A BS 8458:2015 residential watermist system with 6 litres per minute flow

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Anderson Horst

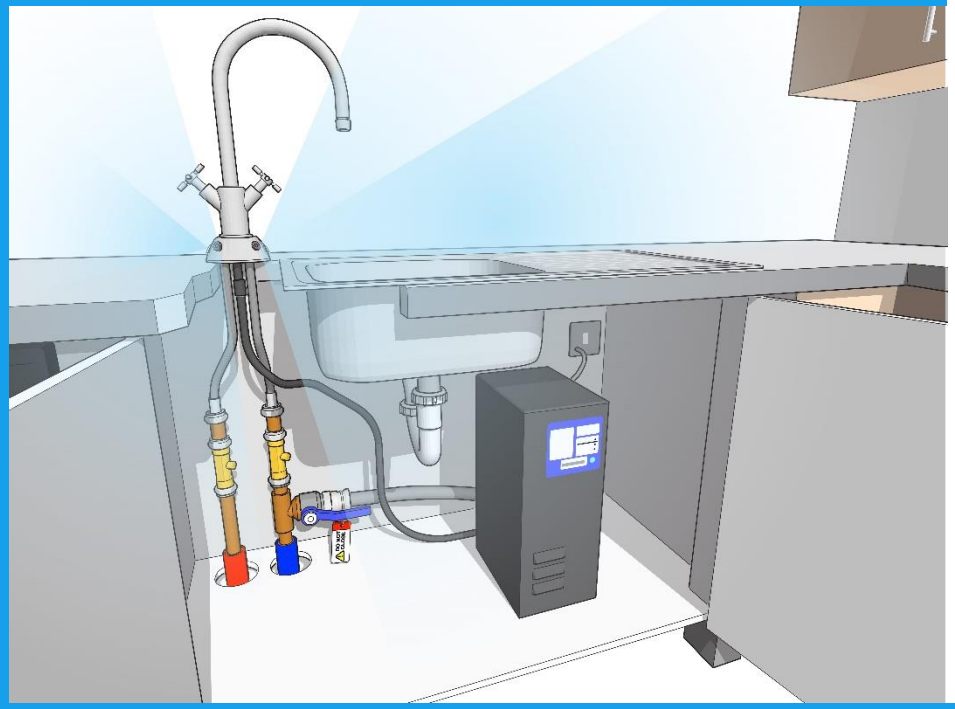
Agenda

- Background
- The essence of BS 8458:2015
- R&D efforts
- Reliability testing

Background

Imperial College London BUSINESS SCHOOL

Royal College of Art



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Sir James Dyson backs kitchen taps to save lives and launches 2010 competition

Royal College of Art graduates create fire extinguishing system using water mist sprayed from kitchen taps and plan to launch the product by the end of the year thanks to a £10,000 award from Sir James Dyson

Yusuf Muhammad and Paul Thomas, inventors of the Automist with their fire extinguishing device which is fitted to a tap Photo: JANE MINGAY

By Richard Tyler
4:40PM BST 17 May 2010

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Plumis

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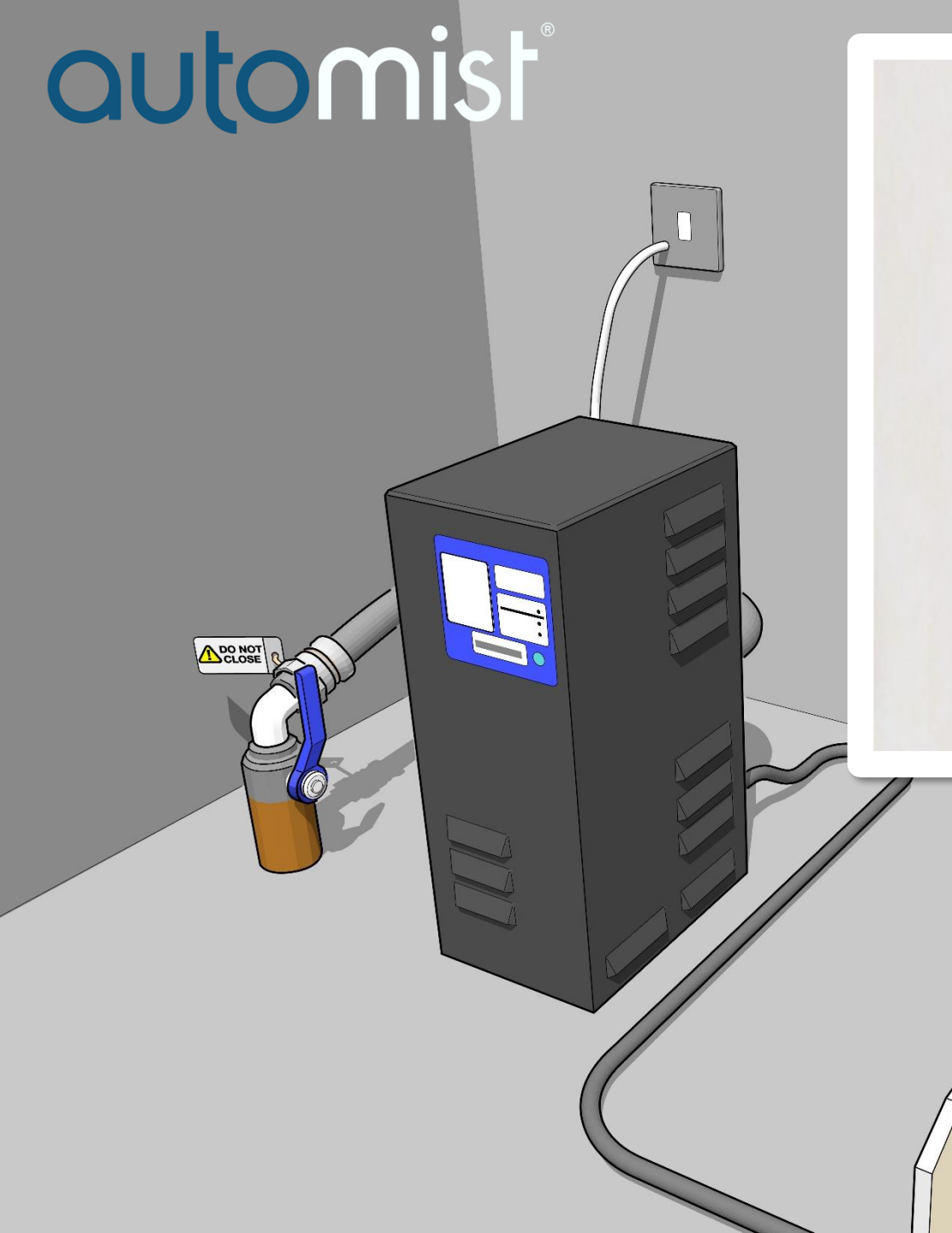
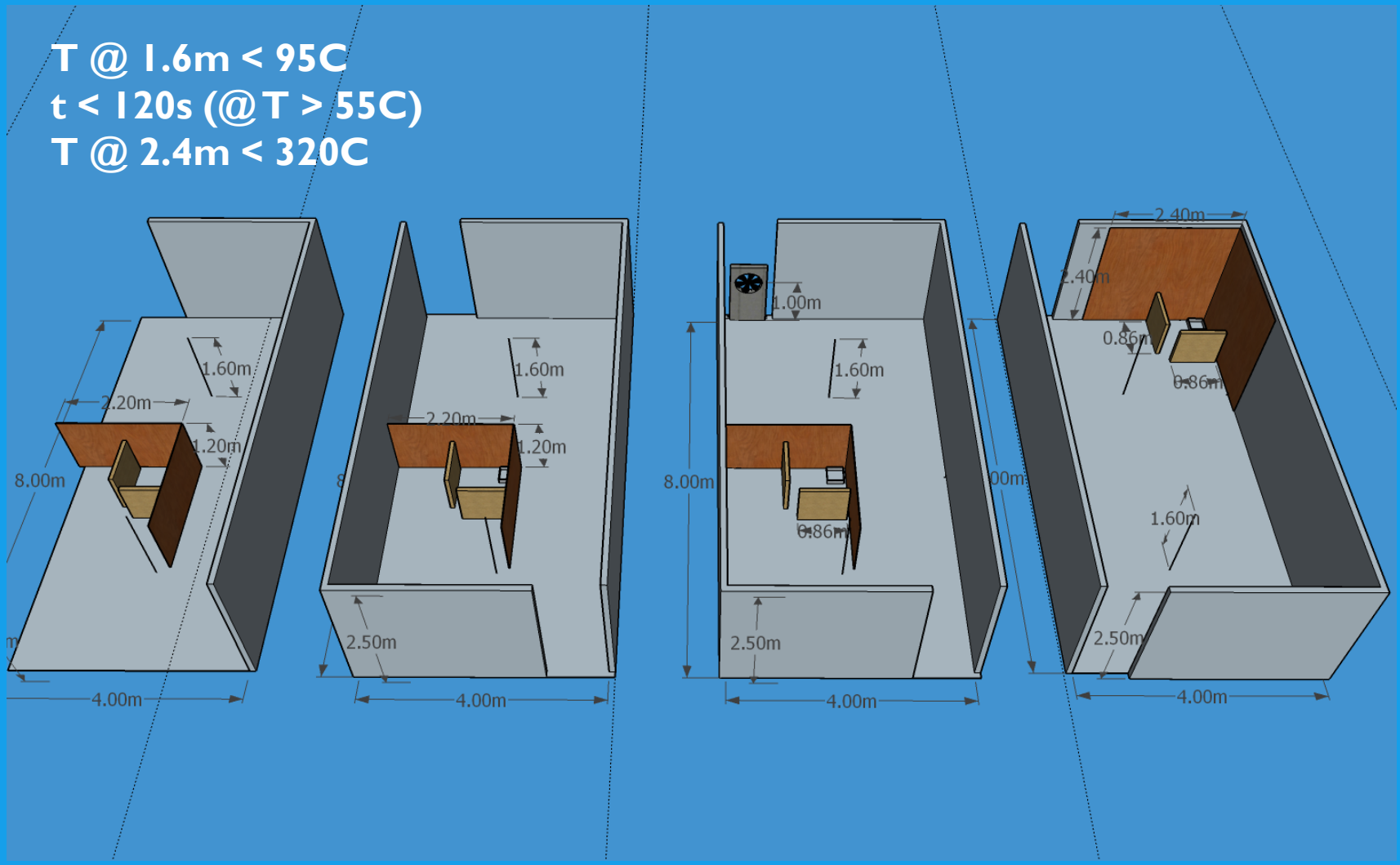


- 180˚uniform spray
- Electrical back box
- Triggered by heat alarm
- BRE & Exova Warringtonfire testing
- Performance close to sprinklers (but below)
- LABC Registered Detail EW171 for 3 storey layout

BS 8458:2015

Fire Testing 2014-2015 - Exova

T @ 1.6m < 95C
t < 120s (@T > 55C)
T @ 2.4m < 320C



Fire Testing 2014-2015 - Exova

Fire Testing 2014-2015 - Exova

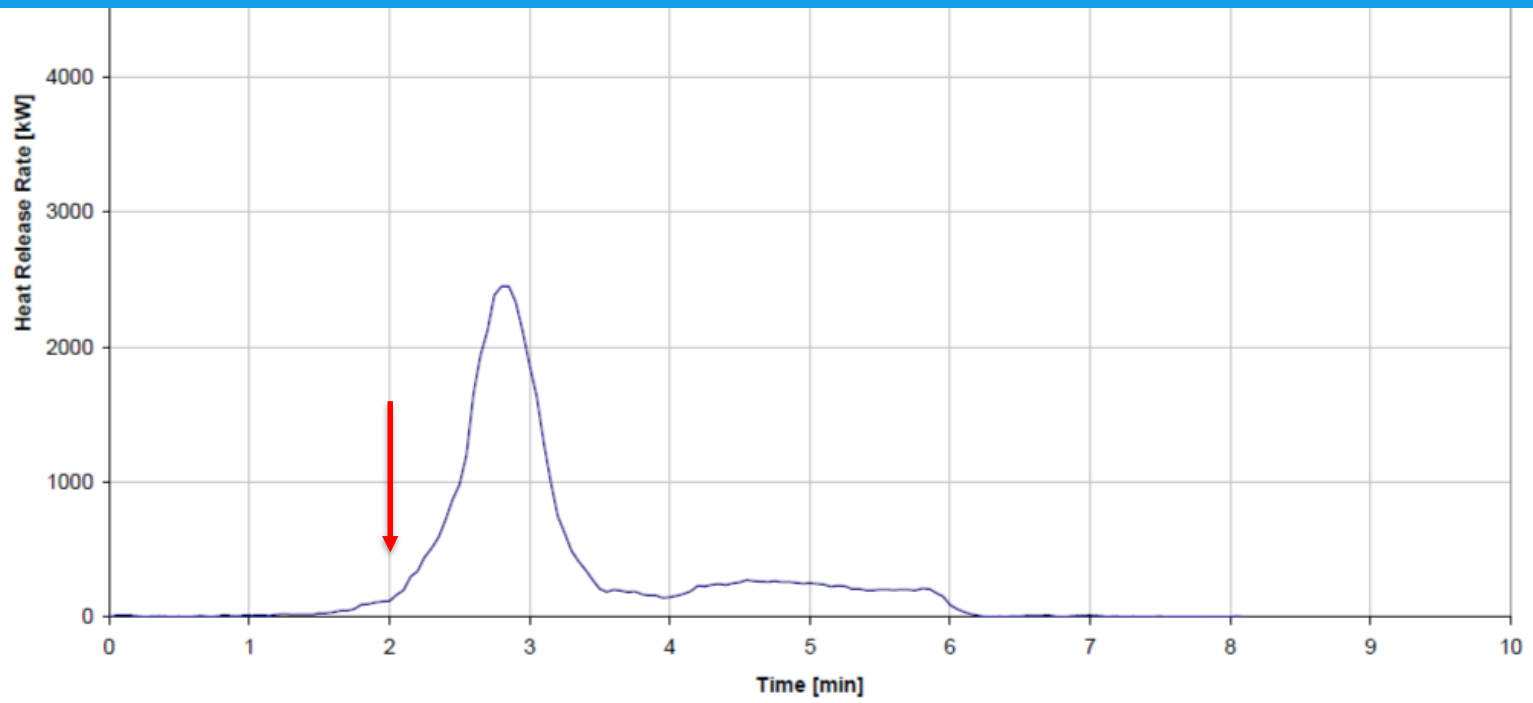


Figure 4F.2 **Graph of heat release with respect to time for unsprinklered corner fire test, cut foam sheets (775 mm by 865 mm by 75**

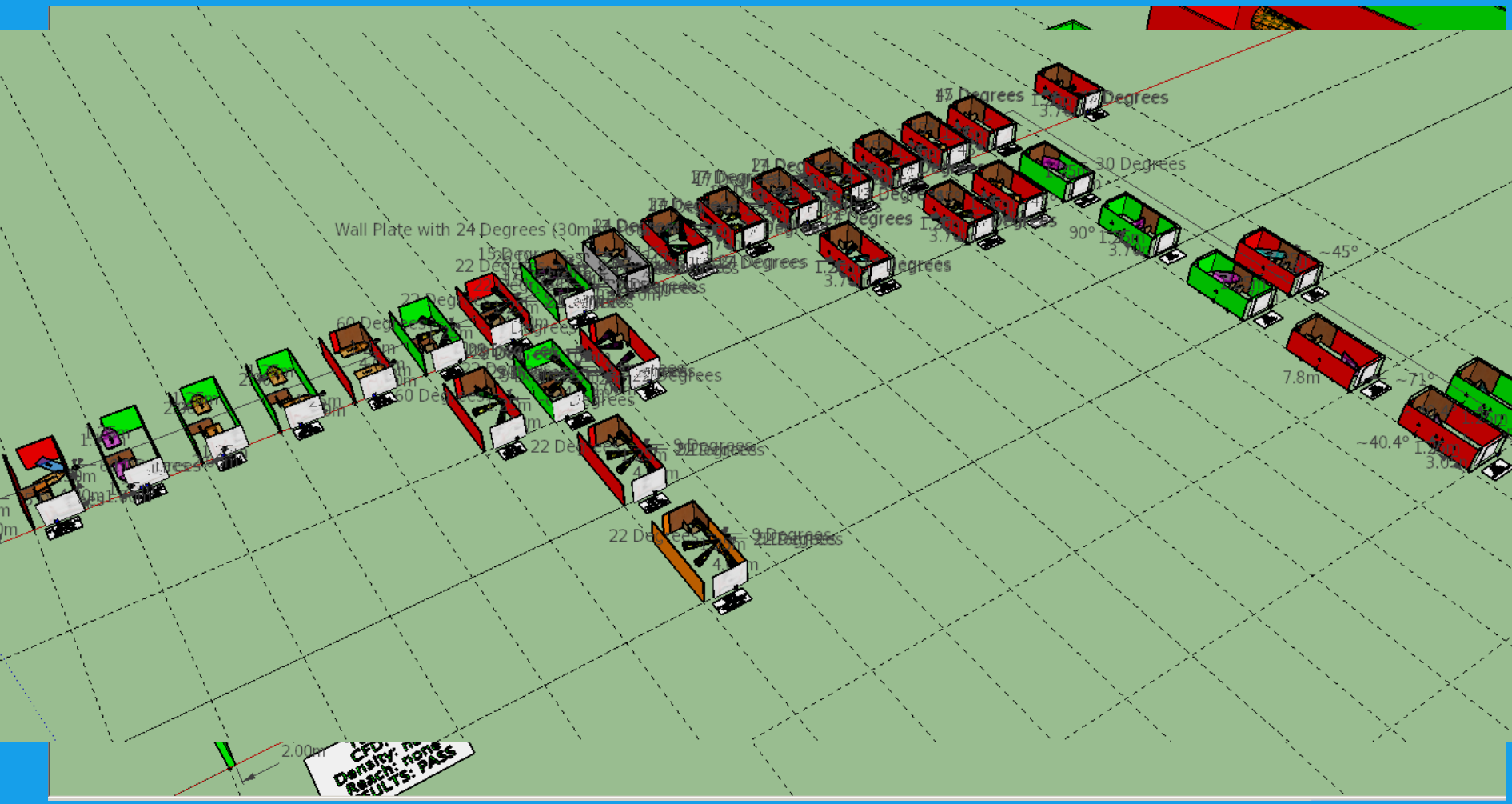
*** From BRE sprinkler research 2005 (DD252)**

R&D for BS 8458:2015 performance

R&D Boundary Conditions

- Low flow: <6lpm
  - Keep ease of retrofit & water damage stigma
- Mid-wall mounted head: 1.5m approx.
  - Most efficient use of mist (Prof. Ragnar's IWMA Eureka prize)
- BS 8458:2015, BS 9252:2011 & UL2167
  - Robust sprinkler equivalence for future US and international markets

Fire Testing Odyssey



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Techniques attempted

- *Computer Fluid Dynamics*
- *Detection*
- *Surfactant additive*
- *Panic*

Fluid Dynamics: control volume

UNIVERSITY of GREENWICH

FSEG

Control volume

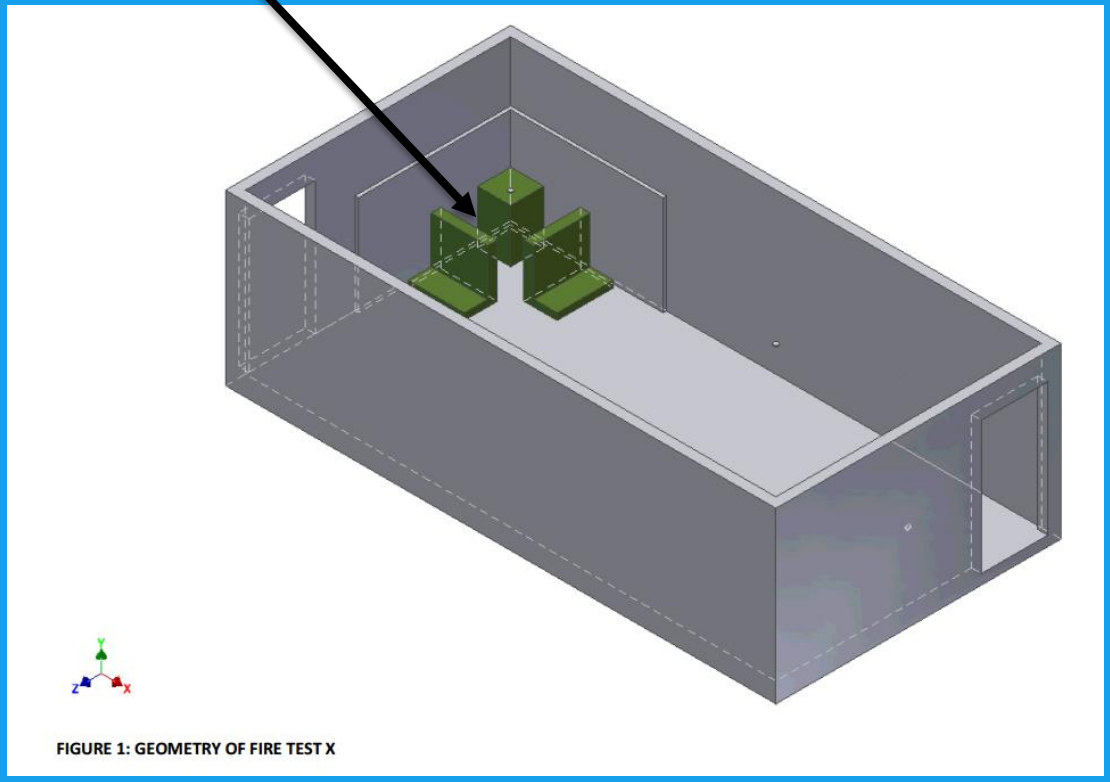

FIGURE 1: GEOMETRY OF FIRE TEST X

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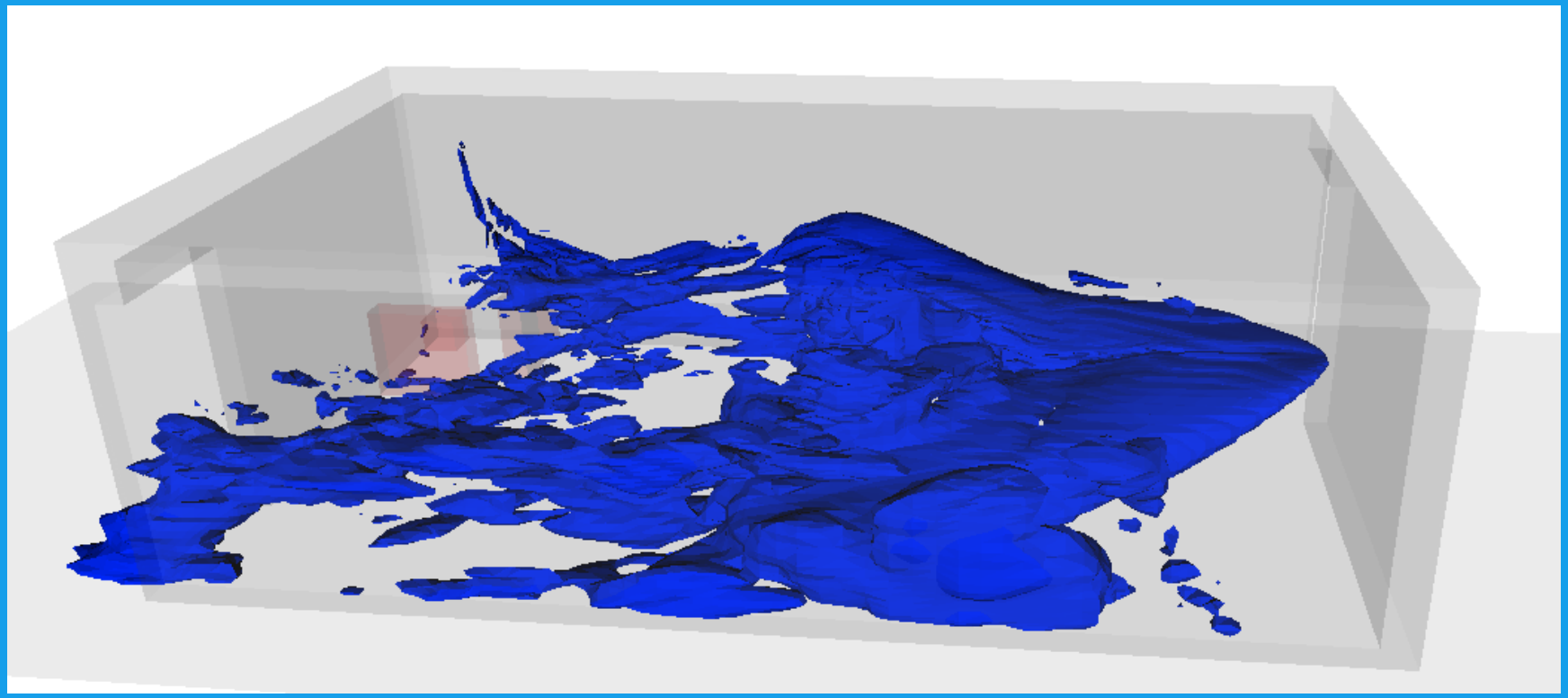
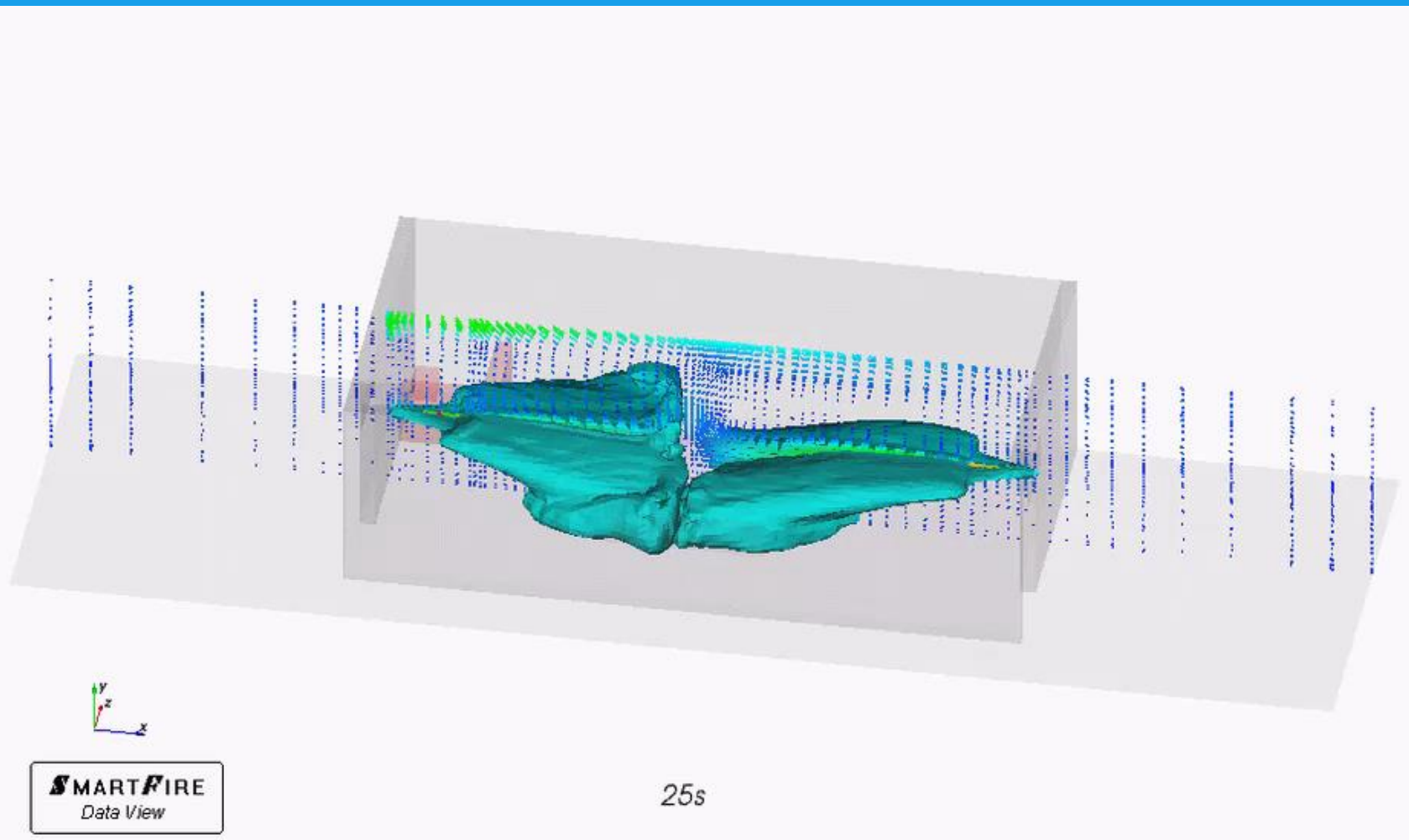
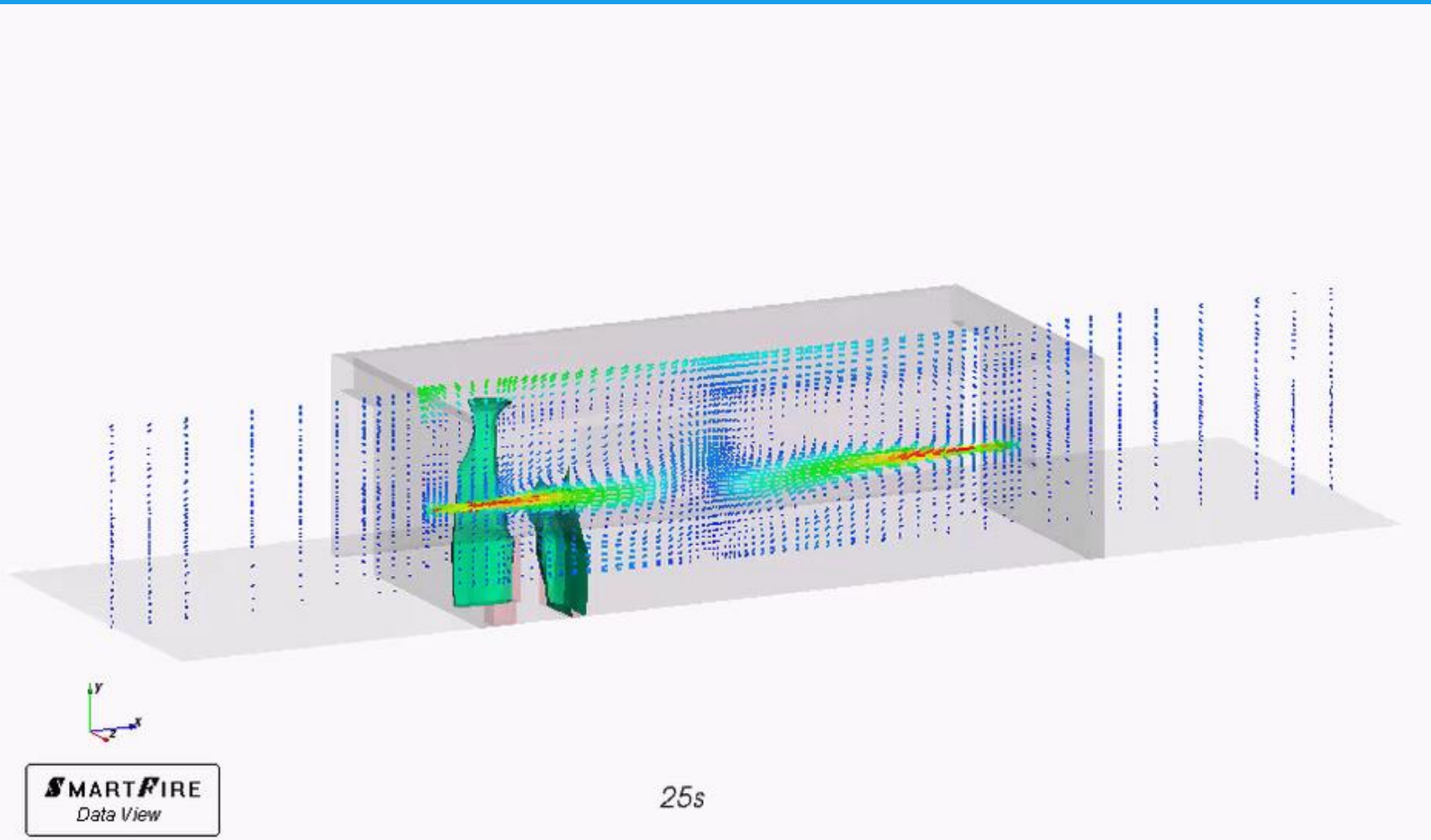
Horizontal planar spray distribution



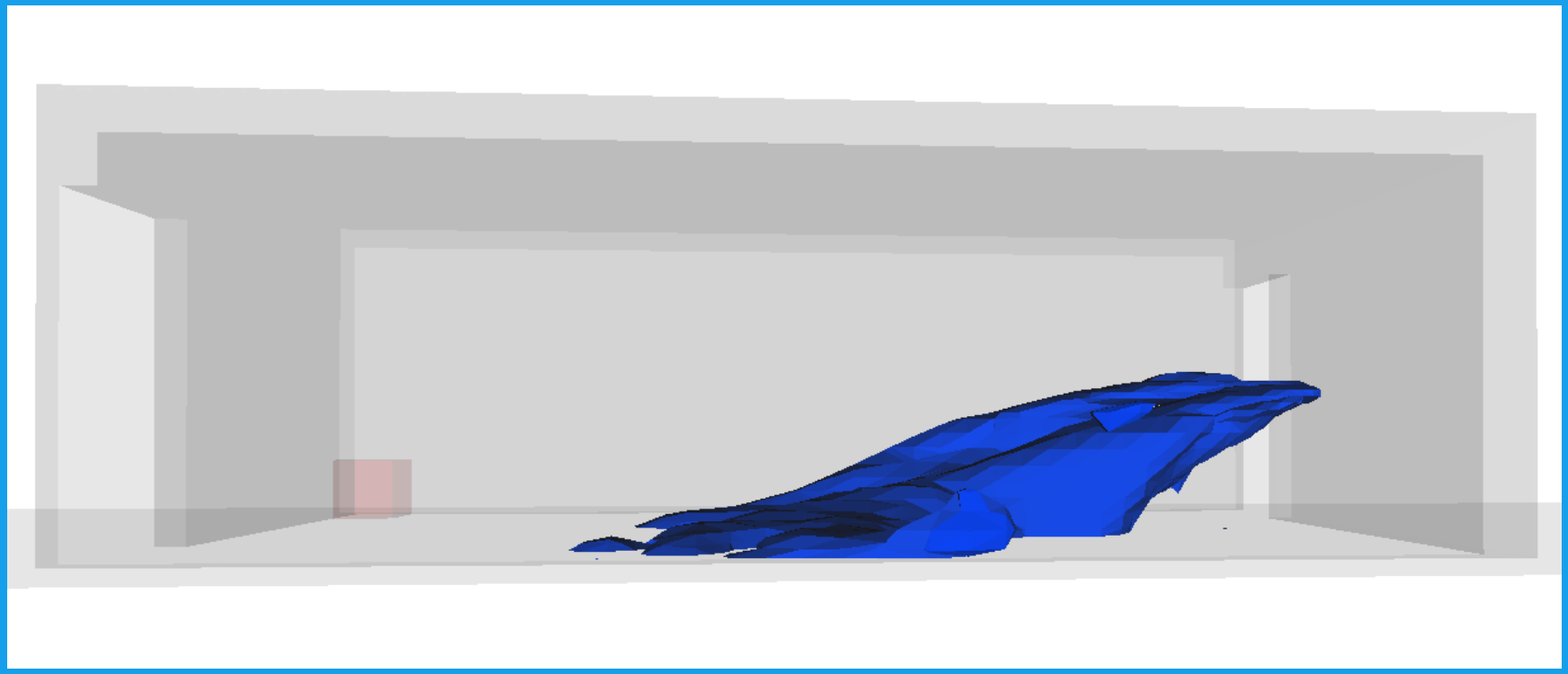
Horizontal planar spray distribution



Horizontal planar spray distribution



Problem: Distribution vs Friction

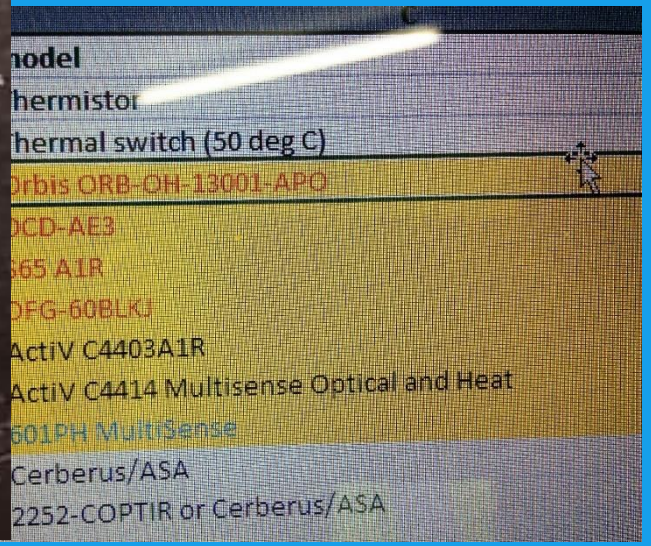


CFD limitations (1)

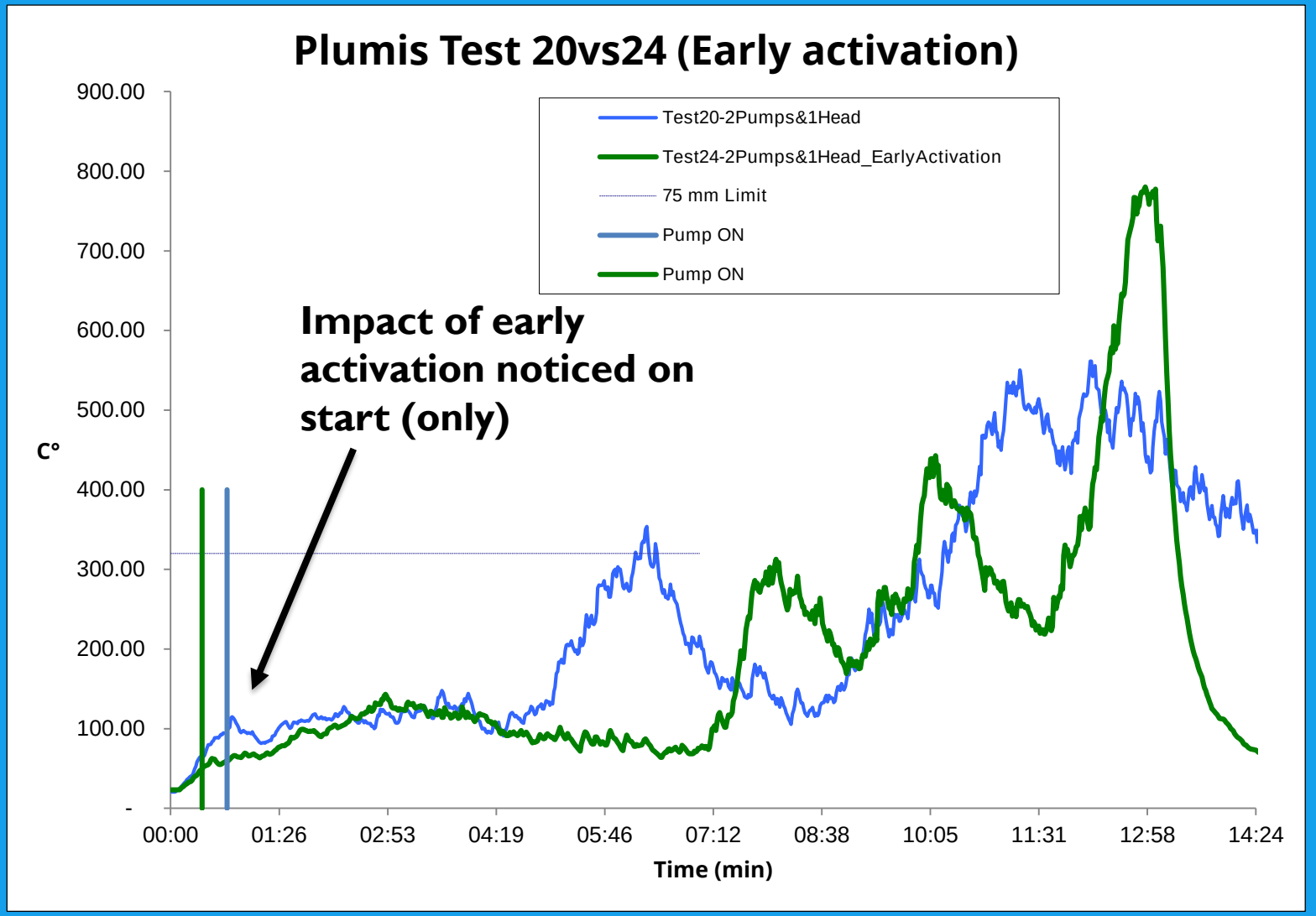
Detection for Early Activation

Detection

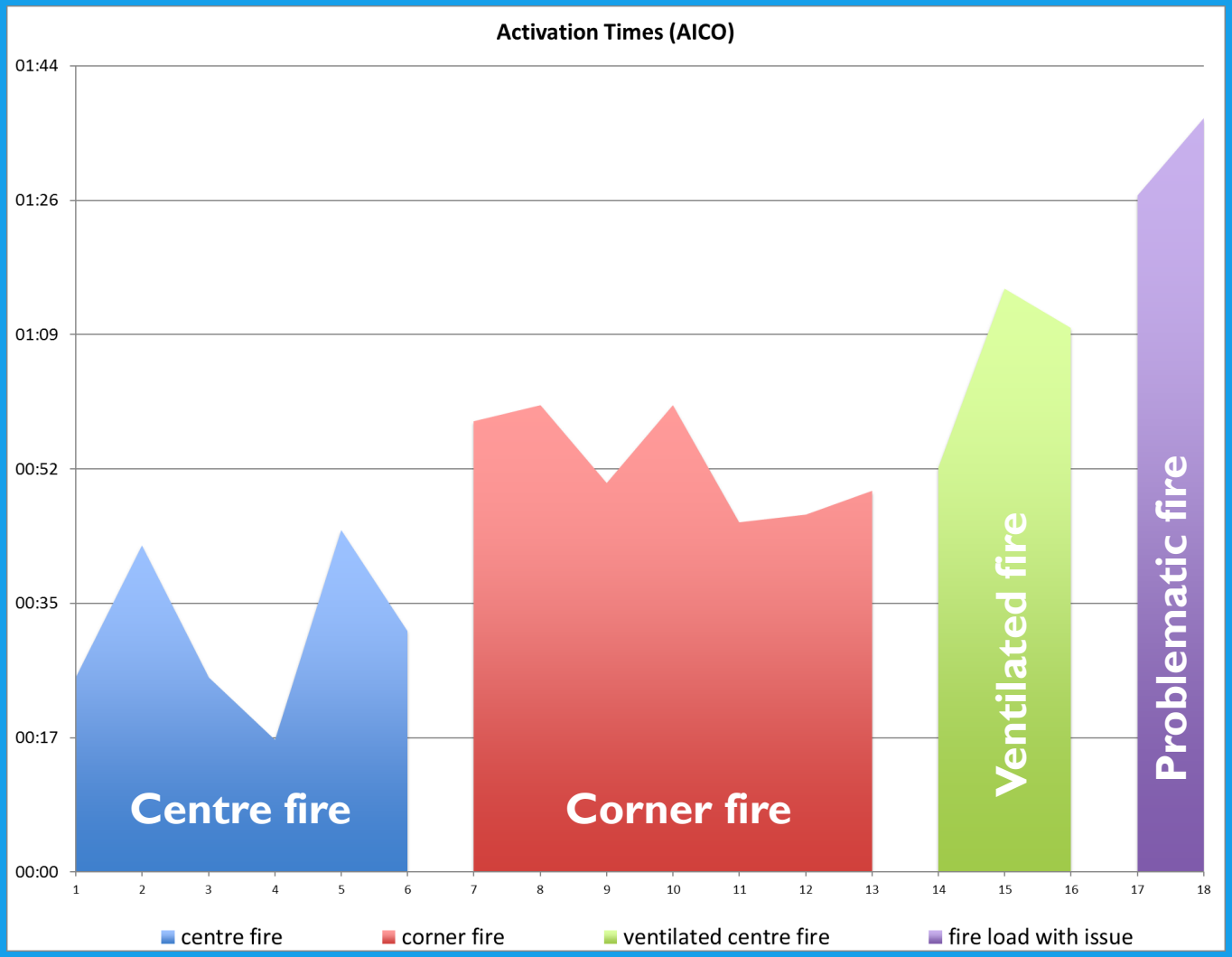
- 10+ detector types
- Price & false alarm trade-off



Detection


Plumis Test 20vs24 (Early activation)
Test20-2Pumps&1Head
Test24-2Pumps&1Head_EarlyActivation
75 mm Limit
Pump ON
Pump ON
Impact of early activation noticed on start (only)
C°
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
-
00:00
01:26
02:53
04:19
05:46
07:12
08:38
10:05
11:31
12:58
14:24
Time (min)

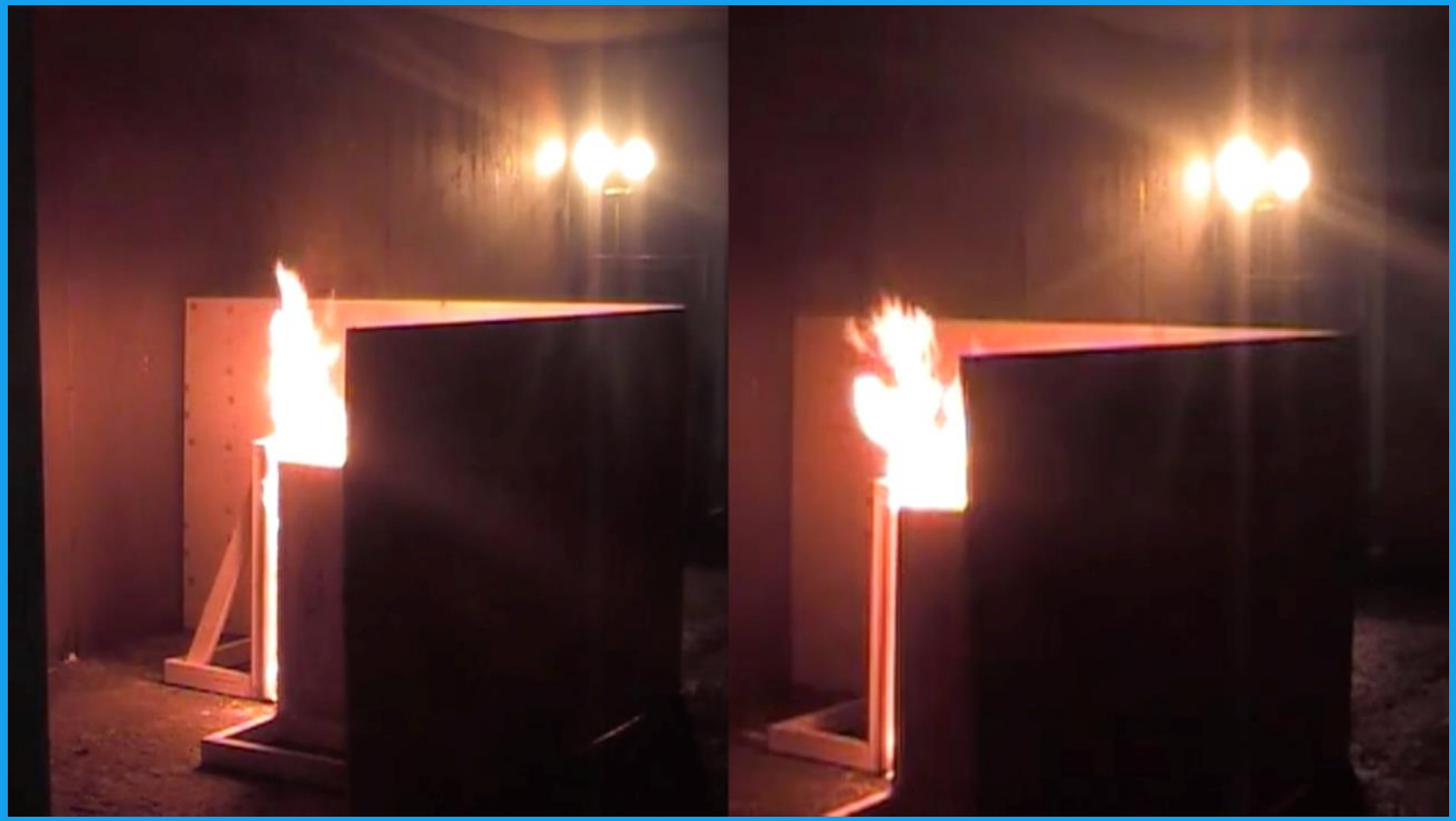
Detection is affected by ventilation (2)



Surfactant Additive

Closed Loop Venturi:
trial & colourimetry

Additive



I minute

Plumis

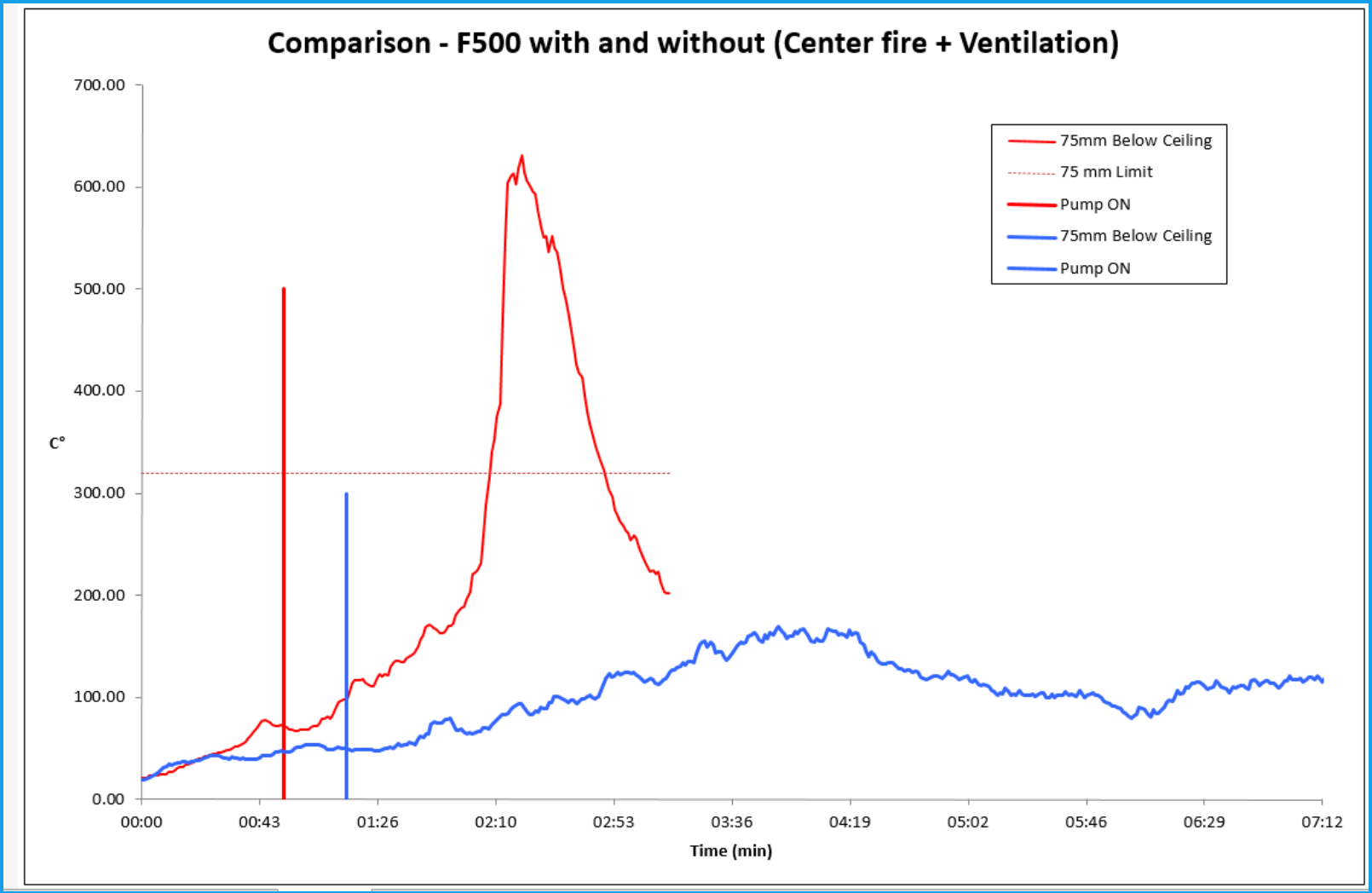
Additive

Without **With**

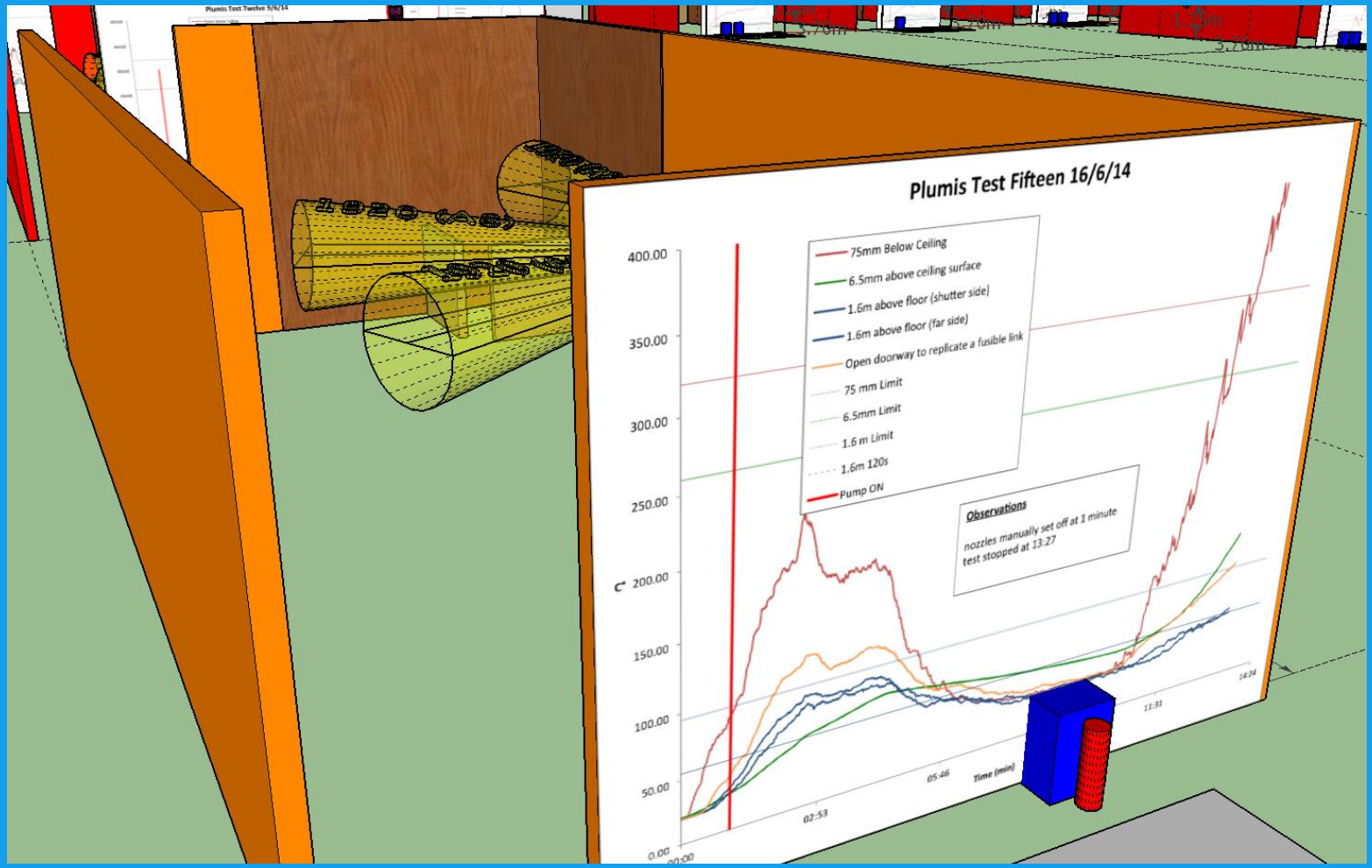
2 minutes

Plumis

Additive: much better



Additive: but not infallible (3)



What left?

Targeted mist to maximise density

Proof of concept

- Infrared heat signature is not only from flames

Figura 1: Partially shielded fire visible light spectrum capture

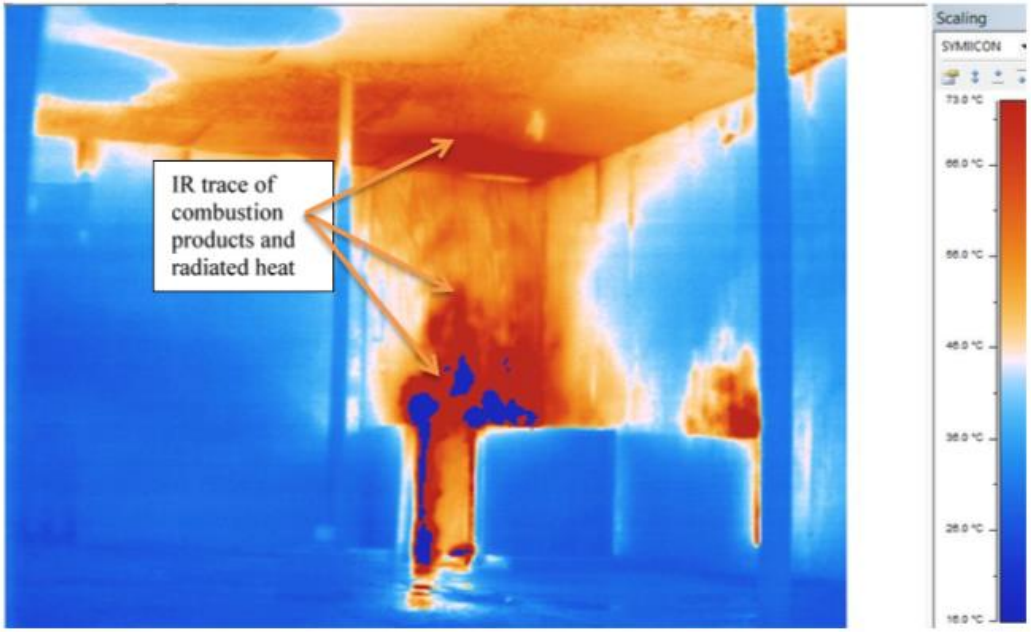


Figure 14: Partially shielded fire IR spectrum capture

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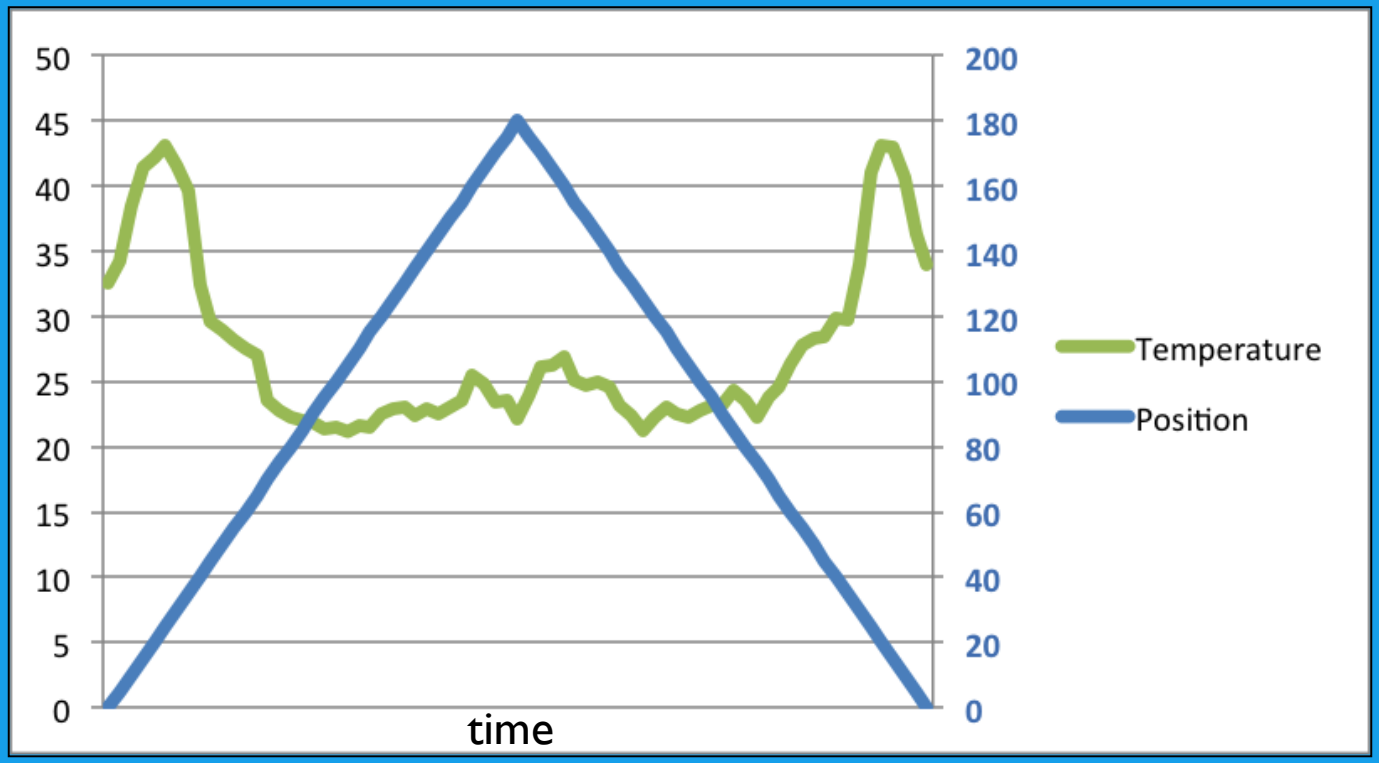
LABC Registered Detail reliability testing

- Same wall long distance
- Shielded fires
- Under nozzle fire
- Heat sources

BS 8458:2015 same wall 6m away

IR sensor corner fire scan data

7.4m (24') from corner fire, same wall
Two sweeps, back/forth



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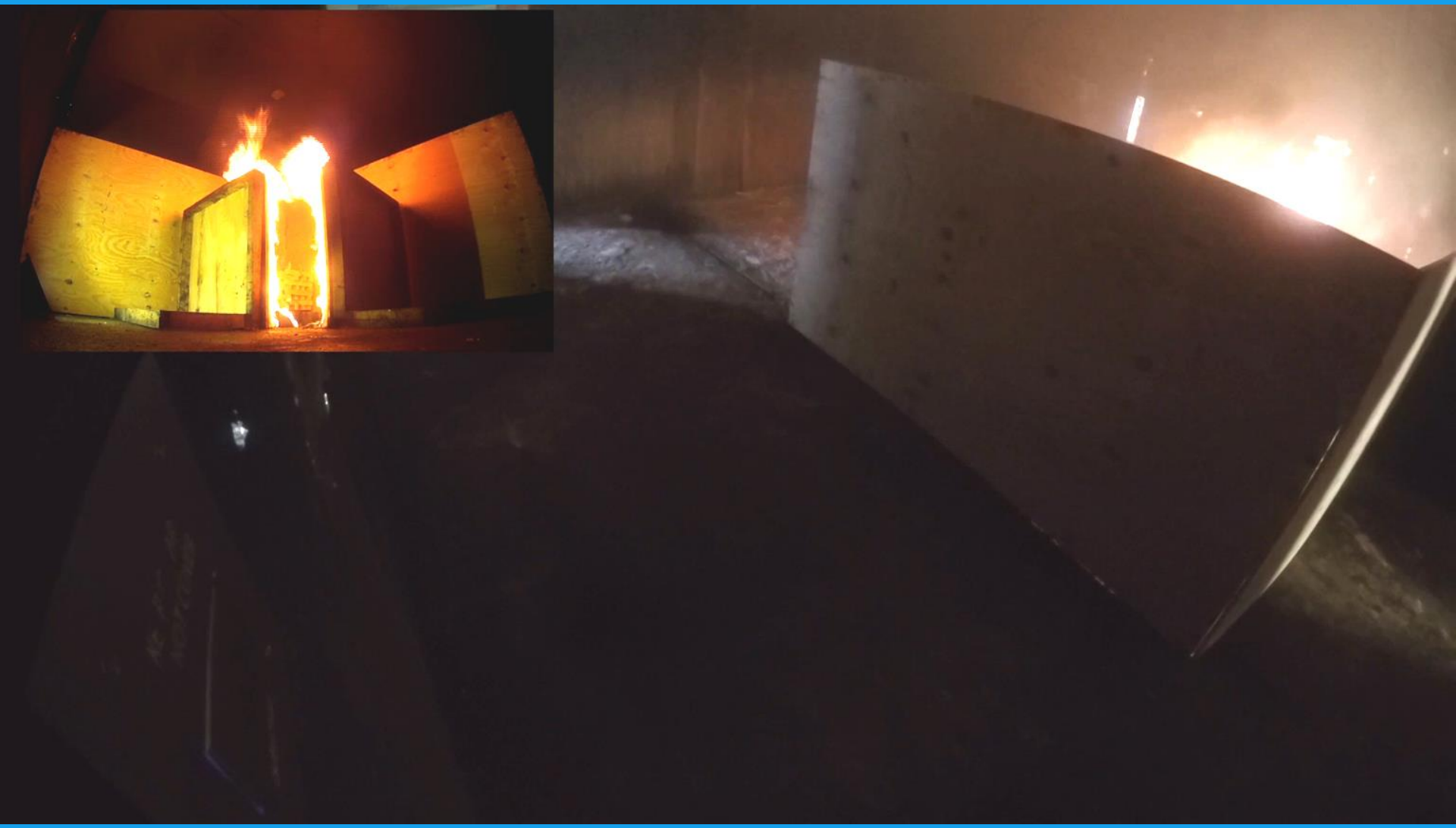
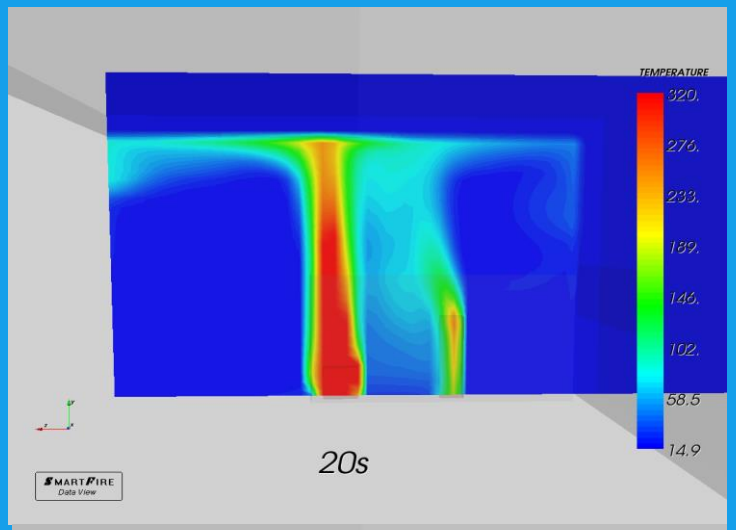
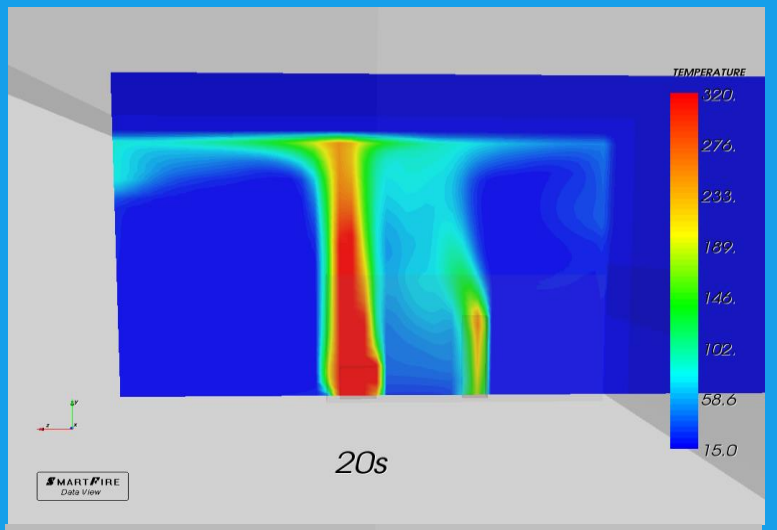
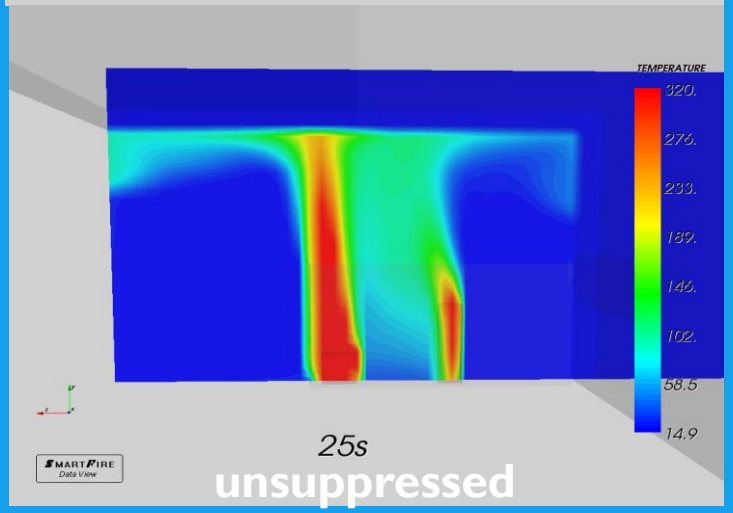
Shielded fire



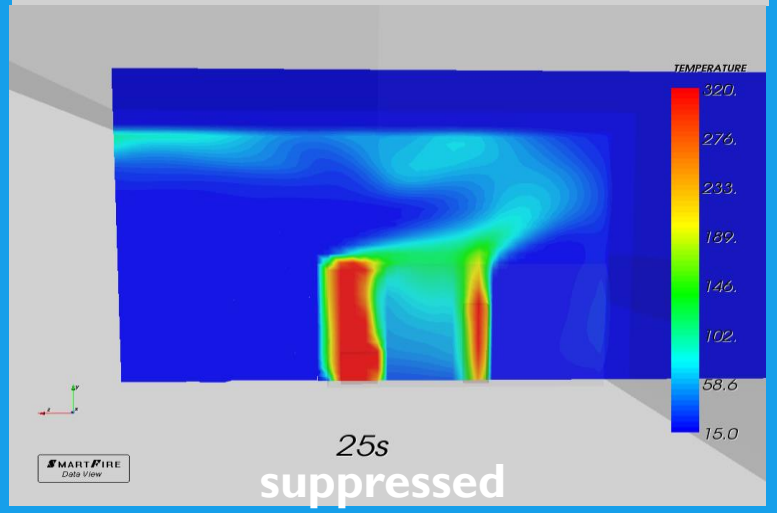
Shielded CFD data







unsuppressed



suppressed

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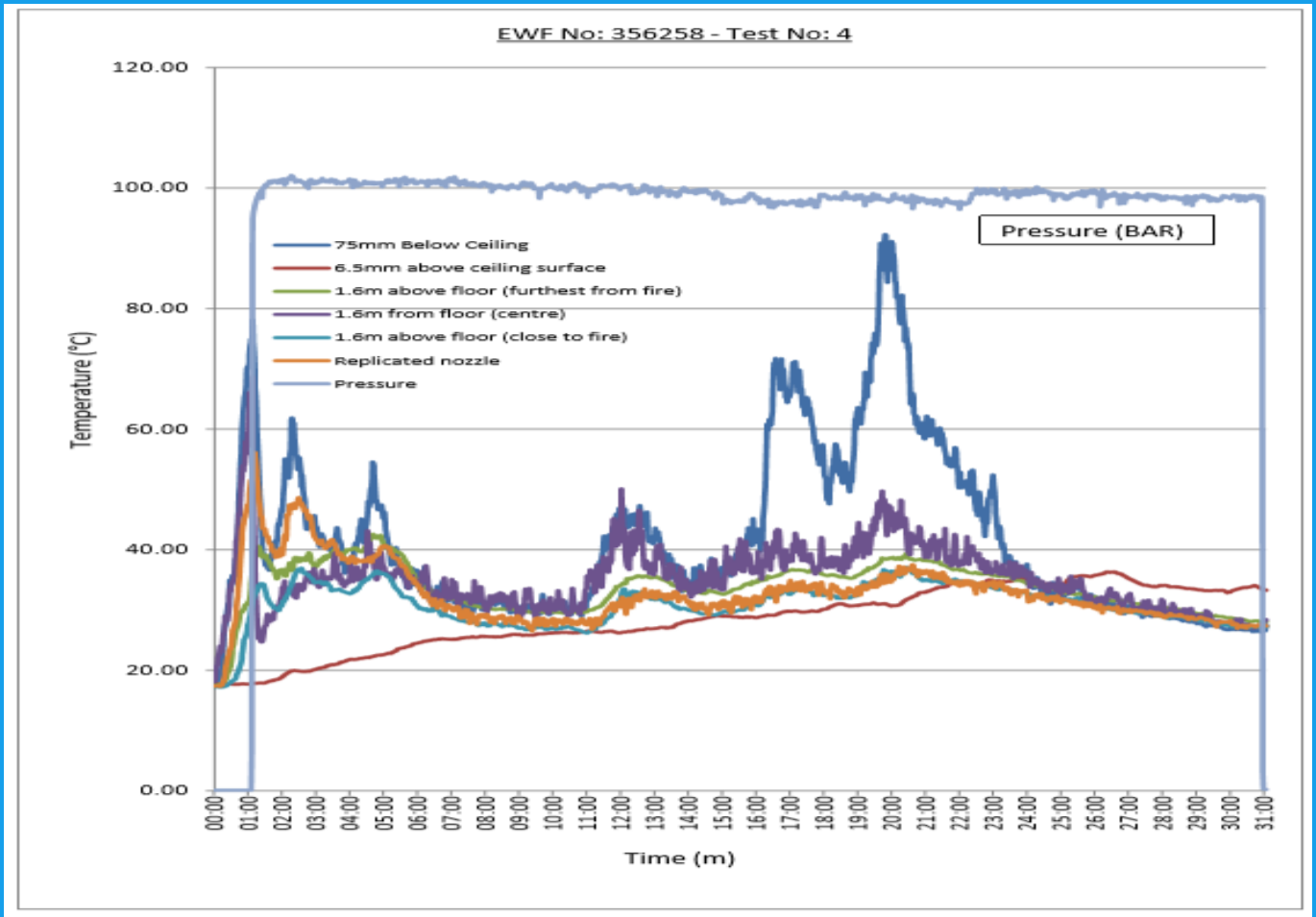
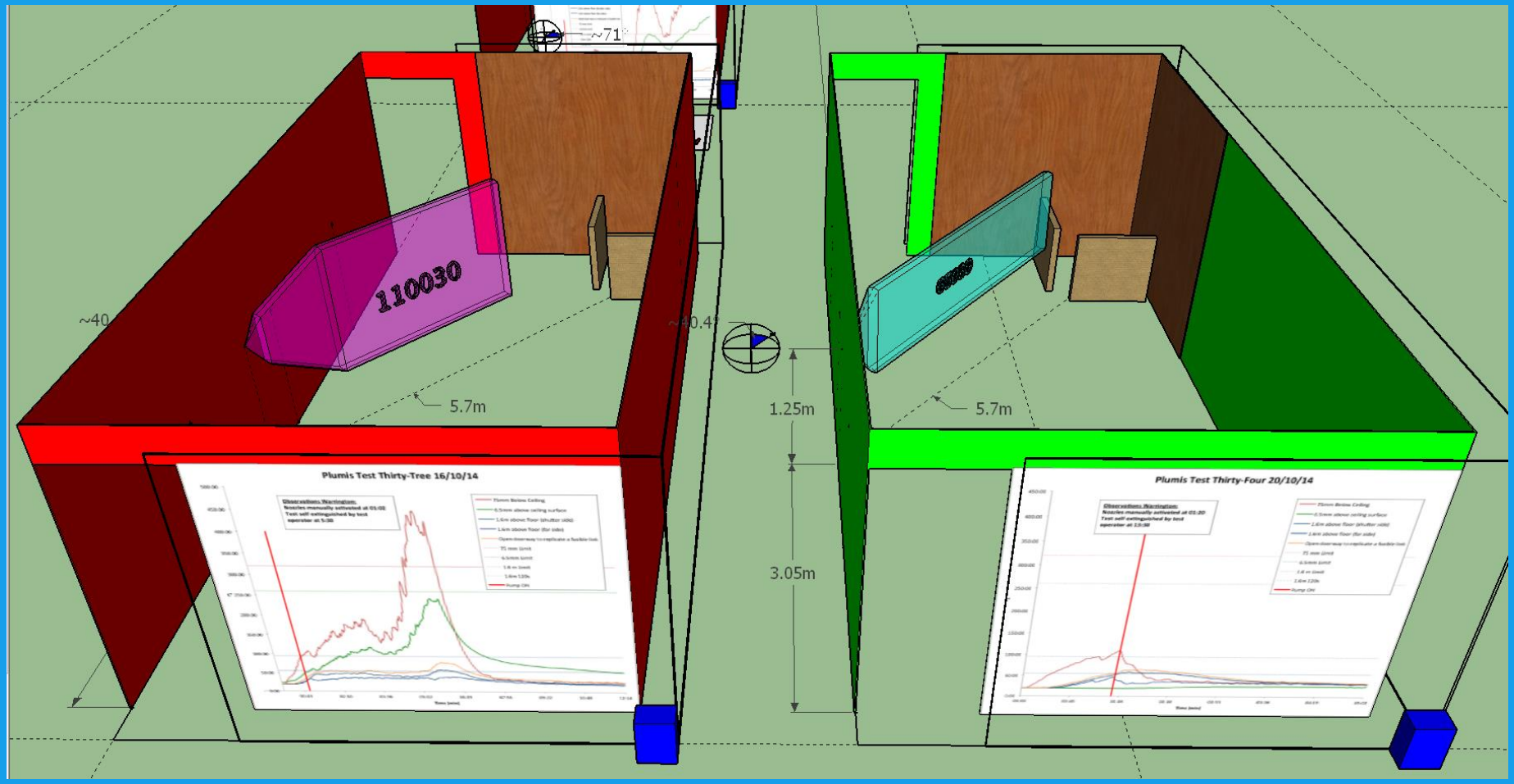
Shielded fire graph

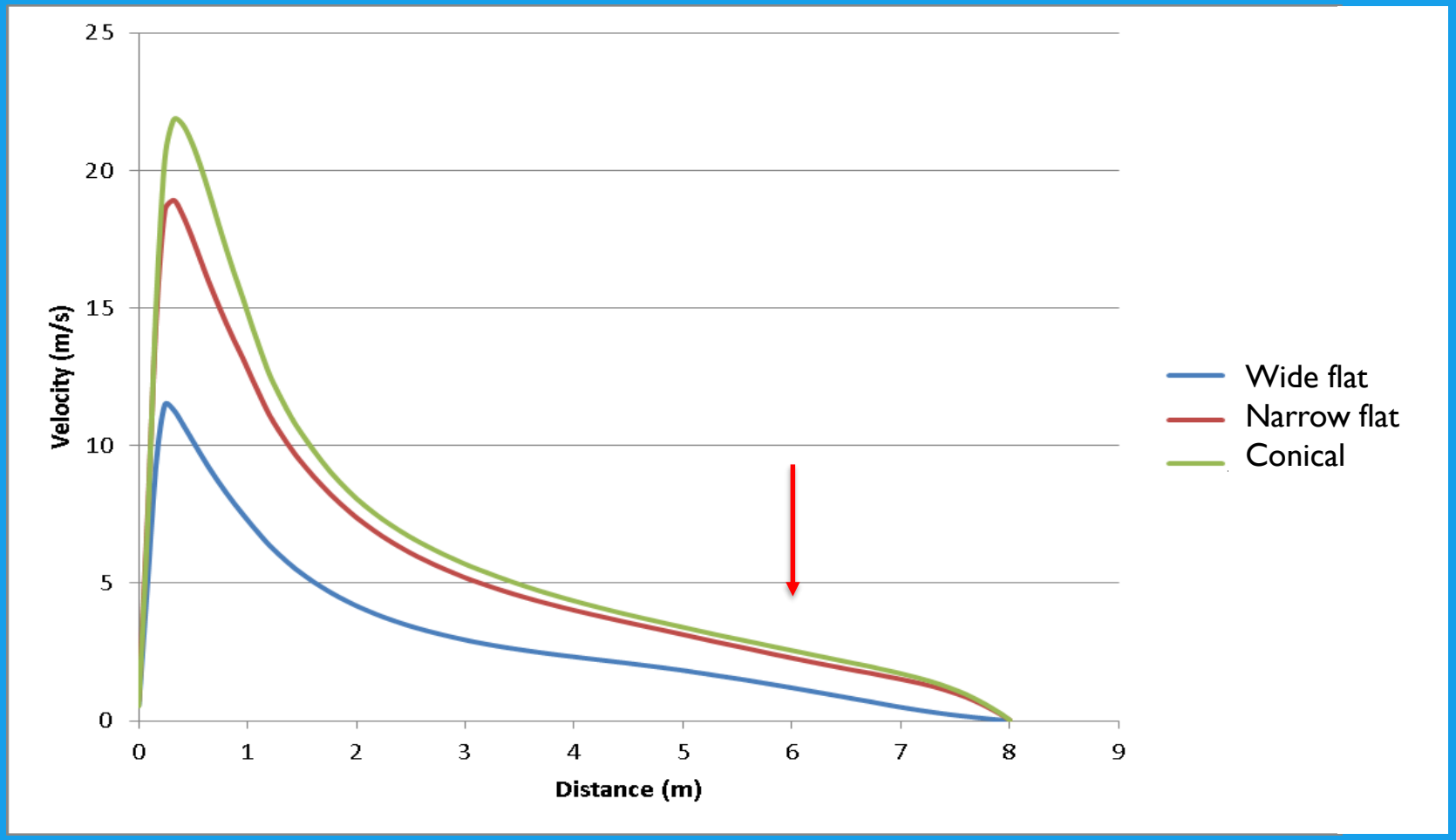


Mist density is not enough

Momentum is key (4)



Momentum is key



BS 9252: fire under nozzle

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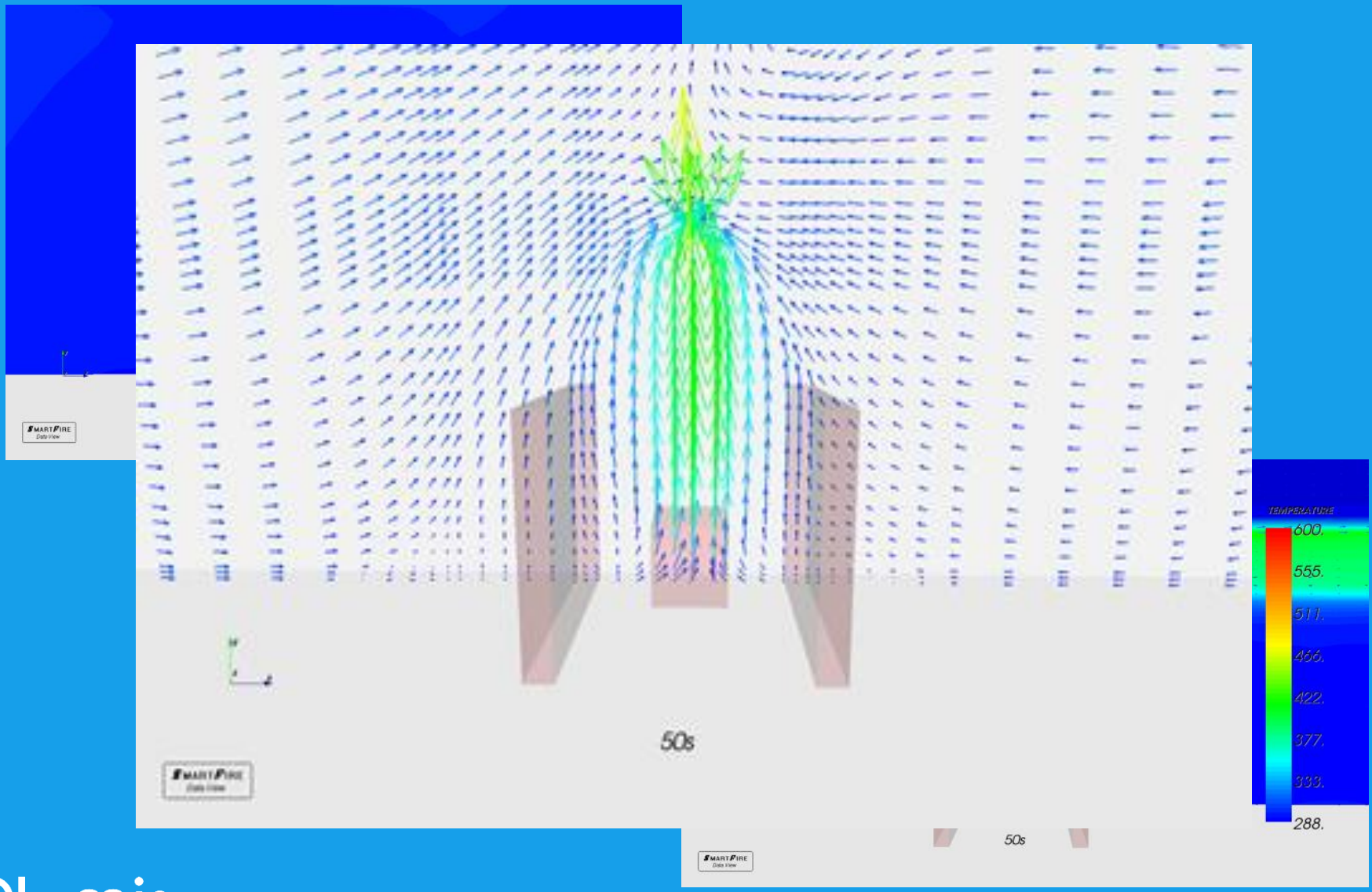
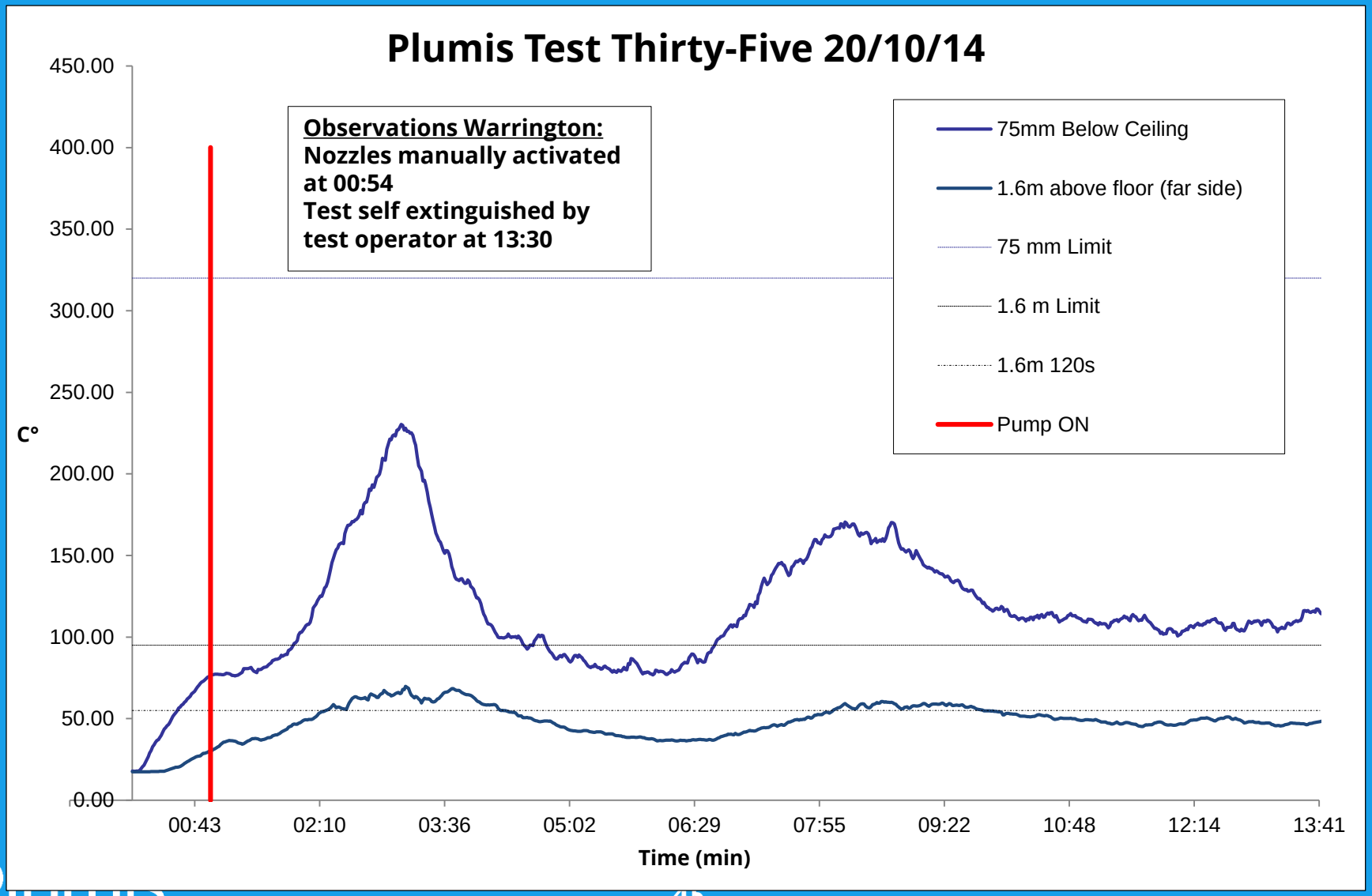


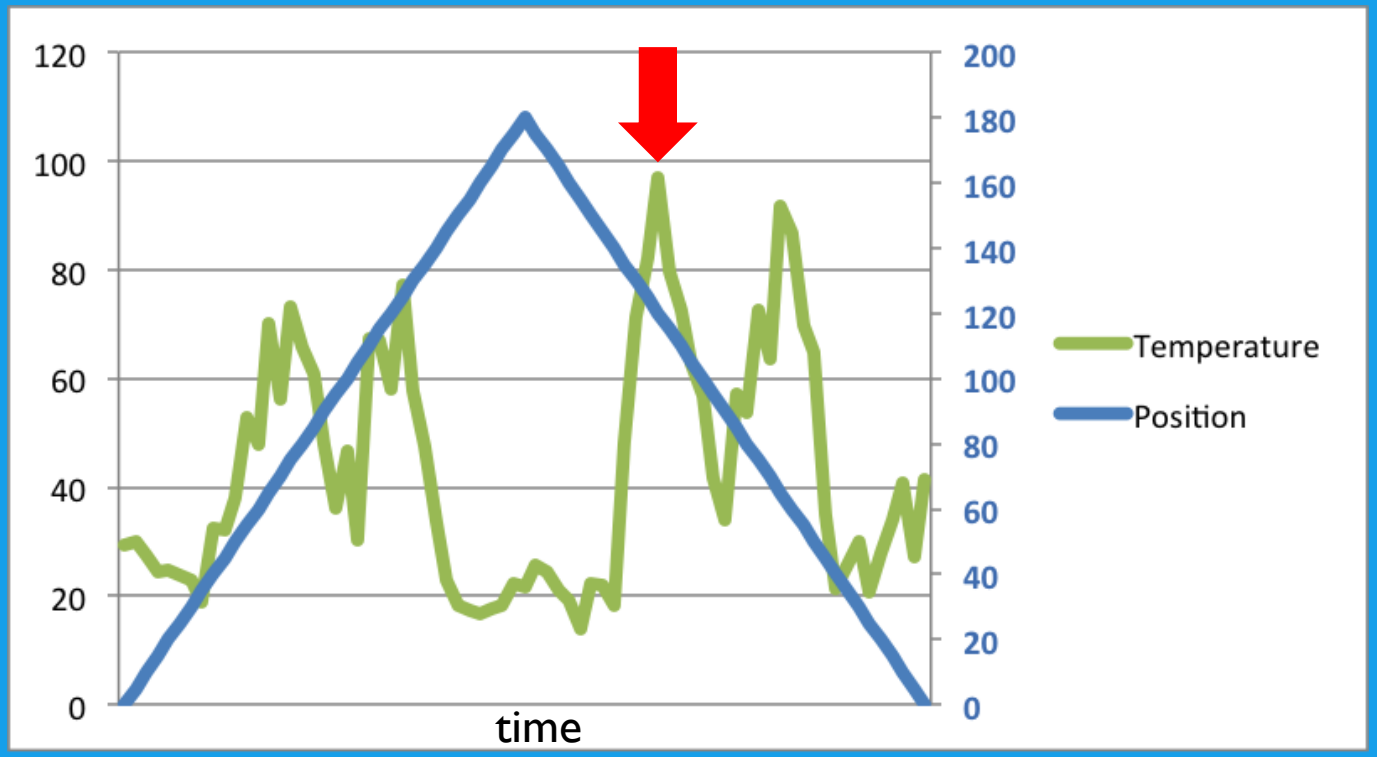
Fire under nozzle graph



IR sensor close fire scan data

Directly over fire

The two separate fires are visible



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Known heat sources: keep hob 2.5m away

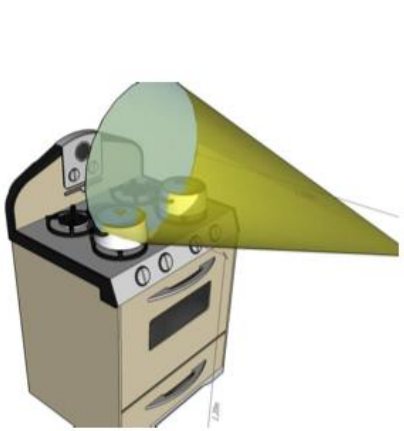

Figure 5: FOV with sensor at 1m distance

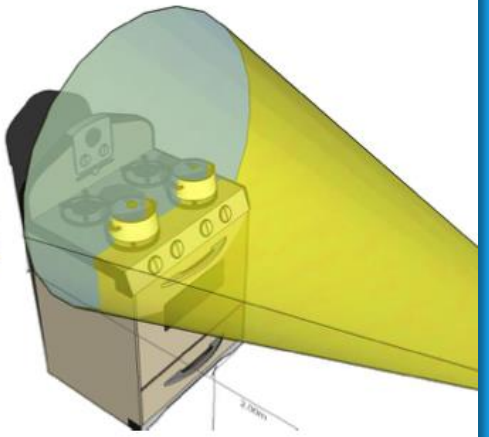

Figure 6: FOV with sensor at 2m distance

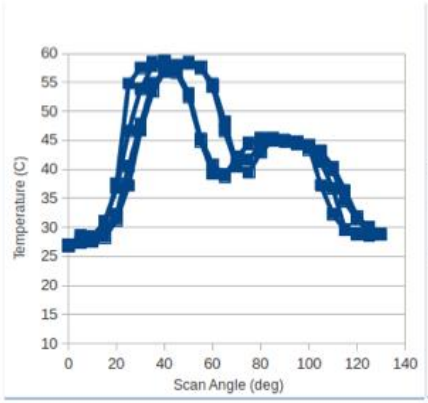

Figure 7: 2 pans (1 large, 1 small) @ 0.7m

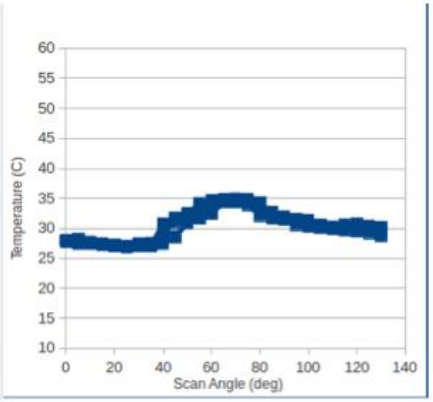

Figure 8: 2 pans (1 large, 1 small) @ 2.3m

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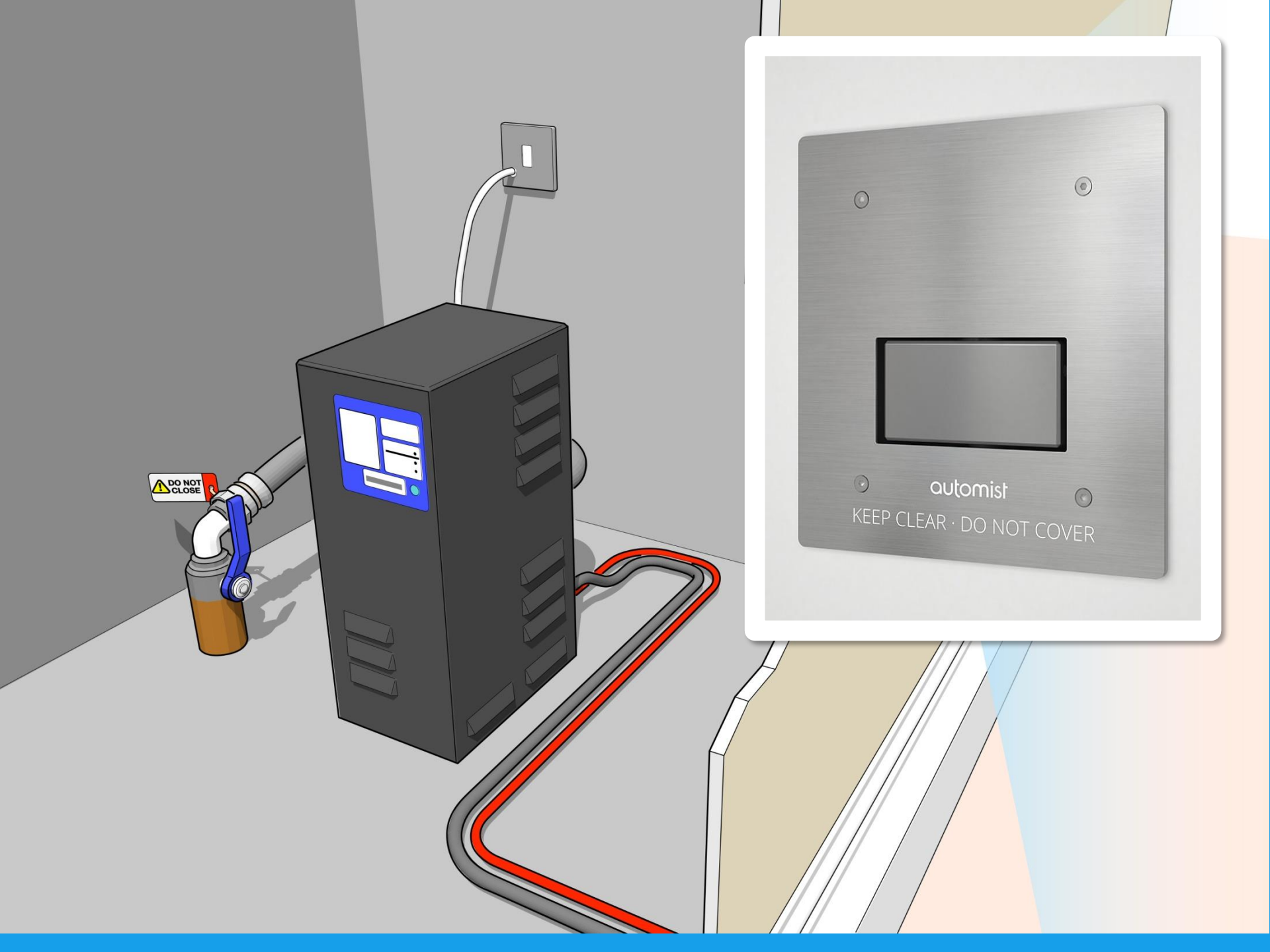
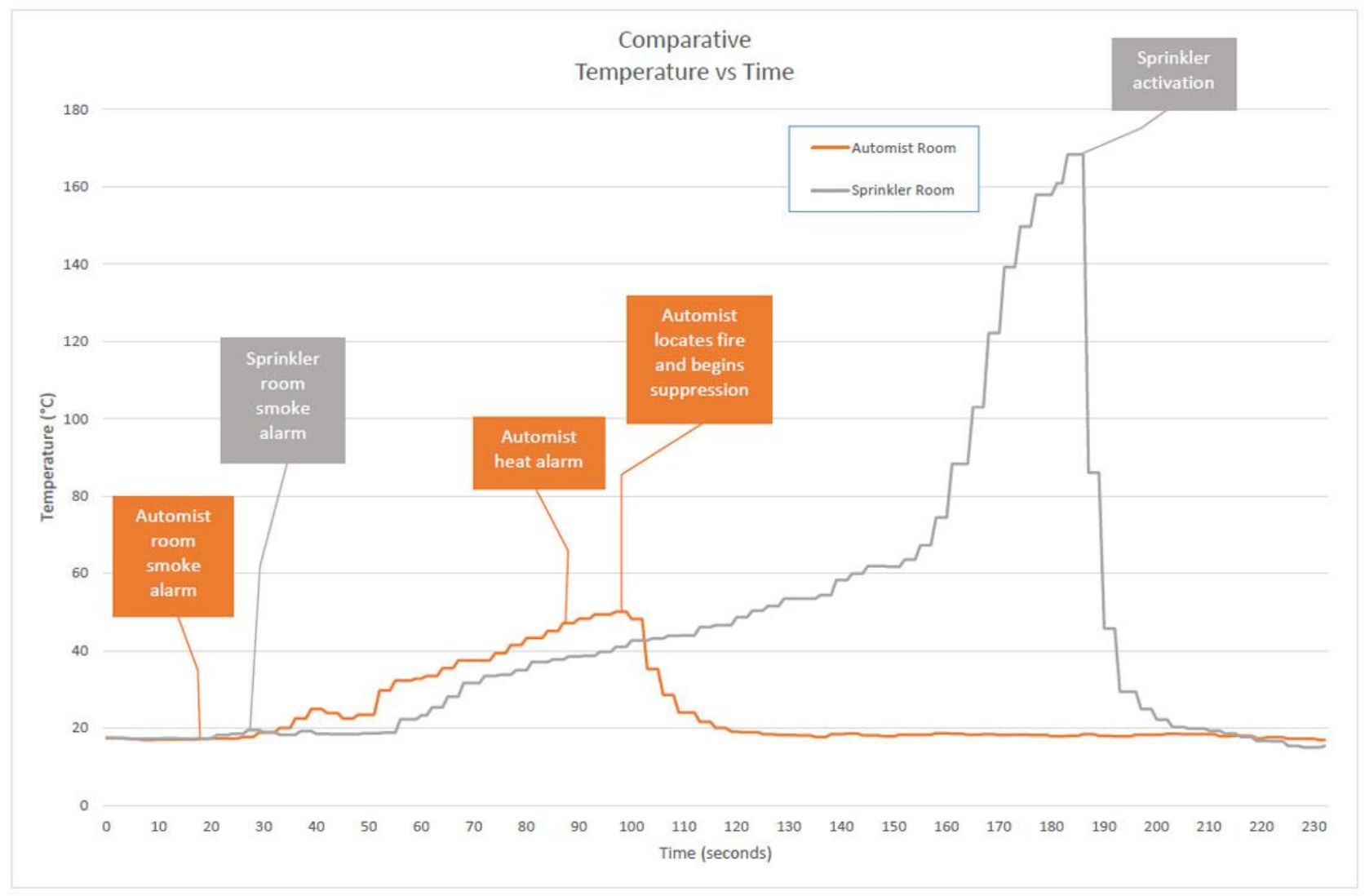

DO NOT CLOSE
automist
KEEP CLEAR · DO NOT COVER

Automist vs Sprinkler

Automist vs Sprinkler



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Automist vs Sprinkler

Next steps

- Multi-room: to serve new build
- Self-diagnosing to ensure reliability (1:9 fail)
- Internet monitored to replace annual service
- Smoke alarm triggering: to avoid ceiling clutter

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Questions?