

**NFPA 1970-P2025 Edition**

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

**TIA Log No.: 1788**

**Reference:** Various in Chapters 7, 8, and 9 (re: hood design & particulate blocking test)

**Comment Closing Date: July 24, 2024**

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[www.nfpa.org/1970](http://www.nfpa.org/1970)

1. *Revise paragraph 7.13.3 and associated Annex material in Chapter 7 to read as follows:*

**7.13.3** The hood shall be designed to cover and provide the limited protection as specified within this section to the head, face, and neck areas, ~~except~~ but not including the face opening specified in 7.13.6.

2. *Revise paragraph 7.13.5 and add new associated Annex A.7.13.5 to read as follows:*

**7.13.5\*** The hood shall be donned properly, in accordance with the manufacturer's instructions for wearing, on the ISO size J headform specified in Figure 9.3.6.4.1. The single size or multiple sizes of the protective hoods shall demonstrate fit on each of the respective headforms specified in ISO 16900-5, *Respiratory protective devices — Methods of test and test equipment — Part 5: Breathing machine, metabolic simulator, RPD headforms and torso, tools and verification tools*, as specified in 7.13.5.1 through 7.13.5.3.

**A.7.13.5** When designing hoods for proper fit, the headforms specified in ISO 16900-5, *Respiratory protective devices — Methods of test and test equipment — Part 5: Breathing machine, metabolic simulator, RPD headforms and torso, tools, and verification tools* can provide a range of head sizes that should be considered when trying to properly fit a hood to a range of users.

3. *Revise paragraph 7.13.5.1 and delete associated Annex A.7.13.5.1 to read as follows:*

**7.13.5.1\*** A single size or multiple sizes of the protective hoods shall be permitted. The hood shall be donned in accordance with the manufacturer's instructions for wearing on the respective headform that is fitted with a surrogate SCBA facepiece meeting the design requirements set forth by Chapter 17.

**A.7.13.5.1** ~~To aid in the determination of the requirements in 7.13.5.2 and 7.13.5.3, it is recommended that the headform be mounted on a pedestal. The suggested surrogate SCBA facepiece should meet the design requirements set forth in Chapter 17.~~

4. *Delete paragraph 7.13.5, Table 7.13.5.3, 7.13.5.4, Figure 7.13.5.4 and 7.13.5.5 as follows:*

**7.13.5.3** ~~In this position, the hood shall provide minimum full coverage around the circumference of the reference plane as specified in Table 7.13.5.3.~~

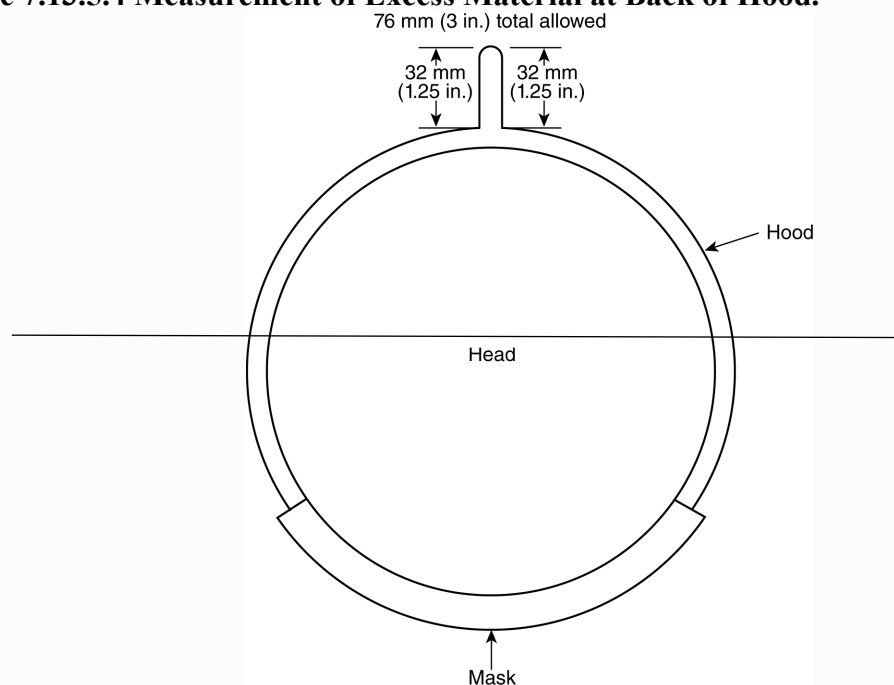
**Table 7.13.5.3 Minimum Coverage**

Size	Minimum Coverage
Small	400 mm (15.7 in.)
Short/Wide	410 mm (16.14 in.)

Size	Minimum Coverage
Medium	420 mm (16.5 in.)
Long/Narrow	430 mm (16.92 in.)
Large	440 mm (17.3 in.)

**7.13.5.4** The hood shall further be evaluated for proper fit on the headform by vertically gathering the excess material of the hood at the back of the headform without stretching it at the intersection of the reference plane and the midsagittal plane does not result in an extension of the outermost layer of the hood from the headform that is more than 32 mm (1.25 in.) as illustrated in Figure 7.13.5.4.

**Figure 7.13.5.4 Measurement of Excess Material at Back of Hood.**



**7.13.5.5** The conformity of the hood in the area adjacent to the SCBA facepiece up to 76 mm (3 in.) away from the SCBA facepiece seal on the headform shall lay flat against the headform surface.

5. Revise paragraph 7.13.5.6, add new Table 7.13.5.3 and add new associated Annex 7.13.5.3 to read as follows:

**7.13.5.36\*** Alternatively, Hoods shall be provided in a sufficient number of sizes that accommodate the range of specific head sizes for both men and women as shown in Table 7.13.5.3 based on achieving the accommodation of the 5th to 95th percentile dimensions in the following measurements as established in the NIOSH Firefighter Anthropometric Data Base:

- (1) Bitragion are length, sitting
- (2) Head are length, sitting
- (3) Head circumference, sitting

**Table 7.13.5.3 Sizing Requirements for Hoods**

<u>Measurement location</u>	<u>Men's sizing (mm)</u>	<u>Women's sizing (mm)</u>
<u>Bitragion arc length, sitting</u>	<u>343–384</u>	<u>327–366</u>
<u>Head arc length, sitting</u>	<u>328–386</u>	<u>306–371</u>
<u>Head circumference, sitting</u>	<u>553–601</u>	<u>538–582</u>

A.7.13.5.3 The sizing specified is based on the hoods meeting the 5<sup>th</sup> to 95<sup>th</sup> percentile dimensions found in the NIOSH Firefighter Anthropometric Database. This information can be found online at [www.cdc.gov/niosh](http://www.cdc.gov/niosh).

6. *Revise paragraph 8.14.1 to read as follows:*

**8.14.1** Hood composite materials and seams including a particulate blocking layer shall be tested for particulate blocking as specified in Section 9.4.4, Particulate Blocking Test, and shall have a particulate filtration efficiency of 90 percent or greater for each particle size from 0.1 µm to 1.0 µm.

7. *Revise paragraph 8.14.3 to read as follows:*

**8.14.3** Where the manufacturer is required to report the results in the user information, hHood composite materials including a particulate blocking layer shall be tested for transmitted and stored thermal energy as specified in Section 9.2.15, Transmitted and Stored Thermal Energy Test, ~~where the manufacturer is required to report the results in the user information.~~

8. *Revise section heading 9.1.18 to read as follows:*

**9.1.18 Flexural Fatigue Procedure for ~~Particle Barrier Layer and Outer Shells.~~**

9. *Revise paragraph 9.4.4.1 to read as follows:*

**9.4.4.1 Application.** This test shall apply to hood particulate-blocking layers and seams or hood composites comprising the function of the particulate-blocking layer and composite seams.

10. *Revise paragraph 9.4.4.2.4 to read as follows:*

**9.4.4.2.4** Sets of particulate-blocking-layer samples and composite seam samples shall be tested both before and after being twice subjected to the following conditioning ~~and sample size changes~~:

(1) Specimens shall be first subjected twice to the procedure specified in 9.1.2.

(2) Specimens shall then be conditioned as specified in 9.1.3.

(3) Specimens shall then be conditioned as specified in 9.1.5.

~~1. Composite samples shall be conditioned as specified in 9.1.22 except for flexing.~~

~~2. Composite samples shall be subject to flexing for 100 cycles.~~

~~3. Composite samples shall be conditioned for UV light exposure as specified in 9.2.16.12.5(2).~~

11. *Revise 9.4.4.3 to read as follows:*

**9.4.4.3 Specimens.**

**9.4.4.3.1** The samples subjected to the full conditioning as specified in 9.4.4.2.4 shall become the particulate blocking test specimens.

**9.4.4.3.1.1** Composite specimens and composite seam specimens shall be large enough to cover the testing area with sufficient overlap to prevent any particulate leakage.

9.4.4.3.1.2 Composite seam specimens shall be centered on the sample holder so that it is bisected by the seam.

9.4.4.3.2 The center of each conditioned sample shall be the specimen and considered to be the test area.

9.4.4.3.23 All specimens to be tested shall be conditioned as specified in 9.1.3.

9.4.4.3.24 All reference specimens to be tested shall be conditioned as specified in ~~9.1.18~~9.1.3.

9.4.4.3.35 A total of ~~three~~four particulate-blocking layer composite specimens ~~representing two specimens from each material direction~~ and three composite seam specimens shall be tested for each condition. One reference specimen shall be tested.

12. Revise 9.4.4.5 to read as follows:

**9.4.4.5 Procedure.**

**9.4.4.5.1** Prior to conditioning in 9.4.4.2.4 and testing, the composite and composite seam samples shall be tested for air permeability in accordance with ASTM D737, *Standard Test Method for Air Permeability of Textile Fabrics*.

13. Revise 9.4.4.6.2 to read as follows:

**9.4.4.6.2** Where testing in 9.4.4.5 is waived due to the air permeability result, the air permeability shall be recorded and reported along with the following statement:

“PARTICULATE BLOCKING TEST WAIVED FOR [sample name and identification] BECAUSE AIR PERMEABILITY WAS MEASURED AS BEING BELOW THE DETECTION LIMIT OF ASTM D737 AND IS PRESUMED TO HAVE A PARTICULATE BLOCKING EFFICIENCY OF 99%~~90%~~ OR GREATER FOR EACH PARTICLE SIZE FROM 0.1 µm TO 1.0 µm.”

**Substantiation:** The data provided in FR-51 does indicate that minimal testing was performed to validate the ISO headforms, and while the fit of the hood on the headform may have initially indicated the improvement of fit on the SCBA facepiece, the rest of the performance requirements in the standard were not aligned to allow this improved fit to occur. For example, the heat and thermal shrinkage and cleaning shrinkage testing still maintained the use of a face opening measuring device that did not change in size. Therefore, the design criteria within this standard may be contradictory.

The purpose of 7.13.5 is to determine whether or not the hood is long enough in the bib area to ensure there is proper overlap between the coat, collar and the hood. It is not intended to be used to determine the fit of the hood to the respirator facepiece. The testing used to determine the fit of the respirator relies on the use of a standardized hood measuring device already contained within this standard.

Additionally, the method cannot be performed in a reproducible manner as written due to the following issues:

1. The headforms described do not have reference or midsagittal planes indicated and therefore the measurements described in 7.13.5.2 are not possible.
2. 7.13.5.1 indicates to use an SCBA facepiece that conforms to chapter 17 of this standard. SCBA facepieces do not have the same shape or circumference, and therefore the selection of the SCBA facepiece would be performed by the testing laboratory. The test labs could select different masks and therefore performance would not be consistent.

3. 7.13.5.4 is a highly subjective method for determining fit of the hood. Further investigation needs to be done in order to determine if this is a reproducible method for determining fit of the hood.

When compared to NFPA 1971-2018 conditioning (NFPA 1971-2018, 8.27.3.4), specimens conditioned per the proposed multi-environment conditioning (NFPA 1970 2<sup>nd</sup> Draft, 9.4.4.2.4) have comparable or higher average percent particulate blocking efficiency.

The below data shows that the proposed conditioning procedure to introduce more rigor was not achieved and the effort and timing associated with the proposed conditioning procedure is not resulting in the perceived gains. As demonstrated by the data below, the conditioning as outlined in the 2018 edition of the standard, results in the lowest test result on average.

Maintaining the conditioning procedures as described in NFPA 1971-2018, for composites, and extending to seams currently reflects the most rigorous conditioning procedure that has been evaluated.

Table 1 - Composites					
ID	Particulate Blocking Efficiency (%)				
	NFPA 1971-2018				NFPA 1970
	As Received		Conditioned		Multi-Environment
	%	ST.DEV.	%	ST.DEV.	%
A	98.84	0.92	98.94	0.61	99.06
C	94.80	1.38	92.70	1.08	94.67
D	99.92	<i>No Data</i>	99.98	<i>No Data</i>	99.73
E	99.21	0.47	98.80	1.12	99.82
Avg	98.19	-	97.61	-	98.32

Table 2 - Seams			
ID	Particulate Blocking Efficiency (%)		
	NFPA 1971-2018		NFPA 1970
	As Received	Conditioned	Multi-Environment
F	93.44	<i>No Data</i>	96.26
H	95.75	<i>No Data</i>	95.98
I	96.03	<i>No Data</i>	96.53
J	93.73	<i>No Data</i>	99.15
K	97.15	<i>No Data</i>	98.22
L	93.53	<i>No Data</i>	99.50
Avg	94.94	-	97.61

The relationship between as received and conditioned samples for seams is as expected. Particulate blocking efficiency is improved with laundering and convective heat exposure. Needle holes formed during seam construction shrink during the conditioning procedures, increasing the particulate blocking efficiency.

Table 3 – Material Key		
ID		Composite Type
Composite	Seams	
A	F	Knit / Laminated Knit PB
C	H, I	Knit / Spunlace / Knit (Quilted)
D	J	Knit / Spunlace / Knit (Laminated) - 1
E	K, L	Knit / Spunlace / Knit (Laminated) - 2

By excluding the flexing portion of the proposed conditioning, neither the conditioning nor the method is impacted by material direction. Three specimens are required for composite specimens (NFPA 1971-2018), and three are proposed for the composite seam specimens, as well.

The number of seam specimens was not specified. Clarified that three specimens are required for each condition.

The second draft language of “90% of greater” is related to the NFPA 1970 performance requirement, not the actual performance of the composite. Historical test results for air-impermeable products support the change to report “99% OR GREATER.” Reporting otherwise is misleading and misrepresents the product performance.

**Emergency Nature:** The proposed TIA intends to correct a circumstance in which the revised NFPA Standard has resulted in an adverse impact on a product or method that was inadvertently overlooked in the total revision process or was without adequate technical (safety) justification for the action.

The changes contained in this TIA are intended to correct the standard so that it can be applied consistently between laboratories as it relates to the hood design requirement changes. If these changes are not implemented, the same hood could be considered compliant at one laboratory and non-compliant at another laboratory. Additionally, the multienvironment conditioning did not prove to be a test for durability like it was intended and therefore could reduce the requirements for hoods with no justification for this testing adjustment.

Anyone may submit a comment by the closing date indicated above. Please identify the TIA number, state whether you SUPPORT or OPPOSE the TIA along with your comment, and forward to the Secretary, Standards Council. [SUBMIT A COMMENT](#)