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The Versatility of Technical Rescue Gear: Changes on the Horizon for NFPA 1951

By Jeffrey O. Stull

Technical rescue gear is a relatively new hybrid set of clothing that has been developed to meet the growing needs of the fire service. Originally, technical rescue gear was designed to provide protection for special operations involving structural collapse, victim extrications, confined space entry, trench/cave-in rescues, and land-based search operation. The gear thus became synonymous with the Federal Emergency Management Agency (FEMA) Urban Search and Rescue (US&R) teams. In fact, a FEMA U.S. Fire Administration study in the early 1990s helped to establish criteria for personal protective equipment, which eventually took the form of NFPA 1951, Standard on Protective Ensembles for US&R Operations.

Over the years, a number of fire departments have looked at the potential for using this gear as a “step down” in protection for main line firefighters for missions other than structural firefighting, which often account for more than 80 percent of a department’s responses. Victim extrication from vehicle accidents are a prime example of technical rescue gear’s benefits. This protection philosophy is based on the need for less overall thermal insulation combined with appropriate levels of flame/heat resistance, physical hazard protection, and protection from dangerous liquid and bloodborne pathogen exposure.

The primary hazards faced in technical rescue operations are generally those of a physical nature where contact with sharp edges and rough surfaces are likely. There is also a need for flame and heat protection in the event of flash fire, which might occur with a ruptured gas line. Given the potential for encountering various hazardous liquids at a disaster scene or accident, limited protection from

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chemicals is needed. There is also the possibility of contact with live electrical sources. Rescue events can involve significant exposure to blood and body fluids. Because wearing periods for this gear are likely to be long, the clothing and equipment must be lightweight, comfortable, breathable, and minimize any effects on wearer mobility and function.

When it was first published in 2001, NFPA 1951 was intended to address these needs. The standard addresses an ensemble of garments (coat and pants or coverall), helmets, gloves, footwear, and eye/face protection. Most clothing that has been certified to NFPA 1951 over the past five years has been used by special operations teams. However, given events such as Sept. 11, 2001, and Hurricane Katrina, a new perspective on rescue gear has been under consideration given the range of tasks during extended emergency operations. As consequence, the normal revision efforts for NFPA 1951 have accounted for changing rescue protection needs. A new edition of NFPA 1951 is nearing final approval for probable release in early 2007.

Probably the most readily noted change in NFPA 1951 will be the title, which is being modified to “Standard on Protective Ensembles for Technical Rescue Operations.” The title has been broadened beyond US&R operations to be more consistent with the potential uses of the ensemble. The most significant change in the standard is its reorganization to recognize three separate types of ensembles:
1. Technical rescue utility
2. Rescue and recovery
3. CBRN

Specifically, technical rescue utility ensembles have design and performance criteria for technical rescue operations where there are no liquid hazards, such as blood/body fluids or liquid chemical splashes. These operations may entail driving vehicles or operating equipment where the principal hazards are physical. Rescue and recovery ensembles are intended for technical rescue operations where liquid hazards are present. CBRN technical rescue ensembles are established for incidents involving chemical, biological, radiological, and nuclear (CBRN) hazards as the result of terrorist activities.

In fact, the primary proposed differences will exist only for garments and gloves where liquid barrier protection is provided in rescue and recovery ensembles, but not for utility ensembles. Otherwise, the criteria for helmets, footwear, and goggles are the same between utility and rescue/recovery ensembles. In general, the types of garments that will meet utility requirements will be single layer garments, whereas rescue and recovery garments will include multiple

layers or a material incorporating a film to provide the liquid barrier protection. Similar distinctions will exist for glove configurations. Helmets will remain relatively lightweight, but more robust than a typical hardhat. All footwear will be multiple layers with a barrier layer and designed for long wearing.

A number of changes are being introduced to the 2007 edition of NFPA 1951. For garments:

- Collars must be at least 2 inches high.
- Requirements for trim on protective garments have been removed from the standard. No criteria are defined for trim or visibility materials. Garments may have no trim or use alternative visibility materials.
- The radiant protective performance (RPP) test has been replaced with a thermal protective performance (TPP) test, involving a spacer between the material and the sensor. A minimum TPP rating of 10 is required.
- Garment material strength requirements have been raised.
- The water repellency test method has been replaced with a water absorption test method. A more stringent requirement is applied.
- Different total heat loss requirements are set for each category of garment to address garment composite breathability. Materials in technical rescue utility garments must have a total heat loss value of at least 650 W/m2 (the highest level), rescue and recovery garments at least 450 W/m2, and CBRN garments at least 250 W/m2 (the lowest level).

The new edition will also include changes for other ensemble elements. For helmets, criteria regarding the type of helmet and its shape have been removed and accessories are no longer addressed. No other changes have been made. A requirement has been added that requires gloves be provided with a wristlet or other design at the end of the glove to ensure that the gauntlet is tight fitting around the wearer's wrist. Glove insulation against flash fires will also be based on the TPP test. Different levels of dexterity and grip are applied to the three categories of gloves. Technical rescue utility gloves will be required to have the best dexterity and grip performance, whereas lesser criteria will be applied to rescue/recovery and CBRN technical rescue gloves because of the need to include a barrier. Footwear is required to provide barrier protection in all three categories of technical rescue ensemble. Other changes were made to update requirements. Only goggles meeting specific type requirements in ANSI Z87.1 will be permitted. In addition, goggles must meet minimum heat and flame

resistance requirements.

CBRN technical rescue ensemble requirements are based on Class 3 requirements in NFPA 1994 (protective ensembles for first responders during CBRN terrorism incidents) for use in non-IDLH situations. The CBRN technical ensemble must include garments, gloves, footwear, and a hood in combination with a NIOSH approved CBRN air-purifying respirator (APR) as the minimum acceptable respirator. CBRN technical rescue ensembles are subject to specific design and performance criteria in addition to the other criteria normally applied to technical rescue utility and rescue/recovery ensembles. These criteria include man-in-stimulant testing, full ensemble liquid integrity testing of the overall ensemble and permeation testing of barrier layer materials in the garments, gloves, footwear and hood. Garments must meet the same criteria as applied to rescue and recovery garments with the exception that a lower total heat loss is required. Helmet requirements are the same as the requirements for both technical rescue utility and rescue/recovery helmets. Gloves must meet the same criteria as applied to rescue and recovery gloves. Footwear must meet the same criteria as for both technical rescue utility and rescue/recovery footwear. Hoods must meet the same criteria as garments.

The release of the new standard in early 2007 will then provide changes for a wider range of missions undertaken by the fire and emergency medical services. With the new standard in place, rescue organizations will be able to choose appropriate protection meeting their specific response needs.

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