HOW TO MAINTAIN TURNOUT GEAR FOR LIFE SAFETY

Guidelines for firefighter PPE maintenance and replacement

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How to Maintain Turnout Gear for Life Safety
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by Jeffrey O. and Grace B. Stull

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Introduction: How turnout gear maintenance and replacement safeguards firefighters

In recent years, there has been more attention placed on the service life and condition of turnout gear. Fire departments across North America now are examining ways to make their overall equipment and gear last longer and function more efficiently.

One of the areas being debated is when gear should be retired. Manufacturers of turnout gear state their gear lasts on the average anywhere from 3 to 7 years.

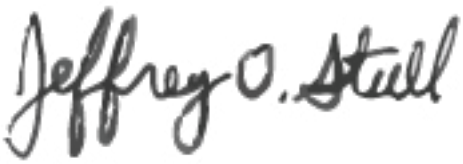
NFPA 1851, the standard that establishes requirements for the selection, care, and maintenance of structural firefighting protective clothing and equipment, dictates gear that is 10 years past its manufacture date should be retired. This requirement has become controversial as some firefighters believe that their gear, especially helmets, remain viable beyond the 10-year limit.

Many in the fire service argue that applying a mandatory rule is the only way to ensure that firefighters remain adequately protected and that their gear remains up-to-date with existing protective product technology. There are several other arguments on this topic and fire service opinion appears to be split down the middle.

In contrast, elevated instances of firefighter cancers are pushing the industry to re-examine gear cleaning and service life. Studies carried out over the past several years suggest that retained contamination in used gear may be contributing to extended firefighter exposure to harmful substances that are known or suspected to cause cancer.

This information points to changes in cleaning and care approaches with greater scrutiny for the continued use of turnout gear. For example, increased cleaning of gear following structural fires may be warranted but these same practices potentially shorten gear service life.

Still, it is recommended that firefighters take steps for handling their gear as part of preventative practices to limit exposure to carcinogens or replace it altogether to safeguard firefighters.



Jeffrey O. Stull

Grace B. Stull

How to rid firefighting PPE of contaminants

Follow these steps to avoid exposure to cancer-causing agents

by Jeffrey O. and Grace B. Stull

Every emergency response represents a possible contamination event. If there is exposure to gases or vapors, liquids, or particles, these substances will get onto clothing. In many cases, they will remain on the clothing until adequately cleaned.

Gases and vapor generally penetrate any textile component. Coated or laminated materials such as trim or moisture barriers together with hard surface items such as helmet shells will physically retard gases and vapors, but many of the substances can still permeate materials on a molecular basis. This is also true for leather and rubber materials.

Like a magnet

Longer exposures produce higher levels of contamination. Yet the extent of contamination also is heavily dependent on the nature of the substances involved. For example, oily, tarry substances created by high heat will bond to clothing materials more readily, particularly as the clothing cools.

Soiled clothing picks up more contamination. Clean clothing may offer more surfaces for contamination, but many forms of contamination on clothing offer compromised materials that can become more soiled or readily pick up other forms of contamination. This is most often seen when soot in fabrics continues to pick up gases and vapors from the fire environment.

In essence, it is easy for dirty clothing to be more soiled than clean clothing. Soils on clothing often negate whatever repellent properties a clothing fabric might have. The finishes placed on clothing fabrics and some other components also can wear down over time, making soiling more likely to occur.

Routine cleaning

After being exposed, it is essential to clean your gear before continuing to use it. NFPA 1851, which is the standard that governs selection, care, and maintenance of turnout clothing prescribes “routine cleaning,” which is principally hand washing. Some organizations will hose down gear after an incident; others have employed the hazmat decon showers at the site to get rid of the worst of the contamination.

To avoid exposure, some cleaning has to take place as soon as possible after the event and preferably before you have to wear the gear again. Remember, it not just clothing that has to be cleaned, but also gloves, helmets (including the ear covers), footwear and especially hoods.

Station wear

It is important to recognize that a station uniform and underclothes also have become contaminated by any substance that may have bypassed your turnout clothing. This clothing must be removed and cleaned.

Generally, use the cleaning methods prescribed by the clothing label unless some known substance has penetrated to your work clothing. Nevertheless, in all cases wash this clothing separate from other personal items to prevent cross contamination.

Lastly, while the skin is a good barrier to many substances, it too will be contaminated. Unfortunately, wearing of heavy clothing under hot, humid conditions only enhances how some chemicals can be absorbed through the skin. So taking a shower immediately after the fire event is critical to prevent any continued contamination exposure.

Advanced cleaning

NFPA 1851 also defines advanced cleaning as a form of clothing care. This type of cleaning must be done at least once a year and whenever gear is exposed to soiling at a fire. If the clothing is visibly soiled or contaminated, then it must be cleaned.

In addition, if clothing has been exposed where there is any concern about continued contamination, it must be cleaned. Laundering is not necessarily decontamination, but most laundering processes specified by clothing manufacturers are designed to remove soils.

This does not mean that all chemicals will be removed. There is active work to learn just how effective current procedures are, but prior research has shown that a great deal of contamination can be removed using appropriate washing procedures or an independent service.

In some cases, fire departments realize that they have encountered particularly hazardous substances and specialized cleaning is needed. This form of cleaning is not defined. It may be a presoak, spot treatment, or special detergent. It also may be an entirely different process altogether.

Current research

The matter of cleaning becomes even more difficult because the industry offers very little guidance on this topic. Such decisions for how to clean and whether the cleaning itself will be effective are made on a case-to-case basis. In some cases, the knowledge of the contaminant and the potential dangers for reuse will warrant disposal.

But the problem in making that decision is how to assess the cleaning as providing decontamination. This problem has existed for some time and is now being addressed through current NFPA committee work and related research.

Firefighters find themselves in the most dangerous of conditions. While the most obvious hazards are burns and physical injuries, the more incipient hazard of exposure to contaminants that include carcinogens is an equally serious threat. Hopefully, the fire service, with the assistance of groups like the Firefighter Cancer Support Network, can consistently apply these practices and promote other forms of protective clothing design and care technology improvements to further create reductions for cancer-causing agent exposures.

8 ways to protect against cancer with PPE

Here are simple steps to reduce your risk

by Jeffrey O. and Grace B. Stull

There was a time when dirty bunker gear was a badge of honor. In fact, firefighters often complained when they were forced to clean their gear and sometimes even became creative in finding ways to avoid having PPE appear newer.

Similarly, many firefighters delayed wearing SCBA during a structure fire and removed their facepieces as soon as they could get away with it. Fortunately, these practices have diminished significantly.

Yet, the dangers of firefighter exposure to carcinogens and other hazardous materials is still a serious problem. There are several proper PPE use and hygiene practices to reduce these exposures and the risks of cancer.

The fatalities statistics presented annually by the National Fire Protection Association (NFPA) and other organizations indicate stress-related incidents often are the principal cause of firefighter fatalities. These statistics do not show the alarming trend for increased incidences of cancer among firefighters.

Know the enemy

Certain types of cancers are prevalent among active firefighters. This is reason enough for focusing serious attention on finding ways to limit exposures during fireground operations and provide information to firefighters who have been diagnosed with cancer.

To this end, the Firefighter Cancer Support Network was formed. This organization has engaged in an aggressive awareness campaign. Its website provides one of the most extensive lists of resources on firefighter cancer issues, including many references related to PPE use and cancer.

Many firefighters are under the false impression that wearing PPE is sufficient to limit exposure to most cancer-causing agents encountered on the fireground. SCBA, when worn, provides respiratory protection. But SCBA is not always worn, particularly during overhaul.

False sense of security

A significant number of chemicals absorb through skin and cause acute and latent toxic effects. While it is true that gear has evolved extensively over the past several decades, its ability to prevent skin exposure to many fireground contaminants is quite limited. If not removed, contaminated exterior surfaces and inner layers of protective clothing and equipment results in exposure well after an incident.

Structural firefighting protective clothing has a moisture-barrier layer throughout most of the ensemble elements — coats, pants, gloves and footwear are all required to have these materials to prevent liquid penetration. Moisture barriers attenuate many contaminants but do not protect against all chemicals.

Certainly, the helmet shell is relatively impervious for protecting much of the firefighter's head; the SCBA facepiece also protects the majority of the firefighter's face. Still, there are several parts of the ensemble that provide penetration pathways for smoke particulates and vapors to reach firefighter's skin.

Helmet ear covers and hoods, and coat and glove wristlets, all lack any form of barrier material. In addition, while garment closures are designed to be resistant to liquid penetration, they are not airtight. Interface areas between gloves and coat sleeves, footwear and pant trouser cuffs, the coat and pants, and the face/head/neck area are all relatively open to airborne contaminants.

The science

A recent U.S. Department of Health and Human Services publication examining firefighter exposure to potential carcinogens shows that the neck area is one of the most likely regions to become contaminated.

Other studies have shown that many fireground gases penetrate the clothing and reach the firefighter's skin. For example, work done in Australia showed specific carcinogens to be present on the firefighter's skin after simulated residential and industrial fires.

The reality is that firefighters are more likely to be exposed to hazardous materials during structure fires than during hazmat incidents.

The most important distinction is that most structural fires create large volumes of hazardous gases and particulates, some of which are persistent and remain in the environment after the fire is extinguished. In contrast, most hazardous material responses involve only a few chemical commodities, and the response teams approach these emergencies with a high level of monitoring and caution.

Lingering toxins

While most of these chemicals are volatile and dissipate over time, the carbon-based soot particles absorb many of these vapors, holding them in place on surfaces including firefighter clothing and skin. These chemicals initially trapped on the particles, migrate into the surrounding environment and come in contact with the firefighter.

It is not surprising that analyses conducted on contaminated PPE often show a range of different types of chemical substances present. In some cases, these chemicals are not removed by washing.

Reducing exposure

So if PPE has limitations in preventing exposure to carcinogens and other hazardous substances, how can firefighters reduce their overall exposure? The Firefighter Cancer Support Network and other organizations have offered many specific suggestions for reducing exposures relative to PPE use and care, as well as specific hygiene practices.

1. Wear SCBA through all stages of the fire, including overhaul.
2. Remove as much of the bulk contamination as possible while still at the fire scene by performing gross contamination.
3. Wipe soot from your head, neck, jaw, throat, underarms and hands using wet wipes immediately after the fire.
4. Change and wash station, work and other clothing right after returning to the station or leaving the fireground.
5. Shower after the fire.
6. Ensure that all gear is properly cleaned right after the fire.
7. Do not transport or take contaminated clothing home or store in a vehicle.
8. Keep all gear out of living and sleeping areas.

In addition to these recommendations, it is important to always wear gear properly. This includes wearing the hood, deploying ear flaps, extending the collar fully and making sure that all interface areas are properly secured with sufficient overlap.

There certainly are other practices that can reduce your risks that are not PPE-related. But the most important is to ensure turnout gear is cleaned after use and properly maintained.

About the Authors

Jeffrey O. and Grace B. Stull are president and vice president, respectively, of International Personnel Protection, which provides expertise on the design, evaluation, selection and use of personnel protective clothing, equipment and related products to end users and manufacturers. International Personnel Protection is considered one of the leading sources of expertise in the field of personal protective equipment.

Mr. and Mrs. Stull are members of several National Fire Protection Association committees on personal protective equipment 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 (ISO) Technical Committee 94/Subcommittees on Protective Clothing and Firefighter PPE.
Mr. and Mrs. Stull participate in the government's Interagency Board for Equipment Standardization and Interoperability. They have written more than 100 articles, chapters, and guides in the area of protective clothing and equipment.

They have authored the book, "PPE Made Easy," now in print by Government Institutes. The Stulls are long-standing subject-matter experts and columnists on PPE for FireRescue1.

Send questions or feedback to Jeffrey or Grace at Jeffrey.O.Stull@FireRescue1.com.

Related Resources

Turnout Gear Inspection, Care, and Cleaning Guidelines
GlobeTurnoutGear.com
Learn about the NFPA standards and requirements for maintaining turnout gear, taking into consideration that it features three piece layering and multiple components.

Understanding Firefighters and Cancer
FireRescue1.com
While we cannot wipe out cancer, understanding its nature and the special risk to firefighters allows us to take steps to reduce its occurrence and severity.

Advanced Cleaning and Inspection Services
GlobeTurnoutGear.com
Globe Cleaning and Repair Evaluation Services (CARES) assists departments with the advanced cleaning and inspection required by NFPA 1851.

Survey: Firefighter PPE care is improving
FireRescue1.com
New survey results show that the fire service is doing a better job of cleaning and repairing its turnout gear than it did 10 years ago.

Free Online Training
PPE101.com
Register for Globe's online training course on Personal Protective Equipment Advanced Care and Cleaning, an easy to follow program that goes through NFPA 1851 chapter by chapter, to learn how to properly care for your turnout gear and how often it should be inspected.

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