Background

Wildfire firefighters face a wide range of health and safety hazards (reference 1). This fact sheet focuses on personal protective equipment (PPE) against flame, smoke, slips and falls, and cuts and abrasion. Respiratory protection is outlined below, followed by a summary of other PPE.

Respiratory Protection (references 2 and 3)

The primary inhalation health hazards of wildfire smoke are airborne particulates. The first step in respiratory protection is to minimize smoke exposures through deployment planning, support area site selection, and exposure monitoring.

- Avoid areas of high smoke exposure.
- Place firefighters and fire lines where exposure will be minimized.
- Locate incident command posts and incident base camps outside of areas where smoke naturally collects.
- Monitor carbon monoxide and other toxic gas levels whenever exposure is a threat.

Respirator Options

All respirators must be approved by the National Institute for Occupational Safety and Health (NIOSH®). A Self-contained breathing apparatus (SCBA) is the only option that provides complete protection against smoke. However, it is too heavy to be practical in fighting wildfires, adding about 40 pounds to an already heavy load of hoses and tools that must be carried in a hot environment. The air supply is strictly limited, requiring frequent tank changeout and support facilities.

Air-purifying respirators (APRs). These primarily provide protection against particulates. A variety of cartridges are available for elastomeric respirators that also provide protection against specific chemicals or groups of chemicals. None are protective against all chemicals or even most that may be found in smoke; none are protective against carbon monoxide or deficient levels of oxygen. The best combination cartridges available protect against particulates and organic vapors.

Particulate filtration efficiency. The most commonly used level of efficiency is N95 (non-oil-resistant, 95% filtration of particles 0.3 micron in size or higher). If exposure to heavy smoke is unavoidable, P100 (Oil proof, 99.97% filtration of particles 0.3 micron in size or higher) should be selected.

APRs in order of most to least protective:
- Full face (FF) – These provide eye protection.
- Powered APRs (PAPRs) – These provide eye protection and a cooling effect but add weight and bulk.
- Half face – These offer no eye protection, so must be used with goggles.
- Filtering facepiece respirators (FFRs) – These are N95, NIOSH-certified for particulates only. Some models have an activated charcoal layer for “nuisance” vapors (below occupational exposure limits). Models with outlet valves should not be used because they do not inhibit the transmission of COVID-19.

Dust masks and surgical type masks are not NIOSH-approved and are not protective due to their lack of a tight seal. Bandanas are ineffective because they can’t filter fine particulate.

Respiratory Protection Programs (RPPs)

All respirator users must be enrolled in a RPP that meets the requirements of Army Regulation (AR) 11-34 (reference 4). Key requirements are medical assessment and surveillance, training, fit testing, and proper respirator cleaning and maintenance.
Other Personal Protective Equipment (references 5-7)

NFPA® 1977, Standard on Protective Clothing and Equipment for Wildland Firefighting (reference 6) specifies the minimum design, performance, testing, and certification requirements for protective clothing, helmets, gloves, and footwear. Use compliant gear whenever possible.

-Hardhats must be made of thermoplastics, such as polycarbonate, or of thermosetting materials, such as fiberglass.

-Face and neck shrouds are rectangular pieces of fire resistant cloth that hang down from the firefighters' hardhats to the level of their shoulders. The front ends of the shroud overlap and fasten securely together with hook and pile tape (Velcro).

-Eye Protection should be "splash guard" goggles that meet ANSI standards unless respirators with facial protection are used. If the firefighter requires glasses, prescription inserts should be used with the respirator. The goggles will allow regular glasses to be worn.

-Hearing protection is required when using chainsaws or working around other loud equipment.

-Shirts and trousers should be made of aramid fabric and should be loose fitting. Aramid fabrics are durable and provide good thermal protection. Like most fabrics, aramid burns if exposed to flame but stops burning when the flame is removed. Instead of melting or burning to ash, it forms a char that helps to protect the skin.

-Coveralls and jumpsuits are discouraged because they add to heat stress, are not durable enough for the lower part of the body, and seldom fit properly.

-Gloves should be full-grained, chrome-tanned leather. Gloves protect the firefighter's hands against blisters, cuts, scratches, and minor burns during routine firefighting. They also play a major fire protection role in the event of an aircraft accident or fire entrapment.

-Boots should be a minimum of 8 inches high, leather lace-type with skid resistant soles. Slips and falls account for more than 15% of all injuries in wildfires, so non-slip soles with lugs or Vibram® are essential. Steel-toed boots are NOT recommended because of the potential for heat transfer from burnt ground.

-Underclothing. A short sleeved t-shirt, underwear, and socks should be worn under fire resistant clothing and boots. T-shirts and underwear should be 100% cotton or a 100% flame-resistant blend. Two pairs of socks, an inner pair of lightweight cotton socks and an outer pair of wool socks, should be worn.

-Chainsaw cut protection. Boots that are cut resistant or with cut-resistant socks, as well as chainsaw chaps, must be worn.

-Fire shelters are required to offer lifesaving protection in the event of an entrapment. The fire shelter reflects radiant heat and helps the firefighter in two primary ways: first, it provides more breathable air; and second, it gives firefighters a way to protect their lungs and airways from flames and hot gases, the leading killers in entrapment.

Maintenance of Other PPE

Fire-resistant fabrics should be kept clean since they lose their fire-retardant capabilities if foreign substances are on or in the fibers. They should never be used if they are contaminated with any flammable liquids. They should be washed in soap and water separate from other clothing. All boots and gloves should be kept clean. Boot grease should be applied as necessary to keep the leather soft. Boots should be kept in good repair by inspecting and replacing soles, ensuring that all stitching is present, and checking the condition of laces.

References

1. APHC Fact Sheet 55-081-1220, Wildfire Smoke Exposure.