



Competition



Design and construction of functional protective clothing for firefighters

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Competition



Introduction

- **Firefighters during their job are exposed to:**
 - fire,
 - water,
 - static electricity and
 - chemicals.
- **Their protective clothing have to be:**
 - fireproof and
 - waterproof.
- **Firefighters' protective clothing has to satisfy the general requirements:**
 - thermal protection,
 - convenience during interventions,
 - comfort under normal climatic conditions and
 - proper ventilation system performed due to release of heat produced by natural firefighters' metabolism.





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Standard EN 340:2003

- Protective clothing from heat and flame should be designed to fit comfortably.
- The European standard EN 340:2003 "Protective clothing - General requirements" - dimensions of protective clothing
- Three main body measures are necessary for establishment of size of protective clothing:
 - chest circumference,
 - waist circumference and
 - body height.
- Three groups of body height:
 - a low growth to 167 cm,
 - the normal growth of 167 to 181 cm and
 - the tall growth above 181 cm.



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Comfort of the protective clothing

- can be classified as:
 - thermophysiological comfort - maintain a comfortable state of heat and moisture (thermal resistance, partial air permeability, transport of moisture through the material, the amount of moisture in the material, the possibility of refusing water ...).
 - sensory comfort - various sensory stimuli during the contact of fabrics with body contact (rough or soft cloth, a feeling of warmth or coldness of the body due to contact with the fabric, creating static electricity, tingling sensation, itching ...).
 - comfort during the use of clothes - the ability of clothing to allow free movement of the body, reduce stress or follows the contours of the body / body part (elongation, weight ...)



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Protective equipment for firefighters

- Firefighter's protection equipment can be divided:
 - personal protective equipment (protective clothing and footwear, helmets, masks and belts with accessories) and
 - collective protective equipment, (clothing for protection from heat and aggressive substances, suits for RCB-protection, climbing ropes, equipment for respiratory protection, dosimeters and detectors, and decontamination equipment).





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Working fire uniforms



- blue jacket,
- blue shirts,
- trousers,
- hats and
- black shoes.





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Intervention firefighting uniforms



- personal protective equipment for firefighters
 - jacket,
 - trousers,
 - gloves,
 - protective boots,
 - fire safety helmets,
 - protective belts and
 - protective masks to be used with insulating apparatus)



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Protective clothing for firefighters

- Multilayered and typically is made of four basic layers of material consisting of a combination / system:
 - external material is also called "outer shell" is very strong, a high resistance to heat, flame and chemical resistance,
 - barriers to moisture - reduce the amount of water from the environment can penetrate into the interior of the garment, combined with a woven or non-woven surface, which gives it strength and durability,
 - thermal interlining, a material designed to slow the passage of heat from outside to inside of the garment and
 - inner lining that protects the material thermal barriers, and provides comfort to user and an extra protective layer.



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Materials for production of the protective clothes

- have to satisfy specific conditions of the flame resistance, water resistance, high strength
- materials can be impregnated and coated with a special coating against fire and water repellency if it is necessary
 - Flame-resistant cotton fabrics, impregnated and single layer metalized
 - Edirne canvas flame resistant, impregnated and single layer metalized
 - Nomex





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Construction and design of the protective clothing for firefighters

- special attention should be given to the construction of certain parts of garment that will protect the user as to prevent penetration of moisture or chemicals under the garment
- very important is to determine the comfort of the garment which multi layered way of dressing have to satisfy, while not inhibit movement in extreme conditions

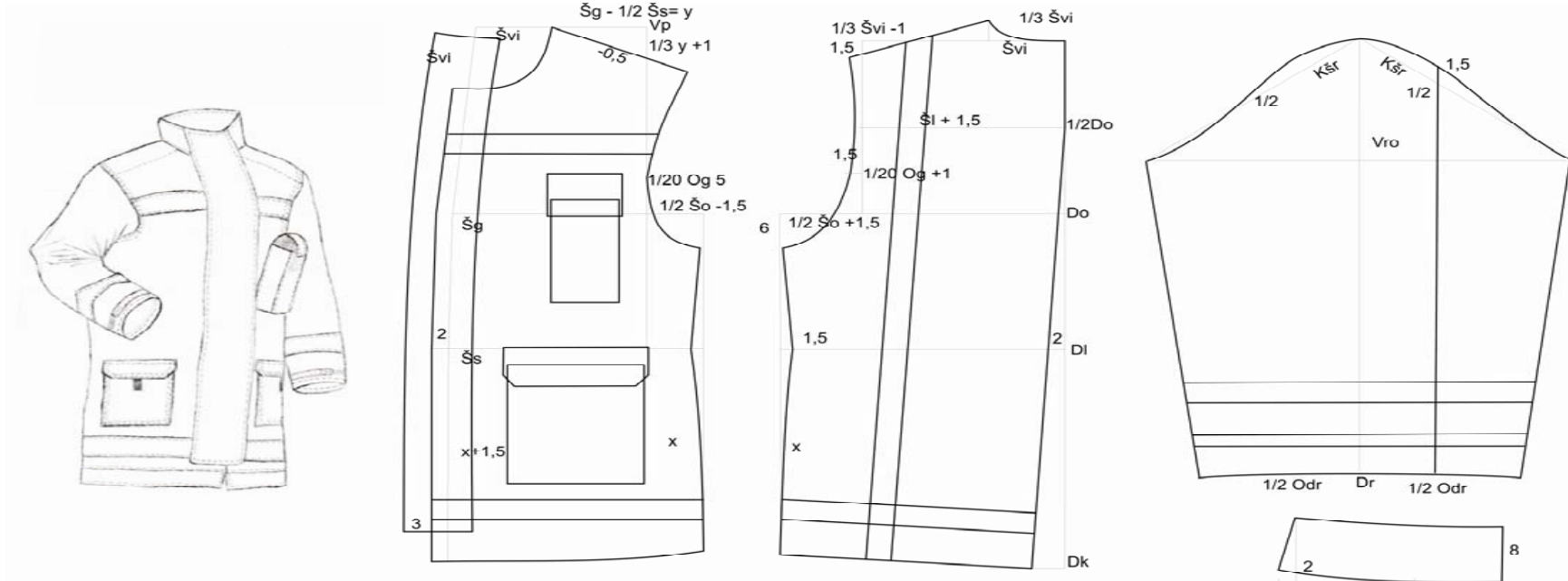




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Construction and design of the protective jacket

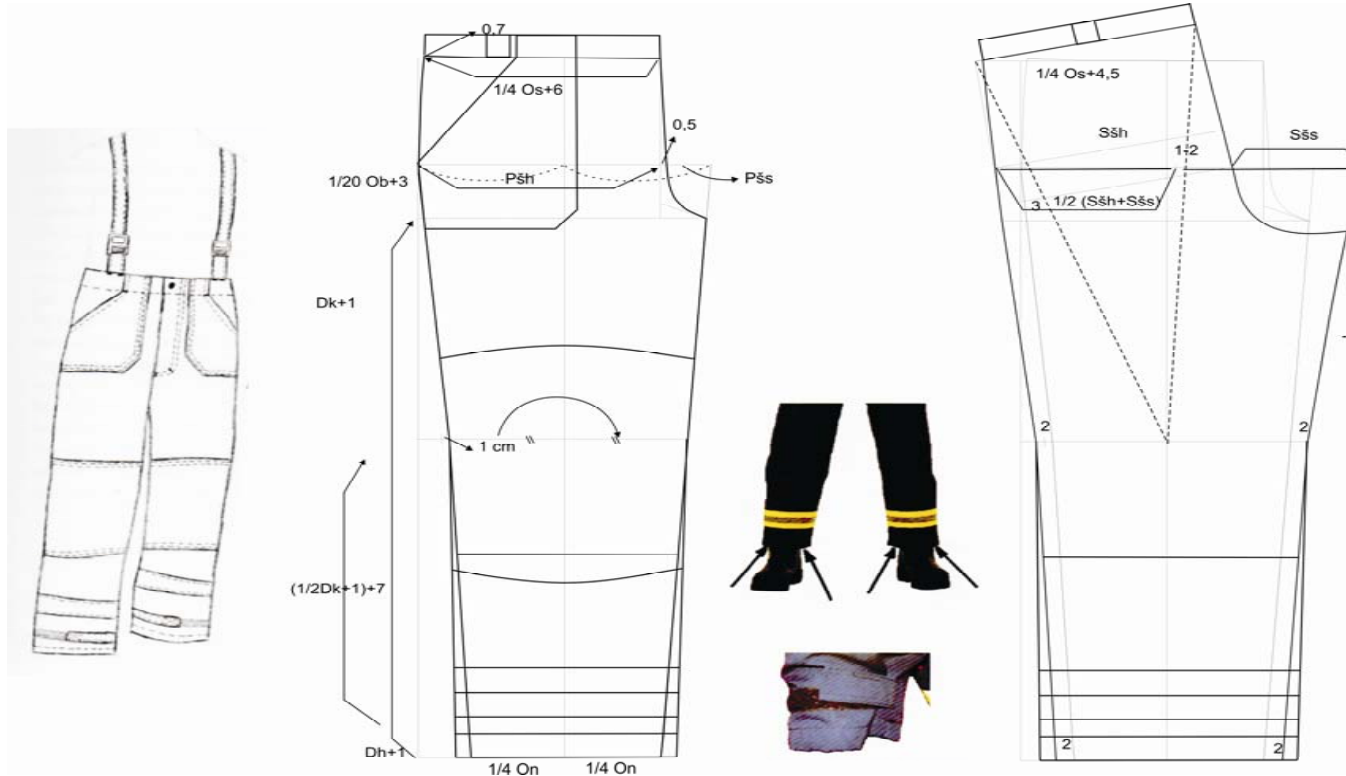




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Construction and design of the protective trousers





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Conclusion

- the studious approach to the selection of materials for making clothes that are used in extreme conditions (protective uniform for firefighters),
- special attention should be paid to the designing of the garment and its construction
- adding commotion during making cuts should be made for multi-layered clothing, extreme movements and extreme conditions
- the construction of a seemingly unimportant detail on fire interventional clothing is extremely important

