



U.S. Department
of Transportation

**Federal Aviation
Administration**

Advisory Circular

Subject: AIRPORT FIRE AND RESCUE PERSONNEL
PROTECTIVE CLOTHING

Date: 7/13/95

AC No: 150/5210-14A

Initiated by: AAS-100

Change:

1. PURPOSE. This advisory circular (AC) identifies minimum standards for design, performance, testing, and safety of personnel protective equipment (PPE), frequently referred to as personnel protective clothing, for airport firefighting. This AC also assists airport management in the development of local procurement specifications for acceptable, cost-effective PPE. Suggestions are also provided for enhancing the design, performance, and safety of PPE utilized in aircraft rescue and firefighting (ARFF) applications.

2. CANCELLATION. AC 150/5210-14, Airport Fire and Rescue Personnel Protective Clothing, dated March 12, 1986, is canceled.

3. APPLICATION. The standards referenced herein are recommended by the Federal Aviation Administration for applications on all airports. They are mandatory for PPE purchased under federally funded projects and are an acceptable means for compliance with 14 CFR Part 139, Certification and Operations: Land Airports Serving Certain Air Carriers, as it pertains to the PPE requirements for airport rescue and firefighting personnel.

4. GENERAL. Components making up the user's PPE include coat, trouser or coverall, flash hood, helmet, gloves, and boots. The PPE ensemble shall be compatible when assembled together. Proximity suits have an aluminized outer shell and insulated inner layers. The proximity suit ensemble should withstand occasional short-duration flame contact but is not designed for fire entry. Proximity suits must be lightweight and provide the mobility, durability, and thermal protection performance capabilities necessary to allow aircraft rescue and firefighting personnel to perform efficiently under extreme environmental

conditions of intense radiant heat, as well as high and low ambient temperatures.

While at least one proximity ensemble per response vehicle is customary, the selection, purchase and use of proximity or nonreflective protective clothing is a decision made by airport management based on operational considerations and risk assessment. Advanced primary firefighting agents, such as Aqueous Film Forming Foam (AFFF), in combination with powerful agent pumps and long-range turrets now enable airport firefighters to control and essentially extinguish large aviation fuel fires while still in the attacking vehicle. This means that aviation fuel fires can be controlled in minutes before leaving the vehicle and advancing handlines. Therefore, firefighters often do not need to leave the ARFF vehicle before the levels of radiant heat are low enough to allow the use of nonreflective gear. If nonreflective protective clothing is selected, fire protection personnel need to be made aware of the limitations of their protective clothing. As with any protective clothing, training and education need to be conducted to educate firefighters concerning proper use, care, and PPE limitations.

5. BACKGROUND. The Emmitsburg III Federal Fire Conference 94 was held in March, 1994. As a result of that conference, the Federal Fire Service found that Federal Fire and Emergency Service policies should be based on national consensus standards to the greatest extent possible. Duplicate agency standards and agency unique policies must be eliminated unless they are absolutely necessary. National consensus standards have been carefully reviewed with the resulting recommendations and modifications.

6. RECOMMENDATIONS.

a. Proximity Suits (Coat And Trouser Or Coverall).

(1) **Design, Performance, Testing, And Certification Standards.** Proximity suits, as a minimum, shall meet the most recent edition of National Fire Protection Association (NFPA) 1976, Standard on Protective Clothing for Proximity Fire Fighting.

(2) **Safety And Health Standards.** Proximity suits, as a minimum, shall meet the requirements of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, 1992 edition, Chapter 5, Sections 5-1.1, 5-1.2, 5-1.3, 5-1.4, 5-4.1, 5-4.1.1, and 5-4.1.2.

b. Nonreflective Garments (coat and trouser or coverall).

(1) **Design, Performance, Testing, And Certification Standards.** Garments meeting this description, as a minimum, shall meet the design, performance, testing and certification of the most recent edition of NFPA Standard 1971, Protective Clothing for Structural Fire Fighting.

(2) **Safety And Health Standards.** Garments meeting this description, as a minimum, shall meet the requirements of NFPA Standard 1500, Standards on Fire Department Occupational Safety and Health Program, 1992 edition, Chapter 5.

Note: Appendix A, A-1-1.1 of the 1992 edition of NFPA 1976, Protective Clothing for Proximity Fire Fighting, advises that insufficient research and testing was available to the committee for development of specific proximity protection requirements for footwear, gloves, head protection, and self-contained breathing apparatus (SCBA) protection. Until specific proximity protective requirements are incorporated into NFPA 1976, the following recommendations are made. After such time, the most recent edition of NFPA 1976 shall apply.

c. **Footwear.** Footwear, as a minimum, shall meet the requirements of the most recent edition of NFPA 1974, Standard on Protective Footwear for Structural Fire Fighting, and for safety and health, as a minimum, shall meet the requirements of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program.

d. Hand Protection.

(1) **Gloves.** Gloves, as a minimum, shall meet the requirements of the most recent edition of NFPA 1973, Standard on Gloves for Structural Fire Fighting; and for safety and health, as a minimum, shall meet the requirements of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, 1992 edition.

(2) **Auxiliary Gloves.** Operations on board aircraft to facilitate engine shutdown or other flight deck shutdown procedures may require firefighters to remove firefighting gloves to improve dexterity. If operational procedures dictate removal of firefighting gloves to accomplish flight deck tasks, an auxiliary glove worn underneath the firefighting glove is recommended. Auxiliary gloves shall meet Mil Spec G-81188B.

e. **Head Protection.** Head Protection, as a minimum, shall meet the requirements of NFPA 1972 Standard on Helmets for Structural Fire Fighting, most recent addition, with additional radiant reflective criteria meeting performance requirements of NFPA 1976 4-3.1 for the head and neck. Also specialized faceshields that will mitigate the effects of high levels of radiant energy to the face and the SCBA facepiece, such as gold coated, reflective faceshields shall be specified. Head protection, for safety and health, as a minimum, shall meet the requirements of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, 1992 edition.

Protective hoods that meet the requirements of the most recent edition of NFPA Standard 1971, Protective Clothing for Structural Fire Fighting shall be worn with helmets. Protective Hoods shall also meet requirements of NFPA Standard 1500, Fire Department Occupational Safety and Health Program, 1992 edition, Chapter 5, Section 5-2.5.

7. RELATED CONSIDERATIONS.

a. **Outer Shell Fabrics.** Outer shell fabrics should be durable, supple, lightweight, and remain flexible under extreme temperatures. These fabrics should provide users, with minimal effort, an uninhibited range of motion.

b. **Thermal Liner.** The thermal liner should be durable, supple, remain flexible under extreme temperatures, and provide users, with minimal effort, an uninhibited range of motion. The thermal liner should provide a balance of protection between adequate thermal protective performance (TPP) and the effects of heat stress. Thermal liner facecloths that greatly reduce the friction encountered between the liner and the user's

personal clothing offer an enhanced range of motion and help address the heat stress concerns.

c. Moisture Barrier. The moisture barrier fabric should provide the user with protection from blood and body fluid contamination and should meet NFPA 1999 Protective Clothing for Emergency Medical Operations. The moisture barrier should be durable, supple, lightweight, remain flexible under extreme temperatures, and provide the user, with minimal effort, an uninhibited range of motion.

d. Stitching, Seams, and Edges. All stitching should be continuous and no joined stitching in mid-seam should be permitted. All exposed edges of the thermal liner and moisture barrier should be manufactured to provide finished edges to prevent fraying and for maximum working life of the composite. The average number of stitches per inch should be consistent throughout the garment. Noticeable changes in the number of stitches per inch will have an affect on the quality of the finished product and could reduce the working life of the garment.

e. Reinforcement. All outer shell stress points should be reinforced for maximum working life. This includes areas such as top and bottom of the storm panel, pocket corners, and pocket flap corners. The use of rivets should be avoided to prevent structural damage to the fabric created when the rivet elongates the hole.

f. Sizing. Garment sizing has a direct affect of the safety and health of the user. Wearing garments that are not properly fit affects safety by compromising mobility, exposing limbs, and accelerating the effects of heat stress. Improper fit can damage the garment causing partial or a total failure of the clothing system. Wearing garments that are too large or long requires additional energy to work with the excess weight, stiffness, and bulk. Wearing a garment that is too small or short will require additional energy to overcome problems associated with a garment that is restrictive and too tight. Garments should be properly sized, and the garment manufacturer consulted with regard to fit.

g. Service Life. Performance requirement of NFPA 1976 and manufacturing technology have greatly improved the adhesion of the aluminized laminate to the

outer shell. This has provided the fire service with a product that exhibits very little delamination. What is mistaken for delamination of the aluminized coating may actually be abrasion. These types of garments do not tolerate the abrasion normally associated with rescue, extrication, or training scenarios. When exposed to prolonged or high levels of abrasion, especially during extrication and rescue type training, the aluminized laminate will be destroyed in a short period of time. Adding additional reflective fabric to areas such as knees, elbows, and cuffs will extend the working life of the garment, especially if this fabric is replaceable. Airport fire departments often supplement their reflective garments with structural type protective clothing for training or when performing structural firefighting operations.

h. Use, Care, Inspection, and Maintenance. Appendix A of NFPA 1976 provides general assistance and NFPA 1581, Standard on Fire Department Infection Control Program, paragraph 3-3.2 should be considered. Agencies should request specific guidance from the garment manufacturer and develop a program for cleaning, maintenance, inspection, repair, retirement, storage, safety and warranty issues.

8. HOW TO ORDER.

a. 14 CFR Part 139. This document may be ordered from: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

b. NFPA Standards. NFPA 1971, Protective clothing for Structural Fire Fighting, NFPA 1976, Protective Clothing for Proximity Fire Fighting, NFPA 1973, Gloves, NFPA 1974 Footwear, and NFPA 1972, Helmets for Structural Fire Fighting, NFPA 1500 Fire Department Occupational Safety and Health Program, NFPA 1999, Protective Clothing for Emergency Medical Operations, and NFPA 1581 Fire Department Infection Control Program may be ordered from: NFPA, 1 Batterymarch Park, P.O. Box 9101, Quincy, Massachusetts 02269-9101.

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