.16.1 Technology has provided the integration of PASS devices with SCBA. When the SCBA unit is activated to an operational mode, the PASS device is activated. Fire departments are encouraged to utilize this technology. The use of PASS devices should be coupled with a solid incident management system, a personnel accountability system, and adequate communications to properly ensure the safety of fire fighters.

Table A.7.15.11 Pressure Associated with 600 L Minimum Exit Volume

	2216 psi	3000 psi	4500 psi
30 minute/1200 L	1100 psi	NA	2250 psi
30 minute/1700 L	NA	1050 psi	NA
45 minute/1800 L	750 psi	NA	1500 psi
60 minute/2400 L	550 psi	NA	1100 psi

NA: Not applicable.

A.7.16.2 The mandatory use and operation of a PASS by fire fighters involved in rescue, fire suppression, or other hazardous duty is imperative for their safety. The primary intent of this device is to serve as an audible device to warn fellow fire fighters in the event a fire fighter becomes incapacitated or needs assistance.

Past fire fighter fatality investigation reports document the critical need to wear and operate PASS devices when fire fighters operate in hazardous areas. Investigation results show that fire fighters most often failed to activate the PASS unit prior to entering a hazardous area. Training and operational procedures are imperative to ensure activation of the PASS whenever PASS devices are used.

A.7.17.3 Life safety rope can be significantly weakened by abrasion, misuse, contamination, wear, and stresses approaching its breaking strength, particularly impact loading. Because there is no approved method to service test a rope without compromising its strength, rope rescue and training operations should be carefully observed and monitored for conditions that could cause immediate failure or result in undetectable damage to the rope. If a rope has been used in a situation that could not be supervised or where potential damage could have occurred, it should be removed from service and destroyed.

It is important that ropes be inspected for signs of wear by qualified individuals after each use. If indications of wear or damage are noted, or if the rope has been stressed in excess of the manufacturers' recommendations or has been impact loaded, it should be destroyed.

The destruction of the rope means that it should be removed from service and altered in such a manner that it could not be mistakenly used as a life safety rope. This alteration could include disposal or removal of identifying labels and attachments and cutting the rope into short lengths that could be used for utility purposes.

The assignment of disposable life safety ropes to members or to vehicles has proven to be an effective system to manage ropes that are provided for emergency use and are used infrequently. Special rescue teams, which train frequently and use large quantities of rope, should include members who are qualified to manage and evaluate the condition of their ropes and determine the limitations upon their reuse.

A.7.18.1.1 Some examples of primary eye protection are goggles and safety glasses, as they provide specific and substantial eye protection against penetration and impact. Helmet faceshields are not primary eye protection, as they do not provide eye protection and should not be relied upon for eye protection. Faceshields should be used to protect the face as secondary protection to primary eye protection. Faceshields currently are often used incorrectly as the only form of eye protection. It is evident that when faceshields are exposed to ultraviolet degradation, abrasion, and products of combus-

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tion, they become scratched, cloudy, opaque, and can be rendered unserviceable in a very short period of time. In many instances, the faceshield is lifted so that the wearer can see what he is doing, leaving the eyes unprotected and exposed to the dangers of flying debris. Goggles and other primary eye devices are more easily protected from damage and also provide specific protection for the wearer's eyes. There are numerous products on the market to protect the goggles from damage when stored on the helmet. Users desiring to keep goggles or eye protection stored on top of the helmets should consider one of these devices. The SCBA facepiece can provide both primary eye protection and full-face protection.

A.7.19.1 The use of PPE to limit noise exposure should be considered as an interim approach until the noise levels produced by vehicles, warning devices, and radios can be reduced. Protective ear muffs are recommended for fire fighters due to the difficulties of proper fit and insertion of ear plugs. Studies in some jurisdictions have indicated that the most harmful noise exposure can come from radios that are turned up loud enough to be heard over the noise of engines and warning devices. Ear muffs are available that provide effective sound attenuation and rapid donning. They should also be provided with built-in speakers and volume controls for radio and intercom communications. Ear muffs should be worn by operators of noisy equipment (in excess of 90 dBA) at the scene of incidents as well as during response. In some jurisdictions, traffic regulations could limit the use of hearing protection by drivers.

The fire apparatus standards require the noise level at any seated position to be a maximum of 90 dBA when measured as specified in the standard, without any warning devices in operation, as the vehicle proceeds at a speed of 45 mph (72 km/h) on a level, hard, smooth surface road. However, it is recommended that the specifications for new fire apparatus provide maximum sound requirements that would allow members to ride in those vehicles without using hearing-protective devices. A maximum limit of 85 dBA without audible warning devices and 90 dBA with warning devices in operation is recommended. Interior noise levels should be measured with the vehicle in motion at the speed that produces the highest noise level, up to 55 mph (80 km/h). All windows should be closed, and the noise level should be measured in each passenger area.

A.7.19.2 When operating in situations where other protective clothing and equipment are necessary, such as in structural fire fighting, the interface between hearing protection and other necessary protection might not be adequately addressed by currently used devices. For example, ear muffs might not interface with helmets, and foam plastic ear plugs could be dangerous in a fire environment due to the potential for melting. In addition, a reduction in hearing capability in an emergency operations setting could create additional hazards. Effective hearing protection should also be used during nonemergency activities such as equipment checks and engine warm-ups. Attention should be given to correcting the deficiencies through the advent of improved protective devices and through the use of alternate or improved procedures that create less noise.

A.7.19.3 An effective hearing conservation program should address the regular audiometric testing of members to identify hearing loss, the development and implementation of steps to prevent further hearing loss by members exhibiting such loss, and the ongoing identification and reduction or elimination of potentially harmful noise sources in the work environment. The standards for hearing conservation included in 29 CFR 1910.95, *Occupational noise exposure,* should be used as a basic minimum approach to this problem.

Any approach to hearing conservation should address personal protective devices, audiometric testing, and the reduction of noise exposure that can be achieved by modifying existing equipment or changing procedures. Examples of modifications would include moving siren speakers and air horns down onto front bumpers, responding with windows closed, and installing sound-attenuating insulation in cabs of fire apparatus. The noise produced by audible warning devices should also be evaluated to determine the most effective balance between warning value and harmful characteristics. Some studies indicate that high-low alternating-tone sirens and lower-pitch air horns could be more effective warning devices and less damaging to hearing.

A long-term approach to hearing conservation should deal with the purchase of apparatus and equipment that is less noisy by design, with noise standards included in the specifications. Improved radio equipment that produces higher clarity of sound with less output volume should also be considered.

For more information on fire department hearing conservation programs, consult the U.S. Fire Administration publication FA-118, *Fire and Emergency Service Hearing Conservation Program Manual.*

A.8.1.1 The National Wildfire Coordinating Group (NWCG) is an operational group that coordinates programs of the participating wildland fire management agencies and is comprised of representatives of the U.S. Forest Service, four Department of Interior agencies (Bureau of Land Management, National Park Service, Bureau of Indian Affairs, and the U.S. Fish and Wildlife Service), the Intertribal Timber Council, 50 state forestry agencies and Puerto Rico (through the National Association of State Foresters), the U.S. Fire Administration, and the Federal Emergency Management Agency (FEMA).

The NWCG has several sources of information regarding wildland fire fighting operations, safety, and training, including the NWCG *Incident Response Pocket Guide,* the *Fireline Handbook* PMS 410-1, and the *Wildland Fire Qualification System Guide* PMS 310-1. For a complete list of NWCG publications, see http://www.nwcg.gov/pms/pubs/pubs.htm.

A.8.1.5 The incident commander should automatically integrate fire fighter safety and survival into the regular command functions. When this integration occurs, the incident commander promotes fire fighter welfare by performing the standard job of command. Under fire conditions, the incident commander is at an extreme disadvantage to perform any additional tasks. The safety plan for the incident commander has to be the regular command plan.

Due to the high number of fire fighter injuries and deaths attributable to lack of or poor implementation of the safety function on the incident scene, the incident commander should recognize the importance of integrating the safety function into the incident command structure as described in NFPA 1561, *Standard on Emergency Services Incident Management System.*

A.8.1.7 Due to the high number of fire fighter injuries and deaths attributable to lack of or poor implementation of incident management, incident managers should be familiar with the use of incident management teams or incident command team as described in NFPA 1561, *Standard on Emergency Services Incident Management System.*

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A.8.1.8 The following explains the responsibilities of the incident commander:

(1) The incident commander should always integrate fire fighter health and safety considerations into the command process. This integration ensures that safety will always be considered and will not be reserved for unusual or high-risk situations when the incident commander is under a high degree of stress. An incident action plan that addresses fire fighter safety should be a routine function of command.
(2) Early evaluation enables the incident commander to consider current conditions in a standard manner and then predict the sequence of events that will follow. The consideration of fire fighter safety should be incorporated into this evaluation and forecasting.
(3) Effective communications are essential to ensure that the incident commander is able to receive and transmit information, obtain reports to maintain an awareness of the situation, and communicate with all component parts of the incident organization to provide effective supervision and controls.
(4) Strategic decisions establish the basic positioning of resources and the types of functions they will be assigned to perform at the scene of a fire or emergency incident. The level of risk to which members are exposed is driven by the strategy; offensive strategy places members in interior positions where they are likely to have direct contact with the fire, while defensive strategy removes members from interior positions and high-risk activities. The attack plan is based on the overall strategy and drives the tactical assignments that are given to individual or groups of companies/crews and the specific functions they are expected to perform. Risk identification, evaluation, and management concepts should be incorporated into each stage of the command process.
(5) Tactical level management component people are command agents and are able to both monitor companies/crews at the actual location where the work is being done (geographic) and to provide the necessary support (functional). The incident commander uses a tactical-level management unit as off-site (from the command post) operational/communications/safety managers-supervisors. The incident commander uses the incident organization along with communications to stay connected. Some incident management systems identify tactical-level management components such as a *division* or a *group* for a functional position within the system, whereas other systems use the term *sectors* for either geographical or functional areas. As incidents escalate, the incident management system should be utilized to maintain an effective span of control ratio of not greater than 1 to 7 with an optimum ratio of 1 to 5.
(6) The incident commander should routinely evaluate and re-evaluate conditions and reports of progress or lack of progress in reaching objectives. This process will allow the incident commander to determine if the strategy and attack plans should be continued or revised. The failure to revise an inappropriate or outdated attack plan is likely to result in an elevated risk of death or injury to fire fighters.
(7) Effective command and control should be maintained from the beginning to the end of operations, particularly if command is transferred. Any lapse in the continuity of command and the transfer of information increases the risk to fire fighters.

A.8.2.2 The intent of the use of "clear text" for radio communications is to reduce confusion at incidents, particularly where multiple agencies are operating at the same incident.

A.8.2.3 Examples of emergency conditions could be "evacuate the building/area," "wind shift from the north to south," "change from offensive to defensive operations."

Examples of situations where the term "mayday" should be used include a lost or missing member, an SCBA malfunction or loss of air, a member seriously injured or incapacitated, a member trapped or entangled, or any life-threatening situation that cannot be immediately resolved.

When a fire fighter experiences a life-threatening situation, he or she must quickly and efficiently be able to take the steps necessary to survive and alert rescuers. This is the time when an individual fire fighter will be tested on his or her knowledge of self-survival techniques. Paramount to surviving such an experience is being able to communicate the emergency to rescuers. The terms used to communicate these needs must be chosen carefully. The terms used must be easily understood over the radio in times when operational noise is high. The terms used must also be recognizable as an emergency call for assistance by those on the incident. All persons, regardless of language accent, must easily be able to annunciate the terms used. And finally, the terms used must be short with two syllables maximum to allow for a simple single inflexion of the voice to recognize the term.

"Mayday" satisfies all of the above demands for a term that can be used to communicate a fire fighter's need for immediate assistance. "Mayday" is approved for fire service use by the National Search and Rescue Committee and is currently being used by most fire departments in the United States. Most importantly, "mayday" is easily remembered and understood over the radio when operational noise challenges radio communications.

The concern over "mayday" causing confusion with aeronautical and nautical emergencies is unfounded. In April 2002, Dr. Burton A. Clark, EFO, CFO, Management Science Program chair at the National Fire Academy, and operations chief for DHS/FEMA during national disasters wrote to Rear Admiral Ken Venuto (USCG), chairman of the National Search and Rescue Committee, requesting clarification on the use of "mayday." In August 2002, Captain Steve Sawyer (USCG) returned a letter to Dr. Clark stating, "Your recent letter inquired about use by fire departments of the term "mayday" over ground fire radios when the life of a fire fighter is in danger. Use of "mayday" under such circumstances is permissible under U.S. law and regulations. The radio frequencies concerned are different from the aeronautical and maritime frequencies, so use of the term should not cause confusion. Further, any effective means of calling for help is authorized under both national and international radio regulations for true distress situations. Within the letter Captain Sawyer gives further insight on the appropriate use of "mayday." On page 2 of the letter it states, 'Mayday' is recognized nationally and internationally as a signal meaning life is in danger and immediate assistance is required, although federal regulations only mention its use for ship aircraft. The above guidance is based on review of the regulations and consultation with experts of the Coast Guard, FCC, International Civil Aviation Organization, and others. We trust that this explanation will help not only for your local training and operations; you may also find it useful seeking to update relevant guidance in NFPA or other standards, as appropriate."

In addition to "emergency traffic" and "mayday," the fire department can use additional signals such as an air horn signal for members to evacuate as part of their standard operating procedures. Some fire departments have developed an

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evacuation signal that consists of repeated short blasts of apparatus air horns. The sequence of air horn blasts should not exceed 10 seconds in length, followed by a 10-second period of silence, and it is done three times (a total air horn evacuation signal including periods of silence lasts 50 seconds). When this evacuation signal is used, the incident commander should designate specific apparatus to sound the evacuation signal using air horns. The apparatus used should not be in close proximity to the command post, if possible, thus reducing the chance of missing any radio messages.

During fire fighter rescue operations, the incident commander should consider implementing the following:

(1) Requesting additional resources
(2) Including a medical component
(3) Utilizing staging for resources
(4) Committing the RIC team from standby mode to deployment
(5) Changing from strategic plan to a high-priority rescue operation
(6) Initiating a PAR (personnel accountability report)
(7) Withdrawing companies from the affected area
(8) Assigning a rescue officer
(9) Assigning a safety officer
(10) Assigning a backup rapid intervention crew/company
(11) Assigning an advanced life support (ALS) or basic life support (BLS) company
(12) Requesting additional command level officers
(13) Requesting specialized equipment
(14) Ensuring that dispatch is monitoring all radio channels
(15) Opening appropriate doors to facilitate egress and access
(16) Requesting additional vertical/horizontal ventilation
(17) Providing lighting at doorways, especially at points of entry

A.8.2.4 Some fire departments can also wish to be provided with reports of elapsed time-from-dispatch. This method can be more appropriate for fire departments with long travel times where significant incident progress could have occurred prior to the first unit arrival.

A.8.2.4.1 Common procedure is for the dispatch center to announce "incident clock is 10 minutes," "incident clock is 20 minutes," "incident clock is 30 minutes," and so forth.

A.8.3.1 The incident commander has the ultimate responsibility for the safety of all fire department members operating at an incident and for any and all other persons whose safety is affected by fire department operations. Risk management provides a basis for the following:

(1) Standard evaluation of the situation
(2) Strategic decision making
(3) Tactical planning
(4) Plan evaluation and revision
(5) Operational command and control

A.8.3.2 The risk to fire department members is the most important factor considered by the incident commander in determining the strategy that will be employed in each situation. The management of risk levels involves all of the following factors:

(1) Routine evaluation of risk in all situations
(2) Well-defined strategic options
(3) Standard operating procedures
(4) Effective training
(5) Full protective clothing ensemble and equipment
(6) Effective incident management and communications
(7) Safety procedures and safety officers
(8) Backup crews for rapid intervention
(9) Adequate resources
(10) Rest and rehabilitation
(11) Regular evaluation of changing conditions
(12) Experience based on previous incidents and critiques

When considering risk management, fire departments should consider the following Rules of Engagement after evaluating the survival profile of any victims in the involved compartment:

(1) We will risk our lives a lot, in a calculated manner, to save SAVABLE LIVES.
(2) We will risk our lives a LITTLE, in a calculated manner, to save SAVABLE property.
(3) We WILL NOT risk our lives at all for a building or lives that are already lost.

A.8.3.3 The acceptable level of risk is directly related to the potential to save lives or property. Where there is no potential to save lives, the risk to fire department members should be evaluated in proportion to the ability to save property of value. When there is no ability to save lives or property, there is no justification to expose fire department members to any avoidable risk, and defensive fire suppression operations are the appropriate strategy.

A.8.3.5 An incident safety officer should be established at all major incidents and at any high-risk incidents. The incident safety officer should be assigned to operate under the incident commander. Depending on the specific situation, this assignment could require one or more members. If the fire department's safety officer is not available or does not have the expertise necessary for the incident, the incident commander should assign one or more members that have the expertise to assume this responsibility. All members should be familiar with the basic duties and responsibilities of an incident safety officer.

A.8.3.7 Atropine auto-injectors are used in the military and have been purchased by many fire departments. Fire departments that have auto-injectors available for their members need to provide training on the use of the auto-injector.

A.8.4.1 A standard system to account for the identity and assignment of each member could be relatively simple when all members arrive as assigned crews on fire apparatus. The identity of each crew member should at least be recorded in a standard manner on the vehicle, and each company officer is responsible for those members. In fire departments where members arrive in their own vehicles or assemble at the scene, a system is required to record the identity of each member arriving and to organize them into companies or groups with appropriate supervision. This requires a standard system of "reporting in" at the incident and becoming part of the organized system of operations.

A.8.4.10 The personnel accountability system is a method of maintaining constant awareness of the identities and location of all personnel involved in emergency operations. The personnel accountability system philosophy starts with the incident command system principles of company unity and unity of command. These duties can be fulfilled initially maintaining company accountability by documenting the situation status and resource status on the tactical worksheet. Other methods include command boards, apparatus riding lists, company personnel boards, and electronic bar-coding systems. These components can be used in conjunction with one another to facilitate the tracking of personnel by both location and func-

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tion. The components of the personnel accountability system should be modular and expand with the size and complexity of the incident.

At major incidents, this function should be separate from the role of the incident commander. The function of personnel accountability should be assigned to an accountability officer (resource status and situation status) who is responsible for maintaining the status of all assigned resources at an incident. As the incident escalates, this function would be placed under the planning section.

A.8.4.11 These accountability supervisors should work with the incident commander and tactical-level management component supervisor to assist in the ongoing tracking and accountability of members.

A.8.5.1.1 The limitation of emergency scene operations to those that can be safely conducted by the number of personnel on the scene is intended to reduce the risk of fire fighter death or injury due to understaffing. While members can be assigned and arrive at the scene of an incident in many different ways, it is strongly recommended that interior fire-fighting operations not be conducted without an adequate number of qualified fire fighters operating in companies under the supervision of company officers.

It is recommended that a minimum acceptable fire company staffing level should be four members responding on or arriving with each engine and each ladder company responding to any type of fire. The minimum acceptable staffing level for companies responding in high-risk areas should be five members responding or arriving with each engine company and six members responding or arriving with each ladder company. These recommendations are based on experience derived from actual fires and in-depth fire simulations and are the result of critical and objective evaluation of fire company effectiveness. These studies indicate significant reductions in performance and safety where crews have fewer members than the above recommendations. Overall, five member crews were found to provide a more coordinated approach for search and rescue and fire-suppression tasks.

During actual emergencies, the effectiveness of companies can become critical to the safety and health of fire fighters. Potentially fatal work environments can be created very rapidly in many fire situations. The training and skills of companies can make a difference in the need for additional personnel and in reducing the exposure to safety and health risks to fire fighters where a situation exceeds their capabilities.

A.8.5.4 For additional information, see 29 CFR 1910.134, *Respiratory protection.*

A.8.5.8 Studies have shown that the severity of incidents involving ARFF can rapidly escalate to catastrophic proportions. If fire fighting and rescue operations are to be effective, fully assembled ARFF companies should be on-scene within the time requirements as specified in NFPA 403, *Standard for Aircraft Rescue and Fire-Fighting Services at Airports.* Experience has shown that it is extremely difficult to assemble personnel who are responding from separate locations for individual ARFF companies within these time constraints. It is strongly recommended that the minimum ARFF company staffing level be three on-duty members responding on or with each ARFF vehicle.

It is also recommended that structural fire apparatus responding in support of ARFF operations should be staffed in accordance with A.8.5.1.1. *(See also* NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.)*

A.8.5.9 If advanced life support personnel are available, this level of service would be preferred. Basic life support is the minimum acceptable level.

A.8.5.14 Consideration for rescue of members working over, in, and around water should be addressed by the incident commander and incident safety officer within the incident action plan.

A.8.5.15.1 Examples include protective shields, mechanical/human barriers, or alerting techniques that are distinguishable and effective under the conditions.

A.8.6.4 Figure A.8.6.4 shows the concept of hazard control zones. The hot zone is the area presenting the greatest risks to members and will often be classified as an IDLH atmosphere. The hot zone can include no-entry zones. Examples of no-entry zones could be holes in floors, explosive devices, crime scenes, and so forth.

The warm zone is a limited-access area for members directly aiding or in support of operations in the hot zone. Significant risk of human injury (respiratory, exposures, etc.) can still exist in the warm zone.

The cold zone establishes the public exclusion or clean zone. There are minimal risks for human injury and/or exposure in this zone.

It might not always be possible or practical to mark the hazard control zones with colored tape, signage, or other appropriate means, depending on the nature or location of the incident, available resources, and so forth. If possible, these hazard control zones should be clearly marked. Other means of marking hazard control zones can include flashing beacons, streets, fences, and so forth. It is essential that the perimeters of these zones are communicated to all members at the incident and that they are aware of these zones and their implications.

When colored tape is being used to mark control zones, it is recommended that the following tape colors be used:

(1) No-entry zone: red/white chevron
(2) Hot zone: red
(3) Warm zone: yellow
(4) Cold zone: green

A.8.6.4.1 A hot zone can include a no-entry zone (marked with red and white chevron tape or other means). No personnel should enter the no-entry zone due to imminent hazard(s) or the need to protect evidence. Examples of no-entry zones could be holes in floors, explosive devices, crime scenes, and so forth. Examples of the PPE are SCBA, flash hood, and so forth.

A.8.6.4.1.1 The hot zone is an area with greater potential for risk of injury or exposure. Members entering the hot zone without an assigned task are placing themselves at greater risk for no reason. In addition, they can be increasing the risk of others operating within this zone by creating some confusion.

A.8.6.4.2 Examples of significant risk of human injury include respiratory and exposures.

A.8.7 For additional information on establishing safe practices at highway incidents, see the NFSIMSC publication, "Model Procedures Guide for Highway Incidents," the U.S. Fire Administration publication FA-272, *Emergency Vehicle Safety Initiative,* and the U.S. DOT publication, *Manual on Uniform Traffic Control Devices for Streets and Highways,* Chapter 61.

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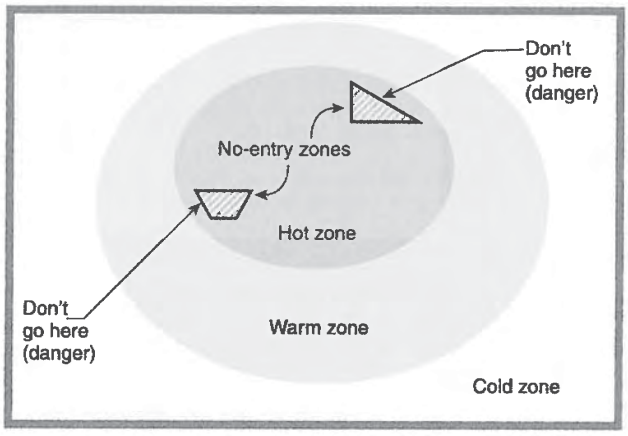

FIGURE A.8.6.4 Example of Control Zones.

A.8.7.4 The apparatus should be positioned to shield the operational area and place the pump panel in the protected area.

A.8.7.4.3 As an example, apparatus could be placed between the fire or emergency and oncoming traffic.

A.8.7.5 Warning signs should be placed in the following sequence based on the expected on-scene time:

(1) The initial arriving apparatus should deploy the sign as shown in "Phase A" in Figure A.8.7.5.
(2) If the incident is expected to take longer than 15 to 30 minutes, a second sign should be deployed as shown in "Phase B" in Figure A.8.7.5, and the original "Emergency Scene Ahead" sign should be changed to the appropriate directional arrow.
(3) Flares, or cones, or both should be placed to block one or two lanes or to completely block a roadway. At least 4 to 6 cones or flares, or both should be used to build a lane closure or safety zone.

Using an estimated speed, flares, or cones, or both, should be placed at the distance indicated in Table A.8.7.5.

Table A.8.7.5 Warning Device Placement

Fastest Speed Expected (mph)	Minimum Distance to Furthest Warning Device
20	100
30	150
40	220
50	310
60	420
70	550

A.8.7.10 Members that operate on roadway incidents should be provided with garments that ensure proper conspicuity enhancement consistent with the requirements in the *Manual on Uniform Traffic Control Devices*, 2009 edition, §6D.03, "Worker Safety Considerations."

A.8.7.11 Proper training on traffic control can be obtained from local or state highway departments, law enforcement, and other agencies involved with controlling the roadway traffic. The AHJ should participate in local or regional traffic incident management committees. The fire department should also be familiar with The National Traffic Incident Management Coalition's *National Unified Goal*.

A.8.8.2 The assembling of four members for the initial fire attack can be accomplished in many ways. In their response plan, the fire department should determine the manner in which they plan to assemble members. The four members assembled for initial fire-fighting operations can include an officer, chief officer, or any combination of members arriving separately at the incident.

Members who arrive on the scene of a working structural fire prior to the assembling of four persons can initiate exterior actions in preparation for an interior attack. These can include, but are not limited to, actions such as the establishment of a water supply, the shutting off of utilities, the placement of ladders, the laying of the attack line to the entrance of the structure, or exposure protection.

If members are going to initiate actions that would involve entering a structure because of an imminent life-threatening situation where immediate action can prevent the loss of life or serious injury and four members are not yet on the scene, the members should carefully evaluate the level of risk that they would be exposed to by taking such action. If it is determined that the situation warrants such action, incoming companies should be notified so that they will be prepared to provide necessary support and backup upon arrival.

A.8.8.2.4 The following examples show how a department could deploy a team of four members initially at the scene of a structure fire, regardless of how the team members are assembled:

(1) The team leader and one fire fighter could advance a fire-fighting hose line into the IDLH atmosphere, and one fire fighter and the pump operator become the standby members.
(2) The team leader could designate the pump operator to be the incident commander. The team leader and one fire fighter enter the IDLH atmosphere, and one fire fighter and the pump operator remain outside as the standby members.
(3) Two fire fighters could advance the hose line in the IDLH atmosphere, and the team leader and the pump operator remain outside as standby members.

A.8.8.7 The difficulty in rescuing a downed member or member in trouble cannot be overstated. While one crew/company might suffice at a single-family dwelling, the act of rescuing a member who is lost, trapped, or missing will become increasingly difficult at a large commercial building or high-rise building.

The ability to rapidly deploy a rapid intervention crew/company from the command post to an area remote from the location of the command post can adversely affect the successful rescue of a member. Consideration should be given to assigning a RIC to each point of crew entry at a commercial building.

For example, if the incident commander has established a tactical level management component (TLMC) at the front and rear of a commercial building, consideration should be given to assigning a RIC to each TLMC. Likewise, at a working fire in a high-rise building, consideration should be given to assigning multiple RICs to vertical positions near the area(s) of operation. At incidents such as the ones described, it could be desirable for the incident commander to establish a RIC TLMC comprised of multiple companies, dependent upon the complexity of the incident.

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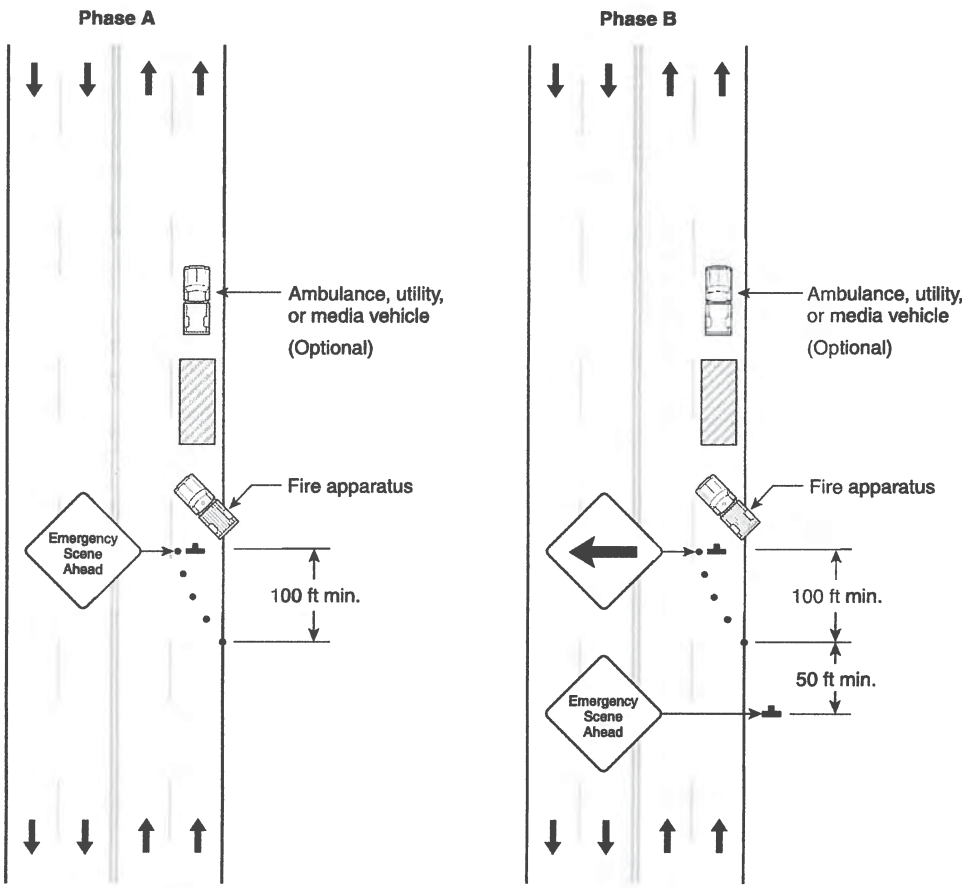

Phase A: Install sign after arrival, channelizing devices within 15 minutes of arrival.
Phase B: Install within 15 minutes after arrival of second apparatuses.

FIGURE A.8.7.5 Typical Emergency Scene Application.

A.8.9.1 Having a preplanned rehabilitation program that is applicable to most incident types is essential for the health and safety of members. The rehabilitation plan should outline an ongoing rehabilitation for simple or short-duration incidents as well as a process to transition into the rehabilitation needs of a large or long-duration incident.

A.8.9.2 See NFPA 1584, *Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises*, for guidelines for implementing incident scene rehabilitation.

A.8.9.3 Rest should be provided away from potentially toxic exposures and loud noises, preferably with the opportunity to dress down and sit down.

Adequate water supplies should allow for up to 1 qt (1 L) per person for incidents lasting an hour or more. Water must be potable, such as in sealed individualized plastic bottles. Avoid caffeinated and high-sugar beverages.

In hot, humid conditions, and/or where members have been working hard for more than 40 minutes, a means to actively cool core body temperature should be provided to prevent heat stress. Forearm immersion in cool water, misting fans, cooling vests, and so forth are types of active cooling. For more information on active cooling, see "Active Versus Passive Cooling During Work in Warm Environments While Wearing Firefighting Protective Clothing," by G. A. Selkirk, T. M. McLellan, and J. Wong.

Medical evaluation and treatment in the on-scene rehabilitation area should be conducted according to EMS protocols developed by the fire department in consultation with the fire department physician and the EMS medical director. If ALS personnel are available, this level of EMS care is preferred.

The assignment of an ambulance or other support crew to the rehabilitation function is essential during long-duration or heavy-exertion incident operations. This crew can assist with rehabilitation functions as well as be available to provide immediate life support needs for members.

Food should be made available for longer-duration incidents (more than three hours). If possible, supplied food should be nutritious. Members should be provided with a means to wash contaminants from their hands and faces before refueling.

Weather factors during emergency incidents can impact severely on the safety and health of members, particularly during extremes of heat or cold. Where these factors combine with long-duration incidents or situations that require heavy exertion, the risks to members increase rapidly. The fire de-

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partment should develop procedures, in consultation with the fire department physician, to provide relief from adverse climatic conditions.

Typical rehabilitation considerations for operations during hot-weather extremes are as follows:

(1) Moving fatigued or unassigned personnel away from the hazardous area of the incident
(2) Removal of PPE
(3) Ensuring that personnel are out of direct sunlight
(4) Ensuring that there is adequate air movement over personnel, either naturally or mechanically
(5) Providing for active cooling by using forearm immersion, misting fans, or other devices proven to quickly and effectively lower a member's core body temperature to avoid heat stress
(6) Providing personnel with fluid replenishment, especially water
(7) Providing medical evaluation for personnel showing signs or symptoms of heat exhaustion or heat stroke
(8) Providing a change of clothing and possibly a change of protective garments

Typical rehabilitation considerations for operations during cold-weather extremes are as follows:

(1) Moving fatigued or unassigned personnel away from the hazardous area of the incident
(2) Providing shelter from wind and temperature extremes
(3) Providing personnel with fluid replenishment, especially water
(4) Providing medical evaluation for personnel showing signs or symptoms of frostbite, hypothermia, or other cold-related injury
(5) Providing a change of clothing and possibly a change of protective garments

A.8.9.5 The importance of hydration during wildland firefighting operations cannot be overemphasized. This concept should be clearly understood and utilized by all members. A method of replenishment of this water supply should be in place to provide 8 qt to 12 qt (8 L to 12 L) of water per day, per member.

A.8.10.1 Fire department members should not enter an environment where there is ongoing violence, or the threat of violence such as persons with weapons, without coordination with law enforcement personnel. This does not necessarily limit the ability of cross-trained fire/law enforcement personnel or specialty trained EMS personnel from entering a violent scene to assist the law enforcement or fire department responders.

A.8.10.3 Such situations include but are not limited to civil disturbances, fights, violent crimes, drug-related situations, family disturbances, deranged individuals, and people interfering with fire department operations.

A.8.10.5 Incidents that appear routine in nature can, after the arrival of responding crews, turn into a violent or hostile environment. A standard communication phrase, known only by communications personnel and other responders, can warn others to the dangers of the situation without triggering violence or hostilities.

A.9.1.1 Where health, safety, building, and fire codes are not legally applicable to fire department facilities, steps should be taken to ensure that equivalent standards are applied and enforced. In the absence of local requirements, the provisions of NFPA 1, *Fire Code*; *NFPA 70, National Electrical Code*; NFPA *101, Life Safety Code*; *NFPA 5000, Building Construction and Safety Code*; the *Uniform Plumbing Code*; and the *Uniform Mechanical Code* should be applied. In addition, the workplace safety standards specified in 29 CFR 1910, *Occupational Safety and Health Standards*, or an equivalent standard should be applied. Applicable requirements of the Americans with Disabilities Act should be met.

A.9.1.3 As new stations are constructed or existing stations are renovated, a separation between the apparatus floor and living quarters should be provided.

A.9.1.5 The operation of a fire department requires the storage and indoor operation of fire apparatus that are generally housed in an enclosed building. The need to keep the apparatus and other vehicles ready for immediate service and in good operating condition, which requires the indoor running of vehicles for response and routine service/pump checks, makes storage in an enclosed area, such as an apparatus bay, necessary. The exhaust from all internal combustion engines, including diesel and gasoline-powered engines, contains over 100 individual hazardous chemical components that, when combined, can result in as many as 10,000 chemical compounds. A large majority of these compounds are today listed by state and federal regulatory agencies as being cancer causing or suspected carcinogens. The target components listed by NIOSH/OSHA consist of both hydrocarbon carbon components and compounds, which are produced as both gas-phase and particulate-phase compounds. The gases and particulates, which are viewed by NIOSH and OSHA as life threatening, consist of a cancer-causing substance know as polynuclear aromatic hydrocarbons (PAHs). Gases in diesel exhaust, such as nitrous oxide, nitrogen dioxide, formaldehyde, benzene, sulfur dioxide, hydrogen sulfide, carbon dioxide, and carbon monoxide, can also create health problems. According to NIOSH, human and animal studies show that diesel exhaust should be treated as a human carcinogen (cancer-causing substance). In accordance with the NIOSH *Pocket Guide to Chemical Hazards*, as it pertains to diesel exhaust, NIOSH recommends that occupational exposure to carcinogens be limited to the lowest feasible concentration. NIOSH uses OSHA's classification, outlined in 29 CFR 1990.103, *Definitions*, which states in part, "Potential occupational carcinogen means any substance, or combination or mixture of substances, which causes an increased incidence of benign and/or malignant neoplasm, or a substantial decrease in the latency period between exposure and onset of neoplasm in humans or in one or more experimental mammalian species as the result of any oral, respiratory or dermal exposure, or any other exposure which results in the induction of tumors at a site other than the site of administration." This definition also includes any substance that is metabolized into one or more potential occupational carcinogen by mammals.

A.9.1.8 As part of the fire station inspection program, the areas around the pole hole and the padding at the bottom of the pole should be regularly checked to ensure the safety of members using the pole.

A.9.3 In some jurisdictions, fire department facilities are maintained by other agencies. In these situations, fire departments should develop a process to expedite requests for repairs or modifications to the facility to address safety or health concerns.

A.10.1.5 If any member, either career or volunteer, reports for duty under the influence of alcohol or drugs, or any other

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substance that impairs the member's mental or physical capacity, this situation cannot be tolerated.

Evidence of substance abuse could include a combination of various factors such as slurred speech, red eyes, dilated pupils, incoherence, unsteadiness on feet, smell of alcohol or marijuana emanating from the member's body, inability to carry on a rational conversation, increased carelessness, erratic behavior, inability to perform a job, or other unexplained behavioral changes.

The possibility of liability exists if a member who is under the influence of alcohol or drugs is allowed to remain on duty, to operate or drive vehicles or equipment on duty, or to drive a private vehicle from the duty site. A member who is believed to be under the influence of alcohol or drugs cannot be allowed to operate equipment or drive a vehicle, including a private vehicle, until the condition of the member has been determined and verified.

A.10.2.1 Fire departments should consider use of the recruiting, mentoring, and training process found in the physical performance requirements referenced in the IAFF/IAFC Candidate Physical Ability Test (CPAT) Manual.

A.10.4.1 The health data base for a fire department should include the reports of regular physical evaluations, injury and illness reports, health exposures, and any supporting information that could be useful in tracking, analyzing, or predicting the health effects of various events on individuals or the group. This process should comply with the medical recordkeeping requirements of 29 CFR 1910.120, *Hazardous waste operations and emergency response.*

A.10.4.3 This information should be managed in a manner that respects the confidentiality of doctor-patient relationships. Electronic data processing is often employed to facilitate management of such a data base.

A.10.4.4 The fire department should try to obtain autopsy or other medical information for all deceased employees or former employees. This information could be useful in establishing relationships between occupational factors and resulting fatalities at some time in the future. Autopsies for fire fatalities should be conducted and recorded according to a standard protocol.

A.10.5.1 Where fire department members routinely respond to emergency medical incidents, the fire department should consult with medical professionals and agencies on measures to limit the exposure of members to infectious and contagious diseases. This should include the provision and maintenance of equipment to avoid or limit direct physical contact with patients, when feasible.

A.10.6.3 A fire department physician should have specific expertise and experience relating to the needs of fire department members and a thorough knowledge of the physical demands involved in emergency operations. If possible, the fire department physician should be a specialist in the field of occupational medicine.

A.10.6.4 Depending on the size and the needs of a fire department, the fire department physician might or might not be required on a full-time basis. A fire department should have a primary relationship with at least one officially designated physician. This physician can serve as the primary medical contact and, in turn, deal with a number of other physicians and specialists. A large fire department can designate more than one fire department physician or might determine that a relationship with a group practice or multiple-provider system is more appropriate to its needs. In any case, the option to consult with a physician who is particularly aware of the medical needs of fire department members and who is available on an immediate basis should exist.

A.11.1 The term *behavioral health program* is recommended in place of the prior designation (*member assistance program*) to minimize conflation of the services to be delivered with the model of service delivery.

The emphasis here is specifically directed toward behavioral health services to be provided, leaving the model for their provision to the discretion of the sponsoring department and its vendors.

A.11.1.1 Basic levels of assistance as enumerated in the standard should be available at the first step of access. The objective should be to provide these services in a manner that facilitates ease of access and usage, minimizes delays and obstacles, and encourages proactive utilization. Members and their families should be informed about the program, its services, and how to access its resources, both at the time that they enter the organization and regularly throughout their tenure. The behavioral health assistance program should also serve as a resource for identification of and access to other important community resources such as self-help groups (e.g., Alcoholics Anonymous, Alanon, Alateen), community health resources, parenting resources, and the like. The behavioral health assistance program should articulate with the fire department's program to address occupational exposure to atypically stressful events (*see Chapter 12*).

The fire department behavioral health assistance program does not need to be operated or financed by the fire department. Many community/county/state mental health agencies provide such services and these can be available without charge or at reduced fees. Labor and employee organizations can also sponsor and/or operate such programs. The fire department need have only the ability to identify when pertinent problems exist and be able to provide confidential referral for professional services when indicated. Program standards developed by the Association of Labor-Management Administrators and Consultants on Alcoholism (ALMACA) recommend the following:

(1) The physical location at which services are provided should facilitate easy access while ensuring confidentiality.
(2) Medical and disability plans should be reviewed to ensure that plans provide adequate coverage for alcohol, substance, and mental health needs (including, where feasible, outpatient care and day treatment options).
(3) Staff should be sufficiently familiar with medical and disability benefit plans to facilitate adequate advising regarding the extent, nature, and cost of the recommended treatment and the reimbursement available.

Primary staff for the program should hold the following:

(1) Appropriate managerial and administrative experience
(2) Skill in problem identification, interviewing, client motivation, and appropriate referral
(3) Appropriate training, licensure, and certification with respect to any direct clinical or counseling services that can be provided by primary staff

Active and appropriately prepared peer personnel are often critical to the success of a fire service behavioral health program. These personnel serve most effectively as a bridge and a link between the professional services and service providers of the program and their coworkers, friends, and asso-

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ciates. They can service valuable roles in outreach, referral, connection, awareness, and support for those who could benefit from support but might be unaware of its availability, are resistant to seeking help, or are uncertain about its benefits or its confidentiality. With proper training, they can help coworkers evaluate situations, consider alternatives, and access resources. Preparation should include training regarding resources, protocols, and procedures related to program, listening skills, referral skills, and appropriate elements of program content for outreach and education. Preparation should emphasize boundaries between peer roles and staff responsibilities, especially with respect to counseling and intervention.

It is important that members and their families are informed about the program and the services it offers and are continually updated on its existence, availability, and confidentiality. Information about the program should be made available to all new members and their families.

A.11.1.2 Referrals for specialty care should be made whenever a member or family requires treatment beyond primary counseling. Specialists receiving referrals should be fully licensed and certified to provide care consistent with appropriate standards (e.g., American Society of Addiction Medicine for alcohol and substance abuse treatment; the American Association for Marriage and Family Therapy for family and relationship issues) and current guidelines for evidence-based practice in the treatment of clinical diagnoses (e.g., published reviews of the Cochrane Collaboration).

A.11.1.3 Policies should recognize the impacts of addictions on job performance, safety, and quality of life and emphasize the need for proactive efforts in treatment and rehabilitation. Responsibilities of management, member organizations, and members as they relate to the policy should be clearly delineated. Prerogatives of management and responsibilities of member organizations should not be altered or abridged by the policies enacted. Participation in assistance programs should not affect future service or career advancement, nor should participation protect the member from disciplinary action for sustained substandard job performance or infractions of department regulations. Joint sponsorship by management and member organizations is highly desirable, and cooperative action in administration of the policy is encouraged.

A.11.1.4 Adherence to federal regulations regarding confidentiality of alcohol and other drug abuse records is required of programs receiving federal funds, directly or indirectly. Compliance with all aspect of the Health Information Portability and Accountability Act (HIPAA) is also required.

A.11.2.1 Components of a prevention and health promotion program include cardiac risk reduction, smoking/tobacco cessation, blood pressure regulation, strength and aerobic physical fitness training, nutrition, stress management, diabetes prevention, metabolic syndrome prevention, weight management or control, and so forth, and should provide education and counseling for the purpose of preventing health problems and enhancing overall well-being.

A.11.2.2 The fire department should develop a policy on the use of tobacco products for all members. The fire department should also develop a policy on the acceptance of new members into the fire department with regard to the use of tobacco products.

A.12.1 Substantial research has been conducted and reported since the last revision of this standard respecting occupational exposure to atypically stressful events and interventions directed toward mitigating their impact. Certain well-engrained approaches, most specifically critical incident stress debriefing (CISD), have not been shown to be effective in controlled studies and have been reported to have resulted in paradoxical, adverse outcomes for at least some participants. A number of authoritative guidelines now recommend against routine debriefing. Accordingly, this revision specifically deletes reference to CISD/CISM (critical incident stress management) as a required or desirable intervention and shifts its emphasis toward the use of professional services.

A.12.1.2 The fire department's written policy should indicate the responsibilities of the organization, its officers, and its members in ensuring that the impact of occupational events is systematically anticipated and considered. The policy should enhance support from officers, supervisors, and peers and full integration where indicated with the department's behavioral health assistance program (Chapter 11). Examples of atypically stressful events include mass casualty incidents, fire fighter line of duty fatality, or any other circumstance that falls outside the ordinary experience of its members.

A.12.1.3.3 Examples of licensed and certified specialists include psychiatrists, psychologists, and clinical social workers.

Annex B Monitoring Compliance with a Fire Service Occupational Safety and Health Program

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 The purpose of this standard is to specify the minimum requirements for an occupational safety and health program for a fire department *(see 1.2.1)*. Further, paragraph 1.2.4 says that nothing in the standard is intended to restrict any jurisdiction from exceeding the minimum requirements stated in the standard. Section 1.5 requires that when the standard is adopted by a jurisdiction, the authority having jurisdiction shall set a date or dates for achieving compliance with the requirements of this standard. As part of that adoption, the fire department is required to adopt a risk management plan that includes a written plan for compliance with this standard.

B.2 The worksheet (see Figure B.2) in this annex was developed to provide a template for fire departments that are beginning implementation of an occupational safety and health program or that are evaluating the current status of their programs.

B.3 This worksheet provides a tool for assessing the yearly progress of the program and for developing a fiscal policy plan to achieve compliance with the applicable requirements of the standard. In the second column, the user can record the percentage of compliance with a specific requirement, whether just getting started, about 50 percent complete, or in full compliance. The remarks can indicate factors that are affecting achieving compliance, whether they are financial, administrative, or in need of legislative action. Where compliance will cost money, the third column can be used to record an estimate of the cost to comply. Again the remarks can indicate whether this is an operating budget or a capital planning budget–type expense. The fourth column allows for indicating an expected or anticipated compliance date. Any additional remarks or changes should be included in the last column for explanatory purposes. This is not a "one size fits all" worksheet and should be modified or expanded to meet the user's needs.

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET

Fire Department: _____ Date: _____

Person(s) Completing Worksheet

Name: _____ Title: _____

Name: _____ Title: _____

Name: _____ Title: _____

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 1 Administration				
1.4 Equivalency				
1.4.1 Equivalency levels of qualifications				
1.4.2 Training, education, competency, safety				
Chapter 4 Organization				
4.1 Fire Department Organizational Statement				
4.1.1 Written statement or policy				
4.1.2 Operational response criteria				
4.1.3 Statement available for inspection				
4.2 Risk Management Plan				
4.2.1 Written risk management plan				
4.2.2 Risk management plan coverage				
4.2.3 Risk management plan components				
4.3 Safety and Health Policy				
4.3.1 Written fire department occupational safety and health policy				
4.3.2 Program complies with NFPA 1500				
4.3.3 Evaluate effectiveness of plan				
4.4 Roles and Responsibilities				
4.4.1 Fire department responsibility				
4.4.2 Comply with laws				
4.4.3 Fire department rules, regulations, and SOPs				
4.4.4 Accident investigation procedure				
4.4.5 Accidents and illnesses investigated				
4.4.6 Individuals cooperate, participate, and comply				

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FIGURE B.2 Fire Service Occupational Safety and Health Program Worksheet.

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 4 Organization *(continued)*				
4.4.7 Member has right to be protected and participate				
4.4.8 Member organization role				
4.5 Occupational Safety and Health Committee				
4.5.1 Establish committee				
4.5.2 Committee purpose				
4.5.3 Regular meetings				
4.6 Records				
4.6.1 Accidents, injury, illness, exposures, death records				
4.6.2 Occupational exposures				
4.6.3 Confidential health records				
4.6.4 Training records				
4.6.5 Vehicles and equipment records				
4.7 Appointment of the Health and Safety Officer				
4.7.1 Appointed by fire chief				
4.7.2 Meets qualifications				
4.7.3 Given authority to administer program				
4.7.4 Performing functions in NFPA 1521				
4.7.5 Managing occupational safety and health program				
4.7.6 Additional safety officers and resources available				
Chapter 5 Training, Education, and Professional Development				
5.1 General Requirements				
5.1.1 Establish and maintain safety and health training				
5.1.2 Training commensurate with duties and functions				
5.1.3 Training and education programs for new members				
5.1.4 Restrict the activities of new members				
5.1.5 Training on the risk management plan				
5.1.6 Training on department's written procedures				
5.1.7 Training for emergency medical services				

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FIGURE B.2 *Continued*

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 5 Training, Education, and Professional Development *(continued)*				
5.1.8 Training on operation, limitation, maintenance, and retirement criteria for personal protective equipment				
5.1.9 Maintaining proficiency in skills and knowledge				
5.1.10 Training includes safe exiting and accountability				
5.1.11 Training includes incident management and accountability system used by the fire department				
5.2 Member Qualifications				
5.2.1 Fire fighters meet NFPA 1001				
5.2.2 Drivers/operators meet NFPA 1002				
5.2.3 Airport fire fighters meet NFPA 1003				
5.2.4 Fire officers meet NFPA 1021				
5.2.5 Wildland fire fighters meet NFPA 1051				
5.2.6 Hazardous materials responders trained to at least operations level per NFPA 472				
5.3 Training Requirements				
5.3.1 Adopt or develop training and education curriculums				
5.3.2 Training supports minimum qualifications and certifications of members				
5.3.3 Members practice assigned skill sets on a regular basis but not less than annually				
5.3.4 Training for members when written policies, practices, procedures, or guidelines are changed				
5.3.5 SCBA training program per NFPA 1404				
5.3.6 Wildland fire fighters trained at least annually in the proper deployment of fire shelter				
5.3.7 Live fire training in accordance with NFPA 1403				
5.3.8 Supervised training				
5.3.9 Emergency medical services training				

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FIGURE B.2 *Continued*

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NFPA 1500

FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 5 Training, Education, and Professional Development *(continued)*				
5.3.10 Training on care, use, inspection, maintenance, and limitations of the protective clothing and equipment				
5.3.11 Incident management training to NFPA 1561				
5.3.12 Infectious disease control training to NFPA 1581				
5.4 Special Operations Training				
5.4.1 Advanced training for special operations				
5.4.2 Train members for support to special operations				
5.4.3 Technician level for hazardous materials mitigation				
5.4.4 Rescue technician training to NFPA 1006 when required				
5.5 Member Proficiency				
5.5.1 Proficiency of members				
5.5.2 Monitor training progress				
5.5.3 Annual skills check				
Chapter 6 Fire Apparatus, Equipment, and Drivers/Operators				
6.1 Fire Department Apparatus				
6.1.1 Safety and health concerns related to fire apparatus				
6.1.2 New fire apparatus meets NFPA 1901				
6.1.3 New wildland fire apparatus meets NFPA 1906				
6.1.4 New marine fire-fighting vessels meet NFPA 1925				
6.1.5 Tools, equipment, and SCBA properly secured				
6.1.6 Apparatus refurbished per NFPA 1912				
6.1.7 Restraints and harnesses for aircraft operations				
6.1.8 Apparatus has hose storage area with positive means to prevent unintentional hose deployment				
6.2 Drivers/Operators of Fire Department Apparatus				
6.2.1 Successful completion of approved driver training				
6.2.2 Complies with traffic laws including having valid driver's licenses				

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FIGURE B.2 *Continued*

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NFPA 1500

FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 6 Fire Apparatus, Equipment, and Drivers/Operators *(continued)*				
6.2.3 Rules and regulations for operating fire department vehicles				
6.2.4 Drivers are responsible				
6.2.5 All persons secured				
6.2.6 Drivers obey all traffic laws				
6.2.7 SOPs for non-emergency and emergency response				
6.2.8 Emergency response, drivers bring vehicle to a complete stop				
6.2.9 Proceed only when safe				
6.2.10 Stop at unguarded railroad grade crossings				
6.2.11 Use caution at guarded railroad grade crossings				
6.2.12 SOPs — engine, transmission and driveline retarders				
6.2.13 SOPs — manual brake limiting valves				
6.2.14 Rules and regulations for private vehicles for emergency response				
6.3 Riding in Fire Apparatus				
6.3.1 Tail steps and standing prohibited				
6.3.2 Seat belts not released while the vehicle is in motion				
6.3.3 Secured to vehicle while performing emergency medical care				
6.3.4 Hose loading operations				
6.3.5 Tiller training				
6.3.6 Helmets for riding in unenclosed areas				
6.3.7 Eye protection for riding in unenclosed areas				
6.3.8 Alternative transportation				
6.4 Inspection, Maintenance, and Repair of Fire Apparatus				
6.4.1 Fire apparatus inspection, maintenance, and repair per NFPA 1911				
6.4.2 Pumpers service tested per NFPA 1911				
6.4.3 Aerial ladders and elevating platforms tested per NFPA 1911				
6.4.4 Apparatus and equipment disinfected per NFPA 1581				

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FIGURE B.2 ***Continued***

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 6 Fire Apparatus, Equipment, and Driver/Operators *(continued)*				
6.5 Tools and Equipment				
6.5.1 Safety and health are primary concerns				
6.5.2 Hearing conservation				
6.5.3 New fire department ground ladders meet NFPA 1931				
6.5.4 New fire hose meets NFPA 1961				
6.5.5 New spray nozzles meet NFPA 1964				
6.5.6 Equipment inspected at least weekly and within 24 hours after any use				
6.5.7 Records maintained for the equipment				
6.5.8 Tested at least annually				
6.5.9 Defective or unserviceable equipment removed from service				
6.5.10 Tools and equipment cleaned per NFPA 1581				
6.5.11 Fire department ground ladders tested per NFPA 1932				
6.5.12 Fire hose inspected and tested per NFPA 1962				
6.5.13 Portable fire extinguishers inspected and tested per NFPA 10				
6.5.14 Powered rescue tools meet NFPA 1936				
Chapter 7 Protective Clothing and Protective Equipment				
7.1 General				
7.1.1 Fire department provides PPE				
7.1.2 Use of PPE				
7.1.3 PPE cleaned every 6 months per NFPA 1851				
7.1.4 Where worn, station work uniforms meet NFPA 1975				
7.1.5 Clothing considered thermally unstable not worn				
7.1.6 Laundry service available for contaminated clothing				
7.2 Protective Clothing for Structural Fire Fighting				
7.2.1 Protective clothing meets NFPA 1971				
7.2.2 Minimum 2 in. (50 mm) overlap of all protective clothing layers				

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FIGURE B.2 *Continued*

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NFPA 1500

FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 7 Protective Clothing and Protective Equipment *(continued)*				
7.2.3 Overlap not required on single-piece protection coveralls				
7.2.4.2 Gloves have proper interface				
7.2.5.1 Program in place for selection, care, maintenance, and use of protective clothing				
7.2.6 Require all members to wear appropriate protective ensemble				
7.3 Protective Clothing for Proximity Fire-Fighting Operations				
7.3.1 Risk assessment performed as required by Chapter 5 of NFPA 1851 to determine need for proximity ensembles				
7.3.2 Proximity fire-fighting protective equipment meeting NFPA 1971 provided and used				
7.3.3 Overlap not required on single-piece protection coveralls				
7.3.4 SCBA protected				
7.4 Protective Clothing for Emergency Medical Operations				
7.4.1.1 Emergency medical protective clothing meeting NFPA 1999 provided and used				
7.4.2 Members use emergency medical gloves				
7.4.3 Members use emergency medical body and face protection				
7.4.4 Infection control program for EMS protective clothing meets NFPA 1581				
7.5 Chemical-Protective Clothing for Hazardous Material Emergency Operations				
7.5.1.1 Members have and use vapor-protective garments that meet NFPA 1991 when appropriate				
7.5.2.1 Members have and use liquid splash-protective garments that meet NFPA 1992 when appropriate				
7.5.3.1 Members have and use appropriate protective ensemble for CBRN terrorism incidents				
7.6 Inspection, Maintenance, and Disposal of Chemical-Protective Clothing				
7.6.1 Inspected and maintained per manufacturer's recommendation				
7.6.2 Dispose of contaminated garments				

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FIGURE B.2 *Continued*

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 7 Protective Clothing and Protective Equipment *(continued)*				
7.7 Protective Clothing and Equipment for Wildland Fire Fighting				
7.7.1 SOPs for use of protective clothing				
7.7.2 Protective clothing that meets NFPA 1977 provided and used				
7.7.3 Fire shelter provided and worn properly				
7.8 Protective Ensemble for Technical Rescue Operations				
7.8.1 Technical rescue protective clothing meeting NFPA 1951 provided and used				
7.8.2 Minimum 2 in. (50 mm) overlap of all protective clothing layers				
7.8.3 Respiratory protection certified by NIOSH provided and used				
7.8.4 Primary eye protection that meets NFPA 1951 provided and used				
7.8.5 Protective clothing used and maintained per manufacturer's instructions				
7.9 Protective Clothing and Equipment for Surface Water Operations				
7.9.1 Members who engage in surface water operations use a protective ensemble meeting NFPA 1951				
7.9.2 Surface water protective ensembles used and maintained in accordance to manufacturer's instructions				
7.9.3 Fire department established maintenance and inspection program for surface water operation protective ensembles				
7.9.4 Proper decontamination procedures for surface water protective ensembles				
7.10 Respiratory Protection Program				
7.10.1 Respiratory protection program addresses the selection, care, maintenance, and use				
7.10.2 SOPs address respiratory protection				
7.10.3 Members qualified at least annually in use				
7.10.4 Reserve SCBA provided and maintained				
7.10.5 Adequate reserve air supply				
7.10.6 Equipment stored ready-for-use and properly protected				

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FIGURE B.2 *Continued*

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NFPA 1500

FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 7 Protective Clothing and Protective Equipment *(continued)*				
7.10.7 SCBA provided that meets NFPA 1981 and required to be used				
7.10.8 Members understand keeping facepiece in place				
7.11 Breathing Air				
7.11 Breathing air meets NFPA 1989				
7.12 Respiratory Protection Equipment				
7.12.1 SCBA meet appropriate standards				
7.12.2 Supplied-air respirators appropriate for intended application				
7.12.3 Air-purifying respirators NIOSH certified with policy for use				
7.13 Fit Testing				
7.13.1 Quantitative fit test annually				
7.13.2 New members fit tested before permitted in hazardous atmospheres				
7.13.3 Respirators quantitative fit testing in negative pressure mode				
7.13.4 Records of facepiece fitting test				
7.13.5 Protection factor at least 500 for negative-pressure facepieces				
7.14 Using Respiratory Protection				
7.14.1 Facepiece-to-face seal required				
7.14.2 Nothing passes through area of seal				
7.14.3 No beard and facial hair in area of seal				
7.14.4 Spectacles fitted to inside of facepiece				
7.14.5 Spectacle strap or temple bars prohibited				
7.14.6 Contact lenses permitted				
7.14.7 Head covering breaking seal prohibited				
7.14.8 SCBA facepiece/head harness worn under protective hood				
7.14.9 SCBA facepiece/head harness worn under hazardous chemical-protective helmet				
7.14.10 Helmet does not interfere with the facepiece-to-face seal				

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FIGURE B.2 *Continued*

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 7 Protective Clothing and Protective Equipment *(continued)*				
7.15 SCBA Cylinders				
7.15.1 Inspected annually				
7.15.2 Hydrostatic test cylinders				
7.15.3 In-service SCBA cylinders stored charged				
7.15.4 In-service SCBA cylinders inspected weekly, monthly, and prior to filling				
7.15.5 Personnel protected during SCBA cylinder filling				
7.15.6 Unique situations for rapid filling identified				
7.15.7 Risk assessment process used to identify rapid filling situations				
7.15.8 Rapid refilling of SCBA on person limited				
7.15.9 Emergency situation for air transfer permitted				
7.15.10 Transfilling per manufacturer's instructions				
7.16 Personal Alert Safety Systems (PASS)				
7.16.1 PASS meet NFPA 1982				
7.16.2 Members provided with and use PASS device				
7.16.3 Tested at least weekly and prior to use				
7.17 Life Safety Rope and System Components				
7.17.1 Life safety rope and system components meet NFPA 1983				
7.17.2.1 Life safety rope used for other purposes removed from service				
7.17.3 Reuse of life safety rope only after evaluation				
7.17.4 Rope inspection by qualified person				
7.17.5 Records document each life safety rope use				
7.18 Face and Eye Protection				
7.18.1 Eye protection appropriate for hazard provided and used				
7.18.2 SCBA facepiece used as primary face and eye protection				
7.18.3 Primary eye protection used when full facepiece not used				

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FIGURE B.2 *Continued*

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 7 Protective Clothing and Protective Equipment *(continued)*				
7.19 Hearing Protection				
7.19.1 Provided and used when apparatus noise in excess of 90 dBA				
7.19.2 Provided and used when tool and equipment noise in excess of 90 dBA				
7.19.3 Hearing conservation program				
7.20 New and Existing Protective Clothing and Protective Equipment				
7.20.1 New PPE meets current standards				
7.20.2 Existing PPE met standards when manufactured				
7.20.3 PPE retired in accordance with NFPA 1851				
Chapter 8 Emergency Operations				
8.1 Incident Management				
8.1.1 Prevent accidents and injuries				
8.1.2 Incident management system in writing and meets NFPA 1561				
8.1.3 IMS used at all emergency incidents				
8.1.4 IMS applied to drills, exercises, and training				
8.1.5 Incident commander responsible for safety				
8.1.6 Incident safety officer assigned when needed				
8.1.7 Span of control				
8.1.8 Incident commander's responsibility				
8.2 Communications				
8.2.1 Dispatch and incident communication systems meet NFPA 1561 and NFPA 1221				
8.2.2 SOPs for use of clear text radio messages				
8.2.3 Procedures for emergency traffic				
8.2.4 Incident clock used				
8.3 Risk Management During Emergency Operations				
8.3.1 Risk management integrated in incident command				

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FIGURE B.2 *Continued*

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FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 8 Emergency Operations *(continued)*				
8.3.2 Risk management principles used				
8.3.3 IC evaluates risk to members				
8.3.4 Risk management principles routinely employed by supervisors				
8.3.5 Incident safety officer with proper expertise appointed				
8.3.6 Protective equipment appropriate for CBRN exposure				
8.3.7 Consider providing atropine for nerve agents				
8.4 Personnel Accountability During Emergency Operations				
8.4.1 Written SOPs for personnel accountability				
8.4.2 Local conditions and characteristics considered				
8.4.3 Members actively participate				
8.4.4 IC maintains awareness				
8.4.5 TLMC officers supervise assigned companies/crews				
8.4.6 Company officers responsible for members				
8.4.7 Members remain with company				
8.4.8 Member responsible for following personnel accountability system				
8.4.9 Personnel accountability system used at all incidents				
8.4.10 Accountability system effective				
8.4.11 Additional accountability officers				
8.4.12 IC and supervisors responsible for tracking and accountability of assigned companies				
8.5 Members Operating at Emergency Incidents				
8.5.1 Adequate number of personnel provided to safely conduct emergency operations				
8.5.2 No evolutions outside of established safety criteria				
8.5.3 Inexperienced members directly supervised				
8.5.4 Members operate in teams of two or more				
8.5.5 Crew members in communication with each other				

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FIGURE B.2 *Continued*

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 8 Emergency Operations *(continued)*				
8.5.6 Crew members operate in proximity to each other				
8.5.7 Two in, two out in initial stages				
8.5.8 At aircraft rescue and fire fighting, IDLH area within 75 ft (23 m) of aircraft				
8.5.9 Highest available level of EMS available for special operations				
8.5.10 EMS personnel at hazmat operations meet NFPA 473				
8.5.11 IC requests EMS to be available				
8.5.12 Members secured to aerial device				
8.5.13 PPE and SCBA used by fire investigators and others in IDLH atmosphere				
8.5.14 Water rescue members wear personal flotation devices				
8.6 Hazard Control Zones				
8.6.1 Hazard control zones established with members wearing appropriate level of PPE				
8.6.2 Hazard control zone perimeters established				
8.6.3 Changes in perimeters communicated to all members on scene				
8.6.4 Hazard control zones identified				
8.6.5 The IC ensures that the designation of the appropriate protective clothing and equipment is commensurate with the hazard zone the member is operating in				
8.6.6 All officers and members using appropriate PPE within that zone				
8.6.7 The use of hazard control zones continued until the hazards have been mitigated				
8.7 Traffic Incidents				
8.7.1 Appropriate measures taken to protect members				
8.7.2 SOPs for operations involving traffic incidents				
8.7.3 Apparatus and warning devices used to protect members				
8.7.4 Apparatus positioned to protect members				
8.7.5 Warning devices used for oncoming traffic				

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FIGURE B.2 *Continued*

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard		Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 8 Emergency Operations *(continued)*					
8.7.6	Warning device placement sensitive to conditions				
8.7.7	First unit addresses traffic issues				
8.7.8	Members and victims in secure area				
8.7.9	Unneeded vehicles parked off roadway				
8.7.10	Members wear garments with visible materials				
8.7.11	Members trained in traffic control				
8.8 Rapid Intervention for Rescue of Members					
8.8.1	Personnel provided for rescue of members				
8.8.2.2	Standby members maintain awareness				
8.8.2.3	Standby members remain in communication				
8.8.2.4	Standby member permitted to perform other duties outside of the hazard area				
8.8.2.5	Standby member restricted activities				
8.8.2.6	Standby members have full PPE and SCBA				
8.8.2.7	Standby members don full PPE and SCBA before entering hazardous area				
8.8.2.8	Standby member limitations				
8.8.2	Rapid intervention crew deployed when incident no longer in initial stage				
8.8.2.10	In imminent life-threatening situation, action to prevent loss of life permitted with less than four personnel				
8.8.4	Rapid intervention crew equipped and available				
8.8.6	Composure and structure of RIC flexible				
8.8.7	IC provides RICs appropriate for incident size				
8.8.8	RIC status in early stages				
8.8.11	RICs for special operations				

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FIGURE B.2 ***Continued***

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 8 Emergency Operations *(continued)*				
8.9 Rehabilitation During Emergency Operations				
8.9.1 SOP for rehabilitation of members				
8.9.2 IC initiates rehabilitation per SOPs and NFPA 1561				
8.9.3 On-scene rehabilitation to include complete support				
8.9.4 Each member responsible to communicate rehabilitation needs				
8.9.5 Each wildland fire fighter provided with 2 qt (2 L) of water				
8.10 Violence, Civil Unrest, or Terrorism				
8.10.1 Fire department not involved in activity without law enforcement present				
8.10.2 Fire department personnel not involved in crowd control				
8.10.3 SOPs for member safety at civil disturbance				
8.10.4 Interagency agreement for protection of members				
8.10.5 Communication to indicate life-and-death situations				
8.10.6 Fire department to coordinate with law enforcement				
8.10.7 Fire department IC identifies and reacts to violent situations				
8.10.8 Fire department IC communicates with law enforcement IC				
8.10.9 Stage resources in a safe area until scene secure				
8.10.10 Secure law enforcement or withdraw when violence occurs				
8.10.11 Body armor used only by members trained and qualified				
8.10.12 Members supporting SWAT operations trained and operating under SOPs				
8.11 Post-Incident Analysis				
8.11.1 SOPs for standardized post-incident critique				
8.11.2 Incident safety officer involved in critique				
8.11.3 Review of conditions and actions on the safety and health of members				

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FIGURE B.2 *Continued*

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NFPA 1500
FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 8 Emergency Operations *(continued)*				
8.11.4 Identify needed action to improve welfare of members				
8.11.5 Analysis includes standard action plan				
Chapter 9 Facility Safety				
9.1 Safety Standards				
9.1.1 Comply with codes				
9.1.2 Facilities for disinfecting, cleaning, and storage per NFPA 1581				
9.1.3 All facilities comply with NFPA *101*				
9.1.3.1 All facilities have smoke detectors				
9.1.3.4 All facilities have carbon monoxide detectors				
9.1.5 Methods to prevent exhaust exposure				
9.1.6 Contaminated PPE not in living and sleeping areas				
9.1.7 Smoke-free facilities				
9.1.8 Pole holes secured				
9.2 Inspections				
9.2.1 Annual code inspection				
9.2.2 Inspections documented				
9.2.3 Monthly safety and health inspection				
9.3 Maintenance and Repairs				
9.3 System to maintain facilities and correct safety or health hazards				
Chapter 10 Medical and Physical Requirements				
10.1 Medical Requirements				
10.1.1 Medical qualified before becoming a member				
10.1.2 Medical evaluation considers risks and functions associated with duties				
10.1.3 Candidates and members meet NFPA 1582				
10.1.4 Aircraft pilots comply with FAA regulations				
10.1.5 Members under influence of drugs or alcohol excluded from participation				

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FIGURE B.2 *Continued*

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NFPA 1500

FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 10 Medical and Physical Requirements *(continued)*				
10.2 Physical Performance Requirements				
10.2.1 Fire department develops requirements				
10.2.2 Candidates qualified prior to training				
10.2.3 Members annually qualified				
10.2.4 Members not qualified not involved in emergency operations				
10.2.5 Physical performance rehabilitation program available				
10.3 Health and Fitness				
10.3.1 Health and fitness program meets NFPA 1583				
10.3.2 Fitness levels determined by individual's assigned functions				
10.3.3 Health and fitness coordinator administers the program				
10.3.4 Health and fitness coordinator acts as liaison				
10.4 Confidential Health Data Base				
10.4.1 Individual health file for each member				
10.4.2 Health file complete				
10.4.3 Composite data base for analysis				
10.4.4 Autopsy results in health data base				
10.5 Infection Control				
10.5.1 Fire department limits or prevents member's exposure				
10.5.2 Infection control program meets NFPA 1581				
10.6 Fire Department Physician				
10.6.1 Fire department physician officially designated				
10.6.2 Provides medical guidance in management of safety and health program				
10.6.3 Physician licensed				
10.6.4 Available on urgent basis				
10.6.5 Health and safety officer and health fitness coordinator liaison with physician				

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FIGURE B.2 ***Continued***

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FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM WORKSHEET *(continued)*

Reference in Standard	Percent in Compliance	Estimated Cost to Comply	Expected Compliance Date	Remarks
Chapter 11 Behavioral Health and Wellness Programs				
11.1 Behavioral Health Program				
11.1.1 Provide member assistance program				
11.1.2 Program refers members to appropriate health care services				
11.1.3 Written policy on alcoholism and substance abuse				
11.1.4 Written rules for records				
11.1.5 Member assistance records not part of member's personnel file				
11.2 Wellness Program				
11.1.6 Program evaluated on a regular basis				
11.2.1 Wellness program preventative goals and strategies				
11.2.2 Wellness program uses peer reviewed and researched strategies supporting safety and efficacy of the program				
11.2.2.1 Program on health effects with tobacco products				
Chapter 12 Occupational Exposure to Atypically Stressful Events				
12.1 General				
12.1.1 Physician to provide guidance				
12.1.2 Written policy that establishes program to relieve stress				
12.1.3 Criteria for implementation				

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FIGURE B.2 *Continued*

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Annex C Building Hazard Assessment

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 Fire fighters are being exposed to increased risks on the fireground. Buildings are being occupied in a manner different from that for which they were originally designed. The design of some buildings has changed so that the roofs and floors can and do fail at a faster rate. Mezzanines over the floor area have created hazards during fire-fighting operations. These changes have created safety hazards, which have increased the risks to fire fighters.

Fire departments should take appropriate measures to identify buildings that can cause hazardous conditions during emergency operations. A method that could be used is to add a letter or letters to the bottom white "specific hazard" area on existing placards as specified in NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response.* Some buildings are constructed utilizing several types of roof construction. The local fire department should determine which identifier is used based upon the construction feature or hazard that creates the greatest risk to fire fighters.

The identifier letter or letters that could be used are as follows:

(1) **A** — Artisans living in a commercial building
(2) **LT** — Lightweight trusses used in roof or floor construction (e.g., roofs-open web, wooden I-beams)
(3) **AT** — Arch trusses used in roof construction
(4) **P** — Panelized roof construction
(5) **M** — Mezzanines above floor area

Fire departments should initiate local actions that allow for the local adoption of NFPA 704 placards, with the same identifiers to be installed on nonplacarded buildings.

The NFPA 704 marking system could prove beneficial for first-responding companies and move-up companies, including companies used during mutual and automatic aid.

It is recommended that fire departments develop tactical plans to address safety concerns for fire fighters confronted with buildings placarded with specific hazards.

Annex D Risk Management Plan Factors

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1 Essentially, a risk management plan serves as documentation that risks have been identified and evaluated and that a reasonable control plan has been implemented and followed.

Some factors to consider for each step of the process are listed in D.1.1 through D.1.6.

D.1.1 Risk Identification. For every aspect of the operation of the fire department, list potential problems. The following are examples of sources of information that could be useful in the process:

(1) A list of the risks to which members are or can be exposed
(2) Records of previous accidents, illnesses, and injuries, both locally and nationally
(3) Facility and apparatus surveys, inspections, and so forth

D.1.2 Risk Evaluation. Evaluate each item listed in the risk identification process using the following two questions:

(1) What is the potential frequency of occurrence?
(2) What is the potential severity and expense of its occurrence?

This will help to set priorities in the control plan.

Some sources of information that could be useful are the following:

(1) Safety audits and inspection reports
(2) Prior accident, illness, and injury statistics
(3) Application of national data to the local circumstances
(4) Professional judgment in evaluating risks unique to the jurisdiction

D.1.3 Establishment of Priorities for Action. Determining the frequency and severity of occurrence of risks will serve as a method for establishing priorities. Any risk that has a low probability of occurrence but will have serious consequences (high risk) deserves immediate action and would be considered a high-priority item. Non-serious incidents with a low likelihood of occurrence are a lower priority and can be placed near the bottom of the "action required" list.

D.1.4 Risk Control. Once risks are identified and evaluated, a control for each should be implemented and documented. The two primary methods of controlling risk, in order of preference, are as follows:

(1) Wherever possible, totally eliminate/avoid the risk or the activity that presents the risk. For example, if the risk is falling on the ice, then do not allow members to go outside when icy conditions are present.
(2) Where it is not possible or practical to avoid or eliminate the risk, steps should be taken to control it. In the example in D.1.4(1), some methods of control would be sand/salt procedures, the wearing of proper footwear, and so forth.

D.1.5 Other Methods of Control. Other methods of control to consider are the following:

(1) Safety program development, implementation, and enforcement
(2) Standard operating procedures development, dissemination, and enforcement
(3) Training
(4) Inspections

D.1.6 Risk Management Monitoring and Follow-Up. As with any program, it is important to evaluate whether the plan is working. Periodic evaluations should be made, and, if the program elements are not working satisfactorily, then modifications should be made.

D.2 Figure D.2 shows a sample risk management plan. For additional information the user should refer to NFPA 1250, *Recommended Practice in Fire and Emergency Services Organization Risk Management.*

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[ANYTOWN] FIRE DEPARTMENT RISK MANAGEMENT PLAN

Purpose

The *[Anytown]* Fire Department has developed and implemented a risk management plan. The goals and objectives of the plan are as follows:

(1) To limit the exposure of the fire department to situations and occurrences that could have harmful or undesirable consequences on the department or its members

(2) To provide the safest possible work environment for the members of the fire department, while recognizing the risks inherent to the fire department's mission

Scope

The risk management plan is intended to comply with the requirements of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*.

Methodology

The risk management plan uses a variety of strategies and approaches to address different objectives. The specific objectives are identified from the following sources of information:

(1) Records and reports on the frequency and severity of accidents and injuries in the *[Anytown]* Fire Department

(2) Reports received from the *[Anytown]* Fire Department's insurance carriers

(3) Specific occurrences that identify the need for risk management

(4) National trends and reports that are applicable to *[Anytown]*

(5) Knowledge of the inherent risks that are encountered by fire departments and specific situations that are identified in *[Anytown]*

(6) Any additional areas identified by fire department staff and personnel

Responsibilities

The fire chief has responsibility for the implementation and operation of the department's risk management plan. The department's health and safety officer has the responsibility to develop, manage, and annually revise the risk management plan. The health and safety officer also has the responsibility to modify the risk management plan when warranted by changing exposures, occurrences, and activities.

All members of the *[Anytown]* Fire Department have responsibility for ensuring their own health and safety based upon the requirements of the risk management plan and the department's safety and health program.

Plan Organization

The risk management plan includes the following:

(1) Identification of the risks members of the fire department could actually or potentially encounter, both emergency and non-emergency

(a) Emergency risks include those presented at emergency incidents, both fire and non-fire (e.g., hazardous materials), Emergency Medical Services incidents, and emergency response.

(b) Non-emergency risks include those encountered while performing functions such as training, physical fitness, non-emergency vehicle operation, and station activities (e.g., vehicle maintenance, station maintenance, daily office functions).

(2) Evaluation of the identified risks based upon the frequency and severity factors

(3) Development and implementation of an action plan for controlling each of the risks, in order of priority

(4) Provisions for monitoring the effectiveness of the controls implemented

(5) A periodic review of the plan with modifications made as needed

The plan requires a monitoring process which may be done by the health and safety committee or the health and safety officers.

Risk Management Plan Monitoring

(1) The *[Anytown]* Fire Department's risk management program will be monitored annually, in January, by the health and safety officer.

(2) Recommendations and revisions will be made based on the following criteria:

(a) Annual accident and injury data for the preceding year

(b) Significant incidents that have occurred during the past year

(c) Information and suggestions from department staff and personnel

(3) Every 3 years, the risk management program will be evaluated by an independent source. Recommendations will be sent to the fire chief, the health and safety officer, and the occupational safety and health committee.

FIGURE D.2 Sample Risk Management Plan.

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Annex E Hazardous Materials PPE Information

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

E.1 Fire department personnel involved in a hazardous materials incident should be protected against potential chemical hazards. The purpose of chemical-protective clothing and equipment is to shield or isolate individuals from the chemical hazards that can be encountered during hazardous materials responses. Adequate chemical-protective clothing should be carefully selected and used to protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing.

Structural fire-fighting protective clothing and equipment should not be used for hazardous materials incidents. Even where certified to the appropriate NFPA standards for structural fire fighting, these clothing and equipment items provide little or no protection against hazardous materials. Use of this clothing for hazardous materials emergency response can result in serious injury or death, as explained in E.1.1 through E.1.3.

E.1.1 Structural fire-fighting protective clothing materials are easily permeated or penetrated by most hazardous materials. Some parts of structural fire-fighting clothing can actually absorb chemical liquids or vapors, increasing the likelihood of serious exposure.

E.1.2 Many hardware items will fail or lose function when contacted by chemicals (e.g., etching of visors, deterioration of straps, corrosion of hooks or other metal items).

E.1.3 Contamination of structural fire-fighting protective clothing might not be effectively removed by laundering. Reuse of contaminated clothing can cause chronic exposure and accelerate physiological effects produced by contact with the chemical. Fire fighters should realize that no single combination of protective equipment and clothing is capable of protecting them against all hazards. Therefore, chemical-protective clothing should be used in conjunction with other protective methods. The use of such clothing can create significant wearer hazards, such as heat stress and physical and psychological stress, as well as impaired vision, mobility, and communication. In general, the greater the level of chemical clothing protection, the greater are the associated risks. For any given situation, equipment and clothing should be selected that provide an adequate level of protection. Overprotection as well as underprotection can be hazardous and should be avoided. The approach to selecting personal protective clothing and equipment should encompass an ensemble of clothing and equipment items that are easily integrated to provide both an appropriate level of protection and the ability to carry out emergency response activities. The following is a checklist of components that can form the chemical-protective ensemble:

(1) Protective clothing (i.e., suit, coveralls, hoods, gloves, boots)
(2) Respiratory equipment (i.e., SCBA, combination SCBA/SAR)
(3) Cooling system (i.e., ice vest, air circulation, water circulation)
(4) Communications device
(5) Head protection
(6) Ear protection
(7) Inner garments
(8) Outer protection (i.e., overgloves, overboots, flashcovers)

E.2 Emergency Response PPE Information. For emergency response, the only acceptable types of protective clothing include fully or totally encapsulating suits and nonencapsulating or "splash" suits combined with accessory clothing items such as chemical-resistant gloves and boots. These descriptions apply to how the clothing is designed, not to its performance. NFPA has classified chemical-protective suits by their performance in the following two standards:

(1) Vapor-protective suits (NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*) (Level A)
(2) Liquid splash-protective suits (NFPA 1992, *Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies*) (Level B with SCBA)

Protective clothing should completely cover both the wearer and the wearer's breathing apparatus. Wearing SCBA or other respiratory equipment outside the suit subjects this equipment to the chemically contaminated environment. The SCBA used for hazardous materials emergency response are generally the same as those used in structural fire fighting. Respiratory protective equipment is not designed to resist chemical contamination and should be protected from these environments. NFPA 1991 vapor-protective suits require that respiratory protection SCBA be worn on the inside. NFPA 1992 liquid splash-protective suits can be configured with the SCBA on either the inside or the outside. However, it is strongly recommended that respiratory equipment be worn inside the ensemble to prevent its failure and to reduce decontamination problems.

A variety of accessories are available for chemical-protective ensembles. As with protective clothing and respirators, it is important that these components integrate easily into an ensemble without a decrease in the protective integrity offered by any one component. For the most part, the protective suit is the main integrating ensemble component because it should accommodate all other equipment while completely covering the wearer. Nevertheless, selection of an ensemble configuration should consider all items simultaneously.

Fire departments are faced with selecting a number of available chemical-protective garments and sorting through the variety of information provided by the manufacturer. What follows are some guidelines that can be used in selecting chemical-protective suits.

E.2.1 It must be determined if the clothing item is intended to provide vapor or liquid splash protection. Vapor-protective suits also provide liquid splash protection. Both vapor- and liquid splash-protective suits also provide protection against solid chemicals and particles. **Many garments can be labeled as totally encapsulating but do not provide gastight integrity due to inadequate seams or closures.** Splash suits must still cover the entire body when combined with the respirator, gloves, and boots. **Applying duct tape to a splash suit does not enable it to protect against vapors.** Gastight integrity can only be determined by performing a pressure or inflation test of the respective protective suit, which should be done per the manufacturer's recommendation. ASTM F 1052, *Standard Test Method for Pressure Testing Vapor Protective Ensembles,* offers a procedure for conducting this test. This test involves the following:

(1) Closing off suit exhalation valves
(2) Inflating the suit to a prespecified pressure
(3) Observing whether the suit holds the above pressure for a designated period of time

Liquid splash-protective suits should provide "liquidtight" integrity. Liquidtight integrity is best evaluated by determining how the chemical-protective suit and other clothing prevent

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sprayed liquid from contacting the wearer. ASTM F 1359, *Standard Test Method for Liquid Penetration Resistance of Protective Clothing or Protective Ensembles Under a Shower Spray While on a Mannequin,* offers procedures for conducting this test involving the placement of the suit and other clothing over a mannequin that is dressed in a water-absorptive garment. Surfactant-treated water is sprayed at the suited mannequin from several different directions. Observations of water penetration on the water-absorptive garment indicate a lack of liquidtight integrity. In particular, seam, closure, and clothing item interface areas should be examined closely for watertight integrity.

E.2.2 It should be determined if the clothing item provides full-body protection. A vapor-protective or totally encapsulating suit will meet this requirement by passing gastight integrity tests. Liquid splash-protective suits can have separate parts. Missing clothing items should be obtained separately and match or exceed the performance of the garment. Buying a polyvinyl chloride (PVC) glove for a PVC splash suit does not mean that the same level of protection is obtained. This determination should be made by comparing chemical resistance data.

Component parts of the liquid splash-protective suit should also integrate and provide liquidtight integrity as described previously.

E.2.3 The manufacturer's chemical resistance data provided with the garment should be evaluated. Technical data packages are required to be supplied by the manufacturers of protective suits that are certified to NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies,* or NFPA 1992, *Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies.* Manufacturers of vapor-protective suits should provide permeation resistance data for their products, while penetration resistance data should accompany liquid splash-protective garments. Data should be provided for every primary material in the suit, including the garment, visor, gloves, and boots.

Permeation data should include a citation that testing was conducted in accordance with ASTM F 739, *Standard Test Method for Resistance of Protective Clothing Materials to Permeation by Liquids or Gases Under Conditions of Continuous Contact,* and the following:

(1) Chemical name
(2) Breakthrough time (indicates how soon the chemical permeates)
(3) Permeation rate (indicates the rate at which the chemical permeates)
(4) System sensitivity (allows comparison of test results from different laboratories)

If no data is provided or if the data lacks any of the information above, the manufacturer should be asked to supply the missing data or the product will not be considered. Manufacturers that provide only numerical or qualitative ratings should support their recommendations with complete test data.

Penetration data should include a pass or fail determination for each chemical listed and a citation that testing was conducted in accordance with ASTM F 903, *Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Liquids.* Protective suits that are certified to NFPA 1991 or NFPA 1992 should meet all of the above requirements.

Suit materials that show no breakthrough or no penetration in response to a large number of chemicals are likely to have a broad range of chemical resistance. (Breakthrough times greater than 1 hour are usually considered to be an indication of acceptable performance.) If there are specific chemicals within a response area that have not been tested, the manufacturer should be consulted for test data on these chemicals.

E.2.4 The manufacturer's instruction manual should be obtained and examined.

This manual should document all the features of the suit and describe those materials that are used in its construction. It should cite specific limitations for the suit and the restrictions that apply to its use. Procedures and recommendations should be supplied for at least the following:

(1) Donning and doffing
(2) Inspection, maintenance, and storage
(3) Decontamination
(4) Use

The manufacturer's instructions should be thorough enough to allow trained fire department members to wear and use the suit without a large number of questions.

E.2.5 Sample garments should be obtained and inspected.

An examination of the quality of suit construction and other features that will impact its wearing should be made. If possible, representative garments should be obtained in advance, inspected prior to purchase, and reviewed with an individual who has experience in their use. It is also helpful to "try out" representative garments prior to purchase by having personnel run through exercises to simulate response activities while wearing the garments.

Despite the fact that a fire department has gone through a very careful selection process, a number of situations will arise where no information is available to judge whether the protective clothing chosen will provide adequate protection. These situations include the following:

(1) Chemicals that have not been tested with the garment materials
(2) Mixtures of two or more different chemicals
(3) Chemicals that cannot be readily identified
(4) Lack of data in all suit components (e.g., gloves, visors)

Testing material specimens using newly developed field test kits can offer one means for making on-site clothing selections. A portable test kit has been developed by the EPA using a simple weight loss method that allows field qualification of protective clothing materials within 1 hour. Use of this kit can compensate for the absence of data and provide additional criteria for clothing selection. Selection of chemical-protective clothing is a complex task and should be performed by personnel with both extensive training and experience. Under all conditions, clothing should be selected by evaluating its performance characteristics against the requirements and limitations imposed by the response activity.

Annex F Sample Facility Inspector Checklists

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

F.1 Figure F.1 is a facilities safety checklist used by the Virginia Beach Fire Department to document and record fire department facility inspections. Fire departments are encouraged to develop an inspection form and procedure that works for their jurisdiction. The inspection procedure should provide direction for company officers to conduct inspections of their particular facilities at least annually as required by this standard.

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FACILITY SAFETY CHECKLIST

Facility: _____ **Date:** _____

I. GENERAL

____ The required OSHA workplace poster shall be displayed in the station, as required, where all employees are likely to see it.

____ Emergency instructions and telephone numbers shall be available for the general public, in the event of an emergency and fire personnel are out of quarters.

Comments: _____

II. HOUSEKEEPING

____ All rooms, offices, hallways, storage rooms, and the apparatus floor shall be kept clean and orderly and in a sanitary condition.

____ All hallways and/or passageways shall be free from any type of hazards.

____ All waste containers shall be emptied regularly.

____ Waste containers shall be provided in the kitchen and/or eating areas. These containers shall be maintained in a clean and sanitary condition. Waste container liners are required in all waste containers kept in kitchen and/or eating areas.

____ All areas of the station shall be adequately illuminated.

____ Stairways shall be in good condition with standard railings provided for every flight having four or more risers.

____ Portable ladders shall be adequate for their purpose, in good condition, and have secure footing.

____ Fixed ladders shall be equipped with side rails, cages, or special climbing devices.

____ Containers of all cleaning agents shall be carefully labeled per OSHA standards.

____ First aid supplies shall be available and clearly identified as to location.

____ Shower curtains shall provide adequate protection to prevent floors from becoming excessively wet and slippery.

____ Cooking appliances, including gas and charcoal grills, and eating utensils shall be kept clean and in good working order.

Comments: _____

III. EXITS

____ All exits shall be visible and unobstructed.

____ All exits shall be marked with a readily visible sign that is illuminated if required by building code.

____ Doors that might be mistaken for exits shall be marked "Not an Exit" if required by building code.

____ Exits and exit signs shall be free of decoration, draperies, and/or furnishings.

____ Primary exit routes shall be obvious, marked, and free of obstruction.

____ Exits shall be wide enough for easy access.

Comments: _____

IV. WALKING AND WORKING SURFACES

____ Floors shall be kept as clean and dry as possible.

____ Fire fighters' routes to slide poles or to apparatus shall be completely free of projections, tripping hazards, loose objects, or other impediments.

____ All slide pole floor openings shall be provided with safety enclosures.

____ A safety mat shall be provided at the bottom of the slide pole.

____ The slide pole shall be regularly inspected and maintained.

Comments: _____

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FIGURE F.1 Sample Facilities Safety Checklist.

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FACILITY SAFETY CHECKLIST *(continued)*

V. APPARATUS FLOOR AND MAINTENANCE AREAS

_____ All projecting tools and objects shall be clearly marked to warn against "head bump" accidents.

_____ Apparatus overhead doors shall be maintained in a safe, operating condition.

_____ Apparatus doors shall have adequate space for proper clearance for vehicles.

_____ Maintenance pits shall be adequately covered, sufficiently lighted, and ventilated.

_____ Pit boundaries shall be clearly marked.

_____ The pit floor shall be kept as clean and dry as possible.

_____ Work rests on grinders shall be adjusted to within ⅛ in. to the grinding wheel.

_____ Grinders and grinding wheels shall be adequately guarded. The safety guard shall cover the spindle end, the nut, and the flange protection.

_____ All power tools shall be provided with proper guarding for electrical, cutting, and moving parts.

_____ Maintenance hand tools shall be safely stored when not being used. They shall be inspected periodically and maintained to assure their safe condition.

Unsafe conditions to check:

_____ Is the tool clean?

_____ Are handles/grips broken?

_____ Are there worn defective points/parts on the tool?

_____ Are there parts missing?

_____ Are safety guards and devices in place and in proper working condition?

_____ Pulleys and belts shall be properly guarded.

_____ Chain drives and sprockets shall be guarded.

_____ Air cleaning nozzles shall not emit more than 30 psi dead end pressure.

_____ A spotter shall be used when vehicles are backed up. A spotter shall be used when a vehicle is driven forward or backward over a pit.

Comments: _____

_____

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VI. LAUNDRY, CLEANING, AND DISINFECTING AREAS

_____ The station designated cleaning and disinfecting area for the care of linen, work uniforms, EMS equipment, and other portable equipment shall be clean and orderly.

_____ The designated cleaning and disinfecting area shall be physically separate from the areas used for food preparation, cleaning of food or cooking utensils, personal hygiene, and sleeping or living areas.

_____ Cleaning and disinfecting facilities shall be equipped with rack shelving of nonporous material located above the sink for drip drying of cleaned equipment.

_____ The utility sink used in the cleaning and disinfecting area shall be kept clean and free of obstruction, and objects shall not be left in the sink.

_____ The washer and dryer shall be kept clean and in good working condition to assure decontamination of work uniforms and linen.

_____ A five-gallon biohazard waste container shall be maintained at each station. The container shall be emptied at least weekly.

Comments: _____

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VII. BUILDING EXTERIOR AND GROUNDS

_____ The exterior of the building shall be in good condition. There shall be no missing finishes or temporary repairs. Roof shingles shall not be missing, and all windows shall function.

_____ There shall be no accumulation of debris or trash next to the building or on the station grounds.

_____ All walkway surfaces, parking lots, and ramps shall be free of hazards and in good condition.

All exterior lighting shall work as designed.

_____ All detached storage buildings shall be kept in good condition and present no obvious hazards.

Comments: _____

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FIGURE F.1 *Continued*

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FACILITY SAFETY CHECKLIST *(continued)*

VIII. DECONTAMINATION ROOMS

_____ The decontamination room shall be clean and orderly and free of storage not related to decontamination.

_____ The decontamination room shall have instructions clearly posted as to how to proceed through decontamination.

_____ There shall be an inventory on hand in the decontamination room, and the inventory shall be complete with the supplies on hand.

_____ The decontamination washer and dryer shall be clean and in working condition.

_____ There shall be instructions posted as to the use of the washer and dryer.

Comments: _____

IX. FIRE PREVENTION AND PROTECTION

_____ Portable fire extinguishers shall be maintained in a fully operable condition and kept in designated places when not in use. They shall be inspected on a monthly basis.

_____ Fire extinguishers shall be of the proper size/type for the expected hazard.

_____ The fire extinguisher shall have a durable tag securely attached to show the maintenance or recharge date. Also, the initials or signature of the person who performed the inspection shall be on the tag.

_____ If the station is equipped with a fire alarm system, the system shall be maintained and tested by a qualified person to the requirements of NFPA 72.

_____ If the station is equipped with a sprinkler system, the system shall be maintained and tested by a qualified person to the requirements of NFPA 25.

_____ The minimum clearance of 18 in. shall be maintained below the sprinkler heads.

_____ Smoke detectors shall be inspected and tested quarterly.

_____ Carbon monoxide detectors shall be inspected and tested quarterly.

Comments: _____

X. HAZARDOUS MATERIALS

_____ Cylinders of compressed gas shall be stored away from combustible materials, in an upright position, and properly secured to prevent cylinders from falling over.

_____ Flammable and combustible materials shall be stored in tanks or closed containers per NFPA 30 and building code requirements. Flammable and combustible liquids in excess of 30 gallons must be stored in an approved storage locker. The containers must be made of metal, or the containers must be stored in a storage cabinet approved for flammable materials.

_____ Safety containers shall have self-closing lids and shall be used for the storage of flammable liquids and soiled, oily rags.

Comments: _____

XI. ELECTRICAL WIRING, FIXTURES, AND CONTROLS

_____ Electrical cords shall be strung so they do not hang on pipes, nails, hooks, etc.

_____ Conduit shall be attached to all supports and tightly connected to junction and outlet boxes.

_____ All electrical cords shall be checked for fraying.

_____ All equipment shall be securely mounted to the surface on which it sits.

_____ Flexible cords and cables shall not be used as a substitute for fixed wiring.

_____ All extension cords shall be properly grounded and approved.

_____ All electrical tools, whether department owned or personal property, shall be properly protected for damaged power cords, plugs, worn switches, defective ground circuits, or other faults that might render them unsafe for use.

_____ Electrical panel boxes and circuit breakers shall be marked to show their purpose.

_____ Electrical switches, outlets, panel boxes, and junction boxes shall be properly covered.

Comments: _____

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FIGURE F.1 *Continued*

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FACILITY SAFETY CHECKLIST *(continued)*

XII. OTHER

_____ Check all physical fitness equipment for safety issues. Inspect all cables, pulleys, seats, hinges, handles, grips, and connectors.

_____ Check the physical fitness equipment inventory to be sure all equipment is available for use.

_____ Check for the appropriate amount of space within the physical fitness area to safely utilize the equipment.

_____ Portable heaters used in stations shall be placed out of travel routes, placed away from combustibles, and if turned over, shall turn themselves off.

_____ Monthly station generator check-off completed.

_____ Stations housing an on-site SCBA air compressor shall have in place and utilize a log book that meets 29 CFR 1910.134, which include the log-in of the following information: date bottle was filled, hydrostatic test date, identification number, and the person filling the bottle.

_____ Compressor and cascade records shall be clear and up to date. Air quality checks shall be posted in compressor room.

_____ Fill station containment device shall be in good working order.

_____ Any situation that warrants a concern shall be brought to the attention of the department's safety officer.

_____ Inspection by certified agency conducted for compressors rated at 60 gal and above.

_____ Inspection by certified agency conducted for hot water heaters with 120 gal and above.

_____ Have problems been documented?

_____ Any other concerns?

Comments: _____

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FIGURE F.1 *Continued*

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Annex G Informational References

G.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

G.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1, *Fire Code*, 2012 edition.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2010 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2011 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2012 edition.

NFPA 70®, *National Electrical Code®*, 2011 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*, 2013 edition.

NFPA *101®*, *Life Safety Code®*, 2012 edition.

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*, 2009 edition.

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NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, 2013 edition.

NFPA 473, *Standard for Competencies for EMS Personnel Responding to Hazardous Materials/Weapons of Mass Destruction Incidents*, 2013 edition.

NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, 2012 edition.

NFPA 901, *Standard Classifications for Incident Reporting and Fire Protection Data*, 2011 edition.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2013 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, 2009 edition.

NFPA 1003, *Standard for Airport Fire Fighter Professional Qualifications*, 2010 edition.

NFPA 1006, *Standard for Technical Rescuer Professional Qualifications*, 2008 edition.

NFPA 1021, *Standard for Fire Officer Professional Qualifications*, 2009 edition.

NFPA 1041, *Standard for Fire Service Instructor Professional Qualifications*, 2012 edition.

NFPA 1051, *Standard for Wildland Fire Fighter Professional Qualifications*, 2012 edition.

NFPA 1071, *Standard for Emergency Vehicle Technician Professional Qualifications*, 2011 edition.

NFPA 1250, *Recommended Practice in Fire and Emergency Services Organization Risk Management*, 2010 edition.

NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, 2013 edition.

NFPA 1401, *Recommended Practice for Fire Service Training Reports and Records*, 2012 edition.

NFPA 1403, *Standard on Live Fire Training Evolutions*, 2012 edition.

NFPA 1404, *Standard for Fire Service Respiratory Protection Training*, 2006 edition.

NFPA 1405, *Guide for Land-Based Fire Departments That Respond to Marine Vessel Fires*, 2011 edition.

NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program*, 2007 edition.

NFPA 1521, *Standard for Fire Department Safety Officer*, 2008 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System*, 2008 edition.

NFPA 1581, *Standard on Fire Department Infection Control Program*, 2010 edition.

NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, 2013 edition.

NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Department Members*, 2008 edition.

NFPA 1584, *Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises*, 2008 edition.

NFPA 1620, *Standard for Pre-Incident Planning*, 2010 edition.

NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, 2010 edition.

NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, 2008 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 2009 edition.

NFPA 1906, *Standard for Wildland Fire Apparatus*, 2012 edition.

NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus*, 2012 edition.

NFPA 1912, *Standard for Fire Apparatus Refurbishing*, 2011 edition.

NFPA 1925, *Standard on Marine Fire-Fighting Vessels*, 2008 edition.

NFPA 1931, *Standard for Manufacturer's Design of Fire Department Ground Ladders*, 2010 edition.

NFPA 1932, *Standard on Use, Maintenance, and Service Testing of In-Service Fire Department Ground Ladders*, 2010 edition.

NFPA 1936, *Standard on Powered Rescue Tools*, 2010 edition.

NFPA 1951, *Standard on Protective Ensembles for Technical Rescue Incidents*, 2013 edition.

NFPA 1961, *Standard on Fire Hose*, 2013 edition.

NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose*, 2008 edition.

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NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, 2013 edition.

NFPA 1975, *Standard on Station/Work Uniforms for Emergency Services*, 2009 edition.

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NFPA 1991, *Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies*, 2005 edition.

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FA-220, *Firefighter Fatality Retrospective Study*, 2002.

FA-248, *Safe Operation of Fire Tankers*, 2003.

FA-272, *Emergency Vehicle Safety Initiative*, 2004.

G.1.2.3 IAFF/IAFC Publications. (IAFF) 1750 New York Avenue, NW, Washington, DC 20006; (IAFC) 4025 Fair Ridge Drive, Fairfax, VA 22033-2868.

The IAFF/IAFC Fire Service Joint Labor Management Candidate Physical Ability Test (CPAT) Manual.

G.1.2.4 IAPMO Publications. International Association of Plumbing and Mechanical Officials, 5001 E. Philadelphia Street, Ontario, CA 91761.

Uniform Mechanical Code, 2003.

Uniform Plumbing Code, 2003.

G.1.2.5 ICMA Publications. International City/County Management Association, 777 North Capitol Street N.E., Suite 500, Washington, DC 20002.

Managing Fire and Rescue Services, 2002.

G.1.2.6 NFSIMSC Publications. Fire Protection Publications, Oklahoma State University, Stillwater, OK 74078.

National Fire Service Incident Management System Consortium (NFSIMSC), "Model Procedures Guide for Highway Incidents," 1st edition, 2004.

G.1.2.7 NTIMC Publications. National Traffic Incident Management Coalition, 444 N Capitol St. NW — Suite 249 — Washington, DC 20001, National Unified Goal, 2007.

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Index

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-A-

Administration ..... Chap. 1
Application 1.3
Equivalency 1.4
Purpose 1.2
Scope 1.1
Advanced Life Support (ALS)
Definition 3.3.1
Aerial Device
Definition 3.3.2
Air Transfer
Definition 3.3.3, A.3.3.3
Aircraft Rescue and Fire Fighting
Definition 3.3.4, A.3.3.4
Approved
Definition 3.2.1, A.3.2.1
Atmosphere
Definition 3.3.5
Hazardous Atmosphere
Definition 3.3.5.1, A.3.3.5.1
Oxygen-Deficient Atmosphere
Definition 3.3.5.2
Authority Having Jurisdiction (AHJ)
Definition 3.2.2, A.3.2.2

-B-

Basic Life Support (BLS)
Definition 3.3.6
Behavioral Health and Wellness Programs ..... Chap. 11
Behavioral Health Program 11.1, A.11.1
Wellness Program 11.2
Biological Terrorism Agents
Definition 3.3.7
Building Hazard Assessment ..... Annex C

-C-

Candidate
Definition 3.3.8, A.3.3.8
CBRN
Definition 3.3.9
Chemical Flash Fire
Definition 3.3.10, A.3.3.10
Chemical Terrorism Agents
Definition 3.3.11
Clear Text
Definition 3.3.12, A.3.3.12
Closed-Circuit SCBA
Definition 3.3.13
Cold Zone
Definition 3.3.14
Communicable Disease
Definition 3.3.15
Company
Definition 3.3.16, A.3.3.16
Confined Space
Definition 3.3.17, A.3.3.17
Contaminant
Definition 3.3.18
Control Zones
Cold Zone
Definition 3.3.19.1
Definition 3.3.19
Hot Zone
Definition 3.3.19.2
Warm Zone
Definition 3.3.19.3
Crew
Definition 3.3.20
Cryogenic Liquid
Definition 3.3.21, A.3.3.21

-D-

Debilitating Illness or Injury
Definition 3.3.22
Defensive Operations
Definition 3.3.23
Definitions ..... Chap. 3
Disease
Communicable Disease
Definition 3.3.24.1, A.3.3.24.1
Definition 3.3.24
Infectious Disease
Definition 3.3.24.2
Drug
Definition 3.3.25

-E-

Emergency Incident
Definition 3.3.26
Emergency Medical Services
Definition 3.3.27
Emergency Operations
Definition 3.3.28
Emergency Operations ..... Chap. 8
Communications 8.2
Hazard Control Zones 8.6
Incident Management 8.1
Members Operating at Emergency Incidents 8.5
Personnel Accountability During Emergency Operations 8.4
Post-Incident Analysis 8.11
Rapid Intervention for Rescue of Members 8.8
Rehabilitation During Emergency Operations 8.9
Risk Management During Emergency Operations 8.3
Scenes of Violence, Civil Unrest, or Terrorism 8.10
Traffic Incidents 8.7, A.8.7
Explanatory Material ..... Annex A
Eye Protection
Definition 3.3.29

-F-

Faceshield
Definition 3.3.30, A.3.3.30
Facility
Definition 3.3.31
Facility Safety ..... Chap. 9
Inspections 9.2
Maintenance and Repairs 9.3, A.9.3
Safety Standards 9.1
Fire Apparatus
Definition 3.3.32
Fire Apparatus, Equipment, and Drivers/Operators ..... Chap. 6
Drivers/Operators of Fire Department Apparatus 6.2

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Fire Department Apparatus 6.1
Inspection, Maintenance, and Repair of Fire Apparatus 6.4
Riding in Fire Apparatus 6.3
Tools and Equipment 6.5
Fire Chief
Definition 3.3.33
Fire Department
Definition 3.3.34, A.3.3.34
Fire Department Administration ..... Chap. 4
Appointment of the Health and Safety Officer 4.7
Fire Department Organizational Statement 4.1
Occupational Safety and Health Committee 4.5
Records 4.6
Risk Management Plan 4.2
Roles and Responsibilities 4.4
Safety and Health Policy 4.3
Fire Department Facility
Definition 3.3.35, A.3.3.35
Fire Department Member
Definition 3.3.36
Fire Fighting
Definition 3.3.37
Proximity Fire Fighting
Definition 3.3.37.1, A.3.3.37.1
Structural Fire Fighting
Definition 3.3.37.2
Wildland Fire Fighting
Definition 3.3.37.3
Fire Shelter
Definition 3.3.38
Fire Suppression
Definition 3.3.39, A.3.3.39
Flame Resistance (Protective Apparel)
Definition 3.3.40, A.3.3.40

-G-

Goggle
Definition 3.3.41

-H-

Hazard
Definition 3.3.42, A.3.3.42
Hazardous Area
Definition 3.3.43
Hazardous Atmosphere
Definition 3.3.44
Hazardous Material
Definition 3.3.45
Hazardous Materials Operations
Definition 3.3.46
Hazardous Materials PPE Information ..... Annex E
Health and Fitness Coordinator
Definition 3.3.47
Health and Safety Officer
Definition 3.3.48, A.3.3.48
Health Data Base
Definition 3.3.49
Hot Zone
Definition 3.3.50

-I-

Immediately Dangerous to Life or Health (IDLH)
Definition 3.3.51
Incident
Definition 3.3.52
Emergency Incident
Definition 3.3.52.1
Rescue Incident
Definition 3.3.52.2
Traffic Incident
Definition 3.3.52.3
Incident Action Plan
Definition 3.3.53
Incident Commander (IC)
Definition 3.3.54
Incident Management System (IMS)
Definition 3.3.55, A.3.3.55
Incident Safety Officer
Definition 3.3.56, A.3.3.56
Industrial Fire Brigade
Definition 3.3.57
Infection Control Program
Definition 3.3.58, A.3.3.58
Infectious Disease
Definition 3.3.59
Informational References ..... Annex G
Interface Component
Definition 3.3.60

-L-

Life Safety Rope
Definition 3.3.61
Life Support
Advanced Life Support (ALS)
Definition 3.3.62.1
Basic Life Support (BLS)
Definition 3.3.62.2
Definition 3.3.62
Liquefied Gas
Definition 3.3.63, A.3.3.63

-M-

Medical and Physical Requirements ..... Chap. 10
Confidential Health Data Base 10.4
Fire Department Physician 10.6
Fitness for Duty Evaluations 10.7
Health and Fitness 10.3
Infection Control 10.5
Medical Requirements 10.1
Physical Performance Requirements 10.2
Member
Definition 3.3.64, A.3.3.64
Member Assistance Program (MAP)
Definition 3.3.65
Member Organization
Definition 3.3.66
Monitoring Compliance with a Fire Service Occupational Safety and Health Program ..... Annex B

-N-

No-Entry Zone
Definition 3.3.67

-O-

Occupational Exposure to Atypically Stressful Events ..... Chap. 12
General 12.1, A.12.1
Occupational Illness
Definition 3.3.68
Occupational Injury
Definition 3.3.69
Offensive Operations
Definition 3.3.70
Operations
Defensive Operations
Definition 3.3.71.1, A.3.3.71.1
Definition 3.3.71
Emergency Operations
Definition 3.3.71.2

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Hazardous Materials Operations
Definition 3.3.71.3
Offensive Operations
Definition 3.3.71.4
Special Operations
Definition 3.3.71.5, A.3.3.71.5
Oxygen-Deficient Atmosphere
Definition 3.3.72

-P-

Particulates
Definition 3.3.73, A.3.3.73
Personnel Accountability System
Definition 3.3.74
Primary Eye Protection
Definition 3.3.75
Procedure
Definition 3.3.76
Protective Clothing and Protective Equipment ..... Chap. 7
Breathing Air 7.11
Chemical-Protective Clothing for Hazardous Materials Emergency Operations 7.5, A.7.5
Liquid Splash-Protective Ensembles and Clothing 7.5.2, A.7.5.2
Protective Ensembles for CBRN Terrorism Incidents 7.5.3, A.7.5.3
Vapor-Protective Ensembles 7.5.1, A.7.5.1
Face and Eye Protection 7.18
Fit Testing 7.13
General 7.1
Hearing Protection 7.19
Inspection, Maintenance, and Disposal of Chemical-Protective Clothing 7.6
Life Safety Rope and System Components 7.17
New and Existing Protective Clothing and Protective Equipment 7.20
Personal Alert Safety System (PASS) 7.16
Protective Clothing and Equipment for Surface Water Operations 7.9, A.7.9
Protective Clothing and Equipment for Wildland Fire Fighting 7.7
Protective Clothing for Emergency Medical Operations 7.4, A.7.4
Protective Clothing for Proximity Fire-Fighting Operations 7.3
Protective Clothing for Structural Fire Fighting 7.2
Gloves 7.2.4
Protective Ensembles for Technical Rescue Operations 7.8
Respiratory Protection Equipment 7.12
Air-Purifying Respirators 7.12.3
SCBA 7.12.1
Supplied-Air Respirators 7.12.2
Respiratory Protection Program 7.10
SCBA Cylinders 7.15
Using Respiratory Protection 7.14
Protective Ensemble
Definition 3.3.77, A.3.3.77
Proximity Fire Fighting
Definition 3.3.78

-Q-

Qualified Person
Definition 3.3.79

-R-

Rapid Intervention Crew/Company (RIC)
Definition 3.3.80, A.3.3.80
Referenced Publications ..... Chap. 2
General 2.1
NFPA Publications 2.2
Other Publications 2.3
References for Extracts in Mandatory Sections 2.4
Related Activities
Definition 3.3.81
Rescue
Definition 3.3.82
Rescue Incident
Definition 3.3.83
Respiratory Protection Equipment (RPE)
Definition 3.3.84, A.3.3.84
Risk
Definition 3.3.85
Risk Management
Definition 3.3.86
Risk Management Plan Factors ..... Annex D

-S-

Sample Facility Inspector Checklists ..... Annex F
SCBA
Definition 3.3.87
Seat Belt
Definition 3.3.88
Self-Contained Breathing Apparatus (SCBA)
Closed-Circuit SCBA
Definition 3.3.89.1
Definition 3.3.89
Service Test
Definition 3.3.90
Shall
Definition 3.2.3
Should
Definition 3.2.4
Special Operations
Definition 3.3.91
Spectacles
Definition 3.3.92, A.3.3.92
Structural Fire Fighting
Definition 3.3.93

-T-

Tactical Level Management Component (TLMC)
Definition 3.3.94
Technical Rescue
Definition 3.3.95
Traffic Incident
Definition 3.3.96
Training, Education, and Professional Development ..... Chap. 5
General Requirements 5.1
Member Proficiency 5.5
Member Qualifications 5.2
Special Operations Training 5.4
Training Requirements 5.3

-V-

Vehicle Safety Harness
Definition 3.3.97

-W-

Warm Zone
Definition 3.3.98
Wildland Fire Fighting
Definition 3.3.99
Wildland Fire Fighting Respirator
Definition 3.3.100

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- "*Notices of intent to make a motion*" are filed, are reviewed, and valid motions are certified for presentation at the Technical Report Session. ("Consent Documents" that have no certified motions bypass the Technical Report Session and proceed to the Standards Council for issuance.)
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NFPA 1852

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NFPA® 1852

Standard on

Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA)

2013 Edition

This edition of NFPA 1852, *Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA)*, was prepared by the Technical Committee on Respiratory Protection Equipment (FAE-RPE) and released by the Technical Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment. It was issued by the Standards Council on November 27, 2012, with an effective date of December 17, 2012, and supersedes all previous editions.

This edition of NFPA 1852 was approved as an American National Standard on December 17, 2012.

Origin and Development of NFPA 1852

The technical committee was assigned the responsibility of addressing selection, care, and maintenance issues for open-circuit self-contained breathing apparatus (SCBA). To address these issues, the Committee developed NFPA 1852, which is oriented to the users of such SCBA and their respective organizations.

This document was developed for organizations that use SCBA for the respiratory protection of their personnel who engage in emergency operations with the goal of reducing the safety risks and potential health risks associated with poorly maintained, contaminated, or damaged SCBA.

This document was also developed to fulfill the SCBA selection, care, and maintenance portions of the overall respiratory protection program required by NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, and applies to all SCBA that are certified as compliant with the current and previous editions of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire and Emergency Services*.

During the development of this document, committee member Deputy Chief Robert Kolenda of the Pittsburgh, Pennsylvania Bureau of Fire (PBF) worked tirelessly to develop meaningful requirements to assure the safety of fire and emergency services personnel who depend on SCBA for their respiratory protection and their lives. Chief Kolenda lost his son, Pittsburgh Fire Fighter Marc Kolenda, at a fire, due in part to inadequate protection provided by his SCBA.

The first edition, the 2002 edition of NFPA 1852, was acted on by the NFPA membership at its November Association Technical Meeting in Dallas, Texas, on November 13, 2001 and became effective on January 31, 2002.

In the 2008 edition, the second edition of NFPA 1852, the Committee processed a complete revision of the document including an overall revision of text for clarity and up-to-date terminology since the previous edition.

Section 1.3 was revised and restructured to include later editions of NFPA 1981 and to clarify to which documents this standard applies. Chapter 2 was revised to include the documents referenced within the mandatory sections of the standard and updated editions approved by the Committee. Section 3.3 was reviewed and revised as necessary to update or add new definitions according to the project on Fire and Emergency Services Protective Clothing and Equipment glossary.

Chapter 4 was completely reviewed for upgrades and modifications to existing text as necessary. A new Section 4.2 was added to cover the special procedures and notifications for hazards involving SCBA. Section 4.4 (formerly Section 4.3), SCBA Compliance — Upgrades and Retirement, was revised and reformatted to add new requirements for SCBA purchased during the effective periods of the 2000 and 2007 editions of NFPA 1981. In Chapter 5, subsection 5.1.1 was expanded to include selected accessories that could be added to SCBA.

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Overall, Chapters 5, 6, 7, and 8 were completely reviewed for upgrades and modifications to existing text as necessary, and the annex material was updated and expanded to provide additional advisory information regarding selection, care, and maintenance issues.

The 2008 edition was issued by the NFPA Standards Council with an effective date of December 31, 2007.

The 2013 edition of NFPA 1852 has been completely reviewed for updates and changes to the existing text. The committee has processed several proposals and comments, most notably changing the term *hazards* in Section 4.2 to *adverse conditions*. Several annex items have been updated to reflect changes in U.S. Department of Transportation terminology, including a replacement of the term *exemptions* with *special permits*. Also, in Annex C the committee has replaced "Research and Special Programs Administration (RSPA)" with the current name of that governmental agency, "Pipeline and Hazardous Material Safety Administration (PHMSA)."

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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.

Committee Scope: This Committee shall have primary responsibility for documents on the design, performance, testing, and certification of protective clothing and protective equipment manufactured for fire and emergency services organizations and personnel, to protect against exposures encountered during emergency incident operations. This Committee shall also have the primary responsibility for documents on the selection, care, and maintenance of such protective clothing and protective equipment by fire and emergency services organizations and personnel.

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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.

Committee Scope: This Committee shall have primary responsibility for documents on respiratory equipment, including breathing air, for fire and emergency services personnel during incidents involving hazardous or oxygen deficient atmospheres. This Committee shall also have primary responsibility for documents on the selection, care, and maintenance of respiratory protection equipment and systems by fire and emergency services organizations and personnel.

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Contents

Chapter 1 Administration 1852– 7
1.1 Scope 1852– 7
1.2 Purpose 1852– 7
1.3 Application 1852– 7

Chapter 2 Referenced Publications 1852– 8
2.1 General 1852– 8
2.2 NFPA Publications 1852– 8
2.3 Other Publications 1852– 8
2.4 References for Extracts in Mandatory Sections. (Reserved) 1852– 8

Chapter 3 Definitions 1852– 8
3.1 General 1852– 8
3.2 NFPA Official Definitions 1852– 8
3.3 General Definitions 1852– 8

Chapter 4 Program Component 1852– 9
4.1 General 1852– 9
4.2 Adverse Conditions Involving SCBA 1852– 9
4.3 SCBA Selection, Care, and Maintenance Program Component 1852– 9
4.4 SCBA Compliance — Upgrades and Retirement 1852–10
4.5 Records 1852–10
4.6 Manufacturer's Instructions 1852–11
4.7 Retirement and Disposal 1852–11
4.8 Quality Assurance 1852–12
4.9 Technical Authorization 1852–12

Chapter 5 Selection 1852–12
5.1 Selection for Purchase 1852–12
5.2 Acceptance 1852–13

Chapter 6 Care 1852–13
6.1 Cleaning and Disinfecting 1852–13
6.2 Contamination and Decontamination 1852–14
6.3 Storage 1852–14

Chapter 7 Maintenance 1852–14
7.1 User Maintenance 1852–14
7.2 Technician Maintenance 1852–16
7.3 Breathing Air Cylinder Filling 1852–16
7.4 Breathing Air Cylinder Requalification 1852–17
7.5 Testing 1852–17

Annex A Explanatory Material 1852–21

Annex B Instructions for External Examination of SCBA Breathing Air Cylinders 1852–25

Annex C Requalification of SCBA Breathing Air Cylinders 1852–25

Annex D Informational References 1852–26

Index 1852–28

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NFPA 1852

Standard on

Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA)

2013 Edition

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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.

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

Information on referenced publications can be found in Chapter 2 and Annex D.

Chapter 1 Administration

1.1 Scope.

1.1.1* This standard shall specify minimum requirements for the selection, care, and maintenance of open-circuit self-contained breathing apparatus (SCBA) and combination SCBA/supplied air respirator (SAR) that are used for respiratory protection during emergency operations in environments where the atmosphere is Immediately Dangerous to Life and Health (IDLH), or could become oxygen deficient or IDLH.

1.1.2 This standard shall specify the requirements for SCBA models as detailed in Section 1.3 of this chapter.

1.1.3 For fire departments, this standard shall specify the requirements for the SCBA selection, care, and maintenance component of the respiratory protection program required in Section 7.10 of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

1.1.4 This standard shall not specify requirements for any closed-circuit SCBA.

1.1.5 This standard shall not specify requirements for other respiratory protection program components of the organization such as SCBA training, appropriate use of SCBA for operations, and breathing air quality as these program components are under the jurisdiction of other NFPA standards.

1.1.6 This standard shall not specify requirements for accessories attached to the SCBA unless specifically addressed herein.

1.1.7 Nothing herein shall restrict any jurisdiction from exceeding these minimum requirements.

1.2 Purpose.

1.2.1 The purpose of this standard shall be to establish procedures as part of a program to provide care and maintenance for open-circuit SCBA and combination SCBA/SAR in order to reduce the safety risks and potential health risks associated with poorly maintained, contaminated, or damaged SCBA.

1.2.2 This standard shall also establish basic criteria for the evaluation and selection process associated with purchasing open-circuit SCBA to assure only SCBA that meet the requirements of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services* are acquired for use by emergency services organizations.

1.3 Application.

1.3.1 New and Existing SCBA.

1.3.1.1 For fire departments, this standard shall apply to the requirements for selection, care, and maintenance of the SCBA component of the fire department's respiratory protection program as required by Section 7.10 of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

1.3.1.2 This standard shall apply to the acquisition of new open-circuit SCBA and to the preparation of new SCBA to go into the "in service" status.

1.3.1.3 This standard shall apply to the organization's existing open-circuit SCBA, other than as constrained by 1.3.1.6 and 1.3.1.7, that are covered in the care and maintenance part of the respiratory protection program for open-circuit SCBA, and shall also apply to the selection process to acquire new open-circuit SCBA to augment or replace existing SCBA.

1.3.1.4 This standard shall apply to open-circuit SCBA that were certified by an independent third-party certification organization as compliant with the 1992 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters,* and the 1997 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire Service.*

1.3.1.5 This standard shall apply to open-circuit SCBA that were certified by an independent third-party certification organization as compliant with the 2002 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire and Emergency Services,* or with the 2007 edition or later editions of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire and Emergency Services.*

1.3.1.6 Only the requirements of Section 4.3 or the requirements referenced within Section 4.3 shall apply to any open-circuit SCBA that were confirmed by the SCBA manufacturer as meeting the requirements of the 1981 or 1987 editions of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters,* or to the 1971 edition of NFPA 19B, *Standard on Respiratory Protective Equipment for Firefighters.*

1.3.1.7 Only the requirements of Section 4.3 or the requirements referenced within Section 4.3 shall apply to any open-circuit SCBA that were never confirmed as meeting the requirements of the 1971 edition of NFPA 19B, *Standard on Respiratory Protective Equipment for Firefighters,* or were never certified as compliant with any edition of NFPA 1981.

1.3.2 Implementation.

1.3.2.1 When this standard is adopted by an organization or by a jurisdiction, the authority having jurisdiction shall set a date or dates for achieving compliance with the requirements of this standard.

1.3.2.2 The organization or the jurisdiction shall be permitted to establish a phase-in schedule for compliance with specific requirements of this standard.

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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, Quincy, MA 02169-7471.

NFPA 19B, *Standard on Respiratory Protective Equipment for Firefighters,* 1971 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* 2013 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus,* 2009 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* 2013 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* 2007 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire and Emergency Services,* 2002 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire Service,* 1997 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters,* 1992 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters,* 1987 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters,* 1981 edition.

NFPA 1982, *Standard on Personal Alert Safety Systems (PASS),* 2013 edition.

NFPA 1989, *Standard on Breathing Air Quality for Emergency Services Respiratory Protection,* 2013 edition.

2.3 Other Publications.

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

Title 29, Code of Federal Regulations, Part 1910.134, *Respiratory Protection,* 23 April 1998.

Title 29, Code of Federal Regulations, Part 1910.156, *Fire Brigades,* 18 June 1998.

2.3.2 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections. (Reserved)

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary,* 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Shall. Indicates a mandatory requirement.

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

3.2.5 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 are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the *Manual of Style for NFPA Technical Committee Documents.*

3.3 General Definitions.

3.3.1 Atmosphere-Supplying Respirator. A respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, which includes self-contained breathing apparatus (SCBA) and supplied air respirators (SAR). *[See also 3.3.14, Self-Contained Breathing Apparatus (SCBA), and 3.3.16, Supplied Air Respirator (SAR).]*

3.3.2 Care. Procedures for cleaning, decontamination, and storage of protective clothing and equipment.

3.3.3* Combination SCBA/SAR. An atmosphere-supplying respirator that supplies a respirable atmosphere to the user from a combination of two breathing air sources both of which are independent of the ambient environment. *[See also 3.3.1, Atmosphere-Supplying Respirator; 3.3.14, Self-Contained Breathing Apparatus (SCBA); and 3.3.16, Supplied Air Respirator (SAR).]*

3.3.4 Contamination/Contaminated. The process by which protective clothing or equipment has been exposed to hazardous materials or biological agents.

3.3.5 Cross Contamination. The transfer of contamination from one item to another or to the environment.

3.3.6 Fully Charged. An SCBA cylinder filled to greater than 90 percent of the NIOSH rated service pressure.

3.3.7 In-Service. Ready for immediate use.

3.3.8 Maintenance. Procedures for inspection, repair, and removal from service of protective clothing and equipment.

3.3.9* Organization. The entity that provides the direct management and supervision for emergency services response personnel.

3.3.10 Rebuild. To clean and examine compliant product thoroughly and make needed repairs and replace components as specified by the manufacturer.

3.3.11 SAR. An abbreviation for supplied air respirator. *[See also 3.3.16, Supplied Air Respirator (SAR).]*

3.3.12 SCBA. An abbreviation for self-contained breathing apparatus. *[See also 3.3.14, Self-Contained Breathing Apparatus (SCBA).]*

3.3.13 Selection. The process of determining what protective clothing and equipment (PCE) are necessary for protection of emergency services response personnel from an anticipated specific hazard or other activity, the procurement of the appropriate PCE, and the choice of the proper PCE for a specific hazard or activity at an emergency incident.

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3.3.14* Self-Contained Breathing Apparatus (SCBA). An atmosphere-supplying respirator that supplies a respirable atmosphere to the user from a breathing air source that is independent of the ambient environment and designed to be carried by the user. *[See also 3.3.1, Atmosphere-Supplying Respirator; 3.3.3, Combination SCBA/SAR; and 3.3.16, Supplied Air Respirator (SAR).]*

3.3.15 Specified Service Life. Time, exposure event, or number of uses to which a compliant product or component is expected to remain functional.

3.3.16* Supplied Air Respirator (SAR). An atmosphere-supplying respirator, also known as an airline respirator, for which the source of breathing air is not designed to be carried by the user. *[See also 3.3.1, Atmosphere-Supplying Respirator; 3.3.3, Combination SCBA/SAR; and 3.3.14, Self-Contained Breathing Apparatus (SCBA).]*

3.3.17 Technician. An individual qualified and authorized by the compliant product manufacturer to provide specified care and maintenance to the product and perform inspection, repair, and testing beyond the level classified as "user repair."

Chapter 4 Program Component

4.1 General.

4.1.1 Emergency services organizations shall have a written respiratory protection program that addresses the respiratory protection for the members of that organization.

4.1.1.1 As part of the organization's respiratory protection program, the organization shall develop, implement, and apply a program component for the selection, care, and maintenance of open-circuit SCBA used for respiratory protection by the members of the organization.

4.1.1.2 For fire departments' respiratory protection programs specified in Section 7.10 of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, the organization shall develop, implement, and apply the program component for the selection, care, and maintenance of open-circuit SCBA used by the members of the organization in the performance of their assigned functions.

4.1.2 The program component shall have the following goals:

(1) Provide SCBA that is suitable and appropriate for the intended use
(2) Maintain SCBA in a safe, usable condition to provide the intended protection to the user
(3) Remove from use any SCBA that could cause or contribute to user injury, illness, or death because of its condition
(4) Recondition, repair, or retire such SCBA

4.1.3 The SCBA selection, care, and maintenance component of the organization's respiratory protection program shall be in accordance with Section 4.3 of this chapter.

4.2 Adverse Conditions Involving SCBA.

4.2.1 As part of the respiratory protection program, the organization shall develop standard operating procedures (SOPs) for a condition or conditions involving SCBA or SCBA components that lead(s) to failure, near-failure, or a significant degradation of performance as a result of normal use.

4.2.2 Where a specific condition involving SCBA is identified, the organization's SOPs shall cause the SCBA manufacturer to be promptly notified in writing of the specific condition(s) or cause, and the circumstances involved with the specific condition(s) or cause.

4.2.3 Copies of the notification to the SCBA manufacturer shall also be promptly supplied to the certification organization that certified the SCBA and to National Institute for Occupational Safety and Health National Personal Protective Technology Laboratory (NIOSH NPPTL).

4.3 SCBA Selection, Care, and Maintenance Program Component.

4.3.1 The organization shall develop written SOPs that shall identify and define the various parts of the organization's respiratory protection program and the various roles and responsibilities of the organization and the members.

4.3.2 As part of the respiratory protection program, the organization shall develop SOPs for the handling and custody of SCBA that is removed from service due to the serious injury or fatality of the wearer.

4.3.3 As part of the respiratory protection program, the organization shall develop SOPs for minimizing exposure to contaminated SCBA.

4.3.3.1 The organization shall define what criteria determine when an SCBA is contaminated beyond the ability to remedy by cleaning and disinfecting in accordance with Section 6.1 of this standard.

4.3.3.2 The SOPs shall detail methods for proper disposal of such contaminated SCBA in accordance with 4.7.2.

4.3.3.3 As a minimum, SCBA that are known to be contaminated or are suspected of being contaminated shall be tagged out-of-service and shall be segregated from other equipment, personnel, and civilians.

4.3.3.4 The organization shall develop procedures to minimize the public's risk of exposure to soiled or contaminated SCBA.

4.3.4 The portion of the respiratory protection program for selection of SCBA shall include the requirements specified in Chapter 5 of this standard.

4.3.5 The portion of the respiratory protection program for care of SCBA shall include the requirements specified in Chapter 6 of this standard.

4.3.6 The portion of the respiratory protection program for maintenance of SCBA shall include the requirements specified in Chapter 7 of this standard.

4.3.6.1 As part of the respiratory protection program for maintenance, the organization shall have written SCBA testing procedures utilizing a breathing machine that meets the requirements of 7.5.5 and 7.5.6.

4.3.6.2 As part of the respiratory protection program for maintenance, the SCBA testing procedures shall include but not be limited to the following:

(1) Administration
(2) Testing protocol
(3) Training in use of the breathing machine
(4) Calibration of the breathing machine
(5) Test technician authorization
(6) Record keeping
(7) Test scheduling
(8) Evaluation of the effectiveness of the program

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4.3.6.3 As part of the respiratory protection program for maintenance, the organization shall develop SOPs for the frequency of technician inspection and testing of SCBA.

4.3.6.3.1 In all cases, the frequency of technician inspection shall not be less than specified in the SCBA manufacturer's instructions.

4.3.6.3.2 The organization shall also consider factors including but not limited to the following:

(1) Specific manufacturer's instructions related to breathing machine testing
(2) Severity of environment in which SCBA is used
(3) Number of uses for each SCBA
(4) User reports of visual damage of SCBA
(5) User complaints of improperly functioning SCBA
(6) Specific worksite issues
(7)*Specific SCBA cylinder inspection

4.3.6.4 Where the part of the respiratory protection program that addresses the maintenance of SCBA includes SCBA technicians who are members of the organization, such technicians shall meet the requirements of Section 4.9 of this chapter.

4.3.7* The organization shall develop an SOP that requires that no member of the organization performs any alterations to the SCBA's form, fit, or function that causes the certification to the National Institute for Occupational Health and Safety (NIOSH) or to NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, to be invalid.

4.3.8 The organization shall require that all members who use SCBA or are responsible for any part of the organization's respiratory protection program are informed and trained not to make any alterations or changes to any SCBA's original condition that causes the NIOSH certification of the respirators or the certification of the SCBA in accordance with NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, to be invalid.

4.4 SCBA Compliance — Upgrades and Retirement.

4.4.1 SCBA that are currently in service shall be certified as compliant with at least one of the following standards:

(1) NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire Service*, 1997 edition
(2) NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire and Emergency Services*, 2002 edition
(3) NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, 2007 edition
(4) NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, 2013 edition

4.4.2* Where currently-in-service SCBA *do not meet the requirements of 4.4.1* and are covered by any of the following four categories, such SCBA shall be upgraded as specified in 4.4.3 or shall be retired as specified in 4.4.5:

(1) Currently-in-service SCBA that were *not* certified as compliant with the 1997 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire Service*, when the SCBA was manufactured
(2) Currently-in-service SCBA that were *not* certified as compliant with the 2002 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire and Emergency Services*, when the SCBA was manufactured
(3) Currently-in-service SCBA that were *not* certified as compliant with the 2007 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus(SCBA) for Emergency Services*, when the SCBA was manufactured
(4) Currently-in-service SCBA that were *not* certified as compliant with the 2013 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, when the SCBA was manufactured

4.4.2.1 The provisions of 4.4.4 shall apply to SCBA that are not covered by any of the four categories specified in 4.4.2.

4.4.3* SCBA shall be permitted to be upgraded to be compliant with the 2013 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, in accordance with the SCBA manufacturer's and certification organization's instructions.

4.4.4* Where currently-in-service SCBA do not meet the requirements of 4.4.1 and are covered by any of the following categories, such SCBA shall be retired as specified in 4.4.5:

(1) Currently-in-service SCBA that met only the requirements of the 1971 edition of NFPA 19B, *Standard on Respiratory Protective Equipment for Firefighters*, when the SCBA was manufactured
(2) Currently-in-service SCBA that met only the requirements of the 1981 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, when the SCBA was manufactured
(3) Currently-in-service SCBA that met only the requirements of the 1987 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, when the SCBA was manufactured
(4) Currently-in-service SCBA that met only the requirements of the 1992 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, when the SCBA was manufactured
(5) Currently-in-service SCBA that were purchased prior to July 29, 1981 that did not meet the requirements of the 1971 edition of NFPA 19B, *Standard on Respiratory Protective Equipment for Firefighters*, when the SCBA was manufactured
(6) Currently-in-service SCBA that were purchased after July 29, 1981 and prior to June 30, 1987 that did not meet the requirements of the 1981 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, when the SCBA was manufactured
(7) Currently-in-service SCBA that were purchased after June 30, 1987 and prior to August 14, 1992 that did not meet the requirements of the 1987 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, when the SCBA was manufactured
(8) Currently-in-service SCBA that were purchased after August 14, 1992 and prior to August 15, 1997 that did not meet the requirements of the 1992 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, when the SCBA was manufactured

4.4.5 Retired SCBA shall be disposed of as specified in 4.7.1.

4.5 Records.

4.5.1* The organization shall create a written procedure to manage the record-keeping system.

4.5.2 The record-keeping system shall accommodate the documents listed in 4.5.8 and all additional documents that are needed after considering the following factors:

(1) Need for the record, report, or document

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(2) How the record, report, or document contributes to realizing the organization's goals within the selection, care, and maintenance program component
(3) Number of copies needed
(4) Person(s) responsible for producing the record, report, or document
(5) Format and substance of the record, report, or document
(6) Person(s) who receives, forwards, reviews, processes, and uses the record, report, or document
(7)*Disposition of the record, report, or document after it has been completely developed

4.5.3* The organization shall consult with legal counsel concerning specific laws that determine the length of time records, reports, and documents shall be retained. Legal counsel shall advise the organization about the form, written or electronic, that is permitted and under what circumstances original or copied documents are needed for various purposes.

4.5.4 The organization shall determine how required records, reports, and documents are created, processed, maintained, and stored. Regardless of the method selected, the organization shall take measures to prevent loss and damage.

4.5.5 The record-keeping system shall be managed by a person who is trained and qualified to ensure that information is obtained, collected, communicated, retrieved, used, and stored according to the plan. The record-keeping manager shall also consider how to reduce waste, redundancy, and cost in the system.

4.5.6 The manager of the record-keeping system shall educate and train personnel within the organization in completing, filing, and using various components of the record-keeping system. The manager shall be assisted by sufficient staff to fulfill the manager's duties.

4.5.7 The manager of the record-keeping system shall conduct an annual inventory and audit of records, reports, and documents. Following the inventory and audit, the manager shall recommend changes in the record-keeping system as needed.

4.5.8 The organization shall create, maintain, and disseminate the following as required:

(1) Written instructions for care, maintenance, and repair that correspond to those provided by the manufacturer
(2) Written instructions for checks while donning SCBA
(3) Written instructions for inspection, including procedures to be followed if defects are found
(4) Forms to document the findings during inspection
(5) Forms to record and to report defects found during inspections and to track the SCBA or cylinder as it is repaired
(6) Forms to document inspections, tests, and repairs by SCBA users and technicians that shall include the following:
  (a) SCBA make, model, and serial number and other information to identify components
  (b) Documentation of the date, result of the inspection or test, and all actions taken as well as who acted
(7) Written instructions for filling and for testing cylinders
(8) Written policy and procedure concerning training and authorization of SCBA technicians as well as documentation of that training and authorization
(9) Written procedures for the inspection of cylinders by technicians
(10) Written procedures for recording information about the inspection and repair of cylinders
(11) Stickers, tags, or other similarly effective means to alert users and technicians to defects, to document inspections, and to certify that tests, repairs, and other actions have been completed
(12) Written procedures for periodic tests and comprehensive inspections that comply with the requirements of this standard
(13) Documentation of the tests to verify SCBA performance
(14) Schedule for retention, disposition, and disposal of each report, record, and document
(15) Methods of identifying all SCBAs, cylinders, parts, and components so that these can be identified and tracked from initial receipt by the organization until removed from the possession and control of the organization
(16) Documentation when a defective or obsolete SCBA or component part is removed from service in accordance with the following:
  (a) Until retirement and disposal of a defective or obsolete SCBA or component as specified in 4.7.3, a tag shall be conspicuously placed on the SCBA or component.
  (b) The tag shall indicate the date and time the SCBA or component was removed from service, by whom, and for what reason.
  (c) SCBA and components that are removed from service shall be stored separately from other SCBA and components and secured, as necessary.
  (d) Access to tagged SCBA and components shall be limited, and only authorized persons shall remove tags after repair or service.
(17) Records for maintenance of each individual SCBA regulator, reducer, harness, cylinder including valve assembly, and facepiece including the following information:
  (a) Manufacturer's serial number or other unique identifier
  (b) Date of manufacture, receipt, service, inspection, test, maintenance, and repair
  (c) Inspections, service, repairs, and tests
  (d) Who performed the work
  (e) Other comments
(18) Records of training provided to each user showing date(s) and subject(s) covered
(19) Such other reports, records, and documents including forms, tags, stickers, and other means necessary to effectuate the purposes of record keeping and the intent of this standard

4.6 Manufacturer's Instructions.

4.6.1 When issuing new SCBA, the organization shall provide users with the instructions provided by the manufacturer on the care, use, and maintenance of their SCBA, including any warnings provided by the manufacturer.

4.6.2 Where the SCBA manufacturer's instructions regarding the SCBA's care, use, and maintenance differ from the requirements in this standard other than the requirements specified in 7.2.1.3 and 7.5.1, the manufacturer's instructions shall be followed.

4.7 Retirement and Disposal.

4.7.1 Retired SCBA shall be destroyed or altered in a manner assuring that they are not used for respiratory protection and shall be rendered unable to hold pressure, or the ownership of the SCBA shall be transferred to the manufacturer or the manufacturer's agent.

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4.7.2 Where SCBA or SCBA components are contaminated beyond the ability to be decontaminated so the SCBA or components can be returned to service, such SCBA or component shall be disposed of.

4.7.2.1 Contaminated SCBA or components as identified according to 4.7.2 shall be segregated from other equipment and personnel and disposed of in a manner consistent with the type of contamination and any governmental regulations governing contaminated items.

4.7.2.2 Prior to disposal, contaminated SCBA or components shall be altered in a manner assuring that they cannot be used for any purpose.

4.7.3 Defective or obsolete SCBA components or defective or obsolete SCBA that have been removed from service and cannot be repaired or upgraded shall be destroyed or altered in a manner assuring that they cannot be used in any emergency operations or other activities, including training; or the ownership of such SCBA shall be transferred to the manufacturer or the manufacturer's agent.

4.7.4 SCBA elastomeric components, including but not limited to facepieces, O-rings, and hose, shall be destroyed or altered in a manner assuring that they cannot be used for any purpose when the component reaches the SCBA manufacturer's specified component service life.

4.7.5* SCBA composite cylinders shall be removed from service and retired when they reach the end of the service life specified by the SCBA manufacturer. Such composite cylinders shall be destroyed or altered in a manner assuring that they cannot be used for respiratory protection and shall be rendered unable to hold pressure, or the ownership of the composite cylinder shall be transferred to the manufacturer or the manufacturer's agent.

4.7.6 Any SCBA cylinders that are beyond repair or not allowed to be repaired shall be destroyed or altered in a manner assuring that they are marked and identified as "Condemned" and shall be rendered unable to hold pressure. Before destroying or rendering them unable to hold pressure, permission from the owner of the cylinder shall be obtained.

4.8 Quality Assurance.

4.8.1 The organization shall establish and maintain a quality assurance plan for selection, care, and maintenance of SCBA.

4.8.2 The quality assurance plan shall be designed to realize all of the following goals:

(1) Assure effective and safe performance of SCBA provided to users
(2) Substantiate compliance with this standard
(3) Confirm the organization's policies and procedures are being followed
(4) Determine the effectiveness of those policies and procedures
(5) Improve the organization's respiratory protection program component for selection, care, and maintenance of SCBA

4.9 Technical Authorization.

4.9.1 Where the portion of the respiratory protection program component that addresses the maintenance of SCBA, as specified in 4.3.6, includes SCBA technicians that are members of the organization, such technicians shall be qualified and authorized by the SCBA manufacturer to perform specified allowable maintenance.

4.9.1.1 Allowable maintenance shall include periodic inspection, repair, and overhaul of all SCBA components and assemblies.

4.9.1.2 Technicians shall also be qualified and authorized in the use of all special tools and equipment required to test and maintain the SCBA.

4.9.2 The program component shall establish policies and procedures for qualification and selection of personnel for SCBA technician training and authorization.

4.9.3 The organization shall maintain evidence that all SCBA technicians that are used by the organization have current authorization by the SCBA manufacturer and have maintained their level of competency.

Chapter 5 Selection

5.1 Selection for Purchase.

5.1.1 Risk Assessment.

5.1.1.1 Prior to starting the procurement process of SCBA, a risk assessment shall be performed.

5.1.1.2 The risk assessment shall include, but not be limited to, the expected hazards that can be encountered by users of SCBA based on the type of duties performed, frequency of use, the organization's experiences, and the organization's geographic location and climatic conditions.

5.1.2 The organization shall review the following standards as a minimum:

(1) NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*
(2) NFPA 1982, *Standard on Personal Alert Safety Systems (PASS)*, where SCBA-integrated PASS are being considered as an accessory for the SCBA

5.1.2.1 Fire department organizations shall also review NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, and 29 CFR 1910.156.

5.1.2.2 Organizations in the United States shall also review 29 CFR 1910.134.

5.1.2.3 Organizations outside the United States shall also review all applicable national, state/provincial, and local regulations.

5.1.3 The organization shall compile and evaluate information on comparative product strengths and weaknesses.

5.1.4 The organization shall ensure that the SCBA interfaces properly with other personal protective items already being used by the organization.

5.1.5 The organization shall also consider the following items during the selection process:

(1) Cross contamination between users and ease of cleaning/decontamination
(2) Legibility of remote pressure indicators in reduced visibility
(3) Size
(4) Weight

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(5) Rated service time
(6) Breathing resistance
(7) Environment
(8) Ease of donning and doffing
(9) Comfort
(10) Fit range and available number of facepiece sizes
(11) Number and complexity of steps involved in operation and maintenance of the SCBA
(12) Design features that provide positive feedback to the user that required steps have been completed properly
(13) Design features that prevent steps from being performed improperly
(14) Operability by user wearing the protective clothing and gloves worn when using SCBA
(15) Facepiece vision area
(16) Cylinder fill station requirements
(17)*Method for uniquely identifying the components of the SCBA
(18)*Facepiece nose cup
(19) Vision correction needs of their personnel
(20) Characteristics of the end of service time indicators
(21) Communication capability (i.e, speech diaphragms, voice amplifiers, radio interface, and so forth)
(22) Supplied air compatibility
(23) Number of spare SCBA and cylinders
(24) Rapid cylinder filling options
(25) Cylinder types
(26) Chemical, biological, radiological, and nuclear (CBRN) respiratory protection
(27) SCBA accessories as follows:
  (a) Telemetry and monitoring systems
  (b) Personnel location systems
  (c) SCBA-integrated PASS
  (d) Emergency egress escape systems

5.1.6 Where a field or laboratory evaluation is conducted, at least the following criteria shall be used for designing a systematic evaluation procedure:

(1) The organization shall develop an evaluation plan including, but not limited to, testing according to 7.5.2 prior to and after field evaluations.
(2) Participants for field evaluations shall be selected based on a cross-section of personnel, willingness to participate, objectivity, and level of operational activity.
(3) Participants shall perform a field evaluation on each different product model being considered from each manufacturer for a particular SCBA. Participants shall be fitted for and instructed in the use of each product model being evaluated from each manufacturer.
(4) A product evaluation form shall be developed for each model.
(5) The organization shall solicit periodic reports from participants in the field evaluation.
(6) The organization shall conclude the evaluation process and analyze the results.

5.1.7 Purchase specifications shall require evidence that the SCBA to be purchased are certified as compliant with NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services.*

5.1.7.1 Where SCBA-integrated PASS are installed as an accessory to the SCBA, the SCBA-integrated PASS shall be certified as compliant with NFPA 1982, *Standard on Personal Alert Safety Systems (PASS).*

5.1.7.2 For both NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* and NFPA 1982, *Standard on Personal Alert Safety Systems (PASS),* the edition of the respective standard(s) that is the current edition at the time of purchase shall be the edition specified.

5.1.8 Where the organization develops purchase specifications, at least the following criteria shall be considered:

(1) All requirements developed by the organization in its evaluations conducted as specified in 5.1.3 through 5.1.7
(2)*Quantitative fit testing
(3) User training
(4) Maintenance training
(5) Manufacturer assistance to develop SOPs for maintenance
(6) SCBA testing on site prior to acceptance
(7) Maintenance schedule
(8) Complete parts list
(9) SCBA user and service manuals
(10) List of any specialized equipment or special tools needed for SCBA maintenance
(11) List of authorized service centers
(12) Warranty statement
(13) Procedures for returning items found defective upon initial receipt

5.2 Acceptance.

5.2.1 Upon receipt, organizations shall inspect and test purchased SCBA in accordance with 7.1.2, and 7.5.2 through 7.5.6, respectively.

5.2.2 Organizations shall verify that the equipment received is as specified.

5.2.3 Procedures shall be established for returning unsatisfactory products if the organization's specifications are not met.

5.2.4 Organizations shall review information supplied with the products such as instructions, warranties, and technical data.

Chapter 6 Care

6.1 Cleaning and Disinfecting.

6.1.1 The external surfaces of the SCBA shall be cleaned and disinfected according to the manufacturer's instructions using only those agents indicated by the manufacturer.

6.1.2 The facepiece shall be thoroughly cleaned after each use and disinfected as needed. Facepiece cleaning and disinfecting shall be performed according to the manufacturer's instructions using only those agents indicated by the manufacturer.

6.1.2.1 The exhalation valve shall be cleaned and flushed.

6.1.2.2 The facepiece shall be dried, and drying shall not be done in direct sunlight or in high heat.

6.1.2.3 The exhalation valve shall be cycled to assure proper operation.

6.1.3 Where the internal components have been exposed to bodily fluids, exhaled breath, dirt, or debris, the second stage regulator shall be thoroughly cleaned and disinfected. The cleaning and disinfecting shall be performed according to the manufacturer's instructions using only those agents indicated by the manufacturer.

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6.1.4 SCBA straps and harness assemblies shall be cleaned and disinfected when required according to manufacturer's instructions. Straps and harness assembly cleaning and disinfecting shall be performed according to the manufacturer's instructions using only those agents indicated by the manufacturer.

6.1.4.1* Under no circumstances shall a chlorine bleach ever be used to clean straps and harness assemblies.

6.1.4.2 The straps and harness assemblies shall be dried, and drying shall not be done in direct sunlight or in high heat.

6.1.5 SCBA cylinder valve assemblies shall be cleaned and disinfected according to the manufacturer's instructions using only those agents indicated by the manufacturer.

6.1.5.1 The valve shall be free of debris.

6.1.5.2 The burst disc outlet shall be inspected and, if debris is present, the cylinder shall be removed from service.

6.1.6* Water or cleaning materials shall be prevented from entering the connection between the cylinder valve and the mating SCBA inlet connector.

6.1.7 Pneumatic component cleaning and disinfecting shall be performed according to the manufacturer's instructions using only those agents indicated by the manufacturer.

6.1.7.1 All pneumatic components shall be thoroughly dried after cleaning.

6.1.7.2 Drying of pneumatic components shall not be done in direct sunlight or in high heat.

6.1.8 All other SCBA components shall be thoroughly air-dried prior to storage in a compartment that does not allow for air circulation.

6.1.9 Appropriate inspections according to 7.1.2 shall be performed after cleaning.

6.2 Contamination and Decontamination.

6.2.1 Where SCBA is suspected of being contaminated, it shall be tagged out-of-service and segregated from other equipment and personnel.

6.2.2 Tags shall include details of the incident including known and suspected contaminants.

6.2.3 The SCBA manufacturer shall be contacted to determine if any additional special procedures can be used to decontaminate the SCBA.

6.2.4 In all cases, decontamination shall be conducted in accordance with the SCBA manufacturer's instructions.

6.2.5 Where it is determined, in accordance with 4.3.3.1, that the SCBA is contaminated beyond the ability to decontaminate it and return it to service, the SCBA shall be disposed of in accordance with 4.7.2.

6.3 Storage.

6.3.1 SCBA shall be stored in their original carrying or storage cases or in a wall or apparatus bracket/rack designed for quick removal and for protection of the SCBA. Brackets/racks shall protect the SCBA and shall be adjusted so they do not cause physical damage to cylinders, hoses, regulators, or straps.

6.3.2 Brackets for securing SCBA in vehicles used for transportation of emergency services personnel shall meet the requirements of 14.1.10 of NFPA 1901, *Standard for Automotive Fire Apparatus.*

6.3.3 SCBA shall be stored with the cylinder valves closed. Other valves or controls shall be positioned according to manufacturer's specifications.

6.3.4 The facepieces of all SCBA shall be positioned to avoid distortion of parts during storage.

6.3.5 All harness straps shall be adjusted to their maximum length during storage.

6.3.6 In all instances, the SCBA shall be stored in a manner to control and minimize exposure to shock, vibration, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and environmental elements.

6.3.7* All in-service SCBA cylinders shall be stored fully charged.

6.3.7.1 Cylinders shall be filled when the pressure falls to 90 percent of the manufacturer's specified pressure level.

6.3.7.2 A positive pressure shall be maintained in depleted SCBA cylinders by keeping the valve closed until they are filled to keep external contamination and condensation out of the cylinder.

6.3.7.3* Compressed breathing air stored in SCBA breathing air cylinders shall be replaced at least annually.

6.3.8 SCBA cylinders shall be stored in a manner that prevents damage to the valve and cylinder.

Chapter 7 Maintenance

7.1 User Maintenance.

7.1.1 Inspection Frequency.

7.1.1.1* Where SCBA is assigned to an individual user for a duty period, the inspection specified in 7.1.2 shall be performed by the individual user at the beginning of each duty period.

7.1.1.2 Where additional SCBA are available for use on response vehicles but not assigned to individual users, the inspection specified in 7.1.2 shall be performed on such additional SCBA at least once each duty period.

7.1.1.3 Where SCBA are not assigned to an individual user for a duty period, the inspection specified in 7.1.2 shall be performed at least once a week on all SCBA that are available for use.

7.1.1.4 In all cases, the interval between the inspections specified in 7.1.2 shall not exceed 1 week.

7.1.2 Inspection.

7.1.2.1 All of the following SCBA components shall be present:

(1) Facepiece
(2) Backframe and harness assembly
(3) Cylinder
(4) Hose
(5) End-of-service-time indicator(s) (EOSTI)
(6) Regulators
(7) Accessories

7.1.2.2 Facepiece inspection shall include the following:

(1) Material checked for deterioration, dirt, cracks, tears, holes, pliability, and tackiness

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(2) Head-harness buckles, strap, and webbing checked for breaks, loss of elasticity, or wear
(3) Lens checked for holes, cracks, scratches, heat-damaged areas, and a proper seal with the facepiece material
(4) Exhalation valve, where present, checked for valve seat
(5) Springs and covers checked for proper operation and cleanliness
(6) Regulator connection(s) checked for proper operation and damage
(7) Speaking diaphragm, where present, checked for damage

7.1.2.3 Backframe and harness assembly inspection shall include the following:

(1) Harness straps and backframe checked for cuts, tears, abrasion, indications of heat damage, and indications of chemical-related damage
(2) All buckles, fasteners, and adjustments checked for proper operation
(3) Cylinder retention system checked for damage and proper operation
(4) Cylinder checked for secure attachment to the backframe
(5) Harness straps checked for full extension

7.1.2.4 Breathing air cylinder assembly inspection shall include the following:

(1) Hydrostatic test date on the cylinder checked to be current
(2) Gauge checked for damage
(3) Cylinder body checked for cracks, dents, weakened areas, indications of heat damage, and indications of chemical damage *(See Annex B)*
(4) Composite portion of the cylinder checked for cuts, gouges, loose composite materials, and the absence of resin *(See Annex B)*
(5) Cylinder valve outlet sealing surface and threads checked for damage
(6) Valve hand wheel checked for damage, proper alignment, serviceability, and secure attachment
(7) Burst disc outlet area checked for debris
(8) Cylinder checked for full charge

7.1.2.5 Hose inspection shall include the following:

(1) Hose checked for cuts, abrasions, bubbling, cracks, heat damage, and chemical damage
(2) External fittings checked for visual signs of damage
(3) Hose checked for tight connections

7.1.2.6 EOSTI inspection shall include the following:

(1) EOSTI alarm and mounting hardware checked for damage, secure attachment, dirt, and debris
(2) EOSTI checked for proper activation in accordance with the manufacturer's instructions

7.1.2.7 Regulator inspection shall include the following:

(1) Regulator controls, where present, checked for damage and proper function
(2) Pressure relief devices checked visually for damage
(3) Housing and components checked for damage
(4) Regulator checked for any unusual sounds such as whistling, chattering, clicking, or rattling during operation
(5) Regulator and bypass checked for proper function when each is operated (Where this is accomplished by donning the facepiece and contamination between users is a possibility, the regulator, facepiece, or both shall be cleaned and disinfected.)

7.1.2.8 Pressure indicator inspection shall include the following:

(1) Pressure indicator checked for damage
(2) Cylinder pressure gauge and the remote gauge checked to read within 10 percent of each other

7.1.2.9 Where SCBA has an integrated PASS, the SCBA-integrated PASS inspection shall include the following:

(1) Wear and damage assessment
(2) Covers/compartments checked for secure attachment
(3) All operating modes checked for proper function
(4) Low battery warning signal

7.1.2.10 Where SCBA has other required components including rapid intervention company/crew universal air connection (RIC UAC), heads-up display (HUD), electronic communications enhancement, and any other required components not otherwise addressed herein, such components shall be inspected in accordance with the manufacturers' instructions and shall include at least inspection for signs of complete assembly of the component, wear, damage, secure attachment, adequate power source, and proper operation and functioning in accordance with the manufacturers' operational instructions.

7.1.2.11 As the final inspection item, the entire SCBA shall be checked for pressure retention by closing all regulator valves, opening the cylinder valve thereby pressurizing the SCBA system, and then closing the cylinder valve.

7.1.2.11.1 The SCBA shall hold system pressure in accordance with the manufacturer's specifications after the cylinder valve is closed.

7.1.2.11.2 Following the pressure check, the system pressure shall be released.

7.1.3 Repair.

7.1.3.1 Where user repair can be accomplished promptly and replacement items or remedial action are immediately available, the SCBA shall be permitted to be restored to proper condition and returned to in-service status.

7.1.3.2 Where user repair cannot be accomplished promptly or where replacement items or remedial action are not immediately available, the SCBA shall be tagged out-of-service and removed from the response vehicle or standby location until the user repair can be completed.

7.1.3.3 The organization's personnel shall follow the organization's SOPs and the manufacturer's written instructions for allowable user repairs and shall be trained on the specific repair procedures before performing them.

7.1.3.4 Users shall not perform work beyond the limits of the organization's SOPs and their training and shall not exceed what is allowed by the manufacturer's written instructions.

7.1.3.5 All repairs shall be done with the proper tools, parts, and equipment as specified by the manufacturer.

7.1.3.6 After repairs are made, the user shall conduct the appropriate inspection as specified in 7.1.2 to verify proper function of the SCBA.

7.1.4 Removal from Service.

7.1.4.1* Where a condition exists that is beyond user repair in accordance with 7.1.3, or the SCBA is suspected to be in an unsafe condition, the SCBA shall be removed from service, tagged, and referred to personnel responsible for technical maintenance.

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7.1.4.2 Where any breathing air cylinder condition specified in 7.1.2.4 is identified, the cylinder shall be immediately depressurized to a slight positive pressure, tagged, and taken out of service. The valve shall be closed to keep external contamination and condensation out of the cylinder.

7.1.4.3 Any SCBA or SCBA components that have been exposed or are suspected of having been exposed to a CBRN agent(s) shall be removed from service, tagged, segregated from other equipment and personnel, and referred to person(s) designated in the organization's SOPs for appropriate disposition as specified in Section 4.7.

7.1.4.4 Any SCBA or SCBA components being taken out of service shall be tagged as specified in 4.5.8(16).

7.1.4.5 Where an SCBA breathing air cylinder is identified as having been filled with air that did not comply with 7.3.2, the cylinder shall be removed from service, tagged, and referred to personnel responsible for technical maintenance.

7.2 Technician Maintenance.

7.2.1 Inspection Frequency.

7.2.1.1 The technician shall perform the inspection specified in 7.1.2 upon receipt of any SCBA removed from service.

7.2.1.2 The technician shall perform the inspection specified in 7.1.2 and the testing specified in Section 7.5 prior to returning any SCBA to service.

7.2.1.3 The SCBA shall be tested on a breathing machine specified in 7.5.6 in accordance with the organization's SOPs or in accordance with the SCBA manufacturer's instructions, whichever is more frequent, but in all cases at least annually.

7.2.1.4 The frequency of technician inspection and testing of SCBA shall be conducted in accordance with the organization's SOPs developed as specified in 4.3.6.3.

7.2.1.5 The organization shall test all newly purchased SCBA as specified in Section 7.5 prior to putting the SCBA in service.

7.2.2 Inspection.

7.2.2.1 Technicians shall perform the level of inspection for which they have been trained and have been qualified to conduct by the SCBA manufacturer.

7.2.2.2 Where an SCBA is removed from service in accordance with 7.1.4, the technician shall verify the user-reported condition.

7.2.2.3 Where the user-reported condition is verified by the technician, the technician then shall determine the appropriate action to be taken to repair, return to service, or retire the SCBA or SCBA component(s).

7.2.2.4 Where the user-reported condition cannot be substantiated, the technician shall perform a complete SCBA inspection in accordance with the manufacturer's instructions.

7.2.3 Repairing and Rebuilding.

7.2.3.1 Technicians shall perform the level of repair or rebuild for which they have been qualified and are authorized to conduct by the SCBA manufacturer.

7.2.3.2 The technician shall verify that all parts and tools used in the maintenance, repair, and rebuild of SCBA are specified by the SCBA manufacturer for the specific SCBA model being repaired.

7.2.3.3* Parts and tools not specified by the manufacturer shall not be used.

7.2.3.4 The technician shall ensure that all components and tools are kept clean and free from contamination during repair and rebuild.

7.2.3.5 The technician shall ensure components are not damaged during repair and rebuild.

7.2.3.6 Product labels shall not be removed or obscured during repair or rebuild. Damaged or missing labels shall be replaced during repair or rebuild.

7.2.3.7 After repair or rebuild, the SCBA or SCBA component shall be inspected and tested in accordance with manufacturer's instructions.

7.2.3.8 Cylinder repairs shall be limited to only those conditions specified by the SCBA manufacturer.

7.2.3.9* SCBA shall be periodically rebuilt to replace all components that are subject to wear and aging at a frequency specified by the manufacturer or by the organization, whichever is more frequent. Such frequency shall be based on the conditions of use of the SCBA as indicated in 4.5.8(17)(a) through (e).

7.2.4 Removal from Service and Disposition.

7.2.4.1* An SCBA breathing air cylinder identified as having been filled with air that is found to not comply with the breathing air requirements of 7.3.2 shall be removed from service.

7.2.4.1.1 Action shall be taken based on consideration of the reason for the air sample failure.

7.2.4.1.2 Further action shall be taken to ensure that if the breathing air cylinder is placed back in service, that breathing air cylinder does not pass contaminants back to the breathing air in future fillings.

7.2.4.2* Any SCBA or SCBA component that is damaged and cannot be repaired shall be removed from service and retired as specified in Section 4.7.

7.2.4.3* Any SCBA or SCBA components that have been exposed to or are suspected of having been exposed to a CBRN agent(s), and where such exposure cannot be remedied by a decontamination process authorized by the SCBA manufacturer, shall be retired as specified in Section 4.7.

7.2.4.4 Any SCBA breathing air cylinder that is beyond repair shall be removed from service and retired as specified in Section 4.7.

7.2.4.5* Composite breathing air cylinders shall be removed from service and retired as specified in Section 4.7 when they reach the end of the SCBA manufacturer's specified service life.

7.2.4.6* Any elastomeric component, including but not limited to facepieces, O-rings, and hose, shall be removed from service and retired as specified in Section 4.7, when they reach the end of the SCBA manufacturer's specified service life.

7.3 Breathing Air Cylinder Filling.

7.3.1 Prior to filling SCBA breathing air cylinders, the cylinder inspection specified in 7.1.2.4(1) through (8) shall be performed.

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7.3.2 Breathing air shall meet the requirements specified in NFPA 1989, *Standard on Breathing Air Quality for Emergency Services Respiratory Protection.*

7.3.3 The SCBA manufacturer's specified fill rate shall not be exceeded.

7.3.4 SCBA breathing air cylinders shall be filled as soon as possible after use.

7.3.5* Where filling breathing air cylinders during routine maintenance, all operators and personnel shall be protected from catastrophic failure of the cylinder by the use of an SCBA fill station that meets the requirements specified in Section 24.9 of NFPA 1901, *Standard for Automotive Fire Apparatus.*

7.3.6 SCBA breathing air cylinders shall be requalified as specified by the SCBA manufacturer.

7.4 Breathing Air Cylinder Requalification.

7.4.1 SCBA breathing air cylinders shall be periodically requalified for service as required by the U.S. Department of Transportation (DOT). *(See Annex C.)*

7.4.2 Where an SCBA breathing air cylinder is found to not be currently qualified for service, it shall be removed from service, tagged, and submitted for requalification testing.

7.4.3 An SCBA breathing air cylinder that fails requalification shall be dealt with in accordance with 4.7.6.

7.5 Testing.

7.5.1 The organization responsible for the maintenance of the SCBA shall perform periodic testing in accordance with the part of the SCBA program component for maintenance as specified in 4.3.6. In all cases, SCBA shall be tested at least annually on a breathing machine that meets the requirements specified in 7.5.5 and 7.5.6.

7.5.2 SCBA shall be tested for the performance specified in Table 7.5.2 after being inspected as specified in 7.1.2.

7.5.2.1 The sound level of all audible EOSTI shall be measured using a calibrated instrument following the SCBA manufacturer's instructions and specifications.

7.5.2.2 All other EOSTI shall be measured in accordance with the manufacturer's instructions and specifications at least annually.

7.5.2.3 SCBA EOSTI signaling device(s) activation and operation shall conform to the SCBA manufacturer's specifications.

7.5.3 SCBA that fail to meet any of the acceptance criteria provided in Table 7.5.2 shall be tagged out-of-service until that SCBA has been adjusted or repaired, retested, and shown to meet all the requirements of Table 7.5.2.

Table 7.5.2 Performance Test Requirements

Performance Element	Acceptance Criteria
Facepiece leakage	In order to proceed with the tests specified in this table, a pressure of at least 0.20 mb (0.1 in.) H_2O gauge below atmospheric shall remain in the facepiece at the end of a testing interval equal to 10 seconds ± 0.5 seconds.
Facepiece exhalation valve opening pressure	Facepiece exhalation valve opening pressure shall be within manufacturer's specifications.
Facepiece static pressure	Pressure shall be between 0 mb (0 in.) H_2O gauge and 3.7 mb (1½ in.) H_2O gauge above atmospheric or shall meet manufacturer's specifications, whichever are more stringent.
First stage regulator (pressure reducer) static pressure	First stage regulator (pressure reducer) static pressure shall be within manufacturer's specifications.
Minimum facepiece pressure during breathing resistance test (at 40 L/min ± 1 L/min)	Minimum facepiece pressure shall meet manufacturer's specifications.
Maximum facepiece pressure during breathing resistance test (at 85 L/min ± 1 L/min)	Maximum facepiece pressure shall be less than or equal to the manufacturer's specifications, but not more than 5.0 mb (2 in.) H_2O gauge above maximum static pressure.
Facepiece pressure during breathing resistance test (at 103 L/min ± 3 L/min)	Pressure shall be between 0 mb (0 in.) H_2O gauge and 8.7 mb (3½ in.) H_2O gauge above atmospheric or shall meet manufacturer's specifications, whichever are more stringent.
First stage pressure during breathing resistance test (at 103 L/min ± 3 L/min)	First stage pressure (pressure reducer) shall be within manufacturer's specifications.
First stage pressure during breathing resistance test (at 40 L/min ± 1.0 L/min)	First stage pressure (pressure reducer) shall be within manufacturer's specifications.
Remote pressure gauge accuracy at ¾-, ½-, ¼- rated cylinder pressure	Remote pressure gauge accuracy shall be within ±5 percent of full scale.
End-of-service-time indicator (EOSTI): Activation	The EOSTI shall activate within manufacturer's specifications. Where the SCBA includes a second EOSTI, the activation pressure of the second EOSTI shall meet manufacturer's specifications.
Bypass flow rate	Where bypass valves are provided on SCBA, the flow rate through the bypass system shall be within manufacturer's specifications.

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7.5.4 All equipment used to test SCBA shall be calibrated in accordance with the test equipment manufacturer's instructions for calibration.

7.5.4.1 Calibration shall be performed periodically in accordance with the test equipment manufacturer's instructions but shall be calibrated at least annually.

7.5.4.2 A label shall be affixed to each piece of test equipment stating the date of the latest calibration and the date of the next scheduled calibration.

7.5.4.3 Records of calibration results shall be kept on file at the maintenance facility.

7.5.5 The breathing machine shall be capable of performing the tests listed in Table 7.5.2.

7.5.6 The breathing machine and any associated equipment shall be capable of meeting the specifications in Table 7.5.6(a) and Table 7.5.6(b).

Table 7.5.6(a) Lung Breathing Waveforms for 103 L/min Volume Work Rate

Step Number	Time (seconds)	Inspire/ Expire	Volume (L) ± 0.1 L	Volume Change (L) ± 5%
0	0.00	—	−1.700	−0.012
1	0.02	Inspire	−1.688	0.012
2	0.04	Inspire	−1.662	0.025
3	0.06	Inspire	−1.626	0.036
4	0.08	Inspire	−1.581	0.045
5	0.10	Inspire	−1.529	0.052
6	0.12	Inspire	−1.471	0.058
7	0.14	Inspire	−1.409	0.062
8	0.16	Inspire	−1.345	0.064
9	0.18	Inspire	−1.277	0.068
10	0.20	Inspire	−1.207	0.070
11	0.22	Inspire	−1.134	0.073
12	0.24	Inspire	−1.059	0.075
13	0.26	Inspire	−0.984	0.076
14	0.28	Inspire	−0.906	0.077
15	0.30	Inspire	−0.828	0.079
16	0.32	Inspire	−0.748	0.080
17	0.34	Inspire	−0.667	0.081
18	0.36	Inspire	−0.586	0.081
19	0.38	Inspire	−0.504	0.082
20	0.40	Inspire	−0.421	0.083
21	0.42	Inspire	−0.337	0.084
22	0.44	Inspire	−0.254	0.084
23	0.46	Inspire	−0.169	0.085
24	0.48	Inspire	−0.085	0.085
25	0.50	Inspire	0	0.085
26	0.52	Inspire	0.085	0.085
27	0.54	Inspire	0.169	0.085
28	0.56	Inspire	0.254	0.085
29	0.58	Inspire	0.337	0.084
30	0.60	Inspire	0.421	0.084
31	0.62	Inspire	0.504	0.083
32	0.64	Inspire	0.586	0.082
33	0.66	Inspire	0.667	0.081
34	0.68	Inspire	0.748	0.081
35	0.70	Inspire	0.828	0.080
36	0.72	Inspire	0.906	0.079
37	0.74	Inspire	0.984	0.077
38	0.76	Inspire	1.059	0.076
39	0.78	Inspire	1.134	0.075
40	0.80	Inspire	1.207	0.073
41	0.82	Inspire	1.277	0.070
42	0.84	Inspire	1.345	0.068
43	0.86	Inspire	1.409	0.064
44	0.88	Inspire	1.471	0.062
45	0.90	Inspire	1.529	0.058

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Table 7.5.6(a) ***Continued***

Step Number	Time (seconds)	Inspire/ Expire	Volume (L) ± 0.1 L	Volume Change (L) ± 5%
46	0.92	Inspire	1.581	0.052
47	0.94	Inspire	1.626	0.045
48	0.96	Inspire	1.662	0.036
49	0.98	Inspire	1.688	0.025
50	1.00	—	1.700	0.012
51	1.02	Expire	1.688	–0.012
52	1.04	Expire	1.662	–0.025
53	1.06	Expire	1.626	–0.036
54	1.08	Expire	1.581	–0.045
55	1.10	Expire	1.529	–0.052
56	1.12	Expire	1.471	–0.058
57	1.14	Expire	1.409	–0.062
58	1.16	Expire	1.345	–0.064
59	1.18	Expire	1.277	–0.068
60	1.20	Expire	1.207	–0.070
61	1.22	Expire	1.134	–0.073
62	1.24	Expire	1.059	–0.075
63	1.26	Expire	0.984	–0.076
64	1.28	Expire	0.906	–0.077
65	1.30	Expire	0.828	–0.079
66	1.32	Expire	0.748	–0.080
67	1.34	Expire	0.667	–0.081
68	1.36	Expire	0.586	–0.081
69	1.38	Expire	0.504	–0.082
70	1.40	Expire	0.421	–0.083
71	1.42	Expire	0.337	–0.084
72	1.44	Expire	0.254	–0.084
73	1.46	Expire	0.169	–0.085
74	1.48	Expire	0.085	–0.085
75	1.50	Expire	0	–0.085
76	1.52	Expire	–0.085	–0.085
77	1.54	Expire	–0.169	–0.085
78	1.56	Expire	–0.254	–0.085
79	1.58	Expire	–0.337	–0.084
80	1.60	Expire	–0.421	–0.084
81	1.62	Expire	–0.504	–0.083
82	1.64	Expire	–0.586	–0.082
83	1.66	Expire	–0.667	–0.081
84	1.68	Expire	–0.748	–0.081
85	1.70	Expire	–0.828	–0.080
86	1.72	Expire	–0.906	–0.079
87	1.74	Expire	–0.984	–0.077
88	1.76	Expire	–1.059	–0.076
89	1.78	Expire	–1.134	–0.075
90	1.80	Expire	–1.207	–0.073
91	1.82	Expire	–1.277	–0.070
92	1.84	Expire	–1.345	–0.068
93	1.86	Expire	–1.409	–0.064
94	1.88	Expire	–1.471	–0.062
95	1.90	Expire	–1.529	–0.058
96	1.92	Expire	–1.581	–0.052
97	1.94	Expire	–1.626	–0.045
98	1.96	Expire	–1.662	–0.036
99	1.98	Expire	–1.688	–0.025

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Table 7.5.6(b) Lung Breathing Waveforms for 40 L/min Volume Work Rate

Step Number	Time (seconds)	Inspire/ Expire	Volume (L) ± 0.1 L	Volume Change (L) ± 5%
0	0.000	—	–0.833	0.001
1	0.025	Inspire	–0.831	0.002
2	0.050	Inspire	–0.825	0.005
3	0.075	Inspire	–0.816	0.009
4	0.100	Inspire	–0.803	0.013
5	0.125	Inspire	–0.787	0.016
6	0.150	Inspire	–0.768	0.019
7	0.175	Inspire	–0.745	0.022
8	0.200	Inspire	–0.720	0.025
9	0.225	Inspire	–0.692	0.028
10	0.250	Inspire	–0.661	0.031
11	0.275	Inspire	–0.628	0.033
12	0.300	Inspire	–0.592	0.035
13	0.325	Inspire	–0.555	0.038
14	0.350	Inspire	–0.515	0.039
15	0.375	Inspire	–0.474	0.041
16	0.400	Inspire	–0.431	0.043
17	0.425	Inspire	–0.387	0.044
18	0.450	Inspire	–0.341	0.046
19	0.475	Inspire	–0.295	0.047
20	0.500	Inspire	–0.247	0.048
21	0.525	Inspire	–0.198	0.049
22	0.550	Inspire	–0.149	0.049
23	0.575	Inspire	–0.100	0.050
24	0.600	Inspire	–0.050	0.050
25	0.625	Inspire	0	0.050
26	0.650	Inspire	0.051	0.050
27	0.675	Inspire	0.100	0.050
28	0.700	Inspire	0.150	0.050
29	0.725	Inspire	0.199	0.049
30	0.750	Inspire	0.248	0.048
31	0.775	Inspire	0.295	0.048
32	0.800	Inspire	0.342	0.047
33	0.825	Inspire	0.388	0.046
34	0.850	Inspire	0.432	0.044
35	0.875	Inspire	0.475	0.043
36	0.900	Inspire	0.516	0.041
37	0.925	Inspire	0.555	0.039
38	0.950	Inspire	0.592	0.037
39	0.975	Inspire	0.628	0.035
40	1.000	Inspire	0.661	0.033
41	1.025	Inspire	0.691	0.031
42	1.050	Inspire	0.719	0.028
43	1.075	Inspire	0.744	0.025
44	1.100	Inspire	0.767	0.022
45	1.125	Inspire	0.786	0.019
46	1.150	Inspire	0.802	0.016
47	1.175	Inspire	0.814	0.013
48	1.200	Inspire	0.823	0.009
49	1.225	Inspire	0.829	0.005
50	1.250	—	0.833	0.004
51	1.275	Expire	0.831	–0.002
52	1.300	Expire	0.825	–0.005
53	1.325	Expire	0.816	–0.009
54	1.350	Expire	0.803	–0.013
55	1.375	Expire	0.787	–0.016
56	1.400	Expire	0.768	–0.019
57	1.425	Expire	0.745	–0.022

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Table 7.5.6(b) *Continued*

Step Number	Time (seconds)	Inspire/ Expire	Volume (L) ± 0.1 L	Volume Change (L) ± 5%
58	1.450	Expire	0.720	–0.025
59	1.475	Expire	0.692	–0.028
60	1.500	Expire	0.661	–0.031
61	1.525	Expire	0.628	–0.033
62	1.550	Expire	0.592	–0.035
63	1.575	Expire	0.555	–0.038
64	1.600	Expire	0.515	–0.039
65	1.625	Expire	0.474	–0.041
66	1.650	Expire	0.431	–0.043
67	1.675	Expire	0.387	–0.044
68	1.700	Expire	0.341	–0.046
69	1.725	Expire	0.295	–0.047
70	1.750	Expire	0.247	–0.048
71	1.775	Expire	0.198	–0.049
72	1.800	Expire	0.149	–0.049
73	1.825	Expire	0.100	–0.050
74	1.850	Expire	0.050	–0.050
75	1.875	Expire	0.000	–0.050
76	1.900	Expire	–0.051	–0.050
77	1.925	Expire	–0.100	–0.050
78	1.950	Expire	–0.150	–0.050
79	1.975	Expire	–0.199	–0.049
80	2.000	Expire	–0.248	–0.048
81	2.025	Expire	–0.295	–0.048
82	2.050	Expire	–0.342	–0.047
83	2.075	Expire	–0.388	–0.046
84	2.100	Expire	–0.432	–0.044
85	2.125	Expire	–0.475	–0.043
86	2.150	Expire	–0.516	–0.041
87	2.175	Expire	–0.555	–0.039
88	2.200	Expire	–0.592	–0.037
89	2.225	Expire	–0.628	–0.035
90	2.250	Expire	–0.661	–0.033
91	2.275	Expire	–0.691	–0.031
92	2.300	Expire	–0.719	–0.028
93	2.325	Expire	–0.744	–0.025
94	2.350	Expire	–0.767	–0.022
95	2.375	Expire	–0.786	–0.019
96	2.400	Expire	–0.802	–0.016
97	2.425	Expire	–0.814	–0.013
98	2.450	Expire	–0.823	–0.009
99	2.475	Expire	–0.829	–0.005

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.1.1.1 Emergency operations where respiratory protection is needed from IDLH atmospheres includes but is not limited to confined spaces, hazardous materials releases, chemical, biological, radiological, nuclear (CBRN) incidents, fire fighting, medical treatment, technical rescue, any operations where the atmosphere is not stable or improving and could become IDLH, and any operations where it is difficult or not possible to accurately monitor the atmosphere.

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.

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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.3.3.3 Combination SCBA/SAR. Combination SCBA/SAR consist of the following:

(1) An SCBA certified as compliant with NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, and having a minimum rated service time of 30 minutes
(2) A connection for the attachment of an air line that provides a continuous supply of breathing air that is independent of the SCBA breathing air supply

The definition does not include SAR that are used in conjunction with escape self-contained breathing apparatus (ESCBA) where ESCBA provide less than a minimum rated service life of 30 minutes. For the purposes of this standard, combination SCBA/SAR are encompassed by the terms *self-contained breathing apparatus* and *SCBA*.

A.3.3.9 Organization. Examples of such organizations include, but are not limited to, fire departments, police and other law enforcement agencies, rescue squads, EMS providers, and hazardous materials response teams.

A.3.3.14 Self-Contained Breathing Apparatus (SCBA). For the purposes of this standard, the terms *self-contained breathing apparatus* and *SCBA* indicate only open-circuit SCBA. Where the term *SCBA* is used without any qualifier in this standard, it indicates only SCBA and combination SCBA/SAR. Combination SCBA/SAR are encompassed by the terms *self-contained breathing apparatus* and *SCBA*.

A.3.3.16 Supplied Air Respirator (SAR). For the purposes of this standard, combination SCBA/SAR are encompassed by the terms *self-contained breathing apparatus* and *SCBA*.

A.4.3.6.3.2(7) A responsible member of the organization should estimate the frequency of SCBA cylinder use. It is not necessary to record or maintain records on the frequency of each SCBA cylinder use. For the purposes of determining the needed frequency of technical inspections of the SCBA cylinder, an estimate of cylinder use is acceptable.

It is also recommended that a responsible member of the organization determine the severity of the environment that the SCBA cylinders are usually exposed to. Where a more severe environment (with regards to hazards such as chemical exposure or physical damage) exists, the organization should contact the SCBA manufacturer for cylinder technical inspection frequency advice.

Where the SCBA manufacturer does not have any technical inspection frequency instructions for SCBA cylinders used with their model, the following guidelines are recommended:

(1) A routine technical inspection of SCBA cylinders should be performed every 2 or 2½ years when the cylinders are in normal service and are filled or used 5 times a week or less.
(2) A routine technical inspection of SCBA cylinders should be performed every year (annually) when the SCBA cylinders are in hazardous service, or when they are estimated to be used or filled more than 5 times a week.

The frequency guidelines are not meant to prevent a nonroutine or specially required technical inspection. Where the user has determined that a cylinder condition exists that warrants a technical inspection *(see 7.1.2.4)*, an immediate technical inspection of the cylinder is required.

A.4.3.7 The SCBA manufacturer should be contacted prior to any after-purchase modifications of any sort to an SCBA. Unapproved modifications could affect the NIOSH certification or certification to NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, and void the certifications.

A.4.4.2 The portion of the text in 4.4.2(1) that applies to the 1987 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, uses the phrase "did not meet the requirements of the 1987 edition" while the portion of the text in 4.4.2(2) that applies to the 1992 and later editions of NFPA 1981 uses the phrase "were not certified as compliant with the 1992 edition." The difference is that third-party certification first became a requirement with the 1992 edition and the terms *certified* and *compliant* are defined as relating to certification. Prior to the 1992 edition of NFPA 1981, the SCBA manufacturers confirmed their product as "meeting the requirements" of the standard.

A.4.4.3 SCBA that were compliant with the 1981 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, could have been upgraded since purchase through the SCBA manufacturer's upgrade program and now be compliant with the later edition of NFPA 1981.

SCBA that are compliant with the 1981 edition of NFPA 1981 and have not been upgraded through the SCBA manufacturer's upgrade program since their purchase should already have been removed from service (in the United States) under OSHA regulations in 29 CFR 1910.156 that effectively removed these SCBA from service on July 1, 1983.

A.4.4.4 SCBA that were compliant with the 1971 edition of NFPA 19B, *Standard on Respiratory Protective Equipment for Firefighters*, cannot be upgraded and should have been removed from service and disposed of many years ago. In the United States, OSHA regulations in 29 CFR 1910.156 effectively removed these SCBA from service on July 1, 1983.

A.4.5.1 The purposes of record keeping are to document what the organization has done, to create a record that can be used for compliance with laws or standards, and to provide information for analysis, evaluation, quality control, and planning. The organization should create and maintain a system of record keeping that achieves these purposes.

Record keeping should be comprehensive and structured to meet the requirements of this standard and needs of the organization. Record keeping should create, process, maintain, and store information with a minimum of effort, time, and cost. Record keeping should provide sufficient data and findings to allow the organization to analyze and to evaluate the selection, care, and maintenance performed under this standard.

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All records, reports, and documents should be accurate and clear. If the reader detects inaccuracy, then the veracity of the writer, as well as the value of the record, could be suspect. Details, without the inclusion of unnecessary information, are necessary. Duplication of information in other forms or reports should be avoided.

A.4.5.2(7) Items to be considered should include the part the record, report, or document plays in the record-keeping system and whether it will be used for checking compliance, tracking, measuring effectiveness, spotting trends, or planning.

A.4.5.3 Some records and reports can be created and stored electronically although other items that are completed by users, such as forms, notices, stickers, and tags, are only practical and effective if tangible.

A.4.7.5 No specific requalification procedures are outlined in 49 CFR for composite cylinders. Therefore, the Department of Transportation (DOT) developed certifications known as *special permits* (previously known as exemptions). DOT-authorized composite cylinders have a maximum service life indicated in the exemption. Most exemptions specify that composite cylinders have a maximum life of 15 years. The composite cylinder is prohibited from being refilled after 15 years from the original hydrostatic test date. All U.S. retest facilities performing requalifications on composite cylinders are required by the DOT to have a current copy of the cylinder's exemption available, and have to follow its instructions and conditions. The DOT, which is the regulatory authority in the United States, specifies the cylinder requalification frequency of every 3 years for composite cylinders and the cylinder requalification frequency of every 5 years for all-metal cylinders. The organization/cylinder owner and retest facility are required by the DOT to know how often to have the requalification performed. *(See also Annex C.)*

A.5.1.5(17) SCBA maintenance and repair record keeping should include labeling and tracking SCBA major component assemblies by a unique identification method. Such identification can help to identify and document problems that are specific to a particular component assembly as well as simplify efforts to take corrective action and implement upgrades.

A.5.1.5(18) SCBA that are certified by NIOSH include a rated service time based on laboratory tests required by NIOSH. The SCBA is tested using a specified breathing machine with a breathing rate of 40 L/min. NIOSH uses this 40 L/min rate because it represents a moderate work rate that an average user can sustain for a period of time. To attain a rated service time of 30 minutes during this 40 L/min test, the typical SCBA cylinder has to contain 1200 L or more of compressed breathable air. A 45 ft^3 cylinder has a capacity of 1273.5 L, based on 28.3 L/ft^3. Because actual work performed by emergency services personnel often results in a ventilation rate that exceeds 40 L/min, these personnel frequently do not attain the rated service time of 30 minutes. During extreme exertion, for example, actual service time can be reduced by 50 percent or more.

To ensure proper utilization of equipment in actual situations, after training and instruction, it is recommended that users gain confidence by actually using the SCBA in a series of tasks representing or approximating the physical demands likely to be encountered.

In addition to the degree of user exertion, other factors that can affect the service time of the SCBA include the following:

(1) Physical condition of the user *(see also ANSI Z88.6, Respiratory Protection — Respirator Use — Physical Qualifications for Personnel)*
(2) Emotional conditions, such as fear or excitement, which can increase the user's breathing rate
(3) Degree of training or experience the user has had with such equipment
(4) Whether or not the cylinder is fully charged at the beginning of use
(5) Facepiece fit
(6) Use in a pressurized tunnel or caisson [At two atmospheres of gauge pressure (29.4 psi), the duration is one-half the duration obtained at one atmosphere of gauge pressure (14.7 psi); at three atmospheres of gauge pressure (44.1 psi), the duration is one-third the duration obtained at one atmosphere of pressure.]
(7) Condition of the SCBA
(8) The SCBA effective dead air space. [Dead air space is a volume proportional to the carbon dioxide (CO_2) concentration in the inhaled breathing gas.]

During normal breathing without a facepiece, CO_2, which is produced by the body's metabolism, is released to the environment with each breath. The facepiece of an SCBA reduces this environment to a small space around the face. On exhalation, a portion of the carbon dioxide-rich exhaled breath is trapped in this space. On inhalation, fresh air from the SCBA cylinder mixes with this carbon dioxide-rich air and then enters the lungs. The concentration of carbon dioxide is dependent on facepiece configuration, flow characteristics, and ventilation rate.

The full effect of increased dead air space has not been demonstrated. However, the scientific work done in this area shows that an increase of CO_2 in the inhalation air leads to increased ventilation and, consequently, shorter service time for a given air supply. Means to reduce CO_2 in the inhalation air by using, for example, a well-fitting nose cup have been demonstrated to give longer service time. Each manufacturer should be contacted for specific data.

A.5.1.8(2) *Quantitative facepiece fit testing* measures the amount (quantity) of leakage around the facepiece-to-face seal. This is normally done, using specifically designed equipment, by measuring the concentration of a detector (challenge) gas or aerosol in the area surrounding a user who is wearing a facepiece and comparing this with the concentration of the challenge gas or aerosol inside the facepiece. Comparing these two concentrations results in a *protection factor* expressed as the following relationship:

Protection factor = 1 ÷ (concentration in facepiece/concentration outside facepiece)

A high protection factor indicates that a very small amount of the challenge gas or aerosol has passed to inside the facepiece, thus the facepiece provides a high degree of protection to the user being tested.

An alternative facepiece fit test method is the *qualitative fit test.* Qualitative fit testing is based on whether the wearer of a facepiece can detect the presence of the challenge gas or aerosol by sensing the odor of it. This is a highly subjective test where a particular wearer determines whether the quality of air in the facepiece is acceptable. Results of qualitative fit testing are not precise and can vary based on the wearer's senses and the concentration of the challenge gas or aerosol.

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A.6.1.4.1 Exposure to chlorine bleach will damage straps and harnesses and cause holes, fraying, fiber fibrillation, and breakage of the strap or harness.

A.6.1.6 Cleaning materials or water in the connection between the cylinder valve and the SCBA inlet connector are forced into the regulator and other pneumatic assemblies and can adversely affect the SCBA's performance over time.

A.6.3.7 SCBA cylinder pressure relief devices, such as frangible discs, are designed to safely relieve the contents of a cylinder when the cylinder internal pressure exceeds ⅝ of the rated service pressure. One way a cylinder can become overpressurized is when a cylinder is exposed to high heat or fire. The frangible disc pressure relief device is designed to protect a fully charged cylinder. If the cylinder is only partially charged, the cylinder structure can catastrophically fail before the cylinder's internal pressure reaches the pressure at which the pressure relief device functions. The conclusion is that SCBA cylinders in storage should be fully charged rather than partially charged.

A.6.3.7.3 Moisture accelerates the formation of rust, and oxygen could be depleted to dangerous levels over time as oxygen combines with the iron in the steel to form iron oxide.

A.7.1.1.1 A duty period should include, but not be limited to, a single shift in a career department, a substitute person taking over a position for part or all of a shift, personnel assigned to station duty in a department where the station is not staffed on a 24-hour daily basis, and other similar situations.

A.7.1.4.1 Defects that should cause an SCBA cylinder to be removed from service include, but are not limited to, cylinders under the following conditions:

(1) Not well cared for and maintained
(2) Dropped, fallen, struck, or crushed
(3) Stored improperly
(4) Degraded, deteriorated, or corroded
(5) In contact with damaging chemicals or an extremely corrosive atmosphere or environment
(6) Damaged, as evidenced by a dent, gouge, crack, scrape, cut, dig, tear, or abrasion
(7) Distorted, discolored, or showing the effects of heat exposure including one or more of the following:
    (a) Charring
    (b) Blistering
    (c) Peeling paint or coating
    (d) Melting
    (e) Loss of resin or loose fibers on composite cylinders
(8) Partially or fully repainted or treated to hide suspected damage, or heat or fire damage
(9) Leaking
(10) Found depleted when it should have been full with no known reason for it to be in this condition

A.7.2.3.3 Many components in an SCBA, while appearing the same as those commonly available at stores and through catalogue sales, are made of special materials or under specific controls that are necessary to meet the stringent performance requirements of NFPA and NIOSH standards. One of the best examples of this is the manufacturer's use of a particular O-ring material and hardness in conjunction with a certain lubricant. Using a different O-ring or lubricant commonly obtainable from a hardware or plumbing store instead of that supplied by the manufacturer could result in a critical failure of the apparatus under certain conditions, even though the apparatus could appear to perform perfectly well immediately after repair.

A.7.2.3.9 It is recommended that organizations request substantiation from the SCBA manufacturer for any SCBA with no prescribed overhaul period.

A.7.2.4.1 The following is a suggested procedure for handling a breathing air cylinder that has been filled with breathing air that does not meet the requirements specified in 7.3.2 or has been filled with a nonbreathing air gas:

(1) Determine what gas was put into the cylinder.
(2) Determine the hazard(s) the gas poses to humans and the environment.
(3) Where the technician is not or cannot be properly protected or cannot be trained to handle the hazard(s) of the gas, or if the facility is not equipped to properly handle the gas, then the cylinder should be retired to an authorized waste disposal facility that is able to properly discard the gas and cylinder.
(4) Where the technician is properly protected and trained to handle the identified gas and its hazard(s), and the facility is equipped to properly release and dispose of the gas, then the gas is released to the atmosphere or scrubber, or disposal container, according to local, state/provincial, or federal environmental regulations.
(5) Purge the cylinder with an inert gas appropriate for the hazard(s) of the incorrect gas to remove any residual gas if the incorrect gas was a hazardous gas.
(6) Inspect the interior of the cylinder for contamination.
(7) Where cylinder contamination is found, clean the interior of the cylinder in accordance with the instructions from the SCBA manufacturer.
(8) Inspect the interior of the cylinder again to verify the cleaning process was successful in removing the contaminant(s).
(9) Once the empty cylinder passes the visual interior inspection and meets other inspections and performance requirements, the cylinder can be considered for return to service.
(10) Where the cylinder cannot be properly cleaned, or any condition prevents the cylinder from being returned to service, the cylinder should be retired.

Where the contents of a filled cylinder are unknown, then the gas should not be released and the cylinder should not be purged until the gas is identified by sampling of the cylinder contents before the cylinder is retired and sent to a waste disposal facility in accordance with local, state/provincial, or federal environmental regulations.

A.7.2.4.2 See A.7.1.4.1.

A.7.2.4.3 Many potential highly toxic or lethal agents exist for which the only known remedy is destruction and disposal. The SCBA manufacturer should affirm a decontamination procedure that achieves both of the following:

(1) Reduces the toxicity of the agent to a level not harmful to the user
(2) Does not adversely affect the performance of the SCBA or component

Decontamination procedures are not known for many toxic or lethal agents. Proper disposal of the SCBA or components exposed to such agents is a joint responsibility of the manufacturer and the user organization.

A.7.2.4.5 No specific design or requalification procedures are outlined in 49 CFR for composite cylinders. Therefore, the

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DOT developed certifications known as *special permits* (previously known as exemptions). DOT-authorized composite cylinders have a maximum service life indicated in the exemption. Most exemptions specify that composite cylinders have a maximum life of 15 years. The composite cylinder is prohibited from being refilled after 15 years from the original hydrostatic test date. All U.S. retest facilities performing requalifications on composite cylinders are required by DOT to have a current copy of the cylinder's exemption available and to follow its instructions and conditions. DOT, which is the regulatory authority in the United States, specifies the cylinder requalification frequency for all cylinders. The organization/cylinder owner and retest facility are required by DOT to know how often to have the requalification performed. *(See also Annex C.)*

A.7.2.4.6 Some of the rubber (elastomeric) components used in the SCBA have a limited shelf/service life and can degrade below a satisfactory level if used beyond the recommended life. Such aging often appears as cracking or brittleness of the material. SCBA manufacturers often use elastomers such as silicone or ethylene propylene that do not have a limited life, but technicians should be cautious to verify that the usable date has not expired when using materials that do have a limited life.

A.7.3.5 During emergency operations and training, cylinders should be filled in accordance with the SCBA manufacturers' instructions and NIOSH-approved fill methods for the specific cylinder. Fire departments should also review the requirements in Section 7.15 of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

Annex B Instructions for External Examination of SCBA Breathing Air Cylinders

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Air Cylinder Examination. Instructions for external examination of SCBA cylinders should be obtained from the SCBA manufacturer. If instructions have not been provided or cannot be obtained from the SCBA manufacturer, then the guidelines in B.2 and B.3 can be used.

B.2 Composite SCBA Breathing Air Cylinders. Composite materials often show damage in a variety of ways.

B.2.1 Fiber Damage. Look for signs of the fiber material coming loose or fraying, or for areas where the fiber strands are separating from each other or from the cylinder surface. Look for "frosty" areas; some composite materials when struck with a possibly damaging blow turn a frosty appearance in the area of the damage. Look for signs of cuts, cracks, gouges, and bulges.

B.2.2 Resin Damage. Abnormal resin conditions can also be evidence of damage. Look for signs that the resin part of the composite material is soft, absent or missing, bubbling, or has characteristics described in B.2.4. Look for scrapes or abrasions that have removed the resin coating or expose composite strands.

B.2.3 Chemical Damage. Chemicals can affect resin and composite materials. Some of the effects are not readily apparent and the best way to know what to do is to know if the cylinder has come into contact with any of the following chemical groups:

(1) Solvents such as paint thinners, kerosene, turpentine, paint solvents, paint cleaners, all paint-like products, Stoddard solvent, epoxy solvents, resin removers, organic solvents
(2) Vehicle fluids such as materials that contain benzene, glycol (anti-freeze), battery acids, window wash fluids and other alkalis, oils containing solvents, flammable materials, organic volatile materials, gasoline and oil additives, fuels such as gasohol, methanol, gasoline, diesel
(3) Bases such as materials that contain sodium hydroxide, potassium, and other hydroxides; materials containing strong soap solutions or alkalis
(4) Acids such as materials that are acids or contain any concentration of acids such as hydrochloric, sulfuric, nitric, phosphoric, acetic acid (vinegar)
(5) Corrosives such as materials that contain corrosive components or that are corrosive themselves
(6) Alcohols such as materials that are alcohol or that contain any type of alcohol

If the cylinder has come into contact with an unknown chemical or a chemical not previously listed, contact the SCBA manufacturer for guidance.

B.2.4 Paint Damage. Sometimes, when a painted or coated cylinder has come into contact with one or more of the previously listed chemicals, it is evident by what is happening to the paint. Look for paint that is soft, bubbling, blistering, discolored, lifting off, cracking, or peeling. Knowing what the paint or coating is supposed to look like will be the standard to determine if the cylinder has come into contact with an unknown chemical.

B.3 All-Metal SCBA Breathing Air Cylinders. Metal surfaces are more tolerant to physical and chemical damage than most composite surfaces. Nonetheless, observed metal conditions require that the cylinder be technically inspected.

Look for deep cuts and gouges. Look for dents; dents that are less than 50 mm (2 in.) in diameter are worse than large shallow dents, but no dent over 150 mm (6 in.) in diameter should be acceptable unless it is very shallow. Look for bulges and evidence of heat damage as indicated by charring, coating, or blistering.

Chemical damage to metal surfaces can occur. Look for discolored metal or the paint conditions as noted in B.2.4 if the metal is painted and where the metal looks like the paint has been removed or dissolved. Any discovered condition should be cause to refer the SCBA cylinder to a technical inspection.

Annex C Requalification of SCBA Breathing Air Cylinders

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 General. Requalification of SCBA cylinders is required for interstate service in the United States, with a frequency depending on the design type of cylinder. The DOT, through the Pipeline and Hazardous Material Safety Administration (PHMSA) agency, issues retester identification numbers (RIN) to retest facilities that can then legally perform cylinder requalifications. Only the DOT has the authority to issue such numbers in the United States.

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C.1.1 An applicant is issued an RIN after meeting the agency's requirements and passing an inspection. A third-party independent inspection agency is charged with performing the application inspections and reporting the results to the PHMSA. Once issued, the RIN is good for 5 years provided that the retest facility maintains equipment and personnel at the degree observed at the time of the original application inspection.

C.1.2 The SCBA cylinder requalification process includes a visual inspection, both internal and external; the hydrostatic test; marking or labeling; and maintenance of proper records of the requalification. Each retest facility has to perform all these functions during a cylinder requalification. Information about the hydrostatic retest is found in 49 CFR 173.34(e).

C.2 Exemptions. No specific requalification procedures are outlined in 49 CFR for composite cylinders. Therefore, the DOT developed certifications known as *special permits* (previously known as exemptions).

C.2.1 All composite cylinders authorized for sale and use in the United States have a DOT special permit number (previously known as an exemption number). This is what is meant by *DOT-authorized.* Information on special permits is found in 49 CFR.

C.2.2 DOT special permitted cylinders are requalified according to specific conditions and frequency written in the exemption. All U.S. retest facilities performing requalifications on composite cylinders are required by DOT to have a current copy of the cylinder's special permit available and have to follow its instructions and conditions. The organization/cylinder owner and retest facility are required by DOT to know how often to have the requalification performed.

C.3 Frequency Regulatory Agency. DOT, which is the regulatory authority in the United States, specifies the cylinder requalification frequency. Any agency, cylinder manufacturer, SCBA unit manufacturer, or industry can recommend a more stringent requalification frequency or can recommend a shorter frequency for just the inspection portion of the requalification. The scuba industry, for instance, performs a voluntary annual visual inspection (internal and external) on all-metal scuba cylinders, in addition to the required requalification.

NIOSH and DOT both recommend a different inspection frequency (not requalification) than that required for all-metal SCBA cylinders manufactured by Luxfer USA prior to July 1988. These cylinders were manufactured using 6351 aluminum alloy, and there is a chance for cracking to develop in the neck region (thread region) or crown of the cylinder. Regardless of whether the inspection recommendation is followed or if the cylinder is requalified as required, if the inspection is not properly and diligently performed, the cylinder could be unsafe to fill. This applies to *any* cylinder requalification. The internal and external inspection, hydro testing, marking, and record keeping has to be properly and diligently performed.

Every organization should verify that the retest facility where their SCBA cylinders are requalified is a duly qualified DOT/PHMSA retest facility, holds a valid RIN, and is diligently performing the requalification. If in doubt, contact the DOT for verification that the retest facility is authorized or find a different DOT/PHMSA retest facility. If the organization suspects that the retest facility has not properly or diligently performed the requalification, the DOT Hazardous Materials Enforcement Branch should be contacted at (202) 366-4700.

DOT-authorized composite cylinders have a maximum service life indicated in the special permit (previously known as an exemption). Most special permits specify that composite cylinders have a maximum life of 15 years. The composite cylinder is prohibited from being refilled after 15 years from the original hydrostatic test date.

The service life of all-metal cylinders is determined at the time of requalification. If the cylinder passes the requalification, it can be used until the cylinder shows signs of serious external damage *(see 7.1.2.4 and Annex B) or until its next requalification.*

C.4 Requalification Process. A brief description of the requalification process follows. The cylinder is first de-valved and all internal and external surfaces made visible to the retester. The cylinder is internally and externally visually inspected according to required DOT specifications. If it passes, the hydrostatic test is performed next.

To hydro-test the cylinder, it is placed inside of a water jacket or bath (containing water) that is specially sealed. The cylinder is filled with water. The cylinder is pressurized with more water. The cylinder expands a little and displaces water in the water jacket. The amount of water displaced in the water jacket is measured by a precision method. This amount of water displaced represents how much the cylinder expanded under pressure. When the water pressure returns to normal, the amount of expansion that still exists (the water not taken back into the water jacket) is called the *permanent expansion.* This information is recorded and compared to DOT requirements to determine if the two expansions of the cylinder comply with DOT regulations.

If the cylinder passes the internal and external inspection and retest, the retester marks the all-metal cylinder by stamping into the metal or labels the composite cylinder with a label sealed in resin. The information marked or labeled includes the RIN identification and the retest date. A record is then made of the requalification with the information required by the DOT.

The retester is required to stamp out cylinder DOT markings with Xs or with the word "Condemned" if the cylinder does not pass the requalification process. Cylinders that are fully wrapped with composite materials that do not pass requalification are labeled condemned. The cylinder should be rendered unable to hold pressure with the permission of the cylinder owner. It is recommended that all organizations permit the retest facility to render condemned cylinders unable to hold pressure by drilling through the cylinder or destroying valve threads. A record is made of condemned cylinders, according to DOT requirements.

Annex D Informational References

D.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

D.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 19B, *Standard on Respiratory Protective Equipment for Firefighters,* 1971 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* 2013 edition.

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NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, 2013 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, 2007 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire Service*, 1997 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, 1992 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, 1987 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters*, 1981 edition.

D.1.2 Other Publications.

D.1.2.1 ANSI Publications. American National Standards Institute Inc., 11 West 42nd Street, 13th floor, New York, NY 10036.

ANSI Z88.6, *Respiratory Protection — Respirator Use — Physical Qualifications for Personnel*, 1984.

D.1.2.2 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 29, Code of Federal Regulations, Part 1910.156, 18 June 1998.

Title 49, Code of Federal Regulations, Parts 100–199, 1999.

D.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.

D.2.1 CGA Publications. Compressed Gas Association, 1725 Jefferson Davis Highway, Arlington, VA 22202-4100.

CGA Pamphlet C-6.2, *Guidelines for the Visual Inspection and Requalification of Fiber Reinforced High Pressure Cylinders.*

D.2.2 DOT Special Permits. Associate Administrator for Department of Transportation, Washington, DC 20590, Attention: DHM-31.

D.2.3 PSI Publications. Professional Scuba Inspectors, 6531 NE 198th Street, Seattle, WA 98155.

William L. High, *Inspecting Cylinders.*

SCBA Cylinder Technician Inspection, Training, and Certification.

D.3 References for Extracts in Informational Sections. (Reserved)

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Index

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-A-

Administration ..... Chap. 1
Application 1.3
Implementation 1.3.2
New and Existing SCBA 1.3.1
Purpose 1.2
Scope 1.1
Approved
Definition 3.2.1, A.3.2.1
Atmosphere-Supplying Respirator
Definition 3.3.1
Authority Having Jurisdiction (AHJ)
Definition 3.2.2, A.3.2.2

-C-

Care
Definition 3.3.2
Care ..... Chap. 6
Cleaning and Disinfecting 6.1
Contamination and Decontamination 6.2
Storage 6.3
Combination SCBA/SAR
Definition 3.3.3, A.3.3.3
Contamination/Contaminated
Definition 3.3.4
Cross Contamination
Definition 3.3.5

-D-

Definitions ..... Chap. 3

-E-

Explanatory Material ..... Annex A

-F-

Fully Charged
Definition 3.3.6

-I-

In-Service
Definition 3.3.7
Informational References ..... Annex D
Instructions for External Examination of SCBA Breathing Air Cylinders ..... Annex B

-M-

Maintenance
Definition 3.3.8
Maintenance ..... Chap. 7
Breathing Air Cylinder Filling 7.3
Breathing Air Cylinder Requalification 7.4
Technician Maintenance 7.2
Inspection 7.2.2
Inspection Frequency 7.2.1
Removal from Service and Disposition 7.2.4
Repairing and Rebuilding 7.2.3
Testing 7.5
User Maintenance 7.1
Inspection 7.1.2
Inspection Frequency 7.1.1
Removal from Service 7.1.4
Repair 7.1.3

-O-

Organization
Definition 3.3.9, A.3.3.9

-P-

Program Component ..... Chap. 4
Adverse Conditions Involving SCBA 4.2
General 4.1
Manufacturer's Instructions 4.6
Quality Assurance 4.8
Records 4.5
Retirement and Disposal 4.7
SCBA Compliance — Upgrades and Retirement 4.4
SCBA Selection, Care, and Maintenance Program Component 4.3
Technical Authorization 4.9

-R-

Rebuild
Definition 3.3.10
Referenced Publications ..... Chap. 2
General 2.1
NFPA Publications 2.2
Other Publications 2.3
References for Extracts in Mandatory Sections. (Reserved) 2.4
Requalification of SCBA Breathing Air Cylinders ..... Annex C

-S-

SAR
Definition 3.3.11
SCBA
Definition 3.3.12
Selection
Definition 3.3.13
Selection ..... Chap. 5
Acceptance 5.2
Selection for Purchase 5.1
Risk Assessment 5.1.1
Self-Contained Breathing Apparatus (SCBA)
Definition 3.3.14, A.3.3.14
Shall
Definition 3.2.3
Should
Definition 3.2.4
Specified Service Life
Definition 3.3.15
Standard
Definition 3.2.5
Supplied Air Respirator (SAR)
Definition 3.3.16, A.3.3.16

-T-

Technician
Definition 3.3.17

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Sequence of Events Leading to Issuance of This NFPA Committee Document

Step 1: Call for Proposals

- Proposed new Document or new edition of an existing Document is entered into one of two yearly revision cycles, and a Call for Proposals is published.

Step 2: Report on Proposals (ROP)

- Committee meets to act on Proposals, to develop its own Proposals, and to prepare its Report.
- Committee votes by written ballot on Proposals. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Proposals (ROP) is published for public review and comment.

Step 3: Report on Comments (ROC)

- Committee meets to act on Public Comments to develop its own Comments, and to prepare its report.
- Committee votes by written ballot on Comments. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Comments (ROC) is published for public review.

Step 4: Technical Report Session

- "*Notices of intent to make a motion*" are filed, are reviewed, and valid motions are certified for presentation at the Technical Report Session. ("Consent Documents" that have no certified motions bypass the Technical Report Session and proceed to the Standards Council for issuance.)
- NFPA membership meets each June at the Annual Meeting Technical Report Session and acts on Technical Committee Reports (ROP and ROC) for Documents with "certified amending motions."
- Committee(s) vote on any amendments to Report approved at NFPA Annual Membership Meeting.

Step 5: Standards Council Issuance

- Notification of intent to file an appeal to the Standards Council on Association action must be filed within 20 days of the NFPA Annual Membership Meeting.
- Standards Council decides, based on all evidence, whether or not to issue Document or to take other action, including hearing any appeals.

Committee Membership Classifications

The following classifications apply to Technical Committee members and represent their principal interest in the activity of the committee.

M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.

U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.

I/M *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.

L *Labor:* A labor representative or employee concerned with safety in the workplace.

R/T *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.

E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.

I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.

C *Consumer:* A person who is, or represents, the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in the *User* classification.

SE *Special Expert:* A person not representing any of the previous classifications, but who has a special expertise in the scope of the standard or portion thereof.

NOTES:
1. "Standard" connotes code, standard, recommended practice, or guide.
2. A representative includes an employee.
3. While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of members or unique interests need representation in order to foster the best possible committee deliberations on any project. In this connection, the Standards Council may make appointments as it deems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.
4. Representatives of subsidiaries of any group are generally considered to have the same classification as the parent organization.

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At this point, the NFPA Standards Development Site will open showing details for the document you have selected. This "Document Home" page site includes an explanatory introduction, information on the current document phase and closing date, a left-hand navigation panel that includes useful links, a document Table of Contents, and icons at the top you can click for Help when using the site. The Help icons and navigation panel will be visible except when you are actually in the process of creating a Public Input.

Once the First Draft Report becomes available there is a Public comment period during which anyone may submit a Public Comment on the First Draft. Any objections or further related changes to the content of the First Draft must be submitted at the Comment stage.

To submit a Public Comment you may access the e-Submission System utilizing the same steps as previous explained for the submission of Public Input.

For further information on submitting public input and public comments, go to: http://www.nfpa.org/publicinput

Other Resources available on the Doc Info Pages

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Next edition tab: Follow the committee's progress in the processing of a Standard in its next revision cycle.

Technical committee tab: View current committee member rosters or apply to a committee

Technical questions tab: For members and Public Sector Officials/AHJs to submit questions about codes and standards to NFPA staff. Our Technical Questions Service provides a convenient way to receive timely and consistent technical assistance when you need to know more about NFPA codes and standards relevant to your work. Responses are provided by NFPA staff on an informal basis.

Products/training tab: List of NFPA's publications and training available for purchase.

Community tab: Information and discussions about a Standard

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Information on the NFPA Standards Development Process

I. Applicable Regulations. The primary rules governing the processing of NFPA standards (codes, standards, recommended practices, and guides) are the NFPA *Regulations Governing the Development of NFPA Standards (Regs)*. Other applicable rules include NFPA *Bylaws*, NFPA *Technical Meeting Convention Rules*, NFPA *Guide for the Conduct of Participants in the NFPA Standards Development Process*, and the NFPA *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council*. Most of these rules and regulations are contained in the *NFPA Standards Directory*. For copies of the *Directory*, contact Codes and Standards Administration at NFPA Headquarters; all these documents are also available on the NFPA website at "www.nfpa.org."

The following is general information on the NFPA process. All participants, however, should refer to the actual rules and regulations for a full understanding of this process and for the criteria that govern participation.

II. Technical Committee Report. The Technical Committee Report is defined as "the Report of the responsible Committee(s), in accordance with the Regulations, in preparation of a new or revised NFPA Standard." The Technical Committee Report is in two parts and consists of the First Draft Report and the Second Draft Report. (See *Regs* at 1.4)

III. Step 1: First Draft Report. The First Draft Report is defined as "Part one of the Technical Committee Report, which documents the Input Stage." The First Draft Report consists of the First Draft, Public Input, Committee Input, Committee and Correlating Committee Statements, Correlating Input, Correlating Notes, and Ballot Statements. (See *Regs* at 4.2.5.2 and Section 4.3) Any objection to an action in the First Draft Report must be raised through the filing of an appropriate Comment for consideration in the Second Draft Report or the objection will be considered resolved. [See *Regs* at 4.3.1(b)]

IV. Step 2: Second Draft Report. The Second Draft Report is defined as "Part two of the Technical Committee Report, which documents the Comment Stage." The Second Draft Report consists of the Second Draft, Public Comments with corresponding Committee Actions and Committee Statements, Correlating Notes and their respective Committee Statements, Committee Comments, Correlating Revisions, and Ballot Statements. (See *Regs* at Section 4.2.5.2 and 4.4) The First Draft Report and the Second Draft Report together constitute the Technical Committee Report. Any outstanding objection following the Second Draft Report must be raised through an appropriate Amending Motion at the Association Technical Meeting or the objection will be considered resolved. [See *Regs* at 4.4.1(b)]

V. Step 3a: Action at Association Technical Meeting. Following the publication of the Second Draft Report, there is a period during which those wishing to make proper Amending Motions on the Technical Committee Reports must signal their intention by submitting a Notice of Intent to Make a Motion. (See *Regs* at 4.5.2) Standards that receive notice of proper Amending Motions (Certified Amending Motions) will be presented for action at the annual June Association Technical Meeting. At the meeting, the NFPA membership can consider and act on these Certified Amending Motions as well as Follow-up Amending Motions, that is, motions that become necessary as a result of a previous successful Amending Motion. (See 4.5.3.2 through 4.5.3.6 and Table1, Columns 1-3 of *Regs* for a summary of the available Amending Motions and who may make them.) Any outstanding objection following action at an Association Technical Meeting (and any further Technical Committee consideration following successful Amending Motions, see *Regs* at 4.5.3.7 through 4.6.5.3) must be raised through an appeal to the Standards Council or it will be considered to be resolved.

VI. Step 3b: Documents Forwarded Directly to the Council. Where no Notice of Intent to Make a Motion (NITMAM) is received and certified in accordance with the Technical Meeting Convention Rules, the standard is forwarded directly to the Standards Council for action on issuance. Objections are deemed to be resolved for these documents. (See *Regs* at 4.5.2.5)

VII. Step 4a: Council Appeals. Anyone can appeal to the Standards Council concerning procedural or substantive matters related to the development, content, or issuance of any document of the Association or on matters within the purview of the authority of the Council, as established by the *Bylaws* and as determined by the Board of Directors. Such appeals must be in written form and filed with the Secretary of the Standards Council (See *Regs* at 1.6). Time constraints for filing an appeal must be in accordance with 1.6.2 of the *Regs*. Objections are deemed to be resolved if not pursued at this level.

VIII. Step 4b: Document Issuance. The Standards Council is the issuer of all documents (see Article 8 of *Bylaws*). The Council acts on the issuance of a document presented for action at an Association Technical Meeting within 75 days from the date of the recommendation from the Association Technical Meeting, unless this period is extended by the Council (See *Regs at* 4.7.2). For documents forwarded directly to the Standards Council, the Council acts on the issuance of the document at its next scheduled meeting, or at such other meeting as the Council may determine (See *Regs* at 4.5.2.5 and 4.7.4).

IX. Petitions to the Board of Directors. The Standards Council has been delegated the responsibility for the administration of the codes and standards development process and the issuance of documents. However, where extraordinary circumstances requiring the intervention of the Board of Directors exist, the Board of Directors may take any action necessary to fulfill its obligations to preserve the integrity of the codes and standards development process and to protect the interests of the Association. The rules for petitioning the Board of Directors can be found in the *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council* and in 1.7 of the *Regs*.

X. For More Information. The program for the Association Technical Meeting (as well as the NFPA website as information becomes available) should be consulted for the date on which each report scheduled for consideration at the meeting will be presented. For copies of the First Draft Report and Second Draft Report as well as more information on NFPA rules and for up-to-date information on schedules and deadlines for processing NFPA documents, check the NFPA website (www.nfpa.org/aboutthecodes) or contact NFPA Codes & Standards Administration at (617) 984-7246.

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APPENDIX K
29 CFR 1910
Subpart L, Occupational Safety and Health Administration _ Fire Protection

these unique problems. Consultation from the local fire/rescue department, appropriate medical professional, or local emergency room may be helpful to employers in these circumstances. By assessing the specific needs of their workplace, employers can ensure that reasonably anticipated supplies are available. Employers should assess the specific needs of their worksite periodically and augment the first aid kit appropriately.

If it is reasonably anticipated that employees will be exposed to blood or other potentially infectious materials while using first aid supplies, employers are required to provide appropriate personal protective equipment (PPE) in compliance with the provisions of the Occupational Exposure to Blood borne Pathogens standard, § 1910.1030(d)(3) (56 FR 64175). This standard lists appropriate PPE for this type of exposure, such as gloves, gowns, face shields, masks, and eye protection.

[39 FR 23502, June 27, 1974, as amended at 63 FR 33466, June 18, 1998; 70 FR 1141, Jan. 5, 2005]

§ 1910.152 [Reserved]

Subpart L—Fire Protection

AUTHORITY: Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 F 35736), 6–96 (62 FR 111), or 3–2000 (65 FR 50017), as applicable; and 29 CFR part 1911.

§ 1910.155 Scope, application and definitions applicable to this subpart.

(a) *Scope.* This subpart contains requirements for fire brigades, and all portable and fixed fire suppression equipment, fire detection systems, and fire or employee alarm systems installed to meet the fire protection requirements of 29 CFR part 1910.

(b) *Application.* This subpart applies to all employments except for maritime, construction, and agriculture.

(c) *Definitions applicable to this subpart.* (1) *After-flame* means the time a test specimen continues to flame after the flame source has been removed.

(2) *Aqueous film forming foam (AFFF)* means a fluorinated surfactant with a foam stabilizer which is diluted with water to act as a temporary barrier to exclude air from mixing with the fuel vapor by developing an aqueous film on the fuel surface of some hydrocarbons which is capable of suppressing the generation of fuel vapors.

(3) *Approved* means acceptable to the Assistant Secretary under the following criteria:

(i) If it is accepted, or certified, or listed, or labeled or otherwise determined to be safe by a nationally recognized testing laboratory; or

(ii) With respect to an installation or equipment of a kind which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another Federal agency and found in compliance with the provisions of the applicable National Fire Protection Association Fire Code; or

(iii) With respect to custom-made equipment or related installations which are designed, fabricated for, and intended for use by its manufacturer on the basis of test data which the employer keeps and makes available for inspection to the Assistant Secretary.

(iv) For the purposes of paragraph (c)(3) of this section:

(A) Equipment is listed if it is of a kind mentioned in a list which is published by a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment and which states that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner;

(B) Equipment is labeled if there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment, and whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner;

(C) Equipment is accepted if it has been inspected and found by a nationally recognized testing laboratory to conform to specified plans or to procedures of applicable codes; and

(D) Equipment is certified if it has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner or is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and if it

bears a label, tag, or other record of certification.

(E) Refer to § 1910.7 for definition of nationally recognized testing laboratory.

(4) *Assistant Secretary* means the Assistant Secretary of Labor for Occupational Safety and Health or designee.

(5) *Automatic fire detection device* means a device designed to automatically detect the presence of fire by heat, flame, light, smoke or other products of combustion.

(6) *Buddy-breathing device* means an accessory to self-contained breathing apparatus which permits a second person to share the same air supply as that of the wearer of the apparatus.

(7) *Carbon dioxide* means a colorless, odorless, electrically nonconductive inert gas (chemical formula CO_2) that is a medium for extinguishing fires by reducing the concentration of oxygen or fuel vapor in the air to the point where conbustion is impossible.

(8) *Class A fire* means a fire involving ordinary combustible materials such as paper, wood, cloth, and some rubber and plastic materials.

(9) *Class B fire* means a fire involving flammable or combustible liquids, flammable gases, greases and similar materials, and some rubber and plastic materials.

(10) *Class C fire* means a fire involving energized electrical equipment where safety to the employee requires the use of electrically nonconductive extinguishing media.

(11) *Class D fire* means a fire involving combustible metals such as magnesium, titanium, zirconium, sodium, lithium and potassium.

(12) *Dry chemical* means an extinguishing agent composed of very small particles of chemicals such as, but not limited to, sodium bicarbonate, potassium bicarbonate, urea-based potassium bicarbonate, potassium chloride, or monoammonium phosphate supplemented by special treatment to provide resistance to packing and moisture absorption (caking) as well as to provide proper flow capabilities. Dry chemical does not include dry powders.

(13) *Dry powder* means a compound used to extinguish or control Class D fires.

(14) *Education* means the process of imparting knowledge or skill through systematic instruction. It does not require formal classroom instruction.

(15) *Enclosed structure* means a structure with a roof or ceiling and at least two walls which may present fire hazards to employees, such as accumulations of smoke, toxic gases and heat, similar to those found in buildings.

(16) *Extinguisher classification* means the letter classification given an extinguisher to designate the class or classes of fire on which an extinguisher will be effective.

(17) *Extinguisher rating* means the numerical rating given to an extinguisher which indicates the extinguishing potential of the unit based on standardized tests developed by Underwriters' Laboratories, Inc.

(18) *Fire brigade* (private fire department, industrial fire department) means an organized group of employees who are knowledgeable, trained, and skilled in at least basic fire fighting operations.

(19) *Fixed extinguishing system* means a permanently installed system that either extinguishes or controls a fire at the location of the system.

(20) *Flame resistance* is the property of materials, or combinations of component materials, to retard ignition and restrict the spread of flame.

(21) *Foam* means a stable aggregation of small bubbles which flow freely over a burning liquid surface and form a coherent blanket which seals combustible vapors and thereby extinguishes the fire.

(22) *Gaseous agent* is a fire extinguishing agent which is in the gaseous state at normal room temperature and pressure. It has low viscosity, can expand or contract with changes in pressure and temperature, and has the ability to diffuse readily and to distribute itself uniformly throughout an enclosure.

(23) *Halon 1211* means a colorless, faintly sweet smelling, electrically nonconductive liquefied gas (chemical formula $CBrC1F_2$) which is a medium for extinguishing fires by inhibiting the chemical chain reaction of fuel and oxygen. It is also known as bromochlorodifluoromethane.

(24) *Halon 1301* means a colorless, odorless, electrically nonconductive gas (chemical formula $CBrF_3$) which is a medium for extinguishing fires by inhibiting the chemical chain reaction of fuel and oxygen. It is also known as bromotrifluoromethane.

(25) *Helmet* is a head protective device consisting of a rigid shell, energy absorption system, and chin strap intended to be worn to provide protection for the head or portions thereof, against impact, flying or falling objects, electric shock, penetration, heat and flame.

(26) *Incipient stage fire* means a fire which is in the initial or beginning stage and which can be controlled or extinguished by portable fire extinguishers, Class II standpipe or small hose systems without the need for protective clothing or breathing apparatus.

(27) *Inspection* means a visual check of fire protection systems and equipment to ensure that they are in place, charged, and ready for use in the event of a fire.

(28) *Interior structural fire fighting* means the physical activity of fire suppression, rescue or both, inside of buildings or enclosed structures which are involved in a fire situation beyond the incipient stage.

(29) *Lining* means a material permanently attached to the inside of the outer shell of a garment for the purpose of thermal protection and padding.

(30) *Local application system* means a fixed fire suppression system which has a supply of extinguishing agent, with nozzles arranged to automatically discharge extinguishing agent directly on the burning material to extinguish or control a fire.

(31) *Maintenance* means the performance of services on fire protection equipment and systems to assure that they will perform as expected in the event of a fire. Maintenance differs from inspection in that maintenance requires the checking of internal fittings, devices and agent supplies.

(32) *Multipurpose dry chemical* means a dry chemical which is approved for use on Class A, Class B and Class C fires.

(33) *Outer shell* is the exterior layer of material on the fire coat and protective trousers which forms the outermost barrier between the fire fighter and the environment. It is attached to the vapor barrier and liner and is usually constructed with a storm flap, suitable closures, and pockets.

(34) *Positive-pressure breathing apparatus* means self-contained breathing apparatus in which the pressure in the breathing zone is positive in relation to the immediate environment during inhalation and exhalation.

(35) *Pre-discharge employee alarm* means an alarm which will sound at a set time prior to actual discharge of an extinguishing system so that employees may evacuate the discharge area prior to system discharge.

(36) *Quick disconnect valve* means a device which starts the flow of air by inserting of the hose (which leads from the facepiece) into the regulator of self-contained breathing apparatus, and stops the flow of air by disconnection of the hose from the regulator.

(37) *Sprinkler alarm* means an approved device installed so that any waterflow from a sprinkler system equal to or greater than that from single automatic sprinkler will result in an audible alarm signal on the premises.

(38) *Sprinkler system* means a system of piping designed in accordance with fire protection engineering standards and installed to control or extinguish fires. The system includes an adequate and reliable water supply, and a network of specially sized piping and sprinklers which are interconnected. The system also includes a control valve and a device for actuating an alarm when the system is in operation.

(39) *Standpipe systems.* (i) *Class I standpipe system* means a 2½″ (6.3 cm) hose connection for use by fire departments and those trained in handling heavy fire streams.

(ii) *Class II standpipe system* means a 1½″ (3.8 cm) hose system which provides a means for the control or extinguishment of incipient stage fires.

(iii) *Class III standpipe system* means a combined system of hose which is for the use of employees trained in the use of hose operations and which is capable of furnishing effective water discharge during the more advanced stages of fire (beyond the incipient stage) in the interior of workplaces. Hose outlets are

available for both 1½″ (3.8 cm) and 2½″ (6.3 cm) hose.

(iv) *Small hose system* means a system of hose ranging in diameter from ⅝″ (1.6 cm up to 1½″ (3.8 cm) which is for the use of employees and which provides a means for the control and extinguishment of incipient stage fires.

(40) *Total flooding system* means a fixed suppression system which is arranged to automatically discharge a predetermined concentration of agent into an enclosed space for the purpose of fire extinguishment or control.

(41) *Training* means the process of making proficient through instruction and hands-on practice in the operation of equipment, including respiratory protection equipment, that is expected to be used and in the performance of assigned duties.

(42) *Vapor barrier* means that material used to prevent or substantially inhibit the transfer of water, corrosive liquids and steam or other hot vapors from the outside of a garment to the wearer's body.

[45 FR 60704, Sept. 12, 1980, as amended at 53 FR 12122, Apr. 12, 1988]

§ 1910.156 Fire brigades.

(a) *Scope and application*—(1) *Scope.* This section contains requirements for the organization, training, and personal protective equipment of fire brigades whenever they are established by an employer.

(2) *Application.* The requirements of this section apply to fire brigades, industrial fire departments and private or contractual type fire departments. Personal protective equipment requirements apply only to members of fire brigades performing interior structural fire fighting. The requirements of this section do not apply to airport crash rescue or forest fire fighting operations.

(b) *Organization*—(1) *Organizational statement.* The employer shall prepare and maintain a statement or written policy which establishes the existence of a fire brigade; the basic organizational structure; the type, amount, and frequency of training to be provided to fire brigade members; the expected number of members in the fire brigade; and the functions that the fire brigade is to perform at the workplace. The organizational statement shall be available for inspection by the Assistant Secretary and by employees or their designated representatives.

(2) *Personnel.* The employer shall assure that employees who are expected to do interior structural fire fighting are physically capable of performing duties which may be assigned to them during emergencies. The employer shall not permit employees with known heart disease, epilepsy, or emphysema, to participate in fire brigade emergency activities unless a physician's certificate of the employees' fitness to participate in such activities is provided. For employees assigned to fire brigades before September 15, 1980, this paragraph is effective on September 15, 1990. For employees assigned to fire brigades on or after September 15, 1980, this paragraph is effective December 15, 1980.

(c) *Training and education.* (1) The employer shall provide training and education for all fire brigade members commensurate with those duties and functions that fire brigade members are expected to perform. Such training and education shall be provided to fire brigade members before they perform fire brigade emergency activities. Fire brigade leaders and training instructors shall be provided with training and education which is more comprehensive than that provided to the general membership of the fire brigade.

(2) The employer shall assure that training and education is conducted frequently enough to assure that each member of the fire brigade is able to perform the member's assigned duties and functions satisfactorily and in a safe manner so as not to endanger fire brigade members or other employees. All fire brigade members shall be provided with training at least annually. In addition, fire brigade members who are expected to perform interior structural fire fighting shall be provided with an education session or training at least quarterly.

(3) The quality of the training and education program for fire brigade members shall be similar to those conducted by such fire training schools as the Maryland Fire and Rescue Institute; Iowa Fire Service Extension; West Virginia Fire Service Extension;

Georgia Fire Academy, New York State Department, Fire Prevention and Control; Louisiana State University Firemen Training Program, or Washington State's Fire Service Training Commission for Vocational Education. (For example, for the oil refinery industry, with its unique hazards, the training and education program for those fire brigade members shall be similar to those conducted by Texas A & M University, Lamar University, Reno Fire School, or the Delaware State Fire School.)

(4) The employer shall inform fire brigade members about special hazards such as storage and use of flammable liquids and gases, toxic chemicals, radioactive sources, and water reactive substances, to which they may be exposed during fire and other emergencies. The fire brigade members shall also be advised of any changes that occur in relation to the special hazards. The employer shall develop and make available for inspection by fire brigade members, written procedures that describe the actions to be taken in situations involving the special hazards and shall include these in the training and education program.

(d) *Fire fighting equipment.* The employer shall maintain and inspect, at least annually, fire fighting equipment to assure the safe operational condition of the equipment. Portable fire extinguishers and respirators shall be inspected at least monthly. Fire fighting equipment that is in damaged or unserviceable condition shall be removed from service and replaced.

(e) *Protective clothing.* The following requirements apply to those employees who perform interior structural fire fighting. The requirements do not apply to employees who use fire extinguishers or standpipe systems to control or extinguish fires only in the incipient stage.

(1) *General.* (i) The employer shall provide at no cost to the employee and assure the use of protective clothing which complies with the requirements of this paragraph. The employer shall assure that protective clothing ordered or purchased after July 1, 1981, meets the requirements contained in this paragraph. As the new equipment is provided, the employer shall assure that all fire brigade members wear the equipment when performing interior structural fire fighting. After July 1, 1985, the employer shall assure that all fire brigade members wear protective clothing meeting the requirements of this paragraph when performing interior structural fire fighting.

(ii) The employer shall assure that protective clothing protects the head, body, and extremities, and consists of at least the following components: foot and leg protection; hand protection; body protection; eye, face and head protection.

(2) *Foot and leg protection.* (i) Foot and leg protection shall meet the requirements of paragraphs (e)(2)(ii) and (e)(2)(iii) of this section, and may be achieved by either of the following methods:

(A) Fully extended boots which provide protection for the legs; or

(B) Protective shoes or boots worn in combination with protective trousers that meet the requirements of paragraph (e)(3) of this section.

(ii) Protective footwear shall meet the requirements of §1910.136 for Class 75 footwear. In addition, protective footwear shall be water-resistant for at least 5 inches (12.7 cm) above the bottom of the heel and shall be equipped with slip-resistant outer soles.

(iii) Protective footwear shall be tested in accordance with paragraph (1) of appendix E, and shall provide protection against penetration of the midsole by a size 8D common nail when at least 300 pounds (1330 N) of static force is applied to the nail.

(3) *Body protection.* (i) Body protection shall be coordinated with foot and leg protection to ensure full body protection for the wearer. This shall be achieved by one of the following methods:

(A) Wearing of a fire-resistive coat meeting the requirements of paragraph (e)(3)(ii) of this section in combination with fully extended boots meeting the requirements of paragraphs (e)(2)(ii) and (e)(2)(iii) of this section; or

(B) Wearing of a fire-resistive coat in combination with protective trousers both of which meet the requirements of paragraph (e)(3)(ii) of this section.

(ii) The performance, construction, and testing of fire-resistive coats and

protective trousers shall be at least equivalent to the requirements of the National Fire Protection Association (NFPA) standard NFPA No. 1971–1975, ''Protective Clothing for Structural Fire Fighting,'' which is incorporated by reference as specified in § 1910.6, (See appendix D to subpart L) with the following permissible variations from those requirements:

(A) Tearing strength of the outer shell shall be a minimum of 8 pounds (35.6 N) in any direction when tested in accordance with paragraph (2) of appendix E; and

(B) The outer shell may discolor but shall not separate or melt when placed in a forced air laboratory oven at a temperature of 500 °F (260 °C) for a period of five minutes. After cooling to ambient temperature and using the test method specified in paragraph (3) of appendix E, char length shall not exceed 4.0 inches (10.2 cm) and afterflame shall not exceed 2.0 seconds.

(4) *Hand protection.* (i) Hand protection shall consist of protective gloves or glove system which will provide protection against cut, puncture, and heat penetration. Gloves or glove system shall be tested in accordance with the test methods contained in the National Institute for Occupational Safety and Health (NIOSH) 1976 publication, ''The Development of Criteria for Fire Fighter's Gloves; Vol. II, Part II: Test Methods,'' which is incorporated by reference as specified in § 1910.6, (See appendix D to subpart L) and shall meet the following criteria for cut, puncture, and heat penetration:

(A) Materials used for gloves shall resist surface cut by a blade with an edge having a 60° included angle and a .001 inch (.0025 cm.) radius, under an applied force of 16 lbf (72N), and at a slicing velocity of greater or equal to 60 in/min (2.5 cm./sec);

(B) Materials used for the palm and palm side of the fingers shall resist puncture by a penetrometer (simulating a 4d lath nail), under an applied force of 13.2 lbf (60N), and at a velocity greater or equal to 20 in/min (.85 cm./sec); and

(C) The temperature inside the palm and gripping surface of the fingers of gloves shall not exceed 135 °F (57 °C) when gloves or glove system are exposed to 932 °F (500 °C) for five seconds at 4 psi (28 kPa) pressure.

(ii) Exterior materials of gloves shall be flame resistant and shall be tested in accordance with paragraph (3) of appendix E. Maximum allowable afterflame shall be 2.0 seconds, and the maximum char length shall be 4.0 inches (10.2 cm).

(iii) When design of the fire-resistive coat does not otherwise provide protection for the wrists, protective gloves shall have wristlets of at least 4.0 inches (10.2 cm) in length to protect the wrist area when the arms are extended upward and outward from the body.

(5) *Head, eye and face protection.* (i) Head protection shall consist of a protective head device with ear flaps and chin strap which meet the performance, construction, and testing requirements of the National Fire Safety and Research Office of the National Fire Prevention and Control Administration, U.S. Department of Commerce (now known as the U.S. Fire Administration), which are contained in ''Model Performance Criteria for Structural Firefighters' Helmets'' (August 1977) which is incorporated by reference as specified in § 1910.6, (See appendix D to subpart L).

(ii) Protective eye and face devices which comply with § 1910.133 shall be used by fire brigade members when performing operations where the hazards of flying or falling materials which may cause eye and face injuries are present. Protective eye and face devices provided as accessories to protective head devices (face shields) are permitted when such devices meet the requirements of § 1910.133.

(iii) Full facepieces, helmets, or hoods of breathing apparatus which meet the requirements of § 1910.134 and paragraph (f) of this section, shall be acceptable as meeting the eye and face protection requirements of paragraph (e)(5)(ii) of this section.

(f) *Respiratory protection devices*—(1) *General requirements.* (i) The employer must ensure that respirators are provided to, and used by, fire brigade members, and that the respirators meet the requirements of 29 CFR 1910.134 and this paragraph.

(ii) Approved self-contained breathing apparatus with full-facepiece, or with approved helmet or hood configuration, shall be provided to and worn by fire brigade members while working inside buildings or confined spaces where toxic products of combustion or an oxygen deficiency may be present.

Such apparatus shall also be worn during emergency situations involving toxic substances.

(iii) Approved self-contained breathing apparatus may be equipped with either a ''buddy-breathing'' device or a quick disconnect valve, even if these devices are not certified by NIOSH. If these accessories are used, they shall not cause damage to the apparatus, or restrict the air flow of the apparatus, or obstruct the normal operation of the apparatus.

(iv) Approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus shall meet DOT and NIOSH criteria.

(v) Self-contained breathing apparatuses must have a minimum service-life rating of 30 minutes in accordance with the methods and requirements specified by NIOSH under 42 CFR part 84, except for escape self-contained breathing apparatus (ESCBAs) used only for emergency escape purposes.

(vi) Self-contained breathing apparatus shall be provided with an indicator which automatically sounds an audible alarm when the remaining service life of the apparatus is reduced to within a range of 20 to 25 percent of its rated service time.

(2) *Positive-pressure breathing apparatus.* (i) The employer shall assure that self-contained breathing apparatus ordered or purchased after July 1, 1981, for use by fire brigade members performing interior structural fire fighting operations, are of the pressure-demand or other positive-pressure type. Effective July 1, 1983, only pressure-demand or other positive-pressure self-contained breathing apparatus shall be worn by fire brigade members performing interior structural fire fighting.

(ii) This paragraph does not prohibit the use of a self-contained breathing apparatus where the apparatus can be switched from a demand to a positive-pressure mode. However, such apparatus shall be in the positive-pressure mode when fire brigade members are performing interior structural fire fighting operations.

[45 FR 60706, Sept. 12, 1980; 46 FR 24557, May 1, 1981; 49 FR 18295, Apr. 30, 1984; 61 FR 9239, Mar. 7, 1996; 63 FR 1284, Jan. 8, 1998; 63 FR 33467, June 18, 1998]

PORTABLE FIRE SUPPRESSION EQUIPMENT

§ 1910.157 Portable fire extinguishers.

(a) *Scope and application.* The requirements of this section apply to the placement, use, maintenance, and testing of portable fire extinguishers provided for the use of employees. Paragraph (d) of this section does not apply to extinguishers provided for employee use on the outside of workplace buildings or structures. Where extinguishers are provided but are not intended for employee use and the employer has an emergency action plan and a fire prevention plan that meet the requirements of 29 CFR 1910.38 and 29 CFR 1910.39 respectively, then only the requirements of paragraphs (e) and (f) of this section apply.

(b) *Exemptions.* (1) Where the employer has established and implemented a written fire safety policy which requires the immediate and total evacuation of employees from the workplace upon the sounding of a fire alarm signal and which includes an emergency action plan and a fire prevention plan which meet the requirements of 29 CFR 1910.38 and 29 CFR 1910.39 respectively, and when extinguishers are not available in the workplace, the employer is exempt from all requirements of this section unless a specific standard in part 1910 requires that a portable fire extinguisher be provided.

(2) Where the employer has an emergency action plan meeting the requirements of § 1910.38 which designates certain employees to be the only employees authorized to use the available

portable fire extinguishers, and which requires all other employees in the fire area to immediately evacuate the affected work area upon the sounding of the fire alarm, the employer is exempt from the distribution requirements in paragraph (d) of this section.

(c) *General requirements.* (1) The employer shall provide portable fire extinguishers and shall mount, locate and identify them so that they are readily accessible to employees without subjecting the employees to possible injury.

(2) Only approved portable fire extinguishers shall be used to meet the requirements of this section.

(3) The employer shall not provide or make available in the workplace portable fire extinguishers using carbon tetrachloride or chlorobromomethane extinguishing agents.

(4) The employer shall assure that portable fire extinguishers are maintained in a fully charged and operable condition and kept in their designated places at all times except during use.

(5) The employer shall remove from service all soldered or riveted shell self-generating soda acid or self-generating foam or gas cartridge water type portable fire extinguishers which are operated by inverting the extinguisher to rupture the cartridge or to initiate an uncontrollable pressure generating chemical reaction to expel the agent.

(d) *Selection and distribution.* (1) Portable fire extinguishers shall be provided for employee use and selected and distributed based on the classes of anticipated workplace fires and on the size and degree of hazard which would affect their use.

(2) The employer shall distribute portable fire extinguishers for use by employees on Class A fires so that the travel distance for employees to any extinguisher is 75 feet (22.9 m) or less.

(3) The employer may use uniformly spaced standpipe systems or hose stations connected to a sprinkler system installed for emergency use by employees instead of Class A portable fire extinguishers, provided that such systems meet the respective requirements of § 1910.158 or § 1910.159, that they provide total coverage of the area to be protected, and that employees are trained at least annually in their use.

(4) The employer shall distribute portable fire extinguishers for use by employees on Class B fires so that the travel distance from the Class B hazard area to any extinguisher is 50 feet (15.2 m) or less.

(5) The employer shall distribute portable fire extinguishers used for Class C hazards on the basis of the appropriate pattern for the existing Class A or Class B hazards.

(6) The employer shall distribute portable fire extinguishers or other containers of Class D extinguishing agent for use by employees so that the travel distance from the combustible metal working area to any extinguishing agent is 75 feet (22.9 m) or less. Portable fire extinguishers for Class D hazards are required in those combustible metal working areas where combustible metal powders, flakes, shavings, or similarly sized products are generated at least once every two weeks.

(e) *Inspection, maintenance and testing.* (1) The employer shall be responsible for the inspection, maintenance and testing of all portable fire extinguishers in the workplace.

(2) Portable extinguishers or hose used in lieu thereof under paragraph (d)(3) of this section shall be visually inspected monthly.

(3) The employer shall assure that portable fire extinguishers are subjected to an annual maintenance check. Stored pressure extinguishers do not require an internal examination. The employer shall record the annual maintenance date and retain this record for one year after the last entry or the life of the shell, whichever is less. The record shall be available to the Assistant Secretary upon request.

(4) The employer shall assure that stored pressure dry chemical extinguishers that require a 12-year hydrostatic test are emptied and subjected to applicable maintenance procedures every 6 years. Dry chemical extinguishers having non-refillable disposable containers are exempt from this requirement. When recharging or hydrostatic testing is performed, the 6-year requirement begins from that date.

(5) The employer shall assure that alternate equivalent protection is provided when portable fire extinguishers are removed from service for maintenance and recharging.

(f) *Hydrostatic testing.* (1) The employer shall assure that hydrostatic testing is performed by trained persons with suitable testing equipment and facilities.

(2) The employer shall assure that portable extinguishers are hydrostatically tested at the intervals listed in Table L–1 of this section, except under any of the following conditions:

(i) When the unit has been repaired by soldering, welding, brazing, or use of patching compounds;

(ii) When the cylinder or shell threads are damaged;

(iii) When there is corrosion that has caused pitting, including corrosion under removable name plate assemblies;

(iv) When the extinguisher has been burned in a fire; or

(v) When a calcium chloride extinguishing agent has been used in a stainless steel shell.

(3) In addition to an external visual examination, the employer shall assure that an internal examination of cylinders and shells to be tested is made prior to the hydrostatic tests.

TABLE L–1

Type of extinguishers	Test interval (years)
Soda acid (soldered brass shells) (until 1/1/82)	(1)
Soda acid (stainless steel shell)	5
Cartridge operated water and/or antifreeze	5
Stored pressure water and/or antifreeze	5
Wetting agent	5
Foam (soldered brass shells) (until 1/1/82)	(1)
Foam (stainless steel shell)	5
Aqueous Film Forming foam (AFFF)	5
Loaded stream	5
Dry chemical with stainless steel	5
Carbon dioxide	5
Dry chemical, stored pressure, with mild steel, brazed brass or aluminum shells	12
Dry chemical, cartridge or cylinder operated, with mild steel shells	12
Halon 1211	12
Halon 1301	12
Dry powder, cartridge or cylinder operated with mild steel shells	12

[1] Extinguishers having shells constructed of copper or brass joined by soft solder or rivets shall not be hydrostatically tested and shall be removed from service by January 1, 1982. (Not permitted)

(4) The employer shall assure that portable fire extinguishers are hydrostatically tested whenever they show new evidence of corrosion or mechanical injury, except under the conditions listed in paragraphs (f)(2)(i)–(v) of this section.

(5) The employer shall assure that hydrostatic tests are performed on extinguisher hose assemblies which are equipped with a shut-off nozzle at the discharge end of the hose. The test interval shall be the same as specified for the extinguisher on which the hose is installed.

(6) The employer shall assure that carbon dioxide hose assemblies with a shut-off nozzle are hydrostatically tested at 1,250 psi (8,620 kPa).

(7) The employer shall assure that dry chemical and dry powder hose assemblies with a shut-off nozzle are hydrostatically tested at 300 psi (2,070 kPa).

(8) Hose assemblies passing a hydrostatic test do not require any type of recording or stamping.

(9) The employer shall assure that hose assemblies for carbon dioxide extinguishers that require a hydrostatic test are tested within a protective cage device.

(10) The employer shall assure that carbon dioxide extinguishers and nitrogen or carbon dioxide cylinders used with wheeled extinguishers are tested every 5 years at 5/3 of the service pressure as stamped into the cylinder. Nitrogen cylinders which comply with 49 CFR 173.34(e)(15) may be hydrostatically tested every 10 years.

(11) The employer shall assure that all stored pressure and Halon 1211 types of extinguishers are hydrostatically tested at the factory test pressure not to exceed two times the service pressure.

(12) The employer shall assure that acceptable self-generating type soda acid and foam extinguishers are tested at 350 psi (2,410 kPa).

(13) Air or gas pressure may not be used for hydrostatic testing.

(14) Extinguisher shells, cylinders, or cartridges which fail a hydrostatic pressure test, or which are not fit for testing shall be removed from service and from the workplace.

(15)(i) The equipment for testing compressed gas type cylinders shall be of the water jacket type. The equipment shall be provided with an expansion indicator which operates with an accuracy within one percent of the total expansion or .1cc (.1mL) of liquid.

(ii) The equipment for testing non-compressed gas type cylinders shall consist of the following:

(A) A hydrostatic test pump, hand or power operated, capable of producing not less than 150 percent of the test pressure, which shall include appropriate check valves and fittings;

(B) A flexible connection for attachment to fittings to test through the extinguisher nozzle, test bonnet, or hose outlet, as is applicable; and

(C) A protective cage or barrier for personal protection of the tester, designed to provide visual observation of the extinguisher under test.

(16) The employer shall maintain and provide upon request to the Assistant Secretary evidence that the required hydrostatic testing of fire extinguishers has been performed at the time intervals shown in Table L–1. Such evidence shall be in the form of a certification record which includes the date of the test, the signature of the person who performed the test and the serial number, or other identifier, of the fire extinguisher that was tested. Such records shall be kept until the extinguisher is hydrostatically retested at the time interval specified in Table L–1 or until the extinguisher is taken out of service, whichever comes first.

(g) *Training and education.* (1) Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire fighting.

(2) The employer shall provide the education required in paragraph (g)(1) of this section upon initial employment and at least annually thereafter.

(3) The employer shall provide employees who have been designated to use fire fighting equipment as part of an emergency action plan with training in the use of the appropriate equipment.

(4) The employer shall provide the training required in paragraph (g)(3) of this section upon initial assignment to the designated group of employees and at least annually thereafter.

[45 FR 60708, Sept. 12, 1980; 46 FR 24557, May 1, 1981, as amended at 51 FR 34560, Sept. 29, 1986; 61 FR 9239, Mar. 7, 1996; 67 FR 67964, Nov. 7, 2002]

§ 1910.158 Standpipe and hose systems.

(a) *Scope and application*—(1) *Scope.* This section applies to all small hose, Class II, and Class III standpipe systems installed to meet the requirements of a particular OSHA standard.

(2) *Exception.* This section does not apply to Class I standpipe systems.

(b) *Protection of standpipes.* The employer shall assure that standpipes are located or otherwise protected against mechanical damage. Damaged standpipes shall be repaired promptly.

(c) *Equipment*—(1) *Reels and cabinets.* Where reels or cabinets are provided to contain fire hose, the employer shall assure that they are designed to facilitate prompt use of the hose valves, the hose, and other equipment at the time of a fire or other emergency. The employer shall assure that the reels and cabinets are conspicuously identified and used only for fire equipment.

(2) *Hose outlets and connections.* (i) The employer shall assure that hose outlets and connections are located high enough above the floor to avoid being obstructed and to be accessible to employees.

(ii) The employer shall standardize screw threads or provide appropriate adapters throughout the system and assure that the hose connections are compatible with those used on the supporting fire equipment.

(3) *Hose.* (i) The employer shall assure that every 1½″ (3.8 cm) or smaller hose outlet used to meet this standard is equipped with hose connected and ready for use. In extremely cold climates where such installation may result in damaged equipment, the hose may be stored in another location provided it is readily available and can be connected when needed.

(ii) Standpipe systems installed after January 1, 1981, for use by employees,

shall be equipped with lined hose. Unlined hose may remain in use on existing systems. However, after the effective date of this standard, unlined hose which becomes unserviceable shall be replaced with lined hose.

(iii) The employer shall provide hose of such length that friction loss resulting from water flowing through the hose will not decrease the pressure at the nozzle below 30 psi (210 kPa). The dynamic pressure at the nozzle shall be within the range of 30 psi (210 kPa) to 125 psi (860 kPa).

(4) *Nozzles.* The employer shall assure that standpipe hose is equipped with shut-off type nozzles.

(d) *Water supply.* The minimum water supply for standpipe and hose systems, which are provided for the use of employees, shall be sufficient to provide 100 gallons per minute (6.3 l/s) for a period of at least thirty minutes.

(e) *Tests and maintenance*—(1) *Acceptance tests.* (i) The employer shall assure that the piping of Class II and Class III systems installed after January 1, 1981, including yard piping, is hydrostatically tested for a period of at least 2 hours at not less than 200 psi (1380 kPa), or at least 50 psi (340 kPa) in excess of normal pressure when such pressure is greater than 150 psi (1030 kPa).

(ii) The employer shall assure that hose on all standpipe systems installed after January 1, 1981, is hydrostatically tested with couplings in place, at a pressure of not less than 200 psi (1380 kPa), before it is placed in service. This pressure shall be maintained for at least 15 seconds and not more than one minute during which time the hose shall not leak nor shall any jacket thread break during the test.

(2) *Maintenance.* (i) The employer shall assure that water supply tanks are kept filled to the proper level except during repairs. When pressure tanks are used, the employer shall assure that proper pressure is maintained at all times except during repairs.

(ii) The employer shall assure that valves in the main piping connections to the automatic sources of water supply are kept fully open at all times except during repair.

(iii) The employer shall assure that hose systems are inspected at least annually and after each use to assure that all of the equipment and hose are in place, available for use, and in serviceable condition.

(iv) When the system or any portion thereof is found not to be serviceable, the employer shall remove it from service immediately and replace it with equivalent protection such as extinguishers and fire watches.

(v) The employer shall assure that hemp or linen hose on existing systems is unracked, physically inspected for deterioration, and reracked using a different fold pattern at least annually. The employer shall assure that defective hose is replaced in accordance with paragraph (c)(3)(ii) of this section.

(vi) The employer shall designate trained persons to conduct all inspections required under this section.

[45 FR 60710, Sept. 12, 1980, as amended at 61 FR 9239, Mar. 7, 1996]

FIXED FIRE SUPPRESSION EQUIPMENT

§ 1910.159 Automatic sprinkler systems.

(a) *Scope and application.* (1) The requirements of this section apply to all automatic sprinkler systems installed to meet a particular OSHA standard.

(2) For automatic sprinkler systems used to meet OSHA requirements and installed prior to the effective date of this standard, compliance with the National Fire Protection Association (NFPA) or the National Board of Fire Underwriters (NBFU) standard in effect at the time of the system's installation will be acceptable as compliance with this section.

(b) *Exemptions.* Automatic sprinkler systems installed in workplaces, but not required by OSHA, are exempt from the requirements of this section.

(c) *General requirements*—(1) *Design.* (i) All automatic sprinkler designs used to comply with this standard shall provide the necessary discharge patterns, densities, and water flow characteristics for complete coverage in a particular workplace or zoned subdivision of the workplace.

(ii) The employer shall assure that only approved equipment and devices are used in the design and installation of automatic sprinkler systems used to comply with this standard.

(2) *Maintenance.* The employer shall properly maintain an automatic sprinkler system installed to comply with this section. The employer shall assure that a main drain flow test is performed on each system annually. The inspector's test valve shall be opened at least every two years to assure that the sprinkler system operates properly.

(3) *Acceptance tests.* The employer shall conduct proper acceptance tests on sprinkler systems installed for employee protection after January 1, 1981, and record the dates of such tests. Proper acceptance tests include the following:

(i) Flushing of underground connections;

(ii) Hydrostatic tests of piping in system;

(iii) Air tests in dry-pipe systems;

(iv) Dry-pipe valve operation; and

(v) Test of drainage facilities.

(4) *Water supplies.* The employer shall assure that every automatic sprinkler system is provided with at least one automatic water supply capable of providing design water flow for at least 30 minutes. An auxiliary water supply or equivalent protection shall be provided when the automatic water supply is out of service, except for systems of 20 or fewer sprinklers.

(5) *Hose connections for fire fighting use.* The employer may attach hose connections for fire fighting use to wet pipe sprinkler systems provided that the water supply satisfies the combined design demand for sprinklers and standpipes.

(6) *Protection of piping.* The employer shall assure that automatic sprinkler system piping is protected against freezing and exterior surface corrosion.

(7) *Drainage.* The employer shall assure that all dry sprinkler pipes and fittings are installed so that the system may be totally drained.

(8) *Sprinklers.* (i) The employer shall assure that only approved sprinklers are used on systems.

(ii) The employer may not use older style sprinklers to replace standard sprinklers without a complete engineering review of the altered part of the system.

(iii) The employer shall assure that sprinklers are protected from mechanical damage.

(9) *Sprinkler alarms.* On all sprinkler systems having more than twenty (20) sprinklers, the employer shall assure that a local waterflow alarm is provided which sounds an audible signal on the premises upon water flow through the system equal to the flow from a single sprinkler.

(10) *Sprinkler spacing.* The employer shall assure that sprinklers are spaced to provide a maximum protection area per sprinkler, a minimum of interference to the discharge pattern by building or structural members or building contents and suitable sensitivity to possible fire hazards. The minimum vertical clearance between sprinklers and material below shall be 18 inches (45.7 cm).

(11) *Hydraulically designed systems.* The employer shall assure that hydraulically designed automatic sprinkler systems or portions thereof are identified and that the location, number of sprinklers in the hydraulically designed section, and the basis of the design is indicated. Central records may be used in lieu of signs at sprinkler valves provided the records are available for inspection and copying by the Assistant Secretary.

[45 FR 60710, Sept. 12, 1980; 46 FR 24557, May 1, 1981]

§ 1910.160 Fixed extinguishing systems, general.

(a) *Scope and application.* (1) This section applies to all fixed extinguishing systems installed to meet a particular OSHA standard except for automatic sprinkler systems which are covered by § 1910.159.

(2) This section also applies to fixed systems not installed to meet a particular OSHA standard, but which, by means of their operation, may expose employees to possible injury, death, or adverse health consequences caused by the extinguishing agent. Such systems are only subject to the requirements of paragraphs (b)(4) through (b)(7) and (c) of this section.

(3) Systems otherwise covered in paragraph (a)(2) of this section which are installed in areas with no employee exposure are exempted from the requirements of this section.

(b) *General requirements.* (1) Fixed extinguishing system components and

agents shall be designed and approved for use on the specific fire hazards they are expected to control or extinguish.

(2) If for any reason a fixed extinguishing system becomes inoperable, the employer shall notify employees and take the necessary temporary precautions to assure their safety until the system is restored to operating order. Any defects or impairments shall be properly corrected by trained personnel.

(3) The employer shall provide a distinctive alarm or signaling system which complies with § 1910.165 and is capable of being perceived above ambient noise or light levels, on all extinguishing systems in those portions of the workplace covered by the extinguishing system to indicate when the extinguishing system is discharging. Discharge alarms are not required on systems where discharge is immediately recognizable.

(4) The employer shall provide effective safeguards to warn employees against entry into discharge areas where the atmosphere remains hazardous to employee safety or health.

(5) The employer shall post hazard warning or caution signs at the entrance to, and inside of, areas protected by fixed extinguishing systems which use agents in concentrations known to be hazardous to employee safety and health.

(6) The employer shall assure that fixed systems are inspected annually by a person knowledgeable in the design and function of the system to assure that the system is maintained in good operating condition.

(7) The employer shall assure that the weight and pressure of refillable containers is checked at least semi-annually. If the container shows a loss in net content or weight of more than 5 percent, or a loss in pressure of more than 10 percent, it shall be subjected to maintenance.

(8) The employer shall assure that factory charged nonrefillable containers which have no means of pressure indication are weighed at least semi-annually. If a container shows a loss in net weight or more than 5 percent it shall be replaced.

(9) The employer shall assure that inspection and maintenance dates are recorded on the container, on a tag attached to the container, or in a central location. A record of the last semi-annual check shall be maintained until the container is checked again or for the life of the container, whichever is less.

(10) The employer shall train employees designated to inspect, maintain, operate, or repair fixed extinguishing systems and annually review their training to keep them up-to-date in the functions they are to perform.

(11) The employer shall not use chlorobromomethane or carbon tetrachloride as an extinguishing agent where employees may be exposed.

(12) The employer shall assure that systems installed in the presence of corrosive atmospheres are constructed of non-corrosive material or otherwise protected against corrosion.

(13) Automatic detection equipment shall be approved, installed and maintained in accordance with § 1910.164.

(14) The employer shall assure that all systems designed for and installed in areas with climatic extremes shall operate effectively at the expected extreme temperatures.

(15) The employer shall assure that at least one manual station is provided for discharge activation of each fixed extinguishing system.

(16) The employer shall assure that manual operating devices are identified as to the hazard against which they will provide protection.

(17) The employer shall provide and assure the use of the personal protective equipment needed for immediate rescue of employees trapped in hazardous atmospheres created by an agent discharge.

(c) *Total flooding systems with potential health and safety hazards to employees.* (1) The employer shall provide an emergency action plan in accordance with § 1910.38 for each area within a workplace that is protected by a total flooding system which provides agent concentrations exceeding the maximum safe levels set forth in paragraphs (b)(5) and (b)(6) of § 1910.162.

(2) Systems installed in areas where employees cannot enter during or after the system's operation are exempt from the requirements of paragraph (c) of this section.

(3) On all total flooding systems the employer shall provide a pre-discharge employee alarm which complies with § 1910.165, and is capable of being perceived above ambient light or noise levels before the system discharges, which will give employees time to safely exit from the discharge area prior to system discharge.

(4) The employer shall provide automatic actuation of total flooding systems by means of an approved fire detection device installed and interconnected with a pre-discharge employee alarm system to give employees time to safely exit from the discharge area prior to system discharge.

[45 FR 60711, Sept. 12, 1980]

§ 1910.161 Fixed extinguishing systems, dry chemical.

(a) *Scope and application.* This section applies to all fixed extinguishing systems, using dry chemical as the extinguishing agent, installed to meet a particular OSHA standard. These systems shall also comply with § 1910.160.

(b) *Specific requirements.* (1) The employer shall assure that dry chemical agents are compatible with any foams or wetting agents with which they are used.

(2) The employer may not mix together dry chemical extinguishing agents of different compositions. The employer shall assure that dry chemical systems are refilled with the chemical stated on the approval nameplate or an equivalent compatible material.

(3) When dry chemical discharge may obscure vision, the employer shall provide a pre-discharge employee alarm which complies with § 1910.165 and which will give employees time to safely exit from the discharge area prior to system discharge.

(4) The employer shall sample the dry chemical supply of all but stored pressure systems at least annually to assure that the dry chemical supply is free of moisture which may cause the supply to cake or form lumps.

(5) The employer shall assure that the rate of application of dry chemicals is such that the designed concentration of the system will be reached within 30 seconds of initial discharge.

[45 FR 60712, Sept. 12, 1980]

§ 1910.162 Fixed extinguishing systems, gaseous agent.

(a) *Scope and application*—(1) *Scope.* This section applies to all fixed extinguishing systems, using a gas as the extinguishing agent, installed to meet a particular OSHA standard. These systems shall also comply with § 1910.160. In some cases, the gas may be in a liquid state during storage.

(2) *Application.* The requirements of paragraphs (b)(2) and (b)(4) through (b)(6) shall apply only to total flooding systems.

(b) *Specific requirements.* (1) Agents used for initial supply and replenishment shall be of the type approved for the system's application. Carbon dioxide obtained by dry ice conversion to liquid is not acceptable unless it is processed to remove excess water and oil.

(2) Except during overhaul, the employer shall assure that the designed concentration of gaseous agents is maintained until the fire has been extinguished or is under control.

(3) The employer shall assure that employees are not exposed to toxic levels of gaseous agent or its decomposition products.

(4) The employer shall assure that the designed extinguishing concentration is reached within 30 seconds of initial discharge except for Halon systems which must achieve design concentration within 10 seconds.

(5) The employer shall provide a distinctive pre-discharge employee alarm capable of being perceived above ambient light or noise levels when agent design concentrations exceed the maximum safe level for employee exposure. A pre-discharge employee alarm for alerting employees before system discharge shall be provided on Halon 1211 and carbon dioxide systems with a design concentration of 4 percent or greater and for Halon 1301 systems with a design concentration of 10 percent or greater. The pre-discharge employee alarm shall provide employees time to safely exit the discharge area prior to system discharge.

(6)(i) Where egress from an area cannot be accomplished within one minute, the employer shall not use Halon 1301 in concentrations greater than 7 percent.

(ii) Where egress takes greater than 30 seconds but less than one minute, the employer shall not use Halon 1301 in a concentration greater than 10 percent.

(iii) Halon 1301 concentrations greater than 10 percent are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.

[45 FR 60712, Sept. 12, 1980; 46 FR 24557, May 1, 1981]

§ 1910.163 Fixed extinguishing systems, water spray and foam.

(a) *Scope and application.* This section applies to all fixed extinguishing systems, using water or foam solution as the extinguishing agent, installed to meet a particular OSHA standard. These systems shall also comply with § 1910.160. This section does not apply to automatic sprinkler systems which are covered under § 1910.159.

(b) *Specific requirements.* (1) The employer shall assure that foam and water spray systems are designed to be effective in at least controlling fire in the protected area or on protected equipment.

(2) The employer shall assure that drainage of water spray systems is directed away from areas where employees are working and that no emergency egress is permitted through the drainage path.

[45 FR 60712, Sept. 12, 1980]

OTHER FIRE PROTECTION SYSTEMS

§ 1910.164 Fire detection systems.

(a) *Scope and application.* This section applies to all automatic fire detection systems installed to meet the requirements of a particular OSHA standard.

(b) *Installation and restoration.* (1) The employer shall assure that all devices and equipment constructed and installed to comply with this standard are approved for the purpose for which they are intended.

(2) The employer shall restore all fire detection systems and components to normal operating condition as promptly as possible after each test or alarm. Spare detection devices and components which are normally destroyed in the process of detecting fires shall be available on the premises or from a local supplier in sufficient quantities and locations for prompt restoration of the system.

(c) *Maintenance and testing.* (1) The employer shall maintain all systems in an operable condition except during repairs or maintenance.

(2) The employer shall assure that fire detectors and fire detection systems are tested and adjusted as often as needed to maintain proper reliability and operating condition except that factory calibrated detectors need not be adjusted after installation.

(3) The employer shall assure that pneumatic and hydraulic operated detection systems installed after January 1, 1981, are equipped with supervised systems.

(4) The employer shall assure that the servicing, maintenance and testing of fire detection systems, including cleaning and necessary sensitivity adjustments are performed by a trained person knowledgeable in the operations and functions of the system.

(5) The employer shall also assure that fire detectors that need to be cleaned of dirt, dust, or other particulates in order to be fully operational are cleaned at regular periodic intervals.

(d) *Protection of fire detectors.* (1) The employer shall assure that fire detection equipment installed outdoors or in the presence of corrosive atmospheres be protected from corrosion. The employer shall provide a canopy, hood, or other suitable protection for detection equipment requiring protection from the weather.

(2) The employer shall locate or otherwise protect detection equipment so that it is protected from mechanical or physical impact which might render it inoperable.

(3) The employer shall assure that detectors are supported independently of their attachment to wires or tubing.

(e) *Response time.* (1) The employer shall assure that fire detection systems

installed for the purpose of actuating fire extinguishment or suppression systems shall be designed to operate in time to control or extinguish a fire.

(2) The employer shall assure that fire detection systems installed for the purpose of employee alarm and evacuation be designed and installed to provide a warning for emergency action and safe escape of employees.

(3) The employer shall not delay alarms or devices initiated by fire detector actuation for more than 30 seconds unless such delay is necessary for the immediate safety of employees. When such delay is necessary, it shall be addressed in an emergency action plan meeting the requirements of § 1910.38.

(f) *Number, location and spacing of detecting devices.* The employer shall assure that the number, spacing and location of fire detectors is based upon design data obtained from field experience, or tests, engineering surveys, the manufacturer's recommendations, or a recognized testing laboratory listing.

[45 FR 60713, Sept. 12, 1980]

§ 1910.165 Employee alarm systems.

(a) *Scope and application.* (1) This section applies to all emergency employee alarms installed to meet a particular OSHA standard. This section does not apply to those discharge or supervisory alarms required on various fixed extinguishing systems or to supervisory alarms on fire suppression, alarm or detection systems unless they are intended to be employee alarm systems.

(2) The requirements in this section that pertain to maintenance, testing and inspection shall apply to all local fire alarm signaling systems used for alerting employees regardless of the other functions of the system.

(3) All pre-discharge employee alarms installed to meet a particular OSHA standard shall meet the requirements of paragraphs (b)(1) through (4), (c), and (d)(1) of this section.

(b) *General requirements.* (1) The employee alarm system shall provide warning for necessary emergency action as called for in the emergency action plan, or for reaction time for safe escape of employees from the workplace or the immediate work area, or both.

(2) The employee alarm shall be capable of being perceived above ambient noise or light levels by all employees in the affected portions of the workplace. Tactile devices may be used to alert those employees who would not otherwise be able to recognize the audibile or visual alarm.

(3) The employee alarm shall be distinctive and recognizable as a signal to evacuate the work area or to perform actions designated under the emergency action plan.

(4) The employer shall explain to each employee the preferred means of reporting emergencies, such as manual pull box alarms, public address systems, radio or telephones. The employer shall post emergency telephone numbers near telephones, or employee notice boards, and other conspicuous locations when telephones serve as a means of reporting emergencies. Where a communication system also serves as the employee alarm system, all emergency messages shall have priority over all non-emergency messages.

(5) The employer shall establish procedures for sounding emergency alarms in the workplace. For those employers with 10 or fewer employees in a particular workplace, direct voice communication is an acceptable procedure for sounding the alarm provided all employees can hear the alarm. Such workplaces need not have a back-up system.

(c) *Installation and restoration.* (1) The employer shall assure that all devices, components, combinations of devices or systems constructed and installed to comply with this standard are approved. Steam whistles, air horns, strobe lights or similar lighting devices, or tactile devices meeting the requirements of this section are considered to meet this requirement for approval.

(2) The employer shall assure that all employee alarm systems are restored to normal operating condition as promptly as possible after each test or alarm. Spare alarm devices and components subject to wear or destruction shall be available in sufficient quantities and locations for prompt restoration of the system.

(d) *Maintenance and testing.* (1) The employer shall assure that all employee alarm systems are maintained

in operating condition except when undergoing repairs or maintenance.

(2) The employer shall assure that a test of the reliability and adequacy of non-supervised employee alarm systems is made every two months. A different actuation device shall be used in each test of a multi-actuation device system so that no individual device is used for two consecutive tests.

(3) The employer shall maintain or replace power supplies as often as is necessary to assure a fully operational condition. Back-up means of alarm, such as employee runners or telephones, shall be provided when systems are out of service.

(4) The employer shall assure that employee alarm circuitry installed after January 1, 1981, which is capable of being supervised is supervised and that it will provide positive notification to assigned personnel whenever a deficiency exists in the system. The employer shall assure that all supervised employee alarm systems are tested at least annually for reliability and adequacy.

(5) The employer shall assure that the servicing, maintenance and testing of employee alarms are done by persons trained in the designed operation and functions necessary for reliable and safe operation of the system.

(e) *Manual operation.* The employer shall assure that manually operated actuation devices for use in conjunction with employee alarms are unobstructed, conspicuous and readily accessible.

[45 FR 60713, Sept. 12, 1980]

APPENDICES TO SUBPART L OF PART 1910—NOTE

NOTE: The following appendices to subpart L, except appendix E, serve as nonmandatory guidelines to assist employers in complying with the appropriate requirements of subpart L.

APPENDIX A TO SUBPART L OF PART 1910—FIRE PROTECTION

§ 1910.156 Fire brigades.

1. *Scope.* This section does not require an employer to organize a fire brigade. However, if an employer does decide to organize a fire brigade, the requirements of this section apply.

2. *Pre-fire planning.* It is suggested that pre-fire planning be conducted by the local fire department and/or the workplace fire brigade in order for them to be familiar with the workplace and process hazards. Involvement with the local fire department or fire prevention bureau is encouraged to facilitate coordination and cooperation between members of the fire brigade and those who might be called upon for assistance during a fire emergency.

3. *Organizational statement.* In addition to the information required in the organizational statement, paragraph 1910.156(b)(1), it is suggested that the organizational statement also contain the following information: a description of the duties that the fire brigade members are expected to perform; the line authority of each fire brigade officer; the number of the fire brigade officers and number of training instructors; and a list and description of the types of awards or recognition that brigade members may be eligible to receive.

4. *Physical capability.* The physical capability requirement applies only to those fire brigade members who perform interior structural fire fighting. Employees who cannot meet the physical capability requirement may still be members of the fire brigade as long as such employees do not perform interior structural fire fighting. It is suggested that fire brigade members who are unable to perform interior structural fire fighting be assigned less stressful and physically demanding fire brigade duties, e.g., certain types of training, recordkeeping, fire prevention inspection and maintenance, and fire pump operations.

Physically capable can be defined as being able to perform those duties specified in the training requirements of section 1910.156(c). Physically capable can also be determined by physical performance tests or by a physical examination when the examining physician is aware of the duties that the fire brigade member is expected to perform.

It is also recommended that fire brigade members participate in a physical fitness program. There are many benefits which can be attributed to being physically fit. It is believed that physical fitness may help to reduce the number of sprain and strain injuries as well as contributing to the improvement of the cardiovascular system.

5. *Training and education.* The paragraph on training and education does not contain specific training and education requirements because the type, amount, and frequency of training and education will be as varied as are the purposes for which fire brigades are organized. However, the paragraph does require that training and education be commensurate with those functions that the fire brigade is expected to perform; i.e., those functions specified in the organizational statement. Such a performance requirement

provides the necessary flexibility to design a training program which meets the needs of individual fire brigades.

At a minimum, hands-on training is required to be conducted annually for all fire brigade members. However, for those fire brigade members who are expected to perform interior structural fire fighting, some type of training or education session must be provided at least quarterly.

In addition to the required hands-on training, it is strongly recommended that fire brigade members receive other types of training and education such as: classroom instruction, review of emergency action procedures, pre-fire planning, review of special hazards in the workplace, and practice in the use of self-contained breathing apparatus.

It is not necessary for the employer to duplicate the same training or education that a fire brigade member receives as a member of a community volunteer fire department, rescue squad, or similar organization. However, such training or education must have been provided to the fire brigade member within the past year and it must be documented that the fire brigade member has received the training or education. For example: there is no need for a fire brigade member to receive another training class in the use of positive-pressure self-contained breathing apparatus if the fire brigade member has recently completed such training as a member of a community fire department. Instead, the fire brigade member should receive training or education covering other important equipment or duties of the fire brigade as they relate to the workplace hazards, facilities and processes.

It is generally recognized that the effectiveness of fire brigade training and education depends upon the expertise of those providing the training and education as well as the motivation of the fire brigade members. Fire brigade training instructors must receive a higher level of training and education than the fire brigade members they will be teaching. This includes being more knowledgeable about the functions to be performed by the fire brigade and the hazards involved. The instructors should be qualified to train fire brigade members and demonstrate skills in communication, methods of teaching, and motivation. It is important for instructors and fire brigade members alike to be motivated toward the goals of the fire brigade and be aware of the importance of the service that they are providing for the protection of other employees and the workplace.

It is suggested that publications from the International Fire Service Training Association, the National Fire Protection Association (NFPA–1041), the International Society of Fire Service Instructors and other fire training sources be consulted for recommended qualifications of fire brigade training instructors.

In order to be effective, fire brigades must have competent leadership and supervision. It is important for those who supervise the fire brigade during emergency situations, e.g., fire brigade chiefs, leaders, etc., to receive the necessary training and education for supervising fire brigade activities during these hazardous and stressful situations. These fire brigade members with leadership responsibilities should demonstrate skills in strategy and tactics, fire suppression and prevention techniques, leadership principles, pre-fire planning, and safety practices. It is again suggested that fire service training sources be consulted for determining the kinds of training and education which are necessary for those with fire brigade leadership responsibilities.

It is further suggested that fire brigade leaders and fire brigade instructors receive more formalized training and education on a continuing basis by attending classes provided by such training sources as universities and university fire extension services.

The following recommendations should not be considered to be all of the necessary elements of a complete comprehensive training program, but the information may be helpful as a guide in developing a fire brigade training program.

All fire brigade members should be familiar with exit facilities and their location, emergency escape routes for handicapped workers, and the workplace ‘‘emergency action plan.’’

In addition, fire brigade members who are expected to control and extinguish fires in the incipient stage should, at a minimum, be trained in the use of fire extinguishers, standpipes, and other fire equipment they are assigned to use. They should also be aware of first aid medical procedures and procedures for dealing with special hazards to which they may be exposed. Training and education should include both classroom instruction and actual operation of the equipment under simulated emergency conditions. Hands-on type training must be conducted at least annually but some functions should be reviewed more often.

In addition to the above training, fire brigade members who are expected to perform emergency rescue and interior structural fire fighting should, at a minimum, be familiar with the proper techniques in rescue and fire suppression procedures. Training and education should include fire protection courses, classroom training, simulated fire situations including ‘‘wet drills’’ and, when feasible, extinguishment of actual mock fires. Frequency of training or education must be at least quarterly, but some drills or classroom training should be conducted as often as monthly or even weekly to maintain the proficiency of fire brigade members.

There are many excellent sources of training and education that the employer may want to use in developing a training program for the workplace fire brigade. These sources include publications, seminars, and courses offered by universities.

There are also excellent fire school courses by such facilities as Texas A and M University, Delaware State Fire School, Lamar University, and Reno Fire School, that deal with those unique hazards which may be encountered by fire brigades in the oil and chemical industry. These schools, and others, also offer excellent training courses which would be beneficial to fire brigades in other types of industries. These courses should be a continuing part of the training program, and employers are strongly encouraged to take advantage of these excellent resources.

It is also important that fire brigade members be informed about special hazards to which they may be exposed during fire and other emergencies. Such hazards as storage and use areas of flammable liquids and gases, toxic chemicals, water-reactive substances, etc., can pose difficult problems. There must be written procedures developed that describe the actions to be taken in situations involving special hazards. Fire brigade members must be trained in handling these special hazards as well as keeping abreast of any changes that occur in relation to these special hazards.

6. *Fire fighting equipment.* It is important that fire fighting equipment that is in damaged or unserviceable condition be removed from service and replaced. This will prevent fire brigade members from using unsafe equipment by mistake.

Fire fighting equipment, except portable fire extinguishers and respirators, must be inspected at least annually. Portable fire extinguishers and respirators are required to be inspected at least monthly.

7. *Protective clothing.* (A) *General.* Paragraph (e) of §1910.156 does not require all fire brigade members to wear protective clothing. It is not the intention of these standards to require employers to provide a full ensemble of protective clothing for every fire brigade member without consideration given to the types of hazardous environments to which the fire brigade member might be exposed. It is the intention of these standards to require adequate protection for those fire brigade members who might be exposed to fires in an advanced stage, smoke, toxic gases, and high temperatures. Therefore, the protective clothing requirements only apply to those fire brigade members who perform interior structural fire fighting operations.

Additionally, the protective clothing requirements do not apply to the protective clothing worn during outside fire fighting operations (brush and forest fires, crash crew operations) or other special fire fighting activities. It is important that the protective clothing to be worn during these types of fire fighting operations reflect the hazards which are expected to be encountered by fire brigade members.

(B) *Foot and leg protection.* Section 1910.156 permits an option to achieve foot and leg protection.

The section recognizes the interdependence of protective clothing to cover one or more parts of the body. Therefore, an option is given so that fire brigade members may meet the foot and leg requirements by either wearing long fire-resistive coats in combination with fully extended boots, or by wearing shorter fire-resistive costs in combination with protective trousers and protective shoes or shorter boots.

(C) *Body protection.* Paragraph (e)(3) of §1910.156 provides an option for fire brigade members to achieve body protection. Fire brigade members may wear a fire-resistive coat in combination with fully extended boots, or they may wear a fire-resistive coat in combination with protective trousers.

Fire-resistive coats and protective trousers meeting all of the requirements contained in NFPA 1971–1975 ''Protective Clothing for Structural Fire Fighters,'' are acceptable as meeting the requirements of this standard.

The lining is required to be permanently attached to the outer shell. However, it is permissible to attach the lining to the outer shell material by stitching in one area such as at the neck. Fastener tape or snap fasteners may be used to secure the rest of the lining to the outer shell to facilitate cleaning. Reference to permanent lining does not refer to a winter liner which is a detachable extra lining used to give added protection to the wearer against the effects of cold weather and wind.

(D) *Hand protection.* The requirements of the paragraph on hand protection may be met by protective gloves or a glove system. A glove system consists of a combination of different gloves. The usual components of a glove system consist of a pair of gloves, which provide thermal insulation to the hands, worn in combination with a second pair of gloves which provide protection against flame, cut, and puncture.

It is suggested that protective gloves provide dexterity and a sense of feel for objects. Criteria and test methods for dexterity are contained in the NIOSH publications, ''The Development of Criteria for Firefighters' Gloves; Vol. I: Glove Requirements'' and ''Vol. II: Glove Criteria and Test Methods.'' These NIOSH publications also contain a permissible modified version of Federal Test Method 191, Method 5903, (paragraph (3) of appendix E) for flame resistance when gloves, rather than glove material, are tested for flame resistance.

(E) *Head, eye, and face protection.* Head protective devices which meet the requirements

contained in NFPA No. 1972 are acceptable as meeting the requirements of this standard for head protection.

Head protective devices are required to be provided with ear flaps so that the ear flaps will be available if needed. It is recommended that ear protection always be used while fighting interior structural fires.

Many head protective devices are equipped with face shields to protect the eyes and face. These face shields are permissible as meeting the eye and face protection requirements of this paragraph as long as such face shields meet the requirements of §1910.133 of the General Industry Standards.

Additionally, full facepieces, helmets or hoods of approved breathing apparatus which meet the requirements of §1910.134 and paragraph (f) of §1910.156 are also acceptable as meeting the eye and face protection requirements.

It is recommended that a flame resistant protective head covering such as a hood or snood, which will not adversely affect the seal of a respirator facepiece, be worn during interior structural fire fighting operations to protect the sides of the face and hair.

8. *Respiratory protective devices.* Respiratory protection is required to be worn by fire brigade members while working inside buildings or confined spaces where toxic products of combustion or an oxygen deficiency is likely to be present; respirators are also to be worn during emergency situations involving toxic substances. When fire brigade members respond to emergency situations, they may be exposed to unknown contaminants in unknown concentrations. Therefore, it is imperative that fire brigade members wear proper respiratory protective devices during these situations. Additionally, there are many instances where toxic products of combustion are still present during mop-up and overhaul operations. Therefore, fire brigade members should continue to wear respirators during these types of operations.

Self-contained breathing apparatus are not required to be equipped with either a buddy-breathing device or a quick-disconnect valve. However, these accessories may be very useful and are acceptable as long as such accessories do not cause damage to the apparatus, restrict the air flow of the apparatus, or obstruct the normal operation of the apparatus.

Buddy-breathing devices are useful for emergency situations where a victim or another fire brigade member can share the same air supply with the wearer of the apparatus for emergency escape purposes.

The employer is encouraged to provide fire brigade members with an alternative means of respiratory protection to be used only for emergency escape purposes if the self-contained breathing apparatus becomes inoperative. Such alternative means of respiratory protection may be either a buddy-breathing device or an escape self-contained breathing apparatus (ESCBA). The ESCBA is a short-duration respiratory protective device which is approved for only emergency escape purposes. It is suggested that if ESCBA units are used, that they be of at least 5 minutes service life.

Quick-disconnect valves are devices which start the flow of air by insertion of the hose (which leads to the facepiece) into the regulator of self-contained breathing apparatus, and stop the flow of air by disconnecting the hose from the regulator. These devices are particularly useful for those positive-pressure self-contained breathing apparatus which do not have the capability of being switched from the demand to the positive-pressure mode.

The use of a self-contained breathing apparatus where the apparatus can be switched from a demand to a positive-pressure mode is acceptable as long as the apparatus is in the positive-pressure mode when performing interior structural fire fighting operations. Also acceptable are approved respiratory protective devices which have been converted to the positive-pressure type when such modification is accomplished by trained and experienced persons using kits or parts approved by NIOSH and provided by the manufacturer and by following the manufacturer's instructions.

There are situations which require the use of respirators which have a duration of 2 hours or more. Presently, there are no approved positive-pressure apparatus with a rated service life of more than 2 hours. Consequently, negative-pressure self-contained breathing apparatus with a rated service life of more than 2 hours and which have a minimum protection factor of 5,000 as determined by an acceptable quantitative fit test performed on each individual, will be acceptable for use during situations which require long duration apparatus. Long duration apparatus may be needed in such instances as working in tunnels, subway systems, etc. Such negative-pressure breathing apparatus will continue to be acceptable for a maximum of 18 months after a positive-pressure apparatus with the same or longer rated service life of more than 2 hours is certified by NIOSH/MSHA. After this 18 month phase-in period, all self-contained breathing apparatus used for these long duration situations will have to be of the positive-pressure type.

Protection factor (sometimes called fit factor) is defined as the ratio of the contaminant concentrations outside of the respirator to the contaminant concentrations inside the facepiece of the respirator.

$$PF = \frac{\text{Concentration outside respirator}}{\text{Concentration inside facepiece}}$$

Protection factors are determined by quantitative fit tests. An acceptable quantitative fit test should include the following elements:

1. A fire brigade member who is physically and medically capable of wearing respirators, and who is trained in the use of respirators, dons a self-contained breathing apparatus equipped with a device that will monitor the concentration of a contaminant inside the facepiece.

2. The fire brigade member then performs a qualitative fit test to assure the best face to facepiece seal as possible. A qualitative fit test can consist of a negative-pressure test, positive-pressure test, isoamyl acetate vapor (banana oil) test, or an irritant smoke test. For more details on respirator fitting see the NIOSH booklet entitled ''A Guide to Industrial Respiratory Protection'' June, 1976, and HEW publication No. (NIOSH) 76–189.

3. The wearer should then perform physical activity which reflects the level of work activity which would be expected during fire fighting activities. The physical activity should include simulated fire-ground work activity or physical exercise such as running-in-place, a step test, etc.

4. Without readjusting the apparatus, the wearer is placed in a test atmosphere containing a non-toxic contaminant with a known, constant, concentration.

The protection factor is then determined by dividing the known concentration of the contaminant in the test atmosphere by the concentration of the contaminant inside the facepiece when the following exercises are performed:

(a) Normal breathing with head motionless for one minute;

(b) Deep breathing with head motionless for 30 seconds;

(c) Turning head slowly from side to side while breathing normally, pausing for at least two breaths before changing direction. Continue for at least one minute;

(d) Moving head slowly up and down while breathing normally, pausing for at least two breaths before changing direction. Continue for at least two minutes;

(e) Reading from a prepared text, slowly and clearly, and loudly enough to be heard and understood. Continue for one minute; and

(f) Normal breathing with head motionless for at least one minute.

The protection factor which is determined must be at least 5,000. The quantitative fit test should be conducted at least three times. It is acceptable to conduct all three tests on the same day. However, there should be at least one hour between tests to reflect the protection afforded by the apparatus during different times of the day.

The above elements are not meant to be a comprehensive, technical description of a quantitative fit test protocol. However, quantitative fit test procedures which include these elements are acceptable for determining protection factors. Procedures for a quantitative fit test are required to be available for inspection by the Assistant Secretary or authorized representative.

Organizations such as Los Alamos Scientific Laboratory, Lawrence Livermore Laboratory, NIOSH, and American National Standards Institute (ANSI) are excellent sources for additional information concerning qualitative and quantitative fit testing.

§ 1910.157 Portable fire extinguishers.

1. *Scope and application.* The scope and application of this section is written to apply to three basic types of workplaces. First, there are those workplaces where the employer has chosen to evacuate all employees from the workplace at the time of a fire emergency. Second, there are those workplaces where the employer has chosen to permit certain employees to fight fires and to evacuate all other non-essential employees at the time of a fire emergency. Third, there are those workplaces where the employer has chosen to permit all employees in the workplace to use portable fire extinguishers to fight fires.

The section also addresses two kinds of work areas. The entire workplace can be divided into outside (exterior) work areas and inside (interior) work areas. This division of the workplace into two areas is done in recognition of the different types of hazards employees may be exposed to during fire fighting operations. Fires in interior workplaces, pose a greater hazard to employees; they can produce greater exposure to quantities of smoke, toxic gases, and heat because of the capability of a building or structure to contain or entrap these products of combustion until the building can be ventilated. Exterior work areas, normally open to the environment, are somewhat less hazardous, because the products of combustion are generally carried away by the thermal column of the fire. Employees also have a greater selection of evacuation routes if it is necessary to abandon fire fighting efforts.

In recognition of the degree of hazard present in the two types of work areas, the standards for exterior work areas are somewhat less restrictive in regards to extinguisher distribution. Paragraph (a) explains this by specifying which paragraphs in the section apply.

2. *Portable fire extinguisher exemptions.* In recognition of the three options given to employers in regard to the amount of employee evacuation to be carried out, the standards permit certain exemptions based on the number of employees expected to use fire extinguishers.

Where the employer has chosen to totally evacuate the workplace at the time of a fire

emergency and when fire extinguishers are not provided, the requirements of this section do not apply to that workplace.

Where the employer has chosen to partially evacuate the workplace or the effected area at the time of a fire emergency and has permitted certain designated employees to remain behind to operate critical plant operations or to fight fires with extinguishers, then the employer is exempt from the distribution requirements of this section. Employees who will be remaining behind to perform incipient fire fighting or members of a fire brigade must be trained in their duties. The training must result in the employees becoming familiar with the locations of fire extinguishers. Therefore, the employer must locate the extinguishers in convenient locations where the employees know they can be found. For example, they could be mounted in the fire truck or cart that the fire brigade uses when it responds to a fire emergency. They can also be distributed as set forth in the National Fire Protection Association's Standard No. 10, ''Portable Fire Extinguishers.''

Where the employer has decided to permit all employees in the workforce to use fire extinguishers, then the entire OSHA section applies.

3. *Portable fire extinguisher mounting.* Previous standards for mounting fire extinguishers have been criticized for requiring specific mounting locations. In recognition of this criticism, the standard has been rewritten to permit as much flexibility in extinguisher mounting as is acceptable to assure that fire extinguishers are available when needed and that employees are not subjected to injury hazards when they try to obtain an extinguisher.

It is the intent of OSHA to permit the mounting of extinguishers in any location that is accessible to employees without the use of portable devices such as a ladder. This limitation is necessary because portable devices can be moved or taken from the place where they are needed and, therefore, might not be available at the time of an emergency.

Employers are given as much flexibility as possible to assure that employees can obtain extinguishers as fast as possible. For example, an acceptable method of mounting extinguishers in areas where fork lift trucks or tow-motors are used is to mount the units on retractable boards which, by means of counterweighting, can be raised above the level where they could be struck by vehicular traffic. When needed, they can be lowered quickly for use. This method of mounting can also reduce vandalism and unauthorized use of extinguishers. The extinguishers may also be mounted as outlined in the National Fire Protection Association's Standard No. 10, ''Portable Fire Extinguishers.''

4. *Selection and distribution.* The employer is responsible for the proper selection and distribution of fire extinguishers and the determination of the necessary degree of protection. The selection and distribution of fire extinguishers must reflect the type and class of fire hazards associated with a particular workplace.

Extinguishers for protecting Class A hazards may be selected from the following types: water, foam, loaded stream, or multipurpose dry chemical. Extinguishers for protecting Class B hazards may be selected from the following types: Halon 1301, Halon 1211, carbon dioxide, dry chemicals, foam, or loaded stream. Extinguishers for Class C hazards may be selected from the following types: Halon 1301, Halon 1211, carbon dioxide, or dry chemical.

Combustible metal (Class D hazards) fires pose a different type of fire problem in the workplace. Extinguishers using water, gas, or certain dry chemicals cannot extinguish or control this type of fire. Therefore, certain metals have specific dry powder extinguishing agents which can extinguish or control this type of fire. Those agents which have been specifically approved for use on certain metal fires provide the best protection; however, there are also some ''universal'' type agents which can be used effectively on a variety of combustible metal fires if necessary. The ''universal'' type agents include: Foundry flux, Lith-X powder, TMB liquid, pyromet powder, TEC powder, dry talc, dry graphite powder, dry sand, dry sodium chloride, dry soda ash, lithium chloride, zirconium silicate, and dry dolomite.

Water is not generally accepted as an effective extinguishing agent for metal fires. When applied to hot burning metal, water will break down into its basic atoms of oxygen and hydrogen. This chemical breakdown contributes to the combustion of the metal. However, water is also a good universal coolant and can be used on some combustible metals, but only under proper conditions and application, to reduce the temperature of the burning metal below the ignition point. For example, automatic deluge systems in magnesium plants can discharge such large quantities of water on burning magnesium that the fire will be extinguished. The National Fire Protection Association has specific standards for this type of automatic sprinkler system. Further information on the control of metal fires with water can be found in the National Fire Protection Association's *Fire Protection Handbook*.

An excellent source of selection and distribution criteria is found in the National Fire Protection Association's Standard No. 10. Other sources of information include the National Safety Council and the employer's fire insurance carrier.

5. *Substitution of standpipe systems for portable fire extinguishers.* The employer is permitted to substitute acceptable standpipe systems for portable fire extinguishers under certain circumstances. It is necessary to assure that any substitution will provide the same coverage that portable units provide. This means that fire hoses, because of their limited portability, must be spaced throughout the protected area so that they can reach around obstructions such as columns, machinery, etc. and so that they can reach into closets and other enclosed areas.

6. *Inspection, maintenance and testing.* The ultimate responsibility for the inspection, maintenance and testing of portable fire extinguishers lies with the employer. The actual inspection, maintenance, and testing may, however, be conducted by outside contractors with whom the employer has arranged to do the work. When contracting for such work, the employer should assure that the contractor is capable of performing the work that is needed to comply with this standard.

If the employer should elect to perform the inspection, maintenance, and testing requirements of this section in-house, then the employer must make sure that those persons doing the work have been trained to do the work and to recognize problem areas which could cause an extinguisher to be inoperable. The National Fire Protection Association provides excellent guidelines in its standard for portable fire extinguishers. The employer may also check with the manufacturer of the unit that has been purchased and obtain guidelines on inspection, maintenance, and testing. Hydrostatic testing is a process that should be left to contractors or individuals using suitable facilities and having the training necessary to perform the work.

Anytime the employer has removed an extinguisher from service to be checked or repaired, alternate equivalent protection must be provided. Alternate equivalent protection could include replacing the extinguisher with one or more units having equivalent or equal ratings, posting a fire watch, restricting the unprotected area from employee exposure, or providing a hose system ready to operate.

7. *Hydrostatic testing.* As stated before, the employer may contract for hydrostatic testing. However, if the employer wishes to provide the testing service, certain equipment and facilities must be available. Employees should be made aware of the hazards associated with hydrostatic testing and the importance of using proper guards and water pressures. Severe injury can result if extinguisher shells fail violently under hydrostatic pressure.

Employers are encouraged to use contractors who can perform adequate and reliable service. Firms which have been certified by the Materials Transportation Board (MTB) of the U.S. Department of Transportation (DOT) or State licensed extinguisher servicing firms or recognized by the National Association of Fire Equipment Distributors in Chicago, Illinois, are generally acceptable for performing this service.

8. *Training and education.* This part of the standard is of the utmost importance to employers and employees if the risk of injury or death due to extinguisher use is to be reduced. If an employer is going to permit an employee to fight a workplace fire of any size, the employer must make sure that the employee knows everything necessary to assure the employee's safety.

Training and education can be obtained through many channels. Often, local fire departments in larger cities have fire prevention bureaus or similar organizations which can provide basic fire prevention training programs. Fire insurance companies will have data and information available. The National Fire Protection Association and the National Safety Council will provide, at a small cost, publications that can be used in a fire prevention program.

Actual fire fighting training can be obtained from various sources in the country. The Texas A & M University, the University of Maryland's Fire and Rescue Institute, West Virginia University's Fire Service Extension, Iowa State University's Fire Service Extension and other State training schools and land grant colleges have fire fighting programs directed to industrial applications. Some manufacturers of extinguishers, such as the Ansul Company and Safety First, conduct fire schools for customers in the proper use of extinguishers. Several large corporations have taken time to develop their own on-site training programs which expose employees to the actual ''feeling'' of fire fighting. Simulated fires for training of employees in the proper use of extinguishers are also an acceptable part of a training program.

In meeting the requirements of this section, the employer may also provide educational materials, without classroom instruction, through the use of employee notice campaigns using instruction sheets or flyers or similar types of informal programs. The employer must make sure that employees are trained and educated to recognize not only what type of fire is being fought and how to fight it, but also when it is time to get away from it and leave fire suppression to more experienced fire fighters.

§ 1910.158 Standpipe and hose systems.

1. *Scope and application.* This section has been written to provide adequate coverage of those standpipe and hose systems that an employer may install in the workplace to meet the requirements of a particular OSHA standard. For example, OSHA permits the substitution of hose systems for portable fire

extinguishers in §1910.157. If an employer chooses to provide hose systems instead of portable Class A fire extinguishers, then those hose systems used for substitution would have to meet the applicable requirements of §1910.157. All other standpipe and hose systems not used as a substitute would be exempt from these requirements.

The section specifically exempts Class I large hose systems. By large hose systems, OSHA means those 2½″ (6.3 cm) hose lines that are usually associated with fire departments of the size that provide their own water supply through fire apparatus. When the fire gets to the size that outside protection of that degree is necessary, OSHA believes that in most industries employees will have been evacuated from the fire area and the ''professional'' fire fighters will take control.

2. *Protection of standpipes.* Employers must make sure that standpipes are protected so that they can be relied upon during a fire emergency. This means protecting the pipes from mechanical and physical damage. There are various means for protecting the equipment such as, but not limited to, enclosing the supply piping in the construction of the building, locating the standpipe in an area which is inaccessible to vehicles, or locating the standpipe in a stairwell.

3. *Hose covers and cabinets.* The employer should keep fire protection hose equipment in cabinets or inside protective covers which will protect it from the weather elements, dirt or other damaging sources. The use of protective covers must be easily removed or opened to assure that hose and nozzle are accessible. When the employer places hose in a cabinet, the employer must make sure that the hose and nozzle are accessible to employees without subjecting them to injury. In order to make sure that the equipment is readily accessible, the employer must also make sure that the cabinets used to store equipment are kept free of obstructions and other equipment which may interfere with the fast distribution of the fire hose stored in the cabinet.

4. *Hose outlets and connections.* The employer must assure that employees who use standpipe and hose systems can reach the hose rack and hose valve without the use of portable equipment such as ladders. Hose reels are encouraged for use because one employee can retrieve the hose, charge it, and place it into service without much difficulty.

5. *Hose.* When the employer elects to provide small hose in lieu of portable fire extinguishers, those hose stations being used for the substitution must have hose attached and ready for service. However, if more than the necessary amount of small hose outlets are provided, hose does not have to be attached to those outlets that would provide redundant coverage. Further, where the installation of hose on outlets may expose the hose to extremely cold climates, the employer may store the hose in houses or similar protective areas and connect it to the outlet when needed.

There is approved lined hose available that can be used to replace unlined hose which is stored on racks in cabinets. The lined hose is constructed so that it can be folded and placed in cabinets in the same manner as unlined hose.

Hose is considered to be unserviceable when it deteriorates to the extent that it can no longer carry water at the required pressure and flow rates. Dry rotted linen or hemp hose, cross threaded couplings, and punctured hose are examples of unserviceable hose.

6. *Nozzles.* Variable stream nozzles can provide useful variations in water flow and spray patterns during fire fighting operations and they are recommended for employee use. It is recommended that 100 psi (700kPa) nozzle pressure be used to provide good flow patterns for variable stream nozzles. The most desirable attribute for nozzles is the ability of the nozzle person to shut off the water flow at the nozzle when it is necessary. This can be accomplished in many ways. For example, a shut-off nozzle with a lever or rotation of the nozzle to stop flow would be effective, but in other cases a simple globe valve placed between a straight stream nozzle and the hose could serve the same purpose. For straight stream nozzles 50 psi nozzle pressure is recommended. The intent of this standard is to protect the employee from ''run-away'' hoses if it becomes necessary to drop a pressurized hose line and retreat from the fire front and other related hazards.

7. *Design and installation.* Standpipe and hose systems designed and installed in accordance with NFPA Standard No. 14, ''Standpipe and Hose Systems,'' are considered to be in compliance with this standard.

§1910.159 Automatic sprinkler systems.

1. *Scope and application.* This section contains the minimum requirements for design, installation and maintenance of sprinkler systems that are needed for employee safety. The Occupational Safety and Health Administration is aware of the fact that the National Board of Fire Underwriters is no longer an active organization, however, sprinkler systems still exist that were designed and installed in accordance with that organization's standards. Therefore, OSHA will recognize sprinkler systems designed to, and maintained in accordance with, NBFU and earlier NFPA standards.

2. *Exemptions.* In an effort to assure that employers will continue to use automatic sprinkler systems as the primary fire protection system in workplaces, OSHA is exempting from coverage those systems not required by a particular OSHA standard and

which have been installed in workplaces solely for the purpose of protecting property. Many of these types of systems are installed in areas or buildings with little or no employee exposure. An example is those warehouses where employees may enter occasionally to take inventory or move stock. Some employers may choose to shut down those systems which are not specifically required by OSHA rather than upgrade them to comply with the standards. OSHA does not intend to regulate such systems. OSHA only intends to regulate those systems which are installed to comply with a particular OSHA standard.

3. *Design*. There are two basic types of sprinkler system design. Pipe schedule designed systems are based on pipe schedule tables developed to protect hazards with standard sized pipe, number of sprinklers, and pipe lengths. Hydraulic designed systems are based on an engineered design of pipe size which will produce a given water density or flow rate at any particular point in the system. Either design can be used to comply with this standard.

The National Fire Protection Association's Standard No. 13, ''Automatic Sprinkler Systems,'' contains the tables needed to design and install either type of system. Minimum water supplies, densities, and pipe sizes are given for all types of occupancies.

The employer may check with a reputable fire protection engineering consultant or sprinkler design company when evaluating existing systems or designing a new installation.

With the advent of new construction materials for the manufacuture of sprinkler pipe, materials, other than steel have been approved for use as sprinkler pipe. Selection of pipe material should be made on the basis of the type of installation and the acceptability of the material to local fire and building officials where such systems may serve more than one purpose.

Before new sprinkler systems are placed into service, an acceptance test is to be conducted. The employer should invite the installer, designer, insurance representative, and a local fire official to witness the test. Problems found during the test are to be corrected before the system is placed into service.

4. *Maintenance*. It is important that any sprinkler system maintenance be done only when there is minimal employee exposure to the fire hazard. For example, if repairs or changes to the system are to be made, they should be made during those hours when employees are not working or are not occupying that portion of the workplace protected by the portion of the system which has been shut down.

The procedures for performing a flow test via a main drain test or by the use of an inspector's test valve can be obtained from the employer's fire insurance company or from the National Fire Protection Association's Standard No. 13A, ''Sprinkler System, Maintenance.''

5. *Water supplies*. The water supply to a sprinkler system is one of the most important factors an employer should consider when evaluationg a system. Obviously, if there is no water supply, the system is useless. Water supplies can be lost for various reasons such as improperly closed valves, excessive demand, broken water mains, and broken fire pumps. The employer must be able to determine if or when this type of condition exists either by performing a main drain test or visual inspection. Another problem may be an inadequate water supply. For example, a light hazard occupancy may, through rehabilitation or change in tenants, become an ordinary or high hazard occupancy. In such cases, the existing water supply may not be able to provide the pressure or duration necessary for proper protection. Employers must assure that proper design and tests have been made to assure an adequate water supply. These tests can be arranged through the employer's fire insurance carrier or through a local sprinkler maintenance company or through the local fire prevention organization.

Anytime the employer must shut down the primary water supply for a sprinkler system, the standard requires that equivalent protection be provided. Equivalent protection may include a fire watch with extinguishers or hose lines in place and manned, or a secondary water supply such as a tank truck and pump, or a tank or fire pond with fire pumps, to protect the areas where the primary water supply is limited or shut down. The employer may also require evacuation of the workplace and have an emergency action plan which specifies such action.

6. *Protection of piping*. Piping which is exposed to corrosive atmospheres, either chemical or natural, can become defective to the extent that it is useless. Employers must assure that piping is protected from corrosion by its material of construction, e.g., stainless steel, or by a protective coating, e.g., paint.

7. *Sprinklers*. When an employer finds it necessary to replace sprinkler system components or otherwise change a sprinkler's design, employer should make a complete fire protection engineering survey of that part of the system being changed. This review should assure that the changes to the system will not alter the effectiveness of the system as it is presently designed. Water supplies, densities and flow characteristics should be maintained.

8. *Protection of sprinklers*. All components of the system must be protected from mechanical impact damage. This can be achieved with the use of mechanical guards or screens

or by locating components in areas where physical contact is impossible or limited.

9. *Sprinkler alarms.* The most recognized sprinkler alarm is the water motor gong or bell that sounds when water begins to flow through the system. This is not however, the only type of acceptable water flow alarm. Any alarm that gives an indication that water is flowing through the system is acceptable. For example, a siren, a whistle, a flashing light, or similar alerting device which can transmit a signal to the necessary persons would be acceptable. The purpose of the alarm is to alert persons that the system is operating, and that some type of planned action is necessary.

10. *Sprinkler spacing.* For a sprinkler system to be effective there must be an adequate discharge of water spray from the sprinkler head. Any obstructions which hinder the designed density or spray pattern of the water may create unprotected areas which can cause fire to spread. There are some sprinklers that, because of the system's design, are deflected to specific areas. This type of obstruction is acceptable if the system's design takes it into consideration in providing adequate coverage.

§ 1910.160 Fixed extinguishing systems, general.

1. *Scope and application.* This section contains the general requirements that are applicable to all fixed extinguishing systems installed to meet OSHA standards. It also applies to those fixed extinguishing systems, generally total flooding, which are not required by OSHA, but which, because of the agent's discharge, may expose employees to hazardous concentrations of extinguishing agents or combustion by-products. Employees who work around fixed extinguishing systems must be warned of the possible hazards associated with the system and its agent. For example, fixed dry chemical extinguishing systems may generate a large enough cloud of dry chemical particles that employees may become visually disoriented. Certain gaseous agents can expose employees to hazardous by-products of combustion when the agent comes into contact with hot metal or other hot surface. Some gaseous agents may be present in hazardous concentrations when the system has totally discharged because an extra rich concentration is necessary to extinguish deep-seated fires. Certain local application systems may be designed to discharge onto the flaming surface of a liquid, and it is possible that the liquid can splatter when hit with the discharging agent. All of these hazards must be determined before the system is placed into operation, and must be discussed with employees.

Based on the known toxicological effects of agents such as carbon tetrachloride and chlorobromomethane, OSHA is not permitting the use of these agents in areas where employees can be exposed to the agent or its side effects. However, chlorobromomethane has been accepted and may be used as an explosion suppression agent in unoccupied spaces. OSHA is permitting the use of this agent only in areas where employees will not be exposed.

2. *Distinctive alarm signals.* A distinctive alarm signal is required to indicate that a fixed system is discharging. Such a signal is necessary on those systems where it is not immediately apparent that the system is discharging. For example, certain gaseous agents make a loud noise when they discharge. In this case no alarm signal is necessary. However, where systems are located in remote locations or away from the general work area and where it is possible that a system could discharge without anyone knowing that it is doing so, then a distinctive alarm is necessary to warn employees of the hazards that may exist. The alarm can be a bell, gong, whistle, horn, flashing light, or any combination of signals as long as it is identifiable as a discharge alarm.

3. *Maintenance.* The employer is responsible for the maintenance of all fixed systems, but this responsibility does not preclude the use of outside contractors to do such work. New systems should be subjected to an acceptance test before placed in service. The employer should invite the installer, designer, insurance representative and others to witness the test. Problems found during the test need to be corrected before the system is considered operational.

4. *Manual discharge stations.* There are instances, such as for mechanical reasons and others, where the standards call for a manual back-up activation device. While the location of this device is not specified in the standard, the employer should assume that the device should be located where employees can easily reach it. It could, for example, be located along the main means of egress from the protected area so that employees could activate the system as they evacuate the work area.

5. *Personal protective equipment.* The employer is required to provide the necessary personal protective equipment to rescue employees who may be trapped in a totally flooded environment which may be hazardous to their health. This equipment would normally include a positive-pressure self-contained breathing apparatus and any necessary first aid equipment. In cases where the employer can assure the prompt arrival of the local fire department or plant emergency personnel which can provide the equipment, this can be considered as complying with the standards.

§ 1910.161 Fixed extinguishing systems, dry chemical.

1. *Scope and application.* The requirements of this section apply only to dry chemical systems. These requirements are to be used

in conjunction with the requirements of §1910.160.

2. *Maintenance.* The employer is responsible for assuring that dry chemical systems will operate effectively. To do this, periodic maintenance is necessary. One test that must be conducted during the maintenance check is one which will determine if the agent has remained free of moisture. If an agent absorbs any moisture, it may tend to cake and thereby clog the system. An easy test for acceptable moisture content is to take a lump of dry chemical from the container and drop it from a height of four inches. If the lump crumbles into fine particles, the agent is acceptable.

§1910.162 Fixed extinguishing systems, gaseous agent.

1. *Scope and application.* This section applies only to those systems which use gaseous agents. The requirements of §1910.160 also apply to the gaseous agent systems covered in this section.

2. *Design concentrations.* Total flooding gaseous systems are based on the volume of gas which must be discharged in order to produce a certain designed concentration of gas in an enclosed area. The concentration needed to extinguish a fire depends on several factors including the type of fire hazard and the amount of gas expected to leak away from the area during discharge. At times it is necessary to ''super-saturate'' a work area to provide for expected leakage from the enclosed area. In such cases, employers must assure that the flooded area has been ventilated before employees are permitted to reenter the work area without protective clothing and respirators.

3. *Toxic decomposition.* Certain halogenated hydrocarbons will break down or decompose when they are combined with high temperatures found in the fire environment. The products of the decomposition can include toxic elements or compounds. For example, when Halon 1211 is placed into contact with hot metal it will break down and form bromide or fluoride fumes. The employer must find out which toxic products may result from decomposition of a particular agent from the manufacturer, and take the necessary precautions to prevent employee exposure to the hazard.

§1910.163 Fixed extinguishing systems, water spray and foam.

1. *Scope and application.* This section applies to those systems that use water spray or foam. The requirements of §1910.160 also apply to this type of system.

2. *Characteristics of foams.* When selecting the type of foam for a specific hazard, the employer should consider the following limitations of some foams.

a. Some foams are not acceptable for use on fires involving flammable gases and liquefied gases with boiling points below ambient workplace temperatures. Other foams are not effective when used on fires involving polar solvent liquids.

b. Any agent using water as part of the mixture should not be used on fire involving combustible metals unless it is applied under proper conditions to reduce the temperature of burning metal below the ignition temperature. The employer should use only those foams that have been tested and accepted for this application by a recognized independent testing laboratory.

c. Certain types of foams may be incompatible and break down when they are mixed together.

d. For fires involving water miscible solvents, employers should use only those foams tested and approved for such use. Regular protein foams may not be effective on such solvents.

Whenever employers provide a foam or water spray system, drainage facilities must be provided to carry contaminated water or foam overflow away from the employee work areas and egress routes. This drainage system should drain to a central impounding area where it can be collected and disposed of properly. Other government agencies may have regulations concerning environmental considerations.

§1910.164 Fire detection systems.

1. *Installation and restoration.* Fire detection systems must be designed by knowledgeable engineers or other professionals, with expertise in fire detection systems and when the systems are installed, there should be an acceptance test performed on the system to insure it operates properly. The manufacturer's recommendations for system design should be consulted. While entire systems may not be approved, each component used in the system is required to be approved. Custom fire detection systems should be designed by knowledgeable fire protection or electrical engineers who are familiar with the workplace hazards and conditions. Some systems may only have one or two individual detectors for a small workplace, but good design and installation is still important. An acceptance test should be performed on all systems, including these smaller systems.

OSHA has a requirement that spare components used to replace those which may be destroyed during an alarm situation be available in sufficient quantities and locations for prompt restoration of the system. This does not mean that the parts or components have to be stored at the workplace. If the employer can assure that the supply of parts is available in the local community or the general metropolitan area of the workplace,

then the requirements for storage and availability have been met. The intent is to make sure that the alarm system is fully operational when employees are occupying the workplace, and that when the system operates it can be returned to full service the next day or sooner.

2. *Supervision.* Fire detection systems should be supervised. The object of supervision is detection of any failure of the circuitry, and the employer should use any method that will assure that the system's circuits are operational. Electrically operated sensors for air pressure, fluid pressure, or electrical circuits, can provide effective monitoring and are the typical types of supervision.

3. *Protection of fire detectors.* Fire detectors must be protected from corrosion either by protective coatings, by being manufactured from non-corrosive materials or by location. Detectors must also be protected from mechanical impact damage, either by suitable cages or metal guards where such hazards are present, or by locating them above or out of contact with materials or equipment which may cause damage.

4. *Number, location, and spacing of detectors.* This information can be obtained from the approval listing for detectors or NFPA standards. It can also be obtained from fire protection engineers or consultants or manufacturers of equipment who have access to approval listings and design methods.

§ 1910.165 Employee alarm systems.

1. *Scope and application.* This section is intended to apply to employee alarm systems used for all types of employee emergencies except those which occur so quickly and at such a rapid rate (e.g., explosions) that any action by the employee is extremely limited following detection.

In small workplaces with 10 or less employees the alarm system can be by direct voice communication (shouting) where any one individual can quickly alert all other employees. Radio may be used to transmit alarms from remote workplaces where telephone service is not available, provided that radio messages will be monitored by emergency services, such as fire, police or others, to insure alarms are transmitted and received.

2. *Alarm signal alternatives.* In recognition of physically impaired individuals, OSHA is accepting various methods of giving alarm signals. For example, visual, tactile or audible alarm signals are acceptable methods for giving alarms to employees. Flashing lights or vibrating devices can be used in areas where the employer has hired employees with hearing or vision impairments. Vibrating devices, air fans, or other tactile devices can be used where visually and hearing impaired employees work. Employers are cautioned that certain frequencies of flashing lights have been claimed to initiate epileptic seizures in some employees and that this fact should be considered when selecting an alarm device. Two way radio communications would be most appropriate for transmitting emergency alarms in such workplaces which may be remote or where telephones may not be available.

3. *Reporting alarms.* Employee alarms may require different means of reporting, depending on the workplace involved. For example, in small workplaces, a simple shout throughout the workplace may be sufficient to warn employees of a fire or other emergency. In larger workplaces, more sophisticated equipment is necessary so that entire plants or high-rise buildings are not evacuated for one small emergency. In remote areas, such as pumping plants, radio communication with a central base station may be necessary. The goal of this standard is to assure that all employees who need to know that an emergency exists can be notified of the emergency. The method of transmitting the alarm should reflect the situation found at the workplace.

Personal radio transmitters, worn by an individual, can be used where the individual may be working such as in a remote location. Such personal radio transmitters shall send a distinct signal and should clearly indicate who is having an emergency, the location, and the nature of the emergency. All radio transmitters need a feedback system to assure that the emergency alarm is sent to the people who can provide assistance.

For multi-story buildings or single story buildings with interior walls for subdivisions, the more traditional alarm systems are recommended for these types of workplaces. Supervised telephone or manual fire alarm or pull box stations with paging systems to transmit messages throughout the building is the recommended alarm system. The alarm box stations should be available within a travel distance of 200 feet. Water flow detection on a sprinkler system, fire detection systems (guard's supervisory station) or tour signal (watchman's service), or other related systems may be part of the overall system. The paging system may be used for nonemergency operations provided the emergency messages and uses will have precedence over all other uses of the system.

4. *Supervision.* The requirements for supervising the employee alarm system circuitry and power supply may be accomplished in a variety of ways. Typically, electrically operated sensors for air pressure, fluid pressure, steam pressure, or electrical continuity of circuitry may be used to continuously monitor the system to assure it is operational and to identify trouble in the system and give a warning signal.

[45 FR 60715, Sept. 12, 1980; 46 FR 24557, May 1, 1981]

APPENDIX B TO SUBPART L OF PART 1910—NATIONAL CONSENSUS STANDARDS

The following table contains a cross-reference listing of those current national consensus standards which contains information and guidelines that would be considered acceptable in complying with requirements in the specific sections of subpart L.

Subpart L section	National consensus standard
1910.156	ANSI/NFPA No. 1972; Structural Fire Fighter's Helmets.
	ANSI Z88.5 American National Standard, Practice for Respirator Protection for the Fire Service.
	ANSI/NFPA No. 1971, Protective Clothing for Structural Fire Fighters.
	NFPA No. 1041, Fire Service Instructor Professional Qualifications.
1910.157	ANSI/NFPA No. 10, Portable Fire Extinguishers.
1910.158	ANSI/NFPA No. 18, Wetting Agents.
	ANSI/NFPA No. 20, Centrifugal Fire Pumps.
	NFPA No. 21, Steam Fire Pumps.
	ANSI/NFPA No. 22, Water Tanks.
	NFPA No. 24, Outside Protection.
	NFPA No. 26, Supervision of Valves.
	NFPA No. 13E, Fire Department Operations in Properties Protected by Sprinkler, Standpipe Systems.
	ANSI/NFPA No. 194, Fire Hose Connections.
	NFPA No. 197, Initial Fire Attack, Training for.
	NFPA No. 1231, Water Supplies for Suburban and Rural Fire Fighting.
1910.159	ANSI-NFPA No. 13, Sprinkler Systems.
	NFPA No. 13A, Sprinkler Systems, Maintenance.
	ANSI/NFPA No. 18, Wetting Agents.
	ANSI/NFPA No. 20, Centrifugal Fire Pumps.
	ANSI/NFPA No. 22, Water Tanks.
	NFPA No. 24, Outside Protection.
	NFPA No. 26, Supervision of Valves.
	ANSI/NFPA No. 72B, Auxiliary Signaling Systems.
	NFPA No. 1231, Water Supplies for Suburban and Rural Fire Fighting.
1910.160	ANSI/NFPA No. 11, Foam Systems.
	ANSI/NFPA 11A, High Expansion Foam Extinguishing Systems.
	ANSI/NFPA No. 11B, Synthetic Foam and Combined Agent Systems.
	ANSI/NFPA No. 12, Carbon Dioxide Systems.
	ANSI/NFPA No. 12A, Halon 1301 Systems.
	ANSI/NFPA No. 12B, Halon 1211 Systems.
	ANSI/NFPA No. 15, Water Spray Systems.
	ANSI/NFPA 16 Foam-Water Spray Systems.
	ANSI/NFPA No. 17, Dry Chemical Systems.
	ANSI/NFPA 69, Explosion Suppression Systems.
1910.161	ANSI/NFPA No. 11B, Synthetic Foam and Combined Agent Systems.
	ANSI/NFPA No. 17, Dry Chemical Systems.
1910.162	ANSI/NFPA No. 12, Carbon Dioxide Systems.
	ANSI/NFPA No. 12A, Halon 1211 Systems.
	ANSI/NFPA No. 12B, Halon 1301 Systems.
	ANSI/NFPA No. 69, Explosion Suppression Systems.
1910.163	ANSI/NFPA No. 11, Foam Extinguishing Systems.
	ANSI/NFPA No. 11A, High Expansion Foam Extinguishing Systems.
	ANSI/NFPA No. 11B, Synthetic Foam and Combined Agent Systems.
	ANSI/NFPA No. 15, Water Spray Fixed Systems.
	ANSI/NFPA No. 16, Foam-Water Spray Systems.
	ANSI/NFPA No. 18, Wetting Agents.
	NFPA No. 26, Supervision of Valves.
1910.164	ANSI/NFPA No. 71, Central Station Signaling Systems.
	ANSI/NFPA No. 72A, Local Protective Signaling Systems.
	ANSI/NFPA No. 72B, Auxiliary Signaling Systems.
	ANSI/NFPA No. 72D, Proprietary Protective Signaling Systems.
	ANSI/NFPA No. 72E, Automatic Fire Detectors.
	ANSI/NFPA No. 101, Life Safety Code.
1910.165	ANSI/NFPA No. 71, Central Station Signaling Systems.
	ANSI/NFPA No. 72A, Local Protective Signaling Systems.
	ANSI/NFPA No. 72B, Auxiliary Protective Signaling Systems.
	ANSI/NFPA No. 72C, Remote Station Protective Signaling Systems.
	ANSI/NFPA No. 72D, Proprietary Protective Signaling Systems.
	ANSI/NFPA No. 101, Life Safety Code.
Metric Conversion	ANSI/ASTM No. E380, American National Standard for Metric Practice.

NFPA standards are available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

ANSI Standards are available from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

[45 FR 60715, Sept. 12, 1980, as amended at 58 FR 35309, June 30, 1993]

APPENDIX C TO SUBPART L OF PART 1910—FIRE PROTECTION REFERENCES FOR FURTHER INFORMATION

I. *Appendix general references.* The following references provide information which can be helpful in understanding the requirements contained in all of the sections of subpart L:

A. *Fire Protection Handbook,* National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

B. *Accident Prevention Manual for Industrial Operations,* National Safety Council; 425 North Michigan Avenue, Chicago, IL 60611.

C. Various associations also publish information which may be useful in understanding these standards. Examples of these associations are: Fire Equipment Manufacturers Association (FEMA) of Arlington, VA 22204 and the National Association of Fire Equipment Distributors (NAFED) of Chicago, IL 60601.

II. *Appendix references applicable to individual sections.* The following references are grouped according to individual sections contained in subpart L. These references provide information which may be helpful in understanding and implementing the standards of each section of subpart L.

A. *§1910.156. Fire brigades:*

1. *Private Fire Brigades,* NFPA 27; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

2. *Initial Fire Attack, Training Standard On,* NFPA 197; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

3. *Fire Fighter Professional Qualifications,* NFPA 1001; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

4. *Organization for Fire Services,* NFPA 1201; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

5. *Organization of a Fire Department,* NFPA 1202; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

6. *Protective Clothing for Structural Fire Fighting,* ANSI/NFPA 1971; .

7. *American National Standard for Men's Safety-Toe Footwear,* ANSI Z41.1; American National Standards Institute, New York, NY 10018.

8. *American National Standard for Occupational and Educational Eye and Face Protection,* ANSI Z87.1; American National Standards Institute, New York, NY 10018.

9. *American National Standard, Safety Requirements for Industrial Head Protection,* ANSI Z89.1; American National Standards Institute, New York, NY 10018.

10. *Specifications for Protective Headgear for Vehicular Users,* ANSI Z90.1; American National Standards Institute, New York, NY 10018.

11. *Testing Physical Fitness;* Davis and Santa Maria. *Fire Command.* April 1975.

12. *Development of a Job-Related Physical Performance Examination for Fire Fighters;* Dotson and Others. A summary report for the National Fire Prevention and Control Administration. Washington, DC. March 1977.

13. *Proposed Sample Standards for Fire Fighters' Protective Clothing and Equipment;* International Association of Fire Fighters, Washington, DC.

14. *A Study of Facepiece Leakage of Self-Contained Breathing Apparatus by DOP Man Tests;* Los Alamos Scientific Laboratory, Los Alamos, NM.

15. *The Development of Criteria for Fire Fighters' Gloves; Vol. II: Glove Criteria and Test Methods;* National Institute for Occupational Safety and Health, Cincinnati, OH. 1976.

16. *Model Performance Criteria for Structural Fire Fighters' Helmets;* National Fire Prevention and Control Administration, Washington, DC. 1977.

17. *Firefighters;* Job Safety and Health Magazine, Occupational Safety and Health Administration, Washington, DC. June 1978.

18. *Eating Smoke—The Dispensable Diet;* Utech, H.P. The Fire Independent, 1975.

19. *Project Monoxide—A Medical Study of an Occupational Hazard of Fire Fighters;* International Association of Fire Fighters, Washington, DC.

20. *Occupational Exposures to Carbon Monoxide in Baltimore Firefighters;* Radford and Levine. Johns Hopkins University, Baltimore, MD. Journal of Occupational Medicine, September, 1976.

21. *Fire Brigades;* National Safety Council, Chicago, IL. 1966.

22. *American National Standard, Practice for Respiratory Protection for the Fire Service;* ANSI Z88.5; American National Standards Institute, New York, NY 10018.

23. *Respirator Studies for the Nuclear Regulatory Commission; October 1, 1977—September 30, 1978. Evaluation and Performance of Open Circuit Breathing Apparatus.* NU REG/CR–1235. Los Alamos Scientific Laboratory; Los Alamos, NM. 87545, January, 1980.

B. *§1910.157. Portable fire extinguishers:*

1. *Standard for Portable Fire Extinguishers,* ANSI/NFPA 10; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

2. *Methods for Hydrostatic Testing of Compressed Gas Cylinders,* C–1; Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.

3. *Recommendations for the Disposition of Unserviceable Compressed Gas Cylinders,* C–2; Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.

4. *Standard for Visual Inspection of Compressed Gas Cylinders,* C–6; Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.

5. *Portable Fire Extinguisher Selection Guide,* National Association of Fire Equipment Distributors; 111 East Wacker Drive, Chicago, IL 60601.

C. *§1910.158. Standpipe and hose systems:*

1. *Standard for the Installation of Sprinkler Systems,* ANSI/NFPA 13; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

2. *Standard of the Installation of Standpipe and Hose Systems,* ANSI/NFPA 14; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

3. *Standard for the Installation of Centrifugal Fire Pumps,* ANSI/NFPA 20; National Fire

Protection Association, Batterymarch Park, Quincy, MA 02269.

4. *Standard for Water Tanks for Private Fire Protection,* ANSI/NFPA 22; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

5. *Standard for Screw Threads and Gaskets for Fire Hose Connections,* ANSI/NFPA 194; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

6. *Standard for Fire Hose,* NFPA 196; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

7. *Standard for the Care of Fire Hose,* NFPA 198; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

D. *§1910.159. Automatic sprinkler systems:*

1. *Standard of the Installation of Sprinkler Systems,* ANSI-NFPA 13; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

2. *Standard for the Care and Maintenance of Sprinkler Systems,* ANSI/NFPA 13A; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

3. *Standard for the Installation of Standpipe and Hose Systems,* ANSI/NFPA 14; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

4. *Standard for the Installation of Centrifugal Fire Pumps,* ANSI/NFPA 20; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

5. *Standard for Water Tanks for Private Fire Protection,* ANSI-NFPA 22; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

6. *Standard for Indoor General Storage,* ANSI/NFPA 231; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

7. *Standard for Rack Storage of Materials,* ANSI/NFPA 231C; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

E. *§1910.160. Fixed extinguishing systems—general information:*

1. *Standard for Foam Extinguishing Systems,* ANSI-NFPA 11; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

2. *Standard for Hi-Expansion Foam Systems,* ANSI/NFPA 11A; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

3. *Standard on Synthetic Foam and Combined Agent Systems,* ANSI/NFPA 11B; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

4. *Standard on Carbon Dioxide Extinguishing Systems,* ANSI/NFPA 12; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

5. *Standard on Halon 1301,* ANSI/NFPA 12A; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

6. *Standard on Halon 1211,* ANSI/NFPA 12B; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

7. *Standard for Water Spray Systems,* ANSI/NFPA 15; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

8. *Standard for Foam-Water Sprinkler Systems and Foam-Water Spray Systems,* ANSI/NFPA 16; National Fire Protection Association, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

9. *Standard for Dry Chemical Extinguishing Systems,* ANSI/NFPA 17; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

F. *§1910.161. Fixed extinguishing systems—dry chemical:*

1. *Standard for Dry Chemical Extinguishing Systems,* ANSI/NFPA 17; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

2. *National Electrical Code,* ANSI/NFPA 70; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

3. *Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapor from Commercial Cooking Equipment,* NFPA 96; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

G. *§1910.162. Fixed extinguishing systems—gaseous agents:*

1. *Standard on Carbon Dioxide Extinguishing Systems,* ANSI/NFPA 12; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

2. *Standard on Halon 1301,* ANSI/NFPA 12B; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

3. *Standard on Halon 1211,* ANSI/NFPA 12B; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

4. *Standard on Explosion Prevention Systems,* ANSI/NFPA 69; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

5. *National Electrical Code,* ANSI/NFPA 70; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

6. *Standard on Automatic Fire Detectors,* ANSI/NFPA 72E; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

7. *Determination of Halon 1301/1211 Threshold Extinguishing Concentrations Using the Cup Burner Method;* Riley and Olson, Ansul Report AL–530–A.

H. *§1910.163. Fixed extinguishing systems—water spray and foam agents:*

1. *Standard for Foam Extinguisher Systems,* ANSI/NFPA 11; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

2. *Standard for High Expansion Foam Systems,* ANSI/NFPA 11A; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

3. *Standard for Water Spray Fixed Systems for Fire Protection,* ANSI/NFPA 15; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

4. *Standard for the Installation of Foam-Water Sprinkler Systems and Foam-Water Spray Systems,* ANSI/NFPA 16; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

I. *§ 1910.164. Fire Detection systems:*

1. *National Electrical Code,* ANSI/NFPA 70; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

2. *Standard for Central Station Signaling Systems,* ANSI/NFPA 71; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

3. *Standard on Automatic Fire Detectors,* ANSI/NFPA 72E; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

J. *§ 1910.165. Employee alarm systems:*

1. *National Electrical Code,* ANSI/NFPA 70; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

2. *Standard for Central Station Signaling systems,* ANSI/NFPA 71; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

3. *Standard for Local Protective Signaling Systems,* ANSI/NFPA 72A; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

4. *Standard for Auxiliary Protective Signaling Systems,* ANSI/NFPA 72B; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

5. *Standard for Remote Station Protective Signaling Systems,* ANSI/NFPA 72C; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269 .

6. *Standard for Proprietary Protective Signaling Systems,* ANSI/NFPA 72D; National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

7. *Vocal Emergency Alarms in Hospitals and Nursing Facilities: Practice and Potential.* National Bureau of Standards. Washington, D.C., July 1977.

8. *Fire Alarm and Communication Systems.* National Bureau of Standards. Washington, D.C., April 1978.

[45 FR 60715, Sept. 12, 1980, as amended at 58 FR 35309, June 30, 1993]

APPENDIX D TO SUBPART L OF PART 1910—AVAILABILITY OF PUBLICATIONS INCORPORATED BY REFERENCE IN SECTION 1910.156 FIRE BRIGADES

The final standard for fire brigades, Section 1910.156, contains provisions which incorporate certain publications by reference. The publications provide criteria and test methods for protective clothing worn by those fire brigade members who are expected to perform interior structural fire fighting. The standard references the publications as the chief sources of information for determining if the protective clothing affords the required level of protection.

It is appropriate to note that the final standard does not require employers to purchase a copy of the referenced publications. Instead, employers can specify (in purchase orders to the manufacturers) that the protective clothing meet the criteria and test methods contained in the referenced publications and can rely on the manufacturers' assurances of compliance. Employers, however, may desire to obtain a copy of the referenced publications for their own information.

The paragraph designation of the standard where the referenced publications appear, the title of the publications, and the availablity of the publications are as follows:

Paragraph designation	Referenced publication	Available from
1910.156(e)(3)(ii)	''Protective Clothing for Structural Fire Fighting,'' NFPA No. 1971 (1975).	National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.
1910.156(e)(4)(i)	''Development of Criteria for Fire Fighter's Gloves; Vol. II, Part II: Test Methods'' (1976).	U.S. Government Printing Office, Washington, D.C. 20402. Stock No. for Vol. II is: 071–033–0201–1.
1910.156(e)(5)(i)	''Model Performance Criteria for Structural Firefighter's Helmets'' (1977).	U.S. Fire Administration, National Fire Safety and Research Office, Washington, D.C. 20230.

The referenced publications (or a microfiche of the publications) are available for review at many universities and public libraries throughout the country. These publications may also be examined at the OSHA Technical Data Center, Room N2439–Rear, United States Department of Labor, 200 Constitution Ave., N.W., Washington, D.C. 20210 (202–219–7500), or at any OSHA Regional Office (see telephone directories under United States Government-Labor Department).

[45 FR 60715, Sept. 12, 1980, as amended at 58 FR 33509, June 30, 1993; 61 FR 9239, Mar. 7, 1996]

APPENDIX E TO SUBPART L OF PART 1910—TEST METHODS FOR PROTECTIVE CLOTHING

This appendix contains test methods which must be used to determine if protective clothing affords the required level of protection as specified in § 1910.156, fire brigades.

(1) *Puncture resistance test method for foot protection.*

A. *Apparatus.* The puncture resistance test shall be performed on a testing machine having a movable platform adjusted to travel at ¼-inch/min (0.1 cm/sec). Two blocks of hardwood, metal, or plastic shall be prepared as follows: the blocks shall be of such size and thickness as to insure a suitable rigid test ensemble and allow for at least one-inch of the pointed end of an 8D nail to be exposed for the penetration. One block shall have a hole drilled to hold an 8D common nail firmly at an angle of 98°. The second block shall have a maximum ½-inch (1.3 cm) diameter hole drilled through it so that the hole will allow free passage of the nail after it penetrates the insole during the test.

B. *Procedure.* The test ensemble consisting of the sample unit, the two prepared blocks, a piece of leather outsole 10 to 11 irons thick, and a new 8D nail, shall be placed as follows: the 8D nail in the hole, the sample of outsole stock superimposed above the nail, the area of the sole plate to be tested placed on the outsole, and the second block with hole so placed as to allow for free passage of the nail after it passes through the outsole stock and sole plate in that order. The machine shall be started and the pressure, in pounds required for the nail to completely penetrate the outsole and sole plate, recorded to the nearest five pounds. Two determinations shall be made on each sole plate and the results averaged. A new nail shall be used for each determination.

C. *Source.* These test requirements are contained in ''Military Specification For Fireman's Boots,'' MIL-B-2885D (1973 and amendment dated 1975) and are reproduced for your convenience.

(2) *Test method for determining the strength of cloth by tearing: Trapezoid Method.*

A. *Test specimen.* The specimen shall be a rectangle of cloth 3-inches by 6-inches (7.6 cm by 15.2 cm). The long dimension shall be parallel to the warp for warp tests and parallel to the filling for filling tests. No two specimens for warp tests shall contain the same warp yarns, nor shall any two specimens for filling tests contain the same filling yarns. The specimen shall be taken no nearer the selvage than 1/10 the width of the cloth. An isosceles trapezoid having an altitude of 3-inches (7.6 cm) and bases of 1 inch (2.5cm) and 4 inches (10.2 cm) in length, respectively, shall be marked on each specimen, preferably with the aid of a template. A cut approximately ⅜-inch (1 cm) in length shall then be made in the center of a perpendicular to the 1-inch (2.5 cm) edge.

B. *Apparatus.* (i) Six-ounce (.17 kg) weight tension clamps shall be used so designed that the six ounces (.17 kg) of weight are distributed evenly across the complete width of the sample.

(ii) The machine shall consist of three main parts: Straining mechanism, clamps for holding specimen, and load and elongation recording mechanisms.

(iii) A machine wherein the specimen is held between two clamps and strained by a uniform movement of the pulling clamp shall be used.

(iv) The machine shall be adjusted so that the pulling clamp shall have a uniform speed of 12 ± 10.5 inches per minute (0.5± .02 cm/sec).

(v) The machine shall have two clamps with two jaws on each clamp. The design of the two clamps shall be such that one gripping surface or jaw may be an integral part of the rigid frame of the clamp or be fastened to allow a slight vertical movement, while the other gripping surface or jaw shall be completely moveable. The dimension of the immovable jaw of each clamp parallel to the application of the load shall measure one-inch, and the dimension of the jaw perpendicular to this direction shall measure three inches or more. The face of the movable jaw of each clamp shall measure one-inch by three inches.

Each jaw face shall have a flat smooth, gripping surface. All edges which might cause a cutting action shall be rounded to a radius of not over 1/64-inch (.04 cm). In cases where a cloth tends to slip when being tested, the jaws may be faced with rubber or other material to prevent slippage. The distance between the jaws (gage length) shall be one-inch at the start of the test.

(vi) Calibrated dial; scale or chart shall be used to indicate applied load and elongation. The machine shall be adjusted or set, so that the maximum load required to break the specimen will remain indicated on the calibrated dial or scale after the test specimen has ruptured.

(vii) The machine shall be of such capacity that the maximum load required to break the specimen shall be not greater than 85 percent or less than 15 percent of the rated capacity.

(viii) The error of the machine shall not exceed 2 percent up to and including a 50-pound load (22.6 kg) and 1 percent over a 50-pound load (22.6 kg) at any reading within its loading range.

(ix) All machine attachments for determining maximum loads shall be disengaged during this test.

C. *Procedure.* (i) The specimen shall be clamped in the machine along the nonparallel sides of the trapezoid so that these sides lie along the lower edge of the upper clamp and the upper edge of the lower clamp with

the cut halfway between the clamps. The short trapezoid base shall be held taut and the long trapezoid base shall lie in the folds.

(ii) The machine shall be started and the force necessary to tear the cloth shall be observed by means of an autographic recording device. The speed of the pulling clamp shall be 12 inches ±0.5 inch per minute (0.5± .02 cm/sec).

(iii) If a specimen slips between the jaws, breaks in or at the edges of the jaws, or if for any reason attributable to faulty technique, an individual measurement falls markedly below the average test results for the sample unit, such result shall be discarded and another specimen shall be tested.

(iv) The tearing strength of the specimen shall be the average of the five highest peak loads of resistance registered for 3 inches (7.6 cm) of separation of the tear.

D. *Report.* (i) Five specimens in each of the warp and filling directions shall be tested from each sample unit.

(ii) The tearing strength of the sample unit shall be the average of the results obtained from the specimens tested in each of the warp and filling directions and shall be reported separately to the nearest 0.1-pound (.05 kg).

E. *Source.* These test requirements are contained in ''Federal Test Method Standard 191, Method 5136'' and are reproduced for your convenience.

(3) *Test method for determining flame resistance of cloth; vertical.*

A. *Test specimen.* The specimen shall be a rectangle of cloth 2¾ inches (7.0 cm) by 12 inches (30.5 cm) with the long dimension parallel to either the warp or filling direction of the cloth. No two warp specimens shall contain the same warp yarns, and no two filling specimens shall contain the same filling yarn.

B. *Number of determinations.* Five specimens from each of the warp and filling directions shall be tested from each sample unit.

C. *Apparatus.* (i) Cabinet. A cabinet and accessories shall be fabricated in accordance with the requirements specified in Figures L–1, L–2, and L–3. Galvanized sheet metal or other suitable metal shall be used. The entire inside back wall of the cabinet shall be painted black to facilitate the viewing of the test specimen and pilot flame.

(ii) Burner. The burner shall be equipped with a variable orifice to adjust the flame height, a barrel having a ⅜-inch (1 cm) inside diameter and a pilot light.

(a) The burner may be constructed by combining a ⅜-inch (1 cm) inside diameter barrel 3 ±¼ inches (7.6 ±.6 cm) long from a fixed orifice burner with a base from a variable orifice burner.

(b) The pilot light tube shall have a diameter of approximately 1/16-inch (.2 cm) and shall be spaced ⅛-inch (.3 cm) away from the burner edge with a pilot flame ⅛-inch (.3 cm) long.

(c) The necessary gas connections and the applicable plumbing shall be as specified in Figure L–4 except that a solenoid valve may be used in lieu of the stopcock valve to which the burner is attached. The stopcock valve or solenoid valve, whichever is used, shall be capable of being fully opened or fully closed in 0.1-second.

(d) On the side of the barrel of the burner, opposite the pilot light there shall be a metal rod of approximately ⅛-inch (.3 cm) diameter spaced ½-inch (1.3 cm) from the barrel and extending above the burner. The rod shall have two 5/16-inch (.8 cm) prongs marking the distances of ¾-inch (1.9 cm) and 1½ inches (3.8 cm) above the top of the burner.

(e) The burner shall be fixed in a position so that the center of the barrel of the burner is directly below the center of the specimen.

(iii) There shall be a control valve system with a delivery rate designed to furnish gas to the burner under a pressure of 2½ ±¼ (psi) (17.5 ±1.8 kPa) per square inch at the burner inlet (see (g)(3)(vi)(A)). The manufacturer's recommended delivery rate for the valve system shall be included in the required pressure.

(iv) A synthetic gas mixture shall be of the following composition within the following limits (analyzed at standard conditions): 55 ±3 percent hydrogen, 24 ±1 percent methane, 3 ±1 percent ethane, and 18 ±1 percent carbon monoxide which will give a specific gravity of 0.365 ±0.018 (air = 1) and a B.T.U. content of 540 ±20 per cubic foot (20.1 ±3.7 kJ/L)(dry basis) at 69.8 °F (21 °C).

(v) There shall be metal hooks and weights to produce a series of total loads to determine length of char. The metal hooks shall consist of No. 19 gage steel wire or equivalent and shall be made from 3-inch (7.6 cm) lengths of wire and bent ½-inch (1.3 cm) from one end to a 45 degree hook. One end of the hook shall be fastened around the neck of the weight to be used.

(vi) There shall be a stop watch or other device to measure the burning time to 0.2-second.

(vii) There shall be a scale, graduated in 0.1 inch (.3 cm) to measure the length of char.

D. *Procedure.* (i) The material undergoing test shall be evaluated for the characteristics of after-flame time and char length on each specimen.

(ii) All specimens to be tested shall be at moisture equilibrium under standard atmospheric conditions in accordance with paragraph (3)C of this appendix. Each specimen to be tested shall be exposed to the test flame within 20 seconds after removal from the standard atmosphere. In case of dispute, all testing will be conducted under Standard Atmospheric Conditions in accordance with paragraph (3)C of this appendix.

(iii) The specimen in its holder shall be suspended vertically in the cabinet in such a manner that the entire length of the specimen is exposed and the lower end is ¾-inch (1.9 cm) above the top of the gas burner. The apparatus shall be set up in a draft free area.

(iv) Prior to inserting the specimen, the pilot flame shall be adjusted to approximately ⅛-inch (.3 cm) in height measured from its lowest point to the tip.

The burner flame shall be adjusted by means of the needle valve in the base of the burner to give a flame height of 1½ inches (3.8 cm) with the stopcock fully open and the air supply to the burner shut off and taped. The 1½-inch (3.8 cm) flame height is obtained by adjusting the valve so that the uppermost portion (tip) of the flame is level with the tip of the metal prong (see Figure L–2) specified for adjustment of flame height. It is an important aspect of the evaluation that the flame height be adjusted with the tip of the flame level with the tip of the metal prong. After inserting the specimen, the stopcock shall be fully opened, and the burner flame applied vertically at the middle of the lower edge of the specimen for 12 seconds and the burner turned off. The cabinet door shall remain shut during testing.

(v) The after-flame shall be the time the specimen continues to flame after the burner flame is shut off.

(vi) After each specimen is removed, the test cabinet shall be cleared of fumes and smoke prior to testing the next specimen.

(vii) After both flaming and glowing have ceased, the char length shall be measured. The char length shall be the distance from the end of the specimen, which was exposed to the flame, to the end of a tear (made lengthwise) of the specimen through the center of the charred area as follows: The specimen shall be folded lengthwise and creased by hand along a line through the highest peak of the charred area. The hook shall be inserted in the specimen (or a hole, ¼-inch (.6 cm) diameter or less, punched out for the hook) at one side of the charred area ¼-inch (.6 cm) from the adjacent outside edge and ¼-inch (.6 cm) in from the lower end. A weight of sufficient size such that the weight and hook together shall equal the total tearing load required in Table L–2 of this section shall be attached to the hook.

(viii) A tearing force shall be applied gently to the specimen by grasping the corner of the cloth at the opposite edge of the char from the load and raising the specimen and weight clear of the supporting surface. The end of the tear shall be marked off on the edge and the char length measurement made along the undamaged edge.

Loads for determining char length applicable to the weight of the test cloth shall be as shown in Table L–2.

TABLE L–2 [1]

Specified weight per square yard of cloth before any fire retardant treatment or coating—ounces	Total tearing weight for determining the charred length—pound
2.0 to 6.0	0.25
Over 6.0 to 15.0	0.50
Over 15.0 to 23.0	0.75
Over 23.0	1.0

[1] To change into S.I. (System International) units, 1 ounce=28.35 grams, 1 pound=453 grams, 1 yard=.91 metre.

(ix) The after-flame time of the specimen shall be recorded to the nearest 0.2-second and the char length to the nearest 0.1-inch (.3 cm).

E. *Report.* (i) The after-flame time and char length of the sample unit shall be the average of the results obtained from the individual specimens tested. All values obtained from the individual specimens shall be recorded.

(ii) The after-flame time shall be reported to the nearest 0.2-second and the char length to the nearest 0.1-inch (.3 cm).

F. *Source.* These test requirements are contained in ''Federal Test Method Standard 191, Method 5903 (1971)'' and are reproduced for your convenience.

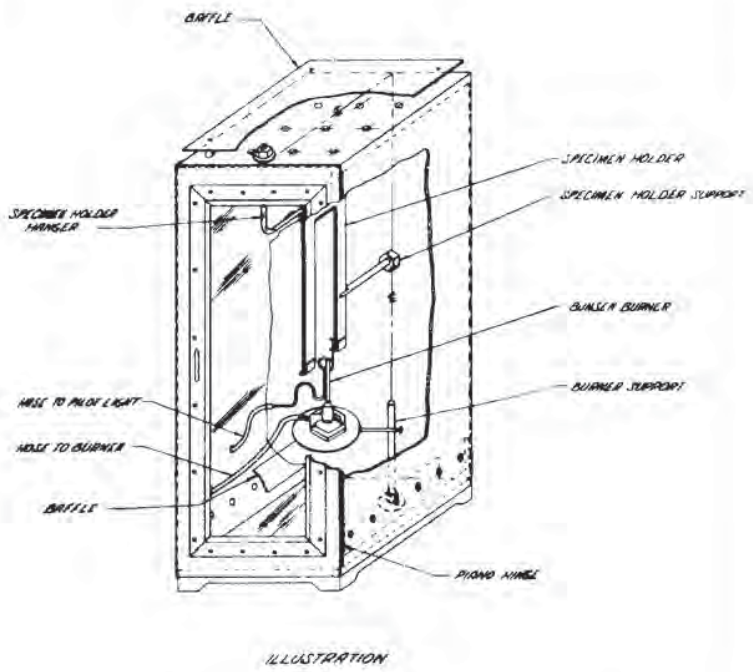

FIGURE L-1 - Vertical flame resistance textile apparatus. All given dimensions are in inches. System International (S. I.) Unit: 1-inch = 2/54 cm.

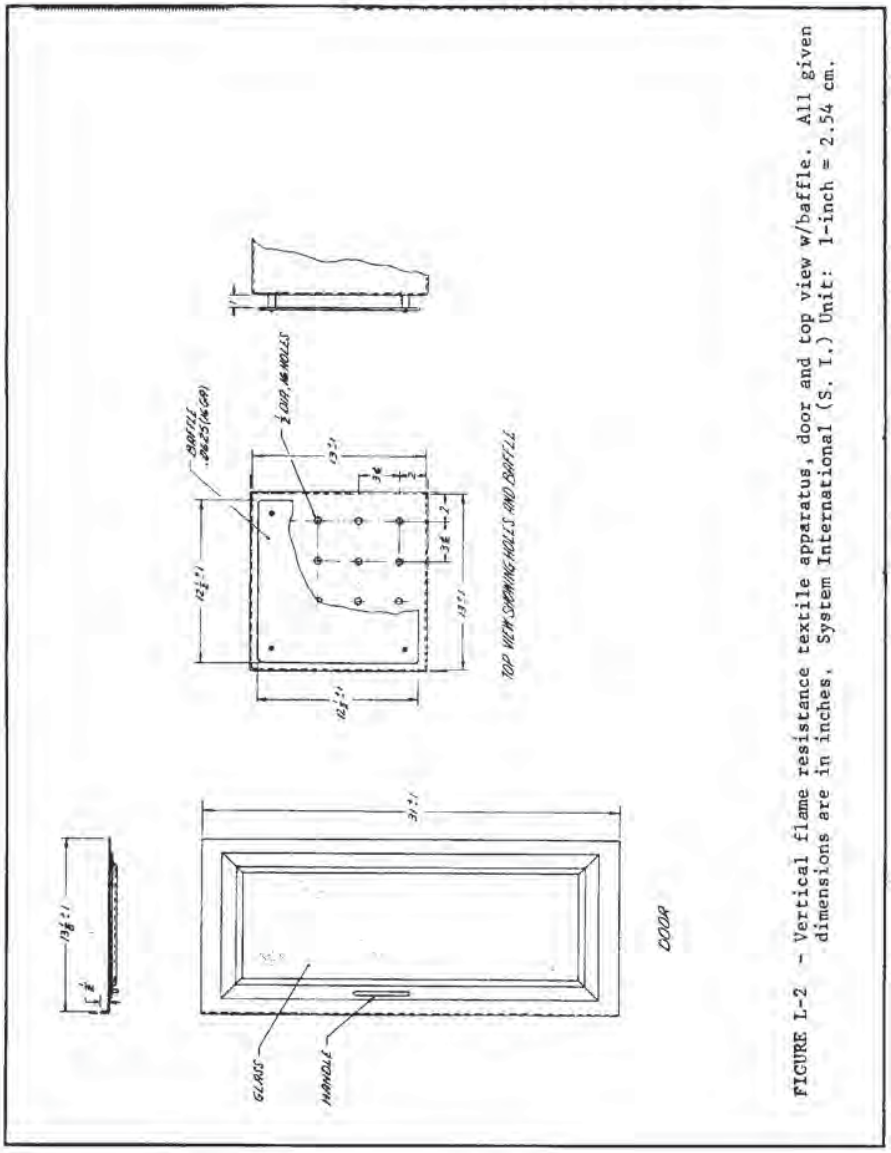

FIGURE L-2 - Vertical flame resistance textile apparatus, door and top view w/baffle. All given dimensions are in inches. System International (S. I.) Unit: 1-inch = 2.54 cm.

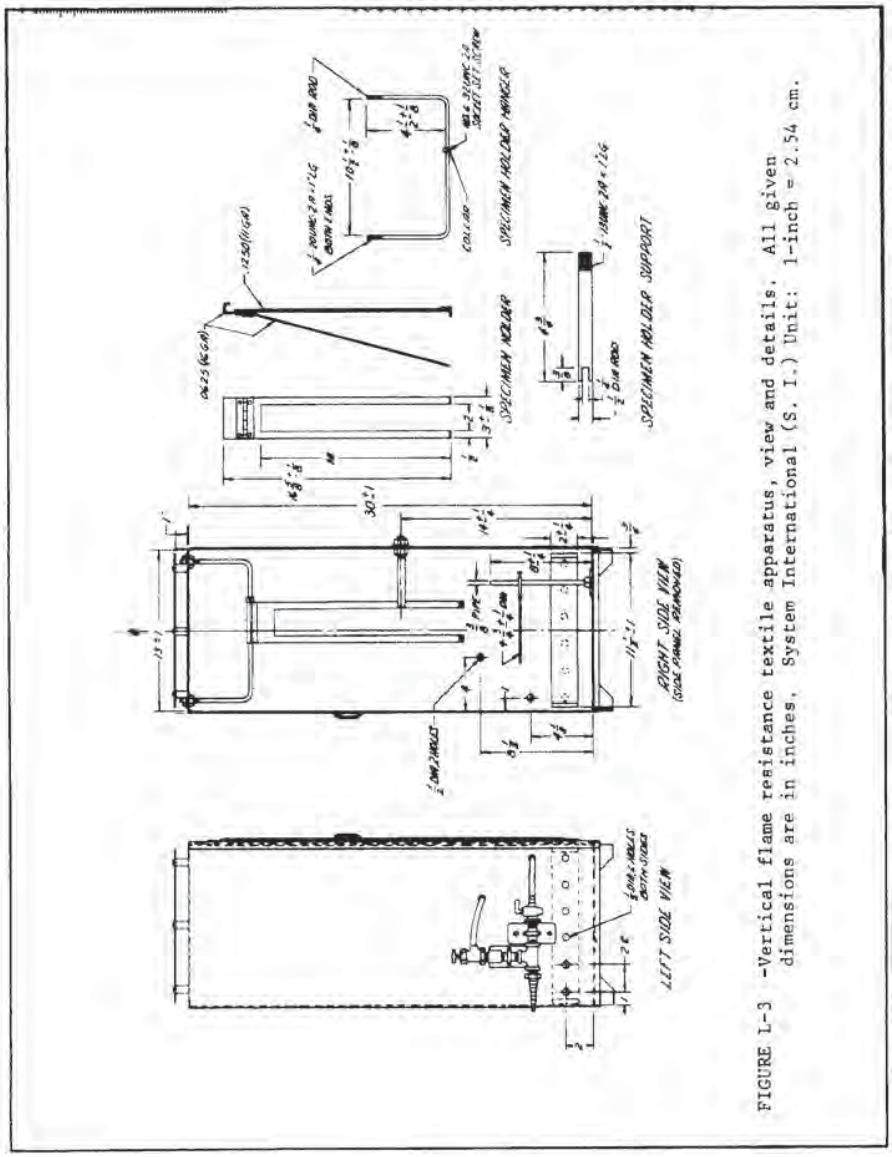

FIGURE L-3 -Vertical flame resistance textile apparatus, view and details. All given dimensions are in inches. System International (S. I.) Unit: 1-inch = 2.54 cm.

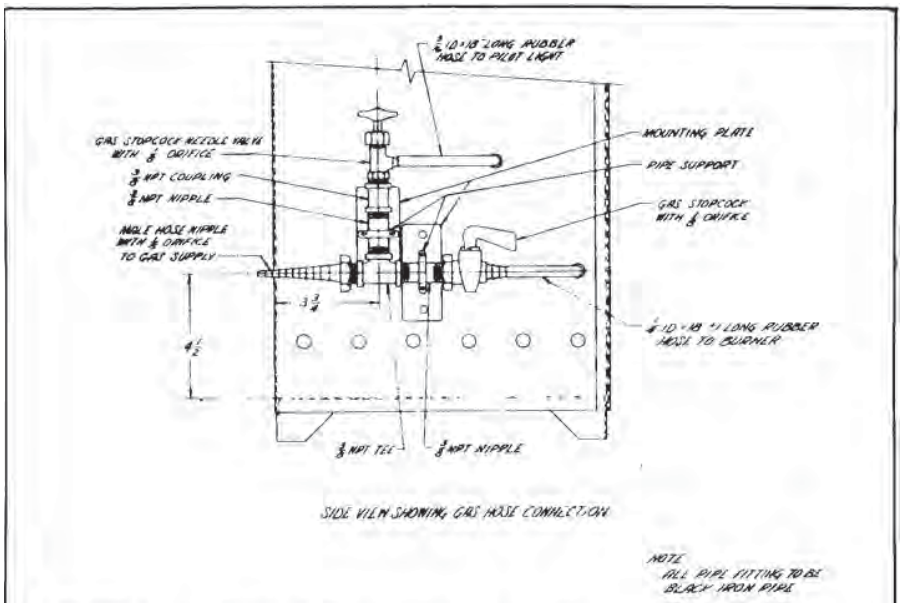

FIGURE L-4 – Vertical flame resistance textile apparatus. All given dimensions are in inches. System International (S. I.) Unit: 1 inch = 2.54 cm.

[45 FR 60715, Sept. 12, 1980; 46 FR 24557, May 1, 1981]

Subpart M—Compressed Gas and Compressed Air Equipment

AUTHORITY: Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736), or 1–90 (55 FR 9033), as applicable.

§§ 1910.166–1910.168 [Reserved]

§ 1910.169 Air receivers.

(a) *General requirements*—(1) *Application.* This section applies to compressed air receivers, and other equipment used in providing and utilizing compressed air for performing operations such as cleaning, drilling, hoisting, and chipping. On the other hand, however, this section does not deal with the special problems created by using compressed air to convey materials nor the problems created when men work in compressed air as in tunnels and caissons. This section is not intended to apply to compressed air machinery and equipment used on transportation vehicles such as steam railroad cars, electric railway cars, and automotive equipment.

(2) *New and existing equipment.* (i) All new air receivers installed after the effective date of these regulations shall be constructed in accordance with the 1968 edition of the A.S.M.E. Boiler and Pressure Vessel Code Section VIII, which is incorporated by reference as specified in § 1910.6.

(ii) All safety valves used shall be constructed, installed, and maintained in accordance with the A.S.M.E. Boiler and Pressure Vessel Code, Section VIII Edition 1968.

(b) *Installation and equipment requirements*—(1) *Installation.* Air receivers shall be so installed that all drains, handholes, and manholes therein are

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