



NATIONAL FIRE PROTECTION ASSOCIATION

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MEMORANDUM

TO: Technical Committee on Structural and Proximity Fire Fighting Protective Clothing and Equipment

FROM: Yvonne Smith, *Committee Administrator*

DATE: August 13, 2021

SUBJECT: NFPA 1970 (1971) Proposed TIA No. 1594 **FINAL TC BALLOT RESULTS**

The public comment circulation has passed, therefore, according to Section 5.6(a) in the NFPA *Regs*, the final results show this TIA **HAS NOT** achieved the ¾ majority vote needed on both Ballot Item No. 1 (**Technical Merit**) and Ballot Item No. 2 (**Emergency Nature**).

36 Eligible to Vote
6 Not Returned (Allen, Berger, Hamma, Necklaus, Ott, Schoppa)

<u>Technical Merit:</u>	<u>Emergency Nature:</u>
7 Abstentions (<i>Cinque, Deaton, Dennison, Lehtonen, McKenna, Tomlinson, Winer</i>)	5 Abstentions (<i>Cinque, Deaton, Dennison, Tomlinson, Walter</i>)
11 Agree (<i>4 w/ comment: Hayden, Stull, Vaughan, Walter</i>)	11 Agree (<i>2 w/ comment: Stull, Vaughan</i>)
12 Disagree (<i>Durby, Eysser, Fesik, Fithian, Freeman, Harkness, Marshall, Newsom, Putorti, Reidy, Tutterow, Weise</i>)	14 Disagree (<i>Durby, Eysser, Fesik, Fithian, Freeman, Harkness, Lehtonen, McKenna, Marshall, Newsom, Reidy, Tutterow, Weise, Winer</i>)

There are two criteria necessary to pass ballot [(1) simple majority (2) affirmative vote of ¾ of ballots received]. Both questions must pass ballot in order to recommend that the Standards Council issue this TIA.

- (1) In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.
 $[36 \text{ eligible} \div 2 = 18 + 1 = \mathbf{(19)}]$
- (2) The number of affirmative votes needed to satisfy the ¾ requirement is **18 for Technical Merit and 19 for Emergency Nature**.
Technical Merit:(36 eligible to vote - 6 not returned - 7 abstentions = $23 \times 0.75 = 17.25$)
Emergency Nature:(36 eligible to vote - 6 not returned - 5 abstentions = $25 \times 0.75 = 18.75$)

Ballot comments are attached for your review.



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The *Regs* at Section 1.6.2.(c) state: An appeal relating to a proposed Tentative Interim Amendment that has been submitted for processing pursuant to Section 5.2 shall be filed no later than 5 days after the notice of the TIA final ballot results are published in accordance with Section 4.2.6.

Appeal Closing Date for this TIA is **August 18, 2021.**

NFPA 1971-2018 Edition

Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting

TIA Log No.: 1594

Reference: 7.1.23, 8.62, Table A.4.3.4(a), Table A.4.3.4(f) and Table B.2

Comment Closing Date: August 4, 2021

Submitter: Edward Kelly, International Association of Fire Fighters

www.nfpa.org/1971

1. Delete paragraph 7.1.23 in its entirety and renumber subsequent sections accordingly as follows:

~~7.1.23~~ Garment moisture barrier materials shall be tested for resistance to light degradation as specified in Section 8.62, Light Degradation Resistance Test, and water shall not appear on the surface of the specimen.

~~7.1.24~~ ~~7.1.23~~ Garment zippers ...

~~7.1.25~~ ~~7.1.24~~ Fastener Tape ...

~~7.1.26~~ ~~7.1.25~~ Fastener Tape ...

~~7.1.27~~ ~~7.1.26~~ Fastener Tape...

2. Delete Section 8.62 in its entirety, including associated Annex material, and renumber subsequent sections accordingly:

~~**8.62 Light Degradation Resistance Test.**~~

~~**8.62.1 Application.** This test method shall apply to moisture barrier materials.~~

~~**8.62.2 Samples.**~~

~~**8.62.2.1** Samples for conditioning shall be at least 380 mm (15 in.) square and shall consist of a composite constructed using a layer of 7.5 oz woven 93 percent meta aramid, 5 percent para aramid, 2 percent antistat fiber, the moisture barrier, a layer of 3.8 oz \pm 0.3 oz, aramid needle punched nonwoven, quilted to a 3.4 oz \pm 0.2 oz, aramid woven plain weave thermal barrier material, and another layer of 7.5 oz woven 93 percent meta aramid, 5 percent para aramid, 2 percent antistat fiber. The four layer composite sample shall be stitched around the entire periphery.~~

~~**8.62.2.2** Where the layer intended to be the moisture barrier is configured of a composite that includes outer shell, moisture barrier, or thermal barrier combinations, the samples to be conditioned shall be constructed using those materials.~~

~~**8.62.2.3** The moisture barrier layer shall be removed from the four layer composite samples after all conditioning has been completed and shall become the moisture barrier specimen.~~

~~**8.62.2.4** Where the moisture barrier is configured as indicated in 8.62.2.2, specimens shall be permitted to be a composite of layers provided that the layer intended to be the moisture barrier will face the light source in the test apparatus and provided that the specimen was conditioned according to 8.62.2.2.~~

~~**8.62.3** Sample Preparation. Sample composites shall be subjected to two cycles of the following conditioning:~~

~~(1) The sample shall first be subjected to the procedure specified in 8.1.2.~~

~~(2) The sample shall then be conditioned as specified in 8.1.3.~~

~~(3) The sample shall then be conditioned as specified in 8.1.5.~~

~~(4) The sample shall then be conditioned at a temperature of 21°C \pm 3°C (70°F \pm 5°F), and a relative humidity of 65 percent \pm 5 percent for at least 4 hours.~~

8.62.4 Specimen Preparation.

8.62.4.1 The moisture barrier material will be removed from the conditioned sample composite and be cut into specimens at least 150 mm (6 in.) square.

8.62.4.2 A minimum of four specimens shall be tested.

8.62.5 Procedure.

8.62.5.1 Light resistance testing shall be conducted in accordance with ASTM G155, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials, using Cycle 8 Exposure Conditions. Both inner and outer filters shall be borosilicate. Exposure duration shall not include dark cycles.

8.62.5.2* For each specimen, a piece of cardstock shall be cut in equal dimensions to the specimen. The specimen shall be stapled to the cardstock at each corner with the film side of the specimen away from the cardstock. The cardstock-backed specimen shall be clipped into the test apparatus, insuring clips do not contact the specimen, and the film side of the specimen is oriented toward the light source.

A.8.62.5.2 A readily available white cardstock material of 1.29 mm (0.05 in.) thickness is suitable for use as a backing material to keep the material flat and unaffected by the air currents created in the test apparatus.

8.62.5.3 Specimens shall be subjected to 40 hours of continuous light exposure.

8.62.5.4 Specimens shall be removed from the test apparatus and conditioned in a dark environment at a temperature of 21°C ± 3°C (70°F ± 5°F), and a relative humidity of 65 percent ± 5 percent, for at least 4 hours.

8.62.5.5 Specimens shall be tested in accordance with ASTM D751, Standard Methods for Testing Coated Fabrics, Hydrostatic Resistance, Procedure B—Rising Column Water Method, Procedure 2, Sections 46–49, with the following modifications:

- (1) Alternative test apparatus shall be permitted provided that the exposed area of the specimen is at least 108 mm (4 1/4 in.) in diameter and the pressure can be applied uniformly over the exposure period at a precision of ± 0.1 kPa (± 0.2 psi).
- (2) The applied pressure shall be 13.8 kPa (2 psi) for an exposure period of 1 minute.
- (3) Restraining materials shall not be used.
- (4) Failing performance shall be if any water appears on the surface of the specimen during the exposure period as discerned by a person with 20/20 vision, or vision corrected to 20/20, at a nominal distance of 305 mm (12 in.) with standard room illumination.

8.62.5.5.1 The moisture barrier specimen shall be placed in the apparatus with the film side facing away from the water source.

8.62.6 Reports. The pass or fail performance for each specimen shall be recorded and reported.

8.62.7 Interpretation. One or more test failures of any specimen shall constitute failure of material.

3. Delete the line entry for “Light degradation resistance” in Table A.4.3.4(a) as shown:

Table A.4.3.4(a) Testing Structural Fire Fighting Garments

Test	Section Number	Test Material or Component											Conditioning			
		Garments	Com- posite	Outer Shell	Moisture Barrier	Thermal Barrier	Winter Liner	Labels	Other Materials	Thread	Seams	Hard- ware	Trim	Washing/ Drying ^a	Room Temp ^b	Convective Heat ^c
...																
Light degradation resistance	8.61				X									X	X	X

...

4. Delete the line entry for “Light degradation resistance” in Table A.4.3.4(f) as shown:

Table A.4.3.4(f) Testing Proximity Fire Fighting Garments

Test	Section Number	Test Material or Composite									Conditioning					
		Garments	Com- posite	Outer Shell	Moisture Barrier	Thermal Barrier	Winter Liner	Labels	Other Materials	Thread	Seams	Hard- ware	Trim	Washing/ Drying ^a	Room Temp ^b	Convective Heat ^c
Light degradation resistance	8.61													X	X	X

...

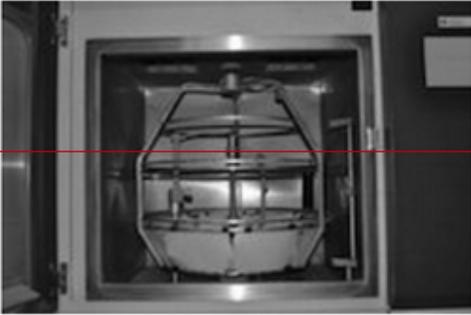
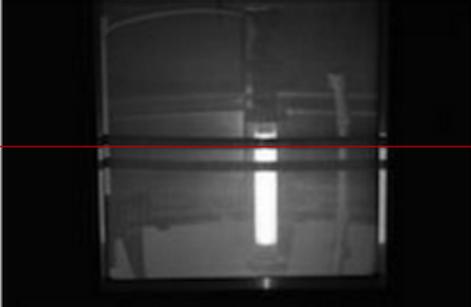
5. Delete the line entry 7.1.23, and photos for “Exterior of Xenon Apparatus” and “Interior of Xenon Apparatus in Use”, and update the cross references in Table B.2 Garments as shown here:

Table B.2 Garments.

...

7.1.23 Light Degradation Resistance Test (moisture barrier)	<p>This test is performed in accordance with ASTM G155, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials, on moisture barrier materials. Samples are conditioned for laundry and heat in specially made pockets comprised of two layers of outer shell and one layer of thermal barrier.</p> <p>After conditioning, the specimens are exposed to continuous light for 40 hours using a xenon apparatus, then conditioned in a dark, temperature-controlled room. The specimens are then tested by applying pressure with water for 1 minute in accordance with ASTM D751, Standard Test Methods for Coated Fabrics.</p>	<p>The Light Degradation Resistance Test is used to measure how much the moisture barrier degrades as a result of excessive light exposure, and the performance requirement sets a minimum exposure limit.</p> <p>Often, the moisture barrier is the first part of the ensemble to fail, especially if it has been exposed to prolonged sunlight or artificial light. This test is a measure of the durability of the moisture barrier.</p>
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Table B.2 Continued

Test Method	Test Method Description	Test Method Application
	Exterior of Xenon Apparatus.	
	Interior of Xenon Apparatus in Use.	

7.1.24 7.1.23 Zipper Strength Test ...

7.1.25 7.1.24 Fastener Tape ...

7.1.26 7.1.25 Fastener Tape ...

7.1.27 7.1.26 Fastener Tape...

Substantiation: Section 8.62 of NFPA Standard 1971 requires a light degradation resistance test for “moisture barrier materials.” Turnout gear pants and jackets are comprised of an outer shell, a moisture barrier, and a thermal barrier. Practically speaking, this means that the middle layer of three-layer turnout gear needs to pass this light degradation resistance test. This specific requirement is preventing non-Teflon (i.e., non per- and polyfluoroalkyl substances, or PFAS) moisture barriers from being used.

The use of PFAS in turnout gear poses a problem for firefighters and the communities in which they live. PFAS are a class of human-made chemicals that have an incredibly strong carbon-fluorine bond that forms the backbone of each molecule. Because of this strong carbon-fluorine bond, PFAS do not easily break down in the environment and are often referred to as “forever chemicals.” PFAS are associated with liver damage, thyroid disease, developmental issues, reduced fertility, high cholesterol, obesity, hormone suppression, and cancer.

Our specific concerns are set forth below.

NFPA Standard 1971 contains a conflict within the NFPA Standard. Although NFPA Standard 1971 states that it applies to “moisture barrier materials,” it does not appear that all boots and gloves – both containing moisture barriers - are subject to the light degradation

resistance test. The moisture barrier in firefighter boots and gloves is, in some cases, PFTE (otherwise known as Teflon, which is a PFAS), but in other cases it is a polyurethane.

The light degradation resistance test is also not necessary, and does not accomplish what it was intended to do: prevent the breakdown of the moisture barrier under UV light. UV light does not penetrate into the moisture barrier unless there is a tear in the turnout gear. The researcher who proposed the light degradation resistance test [stated](#) that moisture barriers of gear could be exposed to sunlight or fluorescent light when turnout gear is cleaned, and the purpose of the provision was to "prevent future failures" of the gear. However, this exposure to light is highly unlikely, as the moisture barrier film is sandwiched between the outer shell and the thermal layer, and faces *in* toward the interior of the lining. Thus, the light degradation resistance test does not protect the moisture barrier from UV degradation in any way.

Therefore, because the light degradation resistance test applies to only some moisture barriers in the protective ensemble, but not all, there is a conflict within NFPA Standard 1971. In addition, the test does not make sense given the construction of turnout gear as required by NFPA Standard 1971.

The proposed TIA intends to correct a previously unknown existing hazard. The inner moisture barrier layer of turnout gear is manufactured from PTFE, and is usually covered with a thermal liner, closest to the skin, made from untreated fabric. There is also an outer shell layer that provides both water and oil resistance. A peer-reviewed reviewed study from 2020 found “significant quantities of fluorochemicals are being shed from the textiles used in PPE for firefighters during the in-service lifetime of the garment.” In fact, the PFAS migrated from the treated moisture barrier into the other layers of the gear. Moreover, fluorine levels in the turnout gear were roughly 2% of the garments, an extraordinarily high level. This study suggested that the PFAS in the turnout gear may be a “direct pathway” for PFAS to enter firefighters’ bodies, through dermal absorption and inhalation.

Firefighters have higher rates of cancer than the general population. Another 2020 peer-reviewed study showed firefighters have higher levels of PFAS in their blood serum. In 2019, more than 75% of line-of-duty firefighter deaths were from occupational cancer.

When NFPA Standard 1971 was written in 2006 to include the light degradation resistance test for moisture barrier materials, neither the firefighters, the International Association of Fire Fighters (IAFF), or the NFPA knew how much PFAS was in turnout gear, nor how it migrated onto skin where it could be dermally absorbed and inhaled by firefighters. Moreover, it was only recently that the alarm sounded about the ability of fairly low levels of PFAS to cause cancer.

Therefore, the proposed TIA intends to correct a previously unknown existing hazard. By removing the light degradation resistance test, turnout gear can be PFAS-free, which would reduce the risk of PFAS entering firefighters’ bodies through their gear.

The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation. As stated above, removing the light degradation resistance test from the moisture barrier layer of turnout gear will reduce

firefighters' exposure to PFAS, thus reducing their risk of cancer and other PFAS-related diseases. Moreover, it is abundantly clear that the vast majority of firefighters do not want PFAS in their turnout gear; Resolution 28, which called for the IAFF to no longer accept sponsorships from the chemical industry, textile manufacturers or PPE manufacturers that use PFAS passed 1,536 to 10; and Resolution 31, which called for the IAFF to actively oppose the use of PFAS in turnout gear passed 1,472 to 4.

In addition to lessening a recognized hazard to the firefighters themselves, removal of the light degradation resistance test will also ameliorate a dangerous situation for communities having fire stations. Dr. Graham Peaslee of Notre Dame University has been studying PFAS in turnout gear, and he states that a single firefighter coat is enough to contaminate 400 Olympic sized swimming pools. Every time firefighters wash their turnout gear, PFAS-laden water gets into the wastewater from washing machines, some of which undoubtedly contaminates soil, groundwater, and even drinking water. Moreover, old gear which is being disposed will end up in landfills, leaching more PFAS into surrounding areas.

By removing the light degradation resistance test from the moisture barrier layer of turnout gear, both firefighters and the public will benefit by reducing the amount of PFAS exposure to them and their communities.

Emergency Nature: The standard contains a conflict within the NFPA Standard or within another NFPA Standard. The proposed TIA intends to correct a previously unknown existing hazard. The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

NFPA Standard 1971 is no longer accepting public comments. In fact, the web page states: Please note: This Standard is slipping cycle due to the Emergency Response and Responder Safety Document Consolidation Plan (consolidation plan) as approved by the NFPA Standards Council. As part of the consolidation plan, this Standard is slipping cycle and being combined into a new consolidated draft, NFPA 1970. Once the draft is available and open for public input on the NFPA 1970 page, a link to the submission system will be updated. We have no idea when the new consolidated draft of NFPA 1970 will be available for comment, and it is imperative that we remove PFAS from turnout gear as soon as possible in order to reduce the risk of firefighter cancer. It is also important to note that the light degradation resistance test is not necessary to protect firefighters. Dr. Peaslee stated that, "...there's nothing essential about PFAS in the gear. You can make a perfectly safe garment without it." Prior to Teflon being in the gear, firefighters used to rely on polyurethane as a moisture barrier. Currently, companies are working on developing PFAS-free gear, and they already have two PFAS-free outer layers available for purchase. Because of the federal void in regulating PFAS, a number of states are passing legislation relative to PFAS in firefighting gear. Kentucky, Massachusetts, and Texas have pending legislation, and Washington has already passed legislation requiring notification that PFAS is in personal protective equipment (PPE). States are also requiring that preference be given to purchasing non-PFAS firefighting equipment while also considering outright bans on the sale of PFAS-containing gear. This is an emerging issue, and more and more states are passing these bills in order to protect their firefighters and their communities. However, because there is currently no PFAS-free moisture barrier available, solely because of the light degradation

resistance test, there is no way for gear to comply with these new laws. All moisture barriers certified to meet NFPA Standard 1971 must currently contain PFAS. Once these bills are enacted, states will be unable to purchase PFAS-free gear because of Section 8.62 of NFPA Standard 1971. Finally, financially strapped communities are finding their drinking water contaminated with PFAS, and many towns find themselves struggling to purchase multi-million dollar filtration systems to comply with new state Maximum Contaminant Levels (MCLs) in soil, groundwater, and drinking water. Continued use of PFAS-laden turnout gear will continue to contaminate communities, and the vicious cycle of contamination will continue. This dilemma will come to a head in coming months. Unless NFPA deletes Section 8.62 of NFPA Standard 1971, it will be impossible for fire departments to comply with both NFPA Standards and state law. This puts these fire departments in an untenable position. In conclusion, the adverse health effects associated with PFAS-laden turnout gear, together with the conflicts between NFPA Standard 1971 and state laws, is resulting in an emergency situation which can only be remedied by the deletion of Section 8.62 and all other relevant sections noted above, from NFPA Standard 1971.

I AGREE with the TECHNICAL MERITS of the Proposed TIA Log No. 1594 on 7.1.23, 8.62, Table A.4.3.4(a) Table A.4.3.4(f) and Table B.2

Eligible to Vote: 36

Not Returned : 6

Jason L. Allen,Louis V. Ott,George E. Berger,Tom
Hamma,Gene Necklaus,Kimberly Schoppa

Vote Selection

Agree

Brian P. Shiels

Daniel Silvestri

David P. Fanning

Votes Comments

11

Agree.

AGREE

agree

Jeffrey O. Stull (Comment also attached)

In 2006, I provided the following public comment for the 2007 edition Report on Comment requesting the removal of the proposed addition of the light degradation performance criterion and test method: "I would like to go on record as finding the 'Light Degradation Test' as erroneous. While the intent of the test is worthy, the task group and the committee have failed in demonstrating that the mode of moisture barrier failure on which the test is based is truly the cause of the Breathetex degradation problem. No evidence has ever been provided that UV degradation alone (even along with the laundering and heat conditioning) adequately explains the phenomena observed in the field. The fact that the chosen conditions would render most outer shell materials to a completely unusable state, remembering that it would be the outer shell that is attenuating the vast majority of UV light exposure, is proof positive that the selected test conditions fail to appropriately mimic the conditions of Breathetex failure. I understand that the task group expended a great effort in developing the proposed requirements, but the commitment of these resources in of itself does not constitute a valid reason for adding this requirement. Consider that if Breathetex degradation had been instead the result of a product defect, either in the film or manufacturing process or both, that was limited to only a portion of the material placed in the marketplace, then the proposed test would have no value whatsoever. I believe the committee should reconsider the test on the basis of its merits only as compared the original direction of the task group to prevent 'Breathetex-like' failures." My public comment was rejected by the Technical Committee at that time for revision of NFPA 1971. My position on this matter remains unchanged and I do not agree that the removal of this test creates undue harm to firefighters or that the test itself must be replaced with another imperfect evaluation that is pertinent to this particular failure mode. The moisture barrier requirements have already advanced since 2007 and these requirements will likely further evolve in successive editions as the fire service establishes specific clothing protection needs and expectations.

Tom Ragan
John M. Karban
Damian L. Owens
Crystal D. Forester
Earl Hayden

Agree
Agree
Agree
Agree

This light degradation test only applies to moisture barriers and does not appear that all boots and gloves containing moisture barriers are subject to this test which in some cases contain PFAS. As stated the light degradation test is not necessary and doesn't accomplish what it is intended to do. This test doesn't protect the moisture barrier from UV degradation in any way. There is a conflict within NFPA Standard 1971.

Christopher R. Vaughan

The test is not required based on the information offered and the fact that the protective barrier should not be exposed to significant amounts of light energy if it is used correctly.

James A. Walter

Honeywell errs on the side of the concerns expressed by the International Association of Fire Fighters and agrees with the elimination of the Light Degradation Resistance Test; Honeywell supports the elimination of the Light Degradation Resistance Test and changes to the NFPA 1971 Standard to make other fabrics used as a moisture barrier to be available so long as they can be scientifically shown to provide the needed levels of protection for firefighters; Honeywell welcomes the opportunity to continue working with suppliers to expand the range of fabric selections that are available to the fire service, requested by our customers, and incorporated into turnout gear.

Disagree

William A. Fithian

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There is no replacement performance test proposed to address this issue, which needs to be resolved before completely removing the existing test from the standard. Additional discussion by the technical committee to adequately address this issue is required before further action can be taken. Additionally, this performance test has been included in previous editions of the standard and any proposed changes can be addressed as part of the next edition process.

Amanda H. Newsom

Firefighter health and safety is always at the forefront at UL and our decisions and actions are based on demonstrated facts, data, and information provided. We appreciate and support the need for continued research related to PFAs and their toxicity. However, the substantiation is missing a few key points that would allow UL to support the immediate removal of the Light Degradation Test method from NFPA 1971-2018. The TIA indicates that there is a conflict within the standard. It is true that only the moisture barriers used within the coat and pant are tested for light degradation. When the test method was added to the standard, this was the only element that had a known degradation issue. The issue was brought to the committee in the form of concerns from a user and these concerns were replicated in a test laboratory. As a result, the test procedure was added to the standard. Additionally, the moisture barrier materials used within gloves and footwear do not have the likelihood of exposure in the same manner as turnout gear, where the outer shell and the liner can be separated. The inner lining of footwear and lining within gloves are permanently attached. There is not sufficient technical data or science presented to substantiate this change. In addition, the removal of this test method does not actually ensure that products would no longer need to use PTFE to comply with the standard. Further research needs to be conducted so that alternative materials are fully investigated. While we are not supporting this TIA at this time, we look forward to participating in continued discussion relative to PFAs and their impact on firefighter safety. Now that the standard is open for public input, the revision process will allow for additional time to investigate this issue.

Patricia A. Freeman

While I am not opposed to removing this test, I am concerned about the possible unintended consequences of making this change without a full evaluation of the benefits and risks.

Anthony D. Putorti, Jr.

While the current UV test method may be overly restrictive in that it limits engineering solutions to the UV degradation problem of some moisture barriers that are candidate replacements for PFAS containing materials, previous turnout gear designs showed UV degradation of moisture barriers protected by outer shells / thermal liners. Until there is a method for testing the UV exposure resistance of the turnout gear composite, the existing UV test method should remain in the standard due to the acute fire fighter exposure hazards associated with moisture barrier failure.

Dick Weise

There are regrettable substitutes associated with this removal, unattended consequences also associated, is the intent purely removal or mitigation of PFA's ? Has there been complete discuss and direction with minimum allowable or acceptable levels, and benefits. What is the true intent, Elimination or health reduction, have discussed a replacement to assure other or new products will not be introduced. We have seen in previous standards when this occurred that other issues were identified. I would request more research and information to support the NFPA process.

Allen Ira Harkness

It doesn't seem that clear cut. Even accepting there is an issue, there are risks either way. I'm concerned about unintended consequences and not convinced this TIA is the best solution.

Robert D. Tutterow, Jr.

I cannot support this TIA and I do not feel good about not supporting it. On the other hand, if I supported the TIA, I would not feel good about that decision either. The main reason I do not support this TIA is because of unintended consequences. The technical committee is faced with a choice of eliminating one health hazard and possibly bringing on other health hazard(s), which could be worse hazard(s). The cure cannot be worse than the disease. The reason PFAS are used in PPE moisture barriers is to increase the durability. There are products on the market that do not have PFAS that might be durable, but they add tremendous heat stress to the firefighter. This test was put into the standard approximately twenty years ago to address known failures of one moisture barrier that was on the market at the time. Though not an ideal test, it has more or less served its purpose. The fire service MUST have durable PPE. Regardless of the outcome of this PPE, improved ways of testing for durability are needed. Everyone wants to get rid of PFAS. They have been referred to as the “forever chemical” as apparently the only way to eliminate them is incineration. Since hardly anyone, if anyone, is incinerating their PPE when it is retired, it is a known fact that these “forever chemicals” are getting into ground water. I sincerely appreciate the IAFF for taking the initiative to get them out of emergency responder PPE. I fully support their intent, but I think we need a lot more information about what is or might soon be available. For example, several members of the technical committee are aware of a possible AFG R&D grant that has a strong chance of being awarded to Dr. Bryan Ormond of N.C. State University to study this issue. Though it takes away from the urgency of the matter, the best solution for now might be to address this issue with public inputs for the next revision cycle. This buys a little time to make a more educated decision. No one knows how many firefighters get cancer from the PFAS in their PPE. No one knows what the impact on durability will be if this test is removed. From a process standpoint, these two unknowns do not meet the criteria for adding or removing a test as instructed by the correlating committee. The end-result of this TIA could well be that we are swapping one hazard for another hazard. Regardless of the outcome of this TIA, I hope the research and testing needed to address this issue now moves to “warp-speed” as soon as possible.

Jonathan Fesik, Sr.

Need for more information examination and more clarification needed

Jim Reidy

My opposition to the TIA is in no way an opposition to reducing exposure to cancer causing carcinogens. Its more about the detrimental consequences that our firefighters more than likely will encounter. First though; The TIA substantiation seems to generalize about the relationship between PFAS and moisture barriers. There is no published study that we've seen or been presented with as a committee that shows any migration of the material the moisture barrier is made of out of the space its contained in and into the wearer's body. And removing the light test does not eliminate the PFAS from the moisture barrier product. At least one moisture barrier product in use by a majority of the fire service is made of medical grade product that is also used in items put into the human body. The 2 current moisture barrier products are a result of years of development and improvement to improve the "breathability" of the firefighter ensemble, reduce the firefighter's heat stress, while still protecting them from the 5 common chemicals, moisture, and blood borne pathogens. Removal of the test will allow substandard, far less breathable (if at all) barriers eliminated in the past to be re-introduced and potentially worn by our firefighters. The significant increase in heat stress alone by using these barrier products should be alarming. Those of us on the job for a while wore these products and remember. Industry reps report the non PFAS DWR being promoted to be used on the outer shell will not stop hydrocarbon fluids from passing thru the outer shell into the outside layer of the moisture barrier. What will these fluids do to the prior barrier products or poly urethane or any non pfas product? In reality there's too many unvalidated unknowns and increasing the heat stress of firefighters with the non breathable polyurethane type products of the past is not in the best interests of not only the firefighters I represent but all of my brothers and sisters. I can not vote for this TIA in good conscience. Jim Reidy TSAFF

Webster Henry Marshall

While I agree that we need to work towards eliminating harmful chemicals allowed in and around our PPE, I must disagree with this due to the lack of a clear understanding of the unintended consequences of removing a test of any kind without extensive information and research. The lack of evidence to show that the direct causal link between this test and the presence of PFAS in our PPE has not been shown. There is also the lack of a study to show the bioavailability of these chemicals and their effect on the wearer of the garments and if they are affected or to what extent they may be affected by the presence of such chemicals. There are studies on the horizon but it seems that from the narrative that has been discussed that there is not sufficient evidence to support this TIA.

Tim Durby

I do not believe there was an error or omission overlook during the regular revision process. I do not see a conflict in the NFPA Standards. I do not see this correcting an unknown hazard. I do not see it would lessen a known hazard. The light Degradation test was put into the standard to correct a known problem. A lot of work went into the development and standards process. It has been successful in solving the original issue. I am not convinced there is a real issue or not or that removing this test improves anything. Removing this test without a fully studied and vetted replacement test will create unintended consequences and could allow a known issue to reemerge. If there is some real issue it should go through the next edition process.

Christopher George Eysser

There are concerns about the ability of adequately testing the bunker gear ensemble to ensure we are protected from fire ground contaminants. In addition ensuring breathability and durability of the moisture barrier

Abstain

7

Michael F. McKenna

I am abstaining because I do not believe the matter has been properly studied. I believe there could be serious unanticipated consequences.

Karen E. Lehtonen (See attachment for full comment)

The question of the Light Degradation Resistance Test preventing the commercialization of PFAS-free moisture barrier materials that are safe for firefighters requires more study. The NFPA 1971 Technical Committee should only make changes to the standard after appropriate study and public comment. Cassie Newsome's 2000 University of Kentucky master's thesis and the follow up thesis by Cassandre Kingsland in 2002 presented evidence that UV exposure was replicating the discoloration and degradation found in sections of Breathe-Tex moisture barriers in the field after two to three years of use. Lion has and will provide to the Technical Committee photos from 2002-2003 of the discoloration and degradation of urethane moisture barrier textiles from two different manufacturers after exposure to natural sunlight in controlled laboratory conditions. In the 1999-2000 time period, the fire service became dissatisfied with the wear life of Breathe-Tex after receiving complaints that portions of some garment barriers were degrading after two to three years of use. The fire service was in favor of the introduction of a test to exclude materials that failed hydrostatic testing after 40 hours of direct UV exposure. Research and testing conducted showed that the method did not discriminate against specific material technologies but set a performance level as an indicator; at least one bicomponent Polyurethane barrier (Comfort Zone) met these requirements. After the introduction of the light degradation test, available moisture barrier film technology provided the durability and wear life that met the expectations of the fire service, and the widespread field complaints were eliminated. Material science, testing and research has changed in the almost 20 years since this test was introduced, and this test may no longer be appropriate. However, the implications of any change should be carefully considered before action is taken to avoid unintended consequences. For example, a unique safety feature of fluorinated polymer textile finishes is their ability to resist both water and chemicals. PFAS-free finishes have limited oil and chemical repellency. According to information from one textile manufacturer, the introduction of PFAS-free outer shell finishes reduced the chemical resistance of the outer shell fabrics in at least one ASTM test. In the field, this may mean that fireground chemicals may be able to pass more easily through the outer shell and more regularly make direct contact with the moisture barrier. With the transition to PFAS-free outer shell finishes, the durability and performance of the moisture barrier layer may become even more critical to protect firefighters from exposure to fuels, battery acid, chlorine bleach, and other toxic chemicals. In addition, barrier materials provide an important layer to protect against exposures to carcinogenic products of combustion. The committee should consider how changes in moisture barrier materials may impact the ingress of highly dermal-absorbent carcinogenic products of combustion such as PAHs into the interior of the turnout gear ensemble. While alternative materials should be encouraged and welcomed to advance technological progress and environmental sustainability, any new PFAS-free products must address the need for durability and heat stress reduction. In summary, the implications of changes need to be carefully assessed by materials science experts using

Harry P. Winer

I have abstained because I did not have enough time to evaluate how the test was determined and what would be the outcome if the test was removed. Committee members were presented with a Thesis : Evaluation of Moisture Barriers for Fire Fighting turnout Gear Assessment of Product Failure and Test Method Development Predicting Failure Modes by the University of Kentucky . In the thesis it states that a Carbon Arc test apparatus was used. NFPA 1971 states that you use a Zenon test apparatus. Either test machine is fine but you can't base a requirement on one and use the other. The spectral response on each machine is different. One hour on Carbon Arc and the affect of the Carbon Arc on fabric does not have to equal one hour on Zenon and the affect of the Zenon on fabric. I have a problem justifying the test method at this time without more investigation and data. I also take exception with the statement that UV light cannot penetrate all layers of the garment. In the early 2000 I investigated a problem with garments becoming weak. The garments look fine initially but in certain areas all layers were weak including moisture barrier. The garments were structural coveralls and after visiting the ship and talking to the fire fighters I determined it was the UV component of the fluorescent light that cased the damage. Coverall stored in lockers had no problems. A number of the coveralls were stored over a pipe right under fluorescent lights. The lights were on all the time. All the damage on the garments was confined to the upper section of the coverall, the sections of the coverall closest to the light fixtures. The coveralls were unzipped and inside liner was exposed to the light the most.

Tim W. Tomlinson

Additional discussion and technical work should and will be done by the technical committee and the industry to adequately address this issue. The current revision cycle is open for NFPA 1971 and time should be taken to fully understand the global impact of all actions taken moving forward to address the topic and determine the most responsible path for accomplishing the overall common goal of firefighter safety.

Vince Cinque

Nobody wants to compromise firefighter safety on any level. While we all agree that the forever chemicals must be removed, in my opinion, simply removing the light degradation requirement does not accomplish that in the proposed TIA. There needs to be more of a cure for the intended problem - not just the prohibition of a certain testing requirement. Additionally, the current data for what other, unknown and yet unidentified issues removing this test may cause is insufficient at this time.

Tyler J. Dennison

The committees responsibility is to consider all relevant information in making a decision relative to the standard. While, limited information has been provided, much of the normal testing, reporting and committee discussion has not been provided or taken place on this subject. The committee should continue to strongly encourage and support targeted research on the moisture barrier.

Anthoney Shawn Deaton

Not enough data is available to make a clear decision on the technical merits.

I AGREE that the subject is of an EMERGENCY NATURE for one or more of the reasons noted in the Instructions Box.

Eligible to Vote: 36

Not Returned : 6

Jason L. Allen,Louis V. Ott,George E. Berger,Tom
Hamma,Gene Necklaus,Kimberly Schoppa

Vote Selection

Agree

Brian P. Shiels

Anthony D. Putorti, Jr.

Daniel Silvestri

David P. Fanning

Jeffrey O. Stull

(Comment also
attached)

Votes **Comments**

11

C. The proposed TIA intends to correct a previously unknown existing hazard.

PFAS contamination is an urgent issue.

AGREE

D

B and F. The current requirement is “extraneous” and has unintended consequences on permitting other moisture barrier products. It is interesting to note that the submitter indicates that moisture barriers in gloves and footwear are not equally evaluated for light degradation. A number of these other product moisture barriers commonly include polyurethane-based material technology. In having examined hundreds of sets of firefighter clothing for a variety of purposes, including garments, gloves, and footwear, that over the decades used a variety of moisture barriers, I have not observed anything remotely resembling the condition of discolored, degraded, and disintegrated Berathetex-based clothing moisture barriers that were found in both used and unused products (some not exposed to light at all). This shows a test that while targeting Breathetex specifically, it likely has unintended consequences for affecting other possible moisture barrier choices. Fire departments and firefighters should have access to product choices that are not inhibited by artificial requirements. Give the concern that some types of products may be subject to restricted use within certain jurisdictions in the future, action is need now to provide open choices among properly qualified moisture barrier products

Tom Ragan

John M. Karban

Damian L. Owens

Crystal D. Forester

Earl Hayden

E.

B. C.

C, D, E, F

A

A,B,C,D,E,F

Christopher R. Vaughan

Disagree

William A. Fithian

The studies indicate the risk and with climbing numbers in FF Cancer any risk that can be curtailed or eliminated should be done so with haste.

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This performance test has been in previous editions of this standard and has not been a concern that warranted a change previously. This does not constitute an emergency nature.

Amanda H. Newsom

While we appreciate the concerns of this issue, the emergency nature of this proposal was not presented. The current standard is now open for public input, therefore any revisions can be submitted through the revision process so that proper consideration may be given to the change.

Michael F. McKenna

Because NFPA 1971 is open for public comments at this time, I believe the proposal should go through the normal public input stage.

Patricia A. Freeman

Since the standard is currently in revision and now open for public input, the technical committee should review all possible options and outcomes in order to make an informed decision on how to best meet the needs of the fire service.

Karen E. Lehtonen
(Comment also
attached)

Existing data does not support the need for emergency measures that could create uncertainty and potentially compromise safety without appropriate study. Currently available studies on PFAS in firefighters provide no evidence that trace amounts of PFAS from turnout gear are entering into firefighters' blood, or at levels that cause adverse health effects. The Firefighter Cancer Cohort Study (FFCCS) has published one paper, which has indicated no association between PFAS and firefighter cardiovascular disease. The FFCCS found elevated levels of two PFAS---PFOS and PFHXS in firefighters' blood. PFOS and PFHXS are known ingredients in AFFF foams and potentially in materials such as carpeting and furniture in the fire environment and were never used in the manufacture of new firefighter turnout gear textiles or finishes. The CDC states that the risks of dermal absorption from PFAS are very low. Based on a review of extensive research, CDC ATSDR stated in its most recent guidance for clinicians, "Dermal absorption of PFAS through the skin is limited and is of minimal concern as an exposure route." FFCCS and NIST have begun studies of turnout gear and PFAS exposures in firefighters and the results should be assessed before conclusions made. NFPA 1970 (for which NFPA 1971 will be contained within) is currently open for public input and a task group within the Technical Committee has been established. The changes proposed by the TIA should be addressed in the upcoming revision cycle for this standard.

More information to determine better path

Dick Weise

Harry P. Winer	I don't see this to be an emergency nature, the standard is currently open for public proposals and we are not slipping cycles. This standard has been this way for years and we should follow the procedure of public proposals on this item.
Allen Ira Harkness	Even accepting there is a potential risk that can be reduced, I don't see why the committee shouldn't address this question in the regular process and do its best to reduce risk overall in the bigger scheme of things.
Robert D. Tutterow, Jr. Jonathan Fesik, Sr.	Disagree In order for this test to be eliminated it should be replaced by a test that better fits needs for safety don't drop a test on a knee jerk reaction you will create more problems
Jim Reidy Webster Henry Marshall	The emergency nature has not been shown There has not been sufficient evidence given to prove an emergency nature for this TIA. The input should follow the public comment protocols which are open and move forward in that manner. There should be more options and data to prove more urgency given to the technical committee.
Tim Durby Christopher George Eysser	I do not agree in the Technical Merits. No Emergency Nature exists. Non emergent in nature, we can work toward this in the next revision as well as allowing more time for additional studies to be conducted.
Abstain Tim W. Tomlinson	5 Additional discussion and technical work should and will be done by the technical committee and the industry to adequately address this issue. The current revision cycle is open for NFPA 1971 and time should be taken to fully understand the true impact of all actions taken moving forward to address the topic and determine the most responsible path for accomplishing the overall common goal of firefighter safety.
Vince Cinque	Please note above comments regarding an abstain vote as it relates to this second vote.
Tyler J. Dennison	The committee has not been provided sufficient information as to the full effect of removing this test from the standard.
Anthony Shawn Deaton	Not enough data is available to make a clear decision on the emergency nature of this TIA.

James A. Walter

Because the NFPA 1971 Standard is currently in the regular revision process (as part of NFPA 1970) and open for public input through November 10, 2021, changes to the Standard can be addressed during the revision cycle. Technology, material science, and requirements/testing methods have evolved since the Light Degradation Resistance Test was first adopted. Honeywell supports continued scientific research to determine the impact of eliminating the Light Degradation Resistance Test with respect to the need for durability and heat stress reduction in turnout gear.

Technical Merit – Abstain K. Lehtonen

The question of the Light Degradation Resistance Test preventing the commercialization of PFAS-free moisture barrier materials that are safe for firefighters requires more study. The NFPA 1971 Technical Committee should only make changes to the standard after appropriate study and public comment. Cassie Newsome's 2000 University of Kentucky master's thesis and the follow up thesis by Cassandre Kingsland in 2002 presented evidence that UV exposure was replicating the discoloration and degradation found in sections of Breathe-Tex moisture barriers in the field after two to three years of use. Lion has and will provide to the Technical Committee photos from 2002-2003 of the discoloration and degradation of urethane moisture barrier textiles from two different manufacturers after exposure to natural sunlight in controlled laboratory conditions. In the 1999-2000 time period, the fire service became dissatisfied with the wear life of Breathe-Tex after receiving complaints that portions of some garment barriers were degrading after two to three years of use. The fire service was in favor of the introduction of a test to exclude materials that failed hydrostatic testing after 40 hours of direct UV exposure. Research and testing conducted showed that the method did not discriminate against specific material technologies but set a performance level as an indicator; at least one bicomponent Polyurethane barrier (Comfort Zone) met these requirements. After the introduction of the light degradation test, available moisture barrier film technology provided the durability and wear life that met the expectations of the fire service, and the widespread field complaints were eliminated. Material science, testing and research has changed in the almost 20 years since this test was introduced, and this test may no longer be appropriate. However, the implications of any change should be carefully considered before action is taken to avoid unintended consequences. For example, a unique safety feature of fluorinated polymer textile finishes is their ability to resist both water and chemicals. PFAS-free finishes have limited oil and chemical repellency. According to information from one textile manufacturer, the introduction of PFAS-free outer shell finishes reduced the chemical resistance of the outer shell fabrics in at least one ASTM test. In the field, this may mean that fireground chemicals may be able to pass more easily through the outer shell and more regularly make direct contact with the moisture barrier. With the transition to PFAS-free outer shell finishes, the durability and performance of the moisture barrier layer may become even more critical to protect firefighters from exposure to fuels, battery acid, chlorine bleach, and other toxic chemicals. In addition, barrier materials provide an important layer to protect against exposures to carcinogenic products of combustion. The committee should consider how changes in moisture barrier materials may impact the ingress of highly dermal-absorbent carcinogenic products of combustion such as PAHs into the interior of the turnout gear ensemble. While alternative materials should be encouraged and welcomed to advance technological progress and environmental sustainability, any new PFAS-free products must address the need for durability and heat stress reduction. In summary, the implications of changes need to be carefully assessed by materials science experts using reliable and verifiable analytical methods prior to taking action that could negatively affect firefighter safety. Based on the foregoing, there presently is insufficient information to assess the technical merit of the proposal.

Emergency Nature – Negative. K. Lehtonen

Existing data does not support the need for emergency measures that could create uncertainty and potentially compromise safety without appropriate study. Currently available studies on PFAS in firefighters provide no evidence that trace amounts of PFAS from turnout gear are entering into firefighters' blood, or at levels that cause adverse health effects. The Firefighter Cancer Cohort Study (FFCCS) has published one paper, which has indicated no association between PFAS and firefighter cardiovascular disease. The FFCCS found elevated levels of two PFAS---PFOS and PFHXS in firefighters' blood. PFOS and PFHXS are known ingredients in AFFF foams and potentially in materials such as carpeting and furniture in the fire environment and were never used in the manufacture of new firefighter turnout gear textiles or finishes. The CDC states that the risks of dermal absorption from PFAS are very low. Based on a review of extensive research, CDC ATSDR stated in its most recent guidance for clinicians, "Dermal absorption of PFAS through the skin is limited and is of minimal concern as an exposure route." FFCCS and NIST have begun studies of turnout gear and PFAS exposures in firefighters and the results should be assessed before conclusions made. NFPA 1970 (for which NFPA 1971 will be contained within) is currently open for public input and a task group within the Technical Committee has been established. The changes proposed by the TIA should be addressed in the upcoming revision cycle for this standard.

Narrative for NFPA 1971 TIA 1594 J. Stull

Technical Merit

In 2006, I provided the following public comment for the 2007 edition Report on Comment requesting the removal of the proposed addition of the light degradation performance criterion and test method: “I would like to go on record as finding the ‘Light Degradation Test’ as erroneous. While the intent of the test is worthy, the task group and the committee have failed in demonstrating that the mode of moisture barrier failure on which the test is based is truly the cause of the Breathetex degradation problem. No evidence has ever been provided that UV degradation alone (even along with the laundering and heat conditioning) adequately explains the phenomena observed in the field. The fact that the chosen conditions would render most outer shell materials to a completely unusable state, remembering that it would be the outer shell that is attenuating the vast majority of UV light exposure, is proof positive that the selected test conditions fail to appropriately mimic the conditions of Breathetex failure. I understand that the task group expended a great effort in developing the proposed requirements, but the commitment of these resources in of itself does not constitute a valid reason for adding this requirement. Consider that if Breathetex degradation had been instead the result of a product defect, either in the film or manufacturing process or both, that was limited to only a portion of the material placed in the marketplace, then the proposed test would have no value whatsoever. I believe the committee should reconsider the test on the basis of its merits only as compared the original direction of the task group to prevent ‘Breathetex-like’ failures.” My public comment was rejected by the Technical Committee at that time for revision of NFPA 1971.

My position on this matter remains unchanged and I do not agree that the removal of this test creates undue harm to firefighters or that the test itself must be replaced with another imperfect evaluation that is pertinent to this particular failure mode. The moisture barrier requirements have already advanced since 2007 and these requirements will likely further evolve in successive editions as the fire service establishes specific clothing protection needs and expectations.

Emergency Nature

Reasons B and F. The current requirement is “extraneous” and has unintended consequences on permitting other moisture barrier products. It is interesting to note that the submitter indicates that moisture barriers in gloves and footwear are not equally evaluated for light degradation. A number of these other product moisture barriers commonly include polyurethane-based material technology. In having examined hundreds of sets of firefighter clothing for a variety of purposes, including garments, gloves, and footwear, that over the decades used a variety of moisture barriers, I have not observed anything remotely resembling the condition of discolored, degraded, and disintegrated Berathetex-based clothing moisture barriers that were found in both used and unused products (some not exposed to light at all). This shows a test that while targeting Breathetex specifically, it likely has unintended consequences for affecting other possible moisture barrier choices.

Fire departments and firefighters should have access to product choices that are not inhibited by artificial requirements. Give the concern that some types of products may be subject to restricted

use within certain jurisdictions in the future, action is need now to provide open choices among properly qualified moisture barrier products

TENTATIVE INTERIM AMENDMENT BALLOT
EMERGENCY NATURE SELECTION OF RESPONSES

- A.** The standard contains an error or an omission that was overlooked during the regular revision process.

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

- C.** The proposed TIA intends to correct a previously unknown existing hazard.

- D.** The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

- E.** The proposed TIA intends to accomplish a recognition of an advance in the art of safeguarding property or life where an alternative method is not in current use or is unavailable to the public.

- F.** 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.