# Textile fire legislation, regulations and test methods – an overview

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***COST Workshop 14/15 October 2013***

# The overview:

- **Statistics and fires**
- **Legislation vs regulation**
- **National vs international regulations**
- **Test methodologies**

# Statistics-1

- UK Fire statistics
- Other national statistics
- EU and World Statistics

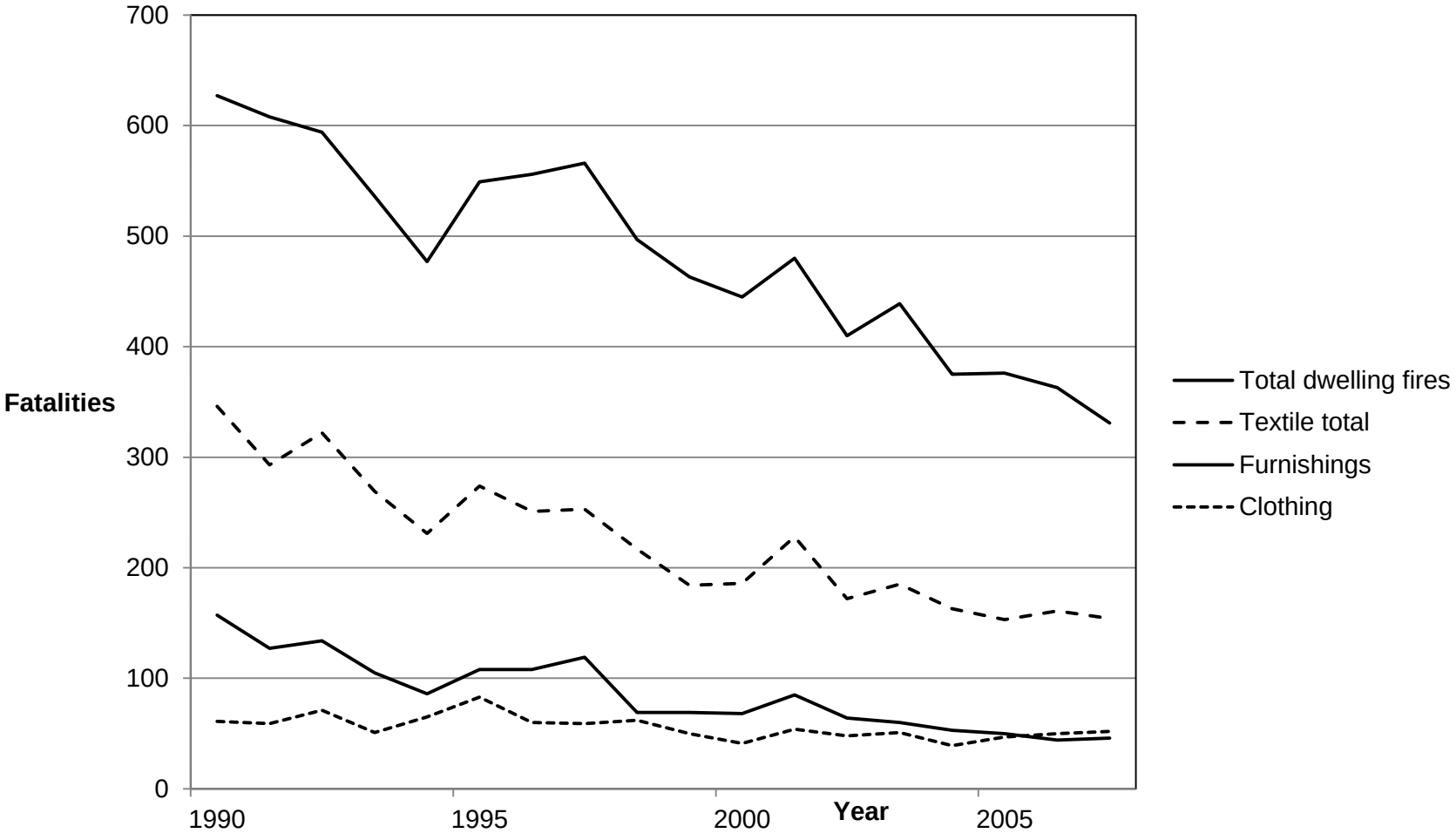
# Statistics-2

- **UK Fire statistics**
  - UK Home Office: Most comprehensive produced from fire brigade data
  - UK Hospital Admission Stats: less comprehensive
- Other **national statistics**
  - Where they exist, they are not very comprehensive
  - Often regional/provincial
- **EU and World Statistics**
  - EU don’t exist and World stats are not reliable

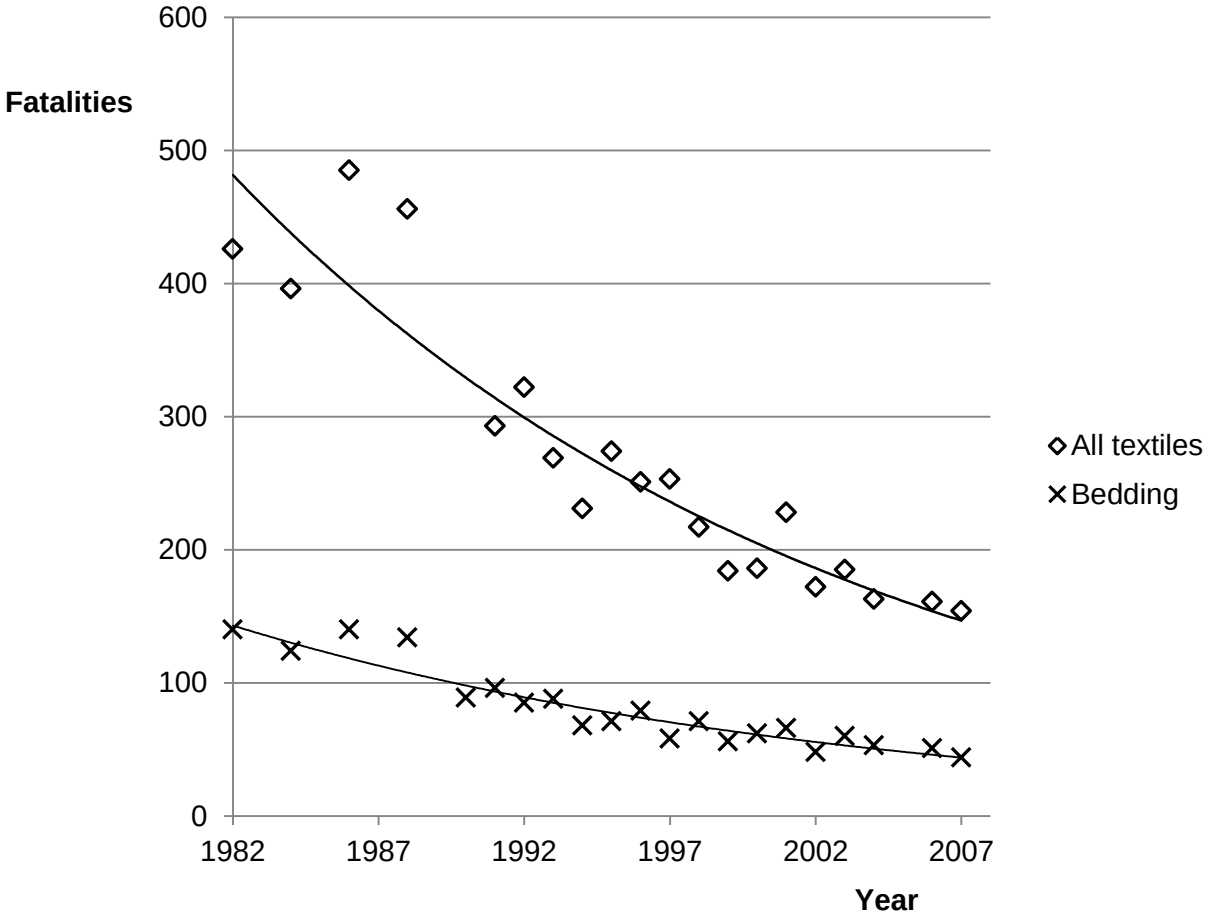
# Annual UK Fire Statistics <1990

- About 1/2 million fires
- About 700 fatalities
- Typically 70,000 dwelling fires
- About 15000 non-fatalities
- Typically 55,000 accidental dwelling fires
- ~20% fires caused by textiles **BUT**
- 500-600 fatalities in dwellings **of which >50% textiles**

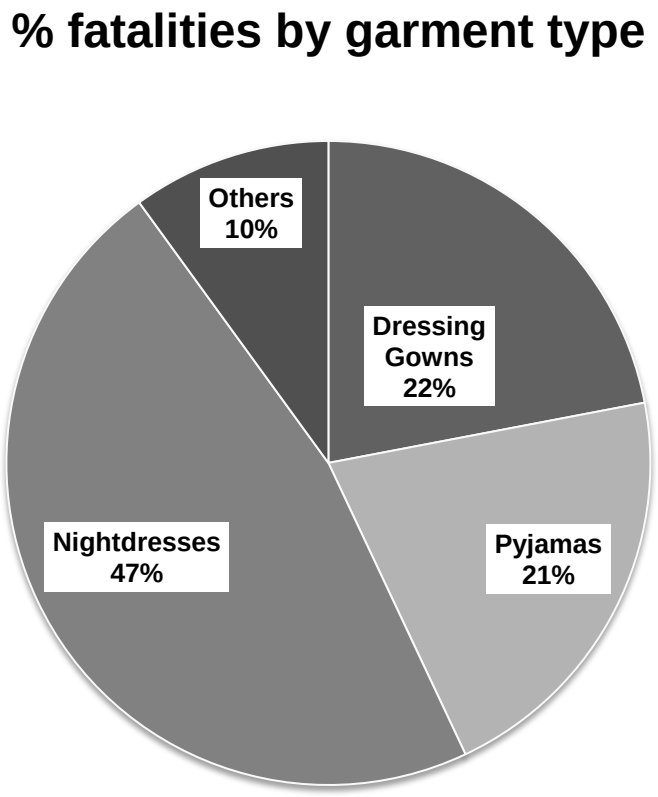
# UK Fire Statistics 1990-2007



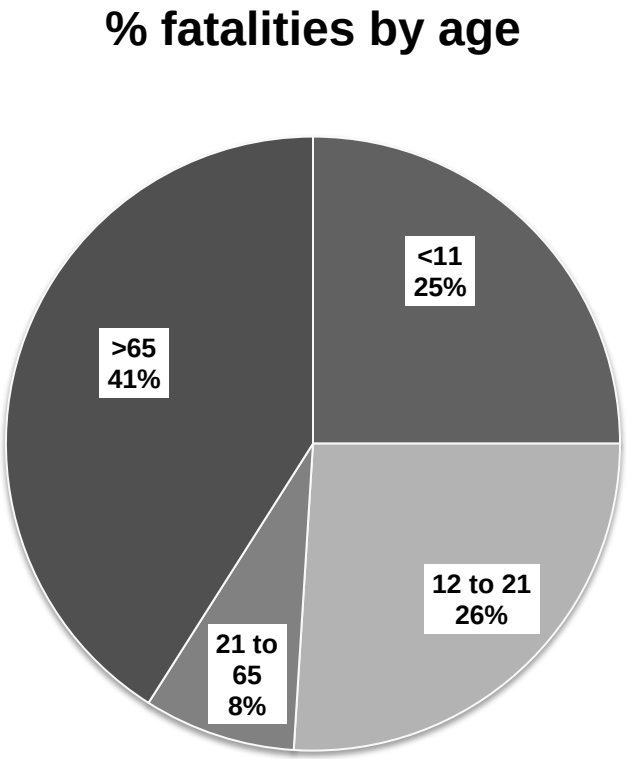
# UK Bedding Fire Statistics



# UK HASS Clothing Stats 1



# UK HASS Clothing Stats 2



# Significant UK/Ireland Textile-related Fires, 1979-1985

| Fire | Cause | Consequences |
|---|---|---|
| Woolworths Store Fire, Manchester, 8 May 1979 | PP upholstered furnishings/match or cigarette. | **10 fatalities** 53 non-fatal casualties |
| Stardust Disco Fire, Dublin, 14 February, 1981 | Ignition of PVC-covered, foam-filled furnishings | **48 fatalities** 128 non-fatalities |
| Boeing 737 Fire, Manchester Airport, 22 August 1985 | Fuel fire igniting internal | **55 fatalities** 15 serious non-fatalities |

- **Statistics and fires**
- **Legislation vs regulation**
- **National vs international regulations**
- **Test methodologies**

# Legislation vs regulation

- Legislation may have direct or indirect reference to regulations:
  - *The Nightdress (Safety) Regulation, S. I. 839:1967 a… 2043:1985*
  - *(… Act (1987) the Furniture and … 324 (1988)*
  - *Health and Safety at Work Act, 1974*

**BS 5722/BS5438**: Vertical strip method – burning rate: embedded in legislation

**BS 5852 Part 1**; cigarette and match ignition: embedded in legislation

Need for PPE is the responsibility of employers

- **Statistics and fires**
- **Legislation vs regulation**
- **National vs international regulations**
- **Test methodologies**

# Regulation and standard hierarchy

- National regulations/standards eg BS, DIN, ASTM, NF, etc;
- International regulations/standards:
  - ISO offers (voluntary) standards not related to regulation
  - EU offers regulations and EN standards that may be **mandatory** or **voluntary**
    - Since 1990s: normalisation
    - EU directives **translate** into national regs/stds)
- International (transport) organisations
  - Maritime: International Marine Organisation (IMO)
  - Aviation: International Civil Aviation Authority (ICAO)

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Eg: EU standard for nightwear under General Product Safety Directive (2001): **EN 14878:2007 {surface flash and burn rate criteria}**

Eg: EU Rail Directive (2008): **BS EN 45545 : Pt 2:2010** defines materials including textile requirements

Eg: all EU national PPE stds now fall within the EU under the **PPE Directive (1989)** to yield specific mandatory standards for workplace clothing

# Textile test typography

- Simple fabric strip tests
- Textile composite tests
- Tests undertaken with the addition of radiant heat (including reaction to fire tests)
- Thermal protection (including protective clothing and manikin tests)

# 1. Simple fabric strip tests

- **Majority** are simple strip burning tests: 0, 30, 45 and 90$^{o}$
- **Parameters** determined:
  - Ease of ignition/extinction
  - Burning rate
  - Damaged length
  - Hole length
  - Burning debris

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**BS 5438 Test 2**
**BS EN ISO15025**

**BS 5438:Part 3BS**
**EN ISO 6941**

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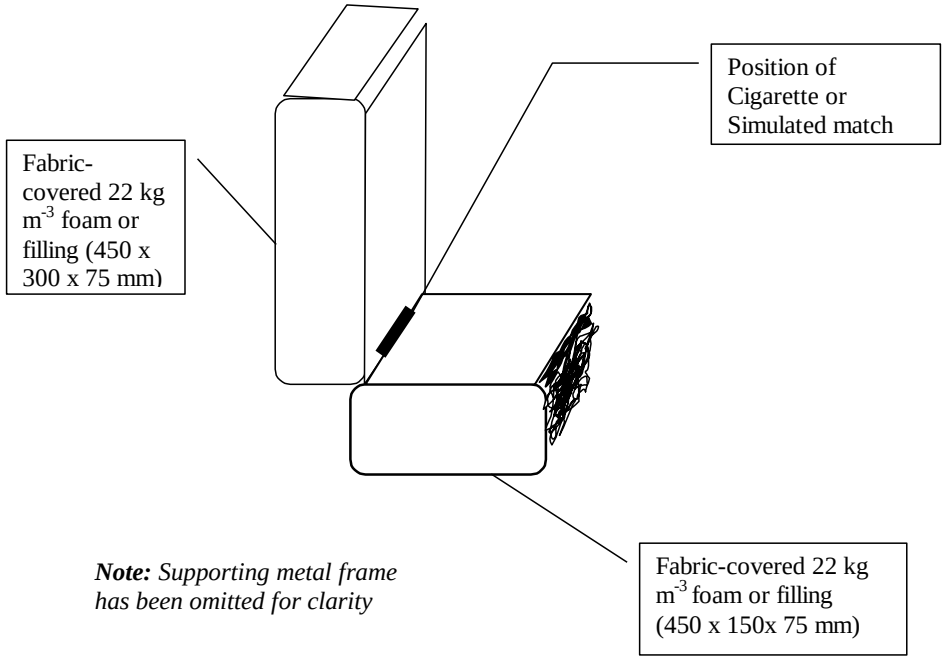
Eg: **BS EN ISO 14116:2008** ; Protective clothing to limited flame spread uses **BS EN ISO 15025**

**BS 5722** (cited in the UK sleepwear legislation) uses BS 5438 Test 3; for FR-treated fabrics, samples must be washed according to **BS 5651**

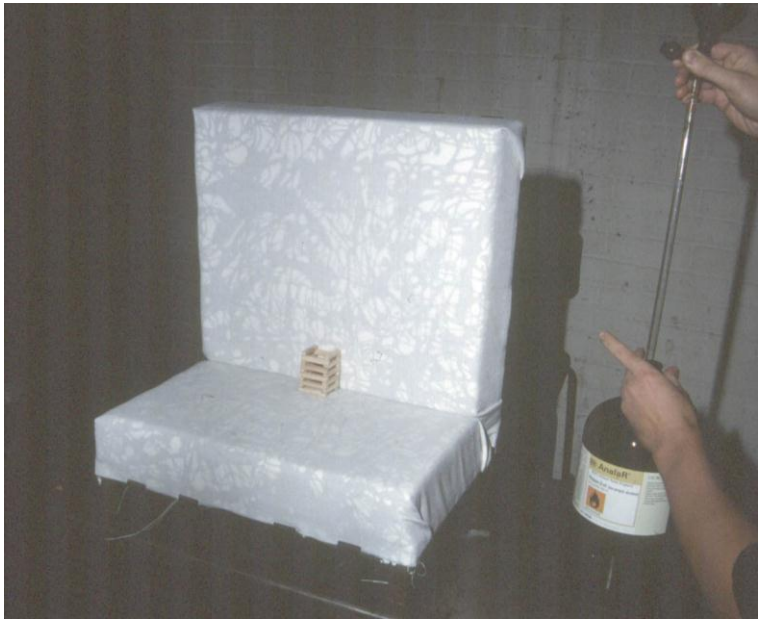
- **May be a part of a performance standard which defines method of test and prior cleansing requirement**

# 2. Textile composite tests

- These may be a small-scale model/mock-up of a real textile product/assembly eg **BS 5852 Part 1** (embedded in the UK Furnishing Regs) and **BS 5852 Part 2:1979** (since revised) for contract furnishings [BS EN 1021 Parts 1 and 2 are EU equivalents]




***Note:*** *Supporting metal frame has been omitted for clarity*



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- **Standards offering advice** using these tests also exist in the UK: **BS 7176** for contract furnishings and **BS 7177** for bedding for various hazard levels:
  - **Low** (Sources 0 and 1) eg schools, museums, etc
  - **Medium** (Sources 0, 1 and 5) eg hotel bedrooms, public buildings
  - **High** (Sources 0, 1, 7) eg hospitals, hostels, off-shore
  - **Very high** (Sources 0, 1, 7) eg prisons

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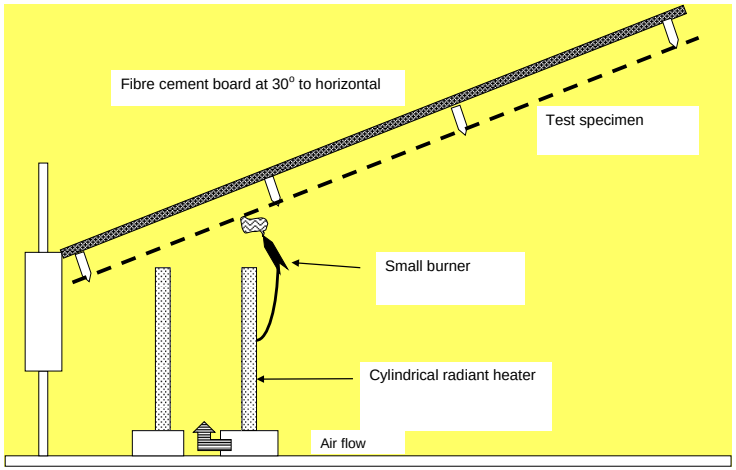
  - **BS EN ISO 9239-1:2010** for carpets
  - **BS 476-7:1997** for textiles attached to walls
  - The French 'Epiradiateur' or 'M' test **NF P 92-503** for textiles in buildings



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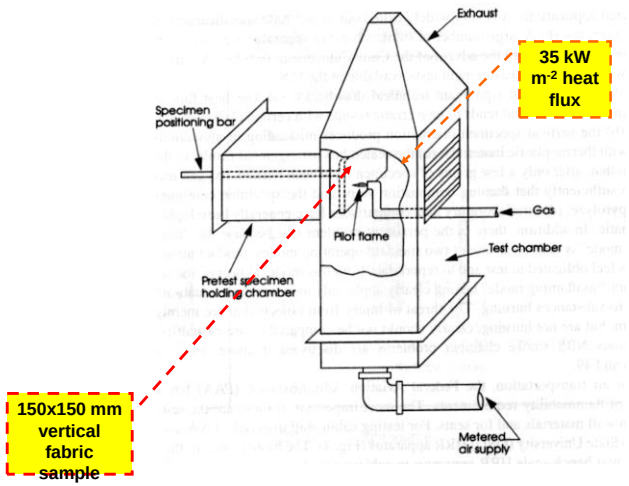
- **Simulated fire conditions requires complex and expensive equipment**

# Fire simulation examples




OSU calorimeter FAR 25.853 Part 4 Appendix F

**84 kw/m²**
**for 8s**

Instrumented manikin: ASTM F 1930 and BS EN ISO 469:2005 Annex E (method BS ISO 13506

# 4. Thermal protection (including protective clothing and manikin tests): examples

- **BS EN 469:2005** - Protective Clothing for Fire-fighters - Performance requirements for protective clothing for fire-fighting.

- **BS EN IS0 11611:2007** - Protective Clothing for Welders. Includes requirements for a weld droplet test and flammability behaviour plus detailed design criteria.

- **BS EN ISO 11612:2008** - Protective Clothing - Clothing to protect against heat and flame. Complex performance specification defining several performance levels to a variety of heat sources including molten metal splash protection plus design criteria for garments and seams.

**Testing can be a very testing experience!**

**THANK YOU FOR NOT FALLING ASLEEP!**