

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 5/8" (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 un-serviceable 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 after-flame 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-de-

mand 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.

(iii) 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, is acceptable for use only during those interior structural fire fighting situations for which the employer demonstrates that long duration breathing apparatus is necessary. Quantitative fit test procedures shall be available for inspection by the Assistant Secretary or authorized representative. Such negative-pressure breathing apparatus will continue to be acceptable for 18 months after a positive-pressure breathing apparatus with the same or longer rated service life is certified by NIOSH. After this 18-month period, all self-contained breathing apparatus used for these long duration situations shall be of the positive-pressure type.

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EFFECTIVE DATE NOTE: At 63 FR 33467, June 18, 1998, §1910.156 was amended by removing paragraph (f)(2)(iii), effective Aug. 17, 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