Milliken™

Effective structural fire turnout gear not only protects first responders from flames, it also prevents heat, liquids, chemicals, and potentially toxic substances—such as carcinogens—from harming a firefighter. Each layer of turnout gear—outer shell, moisture barrier, and thermal liner—utilizes highly technical fabric technology to create a system that works together to provide multi-hazard protection. We explore how each layer plays its part in protecting firefighters as they respond to calls.

The **outer shell** is the most durable layer and the first line of defense from physical hazards firefighters face. This layer guards firefighters against flames, liquids, sharp objects, and chemicals that may be present at a structural fire. This layer is also effective at preventing airborne carcinogens from reaching the firefighter while they are wearing the garment.

The durability of the outer shell is primarily attributed to the types of fibers, yarn formation, and weave construction of the fabric. Durable, lightweight, and pliable fabrics put less strain on the firefighter, allowing them to move more freely while also providing vital protection from abrasions, toxins, and flames.

The **moisture barrier** is the middle layer in structural fire turnout gear and is tasked with preventing water, bloodborne pathogens, and harmful chemicals from penetrating the PPE and impacting the wearer. The moisture barrier typically consists of a layer of ePTFE (polytetrafluoroethylene) laminated to an inherently FR (flame resistant) substrate fabric. This layer also has a significant impact on the breathability and THL (total heat loss) value of the turnout gear system.

The **thermal liner** is the closest layer to the skin and is the most effective at limiting heat transfer to the wearer. This layer helps wick away moisture from the firefighter's skin, keeping them cooler and drier during a call. Additionally, this fabric helps regulate microclimates, a concept where heat and moisture are trapped between the skin and the gear which can lead to overheating and even heat stress conditions. Turnout gear can foster the ideal condition for a microclimate to form, so having an effective thermal liner helps move sweat away from the skin helping it to cool.

Milliken understands the hazards firefighters face on the job and continues to develop technical fabrics for each layer of protection. We understand that a firefighter's turnout gear is a valuable asset when it comes to their safety, so we actively engage firefighters and departments about how we can solve problems and push the envelope of innovation.

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