Personal Protective Equipment

13 Things About Protective Gloves for Emergency Operations

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The ***Fire Protection Association (NFPA)*** reports that approximately 80,000 injuries occur annually to firefighters and roughly 22 percent affect upper extremities (torso, arms, hands).

Gloves and sleeves are an essential part of every firefighter's personal protection equipment (PPE). Firefighters are involved in several operations – structural firefighting, proximity firefighting, technical rescue incidents, emergency medical operations, and related emergency response activities. Therefore, their hand protection must be chosen to offer a good fit, dexterity, protection from physical hazards (e.g., sharp edges or rough surfaces), and protection from flame and heat.

Find out all you need to know to benefit from proper hand protection in emergency operations.

- Firefighters use different types of hand protection for various missions.
- Work gloves for maintenance tasks provide puncture protection but they are not appropriate for firefighting.
- Extrication or rescue gloves protect from cuts, punctures, bodily fluids, and chemicals while allowing the dexterity to operate rescue tools.
- Proximity gloves have a metallic outer layer for use in the extreme heat environments of aircraft and some chemical fires.
- Structural gloves, with resistance to flame, conductive heat, liquid penetration, cuts, and punctures, are designed to fight fires of residential and commercial structures.

1. What are firefighting gloves made of?

Structural firefighting gloves consist of three layers: outer shell, moisture barrier, and thermal barrier or lining. Outer shells include different types of leather that are intended to provide the primary physical protection to the hand. Leathers provide friction grip and puncture resistance and can be specially processed for flame resistance during tanning. Full-grain cowhide, pig, elk, goat, or kangaroo skin are commonly used and are sometimes impregnated with silicone to improve water repellence and durability.

Other products use synthetic fiber materials, such as Kevlar or Nomex, instead of leather for their high strength-to-weight properties. These materials may be combined with additional reinforcements added to the outside palm or back of the hand or internal layers. Some gloves combine several materials.

The moisture barrier prevents physical penetration of certain liquids (water, blood/body fluids and some fire ground chemicals). Polytetrafluoroethylene (PTFE, e.g., Teflon™) is commonly used because it repels water and is heat resistant.

The thermal barriers provide additional insulation to the hand from heat in combination with the outer shell and moisture barrier. Some glove styles may have additional interior layers for insulation, or other layers on the glove exterior for physical protection or to reduce wicking.

In some products, the moisture and thermal barriers are combined into one material. In others, the thermal barrier is an inner lining that insulates the hand from heat and provides a layer of comfort. A synthetic polymer knit material known as a modacrylic is often used for the thermal glove lining because it is flame resistant and an excellent insulator. Kevlar or Nomex may also be used for the

thermal barrier.

All thread used in the glove construction must be inherently flame-resistant fiber, and any metal hardware must be resistant to corrosion.

Some gloves have gauntlets, which are extensions of the glove body, or knit wristlets, protecting the wrist area and even lower forearm depending on their length. Wristlets have a leather pull tab on the palm side of the gloves.

Proximity firefighting gloves share many of the same materials and features as structural firefighting gloves. However, much of their outer shell is replaced with an aluminized material covering the back of the hands, back and sides of the fingers, entire thumb, and wrist area. Leather is used in the palm area of the gloves. The aluminized outer shell provides additional protection from exposure to high levels of radiant heat associated with proximity firefighting.

2. Check the type of emergency operations and the applicable standards

Your protective gloves have been manufactured to comply with and are certified to one or more of the following standards:

- NFPA1971, Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting NFPA 1951
- Standard on Protective Ensembles for Technical Rescue Incidents NFPA 1992
- Standard on Liquid Splash Protective Ensembles and Clothing for Hazardous Materials Emergencies NFPA 1999
- Standard on Protective Clothing for Emergency Medical Operations

Some glove styles are certified to multiple standards.

Protective gloves are tested for several performance properties such as thermal insulation, flame resistance, heat and thermal shrinkage resistance, cut and puncture resistance, liquid chemical and viral penetration resistance, overall fluid integrity, liner pull-out resistance, and various types of hand function.

While designed to protect against several emergency operations hazards, the protective gloves will not protect you against all exposures and under all conditions, even when worn correctly. It is essential to check the label on your gloves to determine the type of emergency operations and the applicable standards to which your gloves have been certified. It is crucial to strictly follow all labels, the NFPA standards listed on the glove certification labels and relevant national, state/provincial, or local regulations for emergency operations.

3. Make sure gloves offer dexterity

The success of a rescue mission depends very much on the firefighter's mobility. Therefore, wearing improper protective gloves reduces his freedom of movement. The dexterity of structural firefighting gloves encompasses finger and palm grip, finger flexibility, and fingertip tactility. Some design elements, such as the location of seams or adhesives at the fingertips or bunching of material in the palms, can reduce dexterity.

Other design features can enhance dexterity, such as seamless fingertips and added texture to increase grip friction. However, the composite layers of materials needed to protect the hand tend to add stiffness and bulk, resulting in a trade-off between hand protection and dexterity. The need to remove gloves to perform certain tasks, such as changing radio frequency or putting on a breathing apparatus,

can undermine a firefighter's overall safety.

4. Choose the right size

Protective gloves are offered in multiple sizes. Some glove sizes range from extra-extra-small (XXS) to extra-extra-large (XXL) and may include a triple extra-large (3XL) size.

NFPA 1971 also uses glove sizing based on the length of the index finger (in mm) and the width of the hand (designated as N - normal, W - wide, or XW - extra-wide). Some styles of gloves are also available in "cadet" sizes in which the fingers have a shorter length. Lastly, some styles are made available in a "unique" sizing in which the gloves have shorter fingers and thumb but an extended body, or "special" sizing with shorter fingers and a swing thumb.

You must select the appropriate size of gloves. Gloves that are too tight will hinder some types of hand movement and reduce the layer of air between your hands and gloves that contributes to thermal insulation protection of your hands. Gloves that are too loose will also negatively affect your hand function, particularly dexterity and tactility.

Choose a comfortable size that gives you the best dexterity, grip, and tactility and that does not result in premature hand fatigue.

5. Check how easily you can don and doff

The ability to easily put on and take off wet or dry gloves is an important aspect when choosing hand protection. Gloves with textured linings that increase grip can be harder to put on. The style of the interface component may also affect the ease of donning and doffing gloves. Wider gauntlets and palm openings may make it easier to don and doff but may reduce protection or grip.

6. The value for the money

The cost of structural gloves may also influence selection. Advanced or exotic materials and complex construction may provide state-of-the-art hand protection at the trade-off of expense. Durability also factors into the overall cost, as gloves are subject to demanding tasks.

7. Proper care and cleaning

After making the right buying decision, it is important that you keep your protective gloves clean, free of contamination, and properly maintained always. Protective gloves that are dirty or contaminated represent significant hazards. The wearing of soiled or contaminated clothing can cause acute or long-term health hazards, as many contaminants, even carcinogenic ones, can be absorbed by the skin. Moreover, many types of contaminants are flammable.

The leather used in gloves contains a variety of oils and chemicals that provide them desirable properties for firefighting such as heat and flame resistance, softness, and some water repellency. Improper care may cause those oils or chemicals to dissipate, leaving the gloves stiff and useless. Improper care may also destroy the thread that holds the inner liner and liquid barrier to the leather shell, causing the liner to pull out.

8. How to clean your structural gloves properly

- In cleaning your protective gloves, use only mild detergents with a pH range of not less than 6.0 pH and not greater than 10.5 pH as indicated on the product's material safety data sheet (MSDS) or original container.
- Never use solvent, chlorine bleach, or cleaning agents that contain chlorine bleach, as these substances rapidly break down glove materials.
- Do not machine wash or dry gloves and do not use wash water or drying temperatures above 105°F (40°C).
- Wear protective gloves and eye/face splash protection when cleaning soiled items.
- Do not wash your protective gloves or other protective clothing with personal items, in your personal laundry, or at a laundromat.
- Do not dry clean your protective gloves.

9. How to do your routine cleaning

Clean your protective gloves after each use or whenever your gloves become soiled. Use the following procedures for routine cleaning your protective gloves by hand, in a utility sink:

- Choose a utility sink that is specifically used for cleaning protective clothing; do not use a kitchen sink or other sink that is employed for personal products.
- Brush off any loose debris.
- Fill the utility sink with warm water.
- Use a mild detergent in volume according to the detergent supplier's instructions.
- Without immersing the gloves, scrub the exterior of the gloves gently using a soft bristle brush. Do not use a brush on the aluminized shell of proximity firefighting gloves. Instead, use a sponge or soft cloth for cleaning soil from these surfaces
- Drain and rinse the sink with clean water and then refill it with warm water.
- Gently wash the interior of the glove by immersing it in water with a mild detergent.
- Drain the sink and thoroughly rinse the gloves. Conduct a second rinse if necessary.
- Inspect the gloves and, where appropriate, rewash the protective gloves or submit them for advanced cleaning procedures.
- Dry the gloves by gently squeezing them dry. Do not tightly wring gloves, as this may compromise the liquid barrier.
- Hang gloves for air drying by the loop provided inside the cuff in a well-ventilated area, but not in direct sunlight. Do not force dry the gloves with a hairdryer or place them over a heating duct or radiator. Forced drying will cause gloves to stiffen.
- Rinse the utility sink using routine cleaning procedures.

10. Advanced cleaning

Your protective gloves must be subjected to an advanced cleaning at least every 12 months at the time of advanced inspection or whenever soiling requires additional cleaning, according to the latest NFPA standards. Advanced cleaning must be performed by a verified organization or by a verified Independent Service Provider (ISP) that has been accepted by the producer of your gloves.

11. Decontamination

Proper decontamination of your protective gloves will depend on the type and extent of the contamination. If your protective gloves become contaminated with blood or body fluids, immediately isolate the gloves and inform your supervisor, department, or organization. Your protective gloves must

be subjected to advanced cleaning using specialized procedures.

If your protective gloves become contaminated with chemicals or other hazardous substances, immediately isolate your gloves and remove them from service, taking care not to cross-contaminate other clothing items. Immediately inform your supervisor, department, or organization. Do not wear protective gloves that were contaminated until verification has been provided and your protective gloves are free from contamination.

12. Repairs

Do not attempt to repair your gloves. If damaged, report the damage to your supervisor, department, or organization and obtain a new set of gloves as a replacement. Your protective gloves must be repaired only by their producer or an organization that has been qualified by the producer.

13. Retirement and disposal

A qualified individual must decide for the continued service of your protective gloves within your department or organization. If you have any doubts about your protective gloves and their condition, immediately bring this matter to your supervisor, department, or organization. Protective gloves that are no longer deemed serviceable for damages, contamination, or other unsafe conditions must be disposed of in a safe manner (such as cutting them in unusable pieces), whereby the gloves cannot be reused.

Contaminated gloves must be disposed of by your department or organization following federal, state/provincial, or local regulations. If your hands or other parts of your body are burned or injured while you are wearing your protective gloves, they must be removed from service and retained by your department or organization for an appropriate period as determined by your department or organization.

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