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PROTECTIVE CLOTHING FOR STRUCTURAL FIRE FIGHTING 1981

NATIONAL FIRE PROTECTION ASSOCIATION, INC.
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NFPA 1971

Standard on
Protective Clothing for Structural Fire Fighting

1981 Edition

This edition of NFPA 1971, *Standard on Protective Clothing for Structural Fire Fighting*, was prepared by the Technical Committee on Protective Equipment for Fire Fighters, and acted on by the National Fire Protection Association, Inc. on May 19, 1981, at its Annual Meeting in Dallas, Texas. It was issued by the Standards Council with an effective date of July 29, 1981.

The 1981 edition of this standard has been approved by the American National Standards Institute.

Origin and Development of NFPA 1971

The original work on this project was done by the Sectional Committee on Protective Equipment for Fire Fighters that was a part of the Committee on Fire Department Equipment. In 1973, the Sectional Committee released a tentative Standard, NFPA 19A-T, *Tentative Standard on Protective Clothing for Fire Fighters*. The Sectional Committee continued its work, and with the cooperation of the Program for Fire Services Technology of the National Bureau of Standards, developed NFPA 1971, *Standard on Protective Clothing for Structural Fire Fighting*. NFPA 1971 was adopted as a standard at the Fall Meeting in Pittsburgh, Pennsylvania on November 18, 1975.

Since that time, the Sectional Committee was removed from the Committee on Fire Department Equipment, and made a full technical committee.

This 1981 edition of NFPA 1971 represents a complete editorial reworking of the 1975 edition to make the document more usable by both the fire service and protective clothing manufacturers.

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Protective Clothing for Structural Fire Fighting

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates explanatory material on that paragraph in Appendix A.

Information on referenced publications can be found in Appendix B.

Chapter 1 Administration

1-1 Scope. This standard applies to protective clothing for structural fire fighting worn for protection against extremes of temperature, steam, hot water, hot particles, and other hazards encountered during fires and related life saving.

1-2* Purpose. The purpose of this standard is to improve the protection afforded fire fighting personnel by their protective clothing for structural fire fighting. It is intended to serve as a minimum standard for fire officers and others responsible for purchasing or preparing specifications for protective clothing for structural fire fighting personnel. This standard may be referenced in purchase specifications. The standard is not intended to serve as a detailed manufacturing specification. It is prepared, as far as practicable, in terms of required performance, avoiding specifications of materials or designs which would preclude obtaining the desired results by other means.

1-3 Definitions.

1-3.1 Coat. A garment worn to protect the upper part of the human body except the hands and head.

1-3.2* Lining. A material or material assemblage attached to the inside of the outer shell for the purpose of thermal protection and padding.

1-3.3 May. This term is used to state a permissive use or an alternative method to a specified requirement.

1-3.4 Outer Shell. The outside material of the garment, except trim.

1-3.5 Protective Clothing for Structural Fire Fighting. Those garments which are worn by fire fighters in the course of performing fire fighting operations in buildings. The assembled garment consists of an outer shell, vapor barrier, and lining.

1-3.6 Shall. This term indicates a mandatory requirement.

1-3.7 Should. This term as used in Appendix A indicates a recommendation or that which is advised but not required.

1-3.8 Trim. A tape material permanently attached to the outer shell material for visibility enhancement.

1-3.9 Vapor Barrier. That material used to prevent or substantially inhibit the transfer of water, corrosive liquids, and steam and other hot vapors from the outside of the garment to the wearer's body.

1-4 General.

1-4.1 The manufacturer shall furnish a certified statement that protective clothing manufactured by that company for fire fighting personnel meets or exceeds the requirements of applicable tests as set forth in this standard.

1-4.2 Tests are used for comparison of materials or systems in ensuring their compliance with the minimum requirements of this standard and shall not be deemed as establishing performance levels for all fire fighting situations to which fire fighting personnel may be exposed.

1-4.3 Protective clothing shall be flame resistant, durable, lightweight, water resistant, nonirritating to the skin, and cleanable as set forth hereafter in this standard.

1-4.4* Protective clothing for structural fire fighting shall be repaired in accordance with manufacturer's requirements. If protective clothing can not be repaired properly without decreasing the protective qualities, it shall be replaced with new protective clothing.

1-4.5* Protective clothing shall be designed to give minimum interference to physical movement, the use of fire fighting tools and protective breathing apparatus.

1-4.6 Materials used in garment construction shall not shrink more than 10 percent under heat exposures of 500°F (260°C) in a forced air oven for a period of five minutes.

Chapter 2 Requirements for All Protective Clothing

2-1 Stitching.

2-1.1 Seams. Each load-bearing seam, including pockets, their dividers, and the storm flap, shall possess a breaking strength of at least 80 lbs or 80 percent of the outer shell material when tested in accordance with ASTM D 1683, *Standard Method of Test for Seam Breaking Strength (Load) of Woven Textile Fabrics* (with the machine operated at a rate of 12 ± ½ in./min).

2-1.2 Thread. The fiber shall be compatible with the material on which it is used and shall not carbonize at a temperature below 500°F (260°C).

2-2 Outer Shell.

2-2.1* Material.

2-2.1.1* The outer shell shall be fabricated of material meeting the requirements specified in Table 2-2.1.1. All test requirements are applicable after five cycles of laundering and drying in accordance with American Association of Textile Chemists and Colorists (AATCC) Method 96-Test-V-E.

2-2.1.2 The manufacturer shall provide the purchaser with the following information prior to purchase:

(a) A statement of the wearability of the garment.

(b) A statement of the stability of the fabric at high temperatures, showing the effects of temperature exposures up to 500°F (260°C) in a forced air laboratory oven for a period of ten minutes, shall also include temperature/shrinkage curve, tensile strength retention/temperature curve, and an indication of the temperature at which the fabric will char, separate, or melt and drip.

(c) A statement of the fabric's resistance to corrosive substances.

2-2.1.3* The outer shell material shall not char, 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.

Table 2-2.1.1 Outer Shell Requirements

Test method references pertain to Federal Test Method Standard 191, *Textile Test Methods*, unless otherwise indicated.

Characteristics and Test Methods	Requirements
Tearing strength, lb (min) Method 5136, except that the tearing strength of the specimen shall be the average of the five highest peak loads of resistance registered for 3 in. of separation of the tear. (Disregard the first high peak.)	22.0
Color fastness (minimum)	
To light, Method 5660	Good
To laundering, Method 5605 without bleach	Good
To crocking, Method 5651	Good
Shrinkage in laundering	
AATCC Method 96 - Test V-E	
Maximum change in length	± 3%
Maximum change in width	± 3%
Maximum difference between length and width	3%
Water absorption, Method 5500	28% maximum
Flame resistance (including trim)	
Method 5903	
Char length (inches), (max.)	4.0
After flame (seconds), (max.)	2.0

2-2.2 Labels. Each outer shell shall have sewn to the inside, in a location not covered by the lining (e.g., inside front or fly flap), one or more permanent labels stating the following:

(a) Fiber content of the outer shell fabric, to conform with the "Rules and Regulations under the Textile Fiber Products Identification Act."

(b) Size of the garment.

(c) Care instructions, including minimum instructions for washing or cleaning. These instructions shall include instructions for home machine laundering and a cautionary statement if this washing can remove the water repellent treatment.

(d) A warning that the garment is not a proximity or entry suit and should not be kept in direct contact with flames.

2-3 Vapor Barrier.

2-3.1 The vapor barrier shall have a minimum water penetration of 25 psi when tested using Method 5512 of Federal Test Method Standard 191, *Textile Test Methods*.

2-3.2 The vapor barrier shall be insulated from the body.

2-4 Linings.

2-4.1 Material.

2-4.1.1* The linings shall be fabricated of material meeting the requirements specified in Table 2-4.1.1. The test requirements contained therein are applicable after five cycles of laundering and drying in accordance with AATCC Method 96-Test III-E.

2-4.1.2 The manufacturer shall provide the following information to the purchaser on the high temperature stability of the fabric, showing the effects of various temperature exposures up to 500°F (260°C) in a forced air laboratory oven for a period of five minutes:

(a) Temperature/shrinkage curves

(b) Tensile strength retention/temperature curves

(c) An indication of the temperature at which a fabric will char, separate, or melt and drip.

2-4.2 General Configuration and Measurements.

2-4.2.1 The linings shall extend to within 3 in. of the bottom hem of the coat or trousers.

2-4.2.2 The size of the lining shall be compatible with that of the outer shell so they do not buckle, pull, or otherwise restrict body motion, even when the arms are raised directly overhead.

Table 2-4.1.1 Requirements for Linings

Test method references pertain to Federal Test Method Standard 191, *Textile Test Methods*, unless otherwise indicated.

Characteristics and Test Methods	Requirements
Tear strength, Method 5136, except that the tearing strength of the specimen shall be the average of the five highest peak loads of resistance disregarding the first high peak, registered for 3 in. of separation of the tear.	Lining type Single layer composite of vapor barrier and lining (lining next to body); insulation liner in a multiple liner coat Warp — 15 lb, minimum Fill — 10 lb, minimum Separate vapor barrier only Warp — 4 lb, minimum Fill — 3 lb, minimum
Water absorption, Method 5500	40% maximum
Shrinkage in laundering AATCC Method 96-Test III-E, except that for those linings next to the body which do not have the vapor barrier integral to them, the laundering requirement will be in accordance with the washing instructions on the label (5 cycles).	Lining type Single layer composite of vapor barrier and lining (lining next to body); insulation liner in a multiple liner coat Maximum change in length ± 3% Maximum change in width ± 3% Maximum difference between length and width 3% Separate vapor barrier only Maximum change in length ± 5% Maximum change in width ± 5% Maximum difference between length and width 5%
Flame resistance, Method 5903	
Char length, maximum (inches)	4.0
After flame, maximum (seconds)	2.0

2-4.3 Labels. Each lining shall have sewn visibly to the inside, near the neck, one or more permanent labels stating the following:

(a) Fiber content of the lining fabric, to conform with the rules and regulations under the Textile Fiber Products Identification Act.

(b) Size of the coat for which the lining is designed.

(c) Care instructions, including minimum instructions for cleaning or washing. These instructions shall include home and commercial machine laundering instructions.

2-5 Thickness (insulation provision).

2-5.1 The minimum thickness of the assembled garment shall be 0.175 in. when tested using a compressometer with a 3-in. diameter presser foot set at 0.05 psi, following the procedure outlined in ASTM Method D 1777, allowing 5 seconds to lapse between the application of the load and the thickness reading.

2-6 Pockets.

2-6.1* The location, size and number of pockets shall be as agreed upon between buyer and seller.

2-6.2 Pockets shall be reinforced in the two top corners and in flap corners with a series of stitches, forming a bar.

2-6.3 Each outside pocket shall have a flap of at least 3 in. in depth.

2-6.4* The lowest 5 in. of each pocket attached to the exterior of the outer shell shall be reinforced with a double thickness of material meeting the requirements of Table 2-2.1.1.

2-6.5 The pocket shall have two holes at the bottom, a means of drainage for water.

2-7 Fasteners.

2-7.1 All outer surfaces on metal parts shall be nonferrous to avoid sparking and shall be rust resistant.

2-7.2 Hooks and Dees.

2-7.2.1 The hooks and dees shall be nonferrous and shall conform to the general design and dimensions shown in Figure 2-7.2.1. The top hook may be outward facing.

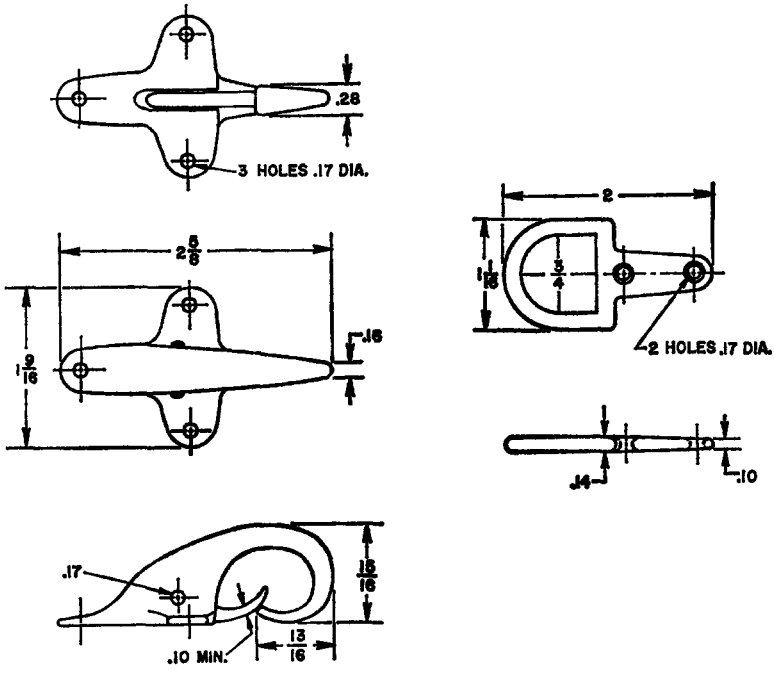

Figure 2-7.2.1 Hook and Dee Ring (inward facing)
(all dimensions in inches)
Although the drawing of the hook shows 3 stays, 4 stays are allowed.

2-7.2.2 The casting shall be sound, smooth, and free from fracture and repair such as impregnations, peening and weld.

2-7.2.3 The commercial finish of the hooks and dees shall be free of any rough spots, burrs, and sharp or rough edges.

2-7.3 Rivets. The rivets shall be $\frac{9}{64}$ in. nominal size and shall meet the requirements of Type XII, Class 3, Grade B of Federal Specification FF-R-556C, Rivet, Solid, Small; Rivet, Split, Small; Rivet, Tubular, Small; Bur, and Cups, Rivet; General Purpose.

Exception: The inside of the rivet shank may be chamfered.

2-7.4 Snap Fasteners. Snap fasteners shall meet the requirements of style 2 of Military Specifications MIL-F-10884D, *Fasteners, Snap.*

2-7.5 Fastener Tape.

2-7.5.1* Fastener tape, hook and pile, used for pockets, collar, and storm flap closures shall meet the requirements of Type II, Class 4, of MIL-F-21840E, *Fastener Tapes, Hook and Pile, Synthetic.*

2-7.5.2 The manufacturer shall provide information to the purchaser, prior to sale, on the high temperature stability of the fastener tape, to include an indication of the temperature at which the fastener tape will char, melt, or shrink, with all results showing the effects of various temperature exposures up to 300°F (149°C) in a forced air laboratory oven for 10 minutes.

Chapter 3 Additional Requirements Only for Protective Coats

3-1 Collar.

3-1.1* The collar shall be snug fitting but comfortable and shall completely cover the neck and throat when in the raised position.

3-1.2 The collar shall provide water penetration protection at least equal to the vapor barrier as specified in 2-3.1.

3-1.3 Throat Strap.

3-1.3.1 A throat strap of at least 3 in. in width shall be sewn to the underside of the collar on the left side and shall be closed by means of hook and pile fastener tape or by a snap fastener.

3-1.3.2 The throat strap shall be held in the stowed position by a piece of hook and pile fastener tape or by a snap fastener.

3-1.3.3 When used, hook and pile fastener tape shall conform to the requirements of 2-7.5.

3-1.3.4 When used, metal fasteners shall not contact the skin when the collar is up and the throat strap is in the closed position.

3-2 Sleeves.

3-2.1* Sleeves shall be attached to the coat so that there is no restriction and the wrist remains covered when the arms are raised above the head.

3-2.2 Wristlets.

3-2.2.1 Each sleeve shall have a suitable and durable wristlet which meets the flame resistance for outer shell material as specified in Table 2-2.1.1.

3-2.2.2 The wristlet ensemble shall be of a configuration such that the material will form a well to collect water below the wristlet when the arm is in the raised position.

3-2.2.3 Wristlet material shall be resilient so that the wristlet will fit snugly but not prohibit donning and will retain its shape for the expected life of the coat.

3-3 Closures.

3-3.1* The front of the coat shall close in a manner which provides secure protection from steam and water when the coat is worn and shall allow freedom for leg movement.

3-4 Hanger Loops.

3-4.1 Unless otherwise specified, a fabric hanger loop shall be provided inside the neck. It shall be designed to provide long service and shall not tear or separate from the coat when the coat is hung up by the hanger loop, loaded evenly with a weight of 80 lbs, and allowed to hang for one minute.

3-5 Attachment of Linings.

3-5.1 Linings shall be securely attached to the outer shell material by stitching in the neck area. Fastener tape meeting the requirements of 2-7.5, or snap fasteners meeting the requirements of 2-7.4, shall secure the remainder of the liner to the front face and wristlet areas of the outer shell.

3-6 Retroreflective Trim.

3-6.1* The coat shall be trimmed with retroreflective fluorescent tape. At least 325 sq in. of trim shall be provided on each coat. Trim configuration shall be as specified by the purchaser and shall include at least the following configuration:

(a) Circumference band on each sleeve near the cuff.

(b) Circumference band around bottom of coat within six in. of the coat hem.

3-6.2 All tape shall be at least two in. wide.

3-7 Weight.

3-7.1* The garments shall be conditioned and weighed at standard atmospheric conditions in accordance with Section 4 of Federal Test Method Standard 191.

3-7.2 The total weight of an assembled coat size 40 with 40 in. back length shall not exceed 7.0 lb when weighed on a scale with an accuracy of ± 0.1 lb.

3-8 Sizing.

3-8.1* The purchaser shall specify chest measurements and back length in purchase specifications for protective coats.

Chapter 4 Additional Requirements Only for Protective Trousers

4-1 General.

4-1.1* Trousers shall be provided with buttons or other holders for suspenders with one set of two buttons provided on each side of the fly on the front of the trousers and one set of two buttons on each side of the center back.

4-1.2 Trousers shall be provided with a fly front. Such fly shall be capable of being fastened and designed so as to remain fastened during all forms of vigorous physical movement.

4-2 Weight.

4-2.1* The garments shall be conditioned and weighed at standard atmospheric conditions in accordance with Section 4 of Federal Test Method Standard 191.

4-2.2 The total weight of an assembled trousers size 36 with 32 in. inseam length shall not exceed 5.0 lb when weighed on a scale with an accuracy of ± 0.1 lb.

4-3 Sizing.

4-3.1* The purchaser shall specify waist measurement. The waist measurement shall be made in a horizontal plane at the top edge of the pelvic bones and over the top of a normally worn belt and trousers. Overlapping allowance for the trouser fly shall be in addition to the waist measurement.

4-3.2* The purchaser shall specify leg length. Leg length shall be the inseam length from the crotch to the bottom of the trouser leg.

Appendix A

This Appendix is not a part of this NFPA standard, but is included for information purposes only.

A-1-2 If referenced in its entirety, care should be taken to specify the particular options which the standard allows, for example, the type of closures, and the size and location of pockets.

A-1-3.2 Any reference to linings in the body of this standard is not intended to 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.

A-1-4.4 Repairs should be accomplished by fire department personnel if proper repair material and equipment are available and repair capabilities have been reviewed by the garment manufacturer. If protective clothing cannot be properly repaired wihtout decreasing the protective qualities, it should be destroyed or otherwise rendered useless to guard against its use at emergency situations.

A-1-4.5 Protective clothing which is uncomfortable to wear or makes the performance of fire fighting actions difficult will cause fire fighters to alter or not wear the protective clothing after a period of time, which increases the likelihood of injury to the involved personnel. Designers of protective clothing should realize that a fire fighter must wear many items of protective clothing or equipment and any interference by one item with another's use may lead to fire ground inefficiency and an unsafe situation. Fire fighter protective clothing and equipment must be designed and worn as a system.

Design Considerations.

(a) *Air Circulation.* Air circulation within the coat is desirable for cooling. Designs which could promote this characteristic would be the use of spacers within the coat, billowing designs at the bottom of the coat, air inlets under the flap in the shoulder area, and air inlets under the arms. The effect of air inlets under the arms, however, appears to be small. Billow designs should not be such as to allow easy entry of flames to the linings of the coat. Belts, it should be noted, serve to increase the heat storage level.

(b) *Impact Resistance.* Striking and being struck by objects are the most frequent causes of injury at a fire and, of these, injuries to the upper extremities are the most numerous. Incorporation of impact protection in the coat by means of padding should be considered highly desirable, provided the weight of the coat is not increased beyond the specified weight requirements, thereby increasing the danger of fatigue and heart strain, the most severe of the various types of injuries.

(c) *Padding.* Consideration should be given by the purchaser to specifying elbow protection for wear resistance and heat protection when crawling. Padding material should meet the requirements of Table 2-4.1.1 and should not melt and drip.

A-2-2.1 Leather. When used to reinforce cuffs, pockets, elbows, and knees leather should be a flesh split cattlehide, suede natural finish, conforming to Type III, Class 2 of Federal Specification KK-L-2004, *Leather, Cattlehide, Deerskin and Horsehide, Chrome Tanned*, except that the shrinkage temperature should not be less than 230°F (110°C) and the requirements for chloroform extract, ash content, chrome oxide, and acidity (pH) should not apply. The thickness of the leather should be not less than 2½ oz nor more than 4½ oz when tested in accordance with Method 1011 of Federal Test Method Standard 311, *Leather, Methods of Sampling and Testing*. The water resistance should be 50 taps when tested in accordance with Method 8121 of Federal Test Method Standard 311.

A-2-2.1.1 The referenced test provides a 203°-212°F (95°-100°C) exposure in a water environment for the materials (outer shell material only).

It is recommended that the coat have a minimum lightness in color. Minimum color visibility should be not less than Munsell Value 7 (43.06%) for CIE source "C" (6774K) when tested in accordance with either American Society for Testing and Materials (ASTM) Method D 1535, *Standard Method of Specifying Color by the Munsell System*, or ASTM E 308, *Standard Recommended Practice for Spectrophotometry and Descriptions of Color in CIE 1931*. This acceptable level of visibility includes most whites and yellow. Of the non-white colors, yellow and yellow green have been found to be highly visible. To continue the benefits of a light color coat, the outer shell should be periodically cleaned. A label with washing instructions is required on the inside of the coat. (See 2-2.2.)

The following information is offered for guidance in the selection of outer shell color.

(a) Light colors assist visibility.

(b) For thermal comfort in sunlight, color has a strong effect on solar heating load, and light colors tend to be best. When the coat is soiled, this effect is reduced.

(c) For radiant heat protection from fires, color has only a small effect on reducing the radiative heating load from fire, and soiled or wet clothing may negate any color effect entirely.

(d) Only special aluminized fabric construction or reflective pigments offer a distinct improvement in reducing the radiative heat load from fires and these only when used on the outside of the outer shell material.

A method which can be used to test the water resistance of the coats is Method 5526, *Water Resistance of Cloth with Hydrophobic Finish; Spray Method*, of Federal Test Method Standard 191, *Textile Test Methods*. A rating of 70 is considered minimum after five washes, using laundering methods described in Table 2-2.1.1.

A-2-2.1.3 The time/temperature requirement for the outer shell material is not intended to establish the limiting working environment for the wearer but is strictly for establishing material performance characteristics.

A-2-4.1.1 Test III-E provides a 140°-149°F (60°-65°C) exposure in a water environment for the materials (lining fabrics only).

A-2-6.1 Pocket Selection. Care should be taken to specify pockets large enough to carry those tools and items normally carried by the intended users. Placement should allow for access to the pockets while wearing breathing apparatus. Specifying ballooned pockets will increase capacity, but may interfere with maneuverability. Ballooning only the back edges may serve to minimize the maneuverability problem. Divided pockets may be desired, as well as pockets for specific items, such as masks and radios. Fastening mechanisms for the mask on the outside of the coat in the area of the left shoulder might also be considered.

A-2-6.4 An optional reinforcement could be leather as outlined in A-2-2.1.

A-2-7.5.1 The ability of the two parts of the fastener tape to remain together when wet should be investigated. The manufacturer should be required to give evidence of the fastener tape's ability to continue to hold under repeated openings and closings.

A-3-1.1 If the material in the collar area of the outer shell is rough, the purchaser may wish to specify that a liner material be used. Such a material could be cotton corduroy (10 wales per inch minimum), moleskin, or other soft material, and should meet the guidelines in Table A-3-1.1 (fabric weight requirements applicable to corduroy only).

Table A-3-1.1

Guidelines for Lining Material Use in Collar

Test method references pertain to Federal Test Method Standard 191, *Textile Test Methods*, unless otherwise indicated.

Characteristics and Test Methods	Requirements
Fabric weight Method 5041	9 oz/yd² minimum*
Breaking strength Method 5100	35 lb minimum in warp and fill
Flame resistance Method 5903	Char length — 4.0 in. max After flame time — 2.0 sec max
Color fastness to perspiration AATCC Method No. 15	
Color change	Class 3.5 or better
Staining	Class 3.5 or better
Shrinkage in laundering AATCC Method No. 96-Test V-E	Results to be reported after 5 laundering cycles
Maximum change in length	±5%
Maximum change in width	±5%
Maximum difference between length and width	5%

Note: All requirements above are also applicable after five cycles of laundering and drying in accordance with American Association of Textile Chemists and Colorists (AATCC) Method 96-Test V-E.

*Applies to corduroy only.

A-3-2.1 An optional reinforcement for the lower part of the sleeve could be leather as outlined in A-2-2.1 or any material which meets the requirements of Table 2-2.1.1. If this option is desired, the purchaser must so state in his specifications.

A-3-3.1 Conventional coat designs utilize a storm flap to provide this protection.

A-3.6.1 The use of fluorescent retroreflective trim material is an important safety feature for fire fighters' outer wear. Information on the high temperature stability of the material to include temperature/shrinkage curves and an indication of the temperature at which the material will char or melt and drip, with all results showing the effects of temperature exposures in a forced air laboratory oven for 10 minutes, should be provided by the manufacturer prior to sale of the garment. (*See flame reistance requirements in Table 2-2.1.1.*)

A possible configuration for striping on the front and back of the coat would be:

(a) Back:

Two 15-in. vertical stripes (separation between vertical stripes should be 15 in.).

(b) Front:

One 30-in. vertical stripe down the center and two 17-in. vertical side stripes (separation between vertical stripes to be approximately 3 in.).

A-3-7.1 The assembled garment includes the required outer shell, vapor barrier, and lining. If a detachable winter liner is provided in addition, it should be removed before conducting this weight test.

A-3-8.1 Chest measurements are made well up under the arms, across the shoulder blades of the individual, with the normal station uniform on. Back length is determined by measuring from the collar base to the coat bottom. In selecting a coat length, consideration should be given to the protection afforded the leg and buttocks area by boots and protective trousers for structural fire fighting. While the coats should be made to allow room for air circulation, in cities with very cold winters it may be desirable to order coats slightly larger than needed to allow room for sweaters or vests, or to specify that an additional detachable liner be added (other than that required by Section 2-4). This additional liner should not be considered an insulation liner for the purpose of meeting the requirements of Section 2-4. The coat should not be of a length which