



United States Department of Commerce
Technology Administration
National Institute of Standards and Technology

NIST Special Publication 911

*Firefighter Thermal Exposure Workshop:
Protective Clothing, Tactics, and Fire
Service PPE Training Procedures
Gaithersburg, Maryland
June 25-26, 1996*

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NFPA STANDARDS ON STRUCTURAL FIRE FIGHTING PROTECTIVE CLOTHING

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Regardless of where fire fighting operations take place, firefighters who operate in the interior of structures in areas involved by the fire, or in areas that are affected by heat and products of combustion, are exposed to a hostile thermal environment. These conditions can rapidly deteriorate with an increase in the volume of fire, with ignition of fire gasses (unburned product of combustion) within the structure that causes flame to roll along the ceiling radiating high levels of heat, and with flashover where all combustibles in the area ignite at once. Firefighters who are confronted with these conditions will face the same thermal exposure with little variance due to the type of building construction and general fire fighting strategy. No structural fire fighting protective equipment can give prolonged protection from such hostile conditions. Certain injury and quite possibly death will occur if firefighters do not quickly extricate themselves from these severe exposures.

The philosophy behind NFPA 1971, *Standard on Protective Clothing for Structural Fire Fighting*, has been to provide adequate protection from the hostile thermal environment normally encountered during aggressive interior structural fire fighting operations. This philosophy also requires that both the protective coat and the protective trousers, each affording the same level of protection, must be worn along with the other protective ensemble items including a protective hood, helmet, positive pressure self-contained breathing apparatus, gloves, and boots. The duration which the ensemble will afford protection, of course, varies depending on the severity of the exposure. If the operation is successful in quickly “knocking down” the fire, then the environment should improve and temperature decrease. If the fire is of the extent that quick “knock down” is not possible, then the protective ensemble may offer only a few minutes of insulative protection before the heat becomes too intense through the clothing. This may allow enough time for firefighters to complete the interior primary search and remove any victims, then withdraw to an exterior operation or to a less hostile environment until the conditions modify. If conditions unexpectedly or rapidly deteriorate during the course of the interior operations, there should be a short period of time in which firefighters can rapidly leave the hostile area (or be removed from it) without failure of their protective ensemble, making it a survivable incident for the firefighter but not necessarily for elements of the ensemble. While the firefighter may sustain some acceptable level of injury in this scenario, the level of protection afforded by an NFPA compliant protective ensemble can make this a survivable event.

The community disposition towards fire protection plays a key role in the planned deployment of fire fighting operations. Fire departments should develop strategy and operating procedures that reflect the nature of the fire hazard in their community, and the available resources must dictate the level of intervention. Well managed, highly trained, closely supervised, and properly staffed fire

departments will perform effectively to minimize the life hazard and economic loss to the community as well as providing proper risk management to enhance operational safety.

Where the fire department is expected to extend interior search and rescue operations into all uninvolved areas of the fire building to locate and remove any endangered occupants and is also expected to minimize the economic loss to the community by confining the fire to the smallest area possible, firefighters will be exposed to hostile thermal environments while performing such operations. These operations call for an aggressive interior attack to achieve the objectives in as little time as possible. The ensemble for firefighters performing such operations should afford optimum protection. However, the protective ensemble is only one link of firefighter protection. *Well managed, highly trained, closely supervised, and properly staffed fire departments are equally essential elements of safety in order to minimize the operational risk.*

In all cases, the community must be clear in what is expected of their fire department in terms of its mission, objectives, and service delivery. The fire department must properly define for the community and for itself what levels of organization, supervision, training, staffing, and resources are necessary to effectively deliver the services and safely perform the operations to achieve the objectives. Part of this process will identify the hazards of the various operations and what is the appropriate protective clothing and equipment.

A current point of view about the structural fire fighting protective ensemble is that it allows firefighters to “over extend” and get into positions that are more likely to cause injury than they would be able to if they were not wearing such “sophisticated” equipment. We suggest that firefighters who “over extend” are not operating under close supervision or in an incident command system that controls the position, function, and safety of all operating teams. It is not the purpose of advanced protective clothing to permit firefighters to go “deeper and deeper” into involved structures but rather to provide increased protection for the “normal” operating positions and to give a margin of safety if conditions unexpectedly deteriorate. State-of-the-art protective clothing can allow fire fighters, operating safely within the incident command system, to be able to perform more effectively. Regardless of the level of protection afforded by clothing, anything except bare skin can allow firefighters to “over extend.” This further enforces the position that all operations must be managed by the incident command system and that firefighters only operate under direct supervision within that system. Free lancing of individuals or teams can not be allowed if safety is to be achieved.

Another opinion is that advanced protective clothing does not allow firefighters to “feel the heat” and to be able to judge the environment. The ability to judge heat build up can differ depending on what the firefighter is wearing. It is a training issue for firefighters to become familiar how an ensemble transmits heat and what detectable level should cause a safety reaction. What may be felt in one garment may be entirely different in another garment. There is not a single “measure of heat build up” that can be applied to all garments. Likewise, it is not practical to rely on exposed human body parts to indicate heat exposure as the skin begins to burn after a short exposure at relatively low temperatures (about 135 °F/57 °C).

Also, there is the opinion that the thermal insulation of the protective clothing causes more injuries, due to heat stress, than lighter weight (but less protective) garments. Incorrect conclusions have been made about the reported stress related injuries and deaths in the United States. Some positions state that these injuries are the result of the protective clothing. Heat stress can not be addressed only by the garment but must be approached from several factors that equally affect it. For garments to be protective from the extremely hostile thermal atmosphere, thermal insulation is needed. Garments alone can not keep a firefighter both comfortably cool and provide adequate thermal insulation for interior structural fire fighting operations. The total factors affecting stress and heat stress must be evaluated including firefighter's age, physical condition, individual metabolism, how they are managed during incident operations, and if their vital signs and physical conditions are monitored and cared for. While it is true that lighter garments will most likely help to reduce the stress to the wearer, lighter garments that still provide at least the protection specified by the standard should be selected.

With any selection of protective equipment, fire departments must carefully review their needs and determine what will be an appropriate level of protection. Purchase specifications should reflect these needs and should specifically require compliance with the applicable standard. NFPA 1971 should not be construed as setting levels of protection for all fire fighting situations and conditions to which structural fire fighters may be exposed. Nothing in NFPA 1971 is intended to limit or restrict any jurisdiction or manufacturer from exceeding the minimum requirements of the standard.