How to buy turnout gear

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Selecting fire protective clothing is not a simple task; it requires extensive analysis to ensure that the garment selected is suited for the needs of each specific fire department. There are so many factors that one must consider that it is often both confusing and time consuming. Influencing this process are the multiple players who get involved such as the manufacturers of individual components and the standard-setting organizations related to product stewardship.

Here the main things to consider when buying new turnout gear.

Standards
The two most recognized standards regulating fire protective clothing are the NFPA 1971 Standard for Fire Protective ensembles in the United States and the EN-469 Protective Clothing for Firefighters in Europe. Both standards seek to specify safety parameters for fire protective garments.

By referencing industry recognized test methods and procedures, manufacturers submit their respective garments for third party testing to determine whether they meet those requirements. Both standards include severe testing that allows firefighters to determine a level of field performance that meets the needs of their department. When compared, both standards are thorough in their assessment of a garment's performance. The NFPA 1971 does, however, offer some slightly more elevated requirements for heat resistance, garment breathability and overall garment integrity - this mainly related to the tactics required to fight fires in building structures typical to North America.

Materials
There are a multitude of materials available for fire protective clothing. Much of the performance characteristics of a garment are determined by the choice of combined fabric components. Fire protective clothing typically consists of three layers: outer shell, moisture barrier and thermal liner. While each layer serves specific multiple functions, as a composite they are expected to provide the firefighter with adequate heat, flame, liquid, chemical and mechanical protection.

As is the case with the physical properties of most materials, there are always "give and take" factors to consider. Most notable is the relationship between thermal protection and breathability. While maximizing both is desirable - this relationship is inversely related. Fire departments requesting lighter, more mobile gear must be aware of the reduced thermal protective factors attendant to such gear. This means that fire departments selecting this gear may have to consider readjusting such aspects as interior attack strategies to reflect this reality.

Fiber Composition and Form

Another important difference related to fabrics is the fiber composition and form. Some fibers will radically transform when exposed to severe heat or flame, thereby allowing them to absorb more heat on the surface layer. Others will not transform, but may allow marginally more heat to be dissipated within the inner layers. Also worth mentioning is the difference between fabrics that are woven using multifilament fibers and those using more traditional spun fibers. Multifilaments consist of smooth uniform yarns that provide enhanced tensile strength, water resistance, and interfacial slipperiness. However, some filament blends can tend to result in weak or separating seams .

Outer Shell Material

Field experience has proven that much emphasis is place on the outer shell material. This is perhaps related to the fact that the shell is most apparent and its condition is often equated with overall performance of the gear. While the shell is important, it must be noted that in terms of thermal protection, the shell is responsible for only 25-30% of the total factor. The purpose of the outer shell material to provide a first line of defense against heat, flame, cut and abrasion. Outer shells are also required to be tested for both thermal and laundry shrinkage, in addition to resistance against water absorption.

Moisture Barrier

The moisture barrier material consists of a permeable film barrier laminated to woven or non-woven substrate material. It has been proven that ePTFE (Expanded PolyTetraFluoroEthylene) films offer enhanced resistance to heat and chemical exposures. Durability of the substrate is also a factor when selecting a moisture barrier with woven vs non-woven substrate. The woven will generally outlast the non-woven backed fabric; conversely, the non-woven will typically contribute marginally more to the overall thermal protective factor of the garment.

Thermal Liner

The thermal liner is also a double layer fabric with a facecloth material quilted to a non-woven batting insulation. Together with the moisture barrier fabric, they account for up to 70-75% of the thermal protective performance of a protective ensemble. Thermal protection being the most important function of the thermal liner, other factors such as water management and interfacial slipperiness must also be factored. The face cloth material is closest to the skin and hence any increase in friction will typically result in more exertion by the wearer. Fabrics containing some or all filament will offer better slipperiness properties.

Water management in thermal liners can be more complex. Facecloth liners containing some or all filament inherently have less affinity for water. This can help to enhance the wicking and even shedding properties particularly as the filament content is increased. The advantage of this for the firefighter is faster drying time between calls. It is important to highlight that water or wetness in a thermal liner can be dangerous for firefighters as it can delay recognition of high heat zone by providing a misguided heat sink effect to the firefighter.

The second layer, that is the thermal insulating component, of the thermal liner is also quite varied. Typically they consist of non-woven battings made of aramid or aramid blends. Thickness is often directly related to thermal performance and inversely related to breathability. Newer, multilayered, spunlaced woven insulations are delivering on enhanced thermal performance with only a marginal effect on breathabilty by taking full advantage of the insulating air between each layer.

Fabric Combination
When determining the right fabric combination, it is important to note that it is not just a matter of "good, better, best", but rather a methodical approach that looks at predetermined factors. All fabrics that are "certified" provide an industry-recognized level of protection. What is of great importance is to match the fabric combination with key department criteria such as: attack strategies, environment, crew demographics, type of calls and climate.

Design
When we speak of design, many think of styling. However in industries related to safety or industrial applications, design is more synonymous with ergonomics. Ergonomics, as defined by Merriam-Webster on-line dictionary, is "applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely". When developing fire protective garments, it is important that designers work closely with firefighters to develop products that respond to the needs of the user. Designers make use of engineered pattern configurations that maximize mobility and optimize safety and protection while maintaining obvious factors related to basic functionality.

Of greatest concern for the firefighter is unobstructed range of motion. This is not only important for movements typically associated with structural firefighting, but also with technical and medical rescue which can be 80% of the firefighter's daily tasks. Given that fire protective clothing is a three-layer composite, ease of movement must be aided by design. Shaping the garment and providing pleats or gussets in key places can usually achieve this, but never at the expense of adding more weight. This would defy the purpose of design engineering.

Mobility
This is particularly important in the areas of the body where bending and twisting occurs - typically the mid-torso and limbs. Shaping the garment will achieve this. Some, more modern, designs provide a height differential between the front and back of the body. The front of the pant will be lower than the back section and conversely the front of the coat will be raised to ease bending when climbing and running. Designers of protective garments may also shape the limbs to mimic the natural stance of the arms or legs, providing enhanced comfort and freer movement for the firefighter.

Other performance factors related to garment design include functionality and enhanced safety. Designers should attempt to anticipate possible vulnerabilities in garments related to firefighter tasks and practices. An example of this is the commonly known fact that

firefighters will often engage the front closures of a coat only once in the truck. Progressive designers, involved with firefighters, will anticipate this in their design by building in components or closures that are more compatible to this practice.

Design differentiation is dynamic and related to the changing tasks of the firefighter as well as the changing demographics of fire departments. It is up to the manufacturer of the fire protective clothing to anticipate and recognize the needs of departments by working closely with them during the development of products. Fire protective clothing is not a "one size fits all" business.