PPE: DOS & DON'TS

THE DOS AND DON'TS OF FIREFIGHTER PERSONAL PROTECTIVE EQUIPMENT – CLOTHING – SELECTION,
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Firefighter garments comprise a complex construction of layers that are required to undergo a number of intensive independent tests to meet mandatory standards. Since the emergence of the first specialized protective clothing for professional firefighters in the 1970s, the advancements in fabric and clothing manufacturing technology have moved the emphasis of PPE design from solely physical protection towards a more holistic approach. The physiological impact of PPE on the wearer, and ease of use and comfort, now play significant roles in selection.

The expected service life of PPE means its procurement is usually categorised as a capital asset. On the valid assumption that for the majority of kit acquired – it will have a service life of seven to ten years (possibly more), procurement considerations go well beyond those for typical revenue expenditure clothing such as station and corporate wear.

Selection considerations

The dos and don’ts of PPE selection involve consideration being given to a range of issues that should be factored into its full appraisal, trialling and ownership. These should include:

- Physical protection. Product qualities measured against both independent performance standards and empirical tests for fire-related risks
- Physiological factors. Impact on the firefighter of prolonged deployment and exposure to typical front line activities
- Weave comfort. Ease of donning kit, its ergonomic flexibility and overall comfort under operational conditions
- Longevity. The quality of the garment and its manufacturer help determine its life expectancy within a managed service environment and impact on whole of life cost
- Supplier and supply chain resilience. With an expected life span of up to ten years, providing a range of physical, IT and financial back-up services is essential to ensuring the achievement of anticipated long term performance and planned cost of ownership when factored into the procurement evaluation.

Product selection

Careful product selection is the starting point in the provision of the best possible protection on which the personal safety of firefighters, and their confidence, ultimately depends. The complexity of today’s leading-edge firefighter garments, including structural, wildland and technical rescue/ARFF kit, makes it essential that each layer’s contribution to the aggregate protection provided must be considered alongside its combined performance within a multi-layered garment.

The outer shell is the first line of defence. It provides protection from flame. In structural kit, especially when fighting fires in buildings, the physical strength of the fabric, in terms of its tear and tensile strength and abrasion resistance, is key to its performance.

The moisture barrier is the second line of defence. It provides essential protection from the ingress of water whilst facilitating the escape of moisture vapour to minimize levels of entrapped sweat inside the garment, and forms a barrier to provide protection against blood-borne pathogens.

The inner lining provides thermal protection, as well as abrasion protection for the moisture barrier. It should be abrasion resistant to minimise wear in contact with the firefighter’s underwear, whilst enhancing comfort and ease of movement. It is also important that this layer helps to move moisture away from the body.

The combination of these three layers also determines the
AMBIENT TO CYLINDER AT THE FLICK OF A SWITCH – JUST ONE OF THE FEATURES OF AVON PROTECTION’S DELTAIR SELF-CONTAINED BREATHING APPARATUS


The product’s patented user-friendly air management switch allows firefighters to instantly shift from ambient air to cylinder air when required, which means the user is able to wear their face mask at all times. A quick disconnect option also enables the firefighter to replace their cylinder in seconds without removing their gloves. These upgrades are designed to extend operational time for focus on fire management and lifesaving efforts.

‘We centered on what the firefighter requires to do their job to the best of their ability whilst ensuring their personal safety. Working with the fire service industry we developed a SCBA which not only meets the new standards, but exceeds expectations.’

‘We have taken Avon’s best military-grade innovations and applied them to meet the needs of firefighters, taking respiratory equipment technology and design for this market to new levels. Every feature and benefit is designed with the firefighter at the front of our thoughts,’ said Tony Topf, Global Product Manager for supplied air products at Avon Protection.

‘Major changes to NFPA 1981 include approval of use for Emergency Breathing Support Systems (EBSS), a 33% end of service time indicator, improved communications and higher heat testing for the SCBA and masks. NFPA 1982 changes include a universal PASS sound. These changes will improve firefighter safety the world over.’

First previewed at FDIC 2013, the respiratory protection product represents a £5 million investment for Avon. The company offers a 10-year warranty on the electronics and a 15-year warranty on the pneumatics of the US-manufactured Delair.

level of radiant heat protection afforded by the garment and its overall thermal protective qualities. Optimising these characteristics in front-line conditions, where the firefighter can be exposed to high levels of convective and radiant heat as well as flashovers, is heavily dependent on the fabric combination. Their ability to achieve the optimum blend of fibres, coupled with the quality of the fabric weave, is critical in delivering high performance protection. Martini testing is widely used to measure burn injury risk and is used to guide the manufacturer in identifying, and eliminating, any ‘hot spots’ at the design stage.

In the UK, national standards were first introduced to ensure that minimum levels of protection were built into firefighting clothing. The first was the Home Office A11 specification, followed by the A20, developed jointly with Bristol Uniforms during the 1990s. European performance standards were introduced in 1995 when the EN469 standard mandated minimum protection performance for municipal fire services across the European Union under the EU’s PPE Directive. Within EN469 2005, provision is made for alternative levels of protection. Levels 1 and 2, which provide usage for fire services to select the appropriate level for their operational environment. Independent testing and quality assessment is a vital component in driving up standards and delivering an environment in which firefighters can be confident in their PPE’s protection. Leading manufacturers provide added confidence to users by achieving quality management accreditation to ISO 9001 to demonstrate the consistency of their production monitoring and inspection management procedures.

Cutting-edge design enables manufacturers to demonstrate their innovative skills and abilities and differentiate their products from competitor offerings. Users should also focus their pre-selection process on ensuring that the entire head-to-toe protection is both ergonomically advanced as well as fully compatible. Compatibility testing through wear trials helps to identify and achieve best levels of protection. By matching helmets, boots and gloves with the preferred design. This ensures good protection around the neck, wrist and ankle areas. Helmets need to be selected with weight and use of hazing or major considerations along with flash hoods offering good comfort and fit. Gloves must provide the necessary levels of dexterity whilst boots need to provide the right level of fit, comfort and weight.

**Supplier considerations**

The long-term implications for PPE procurement justify the time spent on fully evaluating alternative suppliers, and can pay substantial dividends in terms of technical and service support and security of supply. An exhaustive evaluation process can minimise the chances of encountering the unexpected during the lifetime of the contract.

What are the key supplier features to consider when entering into a long-term supplier and supporting partner relationship? These include:

• Pedigree
• Resilience
• Flexibility
• Sustainability

Pedigree is a measure of long-term performance and reliability and can help underpin customer confidence. This can be a combination of experience and a successful track record in the key elements of design, manufacture and after-sales services. Ideally, look for a supplier with a sound and consistent track record of in-house innovation in both design.
and manufacture. This should be coupled with an outstanding record of product quality, managed services, and garment longevity which together provide a useful yardstick to measure overall value for money. The user's time involved in operating a contract can be minimised through round-the-clock access to a range of online management information, in a fast-moving emergency services environment, ready access to information to maintain their operational capability and, feasibility is invaluable. Some examples which a fully integrated managed services provision should provide include information such as level of access to back-up stock, being able to check on current service status, garment condition coding, expected end-of-life-replacement predictions, and forward budgetary implications of current PPE wardrobe management policy.

Resilience encompasses a range of elements from financial strength to a supplier's supply chain security as well as business continuity plans for both the manufacture and storage of PPE. Where does ultimate control of the key components of product and service supply reside? Ideally, product design, garment manufacture, stock, distribution and maintenance should all be directly managed and undertaken in-house in locations which are, as far as possible, not vulnerable to disruption from fragile geopolitical influences. Resilience is also about robust finance, which helps protect a business during fluctuations in economic cycles whilst providing the basis for ongoing investment in new products and product quality and performance standards.

The ability to meet specific requirements depends on the level of flexibility and choice offered. Every firefighter and fire and rescue service has specific needs. This calls for a bespoke approach to design and manufacture characterised by the provision of a generous range of male and female sizes matched to a sizing service able to ensure individually well-fitting garments as well as a head-to-toe compatibility service. Flexibility should include procurement options to meet the finance needs of different fire departments. These should include purchase, lease purchase and contract lease facilities.

A sound, long-term relationship will be enhanced by a supplier having a sustainable business model. Continuity of supply requires a demonstration of sound upstream relationships encompassing research and development, and new product development programmes. Regular product design reviews are dependent upon a commitment to long-term innovation investment. Sustainability in managed services capability relies upon full in-house control: alternative locations to ensure business continuity in the event of unforeseen interruptions outside the supplier's control.

The recent decision by Birmingham International Airport to specify Bristol's XFlex fire coats and trousers, as part of a head-to-toe, five-year lease-purchase contract, exemplifies how an exhaustive process ensured that all the key factors were considered in the final selection decision. As Paul Annett, Birmingham Airport's Fire Manager, said, 'For aviation fire fighting you cannot underestimate the importance of quality PPE for firefighters; it is an area that we will never compromise on. After meeting with other fire-clothing manufacturers it is apparent that this area of industry has come on leaps and bounds over the years and there is much on offer with regard to firefighter protection. However, we chose Bristol fire fighting PPE both for its superior ergonomic quality and the support service that goes along with their products.'