Tentative Interim Amendment

NFPA® 1970

Standard on Protective Ensembles for Structural and Proximity Firefighting, Work Apparel, Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services, and Personal Alert Safety Systems (PASS)

2025 Edition

Reference: Various paragraphs in Chapters 2, 7, 8, 9, Annex A, and Annex G
TIA 25-5
(SC 24-8-28 / TIA Log #1790)

Note: Text of the TIA was issued and approved for incorporation into the document prior to printing.

1 Delete paragraph 8.1.27 as follows:

~~**8.1.27** Garment outer shells, moisture barriers, and thermal barriers shall be separately evaluated for ease of cleaning where the garment manufacturer or component supplier is required to report the contaminant removal efficiency for semi-volatile organic compounds and heavy metals as specified in Section 9.9.4, Flame Resistance Following Fuel Exposure and Cleaning Test.~~

2. Add a new paragraph 8.2.8 to read as follows:

8.2.8 Where the garment manufacturer or component supplier is required to report the contaminant removal efficiency for semivolatile organic compounds and heavy metals in the user information, outer shells, moisture barriers, and thermal barriers shall be evaluated for ease of cleaning as specified in 9.9.3, Contamination Removal Efficiency Tests.

3. Delete paragraph 8.4.17 as follows:

~~**8.4.17** Helmet ear cover materials, suspension system materials, and retention system materials that come in contact with the wearer's head or neck without a protective hood shall be evaluated for ease of cleaning where the helmet manufacturer or component supplier is required to report the contaminant removal efficiency for semi-volatile organic compounds and heavy metals as specified in Section 9.9.3, Contamination Removal Efficiency Tests.~~

4. Add a new paragraph 8.5.11 to read as follows:

8.5.11 Where the helmet manufacturer or component supplier is required to report the contaminant removal efficiency for semivolatile organic compounds and heavy metals in the user information, helmet ear cover materials, textile-based suspension system materials, and textile-based retention system materials that come in contact with the wearer's head or neck without a protective hood shall be evaluated for ease of cleaning as specified in 9.9.3, Contamination Removal Efficiency Tests.

5. Revise paragraphs 8.7.6, 8.7.7, and 8.7.8 to read as follows:

8.7.6 The glove body composite, including, but not limited to, trim, external labels, external nonvisual/machine-readable tags, and external tags, but excluding hardware, and excluding hook and pile fasteners that do not directly contact the wearer's body, shall be tested for resistance to flame as specified in ~~8.4~~9.2.17, Flame Resistance Test 3, and shall not have an average char length of more than 100 mm (4 in.), shall not have an average afterflame of more than 2.0 seconds, shall not melt or drip, and shall not have the amount of consumed materials exceed 5 percent.

8.7.7 The glove interface component composite, including, but not limited to, trim, external labels, external nonvisual/machine-readable tags, and external tags, but excluding hardware and hook and pile fasteners that do not directly contact the wearer's body, shall be tested for resistance to flame as specified in ~~9.4~~9.2.17, Flame Resistance Test 3, and shall not have an average char length of more than 100 mm (4 in.), shall not have an average afterflame of more than 2.0 seconds, shall not melt or drip, and shall not have the amount of consumed materials exceed 5 percent.
8.7.8 The glove extension composite, including, but not limited to, trim, external labels, ~~and external tags,~~ external nonvisual/machine-readable tags, and external tags, but excluding hardware and hook and pile fasteners that do not directly contact the wearer's body, shall be tested for resistance to flame as specified in ~~Section~~ 9.2.17, Flame Resistance ~~Test 4~~Test 3, and shall not have an average char length of more than 100 mm (4 in.), shall not have an average afterflame of more than 2.0 seconds, shall not melt or drip, and shall not have the amount of consumed materials exceed 5 percent.

6. Add new section 9.2.17 to read as follows:

9.2.17 Flame Resistance Test 3.

9.2.17.1 Application.

This test method shall apply to the protective glove body, glove interface components, and glove extension composites.

9.2.17.2 Samples.

9.2.17.2.1 Samples shall be prepared for each glove body composite, each glove interface component, and each glove extension composite.

9.2.17.2.2 Samples for conditioning other than wristlets shall be prepared pouches as described in 9.1.14.

9.2.17.2.3 Wristlet samples shall consist of wristlet material.

9.2.17.2.4 Samples other than wristlets shall be conditioned as specified in 9.1.12 followed by the conditioning specified in 9.1.3.

9.2.17.2.5 Wristlet samples shall be conditioned as specified in 9.1.2, followed by the conditioning specified in 9.1.3.

9.2.17.2.6 Separate samples shall be conditioned as specified in 9.1.3 only.

9.2.17.3 Specimens.

9.2.17.3.1 After conditioning, the necessary stitching shall be cut to form 50 mm × 150 mm (2 in. × 6 in.) specimens for testing.

9.2.17.3.2 Three specimens shall be tested after the conditioning specified in 9.2.17.2.4 for other than wristlet samples or 9.2.17.2.5 for wristlet samples of.

9.2.17.3.3 Three additional specimens shall be tested after the conditioning specified in 9.2.17.2.6.

9.2.17.4 Apparatus.

9.2.17.4.1 The test apparatus specified in Method 5905.1, *Flame Resistance of Material; High Heat Flux Flame Contact*, of Federal Test Method Standard 191A, *Textile Test Methods*, shall be used.

9.2.17.4.2 A freestanding flame height indicator shall be used to assist in adjusting the burner flame height.

9.2.17.4.2.1 The flame height indicator shall mark a flame height of 75 mm (3 in.) above the top of the burner.

9.2.17.4.3 A specimen support assembly shall be used that consists of a frame and steel rod of 2 mm (1/16 in.) in diameter to support the specimen in an L-shaped position as shown in Figure 9.2.17.4.3.

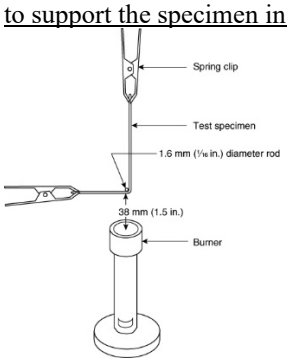


Figure 9.2.17.4.3 Relationship of Test Material to Burner.

9.2.17.4.4 The horizontal portion of the specimen shall be not less than 50 mm (2 in.).

9.2.17.4.5 The vertical portion of the specimen shall be not less than 100 mm (4 in.).

9.2.17.4.6 The specimen shall be held at each end by spring clips under light tension as shown in Figure 9.2.17.4.3.

9.2.17.5 Procedure.

9.2.17.5.1 A balance shall be used to determine the weight of each specimen to the nearest 0.1 g (0.04 oz) before and after testing.

9.2.17.5.2 The burner shall be ignited.

9.2.17.5.2.1 The test flame shall be adjusted to a height of 75 mm (3 in.) with the gas on/off valve fully open and the air supply completely and permanently off, as it is important that the flame height be closely controlled.

9.2.17.5.2.2 The 75 mm (3 in.) height shall be obtained by adjusting the orifice in the bottom of the burner so that the top of the flame is level with the marked flame height indicator.

9.2.17.5.3 With the specimen mounted in the support assembly, the burner shall be moved so that the middle of the folded corner projects into the flame 38 mm ($1\frac{1}{2}$ in.) as shown in Figure 9.2.17.4.3.
9.2.17.5.4 The burner flame shall be applied to the specimen for 12 seconds.
9.2.17.5.4.1 After 12 seconds, the burner shall be removed.
9.2.17.5.5 The afterflame time shall be measured as the time, in seconds, to the nearest 0.2 second that the specimen continues to flame after the burner is removed from the flame.
9.2.17.5.6 Each layer of the specimen shall be examined for melting or dripping.
9.2.17.5.7 Each tested sample shall be reconditioned as specified in 9.1.3 and then weighed to the nearest 0.1 g (0.04 oz).
9.2.17.5.8 The specimen then shall be further examined for char length.
9.2.17.5.8.1 The char length shall be determined by measuring the length of the tear through the center of the charred area as specified in 9.2.17.5.8.2 through 9.2.17.5.8.7.
9.2.17.5.8.2 The specimen shall be folded lengthwise and creased, by hand, along a line through the highest peak of the charred area.
9.2.17.5.8.3 The hook shall be inserted into a hole punched in the specimen in accordance with the following:
(1) The hole shall be 6 mm (1⁄4 in.) in diameter or less.
(2) The hole shall be punched out for the hook at one side of the charred area that is 6 mm (1⁄4 in.) from the adjacent outside edge, at the point where the specimen contacted the steel rod, and 6 mm (1⁄4 in.) away from the point where the specimen contacted the steel rod in the 101 mm (4 in.) direction as shown in Figure 9.2.17.5.8.3(2).

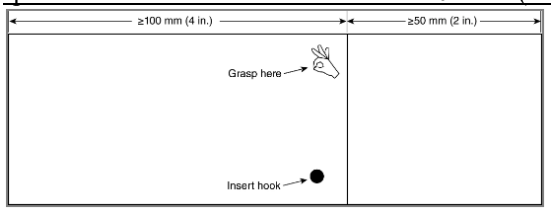


Figure 9.2.17.5.8.3(2) Position of Hole and Side to Grasp for Determining Char Length.
9.2.17.5.8.4 A weight shall be attached to the hook so that the weight and hook together equal the total tearing weight required by Table 9.2.17.5.8.4 based on the weight of the composite specimen.
Table 9.2.17.5.8.4 Determination of Tearing Weight

Specified Weight per Square Yard of Material Before Any Fire-Retardant Treatment or Coating		Total Tearing Weight for Determining Charred Length	
g/m^2	oz/yd^2	kg	lb
68–203	2.0–6.0	0.1	1⁄4
>203–508	>6.0–15.0	0.2	1⁄2
>508–780	>15.0–23.0	0.3	3⁄4
>780	>23.0	0.45	1

9.2.17.5.8.5 A tearing force shall be applied gently to the specimen by grasping the side of the material at the edge of the char opposite the load as shown in Figure 9.2.17.5.8.3(2) and raising the specimen and weight clear of the supporting surface.
9.2.17.5.8.6 The end of the tear shall be marked off on the edge.
9.2.17.5.8.7 The char length measurement shall be made along the undamaged edge.
9.2.17.6 Report.
9.2.17.6.1 The afterflame time and char length shall be recorded and reported for each specimen.
9.2.17.6.1.1 The average afterflame time and char length shall be calculated, recorded, and reported.
9.2.17.6.1.2 The afterflame time shall be recorded and reported to the nearest 0.2 second.
9.2.17.6.1.3 The char length shall be recorded and reported to the nearest 2.5 mm (0.10 in.).
9.2.17.6.2 The percent consumed shall be calculated using the following formula:

$$\text{Percent consumed} = \frac{W - R}{W} \times 100 \qquad \textbf{[9.2.17.6.2]}$$

where:
W = original conditioned weight
R = conditioned weight 24 hours after testing
9.2.17.6.2.1 The percent consumed shall be recorded and reported for each specimen to the nearest 0.1 percent.
9.2.17.6.2.2 The average percent consumed shall be calculated, recorded, and reported to the nearest 0.1 percent.
9.2.17.6.3 Observations of melting or dripping for each specimen shall be recorded and reported.

9.2.17.7 Interpretation. Pass or fail performance shall be based on melting or dripping, the average afterflame time, and the average char length.

7. Revise 2.3.5, delete section 9.2.17 in its entirety, revise Table A.9.1(c) and Table A.9.1(h), and revise G.3.4.5:

2.3.5 ASTM Publications.

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~~ASTM D1835, *Standard Specification for Liquified Petroleum (LP) Gases*, 2020.~~

~~**9.2.17 Small Scale Flash Fire Exposure Test**~~

[Delete this entire test method including Figure 9.2.17.4.1, Figure 9.2.17.4.1.5(A), and Figure 9.2.17.4.4.1]

Table A.9.1(c) Testing of Structural Firefighting Gloves

		Test Material or Component						Test Conditioning			
Test	Section Number	Whole Glove	Glove Composite	Glove Lining	Glove Gauntlet	Glove Wristlet	Thread Hardware	Room Temp[a]	Washing/Drying[b]	Convective Heat[c]	Wet[d] Flex[e]
Flame resistance test 3	9.2.17	X						X	X		

Table A.9.1(h) Testing of Proximity Firefighting Gloves

		Test Material or Component						Test Conditioning			
Test	Section Number	Whole Glove	Glove Composite	Glove Lining	Glove Gauntlet	Glove Wristlet	Thread Hardware	Room Temp[a]	Washing/Drying[b]	Convective Heat[c]	Wet[d] Flex[e]
Flame resistance test 3	9.2.17	X						X	X		

G.3.4.5 Procedure. Testing should follow the procedures identified in ASTM F2370, *Standard Test Method for Measuring the Evaporative Resistance of Clothing Using a Sweating Manikin*, with the following modifications:

~~(1) Instead of a full-sized manikin, only use the hand manikin specified in 9.2.17.4.~~

(1~~2~~) Use a 1 m/s wind flow to measure the evaporative resistance.

(2~~3~~) The calculation for the parallel evaporative resistance value for the hand should only include the fingers, thumb, palm, and back. The wrist area should not be included in the calculation.

(3~~4~~) When a specimen does not cover the entire wrist, this area should be covered to limit evaporation and excessive heating in that area of the hand.

(4~~5~~) If steady state values cannot be achieved within a 2*1⁄2* hour period and evaporative resistance values are higher than 300 $Pa \cdot m^2/W$, the glove can be labeled with a greater than 300 $Pa \cdot m^2/W$ evaporative resistance value.

8. Revise paragraph 9.1.5 to read as follows:

9.1.5 Convective Heat Conditioning Procedure for Helmets, Faceshield/Goggle Components, Gloves, Footwear, Moisture Barriers, Moisture Barrier Seams, Labels, Particulate Blocking Layer(s), ~~and~~ Trim, and Outer Shells. Samples shall be conditioned by exposing them to the procedures specified in 9.2.4.4 and 9.2.4.5.2 through 9.2.4.5.3, with the following modifications:

(1) The oven temperature shall be stabilized at 140°C, +6/−0°C (285°F, +10°/−0°F), ~~for helmets, footwear, moisture barriers, moisture barrier seams, labels, particulate blocking layer(s), trim, and outer shells for testing in accordance with 9.1.12,~~ and the test exposure time shall be 10 minutes, +15/−0 seconds~~.~~, for the following:

(a) Helmets

(b) Footwear

(c) Moisture barriers

(d) Moisture barrier seams

(e) Labels

(f) Particulate blocking layers

(g) Trim

(h) Outer shells for conditioning in accordance with 9.1.21

…

9. Revise paragraph 8.13.11 to read as follows:

~~**8.13.11**~~ **8.14.4** Where the hood manufacturer is required to report the contaminant removal efficiency for semivolatile organic compounds and heavy metals in the user information, ~~H~~hood composites shall be evaluated for ease of cleaning as specified in ~~Section~~ 9.9.3, Contamination Removal Efficiency Tests~~, where the hood manufacturer is required to report the contaminant removal efficiency for semivolatile organic compounds and heavy metals in the user information~~.

10. Revise Table 9.1.12.3(a), and paragraph 9.1.12.5 to read as follows:

9.1.12.3 The wash cycle procedure and water levels specified in Table 9.1.12.3(a) and Table 9.1.12.3(b) shall be followed. In addition, the *g* force shall not exceed 125 *g* throughout the wash cycle.

Table 9.1.12.3(a) Front-Loading Wash Cycle

Operation	Time (min)	Temperature ±3°C	Temperature ±5°F	Water Level
Suds using AATCC detergent #1993 without optical brighteners, 1.0 g/gal ±1% water	10	~~60~~49	~~140~~120	Low*
Drain	1	—	—	—
Carryover	5	~~60~~49	~~140~~120	Low*
Drain	1	—	—	—
Rinse	2	~~Unheated~~38	~~Unheated~~100	High*
Drain	1	—	—	—
Rinse	2	~~Unheated~~38	~~Unheated~~100	High*
Drain	1	—	—	—
Rinse	2	~~Unheated~~38	~~Unheated~~100	High*
Drain	1	—	—	—
Extract	5	—	—	—

*See Table 9.1.2.3(b) for high and low water levels.

Table 9.1.12.3(b) Water Level for Front-Loading Wash Cycle Procedure

Low Water Level ±1 cm (3⁄8 in.)		High Water Level ±1 cm (3⁄8 in.)	
cm	**in.**	**cm**	**in.**
12.7	5.0	25.4	10.0

9.1.12.5 Samples shall be tumbled ~~until dry~~ for 60 minutes and shall be removed immediately at the end of the drying cycle. At the conclusion of the final drying cycle, the garment samples shall be allowed to air dry for at least 48 hours prior to conducting the test and the use of a forced-air dryer operated at ambient temperature, −0°+ 5°C (−0°+ 10°F) shall be permitted.

11. Revise paragraph 9.1.18.4 and add new associated Annex A.9.1.18.4 and new Figures A.9.1.18.4(a) and (b) to read as follows:

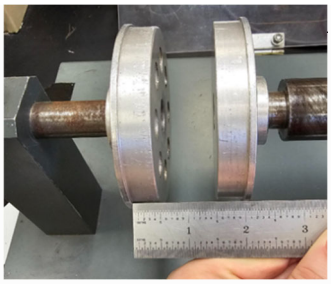
9.1.18.4* The mandrels shall be spaced at a distance of ~~235~~204 mm ± 6 mm (~~9 1/4~~8 in. ± 1⁄4 in.) in the starting position and ~~83~~50 mm (~~3 1/4~~2 in.) at the closed position when measured from the back sample holding area of each mandrel.

A.9.1.18.4 The mandrel spacing should be measured according to Figure A.9.1.18.4(a) and Figure A.9.1.18.4(b).

Figure A.9.1.18.4(a) Mandrel Starting Position.



Figure A.9.1.18.4(b) Mandrel Closed Position.



12. Revise paragraph 9.1.21.2 to read as follows:

9.1.21.2 ~~Composite~~Outer shell samples shall be subject to the various conditions in the following order:
(1) Outer shell samples shall be laundered a total of 20 laundering cycles as specified in ~~9.1.12~~ 9.1.2.
(2) Outer shell samples shall be subjected to convective heat conditioning procedures as specified in 9.1.5.
(3) Outer shell samples shall be conditioned for a minimum of 4 hours as specified in 9.1.3.
~~(3)~~(4) ~~Composite~~ Outer shell samples shall be subject to repeated flexing for 3000 cycles as specified in ~~9.1.3~~ 9.1.18.
~~(4)~~(5) Outer shell specimens for testing shall be taken so that one warp and one fill specimen is cut from the center of the conditioned samples.

13. Delete paragraph 9.2.4.4.1 as follows:

~~**9.2.4.4.1** The specific holder for footwear shall provide the following mounting and positioning of the specimen:~~
~~(1) The toe shall be at an angle of 7.5 degrees ± 2.5 degrees, above the heel.~~
~~(2) The height of the lowest edge of the specimen shall be 305 mm ± 25 mm (12 in. ± 1 in.) from the surface of the water and n-heptane fluid as measured before ignition.~~
~~(3) The heel-toe axis of the specimen shall be parallel with the 457 mm (18 in.) side of the fuel pan.~~

14. Revise paragraph 9.2.4.8 heading only to read as follows:

9.2.4.8 Specific Requirements for Testing Garment Outer Shell~~, Moisture Barrier~~, Thermal Liner, Winter Liner Materials, Helmet Ear Cover, Helmet Shrouds, Helmet Covers, and Glove Lining Materials.

15. Revise 9.2.4.9.1.2 to read as follows:

9.2.4.9.1.2 Where samples are prepared for evaluating the moisture barrier material only, marks shall be placed on the moisture barrier at ~~305~~250 mm (~~12~~10 in.) intervals on the moisture barrier layer for the post-oven exposure assessment of moisture barrier shrinkage.

16. Revise 9.2.4.14.13 to read as follows:

9.2.4.14.13 After flexing, the footwear specimen shall be marked with a water height line on the exterior at a height of 75 mm (3 in.) below the height of the boot as defined in 7.10.3.1 but no lower than 225 mm (8.86 in.) ~~25 mm (1 in.) lower than the minimum height for the size of the footwear specimen being tested~~ where measured up from the center of the insole at the heel as specified in 9.1.22.

17. Revise 9.2.7.7.2 to read as follows:

9.2.7.7.2 For glove body composites, specimens for conditioning shall be in the form of a pouch as described in 9.1.14 ~~9.1.15~~.

18. Revise 9.2.15.9.4 and 9.2.15.9.5 to read as follows:

9.2.15.9.4 One set of specimens shall be preconditioned ~~by uniformly applying 3.4 grams ± 0.2 grams of water to the innermost layer of the composite and be tested within 2 minutes after preconditioning.~~ as specified in 9.1.9 with the following modifications:
(1) The volume of water applied shall be 3.4 grams ± 0.2 grams.
(2) The water shall be applied to the innermost layer of the composite and be tested within 2 minutes after preconditioning.
9.2.15.9.4.1 A second set of specimens shall be tested in a dry condition.
9.2.15.9.5 Transmitted and stored thermal energy testing shall be conducted in accordance with Procedure B of ASTM F2731, *Standard Test Method for Measuring the Transmitted and Stored Thermal Energy of Firefighter Protective Clothing Systems*, with the following modifications:
(1) The upper mounting plate shall be replaced with an alternate upper mounting plate whose thickness shall not exceed 3 mm (1/8 in.). Alternate methods meeting the minimum thickness requirements shall be permitted to be used to achieve specimen mounting. ~~Testing shall be conducted without the use of the 6 mm (1/4 in.) spacer.~~
(2) The exposure time shall be for a period of 120 seconds, + 1/– 0 seconds, or until a time to predicted second-degree burn is achieved up to 240 seconds. No compression period shall be used for this testing.

19. Add new 7.1.15 and 7.1.16 and delete 9.2.10.2.1.1 and 9.2.10.2.1.2 to read as follows:

7.1.15 The shoulder areas shall consist of reinforcement composite meeting the requirements of 8.1.9.

7.1.15.1 The composite shall be at least 100 mm (4 in.) wide on the crown of each shoulder as defined in 7.1.15.3.

7.1.15.2 The composite shall extend down from the crown, as defined in 7.1.15.3, on both the front and back of the garment by at least 50 mm (2 in.).

7.1.15.3 The crown of the shoulder shall be the uppermost line of the shoulder when the garment is lying flat on an inspection surface with all closures fastened.

7.1.16 The knee areas shall consist of reinforcement composite meeting the requirements of 8.1.9.

7.1.16.1 The composite shall measure at least 150 mm × 150 mm (6 in. × 6 in.).

~~**9.2.10.2.1.1** Samples of garment shoulder areas shall be representative of the area in the actual garment that measures at least 100 mm (4 in.) along the crown of the shoulder and extending down from the crown on both the front and back of the garment at least 50 mm (2 in.). The crown of the shoulder shall be the uppermost line of the shoulder when the garment is lying flat on an inspection surface with all closures fastened.~~

~~**9.2.10.2.1.2** Samples of garment knee areas shall be representative of the knee area in the actual garment that measures at least 150 mm × 150 mm (6 in. × 6 in.).~~

20. Revise 9.3.1.2.4 to read as follows:

9.3.1.2.4 Separate outer shell samples shall be tested after being conditioned as specified in ~~9.1.22~~ 9.1.21.

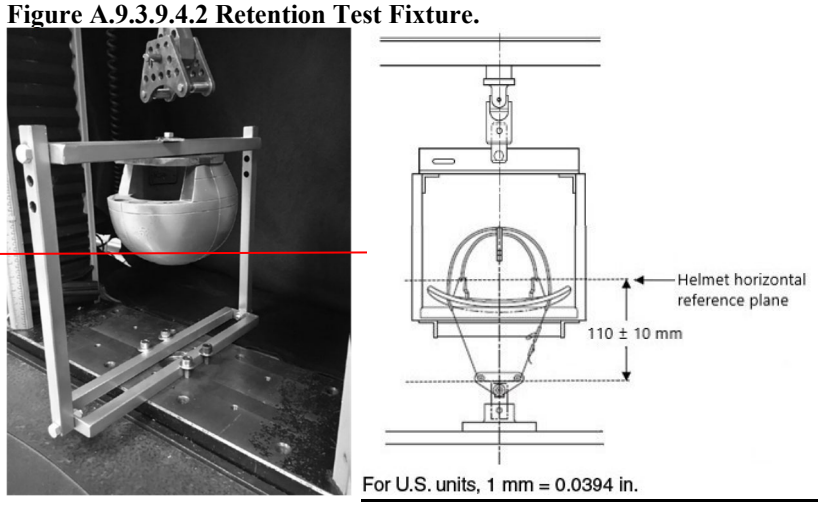
21. Revise 9.3.8.4.1, 9.3.9.4.1, A.9.3.9.4.2, Figure A.9.3.9.4.2, and A.9.3.9.5.4 to read as follows:

9.3.8.4.1* The shell retention test fixtures shall consist of rigid material of sufficient thickness to facilitate firm attachment of the helmet shell while attached to a ~~the chinstrap~~ tensile testing machine ~~specified in 9.3.10.4.1~~.

9.3.9.4.1 The chin strap elongation test fixture shall consist of rigid material to facilitate firm attachment of the helmet assembly while attached to a ~~the chinstrap~~ tensile testing machine specified in 9.3.8.4.1 ~~9.3.10.4.1~~.

A.9.3.9.4.2 Figure A.9.3.9.4.2 represents an example of an appropriate retention test fixture. Other appropriate test fixtures might be used.

Figure A.9.3.9.4.2 Retention Test Fixture.



A.9.3.9.5.4 The retention system test is measuring vertical movement. When applying the load, the helmet could shift from its original horizontal plane position. If this occurs, the helmet should be secured in such a manner that the horizontal plane position is maintained, but the vertical movement is not influenced. ~~For example, this could be accomplished with a securing mechanism for the brim that moves vertically with the helmet.~~

22. Revise 2.3.5 and 9.3.19.4.1 to read as follows:

2.3.5 ASTM Publications.

…

ASTM D5034, Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test), 2021.

ASTM D5035, *Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)*, 2011, reapproved 2019.

…

9.3.19.4.1 Fastener tape breaking strength shall be measured in accordance with ASTM ~~D5034~~ D5035, *Standard Test Method for Breaking ~~Strength~~Force and Elongation of Textile Fabrics (~~Grab Test~~Strip Method),* with the following modifications:
(1) Specimens shall be tested in the provided width only in lieu of the specified 100 mm (3.9 in.) width.
(2) Only specimens parallel to the length of the tape shall be tested.

23. Revise paragraph 9.4.2.4.1 to read as follows:
9.4.2.4.1 Specimens shall be tested at 172 kPa (25 psi) in accordance with ASTM D751, *Standard Test ~~Method~~ Methods for Coated Fabrics,* Hydrostatic Resistance, Procedure A — Mullen Type Tester.

24. Revise paragraph 9.7.2.2 to read as follows:
9.7.2.2 Samples. Samples shall be conditioned as specified in 9.1.3~~at a temperature of 35°C ± 2°C and a relative humidity of 40 percent ± 5 percent~~ for at least 4 hours.

25. Revise paragraphs 8.5.4 and 8.6.10, and revise 9.8.2 (section title only) to read as follows:
8.5.4 Faceshield/goggle component lenses shall be tested for transmittance of light as specified in ~~Section~~ 9.8.2, Faceshield/Goggle Component Lens ~~Trim~~ Luminous (Visible) Transmittance Test, and shall have clear lenses transmit a minimum of 85 percent of the incident visible radiation, and shall have colored lenses transmit a minimum of 43 percent of the incident visible radiation.

8.6.10 Helmet faceshield component lenses shall be tested for transmittance of light as specified in ~~Section~~ 9.8.2, Faceshield/Goggle Component Lens ~~Trim~~ Luminous (Visible) Transmittance Test, and shall transmit not less than 30 percent of the incident visible radiation.

9.8.2 Faceshield/Goggle Component Lens ~~Trim~~ Luminous (Visible) Transmittance Test.

26. Revise paragraph 9.8.11.4.3.3 to read as follows:
9.8.11.4.3.3* The SCBA facepiece shall be sized to fit the test technician and be obscured according to the following:
(1) An adhesive vinyl shall be adhered to the external side of the viewing area of the facepiece.
(2) The vinyl shall be hazed so that there is a maximum of 71 percent blackout and a minimum of 50 percent blackout.
(3) The vinyl shall cover enough of the viewing area so that the test technician cannot perform the test without looking through the blackout area.

27. Revise paragraph 9.8.11.4.4 to read as follows:
9.8.11.4.4 One particulate-blocking hood certified as compliant with this standard shall be provided.

28. Revise paragraph 9.8.12.4.1.1 to read as follows:
9.8.12.4.1.1 Specimens shall be subjected to ten cycles of laundering and drying using Machine Cycle 1, Wash Temperature V, and Drying Procedure Ai of AATCC LP1 ~~TM 135~~, *Home Laundering: Machine Washing ~~Test Method for Dimensional Changes of Fabrics after Home Laundering~~*.

29. Revise paragraphs 9.8.12.11.1 through 9.8.12.11.6 to read as follows:
9.8.12.11 Specific Requirements for Testing Nonvisual/Machine-Readable Tags.
9.8.12.11.1 Garment, hood, and glove n~~N~~onvisual/machine-readable tags shall be tested to 9.8.12.4.1 and 9.8.12.4.3 only.
9.8.12.11.1.1 Footwear nonvisual/machine-readable tags shall be tested to 9.8.12.4.3 only.
9.8.12.11.2 For testing after laundering, garment specimens shall include tags attached to a 1 m^2 (1 yd^2) square of ballast material no closer than 51 mm (2 in.) apart in parallel strips. The ballast material shall be a material that meets the outer shell requirements of this standard.
9.8.12.11.2.1 For testing after laundering, hood specimens shall include complete hoods with tags attached.
9.8.12.11.2.2 For testing after laundering, glove specimens shall include complete gloves with tags attached.
(A) For the drying cycles of the laundering durability test specified in 9.8.12.4.1.1, gloves shall be tumble dried for 60 minutes and removed immediately at the end of the drying cycle.
(B) At the conclusion of the final drying cycle, the gloves shall be direct dried on a forced-air, non-tumble-drying mechanism operated at 10°C ± 5°C (18°F ± 9°F) above current room temperature for at least 8 hours and until dry.
9.8.12.11.3 For testing after convective heat exposure, garment specimens shall include tags attached to a separate 380 mm ± 13 mm (15 in. ± 1⁄2 in.) square of material that meets the outer shell requirements of this standard.
9.8.12.11.3.1 For testing after convective heat exposure, hood specimens shall include tags attached to a separate 380 mm ± 13 mm (15 in. ± 1⁄2 in.) square of hood material that meets the hood material requirements of this standard.
9.8.12.11.3.2 For testing after convective heat exposure, glove specimens shall include complete gloves with tags attached.

9.8.12.11.3.3 For testing after convective heat exposure, footwear specimens shall include complete footwear items with tags attached or representative sections of the footwear with tags attached.
9.8.12.11.4 Sample conditioning shall be the same conditioning as specified for the respective tests.
9.8.12.11.5 Garment, hood, and glove s~~S~~pecimens shall be tested separately for functionality after laundering and heat durability tests as specified in 9.8.12.4.1 and 9.8.12.4.3, respectively.
9.8.12.11.5.1 Footwear specimens shall be tested separately for functionality after the heat durability test as specified in 9.8.12.4.3 only.
9.8.12.11.6 Specimens shall be tested for functionality within 15 minutes of removal of the respective conditioning.

30. Revise paragraphs 9.8.1.4.1, 9.9.3.2, and 9.11.2.3 to read as follows:
9.9.1.4.1 Specimens shall be tested using five cycles of the laundering procedure in 9.1.2~~9.1.12~~.

9.9.3.2 Sample Preparation. Garment, helmet, and hood samples shall be subject to five cycles of laundering conditioning as specified in 9.1.2~~9.1.12~~.

9.11.2.3 Moisture barrier material and moisture barrier seam specimens shall be tested after being twice subjected to the following conditioning process:
(1) Specimens shall be subjected to the procedure specified in 9.1.2~~9.1.12~~.
(2) Specimens shall be conditioned as specified in 9.1.3.
(3) Specimens shall be conditioned as specified in 9.1.5.
(4) Specimens shall be conditioned at a temperature of 21°C ± 3°C (70°F ± 5°F) and at a relative humidity of 65 percent ± 5 percent for at least 4 hours.

31. Revise paragraph 9.11.2.2 to read as follows:
9.11.2.2 A minimum of six samples ~~shall be prepared~~ for each moisture barrier material and a minimum of ~~three~~ six samples for each moisture barrier seam shall be prepared.

32. Revise Annex A.9.4.3.4.2 to read as follows:
A.9.4.3.4.2 The list of common fireground chemicals is intended to provide a number of substances to which firefighters might be exposed during ordinary fireground and other emergency operations. It is not intended to be an all-inclusive list of hazardous liquids to which firefighters might be exposed while wearing protective clothing.
~~In 2015, the list was reviewed by a task group of the NFPA Technical Committee on Structural and Proximity Fire Fighting Protective Clothing and Equipment. The investigation involved a review of information indicating differences in the effect of hydraulic fluid on moisture barrier materials; an examination of the types of hydraulic fluids used throughout industry, including those in fire service tools; and a detailed survey with more than 1500 responses that addressed fire service member exposure to different liquids on the fireground, including hydraulic fluid. These findings, including the survey results, are captured in supplemental material that was made available to NFPA. As a result of this investigation, it was concluded that different types of fire-resistant hydraulic fluid are still in use throughout a variety of industries, and that some of these hydraulic fluids contain low molecular weight phosphate esters. It was further concluded that most gasoline contains ethanol, and that antifreeze fluid, which predominantly contains ethylene glycol, is frequently encountered and should be added to the list of the original five fireground liquid chemicals.~~
The list of chemicals is used in the evaluation of the liquid penetration resistance of moisture barriers provided in structural and proximity firefighting protective ensemble elements with the objective that moisture barrier materials and seams should not allow the penetration of these liquids through the element onto the firefighter's skin. This penetration might occur as the result of the liquid causing degradation of the moisture barrier material or seam. In some cases, such as in glove and footwear elements, it might not be possible to inspect the moisture barrier.

33. Revise paragraph 9.9.3.4 to read as follows:
9.9.3.4 Procedure. Specimens shall be evaluated for cleaning efficiency in removing semivolatile organic compounds and for cleaning efficiency in removing heavy metals in accordance with Sections 12.6 and 12.7, respectively, of NFPA 1851 with the following modifications:
(1) For garment and helmet material specimens, the subject material shall be contaminated on the normal exterior side of the respective material.
(2) For hood composites, the subject composite specimen shall be contaminated on the exterior side of the composite of the whole hood specimen.
(3) For garment materials, specimens shall be placed in the surrogate garment for carrying out advanced cleaning as specified in Section 12.9 of NFPA 1851.
(4) Ballast material as specified in Section 12.4.4.3 of NFPA 1851 shall conform only to Panel F specifications that measure 229 mm × 750 mm (9 in. × 29.5 in.)
(5) For helmet materials and hood composite specimens, specimens shall be attached by a safety pin or similar device to individual ballast material panels.

(6) Garment outer shell, garment moisture barrier, garment thermal barrier, hood composite, and helmet specimens shall be subject to ~~a single advanced cleaning using the washer extractor formulation specified in A.7.3.9(5)(a) of NFPA 1851, with 3.8 L (1.0 gal) AATCC liquid detergent per 3.8 L (1.0 gal) of wash water.~~ one cycle of washing and drying as specified in 9.1.12 with the following modifications:

(a) If ballast is needed to reach load capacity, ballast as specified in 12.4.4.3 of NFPA 1851 shall be used.

(b) High efficiency (HE) standard reference liquid detergent without optical brighteners at a ratio of 38 mL per 3.8 L ± 1 percent of water shall be used.

(c) Air drying and forced-air drying as specified in 9.1.12.5 shall not be permitted.

(d) Specimens shall be washed and dried for a total of one cycle.

~~(7) Garment moisture barrier, garment thermal barrier, and hood composite specimens shall be subject to a single advanced cleaning using washer extractor formulation specified in A.7.3.9(5)(b) of NFPA 1851, with 3.8 L (1.0 gal) AATCC liquid detergent per 3.8 L (1.0 gal) of wash water.~~

34. Revise paragraphs 9.1.18.2, 9.2.4.3.3, 9.2.7.3.2, 9.2.7.3.3, 9.2.10.3.2, 9.2.14.3.5, 9.2.14.3.6, 9.2.15.8.2, 9.2.15.8.3, 9.2.16.3.3, 9.2.16.3.4, 9.7.1.3.3, and 9.7.1.3.4 to read as follows:

9.1.18.2 Samples shall be flexed within 4 hours of removal of the conditions specified in 9.1.21.2(3) ~~at 21°C ± 3°C (70°F ± 5°F) and a relative humidity of 65 percent ± 5 percent~~.

9.2.4.3.3 The unit area weight of materials specified in 9.2.4.3.2 shall be measured in accordance with the method in ASTM D3776/D3776M, *Standard Test Methods for Mass Per Unit Area (Weight) of Fabric*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*.

9.2.7.3.2 The thickness of each specimen shall be measured in accordance with ASTM D1777, *Standard Test Method for Thickness of Textile Materials*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*.

9.2.7.3.3 The weight of each specimen shall be measured in accordance with the method in ASTM D3776/D3776M, *Standard Test Methods for Mass Per Unit Area (Weight) of Fabric*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*.

9.2.10.3.2 The thickness of each specimen shall be measured in accordance with ASTM D1777, *Standard Test Method for Thickness of Textile Materials*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*.

9.2.14.3.5 The thickness of each specimen shall be measured in accordance with ASTM D1777, *Standard Test Method for Thickness of Textile Materials*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*.

9.2.14.3.6 The weight of each specimen shall be measured in accordance with the method in ASTM D3776/D3776M, *Standard Test Methods for Mass Per Unit Area (Weight) of Fabric*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*.

9.2.15.8.2 The thickness of each specimen shall be measured in accordance with ASTM D1777, *Standard Test Method for Thickness of Textile Materials*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*, and provided in the report.

9.2.15.8.3 The weight of each specimen shall be measured in accordance with the method in ASTM D3776/D3776M, *Standard Test Methods for Mass Per Unit Area (Weight) of Fabric*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*, and provided in the report.

9.2.16.3.3 The thickness of each specimen shall be measured in accordance with ASTM D1777, *Standard Test Method for Thickness of Textile Materials*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*.

9.2.16.3.4 The weight of each specimen shall be measured in accordance with the method in ASTM D3776/D3776M, *Standard Test Methods for Mass Per Unit Area (Weight) of Fabric*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*.

9.7.1.3.3 The thickness of each specimen shall be measured in accordance with ASTM D1777, *Standard Test Method for Thickness of Textile Materials*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*.

9.7.1.3.4 The weight of each specimen shall be measured in accordance with the method in ASTM D3776/D3776M, *Standard Test Methods for Mass Per Unit Area (Weight) of Fabric*, within 4 hours of removal from conditioning as described in ASTM D1776 /D1776M, *Standard Practice for Conditioning and Testing Textiles*.

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