



Jeffrey O. and Grace G. Stull

PPE Update

2 projects will improve firefighter PPE cleanliness

Methods to better test both the level of contamination and the level of "clean" are moving forward

May 19, 2014

We have just become involved in an exciting new project to identify nondestructive methods for evaluating contamination in turnout clothing. This project should help determine if and when specialized cleaning can be applied for removing contamination from turnout clothing.

A task group of the committee for NFPA 1851 is planning a related project that covers selection, care and maintenance of structural firefighting ensembles. That project will look at the effectiveness of current and alternative cleaning processes for removing specific contaminants.

The levels of exposure to toxic substances during structure fires are significant. In fact, structure fires are often more of a hazardous-materials event than are the incidents to which the hazmat team responds.

Unfortunately, many in the fire service still do not regard structure fires as producing hazardous materials and the danger of exposure to firefighters during these responses. However, the increasing incidence of certain cancers in firefighters shows that this concern has to be taken seriously.

No guidance

In typical hazmat operations, the continued use of protective clothing and related equipment requires a determination of the levels of contamination and if that contamination can be effectively removed when the PPE is exposed to hazardous agents.

With the exception of some highly specialized PPE ensembles and certain chemical or biological contaminants, most organizations that rely on PPE cannot assess contamination levels unless

destructive testing has been performed. The absence of industry guidance in this area causes many fire departments to unknowingly use contaminated PPE or decide to prematurely dispose of expensive PPE that might otherwise be decontaminated and reused.

While manufacturers provide instructions for cleaning and decontaminating PPE, the procedures are vague and often point responders to their hazmat team or other "experts" in their organization.

Many independent service providers that regularly clean and repair clothing generally exclude contaminated PPE from their services or are inconsistent in applying decontamination. Those that do apply specialized cleaning often do not have evidence for basing claims for removing contamination. There are no requirements that address PPE decontamination and the few existing standards that mention decontamination only offer relatively generic information.

For example, NFPA 1851 for structural firefighting protective clothing defines decontamination and establishes a category of specialized cleaning for contaminated clothing but does not set any specific criteria for fire departments to determine when to apply decontamination or judge its effectiveness. The same standard includes advisory appendix information with recommendations for some analytical procedures, but these methods do not target specific contaminants.

Test methods

Limited information is available for effective decontamination approaches partly because nondestructive techniques are either unavailable or are inconsistently applied for assessing contaminant levels to base appropriate decontamination decisions and to determine if cleaning effectively removes contaminants.

The principal methods for evaluating clothing items for chemical contamination involve removing a section of material from the clothing item, using a solvent or some other medium to remove the contaminants, and analyzing the extract or medium by a selected instrumental technique.

Many of the test methods, typically applied for solid media such as soil, require specific solvent extraction (for organic compounds) or acid digestion (for inorganic compounds) that destroys the sample.

Even when analytical techniques are applied, the results can be difficult to interpret because there are generally few standards that relate the quantities of micrograms per kilogram of contaminant in the analyzed material to permissible contamination levels, which generally do not exist for most chemicals. Particularly for chemicals, organizations receiving these results have no idea how clean is clean.

Danger zones

Most structural fires yield soot particles that becomes entrained in and on clothing materials. These exposures are considered to be routine even though analyses show potentially significant levels of persistent hazardous materials adsorbed either by the soot or directly into the PPE.

Earlier research demonstrated that firefighters are routinely exposed to carcinogenic and skin-toxic substances as the results of ordinary operations during interior structural fires.

One recent report points to evidence that the firefighter's neck area is specifically vulnerable to polycyclic aromatic hydrocarbons that easily make their way through hoods. A report prepared by Underwriters' Laboratory and the University of Cincinnati published in 2010 in work sponsored by the Department of Homeland Security showed high levels of contaminants in both firefighter hoods and gloves.

Yet, such exposures are considered routine. For the most part, fire departments only consider the need for analysis after firefighters encounter specific chemical commodities on the fireground (such as at an industrial facility) or complaints arise after a particular incident related to a skin condition or some other malady.

New techniques

Over the past few decades, new techniques have evolved to non-destructively evaluate complex solid media and provide information that permits fire departments or qualified laboratories to make relatively timely assessments for levels of contaminants. When applied to key chemical, biological, and particulate contaminants, this can provide guidance for judging whether clothing can be decontaminated and if decontamination processes are likely to be effective.

The creation of a logical decision-based guidance supported by non-destructive analytical sampling and test procedures can help improve the fire department's ability to judge the appropriateness for continuing the use of turnout gear where contamination concerns exist, apply correct cleaning and decontamination approaches, and limit continued exposure for firefighters to persistent chemical, biological, or particulate hazards.

As both of these efforts proceed, we will be sure to keep you informed as to their findings. We believe that solid recommendations will evolve from these investigations, and when taken with other practices for good hygiene the fire service will begin to minimize firefighter exposures — those often taken for granted.

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](#).

Tags > [Cancer](#) • [Health & Wellness](#) • [Personal Protective Equipment](#) • [Safety](#)

JOIN THE DISCUSSION



Please [sign in](#) or [register](#) to write your own comments below.
Before commenting, please read [FireRescue1's Commenting Policy](#)





Be the first
to comment

LATEST PRODUCT NEWS

- [Don't ditch your helmet for rescue missions – just find the right one](#)
- [4 ways to tap the potential of data and use it to improve community health and safety](#)
- [Maine FFs call on state CDC to prioritize first responder virus tests after FD outbreak](#)
- [The contamination is coming from within the building](#)
- [Purging Mr. Hyde: 3 ways to cultivate the good within our ranks](#)

[MORE PRODUCT NEWS >](#)

PRODUCT ORIGINALS

- [Don't ditch your helmet for rescue missions – just find the right one](#)
- [Beyond the traditional fire-rescue mission: Loveland's TAC Fire](#)  1
- [COVID-19: How public safety companies are assisting the frontline pandemic response](#)  1
- [Face masks: Here's what cops, firefighters, medics and COs have to say about use, policy and effectiveness](#)
- [Fire service proximity suits: What firefighters need to know](#) 

[MORE PRODUCT ORIGINALS >](#)

Copyright © 2020 FireRescue1. All rights reserved.