

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.: 1785

Reference: Various in Chapters 1, 5, 6,7, 8, and 9 (re: permitting non-particulate blocking hoods)

Comment Closing Date: July 26, 2024

Submitter: Janeane Leggett, Majestic Fire Apparel, Inc.

www.nfpa.org/1970

1. *Revise paragraph 1.1.1 to read as follows:*

1.1.1* This standard provides minimum design, performance, testing, and certification requirements for the following:

- (1) New structural and proximity firefighting protective ensembles and ensemble elements that include coats, trousers, coveralls, helmets, gloves, footwear, and hoods, which further include optional requirements for structural firefighting protective garments and proximity garments that provide limited detection from liquid and particulate hazards, and optional requirements for particulate barrier protective hood interface components.

2. *Revise paragraph 5.1.3.2.1 to read as follows:*

5.1.3.2.1 This standard shall also apply to the design, manufacturing, testing, and certification of new structural firefighting protective hoods and new proximity firefighting protective hoods for additional optional protection from particulate contaminants.

3. *Revise paragraph 6.1.7.1 item 5 to read as follows:*

6.1.7.1 Principal materials shall include the individual layers or components as identified for the respective element as follows:

1. For garments, at least the outer shell, moisture barrier, and thermal barrier
2. *For helmets, at least the shell
3. *For gloves, at least the outer shell, moisture barrier, thermal barrier, and glove interface component (wristlet)
4. *For footwear, at least the outer shell, moisture barrier, and thermal barrier
5. For hoods, the outer shell, particulate-blocking layer, if present, and any lining material

4. *Add new paragraph 6.2.1.2 to read as follows:*

6.2.1.2 For particulate-blocking hoods only, the following additional language shall be provided on the product label:

THIS HOOD PROVIDES LIMITED PARTICULATE-BLOCKING PROTECTION.

5. *Revise section 7.14 to read as follows:*

7.14 Additional Design Requirements for Structural and Proximity Firefighting Protective Hood Interface Components Only. (Reserved)

~~**7.14.1** The hood interface component shall include a particulate blocking material specifically for meeting the requirements of 8.14.1 that includes all areas of the hood except as specified in 7.14.2 and 7.14.3.~~

~~**7.14.2** The particulate blocking hood material shall be extended at least to within 19 mm (3/4 in.) of any hem of the hood bib.~~

~~**7.14.3** Binding, including the elastic and stitching around the hood face opening, shall be~~

permitted to exclude particulate-blocking material specifically for meeting the requirements of 8.14.1 for a distance of 19 mm (3/4 in.) from the leading edge of the hood face opening. The distance shall be measured in eight separate locations, with the hood lying on a flat surface and the face opening facing upward, and measured from the innermost row of stitching to the face opening leading edge.

6. *Revise section 7.15 to read as follows:*

7.15 Additional Optional Design Requirements for Structural and Proximity Firefighting Protective Hood Interface Components with Limited Particulate-Blocking Protection Only. (Reserved)

7.15.1 The hood interface component shall include a particulate-blocking material specifically for meeting the requirements of 8.14.1 that includes all areas of the hood except as specified in 7.15.2 and 7.15.3.

7.15.2 The particulate-blocking hood material shall be extended at least to within 19 mm (3/4 in.) of any hem of the hood bib.

7.15.3 Binding, including the elastic and stitching around the hood face opening, shall be permitted to exclude particulate-blocking material specifically for meeting the requirements of 8.14.1 for a distance of 19 mm (3/4 in.) from the leading edge of the hood face opening. The distance shall be measured in eight separate locations, with the hood lying on a flat surface and the face opening facing upward, from the innermost row of stitching to the leading edge of the face opening.

7. *Revise section 8.14 to read as follows:*

8.14 Additional Performance Requirements for Structural and Proximity Firefighting Protective Hood Interface Components Only. (Reserved)

8.14.1 ~~Hood composite materials 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 .~~

8.14.2 ~~Hood composites including a particulate blocking layer shall be tested for evaporative heat transfer as specified in Section 9.7.1, Total Heat Loss (THL) Test, and shall have a THL of not less than 325 W/m^2 .~~

8.14.3 ~~Hood 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 8.15 to read as follows:*

8.15 Additional Optional Performance Requirements for Structural and Proximity Firefighting Protective Hood Interface Components with Limited Particulate-Blocking Protection Only. (Reserved)

8.15.1 Hood composite materials and seams including a particulate-blocking layer shall be tested for particulate blocking as specified in 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 .

8.15.2 Hood composites including a particulate-blocking layer shall be tested for evaporative heat transfer as specified in 9.7.1, Total Heat Loss (THL) Test, and shall have a THL of not less than 325 W/m^2 .

8.15.3 Hood composite materials including a particulate-blocking layer shall be tested for

transmitted and stored thermal energy as specified in 9.2.15, Transmitted and Stored Thermal Energy Test, where the manufacturer is required to report the results in the user information.

9. *Revise paragraph 9.2.15.1.4 to read as follows:*

9.2.15 Transmitted and Stored Thermal Energy Test

9.2.15.1

...

9.2.15.1.4 Modifications to this test method for testing protective hood interface components with optional particulate-blocking hoods protection shall be as specified in 9.2.15.9.

10. *Revise paragraph 9.7.1.1 to read as follows:*

9.7.1* Total Heat Loss (THL) Test.

9.7.1.1 ...

9.7.1.1.1 This test method shall apply to structural firefighting protective garment element composites and protective hood interface component composites where the optional particulate-blocking protection requirements are applied.

Substantiation: This proposed Tentative Interim Amendment seeks to keep particulate blocking hoods as optional within the NFPA 1971 Requirements of NFPA 1970 (2024 Edition Proposed).

I am requesting the proposed changes to NFPA 1970, which would retain the previous approach to structural fire fighting protective hoods where the specification of hoods with particulate blocking capabilities remains an option rather than becoming mandatory. The proposed changes provide a realignment of labeling, design, and performance criteria in the relevant sections of NFPA 1970, which are similar to the prior 2018 edition of NFPA 1971.

The principal reasons for supporting this amendment include:

1. The transition from optional to mandatory particulate blocking capabilities represents a major transformation of personal protective equipment for protecting firefighters during structural firefighting that does not account for fire department protection priorities based on the individual fire department's hazards/risk assessments, prescribed firefighting tactics, and available resources.
2. Key changes were introduced as part of the revised requirements for particulate blocking hoods, which were not fully validated for their efficacy in achieving perceived benefits. Not only was the change made to mandate particulate blocking hoods for all of structural firefighting activities, additional modifications to the design and performance criteria for particulate blocking hoods were made without any verification for achieving touted protection benefits to firefighters.
3. The particulate blocking performance for particulate blocking hoods relative to hoods without these capabilities is overstated and also creates additional tradeoffs. The perception that particulate blocking hoods stop all particulate penetration onto the firefighter's face and neck is not consistent with the criteria that permits 10% leakage in a filtration type test. The use of particulate blocking hoods with additional applied criteria also limits firefighter fireground situational awareness.
4. Making protective blocking hoods mandatory for structural firefighting is inconsistent with other requirements of the NFPA 1971 portion of NFPA 1970. For example, a similar change was not made to protective garments or other ensemble elements where particulate blocking capabilities remain optional as they were for both hoods and full

ensembles in the 2020 edition of NFPA 1971. Moreover, where the technical committee proposed that particulate blocking capabilities be applied to all protective hoods for both structural firefighting and proximity firefighting, an objection by the U.S. Navy for having particulate blocking hoods resulted in the criteria for particulate blocking capabilities to remain optional for proximity firefighting.

5. While a large majority of firefighters agree on having the option for choosing particulate blocking hoods, a significant proportion of firefighters along with manufacturers and dealers believe that the choice for particulate blocking versus standard structural firefighting protective hoods should remain as part of the NFPA 1971 requirements.

Background: Over the past 30+ years since protective hoods were specified as an item of protective clothing for firefighters in the 1991 edition of NFPA 1971, protective hoods have been mainly offered in a balaclava-like construction generally comprising multiple layers of knit flame-resistant materials (referred to here as a “traditional hood”). The concept of protective blocking hoods first took place in late 2015 after the IAFF demonstrated through testing at Research Triangle Institute in North Carolina that showed the deposition of simulated fireground smoke particulate on the skin of a test subject wearing a full firefighter ensemble during an exercise inside a chamber where he was exposed to wind driven fluorescent particles. The testing showed particulate going through the traditional hood as well as other parts of the ensemble primarily at interface areas between clothing items. These findings and research by others led to the industry scrambling to create “barrier” hoods, which first appeared at the 2016 Fire Department Instructors Conference. It also led to the activity for the NFPA Technical Committee on Structural and Proximity Protective Clothing and Equipment to begin developing requirements for hoods that could be considered as providing particulate blocking capabilities. The first version of these requirements appeared in the 2018 edition of NFPA 1971 and allowed manufacturers to provide hoods meeting optional particulate blocking requirements. At the time these requirements were introduced, several existing hood products claiming particulate blocking protection available from various manufacturers had to be changed to meet the new optional criteria for certification against the new edition of NFPA 1971.

In more recent work by the same technical committee, an early decision was made during the revision of NFPA 1971 to make firefighter protective hoods with particulate blocking capabilities mandatory for the proposed 2024 edition of the standard. As part of this effort, a number of different changes were proposed and accepted as part of the second draft of the standard, including the decision being taken to only allow hoods that demonstrated protective blocking capabilities, which for the purpose of the standard included meeting a certain level of filtration efficiency for the hood materials as well as a minimum “breathability” requirements that have not been previously applied to traditional hoods. A task group of the technical committee further supported other changes to the standard that were believed to provide a higher level of quality for hood products of this type. While many of these requirements were accepted as second revisions and became part of the current second draft for NFPA 1971, very little debate was undertaken for determining whether protective blocking capabilities should be mandatory or optional in response to eight different public comments (Nos. 128, 129, 132, 134, 152, 154, 164, and 183) including those from several firefighter end-users.

The one exception that occurred involving any substantial debate on particulate blocking requirements for hoods as mandatory or optional was in response to Public Comment No. 30. This public comment was submitted by Harry Winer of Saalex Corporation indicating an affiliation with the Naval Air Systems Command. The public comment sought to return the

requirements for protective hoods used with proximity firefighting ensemble to the 2018 requirements of NFPA 1971 where particulate blocking capabilities were optional for these hoods. The technical committee made a second revision in response to this public comment that accomplished what the submitter requested. Though the committee statement only describes the actions specifically to make these changes as part of a second revision to several sections related to protective hoods in NFPA 1971 and did not cite specific reasons for doing so. Based on the discussion of this public comment at the technical committee meeting, the compelling argument to permit this exception was based on statements from representatives of the U.S. Navy, as to their organization being a substantial user of the standard (and hence of protective hoods) and that the use of these hoods would create an unnecessary burden to its membership.

Majestic Fire Apparel, Inc. is a leading manufacturer of protective hoods for the fire service. Like other companies, we developed our “solution” for providing particulate blocking capabilities for offering some hoods for firefighters who wanted this level of protection once the specific area of concern had been identified in 2016. Majestic Fire Apparel, Inc. then responded with new products that met the 2018 edition of NFPA 1971, which established optional particulate blocking requirements alongside our many other products that met the original traditional hood criteria, also certified to the same standard.

Since the introduction of these particulate blocking hoods, the relative sales of these items compared to hoods without this capability has been only 6.9% over the period of 2017 (the year before optional particulate blocking requirements were adopted as part of NFPA 1971) through 2024 to date. The percentage for the number of particulate-blocking hoods relative to the number of total protective hoods meeting NFPA 1971 hood requirements on a year-to-year basis, which were sold by Majestic Fire Apparel, Inc. appears in Table 1.

Table 1: Percentage of 1971-Compliant Hoods Sold Annually that Provided Particulate Blocking Capabilities.

2017*	2018	2019	2020	2021	2022	2023	2024 YTD**
6.5%	13.1%	6.9%	5.4%	3.5%	5.2%	6.9%	9.1%

* Formal particulate blocking hood capabilities had not yet been established until 2018 Edition of NFPA 1971 was promulgated in late 2017.

** Year to date through May 6, 2024.

Motivated by our objectives to offer a variety of compliant products and meet the additional needs of the fire service, we do everything possible to encourage firefighters to consider all of the relevant factors related to the levels of protection provided by hoods based on how they operate within structural and other types of fire events.

The following paragraphs provide additional substantiation for the five principal reasons expressed at the beginning of this section.

Uneven Impact on Fire Service. Not all firefighters, fire events, and fireground hazards are the same. Completely switching from a clothing product that has provided adequate protective performance over decades to a new product that has not yet gained full acceptance in the fire service ignores the impacts that this transition will create. There are several reasons why firefighters were given the choice and should retain that choice between traditional hoods

(without particulate blocking capabilities) and particulate-blocking hoods:

- **Individual needs and preferences are different among firefighters:** Firefighters have different perceptions of their comfort and impact of hoods as part of their overall protective ensemble. Some firefighters may prefer the feel of a traditional knit hood, while others may prefer the protection of a particulate blocking hood, which often fit differently and are noisy for some products. Giving firefighters the option to choose the type of hood that best suits their individual needs can help to ensure that they are comfortable and confident using their PPE.
- **Exposure environments vary:** Firefighters work in a variety of environments, each with their own unique hazards. In some environments, the risk of exposure to harmful particulates may be relatively low, while in other environments, the risk may be much higher. Giving firefighters the option to choose between a traditional hood and a particulate blocking hood allows them to tailor their PPE according to the specific risks they face and commensurate with their operating procedures and responsibilities.
- **The hazards of particulate protection can be addressed in other ways:** As awareness to particulate exposure to all parts of the firefighter's body has increased within the fire service, so have the solutions for addressing this hazard evolved. While the use of particulate-blocking hoods is one solution, fire departments and others have devised a variety of practices to help limit their exposure to harmful particulates. These include reissuing clean hoods for each fire event, cleaning hoods after every fire, using procedures in doffing hoods that limit contaminated exterior surfaces from contacting the firefighter's face and neck, and the use of skin wipes and other hygiene practices immediately after the fire exposure.
- **User acceptance of particulate blocking hoods is not universal:** Some firefighters may be hesitant to adopt particulate blocking hoods due to concerns about their comfort, fit, or ability to interfere with other PPE ensemble elements. This is the type of feedback that we receive from our customers. Giving firefighters the option to use traditional hoods allows them to try out particulate blocking hoods and see if they are comfortable and effective for them. This can help to increase user acceptance and adoption of particulate blocking hoods over time.
- **Ongoing research is still needed:** Research on the effectiveness of particulate blocking hoods and their impact on firefighter health and safety is still ongoing. More data is needed to fully understand the long-term benefits and risks of using particulate blocking hoods. Giving end users the option to use traditional knit hoods provides an opportunity to continue to gather data and evaluate the effectiveness of particulate blocking hoods in real-world scenarios.
- **Costs and benefits must be weighed:** Particulate blocking hoods are typically more expensive than traditional knit hoods. Fire departments need to be able to weigh the costs and benefits of switching to particulate blocking hoods before making a decision. Giving end users the option to use traditional knit hoods allows fire departments to make this decision on a case-by-case basis, based on their individual budgets and risk assessments.

Lack of Validation for Meaningful Particulate Blocking Capabilities. As described in the

background section, particulate blocking hood performance is primarily based on two criteria: particulate filtration efficiency and breathability. Neither requirement has previously been applied to traditional hoods. The obvious difference between a traditional and particulate blocking hood is the addition of one or more layers to the hood composite that attenuate the passage of particles through the overall hood composite. In this case, the minimum acceptable filtration efficiency was set at 90% for 0.1 μm sized particles considered representative of fire smoke. Due to the concern that the addition of the particulate blocking layer could create additional physiological stress on the firefighter in the head and neck areas, the breathability requirement was added, although the level of breathability was established much higher than it is for the material composites used in the construction of protective garments that cover a substantially larger proportion of the body (325 W/m^2 for hoods versus 205 W/m^2 for garments). No specific validation went into demonstrating either the hood filtration efficiency or the breathability requirement in the base requirements or going forward. The breathability requirement adversely affects some relatively heavy products that historically have been used for individual firefighters in repetitive high heat events such as instructors involved in live fire training repeatedly demonstrating flashovers to firefighter trainees.

In the substantiation statement provided by the committee to the individuals who submitted public comments related to their request to maintain particulate blocking capabilities as optional for protective hoods with the 1971, reference was made to the paper, Kesler et al., “Effects of firefighting hood design, laundering, and doffing on smoke protection, heat stress and wearability” [Ergonomics, 2021, 64,6, 755-767, DOI: 10.1080/00140139.2020.186724] (<https://doi.org/10.1080.00140139.2020.1867241>). Within this paper were several findings and conclusions based on a broad assessment of traditional versus particulate blocking hoods that also involved the investigation of repeated launderings and the method of doffing on hood particulate filtration performance, physiological effects on the wearer, and end-user acceptability:

- The researchers measured levels of a specific class of common fireground contaminants known as polynuclear aromatic hydrocarbons (PAHs) found on the neck skin of firefighter test subjects after wearing sample hoods in a live fire exposure study. While the study did show large differences between traditional and particulate blocking hoods, these differences were radically reduced when the particulate blocking hoods were laundered.
- A more interesting finding showed that the differences in neck contamination levels were reasonably similar between all types of traditional and particulate blocking hoods when a new “overhead” doffing method that minimized contact with the wearer’s neck was employed instead of the more “traditional” doffing practices utilized by the fire service where the hood remains around the neck before being pulled off. These results are shown in Figure 1 in the cited paper (page 761). This finding suggests that the contamination of firefighter necks has more to do with how hoods are doffed than the particulate blocking nature of the hood itself. In fact, a significant recommendation was that “teaching new hood techniques can be implemented with any type of hood and resulted in as much as 90% reduction in neck skin contamination in this study,” that is also echoed in the conclusion of the article.
- The paper did provide the finding that contamination levels found on the exterior versus the interior layer of hoods were notably different between traditional and particulate

blocking hoods indicating but concluded that particulate blocking hoods did not eliminate PAHs in the neck region.

- No statistical significant differences were found in the impact of these hoods on the basis of physiological effects related to heart rate, neck skin temperature, or core temperature. However, in the survey of wearer perception relative to the different types of hoods, particulate blocking hoods were perceived as less favorable with respect to hearing reduction, being heavy/thick, stiff, noisy, and non-stretchy.

In the second draft of the proposed NFPA 1971 requirements for protective hoods, additional preconditioning techniques were added to the preparation of samples prior to measuring particulate efficiency testing based on the above research. However, we have learned that some manufacturers anticipating these requirements (that included Majestic Fire Apparel, Inc.) for the new edition of the standard have found that those preconditioning techniques while adding a large degree of cost in task complexity, the new preconditioning had relatively no effect on their products further indicating a lack of appropriate validation for the changes on hoods for the new edition.

Overstated Performance and Unaccounted Tradeoffs. In addition to the information reported above, the basis for the technical committee to reject broad requests to keep particulate blocking capabilities optional for hoods highlights the need to account for tradeoffs. These are tradeoffs that fire departments and firefighters may sustain as a result of being forced into wearing particulate blocking hoods. We believe that these tradeoffs may be even more significant when, unbeknownst to more firefighters, the differences in the particulate filtration performance between particulate-blocking and traditional hoods is much less than most firefighters realize. As it turns out, traditional hoods can have measured particulate filtration efficiencies ranging from 60 to 80%, whereas many certified traditional hoods are actually at the upper end of this performance. In contrast, particulate blocking hoods are required to have a minimum efficiency of 90%. This represents only a 10% difference in performance for a test that is actually pulling particulate-laden air through a material in a manner not representative of its actual exposure. Given the different tradeoffs involving fire department standard operating procedures, based on their hazard/risk assessments, and individual firefighter preferences, this overstated performance denies a viable product choice for many firefighters in their ability to decide when to implement a slightly higher level of performance over their current traditional hoods.

Inconsistency with Other Parts of Standard. As described in the background section above, there are specific inconsistencies with the logic applied by the technical committee in the decision to reject the potential for keeping protective blocking hoods as optional. In essence, acquiescing to the “voice” of a large end-user group (the U. S. Navy), the technical committee did not consider the similar requests of another large end-user group, which comprises a large part of the entire fire service and their differences in perceptions relative to this product, and more specifically to the need for its use, given its other options and practices.

The above inconsistency between structural and proximity firefighting hood requirements will likely result in structural firefighter purchasing proximity firefighting protective hoods when they want to maintain their use of traditional hoods.

Moreover, optional liquid and particulate protection requirements have also been offered for garments in the 2018 edition of NFPA 1971, but in the proposed 2024 edition, those requirements will remain optional to be implemented when chosen by the manufacturer. At the

very least, this represents a lack of correlation within the NFPA 1971 standard for how claims are managed relative to protective blocking performance for garments and hoods.

Significant Fire Service and Industry Objections to Making All Structural Hoods

Particulate Blocking. As a manufacturer of both traditional and particulate blocking hoods, we believe in the choice of products for the fire service given agreed upon minimum design and performance criteria. However, we respect the opinions and attitudes of our customers relative to their specific needs and expectations for performance of protective hoods. To this end, we have acquired a large number of letters (totaling 53) provided by firefighter end users as well as dealers and other manufacturers that agree with maintaining the particulate blocking capabilities, protective hoods as optional as has been the case for the 2018 edition of NFPA 1971. The 3 manufacturers that provided letters are not members of the technical committee.

During 2023, we undertook a survey of individuals that stopped by our booth at the Fire Instructor Developmental Conference (FDIC), and obtained the following results for questions below related to this topic (we received a total of 143 responses):

1. With the revision of NFPA 1971, which will become effective mid-2024, the committee has determined that all protective hoods must be particulate blocking. Standard traditional knit hoods will no longer be certified for structural firefighting. Were you aware of these changes?
YES = 45.45%
NO = 54.55%
2. Do you believe that fire departments and firefighters should have a choice as to which type of hood they want to wear (standard knit hood or particulate blocking hood)?
YES, I believe the choice should be our own to make = 78.32%
NO = 21.68%

Similarly, earlier this year, we had two different petitions at our 2024 FDIC booth where the individuals could indicate support for keeping particulate blocking hoods optional or the current position as reflected in the second draft of the proposed NFPA 1971 requirements within NFPA 1970 that structural firefighting hoods must have particulate blocking capabilities in order to be certified. Based on our offering of both petitions:

- 112 individuals signed a petition to support traditional hoods and advocate for their inclusion in the standard, which implies that both traditional hoods and particulate blocking hoods should be allowed.
- 11 individuals signed a petition for making particulate blocking hoods the sole option.

Emergency Nature: The NFPA Standard contains a conflict within the NFPA Standard or within another NFPA Standard. 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.

There is an urgent need for this tentative interim amendment because of a drastic change in the proposed NFPA 1971 portion of the new NFPA 1970 standard, as it will illuminate firefighter access to a protective hood product that has adequately provided protection and continued performance over several decades. Multiple reasons indicate, that while well intended, sufficient justification has not been established to make this change.

The NFPA Standard contains a conflict within the NFPA Standard or with another NFPA Standard.

Clearly, when it comes to particulate protection, disparate requirements are set relative to the mandatory compliance of 2 different protective elements where individual firefighters can still be exposed to particulate hazards. Protective garments, which had a prior requirement for optional liquid and particulate protection for the 2018 edition, still permits the additional certification requirements for claiming this level of protection as being optional. However, while the same caveat applied to protective hoods for the 2018 edition, the option for traditional hoods has been prematurely taken away.

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](#)