



**Jeffrey O. and Grace G. Stull**

PPE Update

## When does PPE warrant advanced cleaning?

What you need to know about the differences between soiling, contamination and cleaning, decontaminating firefighter turnout gear

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By Jeff and Grace Stull

We have written extensively about PPE contamination issues facing the fire service, trying to create an awareness for how the contamination occurs. We've shared basic practices that should be undertaken to minimize contaminate transfer to the firefighter, to other clothing, apparatus, the station and to others.

A key theme we've followed has been to recognize that turnout clothing exposed to a structural fire is contaminated and not just soiled. By making this admission, the frequency for applying advanced **cleaning practices** increases in frequency.



## NFPA STANDARD ON PPE CLEANING

According to the current edition of **NFPA 1851: Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting**, turnout clothing advanced cleaning should take place at least every 12 months. However, the standard further states that turnout clothing should be subjected to advanced cleaning when soiled.

Advanced cleaning means taking the gear out of service and performing a thorough cleaning of the item (which, for garments and certain other elements, means laundering them).

“Soiling” has been defined as having accumulated materials that are not considered hazardous materials or body fluids, but of the nature that could degrade the performance of the clothing. In contrast, “contamination” is defined as containing hazardous materials or body fluids. Yet, the trigger for performing advanced cleaning is ordinary soiling, which by definition, is not hazardous. Needless to say, this information was not particularly helpful for fire departments to decide when they should perform advanced cleaning.

The technical committee responsible for NFPA 1851 has endeavored to propose changes that help the fire service make a clearer distinction for judging contamination and specifically the need for advanced cleaning. A key part of this process has been to go back to the definitions. Most of the fire service considers soiling a natural outcome of fighting a fire. When they consider contamination, they think of the HazMat team and the types of products faced during specialized responses. This is not the correct way for judging clothing that has been worn in a potentially hazardous environment.

## NEW DISTINCTIONS FOR CONTAMINATION

“Products of combustion” is a new important definition for the proposed new revision of NFPA 1851. We know that products of combustion arise from fires and most of the particles and chemicals created in the combustion process can be dangerous to breathe, particularly when synthetic materials are involved as the fuels. What many people do not know is that some of those same products are not only respiratory hazards, but also hazardous by skin absorption, which can occur when the chemicals are both persistent and skin contact is maintained over extended periods of time. Products of combustion from fires include a variety of toxic, corrosive and carcinogenic chemicals. Thus, products of combustion – soot and fire gases – **are genuinely contamination**.

By incorporating products of combustion into the definition of contamination, this means that entry into any structural fire can be considered an event that warrants advanced cleaning. A recommended rule of thumb is that individual members that have to wear self-contained breathing apparatus by virtue of entering an immediately dangerous to life and health (IDLH) environment have clothing that is contaminated (a more straightforward determination that contamination has occurred). If contaminated with products of combustion, then advanced cleaning should be undertaken.

## PPE ADVANCED CLEANING VS. DECONTAMINATION

Another point of confusion when it comes to terminology is understanding the difference between advanced cleaning and decontamination in protective clothing and equipment:

- Cleaning is the act of removing both soiling and contamination.
- Decontamination is the act of removing or neutralizing contamination.

These definitions are similar. However, it is now proposed that advanced cleaning be defined as the act of removing both soiling and contamination that is generally associated with products of combustion (i.e., structural firefighting). On the other hand, decontamination is applicable to wider range of contaminants.

Other forms of contamination may be more easily recognized:

- Structural gear used in a hazardous materials incident where potential contact with toxic or harmful chemicals occurs.
- Clothing exposed to blood, body fluids or flood water, often contaminated with potentially infectious microorganisms.
- Encountering specific bulk chemicals during a structural fire response.
- Learning after a response that the structure contained asbestos.

Other than blood and body fluids, which warrant additional procedures to address the microbial contamination (a process called sanitization), it is recognized that the clothing should be taken out of service and require “specialized cleaning,” essentially another form of decontamination.

However, sometimes the question is not whether cleaning should be applied but whether the clothing can be adequately cleaned at all. Qualified individuals must judge if suitable cleaning methods exist or to condemn the gear. Access to these qualified individuals will vary for the department but could include the hazardous materials team, a verified independent service provider for cleaning services or other industry experts who are familiar with the types of contamination involved.

## **HOW DOES SOILING RELATE TO ADVANCED CLEANING?**

As it stands now, soiled firefighting clothing necessitates **advanced cleaning**. There has been no proposal to change the definition of soiling. So, if clothing is just soiled, why should it be subjected to advanced cleaning?

To overcome this issue, it is important to realize that soiling, likely to be regular sweat, body oils and just plain dirt, does have an impact on the performance of the gear. Yet, to get around this problem, if the clothing is simply soiled, the committee now recommends that advanced cleaning be applied as needed. This approach gives the department the opportunity to assess whether clothing could be compromised or is unsafe simply because it is too dirty.

This latitude to apply advanced cleaning for soiling should not be seen as a way out from having clothing properly cleaned. PPE used in structural fires should still be subject to advanced cleaning.

## CHALLENGES TO PPE ADVANCED CLEANING

We still don't have all of the evidence to make direct connections between contamination of PPE and its impact on firefighter health. We do know that turnout clothing becomes regularly contaminated with hazardous substances, including carcinogens, and that some of these contaminants are relatively persistent in the clothing and can transfer to the firefighter.

We further recognize that advanced cleaning will help to remove much of the contamination but also poses challenges:

- 1. Taking clothing out of service to clean presents logistical issues.
- 2. Frequent cleaning itself could lead to **earlier degradation** of turnout clothing.

The fire service is at the crossroads of a transformation when it comes to contamination control. Regular advanced cleaning is just one part of that transformation.

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*The views of the author do not necessarily reflect those of the sponsor.*


## 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 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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