

## FIRE FIGHTERS' PROTECTIVE CLOTHING

Mäkinen, Helena

Institute of Occupational Health

Address for reprints  
Institute of Occupational Health  
Department of Safety  
Laajaniityntie 1  
SF-01620 Vantaa Finland

Functional protective clothing for fire fighters must entail a combination of the following properties: protection, comfort, durability and washability. An optimal compromise should be found between the different properties.

Priorities for the different properties were sought by studying accidents, by inquiries, and by testing the present garments in use. A new turnout overall was developed to better meet the demands of various alarm situations.

42 % of the accidents occurred during fire or rescue operations when the turnout overall was worn. In about 14 % of the accidents in alarm situations, more protection was needed from the clothing. In 77 % of these cases protection against burns was needed, and in the rest of the cases protection against mechanical injuries.

27 suits that had been in use were collected from the fire stations and analyzed. Their properties were *tested to evaluate* the effects of wear, i.e. degradation of properties due to alteration, and also to set priorities for the new suits. The flammability properties were sufficient. No unexpected latent alteration was found. The general state of the suits gave an indication of when to replace the garment. Reflective stripes lost their effectiveness faster than the basic garment. More protection was desired as regards water repellency and shrinkage in laundering. Measuring methods are needed to test the protective properties and comfort of the garment systems.

None of the studied new materials improved the sorely needed property of water repellency. By using fire resistant synthetic materials, the shrinkage problem of the suits will be eliminated.

The new design of the garment, with partial protection on the shoulder area, improved the water repellency without diminishing the comfort properties. The interference with the protective helmet gloves and safety belt was improved, as was the mechanical protection on the knees and elbows. Visibility was improved by a new color combination and by using reflective stripes over a wider area. The final protective capacity of the new outfits depends on the used garment complex.