

Format and CBRN Option

- Organizationally, the standard has been reformatted with separate chapters on terminology and certification. Labeling Requirements will now appear in Chapter 5, Design Criteria in Chapter 6, Performance Criteria in Chapter 7, and Test Methods in Chapter 8. References are now at the front of the document in Chapter 2.
- One significant technical change has been the merger of NFPA 1976 for Proximity fire fighting protective ensembles with NFPA 1971 for Structural fire fighting protective ensembles. This merger takes advantage of the fact that many of the requirements between the two types of ensembles are identical. For this reason, the requirements in the standards are now organized with one section on requirements that apply to both types of ensembles, another section on requirements specific to Structural fire fighting ensembles, and a last section for requirements specific to Proximity fire fighting ensembles. For example, the flame and heat resistance apply to both types of garments, whereas the total heat loss test applies only to Structural fire fighting protective garments and the radiant protective performance test applies only to Proximity fire fighting protective garments.
- A CBRN option has been added to the standard (for both Structural and Proximity fire fighting protective ensembles). The CBRN option is for demonstrating protection against chemical, biological, and radiological particulate agents that could be released during a terrorism incident. The CBRN option includes a series of design, performance, and labeling criteria to be met in addition to the base requirements of the standard. In order to apply this option, the manufacturer must specify a full ensemble (garments, hood, gloves, and footwear, and the SCBA, excluding the helmet which is not integral to the offered protection). Only a full ensemble can be certified – the certification of individual elements is not permitted under the option. In addition, design restrictions exist that prevent outer covers, outer gloves, and footwear covers that are not continuously part of the ensemble during normal operations. The intent of the requirements is to have the CBRN protection in place at all times during the use of the ensemble. Specific criteria have been added to evaluate the integrity of the entire ensemble, including interfaces between elements, in preventing the inward leakage of chemical agents using a Man-In-Simulant Test (MIST). This test involves the placement of adsorbent pads onto the skin of individual test subjects at specific locations underneath the protective ensemble. The test subjects wear the ensemble in a closed chamber containing a surrogate chemical agent and perform a series of exercises simulating ensemble use for a 30-minute period.

Following the exposure, levels of the surrogate agent are measured at each pad location and a determination is made for the localized and overall protection provided by the ensemble. Additional tests in the CBRN option include permeation resistance of the ensemble barrier layers to specific chemical warfare agents and toxic industrial chemicals after the material has undergone extensive conditioning that includes laundering, heat exposures, repeated flexing, and abrasion at levels intended to demonstrate long-term durability and performance of the barrier. Even in providing this high level of barrier performance, the overall garment composite must still meet the required breathability as shown in providing an acceptable level of total heat loss.

- A number of changes to the design criteria have been made to permit flexibility of the ensemble design. While many of these changes were originally intended to address changes to allow design innovations for applying the CBRN option, the committee decided

to extend these changes to the base ensembles as well. These changes will allow new design innovations, such as Total Fire Group's integrated boot-to-pant interface, integrated hoods, Magnet Mate gloves, to be used in ordinary Structural and Proximity fire fighting gear.

Garments

- The most noticeable change to Structural and Proximity fire fighting garments will be the addition of a Drag Rescue Device (DRD). This feature is an integrated system of webbing rope, or other material into the fire fighting coat to permit the rescue of an incapacitated firefighter. The DRD must be designed such that a portion of the device is accessible from the coat interior and can be readily grabbed by other firefighters without interference by the firefighter's SCBA. The DRD must permit a firefighter to be dragged horizontally over a specified distance without breaking. The materials used in the construction of the DRD are subject to certain breaking strength requirements. The DRD is not permitted to be used for any vertical operations, such as lowering a firefighter from a building.
- Structural fire fighting coat collars will be required to be a minimum of 3" high compared to the current requirement of 4". Proximity coat collars will remain a minimum 4" height.
- The garment composite breathability requirement has increased. A total heat loss (THL) value of 205 W/m² will now be required compared to the existing requirement of 130 W/m². This change will eliminate some current moisture barriers and heavyweight composites, but will afford a higher uniform level of stress reduction for Structural fire fighting protective ensembles.
- The conductive and compressive heat resistance (CCHR) requirements for shoulder and knee reinforcements have increased from a CCHR rating of 13.5 to 25. The net effect of this change will mean that single outer shell reinforcements for knees and 3-layer composites for shoulders will no longer be acceptable in garment design. More extensive layering will be required for these reinforcement areas. In addition, a new wet conditioning method has been provided in the test method.
- The garment moisture barriers must now be evaluated for resistance to degradation by UV light. This test was added to the standard to address the degradation of the film part of the material that was suspected to be partly caused by exposure to UV. While the inception of the requirement was based on the BreatheTex failures noted in the late 1990s and early 2000s, the requirement does not replicate the failure mode observed for BreatheTex and instead will eliminate all moisture barriers that are principally composed of polyurethane. The test involves subjecting an unprotected moisture barrier film to UV light and then subjecting the material to water penetration resistance testing.
- The determination of trim fluorescence will now be based on color coordinates and a measured level of brightness in contrast to the black light visual determination that is now part of the existing edition. Trim is further permitted to have gaps of 1/8 inch as long as the trim appears continuous from a distance of 100 feet. The lower trim band on the coat sleeves must now be within 2 inches of the sleeve hem. This latter change was made to help minimize potential burn injuries resulting from the stored energy in trim; by lowering the band, there is a greater likelihood of trim overlap with the sleeve waterwell and glove.
- The "chest" area for placement of the upper trim band on coats has been defined.

Helmets

- Helmets must still be supplied with faceshields or goggles, but goggles are no longer required to be attached to the helmet. This change is afforded to help extend the service life of the goggles.
- The ear covers provided with helmets must now meet a thermal protective performance (TPP) requirement of 20 or more. Previously, there was no insulation requirement for this part of the helmet. This insulation is consistent with the minimum TPP requirement for hoods and wristlets and will result in more robust ear covers
- Flame resistance testing of the helmets will now include the application of the flame at the inside of the brim at the goggle attachment points. This testing will provide an evaluation of helmet components not previously evaluated.
- On structural helmet ear covers we are now permitted to have a hole for the ratchet to extend through for ease of adjustment of the head band – this is not permitted for proximity shrouds.
- Trim can now be placed on the helmet cover in proximity ensemble as an option, but it is not mandatory.

Gloves

- Gloves must now extend a total of 2 inches beyond the wrist crease whether with a gauntlet or wristlet, representing an additional 1 inch of glove coverage as compared to the existing edition of the standard.
- Two additional sizes of gloves have been added (XX-Small and XX-Large).
- The conductive heat resistance test as applied to gloves will be done at an elevated pressure (2 psi versus 0.5 psi) on the glove back and finger composite materials. This change will affect the thickness of insulation on the back side of the gloves.
- A new test has been added to measure the liner retention in gloves. The previous test is maintained as a donning ease test after the gloves have been laundered. The new test physically measures the force required to separate the liner from the glove interior.

Footwear

- The measured height of footwear must be a minimum of 10 inches (compared to 8 inches in the existing edition). This height is measured from the interior of the boot with the insole in place to the lowest point of the boot where waterproof performance is provided (the measurement does not allow for stitched through pull tabs and other features on leather boots, which could cause an area of water penetration). The overall effect of the new height requirement and measurement technique adds several inches to the total footwear height when measured from ground level (some footwear styles may increase up to 4 inches in height in order to comply with these requirements).
The implementation of this requirement will eliminate several footwear styles from the marketplace and have a dramatic effect on the design and availability of lace-up footwear.
- Footwear will not be permitted to be graded for height – even the smallest size will have to meet the height requirements above.

- The puncture-resistant plate used in the sole of footwear to prevent nail puncture will now be subjected to a flex cracking test to assess its durability consistent with other industry footwear standards.

Hoods

- Hoods are required to cover the top of the head where the helmet is positioned; however, the Total Fire Group vented hood design is still permitted because the areas requiring thermal protective performance (TPP) include the sides and neck only.
- Hood cleaning shrinkage will now be measured for the whole hood as compared to the material only as done in the existing edition. This change in the testing approach may permit other types of materials that have previously shown relatively high levels of cleaning shrinkage.

Other

- Accessories are no longer addressed in the standard since it is impossible to address each type of potential accessory in detail.
- Subcontractors that assemble portions of garments will now have to be registered to ISO 9001.

A number of other changes were made to update and clarify the design criteria, performance requirements, and test methods.