Firefighters' Working Environments and their Personal Protective Equipment

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Productive or not Productive ??

- Fire Service / Emergency Response Teams
- Make Community / Work Place Safer
- Reduce number of Incidents
- Low number of incidents =

- Financial Management
- Assess success / failure by profit made
- Eliminate "unnecessary" costs
- Perceived lack of activity of Emergency Response Team

SUCCESS **equals** ***FAILURE***

Every Worker is entitled to a safe Work Place – including Firefighters !!

User Risk Assessment – to establish……..

- **First line of defence**
  - **Identify, remove or reduce all hazards**
- **Second line of defence**
  - **If hazard cannot be removed, introduce controls to ensure safety of personnel in the Work Place**
- **Third line of defence**
  - **If hazards still exist in the Work Place, provide the correct type of PPE**

Personal Protective Equipment (PPE)

- **PPE of "LAST RESORT"**
- To protect against ***Incident risk***
  - to allow a safe escape if necessary

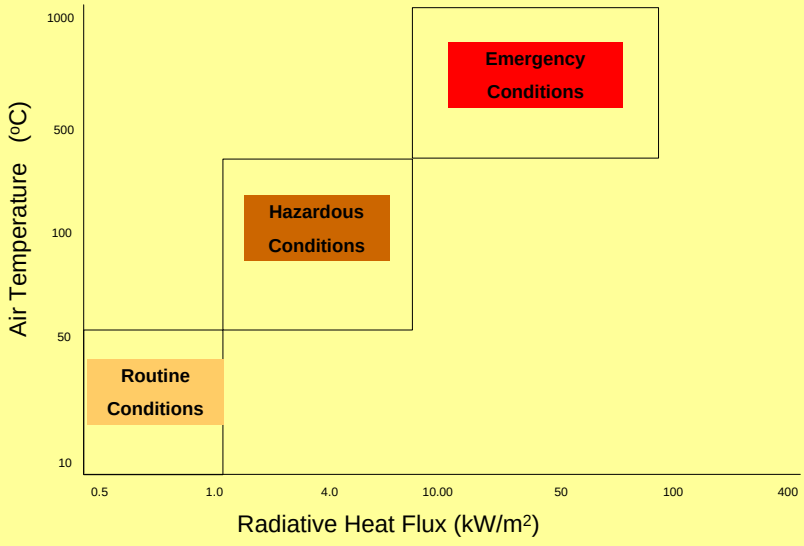
- **PPE of "FIRST RESORT"**
- To protect against ***On-going risk***
  - to allow work to be carried out when exposed to risk

EN 469 : 1995

• **Protective Clothing for Firefighters -**

Requirements and test method
for protective clothing for firefighting

Hoschke Table (Fire Safety Journal 4 1981)



Heat Flux Levels

Heat Flux Level	Occurrence
• Routine conditions **0.7 - 1 kW/m²**	0.1 – 1.5 kW/m² • **Sun burn**
• Hazardous conditions **5 kW/m²** **10 kw/m²**	1.5 – 10 kW/m² • **2nd degree burns in 25 secs.** • **Lower level for Flashover**
• Emergency conditions **50 kW/m²** **84 kW/m²**	10 - 100 kW/m² • **2nd degree burns in 1 sec.** • **Heat flux level for flame engulfment test (prEN 469 8 secs.)**

FLASHOVER

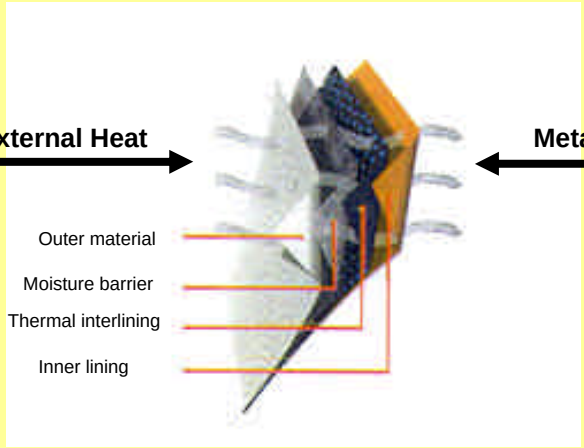
- **A Flashover is :**

  a rapid escalation of a fire resulting in

  – ***a sudden large scale flame or heat blast at extremely high temperatures with***

  – ***accompanying pressure waves that can destroy buildings and structures.***

Resistance to heat transfer



Core Body Temperature

- **Physiological facts**
- **1°C rise in core body temperature** ***(to 38°C)***
  - seeing and hearing are impaired,
- **2°C rise in core body temperature** ***(to 40°C)***
  - risk of collapse
- **2.5°C rise in core body temperature** ***(to 40.5°C)***
  - 50% of people have impaired thinking and their speech makes little sense

"Heat Stress" – overheating of the body

Firefighters are regularly submitted to rises in core body temperature of or greater than 2.5°C

» critical decisions are taken – not questioned
» is medical attention sought ?

Short Term –

- **What is the <u>actual</u> quality / value of the work being carried out ?**

Long Term –

- **what permanent damage is being caused to the body and brain ?**

How many Firefighters suffer medical complaints, disability and premature death after completing active service, due to unnecessary stress to which they have been exposed during service ?

Effects of Temperature – PPE and the Body

°C	°F	Observed effect
37	98.6	Average human body core temperature
39	*102*	*Limit of efficiency/health of human body core temperature*
44	*111*	*Human skin temperature – discomfort and pain*
60	*140*	*Human skin temperature – maximum pain*
120	***248***	***Firefighters Helmet – visor melts***
350 +	***660 +***	***Aramids Nomex/Kermel begin to char***

PPE to current Standards can withstand extreme exposures without any damage whatsoever for a long time – conditions that the human body cannot deal with:

Weakest part of PPE – helmet visor – starts to fail
@ human body limit of efficiency x 3
Outer clothing starts to fail
@ human body limit of efficiency x 9.6

CEN Joint Working Group for Firefighters PPE

- Performance levels in PPE standards should be based on fact not perceptions
- Main risk to health of Firefighter is Heat Stress
- It is critical to the safety of Firefighters to limit their exposure times to extreme environments

European Directives specific to PPE

- **89/656/EEC**
- **the "Use" Directive**
  - minimum Health and Safety requirements for the use by Workers of personal protective equipment at the workplace

- **89/686/EEC**
- **the "Product" Directive**
  - the laws specifying the procedures to be taken in the manufacture and certification of personal protective equipment

CEN Technical Committees
Firefighters PPE

- TC 79 Respiratory Protection
- TC 85 Eye Protection
- TC 158 Head Protection
- TC 159 Hearing Protection
- TC 160 Protection against falls from a height
- TC 161 Foot and Leg Protectors
- TC 162 Protective Clothing

ISO TC 94 SC 14 - PPE for Firefighters

- WG 1 - General Requirements
- WG 2 - PPE for Firefighting (excluding Wildland)
- WG 3 - PPE for Wildland Firefighting
- WG 4 - PPE for Hazardous Materials Incidents
- WG 5 - PPE for Rescue

ISO TC 94 SC 14 Working Group 5 - PPE for Firefighters during Rescue

- Rope Rescue
- Water Rescue
- Rescue from Vehicles and Plant
- Special Rescue – USAR, Mine Rescue etc.

Safe system of work for Firefighters

- Risk Assessment +
- Competency Based Training +
- Provision of the correct type of PPE +
- Effective Planning +
- Effective Command and Control

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Thank you for your attention

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