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PPE Update

2 big changes to make firefighter PPE buying better

Shifting the focus from the materials to the design would improve PPE and make buying easier

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Editor's Note:

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The process for selecting firefighter PPE, particularly clothing, is daunting. For turnout garments, there are simply too many choices to go through a rational selection process and we believe the industry should change its offerings.

For ensemble items such as helmets, hoods, gloves and footwear, there are many choices, but the choices are relatively simple. A helmet may be offered with different eye and face protection, ear covers, and suspension systems along with different accessories to customize it.

Different footwear and glove options abound as variations in materials can be used in part of these products as well as design features. Hoods are even simpler, usually without any sizing, but with a smattering of material choices, lengths and bib designs.

The number of these product offerings are reasonable and many fire departments and firefighters can negotiate the selection process.

Complexity of garments

This all changes with garments, coats and pants, that are different because of the innumerable material options that exist. There is no doubt that garments are more complicated. Garments cover a larger portion of the body and employ a more difficult geometry.

These are much more diverse because of the need for specific closures to enable donning and doffing, the need for reinforcements in certain parts, the application of high-visibility trim, the positioning of pockets, the implementation of a drag rescue device, and a whole host of other features.

Even with these variations, the selection process does not become overly cumbersome. What escalates this complexity is the myriad of material choices.

Just consider the primary three-layer system that makes up the principal part of each garment. This system consists of an outer shell, a moisture barrier and a thermal barrier.

There are three major domestic suppliers of outer shell and thermal barriers. One supplier offers nine outer shell and five thermal barrier materials, with some of the outer shell materials in more than one weight. Another supplier offers five outer shells and three thermal barriers.

1,400 combinations

Overall, there are nearly 20 different outer shells and 12 thermal barriers. In North America, there are six to seven moisture barriers to choose from. This means there are potentially more than 1,400 different combinations of outer shells, moisture barriers and thermal barriers just within the three-layer composite.

Of course, some of these composites do not meet the minimum requirements of NFPA 1971 because they have either insufficient thermal protective performance, a measure of heat insulation, or total heat-loss values that are too low as a measure of stress reduction or composite breathability.

Yet in practice, there are hundreds of different combinations that have been fully qualified to these minimum requirements; some may exceed those requirements by larger and larger margins.

When faced with enormity of choice, many departments look to the specific claims that go beyond minimum NFPA 1971 whether it be durability, flexibility, or other features, in addition to cost. This may be supplemented by close scrutiny of the subtle differences in the TPP and THL measurements.

However, the small differences between reported values may not be all that significant. They may have more to do with when and where the material system was tested and less to do with real meaningful performance advantages and disadvantages.

Written in the rule

While there are protection differences in materials and material systems, the overall range of performance in most cases is not as great as the test data may suggest. Tests serve as ways of benchmarking performance and even though some tests simulate fireground exposures, the reality is

that many material systems offer equivalent minimum performance when in the form of clothing and there are few radical differences in material systems.

One reason there are so many material systems is the way NFPA 1971 is written. Test performed on helmets, gloves and footwear are done on the whole items. For garments, almost all tests are at the material level.

To ease the burden of material testing costs, which are extensive for each material layer, composites and reinforcements, the fire service protective clothing industry adopted a practice of component recognition.

Materials are qualified to the respective NFPA 1971 requirements by the suppliers and these results are shared among garment manufacturers. A manufacturer can use any recognized material allowing for a large number of options.

Emphasis on design

This is a generally a good thing for the fire service because otherwise firefighter clothing would be prohibitively expensive. However, there is a cost for managing the wide range of material choices that limits attention on the characteristics that also have a greater impact on firefighter clothing protective capabilities.

We believe the design attributes are of equal if not greater importance than the material system. In fact, limit the number of material candidates by grouping material systems with known, demonstrated performance, and seek possible clothing design features in parallel.

It is important to cull the list of material choices because placing too much attention on small differences in test performance will likely not yield much extra field protection.

The current approach for focusing on materials first should change. This system exists because the NFPA 1971 standard places an emphasis on material performance rather than systems performance.

If the standard would instead move into more full-scale garment evaluations in a meaningful way, there would incentive for the industry to focus more on design and effective material use than on the testing of relatively flat, non-representative material samples.

This philosophy would encourage a better balance of ensemble performance where right now departments have to make their best guesses or have the resources available to undertake expensive field testing. After all, wouldn't it be better to have fewer, but better-qualified choices to make your safety decisions?

About the author

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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

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