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PPE Update

# How to improve the next-gen firefighter hood

## Worn properly, even the best PPE has limitations in keeping contaminants off the skin; better hood material is needed

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It is wrong to believe that firefighter protective gear, including SCBA, should only be worn in the structural fire itself. While it is most certainly cumbersome and uncomfortable, wearing appropriate protective clothing and equipment must start outside the fireground to limit exposure to potentially harmful carcinogens found in fire smoke and other sources of contamination.

Wearing of PPE must begin whenever you expect that exposure to fire smoke and other contaminants may occur. The failure to wear PPE or to wear it correctly will increase the likelihood that chemicals and other harmful substances come in contact with your skin or enter your respiratory system.

The same is true for the post-fire environment. In fact, some studies have shown that contaminant exposure during overhaul and non-structural fires can result in exposure levels that are comparable to structural fire itself.

This is particularly true when combusted materials continue to emanate decomposition gases where high heat is not present to break those gases down or create the thermals that lead to their movement and dilution away from the fireground.

Protecting your respiratory system means having the facepiece properly secured as it was when you were fit tested. Fit testing is a required part of any respiratory protection program and ensures that the facepiece seal against your head prevents contaminated air from leaking into your breathing zone.

For this reason, it is important that you are fit tested by your department regularly and that you wear the correct size of facepiece. In addition, inspect and clean the facepiece often just like any other part of your protective gear. Soils and contaminants that build up on the facepiece exterior can easily be transferred to the interior if it is not properly cleaned — this means cleaning after every incident and ensuring that is free from any damage.

Lastly, any facial hair interferes with your facepiece seal, so it is equally important to be clean-shaven.

**Skin as a pathway**

Your protective clothing ensemble must completely cover your skin when working in an environment where there is smoke or other potentially harmful substances. We have often observed gear not being properly worn that permits exposure of different body areas.

Foremost among these is the face area, which already has the limited protection provided by hoods — they offer no vapor or smoke protection on their own. To compensate for this limitation, it is critical that the hood is properly donned and fitted around the facepiece opening, and that it extends underneath your turnout clothing so that is does not pull loose during movement on the fireground.

To provide overlap with the parts of the clothing ensemble that have barrier components, the collar must be in its complete raised position with its closure flap properly secured. The helmet's ear covers must cover the sides and back of your head.

Very little of the hood should be visible if your helmet, SCBA facepiece, hood and coat are properly worn and properly fitted. If this is not the case, then those gaps will become avenues for smoke and contaminant penetration.

**Proper decon**

Once fireground activities are done, is essential to get your clothing as clean as possible instead of wearing it back to the fire station. This can be accomplished by using a hose to knock off the worst of exterior contamination, primarily the soot and other soils that accumulated during response.

Removing this visible contamination will lessen the quantity of substances in your gear until it can be properly washed. Remember to have your hood, gloves, footwear and helmet ear covers cleaned.

We recognize that is not always practical to do this, so at the very least do not wear your full turnout clothing back to the station. Those departments that have spare sets of gear available have an easier time addressing this practice.

Even if you have been properly wearing your gear, assume that your skin and body were exposed to harmful substances on the fireground.

Fire smoke presents a complicated mixture of different toxic chemicals, some of which are persistent and some of which are known carcinogens or acute skin hazards. Many of these chemicals will become entrained within the clothing materials or penetrate through the clothing and get onto your skin.

While your skin can be a great barrier for many substances, some chemicals more easily permeate and can get in to your bloodstream. Continued exposure to such chemicals over long periods of time can result in increased risk for a variety of different health disorders.

Therefore, an important practice upon returning to the fire station is to take a shower and thoroughly scrub your skin. Any station work clothing that you were wearing underneath your turnout clothing should obviously be changed and laundered.

**Shoring up weak areas**

Protective clothing and equipment technology has advanced significantly. However, the consequences for wearing this clothing are enormous and the stress and encumbrance that it creates are difficult challenges. The modern protective clothing ensemble for firefighters is truly a balance of different trade-offs for protection, function, and stress/comfort.

Yet, the protective hood remains the weak area of the ensemble from a contaminant-exposure standpoint. Protective hoods consist of knit materials that are elastic and stretch to cover the interface areas in the head, face and neck that are not covered by other parts of the ensemble.

These porous materials readily allow contaminants to pass through, which has recently been demonstrated by research showing the neck area is a firefighter's most contaminated area. We have a vision for changes in hood material and designs that will offer better protection against soot particles and at least help attenuate some vapor exposure.

While we do not advocate that hoods contain a moisture barrier like garments, gloves, and footwear, some filtration capacity should be incorporated within the hood material system. Further, the exterior surface of the hood should be highly repellent to liquids that may carry contaminants while the interior layer should manage extensive moisture that occurs from sweating. Hood improvements should be part of the strategy for firefighter cancer risk reduction.

## About the author

*Sponsored by Globe*

Jeffrey and Grace Stull are president and vice president, respectively, of International Personnel Protection, Inc. They are members of several NFPA committees on PPE as well as the ASTM International committee on protective clothing. Mr. Stull was formerly the convener for international work groups on heat/thermal protection and hazardous materials PPE as well as the lead U.S. delegate for International Standards Organization Technical Committee 94/Subcommittees on Protective Clothing and Firefighter PPE. They participate in the Interagency Board for Equipment Standardization and Interoperability and have authored the book, "PPE Made Easy." Send questions or feedback to the Stulls via email.

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