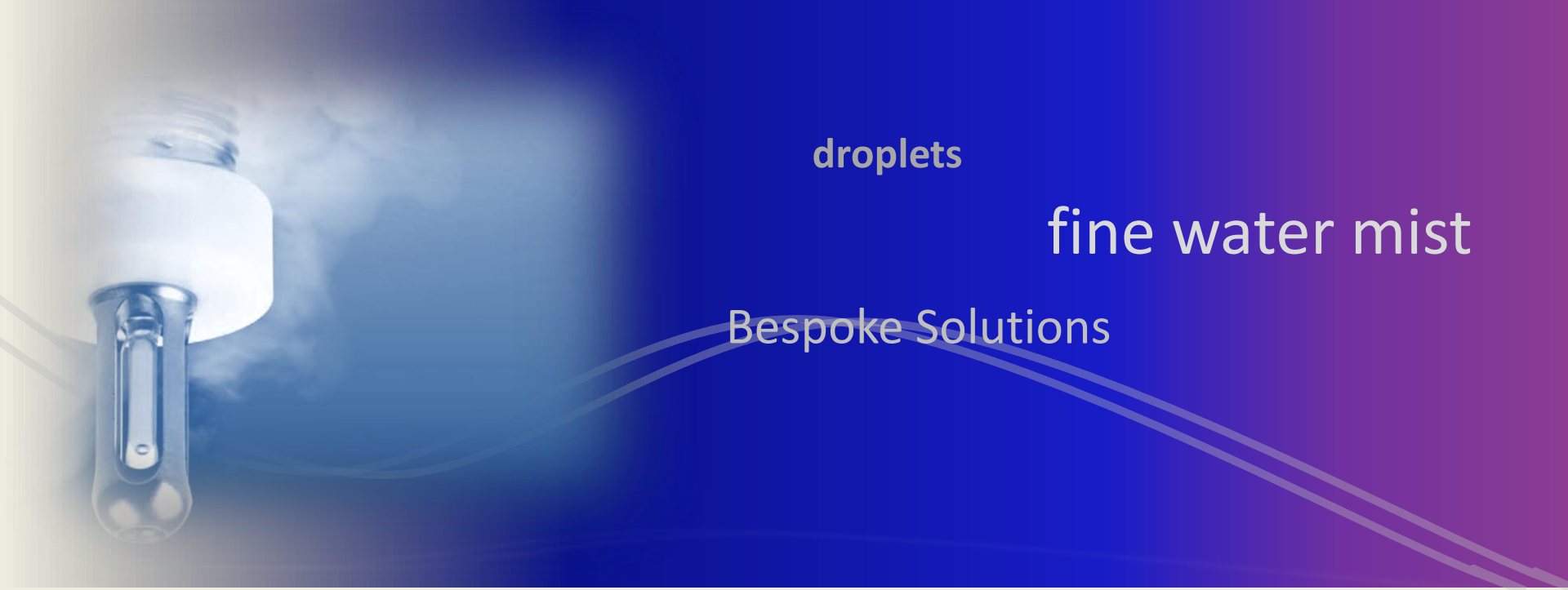


# Welcome To Water Mist

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droplets

fine water mist

Bespoke Solutions

# Fundamentals of water mist

**Nick Ketteridge**
**Technical Director**

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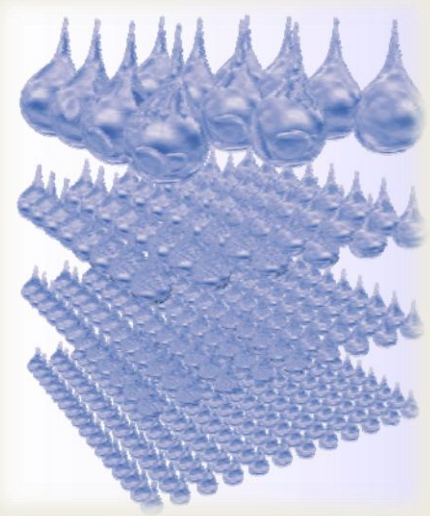
# What is Mist?

- NFPA 750 *"A water spray for which the $Dv_{0.99}$ ..... of the water droplets is less than 1000µ"*

- Water Sprinkler >1000µ
- Fine Water Spray 300-1000µ
- Water Mist 150-300µ
- Water Fog 50-150µ
- Aerosol <50µ



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# Why Developed

- Marine Use
  - Scandinavian Star
  - Cabin Fire
  - 158 Lives Lost
- Land Use
  - Kings Cross Fire
  - Platform Level Stores
  - No Water Services Available
  - Self Contained Systems Required

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# Properties of Water

- Cooling
- Energy Conversion
  - 1 litre of water from 15°C - 99°C
    - Thermal Change – 357 kJ of energy
  - 1 litre of water from liquid to steam
    - Endothermic reaction – 2272 kJ of energy

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# Increasing Efficiency

- Efficiency is a Factor of Surface Area

| 1 litre of water | | | |
|---|---|---|---|
| Droplet Size In mm | Quantity | Surface Area In $m^2$ | Time to Steam In Seconds |
| 1000µ | 1’900 | 6 | 6 |
| 300µ | 5’700’000 | 20 | 0.002 |
| 100µ | 1’900 ‘000’000 | 60 | 0.0000006 |

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# Expansion of Steam

- Rate of Expansion
  - 1 litre water = 1’700 litres of Steam
  - Steam Blanket
  - Oxygen Exclusion
  - Localised Inerting

# Droplet Velocity

- Overcome the Fire Plume
- High Pressure
  - High Velocity
  - Penetration
- Low Pressure
  - Larger Droplets
  - Greater Mass
  - Entrain Smaller Droplets

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# Performance Definition

- Fire Suppression System
  - Fire Control
    - *Prevention of fire spread beyond a defined zone*
  - Fire Suppression
    - *Reduction in the heat release and prevention of re-growth of a fire over the discharge duration*

# Fire Fighting Process

- Class A Fires
  - Rapid Cooling
  - Flame Reduction
  - Blocking of Radiated Heat
  - Pre Wetting Combustibles
  - Entrainment of Flammable Vapours
- Similar to a Sprinkler
  - Less Water
  - Faster Control

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# Fire Fighting Process

# Performance Definition

- Fire Extinguishing System
  - Fire Extinguishment
    - *Complete elimination of any flaming or smouldering fire*
  - Defined risk
  - Timed discharge

# Fire Fighting Process

- Class B Fires
  - Rapid Cooling
  - Fast Steam Production
  - Minimal Surface Penetration
  - Oxygen Displacement
  - Cooling of Flammable Vapours
  - Cooling of Heated Surfaces
- Similar to a Gaseous System
  - Sealed rooms not required
  - More Efficient Cooling

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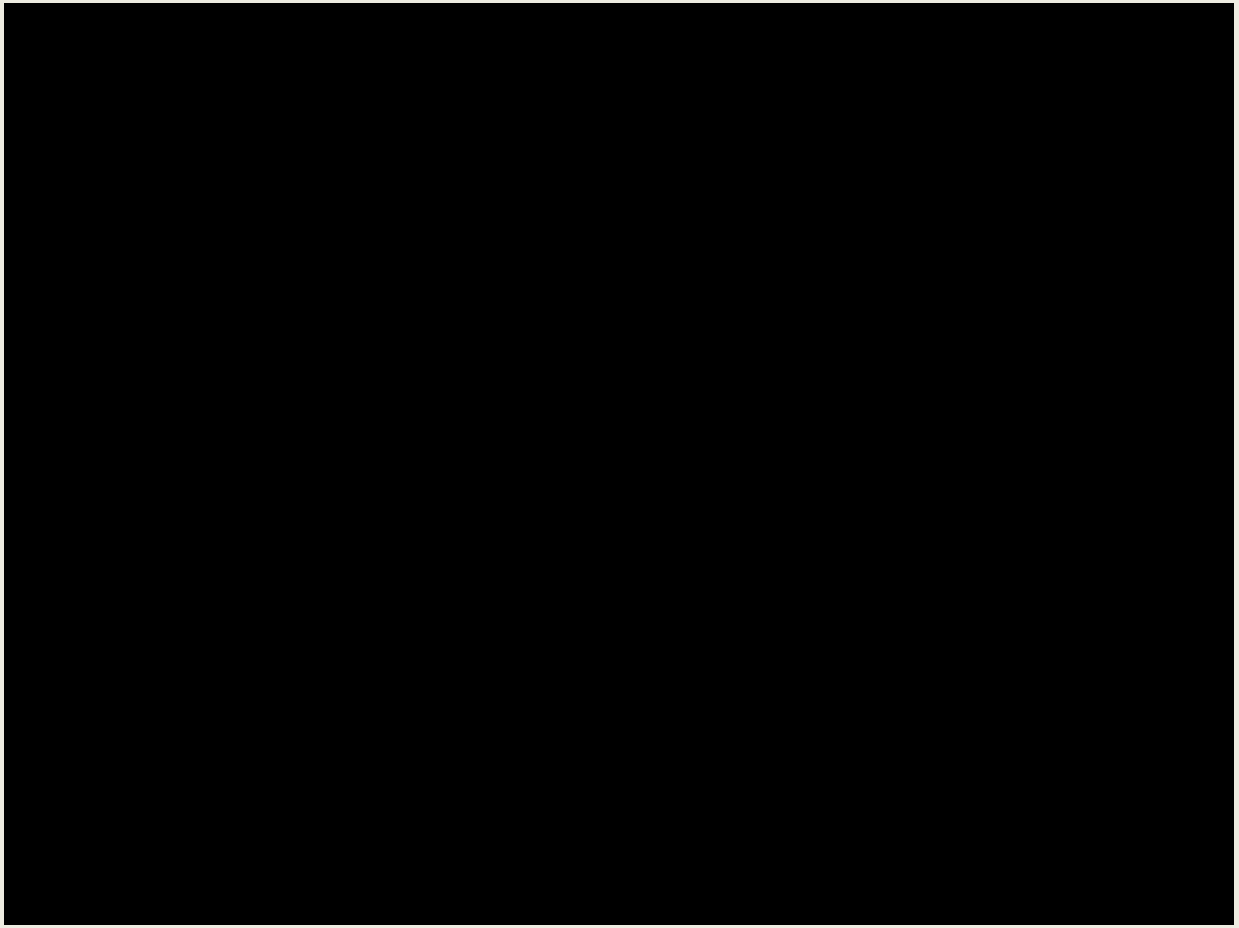
# Fire Fighting Process



# Water Mist Standards

- International Maritime Organization(IMO)
  - Sprinkler Equivalent Systems
    - A800 – Public Spaces
  - Fixed Pressure Spray Systems
    - A668 – Machinery Spaces  Enclosed
    - A913 – Machinery Spaces Local Application
- NFPA 750
  - Water Mist Fire Protection Systems
    - Design requirement/Installation Guide

IMO

NFPA

ULTRA

# Water Mist Standards

- CEN/TS 14972
  - Fixed Fire Fighting Systems – Watermist Systems
- FM5560
  - Approval Standard for Water Mist Systems
- British Standards
  - BS 9251, BS-EN 12845?????

CEN

FM Approvals

Member of the FM Global Group

BSI

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# BSI Standards Development

- Committee FSH/18 – Fixed Fire Fighting Systems
  - Sub Committee FSH/18/JWG – Water Mist Systems
    - BAFSA
    - CAA
    - FIA
    - FM
    - HMPS
    - LFEPA
    - AFC
    - LPCB









# Working Groups

- FSH/18/2
  - DD8458 Compliment to BS 9251
    - Fixed Fire Protection Systems – Residential and Domestic Watermist Systems
    - Part 1 - Code of Practice for Design and Installation
  - Applications
    - Domestic
      - Individual Houses, Flats, Maisonettes
    - Residential
      - Apartments, Residential Homes, HMO's, Flats, Boarding Houses, Care Facilities, Dormitories.
- Published November 2010


BSI PRIVATE CIRCULATION FSH/18_10_0010

DD 8458-1:2010

DRAFT FOR DEVELOPMENT

Fixed fire protection systems – Residential and domestic watermist systems –

Part 1: Code of practice for design and installation

FINAL DRAFT FOR COMMITTEE APPROVAL
22 July 2010

If no errors are notified by Friday 6 August, this Draft for Development will proceed to publication.

Please note that only comments relating to technical errors that would render the document unusable or unsafe, or to typographical errors, will be accepted at this stage.

Please send any comments to Sophie Watson AND to Leslie Hearnshaw.

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BSI British Standards

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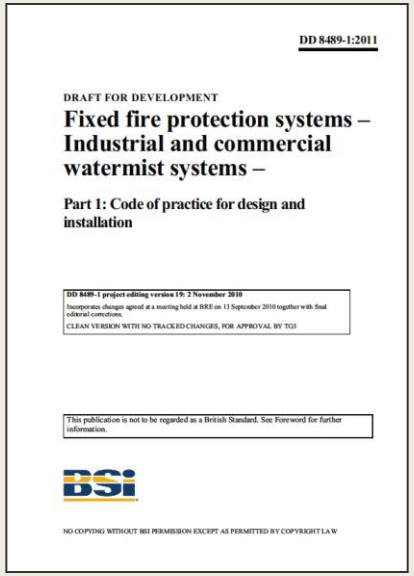
# Working Groups

- FSH/18/3
  - DD8489 – Compliment to BS-EN 12845
    - Fixed Fire Protection Systems – Industrial and Commercial Watermist Systems
    - Part 1 - Code of Practice for Design and Installation
    - Parts 4-7 Test Protocols
    - Part 4 – Liquid Fuels
    - Part 5 – Turbines and Machinery
    - Part 6 – Cooking Processes
    - Part 7 - Low Hazard Occupancies
- Published February 2011



DD 8489-1:2011

DRAFT FOR DEVELOPMENT

**Fixed fire protection systems – Industrial and commercial watermist systems –**

**Part 1: Code of practice for design and installation**

DD 8489-1 project editing version 19: 2 November 2010
Incorporates changes agreed at a meeting held at BRE on 13 September 2010 together with final editorial corrections.
CLEAN VERSION WITH NO TRACKED CHANGES, FOR APPROVAL BY TGI

This publication is not to be regarded as a British Standard. See Foreword for further information.

BSI



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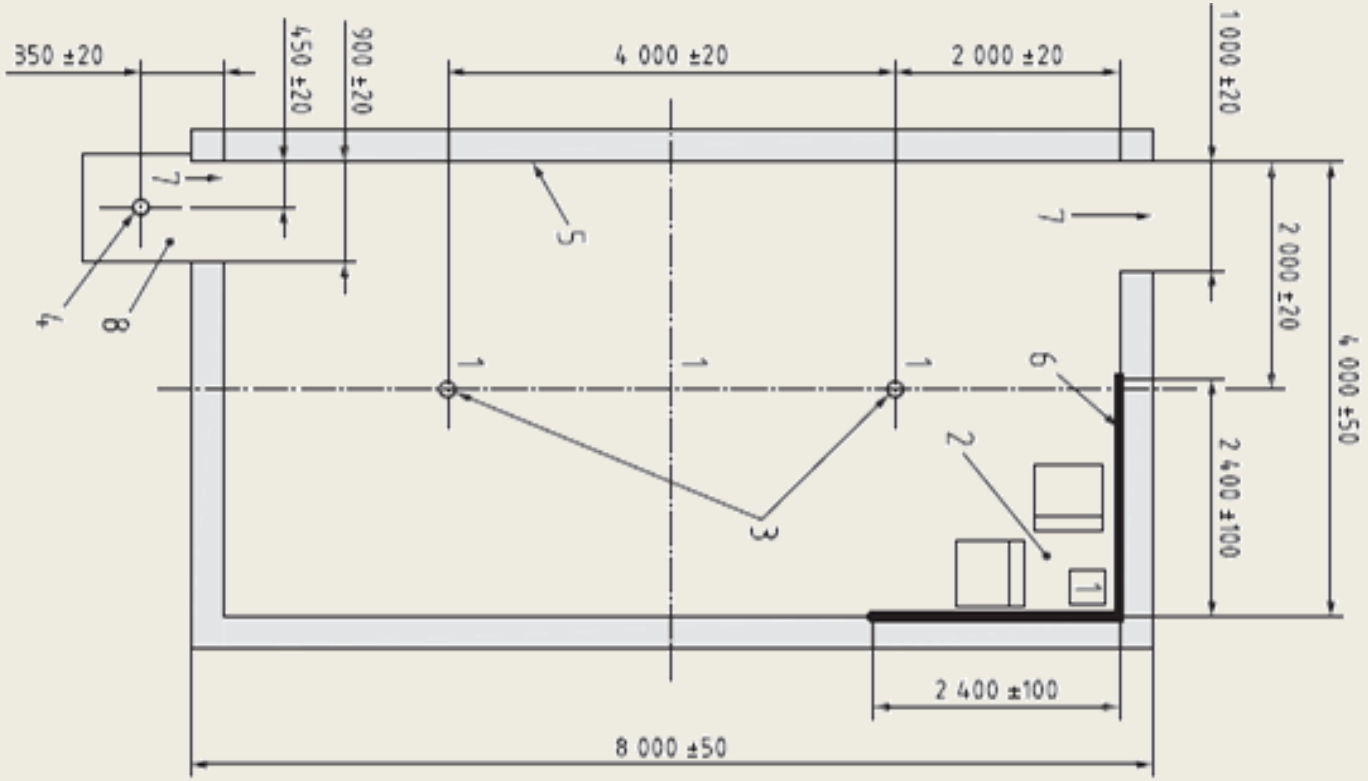
# System Performance

- BS 12845
  - Standardised Sprinklers
    - Flow Rates
      - 5mm-10mm risk dependant
    - Spacings
      - Maximum Coverage 12m²
      - Maximum Spacing 4m
    - Area of Discharge
      - 72m² for OH1
      - 144m² for OH2
      - 216m² for OH3

# System Performance

- DD 8489
  - No Standardised Mist
    - Flow Rates
      - From 8lpm to 40lpm
    - Spacings
      - From 2m to 6m
    - Area of Discharge
      - Dependant on Nozzle
- Solution?
  - Full Scale Fire Testing

# Test Room




Key

1 Thermocouple
2 Corner fire test ignition and fuel package (see Figure A.4)
3 Nozzle connected to water supply (see A.3)
4 Nozzle connected to water-filled pipe
5 Test room
6 Full room height plywood panels
7 Doorway
8 Porch

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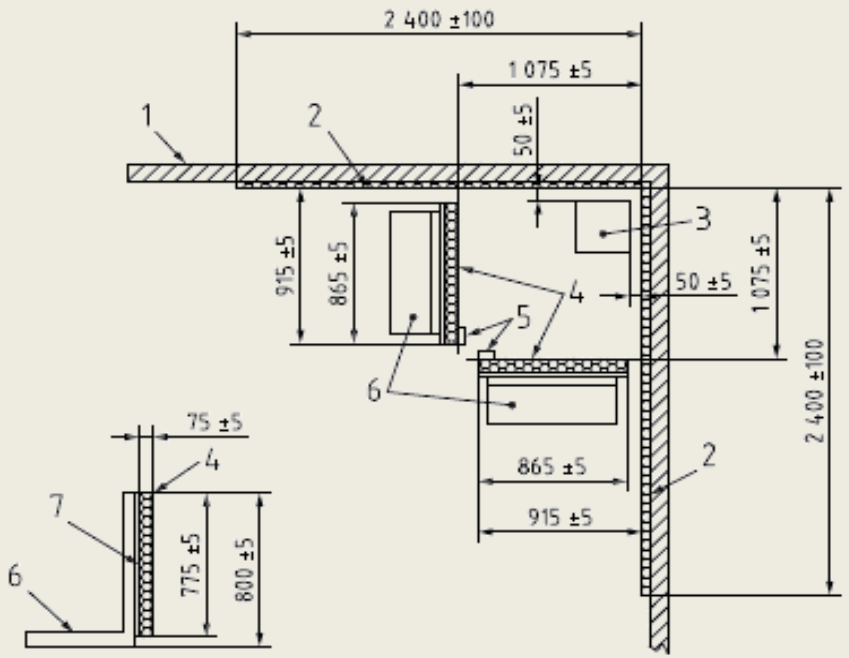
# Fuel Package

Dimensions in millimetres




a) Side view of foam and stand arrangement

b) Plan view

**Key**

1 Wall of test room
2 12 mm thick plywood sheets
3 Crib on tray containing heptane on water
4 Foam sheet glued to sacrificial board
5 Fire brick supporting ignition wick
6 Support stand
7 Sacrificial plywood board

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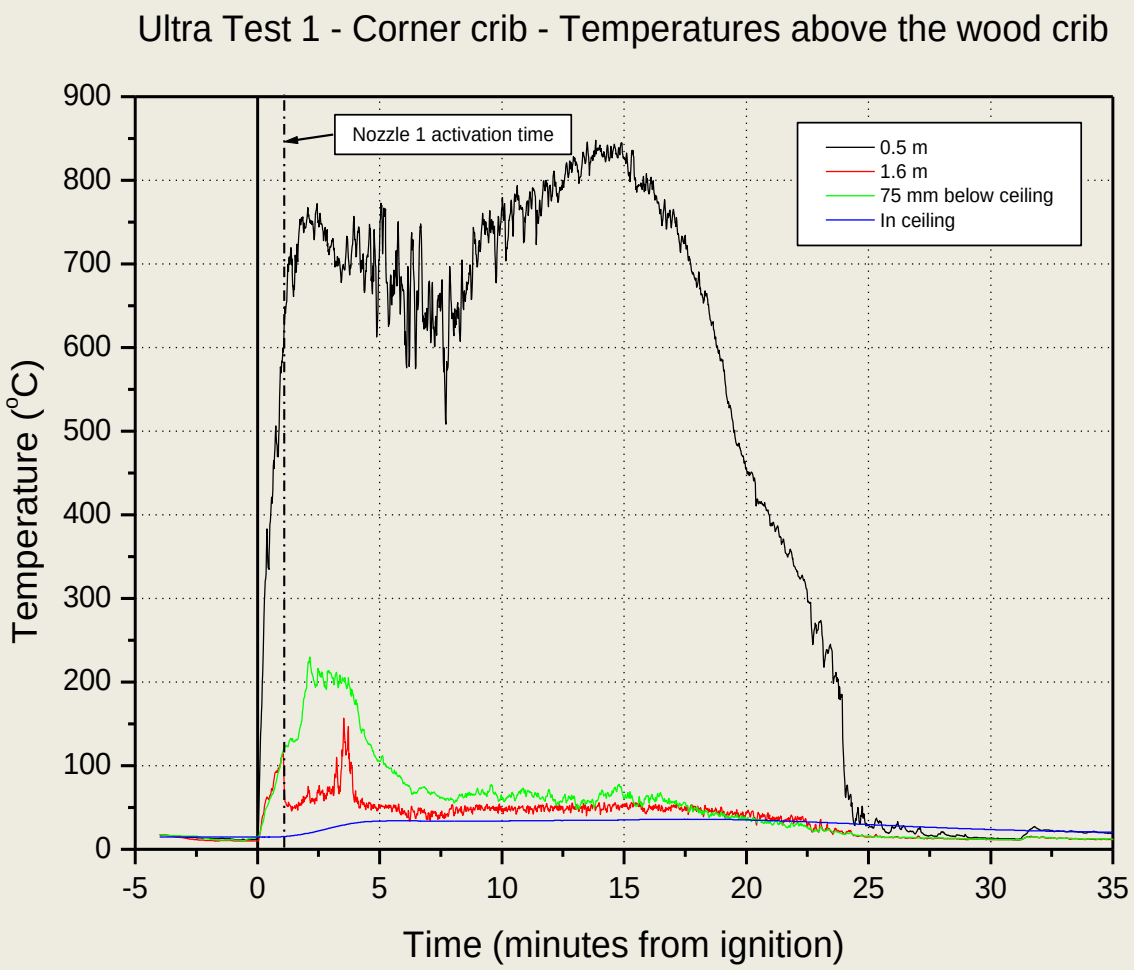
# Test Protocol

- Test Programme
  - Corner Fire
  - Fuel Package beneath a Nozzle
  - Fuel Package between 2 Nozzles
- Evaluate the Worst of the Test Results
  - Repeat the Test with Airflow Left to Right
  - Repeat the Test with Airflow Right to Left

# Test Results



# Test Protocols

- Small Enclosed Room
- Large Enclosed Room
- Open Room
- Office Environment
- Turbines and Generators
- Industrial Food Production
- Machinery Spaces
- Others to be added.....

# Questions

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