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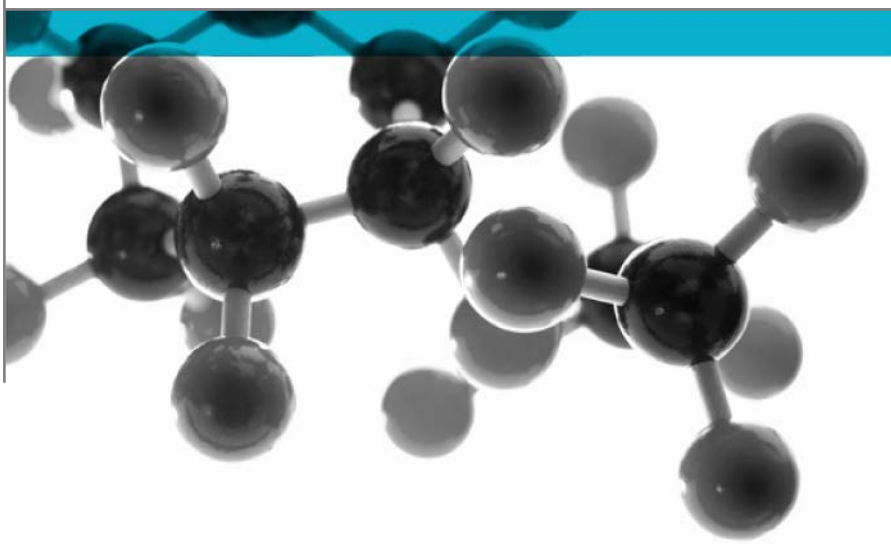
Ad-hoc tests on watermist systems utilising the principles of the procedure defined in Draft BS 8458: 2014: Annex B



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

A Report To: Plumis

Document Reference: 356142

Date: 7th September 2015

Issue No.: 1

Testing
Advising
Assuring

Executive Summary

Objective To evaluate the fire suppression performance of a fixed 4 nozzle spray head utilising the principles of the test procedure defined in Draft BS 8458: 2014: Annex B

Generic Description	Product reference	Thickness / diameter / angle	Weight per unit area or density
Automist "wall production head" fire suppression system	"Automist Fixed System"	Not applicable	Not applicable
Individual components used to manufacture the system:			
Nozzle	"Production Automist 4 nozzle wall head 4xA8"	4 nozzle wall head with 2 nozzles at an angle of 24º from the centreline and another 2 nozzles at 73º from centreline	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 5 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
75mm below the underside of the ceiling		799	365	172	164
Ceiling temperature – 6.5mm above the underside of the ceiling		163	58	71	46
1.6m above the floor, furthest from fire		233	128	51	100
1.6m above the floor, centre (if applicable)		280	N/A	49	N/A
1.6m above the floor, close to fire		227	58	39	42
'Tree 1', furthest from fire	600mm (above the floor)	45	44	30	45
	1200mm (above the floor)	60	83	37	70
	1600mm (above the floor)	253	128	51	100
	1800mm (above the floor)	291	169	63	113
	2300mm (above the floor)	323	289	77	165
'Tree 2', close to fire	600mm (above the floor)	51	44	29	39
	1200mm (above the floor)	70	51	35	40
	1600mm (above the floor)	244	58	39	42
	1800mm (above the floor)	271	108	40	54
	2300mm (above the floor)	437	225	108	97

Key:
Test 1 – Room corner using 'free burn' without any suppression system and 1 plywood sheet per wall.
Test 2 – Room centre test.
Test 3 – Room corner test.
Test 4 – Room centre ventilation test.

Date of Test 1st, 23rd and 27th July 2015

Signatories

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

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

Report Issued: 7th September 2015

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Test Details

Purpose of test

To evaluate the fire suppression performance of a fixed 4 nozzle spray head utilising the principles of the test procedure defined in Draft BS 8458: 2014: Annex B: 2014 “Code of practice for design and installation” Annex B "Room fire test for watermist systems with automatic nozzles".

The tests were performed in accordance with the procedure specified in Draft BS 8458: 2014: Annex B and should be read in conjunction with that Standard.

Deviation from test standard

Draft BS 8458: 2014 Annex B.4 details that the following tests should be carried out:

a) Corner test
b) Fuel package beneath a nozzle test
c) Fuel package between two nozzles test.
d) Ventilation test.
e) Open room test.

At the specific request of the sponsor, only the corner, fuel package between two nozzles (centre) and fuel package between two nozzles (centre) ventilation test arrangement was used for the tests.

This test has been reported as an Ad-Hoc test as a consequence of these deviations.

Instruction to test

The test was conducted on the 1st, 23rd and 27th July 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% at 3mm 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 constructed such that the dimensions detailed in B.1.1., were complied with, with the exception of the doorways which were constructed to a height of 2.2m, as specified by the sponsor of the test.

Operating pressure

The system’s operating pressure was 90 bar.

Water flow rate

The system’s water flow rate at operation was 6.0 l/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 "wall production head" fire suppression system
System reference		"Automist Fixed System"
Name of manufacturer		Plumis
Detailed description		Automist pre-engineered active watermist fire suppression system
Nozzle	Product reference	"Production Automist 4 nozzle wall head 4xA8"
	General description	Full cone 60º Watec 316SS nozzles with M13x1 thread, 0.144 K factor for A8 nozzle. Production heads, 316SS machined for wall head
	Name of manufacturer	Plumis supply chain
	Angle	4 nozzle wall head with 2 nozzles at an angle of 24º from the centreline and another 2 nozzles at 73º from centreline
	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
75mm below the underside of the ceiling		799	365	172	164
Ceiling temperature – 6.5mm above the underside of the ceiling		163	58	71	46
1.6m above the floor, furthest from fire		233	128	51	100
1.6m above the floor, centre (if applicable)		280	N/A	49	N/A
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'Tree 1', furthest from fire	600mm (above the floor)	45	44	30	45
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	2300mm (above the floor)	323	289	77	165
'Tree 2', close to fire	600mm (above the floor)	51	44	29	39
	1200mm (above the floor)	70	51	35	40
	1600mm (above the floor)	244	58	39	42
	1800mm (above the floor)	271	108	40	54
	2300mm (above the floor)	437	225	108	97

Key:

Test 1 – Room corner using 'free burn' without any suppression system and 1 plywood sheet per wall.
Test 2 – Room centre test.
Test 3 – Room corner test.
Test 4 – Room centre ventilation test.

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 and 4.

Fire test layout

Diagrams detailing the fire test layouts are presented in Figures 5, 6, 7 and 8.

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.

04:23 Test terminated.

Observations during test of Test 2

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

00:31 Heat alarm sounded and system automatically activated.

10:30 Test terminated.

Observations during test of Test 3

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

00:48 Heat alarm sounded and system automatically activated.

14:15 Test terminated.

Observations during test of Test 4

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

01:16 Heat alarm sounded and system automatically activated.

11:26 Test terminated.

Figure 1

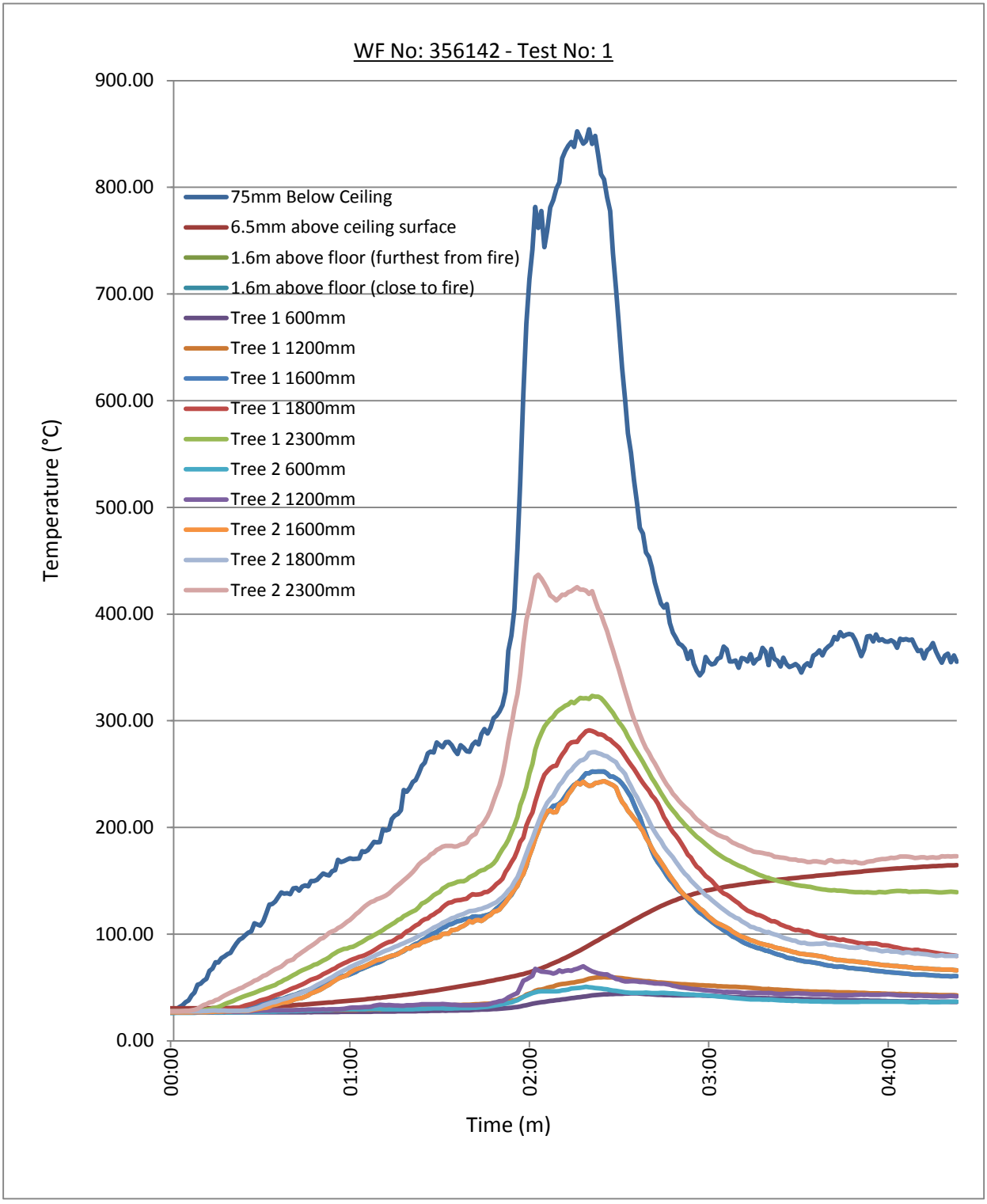

WF No: 356142 - Test No: 1
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
Temperature (°C)
00:00
01:00
02:00
03:00
04:00
Time (m)
75mm Below Ceiling
6.5mm above ceiling surface
1.6m above floor (furthest from fire)
1.6m above floor (close to fire)
Tree 1 600mm
Tree 1 1200mm
Tree 1 1600mm
Tree 1 1800mm
Tree 1 2300mm
Tree 2 600mm
Tree 2 1200mm
Tree 2 1600mm
Tree 2 1800mm
Tree 2 2300mm

Figure 2

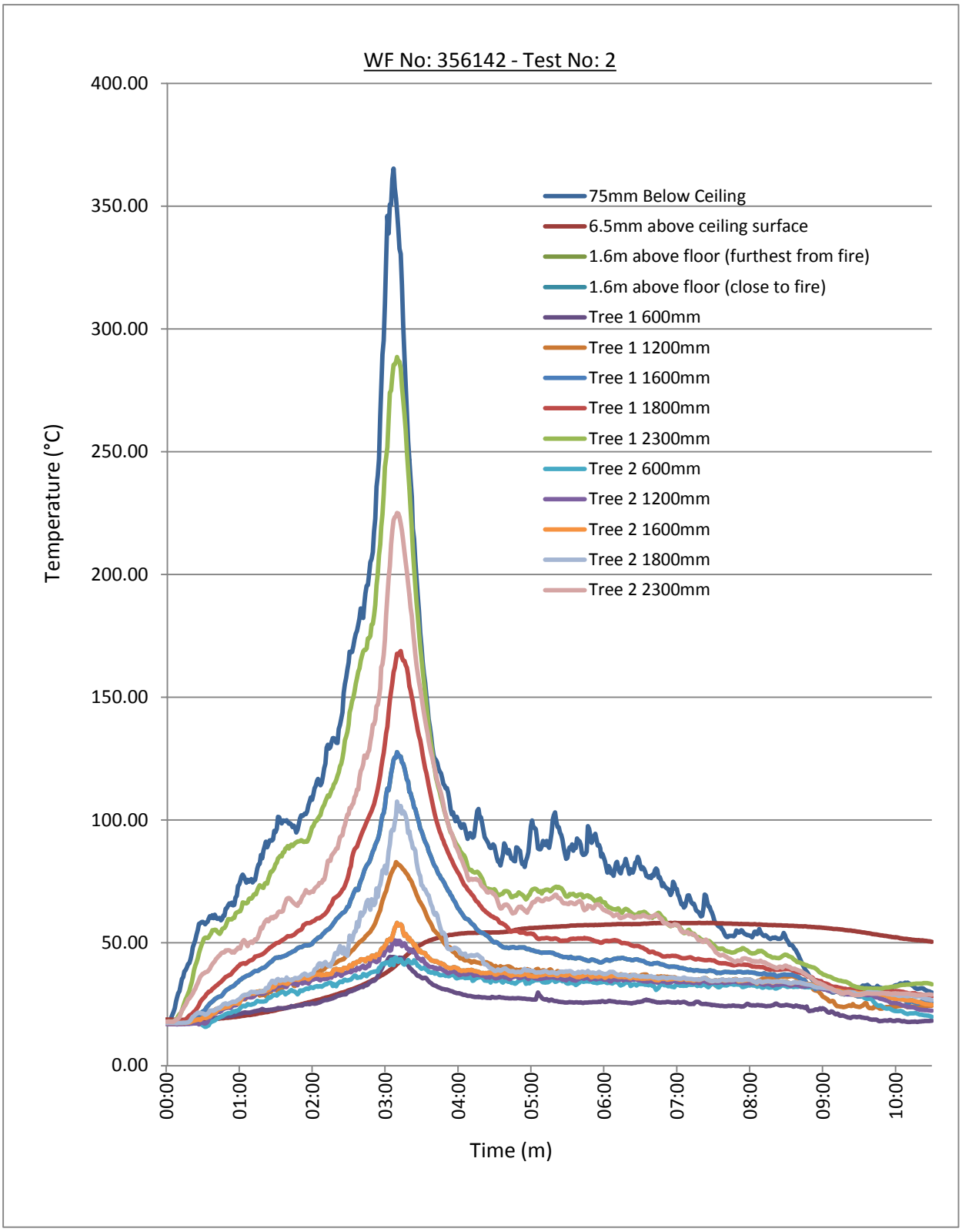

WF No: 356142 - Test No: 2
Temperature (°C)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
Time (m)
75mm Below Ceiling
6.5mm above ceiling surface
1.6m above floor (furthest from fire)
1.6m above floor (close to fire)
Tree 1 600mm
Tree 1 1200mm
Tree 1 1600mm
Tree 1 1800mm
Tree 1 2300mm
Tree 2 600mm
Tree 2 1200mm
Tree 2 1600mm
Tree 2 1800mm
Tree 2 2300mm

Figure 3

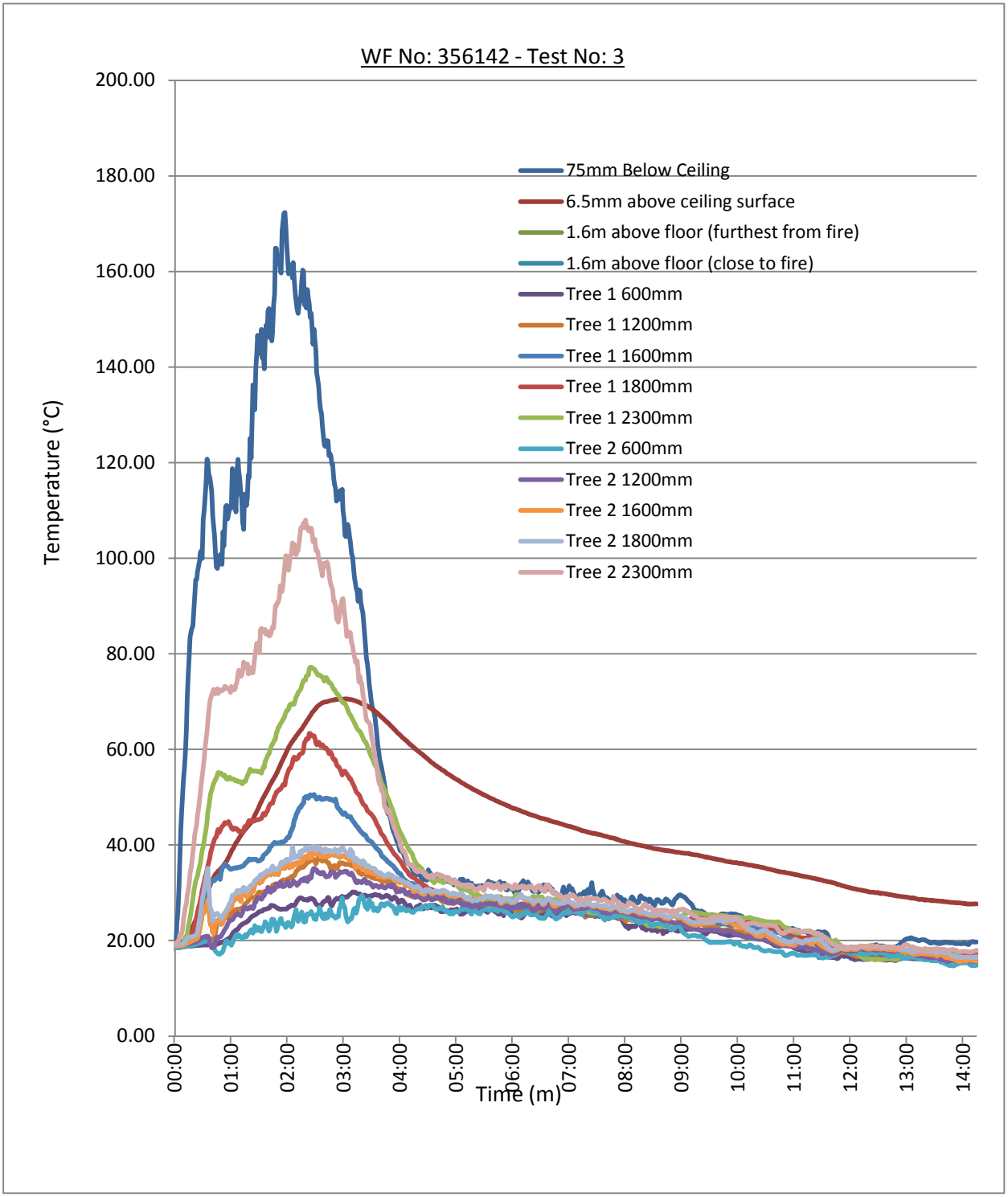

WF No: 356142 - Test No: 3
Temperature (°C)
Time (m)
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
75mm Below Ceiling
6.5mm above ceiling surface
1.6m above floor (furthest from fire)
1.6m above floor (close to fire)
Tree 1 600mm
Tree 1 1200mm
Tree 1 1600mm
Tree 1 1800mm
Tree 1 2300mm
Tree 2 600mm
Tree 2 1200mm
Tree 2 1600mm
Tree 2 1800mm
Tree 2 2300mm

Figure 4

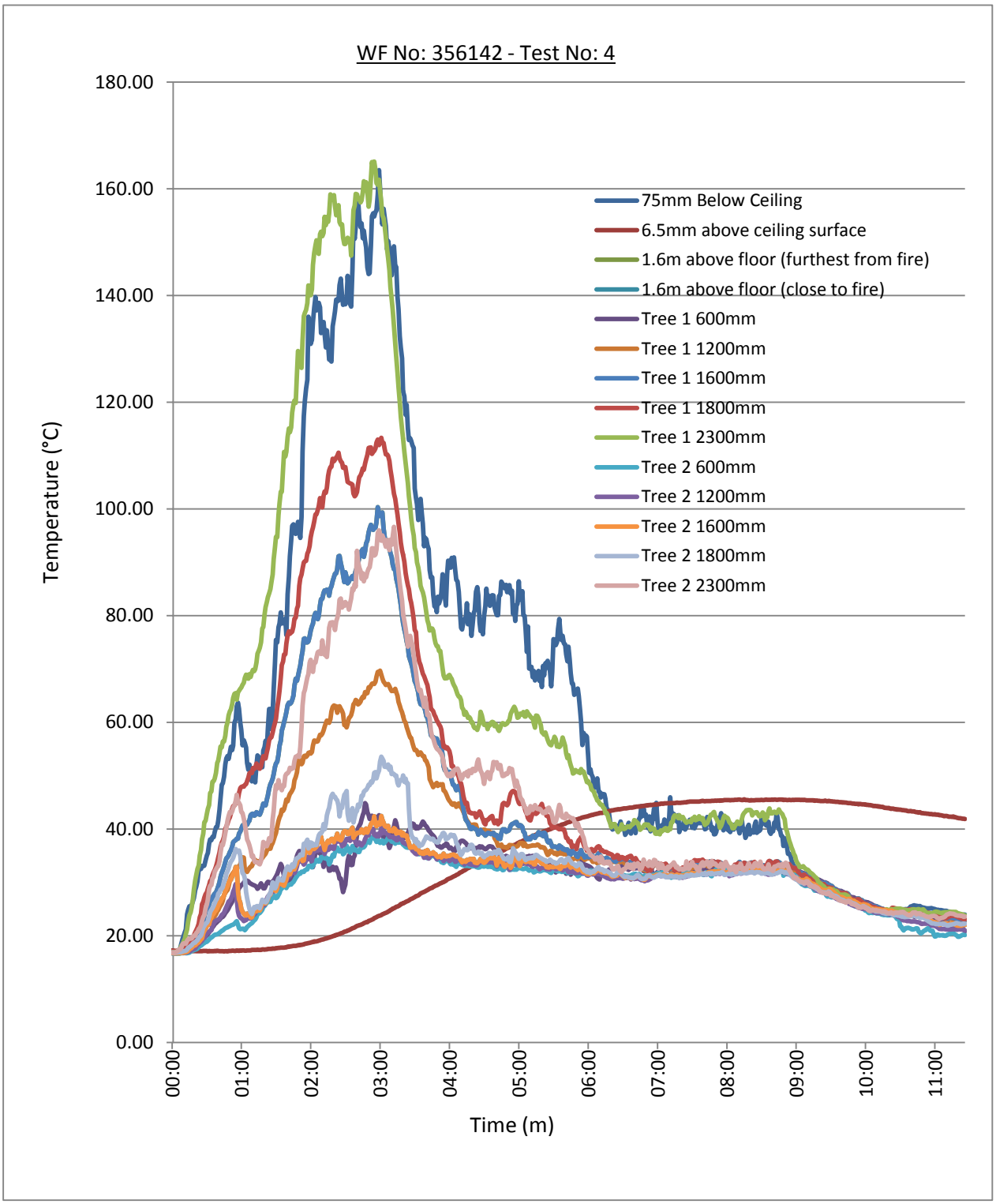
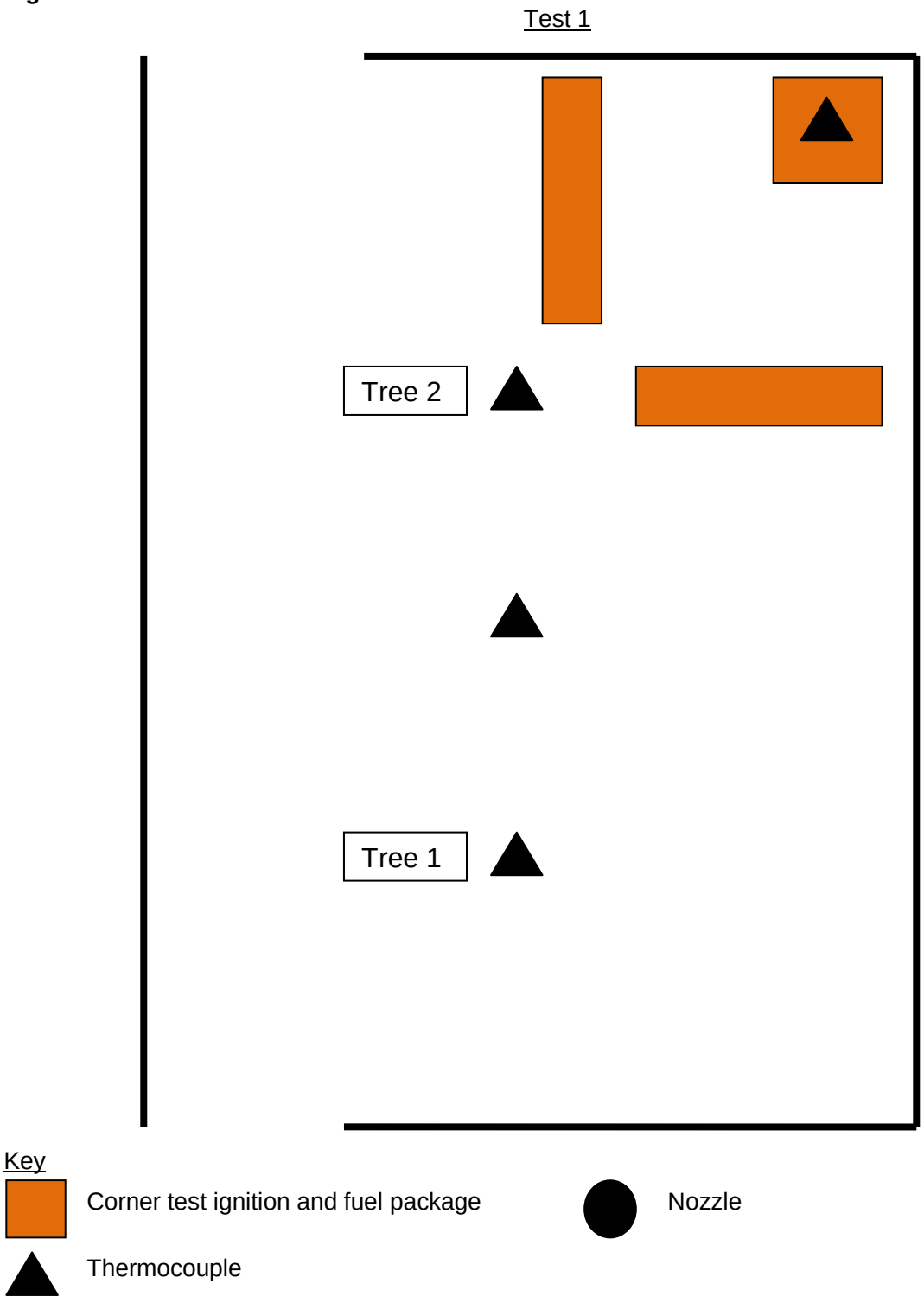
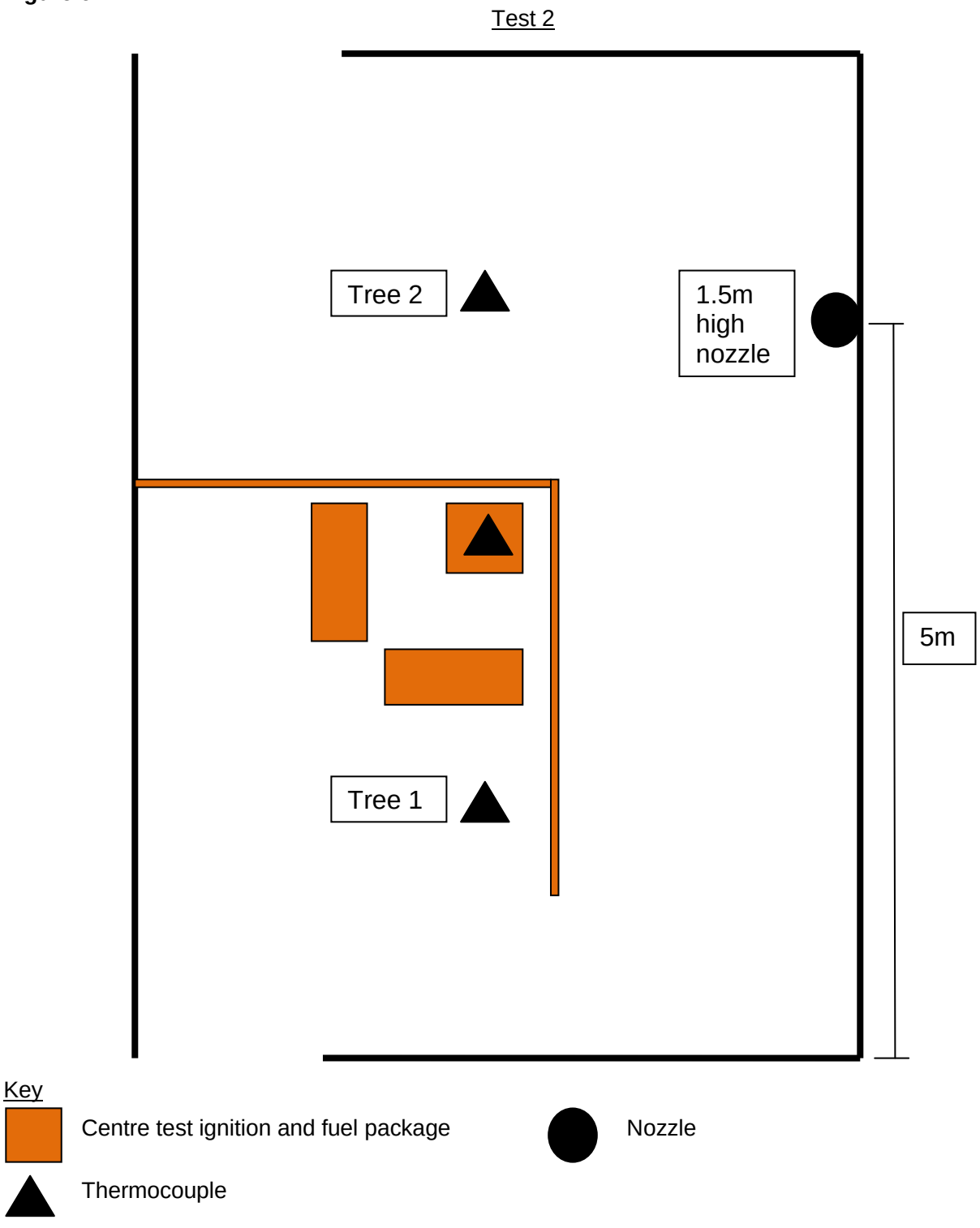

WF No: 356142 - Test No: 4
Temperature (°C)
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
Time (m)
75mm Below Ceiling
6.5mm above ceiling surface
1.6m above floor (furthest from fire)
1.6m above floor (close to fire)
Tree 1 600mm
Tree 1 1200mm
Tree 1 1600mm
Tree 1 1800mm
Tree 1 2300mm
Tree 2 600mm
Tree 2 1200mm
Tree 2 1600mm
Tree 2 1800mm
Tree 2 2300mm

Figure 5



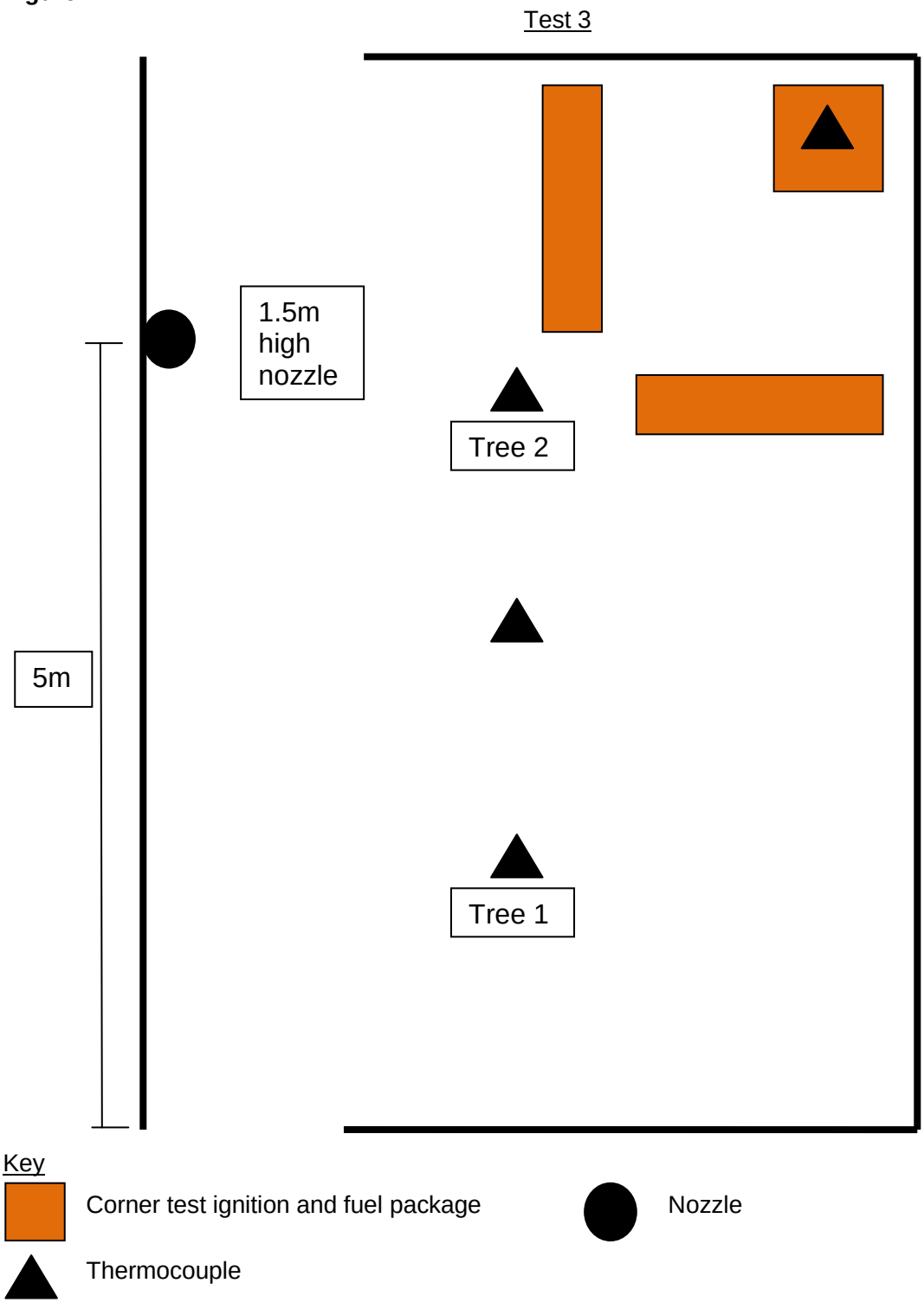
Drawing not to scale

Figure 6



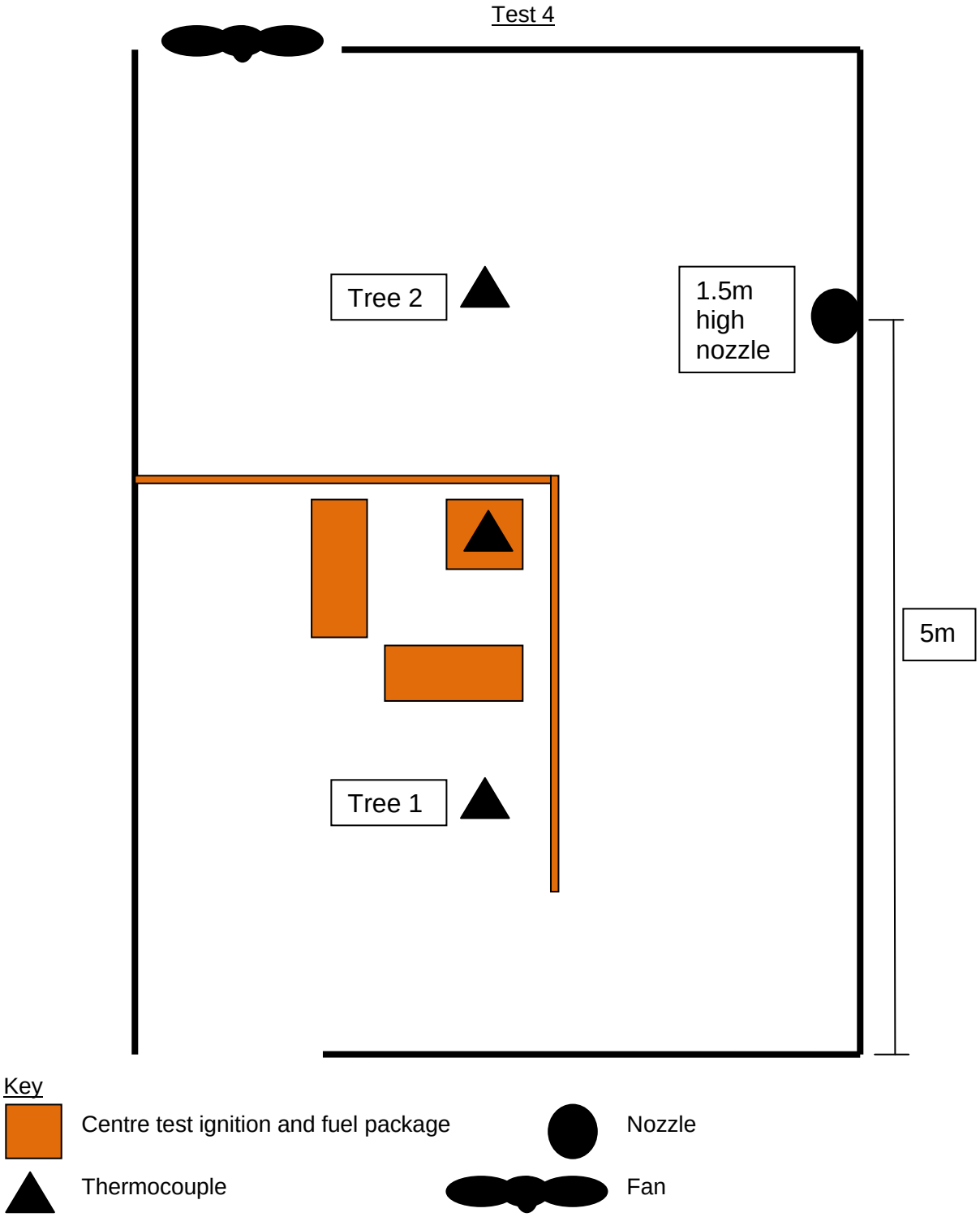
Drawing not to scale

Figure 7



Drawing not to scale

Figure 8



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

Revision History

Issue No :	Issue Date:
Revised By:	Approved By:
Reason for Revision:	

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