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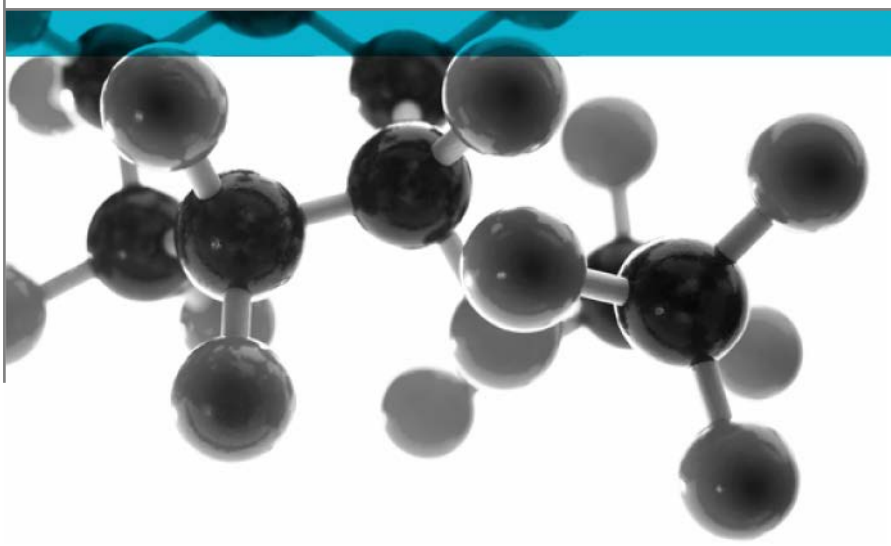
BS 8458:2015: Annex C



Method for Measuring the Capability of a Watermist System to Control a Fire – "Room Fire Tests for Watermist Systems with Automatic Nozzles"

A Report To: Plumis

Document Reference: 356258

Date: 18th January 2016

Issue No.: 3

Testing
Advising
Assuring

Executive Summary

Objective

To demonstrate the capability of a watermist system to control a fire when tested in accordance with BS 8458:2015: Annex C.

Generic Description	Product reference	Thickness / diameter / angle	Weight per unit area or density
Automist "Smartscan" targeted water mist fire suppression system	"Automist Smartscan System"	Not applicable	Not applicable
Individual components used to manufacture the system:			
Nozzle	"Smartscan vertical flat 65º spray nozzle"	65º flat cone	Not applicable
Pipe	"Production High Pressure Hose 150bar Working Pressure"	Internal: Ø 6.3mm External: Ø 11.5mm	Unable to provide
Pump	"Production Pluvia Pump"	Not applicable	Not applicable
Heat alarm	"Ei164 Heat Alarm"	Not applicable	Not applicable
Please see page 6 of this test report for the full description of the system tested			

Test Sponsor

Plumis, HMS President (1918), Victoria Embankment, London, EC4Y 0HJ

Test Results:

Thermocouple location	Maximum temperature °C				
	Test 1	Test 2	Test 3	Test 4	Test 5
75mm below the underside of the ceiling	94	178	144	92	307
Ceiling temperature – 6.5mm above the underside of the ceiling	36	39	36	36	45
1.6m above the floor, furthest from fire	38	80	67	43	71
1.6m above the floor, centre (if applicable)	35	80	138	69	104
1.6m above the floor, close to fire	32	62	68	37	67

Key:
Test 1 – Room corner (Spray head on opposite wall)
Test 2 – Room corner (Spray on same wall wall)
Test 3 – Centre (Spray head on opposite wall)
Test 4 – Centre (Spray head on opposite wall) Ventilation test
Test 5 – Centre (Spray head on opposite wall) Open room test

Where the thermocouples were positioned at 1.6m above the floor, the temperatures did not exceed 55°C for any 120 s interval, during test 1, 2, 3, 4 & 5.

The fire test maximum temperatures as defined in BS 8458:2015: Table 2 are detailed in Appendix 2.

Conclusion

The temperatures during tests 1 and 2 were all declining 2 minutes after the nozzle operation (See Figures 1 and 2).

The watermist system suppressed the fuel packages and met all the criteria specified in Clause 6.1 (a), (b) and Table 2 of BS 8458:2015.

Date of Test

29th July, 21st, 27th August 2015

Reason for Revision

This document replaces Issue 2 (dated 22nd December 2015) of the same number which has been withdrawn. Subsequent to the report being issued, the Draft BS 8458: 2014 DPC document has been re- issued as BS 8458:2015.The sponsor of the test has requested an updated report that references this new standard.

Signatories

	
Responsible Officer T. Kinder * Technical Officer	Authorised T. Mort * Senior Technical Officer

* For and on behalf of **Exova Warringtonfire**.

Report Issued: 18th January 2016

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Test Details

Purpose of test	To determine the performance of a system when it is subjected to the conditions of test specified in BS 8458:2015 “Code of practice for design and installation” Annex C "Room fire tests for watermist systems with automatic nozzles". The test was performed in accordance with the procedure specified in BS 8458:2015: Annex C and this report should be read in conjunction with that Standard.
Deviation from test standard	BS 8458:2015: Annex C.3 details that a nozzle connected to a water-filled pipe should be used and in accordance with BS 8458:2015: 6.1 (c) the nozzle, external to the room, should not operate. No thermal sensitive bulb or shared water supply is used with the “Automist Smartscan System” therefore the third nozzle, external to the room was deemed not to be applicable.
Instruction to test	The test was conducted on the 29th July, 21st, 27th August 2015 at the request of Plumis, the sponsor of the test.
Provision of the system to test	The system was supplied by the sponsor of the test. **Exova Warringtonfire** was not involved in any selection or sampling procedure.
Conditioning of ignition and fuel packages	The plywood sheets, sacrificial boards, wooden frames, foam sheets and wood crib sticks were conditioned to constant mass at a temperature of 23 ± 2°C and a relative humidity of 50 ± 5% prior to testing. The cribs were conditioned, such that the moisture content was 10 ± 2%, 3 mm below the wood stick surface prior to testing.
Ignition package	Ignition packages, as detailed in Annex B.1.3 were used.
Fuel package	Fuel packages, as detailed in Annex B.1.4 were used.
Test room	The test room was erected, as detailed in Annex B.1.1.
Operating pressure	The systems operating pressure was 90bar. The operating pressures throughout the tests are presented in Figures 1, 2, 3, 4 and 5.
Water flow rate	The systems water flow rate at operation was 6.0l/min.

Description of system

The description of the system given below has been prepared from information provided by the sponsor of the test. All values quoted are nominal, unless tolerances are given.

General description		Automist "Smartscan" targeted water mist fire suppression system
System reference		"Automist Smartscan System"
Name of manufacturer		Plumis
Detailed description		Automist pre-engineered active targeted, single nozzle, watermist fire suppression system
Nozzle	Product reference	"Smartscan vertical flat 65º spray nozzle"
	General description	Flat cone 65º 316SS single nozzle with M10x1 thread, 0.576 K factor.
	Name of manufacturer	Plumis supply chain
	Angle	65º flat cone
	Colour reference	"316 stainless steel" "Silver" (observed by **Exova Warringtonfire**)
Pipe	Product reference	"Production High Pressure Hose 150bar Working Pressure"
	Generic type	PE (Polyethylene) core, Polyester braid, PVC (Polyvinylchloride) outer
	Name of manufacturer	Plumis supply chain
	Diameter	Internal: Ø 6.3mm External: Ø 11.5mm
	Wall thickness	2.6mm
	Length	4000mm
	Density	**See Note 1 below**
	Colour reference	"Black"
	Flame retardant details	**See Note 2 below**
Pump	Product reference	"Production Pluvia Pump"
	General description	Automist Pluvia high pressure pump. 6.0 l/min, 90 bar working pressure, 120bar pressure limit.
	Name of manufacturer	Plumis supply chain
Heat alarm	Product reference	"Ei164 Heat Alarm"
	General description	Aico 57° fixed point heat alarm
	Name of manufacturer	Ei Electronics
	Colour reference	"White"
Brief description of manufacturing process		**See Note 1 below**

Note 1. The sponsor was unable to provide this information.

Note 2. The sponsor of the test has confirmed that no flame retardant additives were utilised in the production of the component.

Test Results

Applicability of test results

The test results relate only to the behaviour of the system under the particular conditions of test, they are not intended to be the sole criterion for assessing the potential fire hazard of the system in use.

The test results relate only to the system in the form in which it was tested. Small differences in the composition of the system may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any system which is supplied or used is fully represented by the system which was tested.

Test results

Thermocouple location	Maximum temperature °C				
	Test 1	Test 2	Test 3	Test 4	Test 5
75mm below the underside of the ceiling	94	178	144	92	307
Ceiling temperature – 6.5mm above the underside of the ceiling	36	39	36	36	45
1.6m above the floor, furthest from fire	38	80	67	43	71
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Key:
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Where the thermocouples were positioned at 1.6m above the floor, the temperatures did not exceed 55°C for any 120 s interval, during test 1, 2, 3, 4 & 5.

The fire test maximum temperatures as defined in BS 8458:2015: Table 2 are detailed in Appendix 2.

Conclusion

The temperatures during tests 1 and 2 were all declining 2 minutes after the nozzle operation (See Figures 1 and 2).

The watermist system suppressed the fuel packages and met all the criteria specified in Clause 6.1 (a), (b) and Table 2 of BS 8458:2015.

Observations

The visual observations taken during the tests are shown in Appendix 1.

Temperatures

The temperatures logged during the tests are presented in Figures 1, 2, 3, 4 and 5.

Fire test layout

Diagrams detailing the fire test layouts are presented in Figures 6, 7, 8, 9 and 10.

Validity

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

Appendix 1

Observations during test of Test 1

00:01 Test start, the fire loads were ignited.

00:45 Heat alarm sounded. Nozzle began to scan room.

00:50 Nozzle activated.

30:50 Test terminated.

Observations during test of Test 2

00:01 Test start, the fire loads were ignited.

00:46 Heat alarm sounded. Nozzle began to scan room.

01:54 Nozzle activated.

31:54 Test terminated.

Observations during test of Test 3

00:01 Test start, the fire loads were ignited.

00:28 Heat alarm sounded. Nozzle began to scan room.

02:04 Nozzle activated.

32:04 Test terminated.

Observations during test of Test 4

00:01 Test start, the fire loads were ignited.

00:47 Heat alarm sounded. Nozzle began to scan room.

01:06 Nozzle activated.

31:06 Test terminated.

Observations during test of Test 5

00:01 Test start, the fire loads were ignited.

00:27 Heat alarm sounded. Nozzle began to scan room.

01:21 Nozzle activated.

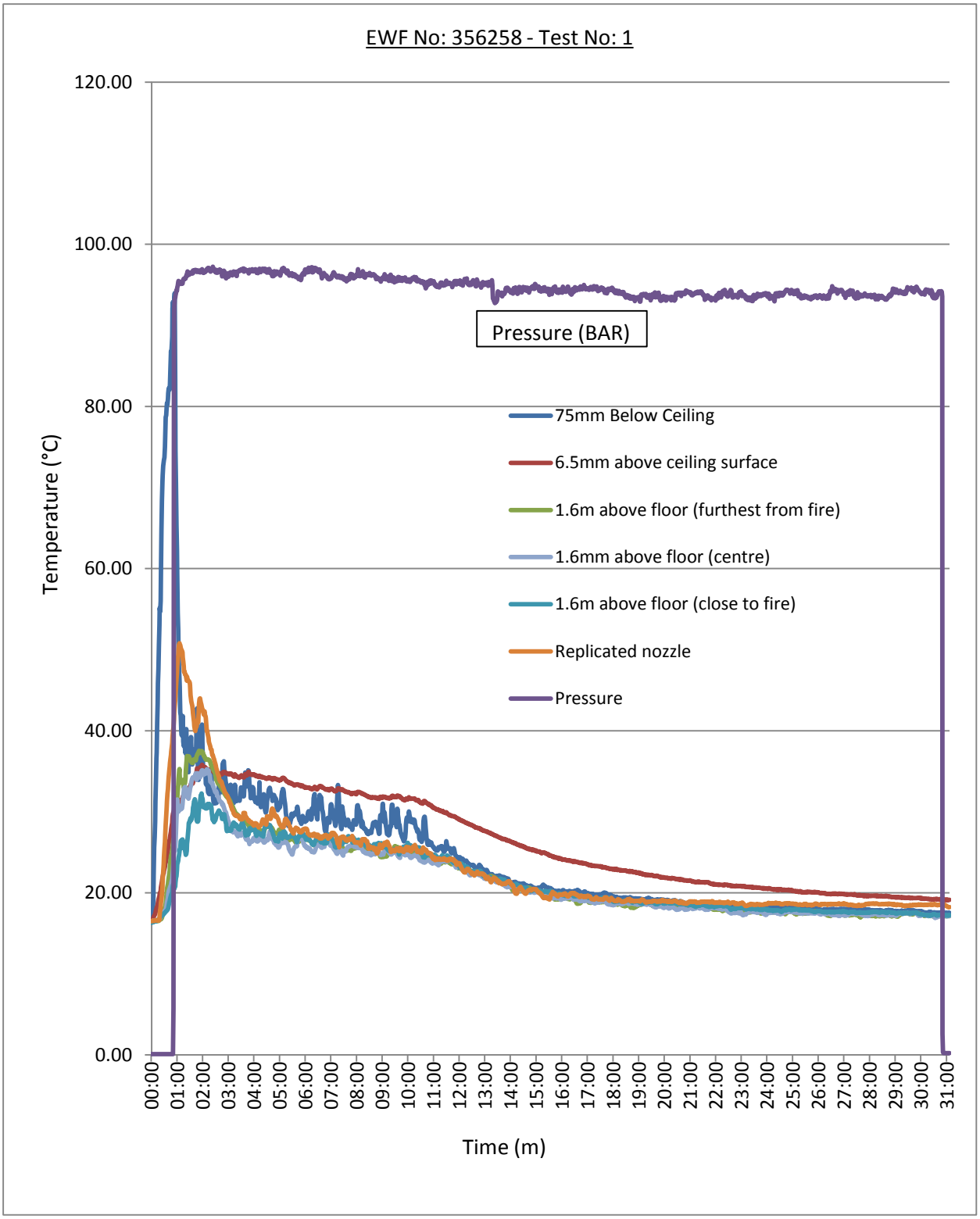
31:21 Test terminated.

Appendix 2

Table 2 **Fire test maximum temperatures**

Thermocouple location	Maximum allowable temperature °C
75mm below the underside of the ceiling	320
1.6 m above the floor	95
1.6 m above the floor	55 (for not more than any 120 s interval)

Figure 1


EWF No: 356258 - Test No: 1
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Temperature (°C)
Pressure (BAR)
75mm Below Ceiling
6.5mm above ceiling surface
1.6m above floor (furthest from fire)
1.6mm above floor (centre)
1.6m above floor (close to fire)
Replicated nozzle
Pressure
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
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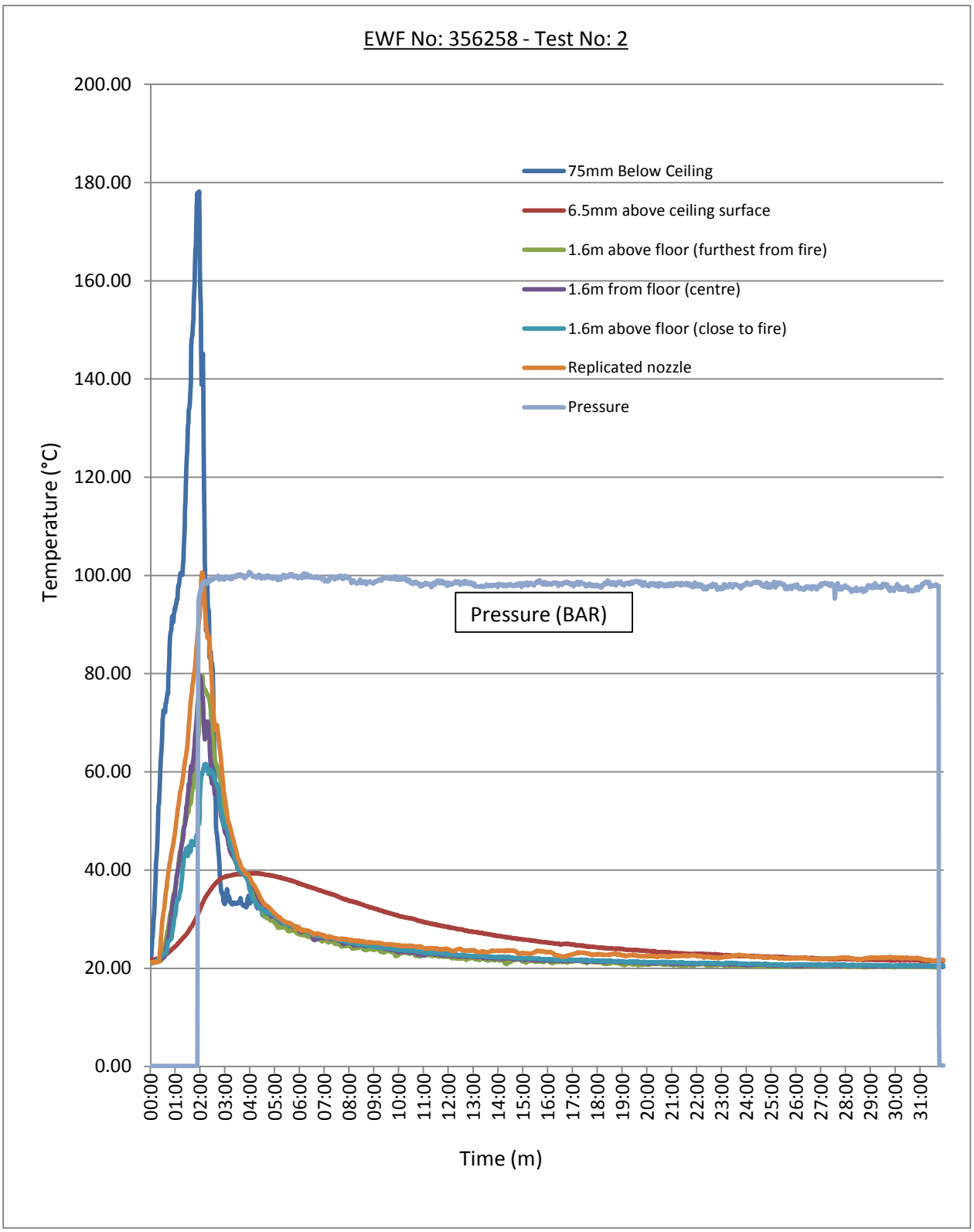
26:00
27:00
28:00
29:00
30:00
31:00
Time (m)

Figure 2


EWF No: 356258 - Test No: 2
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Temperature (°C)
75mm Below Ceiling
6.5mm above ceiling surface
1.6m above floor (furthest from fire)
1.6m from floor (centre)
1.6m above floor (close to fire)
Replicated nozzle
Pressure
Pressure (BAR)
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
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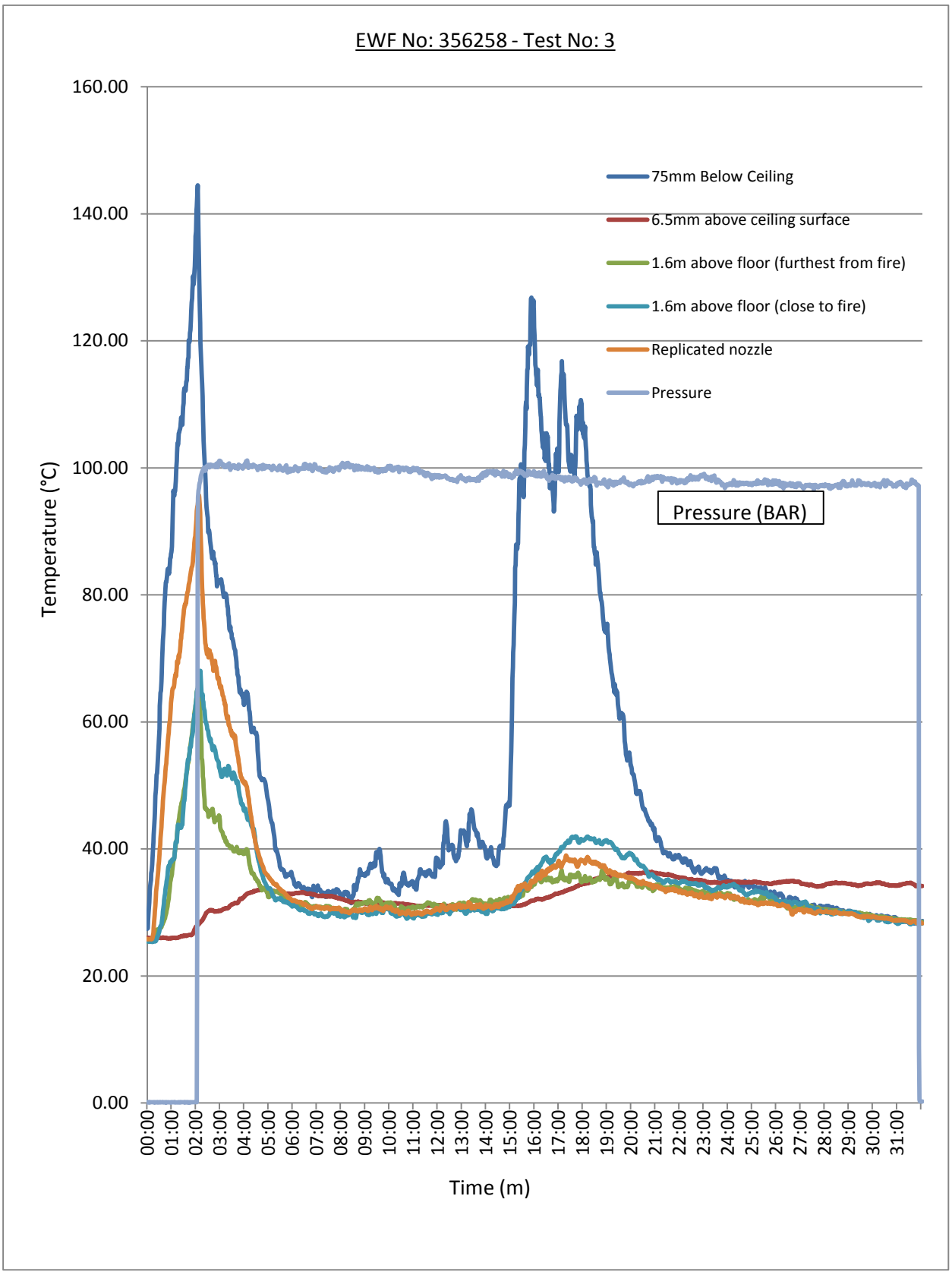
25:00
26:00
27:00
28:00
29:00
30:00
31:00
Time (m)

Figure 3


EWF No: 356258 - Test No: 3
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Temperature (°C)
75mm Below Ceiling
6.5mm above ceiling surface
1.6m above floor (furthest from fire)
1.6m above floor (close to fire)
Replicated nozzle
Pressure
Pressure (BAR)
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
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25:00
26:00
27:00
28:00
29:00
30:00
31:00
Time (m)

Figure 4

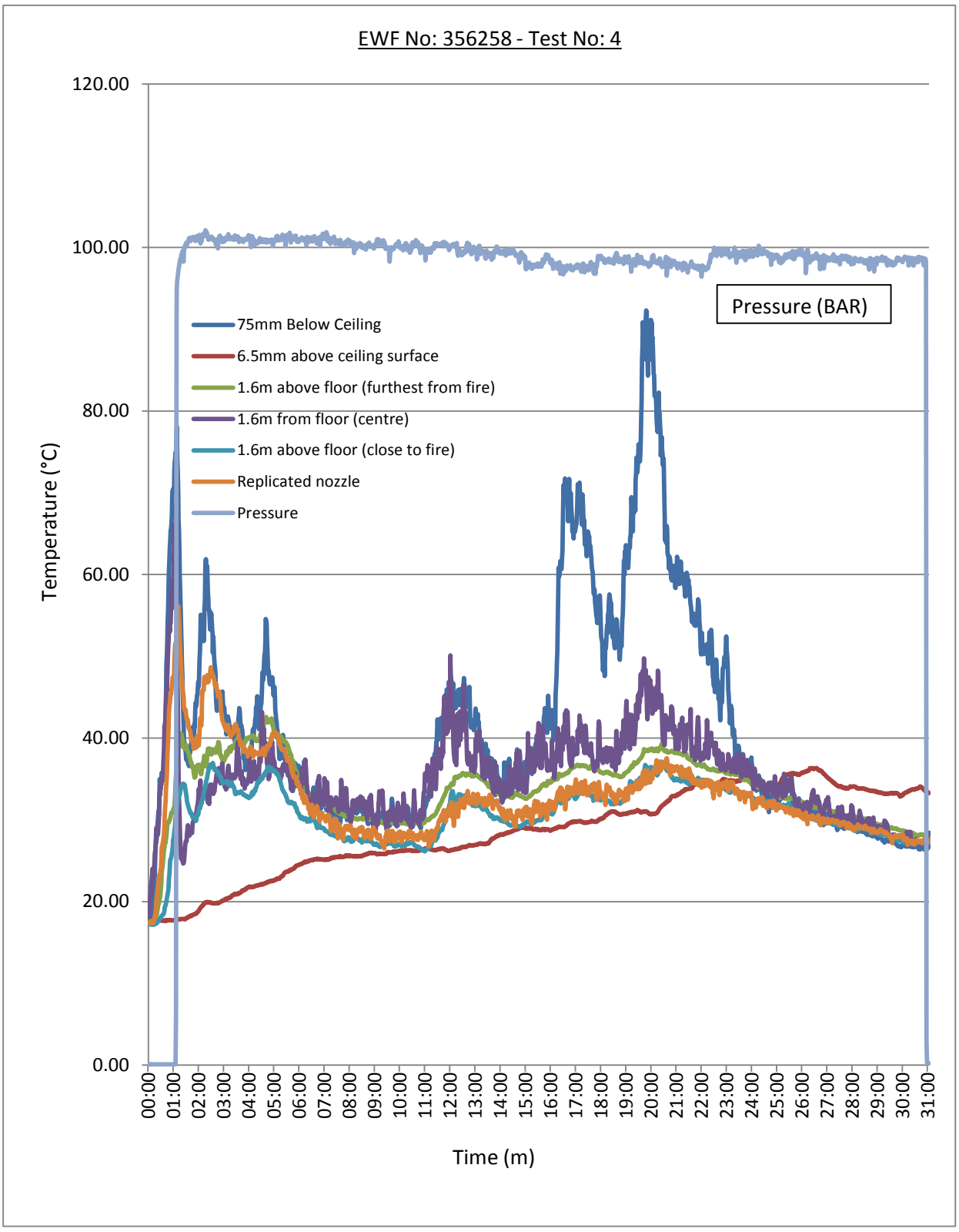
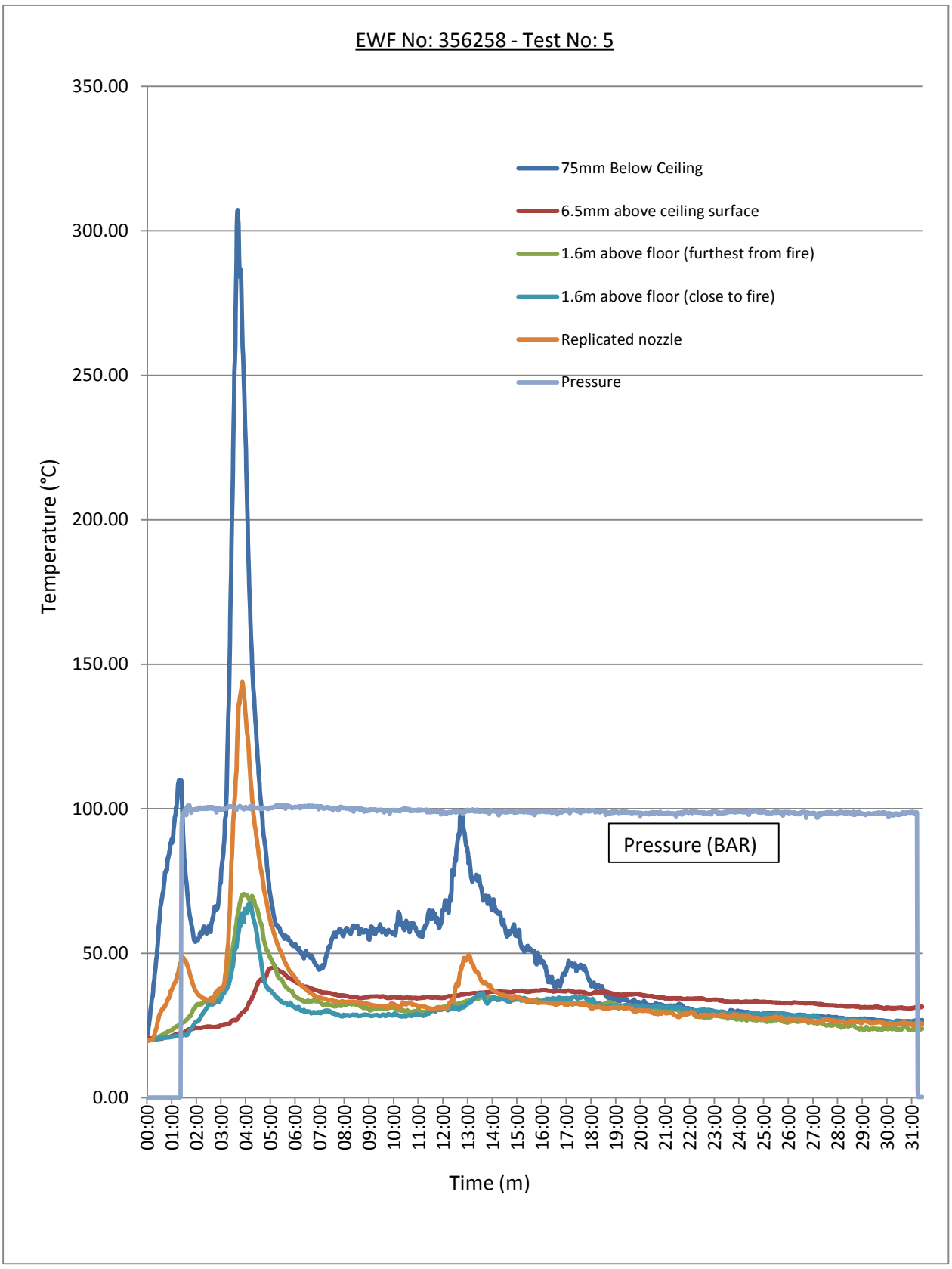

EWF No: 356258 - Test No: 4
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Temperature (°C)
Pressure (BAR)
75mm Below Ceiling
6.5mm above ceiling surface
1.6m above floor (furthest from fire)
1.6m from floor (centre)
1.6m above floor (close to fire)
Replicated nozzle
Pressure
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
24:00
25:00
26:00
27:00
28:00
29:00
30:00
31:00
Time (m)

Figure 5


EWF No: 356258 - Test No: 5
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Temperature (°C)
75mm Below Ceiling
6.5mm above ceiling surface
1.6m above floor (furthest from fire)
1.6m above floor (close to fire)
Replicated nozzle
Pressure
Pressure (BAR)
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
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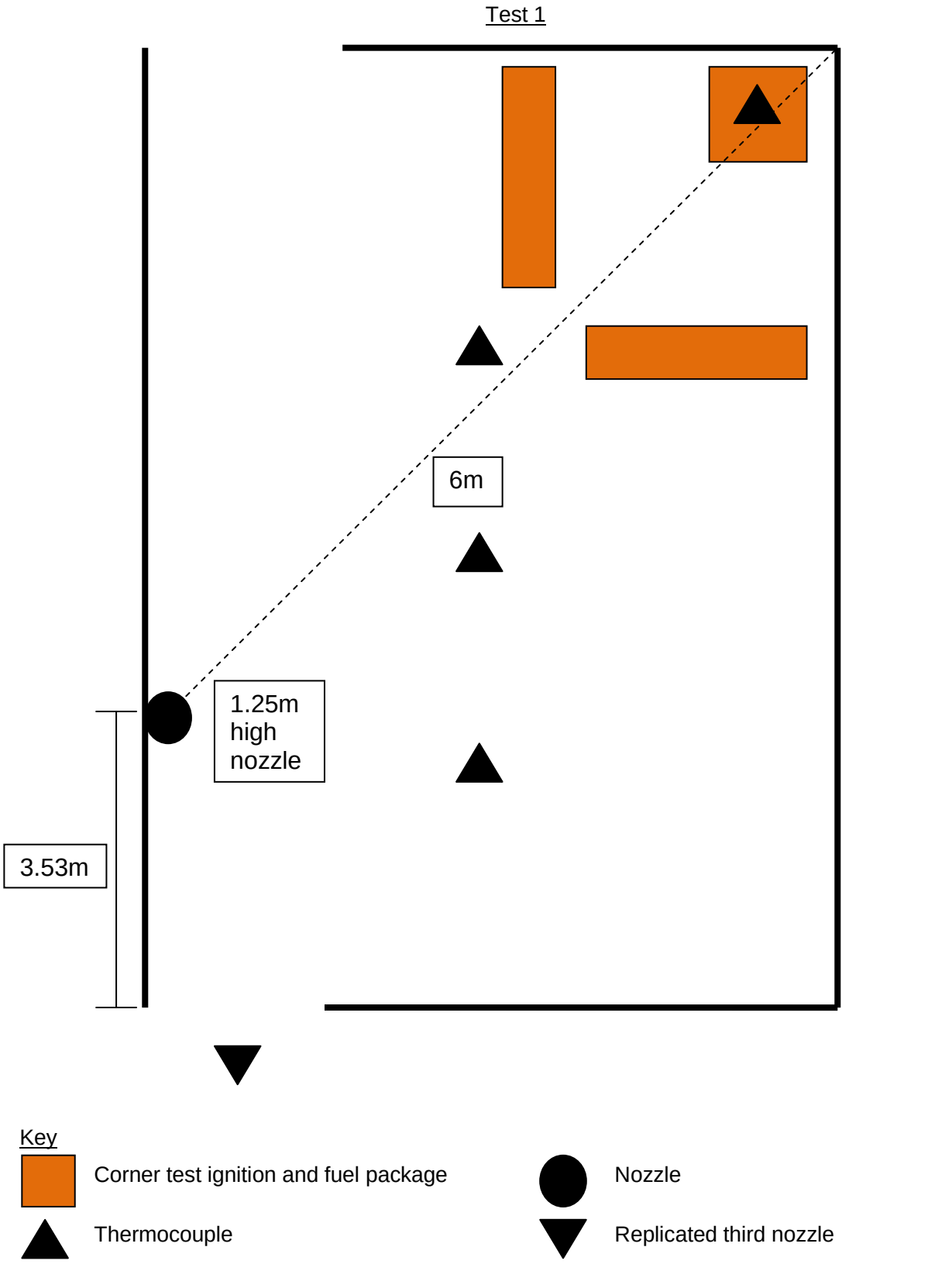
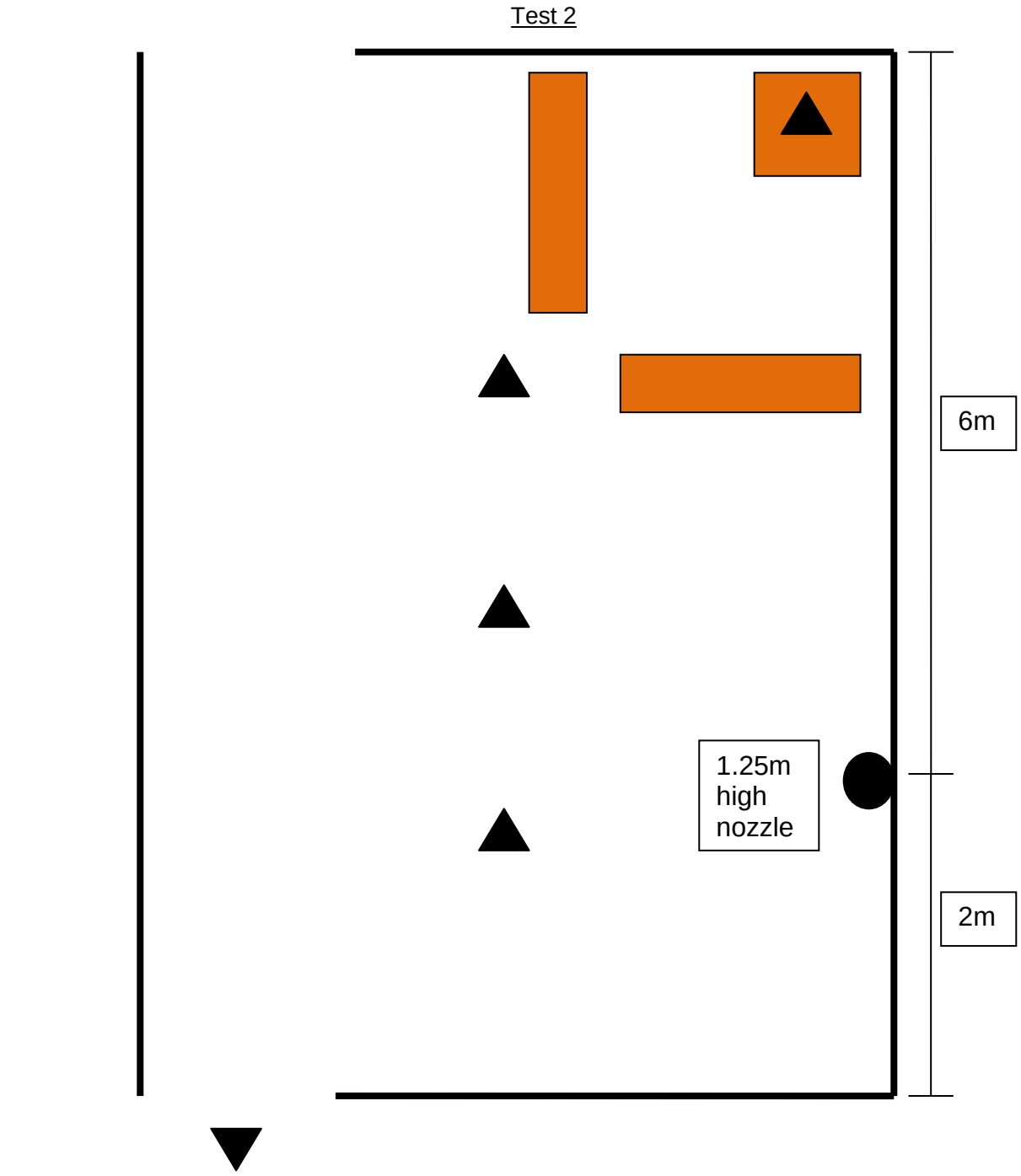
25:00
26:00
27:00
28:00
29:00
30:00
31:00
Time (m)

Figure 6



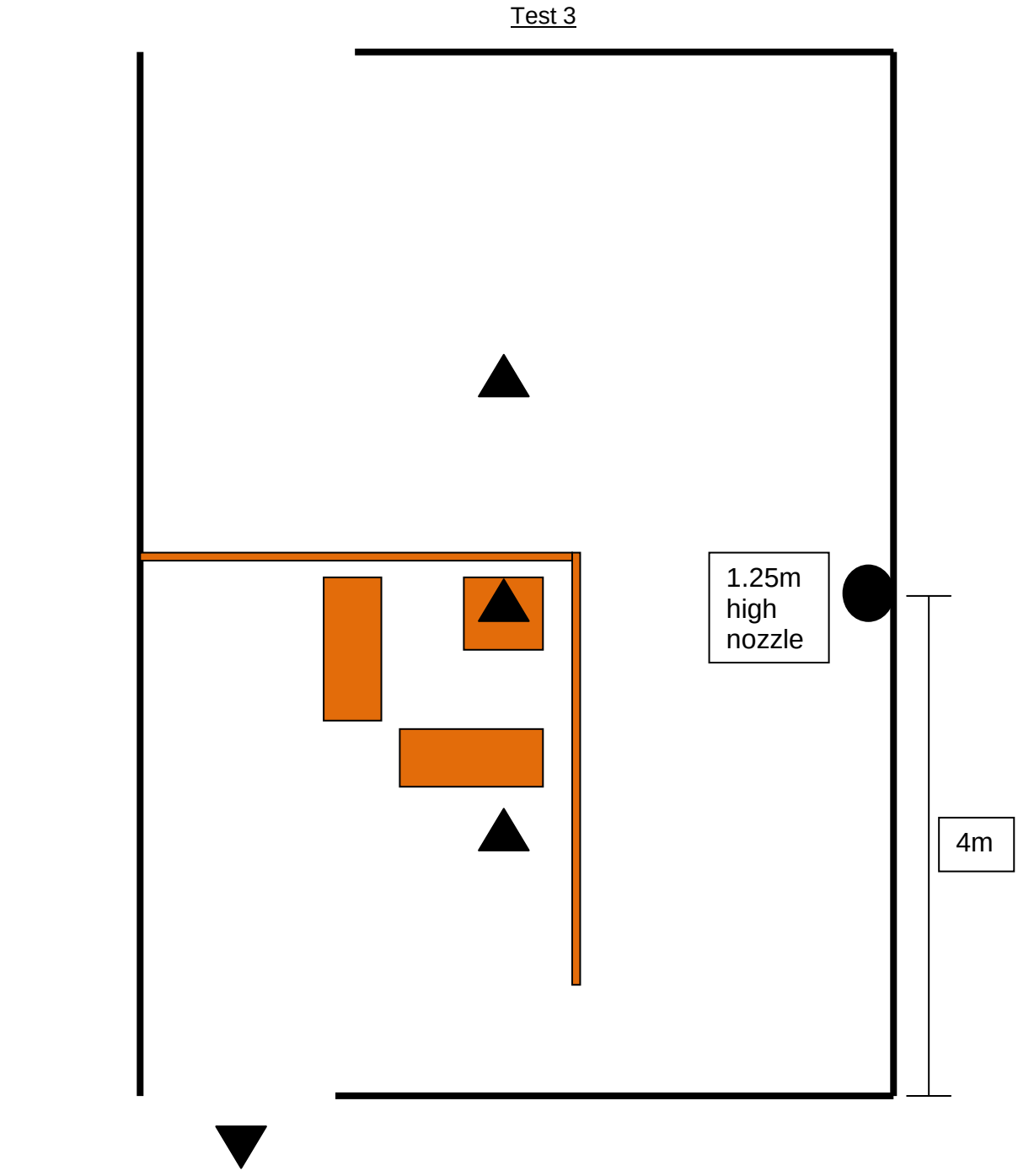
Drawing not to scale

Figure 7



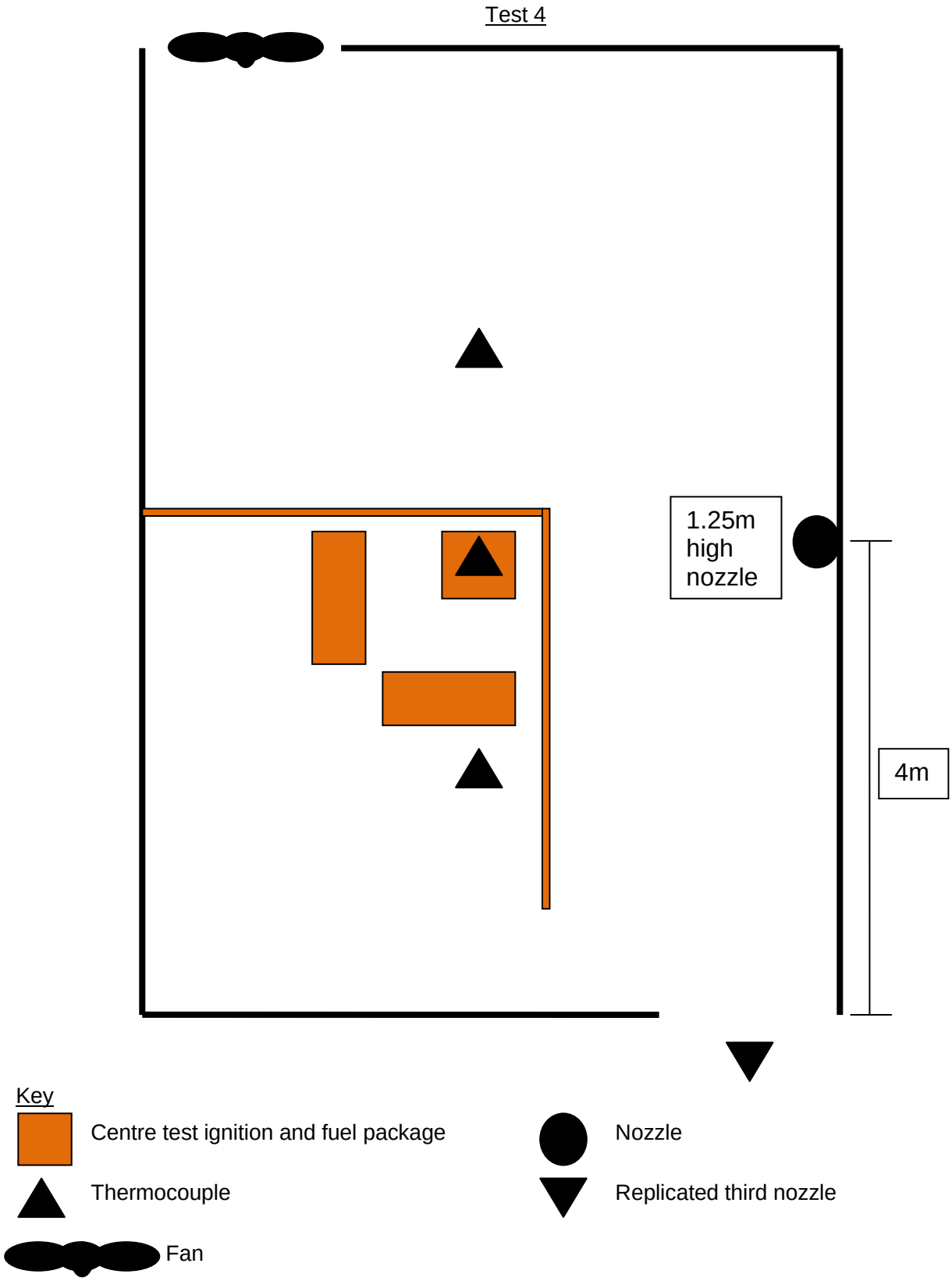
Drawing not to scale

Figure 8



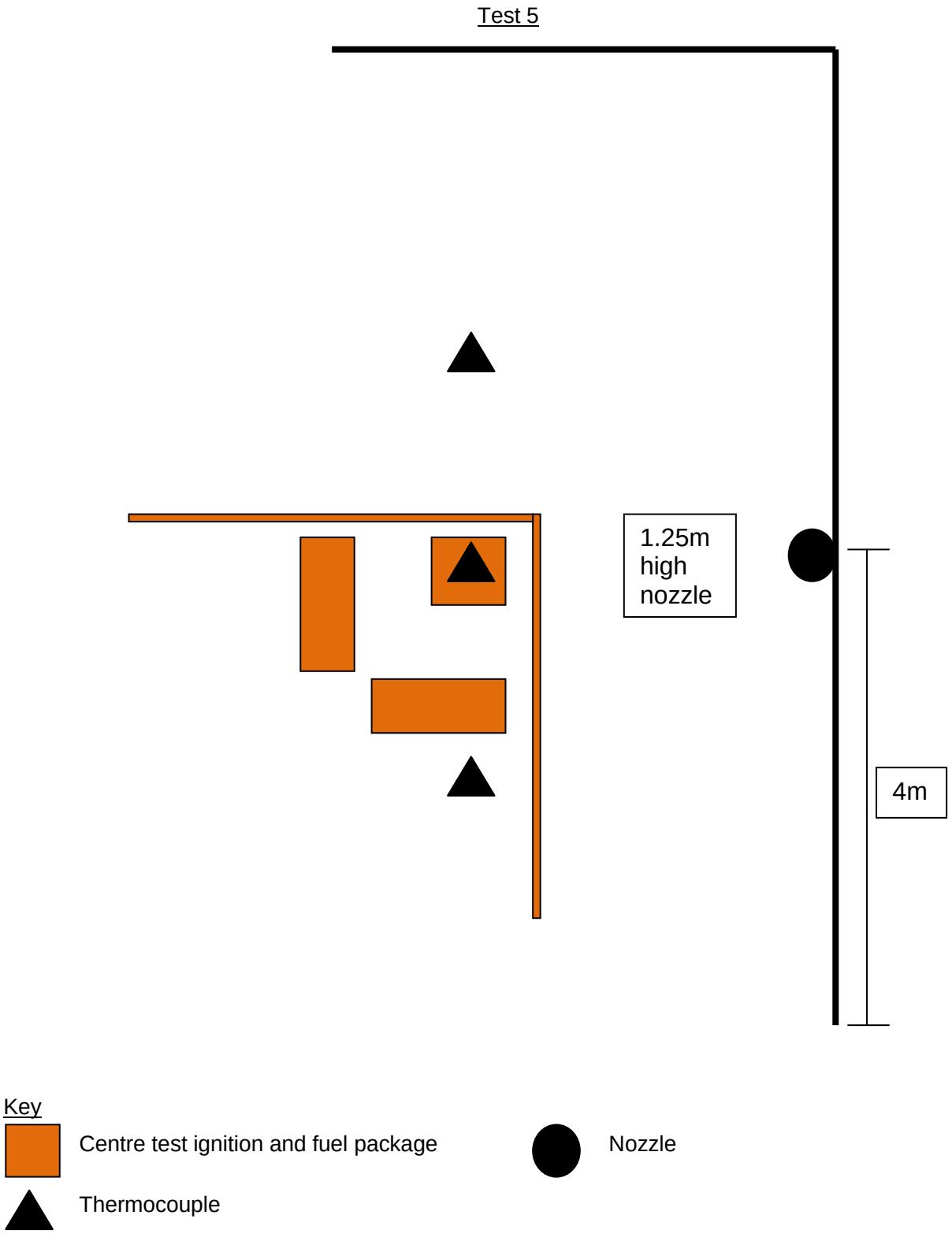
Drawing not to scale

Figure 9



Drawing not to scale

Figure 10

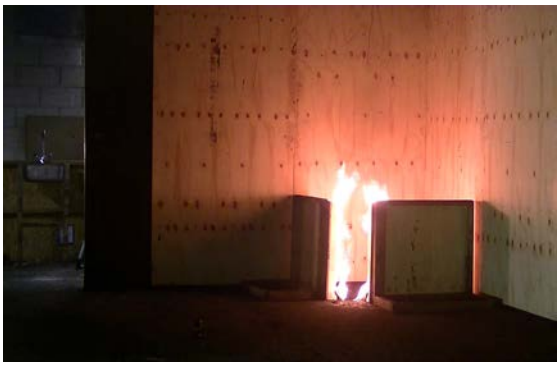


Drawing not to scale

Photographs


Photographs of ignition and fuel package before a test

Photographs of nozzle system before a test




Photographs during a test

Photograph after a test

Revision History

Issue No : 2	Issue Date: 22nd December 2015
Revised By: T. Kinder	Approved By: T. Mort
Reason for Revision: This document replaces Issue 1 (dated 15th September 2015) of the same number which has been withdrawn. Subsequent to the report being issued, the sponsor of the test has confirmed that details in the Key for Test 4 and Test 5 were incorrect and the correct details have been detailed in this issue 2 report.	

Issue No : 3	Issue Date: 18th January 2016
Revised By: T. Kinder	Approved By: T. Mort
Reason for Revision: This document replaces Issue 2 (dated 22nd December 2015) of the same number which has been withdrawn. Subsequent to the report being issued, the Draft BS 8458: 2014 DPC document has been re- issued as BS 8458:2015.The sponsor of the test has requested an updated report that references this new standard.	