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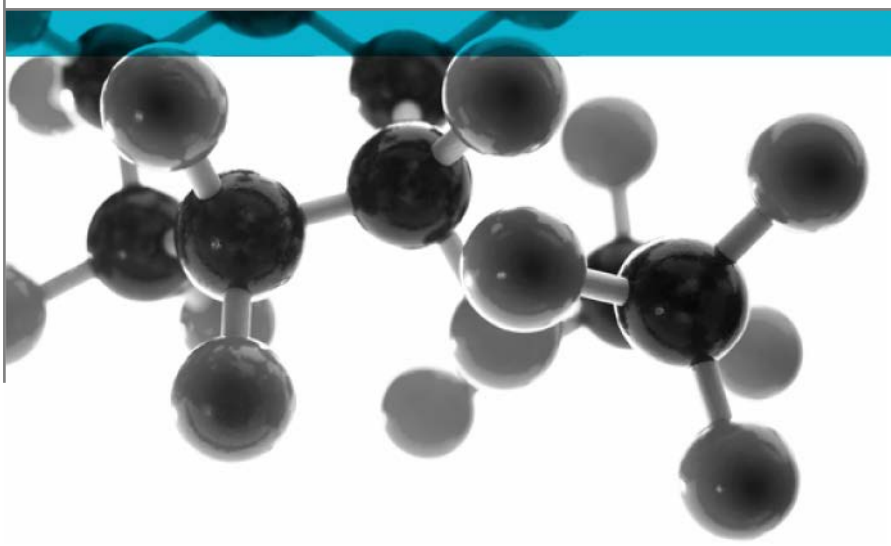
BS 8458:2015: Annex C



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: I-Mist Ltd

Document Reference: 367730

Date: 18th August 2016

Issue No.: 1

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	Diameter / angle / wall thickness	Weight per unit area or density
High pressure water mist fire suppression system	"STX 12"	Not applicable	Not applicable
Individual components used to manufacture the system:			
Nozzle	"Q12i"	55° and 30°	Not applicable
Glass bulb	"Frangible Bulb 57º"	Not applicable	Not applicable
Hose • Braiding • Teflon	"PTFE 06" "304 Stainless Steel" "Teflon"	Ø 3/8" BSP 0.5mm 1.5mm	0.18kg/m Not stated Not stated
Pump	"STX 12"	Not applicable	Not applicable
Please see pages 7 & 8 of this test report for the full description of the system tested			

Test Sponsor

I-Mist Ltd, Unit 23, Factory Estate, Argyll Street, Hull, HU3 1HD

Test Results:

Thermocouple location	Maximum temperature °C (as per BS 8458:2015: Annex C.4 paragraph 3)					
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
75mm below the underside of the ceiling	129	50	137	92	136	157
1.6m above the floor, furthest from fire	42	36	37	39	31	31
1.6m above the floor, centre (if applicable)	45	N/A	27	N/A	34	N/A
1.6m above the floor, close to fire (if applicable)	38	26	N/A	43	32	32

Key:
Test 1 – Corner.
Test 2 – Beneath a nozzle.
Test 3 – Between two nozzles.
Test 4 – Between two nozzles ventilation test.
Test 5 – Corner open room test.
Test 6 – Between two nozzles 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 & 6.

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

During tests 1, 2, 3, & 4 the external nozzle did not activate.

Conclusion

Within 2 minutes from the operation of the first nozzle, the mean recorded temperatures 75mm below the underside of the ceiling decreased and remained steady during tests 1, 2, 3 & 5.

The watermist system suppressed the fuel packages and met all the criteria specified in Clause 6.1 (a)(1), (b) & (c) of BS 8458:2015 for domestic and residential purposes at a maximum room size of 80m² and maximum ceiling height of 3.5m

Date of Test 11th, 12th and 13th July 2016

Signatories

	
Responsible Officer T. Kinder * Technical Officer	Authorised S. Deeming * Business Unit Head

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

Report Issued: 18th August 2016

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Test Details

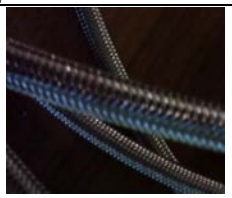
Purpose of test	To determine the performance of a system when it is subjected to the conditions of test specified in BS 8458:2015 “Code of practice for design and installation” Annex C "Room fire tests for watermist systems with automatic nozzles". The test was performed in accordance with the procedure specified in BS 8458:2015: Annex C and this report should be read in conjunction with that Standard.
Instruction to test	The test was conducted on the 11th, 12th and 13th July 2016 at the request of I-Mist Ltd, 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 C.1.3 were used.
Fuel package	Fuel packages, as detailed in Annex C.1.4 were used.
Test room	The test room was erected, as detailed in Annex C.1.1.
Operating pressure at pump	The systems operating pressure was 170 bar (when one nozzle activated) and dropped to 100 bar (when both nozzles activated).
Water flow rate	The systems water flow rate at operation was 12 l/min.
Detection/actuation method	The system utilised glass bulb nozzle detection that automatically activated the system on detection of the fire.
Additives, propellants and atomizing media used	No additives, propellants or atomizing media were used in the system.
Test hall geometry	The test room is located inside a dry, naturally ventilated, approximately 14.7m (length) x 8m (width) x 5.1m (high) building.

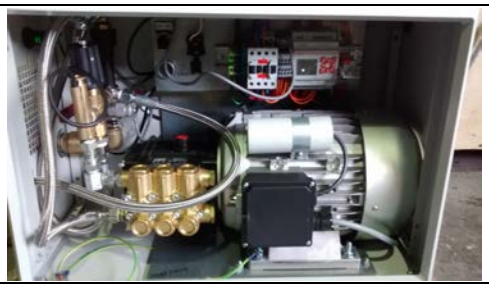
Environmental conditions at the beginning of the test

Test No.	Temperature (ºC)	Humidity (%)
1	27.0	51.8
2	23.8	60.2
3	24.5	58.4
4	22.3	58.1
5	23.5	54.3
6	22.8	53.0

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		High pressure water mist fire suppression system
System reference		"STX 12"
Name of manufacturer		I-Mist Ltd
Design manual reference (version/date issued)*		"IM/QA/002" (Issue 2) dated 29th July 2016
Nozzle	Product reference	"Q12i"
	General description	Concealed recessed nozzle with machined in bulb protection plate
	Name of manufacturer	I-Mist Ltd
	Angle	55° and 30°
	Nozzle positons	4 metre centres on ceiling, Max 16m²
	Distance between the ceiling and nozzle orifice	25mm
	Colour reference	"Stainless steel"
	Photograph	  
Glass bulb	Product reference	"Frangible Bulb 57º"
	General description	Ultra fast acting frangible bulb
	Name of manufacturer	Day-Impex
	Colour reference	"Orange"
Hose	General description	Stainless steel braided hose with "Teflon"
	Product reference	"PTFE 06"
	Name of manufacturer	I-Mist Ltd
	Diameter	Ø 3/8" BSP
	Weight per unit length	0.18kg/m
	Length	100m vertical, 200m horizontal before pressure drop to be considered (stated by sponsor) Up to 12m used for test purposes
	Photograph	 
	Braiding	Product reference	"304 Stainless Steel"
		General description	Braided 304 stainless steel
		Name of manufacturer	I-Mist Ltd
		Diameter	Ø 3/8" BSP
		Wall thickness	0.5mm
		Colour reference	"Stainless steel"
		Flame retardant details	Class 0/1

Hose (continued)	Teflon	Product reference	“Teflon”
		General description	Flexible “Teflon” hose
		Name of manufacturer	I-Mist Ltd
		Diameter	Ø 3/8" BSP
		Wall thickness	1.5mm
		Colour reference	“Blue”
		Flame retardant details	Class 0/1
	Pump	Product reference	“STX 12”
		General description	High pressure water mist fire suppression system pump
		Name of manufacturer	I-Mist Ltd
		Power supply	230v
		Photograph	 
Brief description of manufacturing process			Full assembly

***The sponsor of the test has provided a copy of design manual referenced “IM/QA/002” (Issue 2) dated 29th July 2016 in support of the system as described above.**

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 (as per BS 8458:2015: Annex C.4 paragraph 3)					
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
75mm below the underside of the ceiling	129	50	137	92	136	157
1.6m above the floor, furthest from fire	42	36	37	39	31	31
1.6m above the floor, centre (if applicable)	45	N/A	27	N/A	34	N/A
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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 & 6.

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

During tests 1, 2, 3, & 4 the external nozzle did not activate.

Conclusion

Within 2 minutes from the operation of the first nozzle, the mean recorded temperatures 75mm below the underside of the ceiling decreased and remained steady during tests 1, 2, 3 & 5.

The watermist system suppressed the fuel packages and met all the criteria specified in Clause 6.1 (a)(1), (b) & (c) of BS 8458:2015 for domestic and residential purposes at a maximum room size of 80m² and maximum ceiling height of 3.5m

Observations

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

Temperatures

The temperatures logged and calculated average for every 30 seconds during the tests are presented in Figures 1, 2, 3, 4, 5 and 6.

Fire test layout

Diagrams detailing the fire test layouts are presented in Figures 7, 8, 9, 10, 11 and 12.

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.

01:16 Nozzle 1 bulb popped.

01:26 Nozzle 1 activated.

31:26 Test terminated. Flaming from fire loads ceased but continued to smoulder.

Observations during test of Test 2

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

00:28 Nozzle 1 bulb popped.

00:30 Nozzle 1 activated.

30:30 Test terminated. Flaming from fire loads ceased but continued to smoulder.

Observations during test of Test 3

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

01:46 Nozzle 1 and 2 bulb popped.

01:48 Nozzle 1 and 2 activated.

31:48 Test terminated. Flaming from fire loads ceased but continued to smoulder.

Observations during test of Test 4

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

01:21 Nozzle 2 bulb popped.

01:23 Nozzle 2 activated.

13:12 Nozzle 1 bulb popped.

13:14 Nozzle 1 activated.

31:23 Test terminated. Flaming from fire loads ceased but continued to smoulder.

Observations during test of Test 5

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

01:20 Nozzle 1 bulb popped.

01:21 Nozzle 1 activated.

31:21 Test terminated.

Observations during test of Test 6

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

00:58 Nozzle 2 bulb popped.

00:59 Nozzle 2 activated.

02:43 Nozzle 1 bulb popped.

02:45 Nozzle 1 activated.

31:00 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

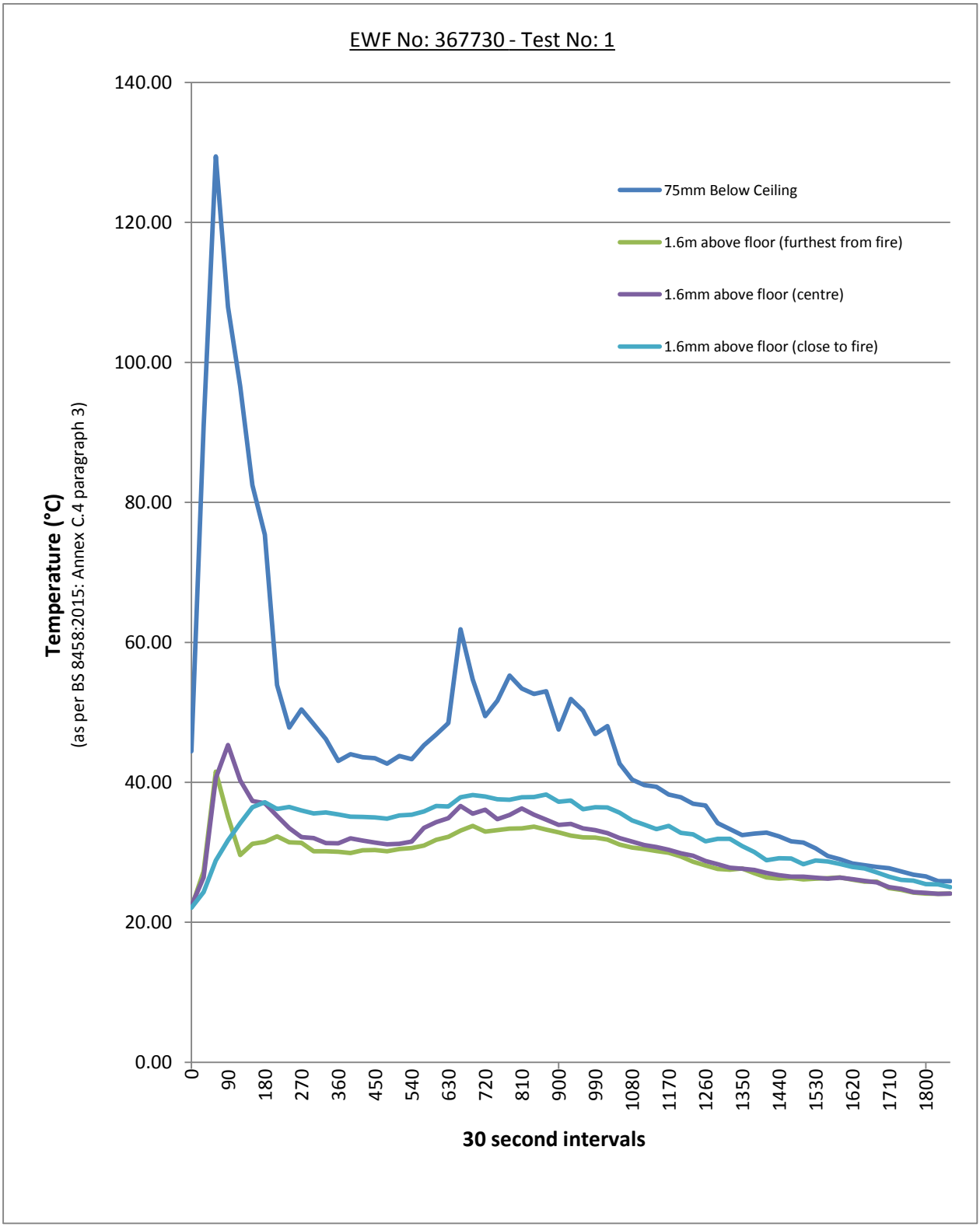

EWF No: 367730 - Test No: 1
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Temperature (°C)
(as per BS 8458:2015: Annex C.4 paragraph 3)
75mm Below Ceiling
1.6m above floor (furthest from fire)
1.6mm above floor (centre)
1.6mm above floor (close to fire)
0
90
180
270
360
450
540
630
720
810
900
990
1080
1170
1260
1350
1440
1530
1620
1710
1800
30 second intervals

Figure 2

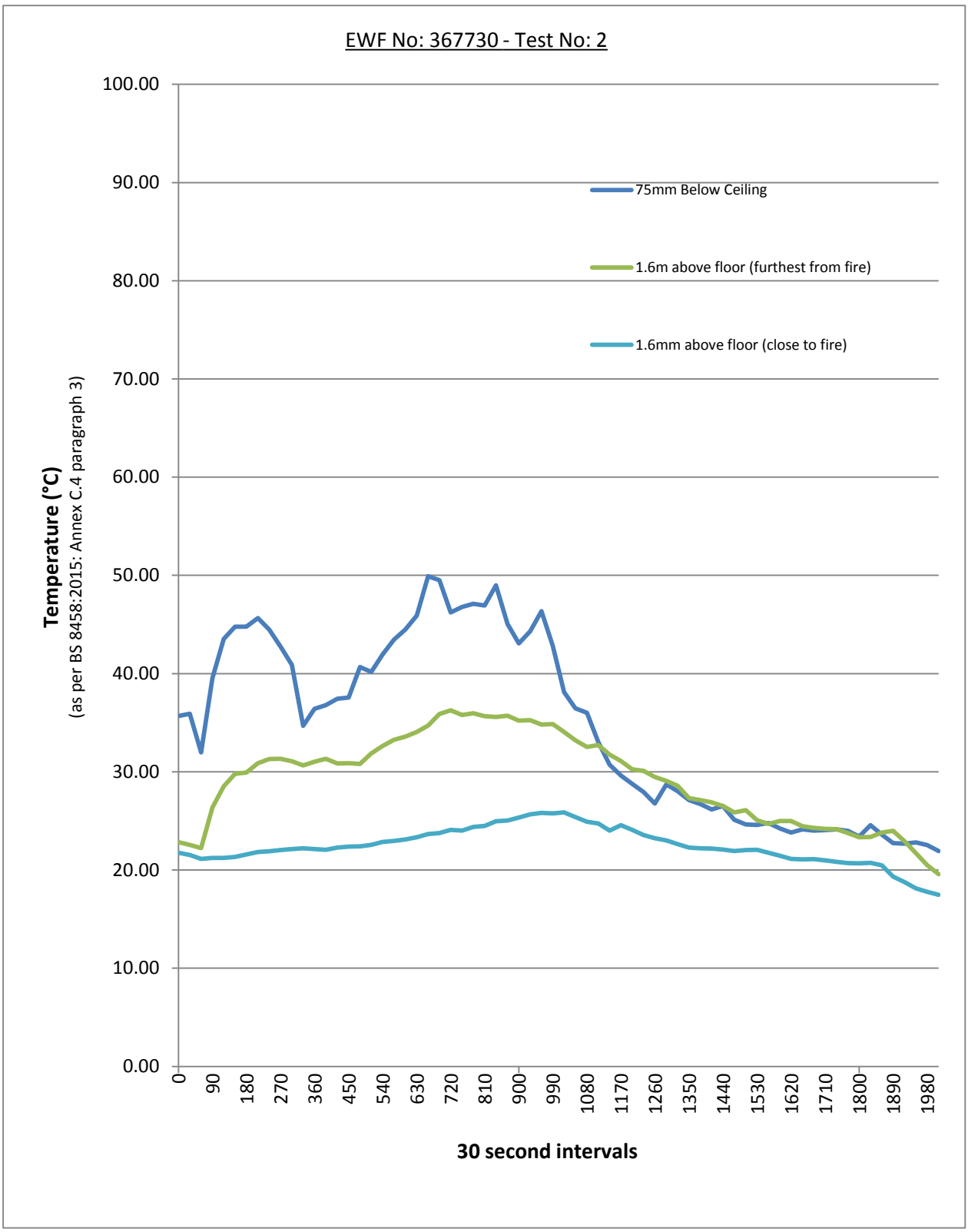

EWF No: 367730 - Test No: 2
Temperature (°C)
(as per BS 8458:2015: Annex C.4 paragraph 3)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0
90
180
270
360
450
540
630
720
810
900
990
1080
1170
1260
1350
1440
1530
1620
1710
1800
1890
1980
30 second intervals
75mm Below Ceiling
1.6m above floor (furthest from fire)
1.6mm above floor (close to fire)

Figure 3

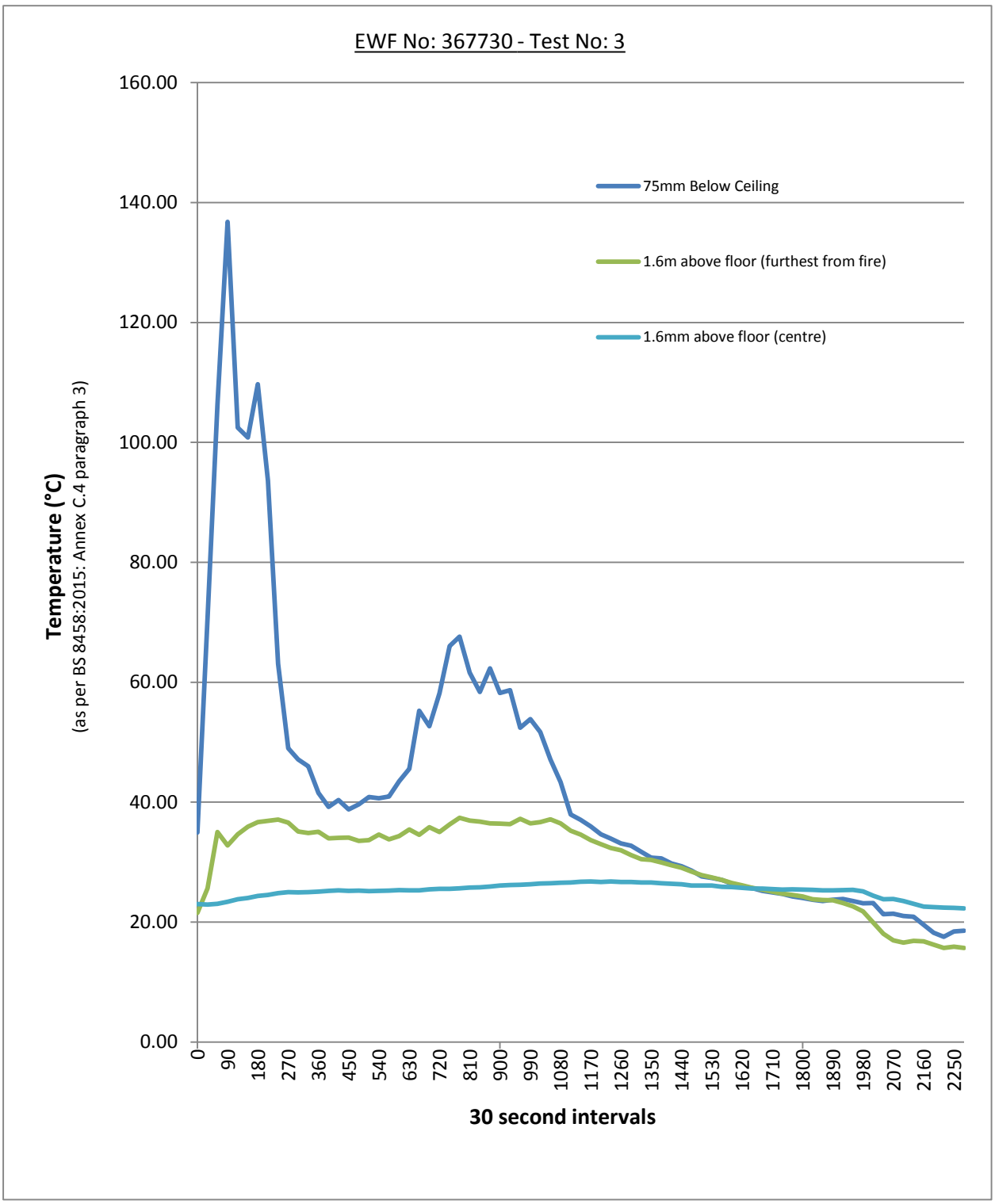

EWF No: 367730 - Test No: 3
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Temperature (°C)
(as per BS 8458:2015: Annex C.4 paragraph 3)
75mm Below Ceiling
1.6m above floor (furthest from fire)
1.6mm above floor (centre)
0
90
180
270
360
450
540
630
720
810
900
990
1080
1170
1260
1350
1440
1530
1620
1710
1800
1890
1980
2070
2160
2250
30 second intervals

Figure 4

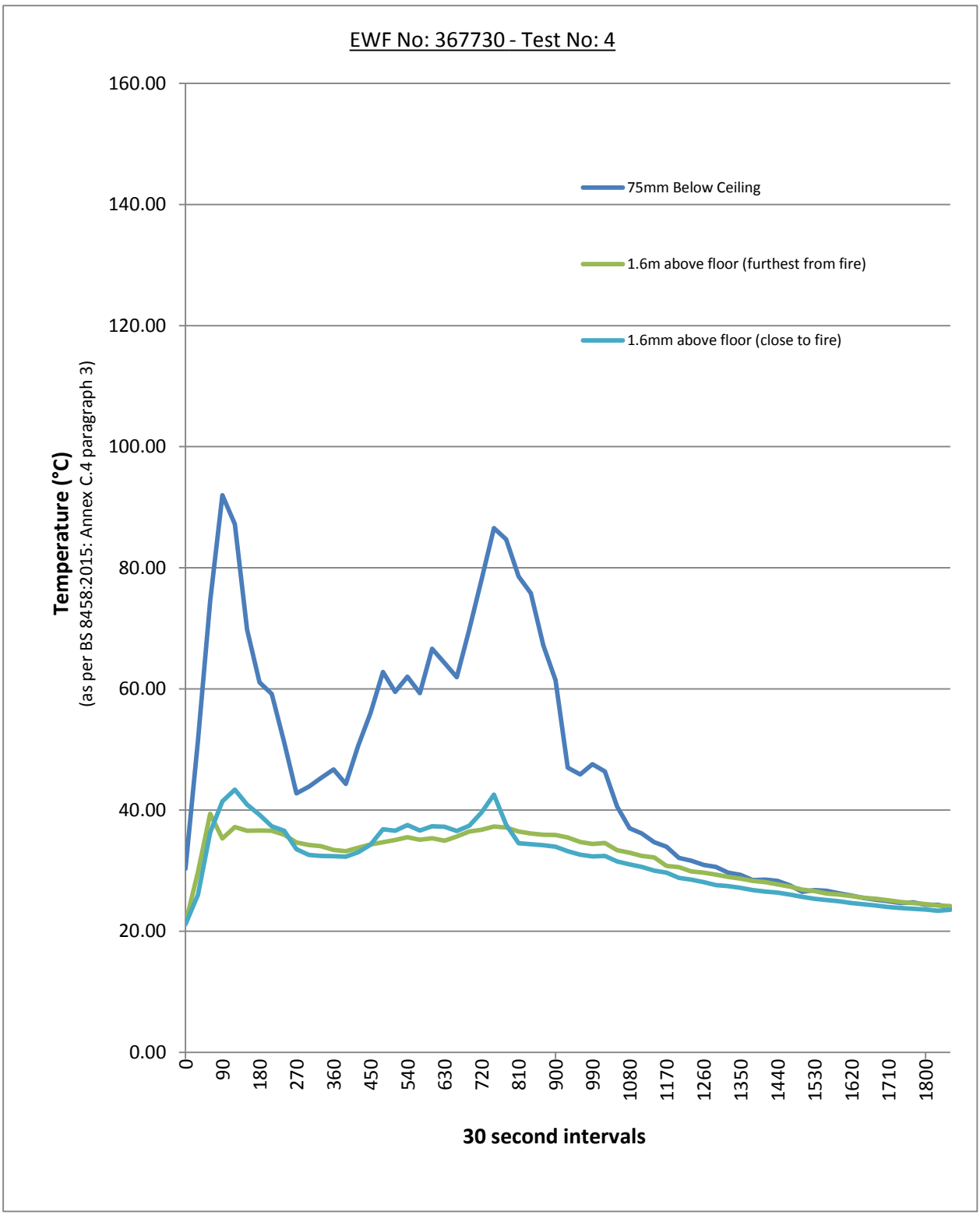

EWF No: 367730 - Test No: 4
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Temperature (°C)
(as per BS 8458:2015: Annex C.4 paragraph 3)
75mm Below Ceiling
1.6m above floor (furthest from fire)
1.6mm above floor (close to fire)
0
90
180
270
360
450
540
630
720
810
900
990
1080
1170
1260
1350
1440
1530
1620
1710
1800
30 second intervals

Figure 5

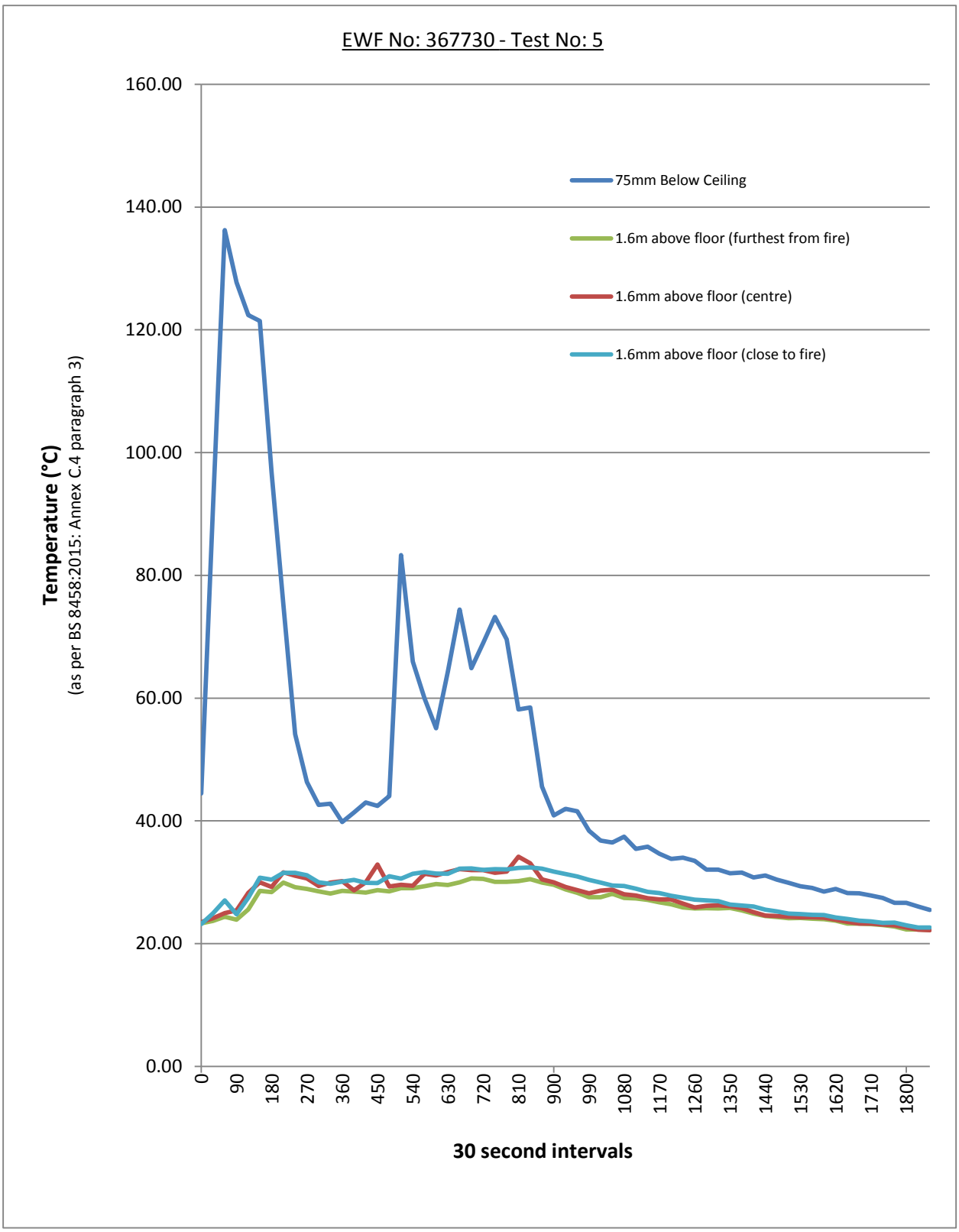

EWF No: 367730 - Test No: 5
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Temperature (°C)
(as per BS 8458:2015: Annex C.4 paragraph 3)
75mm Below Ceiling
1.6m above floor (furthest from fire)
1.6mm above floor (centre)
1.6mm above floor (close to fire)
0
90
180
270
360
450
540
630
720
810
900
990
1080
1170
1260
1350
1440
1530
1620
1710
1800
30 second intervals

Figure 6

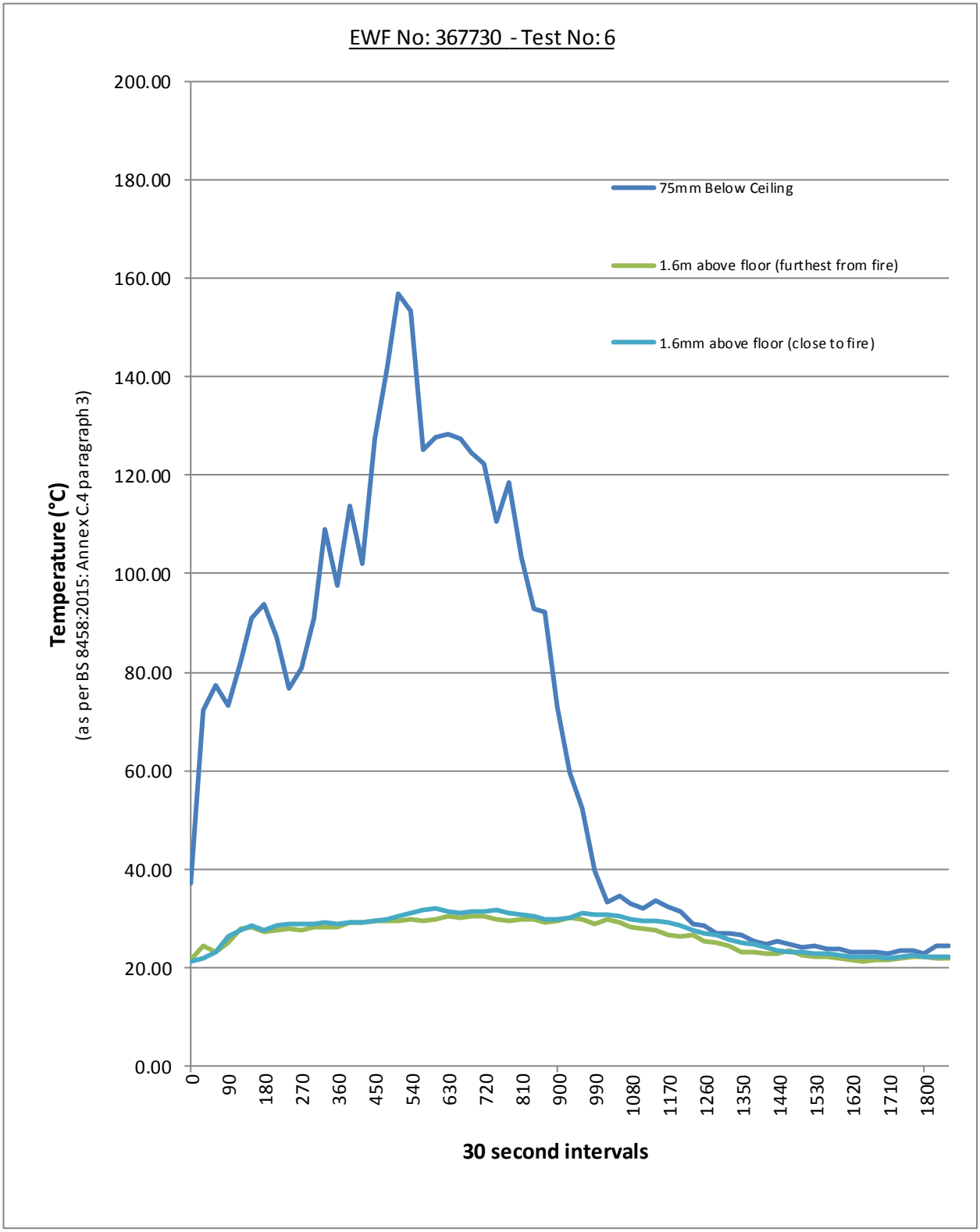

EWF No: 367730 - Test No: 6
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Temperature (°C)
(as per BS 8458:2015: Annex C.4 paragraph 3)
75mm Below Ceiling
1.6m above floor (furthest from fire)
1.6mm above floor (close to fire)
0
90
180
270
360
450
540
630
720
810
900
990
1080
1170
1260
1350
1440
1530
1620
1710
1800
30 second intervals

Figure 7

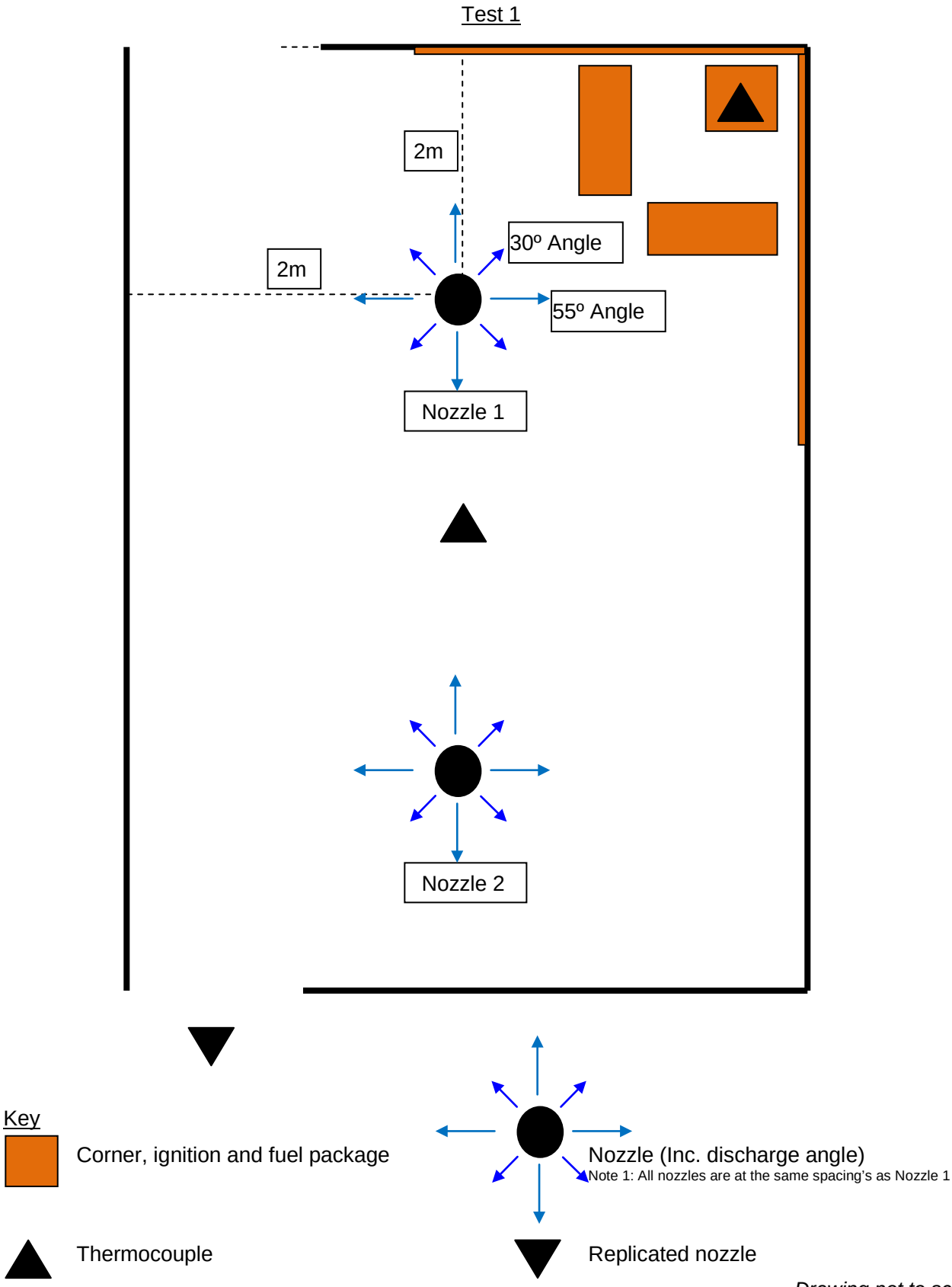

Test 1
2m
2m
30º Angle
55º Angle
Nozzle 1
Nozzle 2
Key
Corner, ignition and fuel package
Nozzle (Inc. discharge angle)
Note 1: All nozzles are at the same spacing's as Nozzle 1
Thermocouple
Replicated nozzle
Drawing not to scale

Figure 8

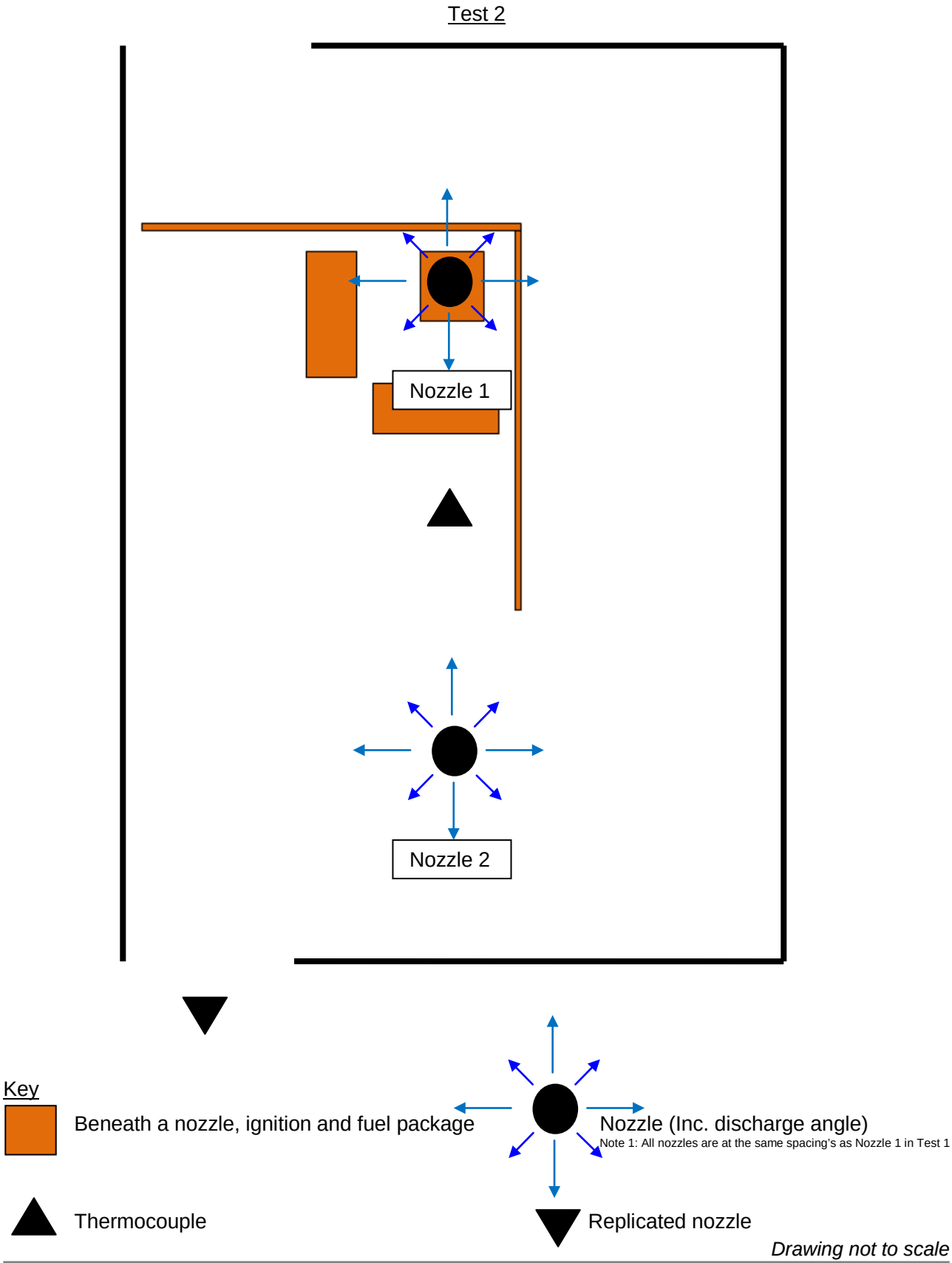

Test 2
Nozzle 1
Nozzle 2
Key
Beneath a nozzle, ignition and fuel package
Nozzle (Inc. discharge angle)
Note 1: All nozzles are at the same spacing's as Nozzle 1 in Test 1
Thermocouple
Replicated nozzle
Drawing not to scale

Figure 9

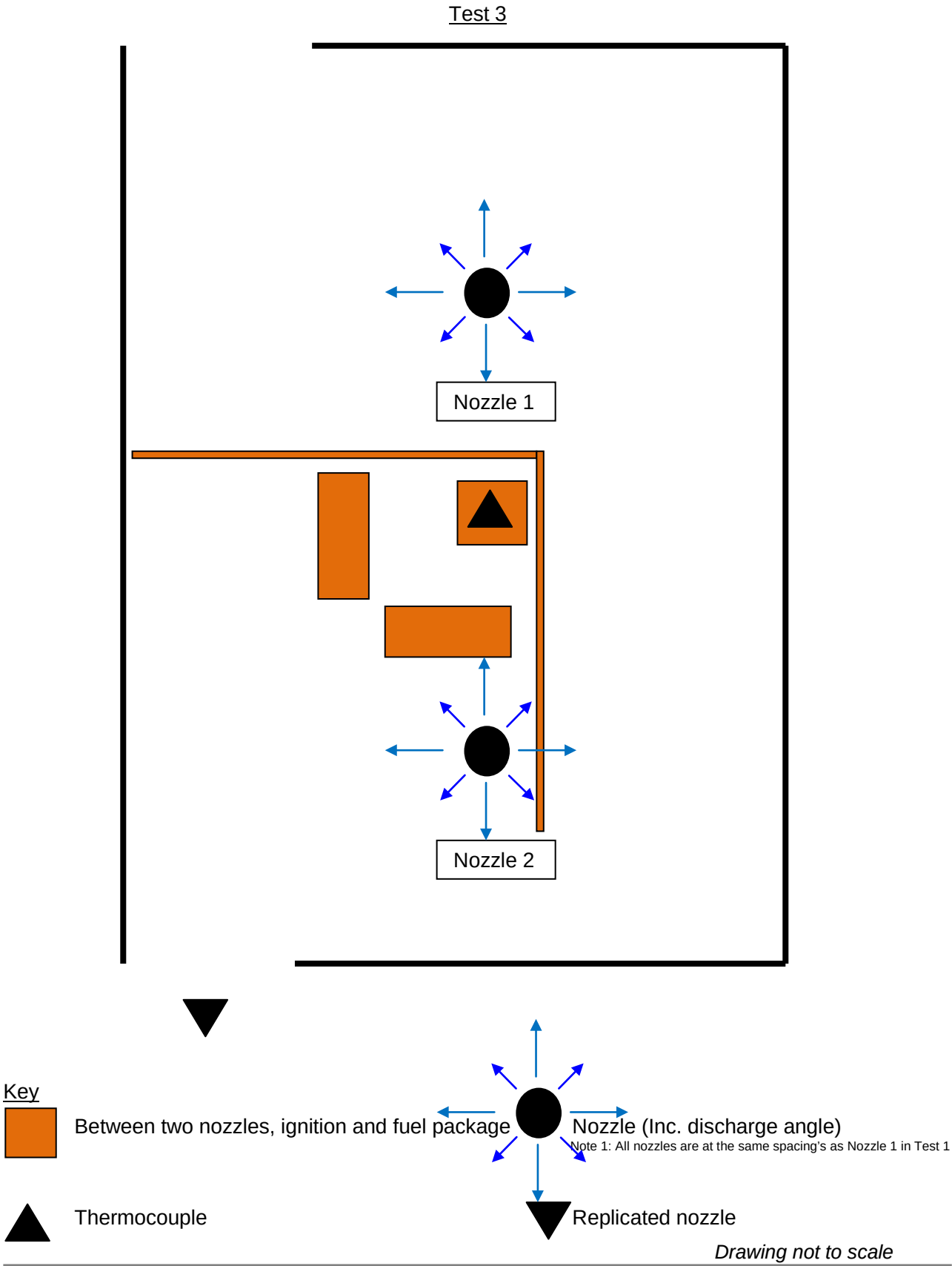

Test 3
Nozzle 1
Nozzle 2
Key
Between two nozzles, ignition and fuel package
Nozzle (Inc. discharge angle)
Note 1: All nozzles are at the same spacing's as Nozzle 1 in Test 1
Thermocouple
Replicated nozzle
Drawing not to scale

Figure 10

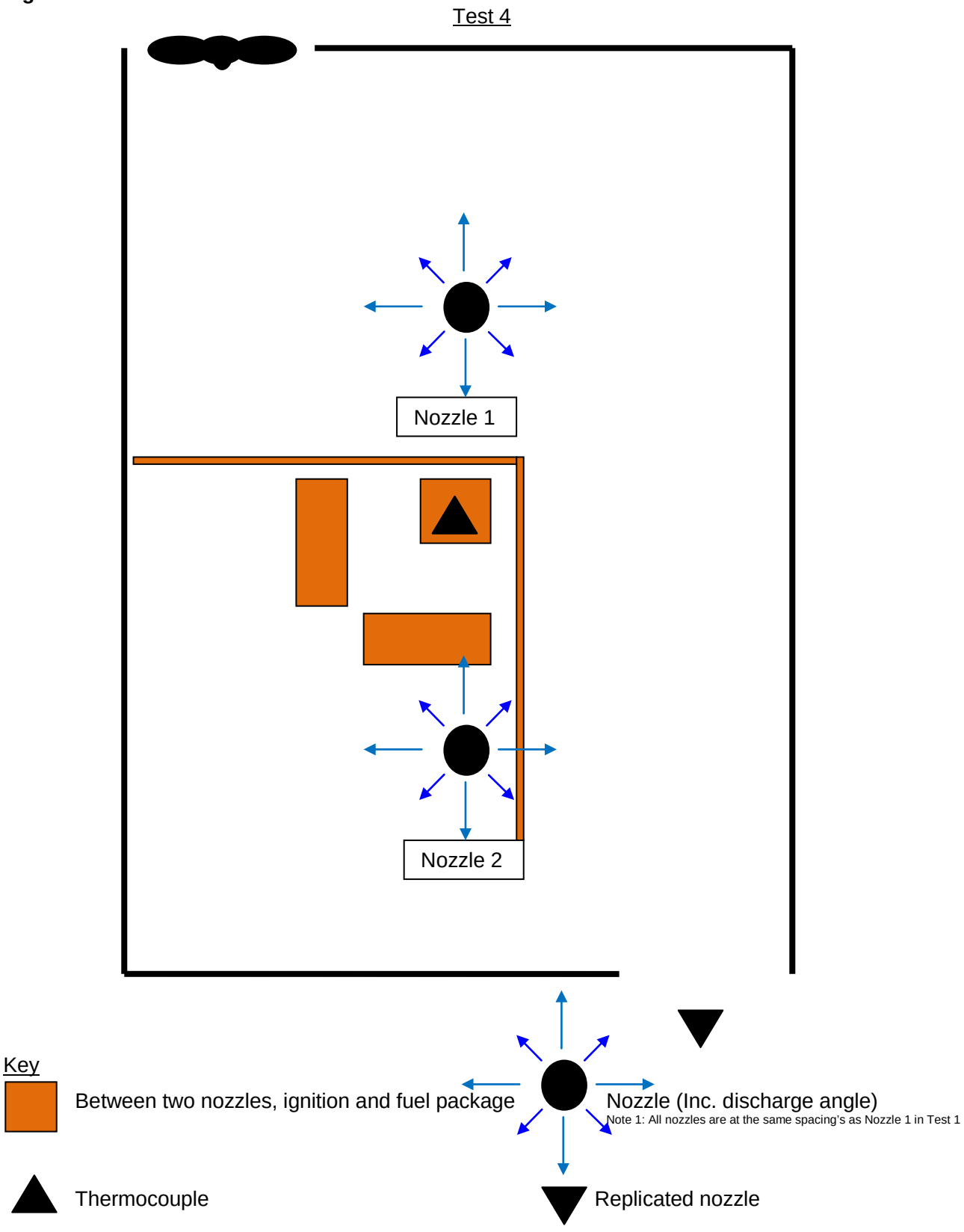

Test 4
Nozzle 1
Nozzle 2
Key
Between two nozzles, ignition and fuel package
Nozzle (Inc. discharge angle)
Note 1: All nozzles are at the same spacing's as Nozzle 1 in Test 1
Thermocouple
Replicated nozzle
Fan
Drawing not to scale

Figure 11

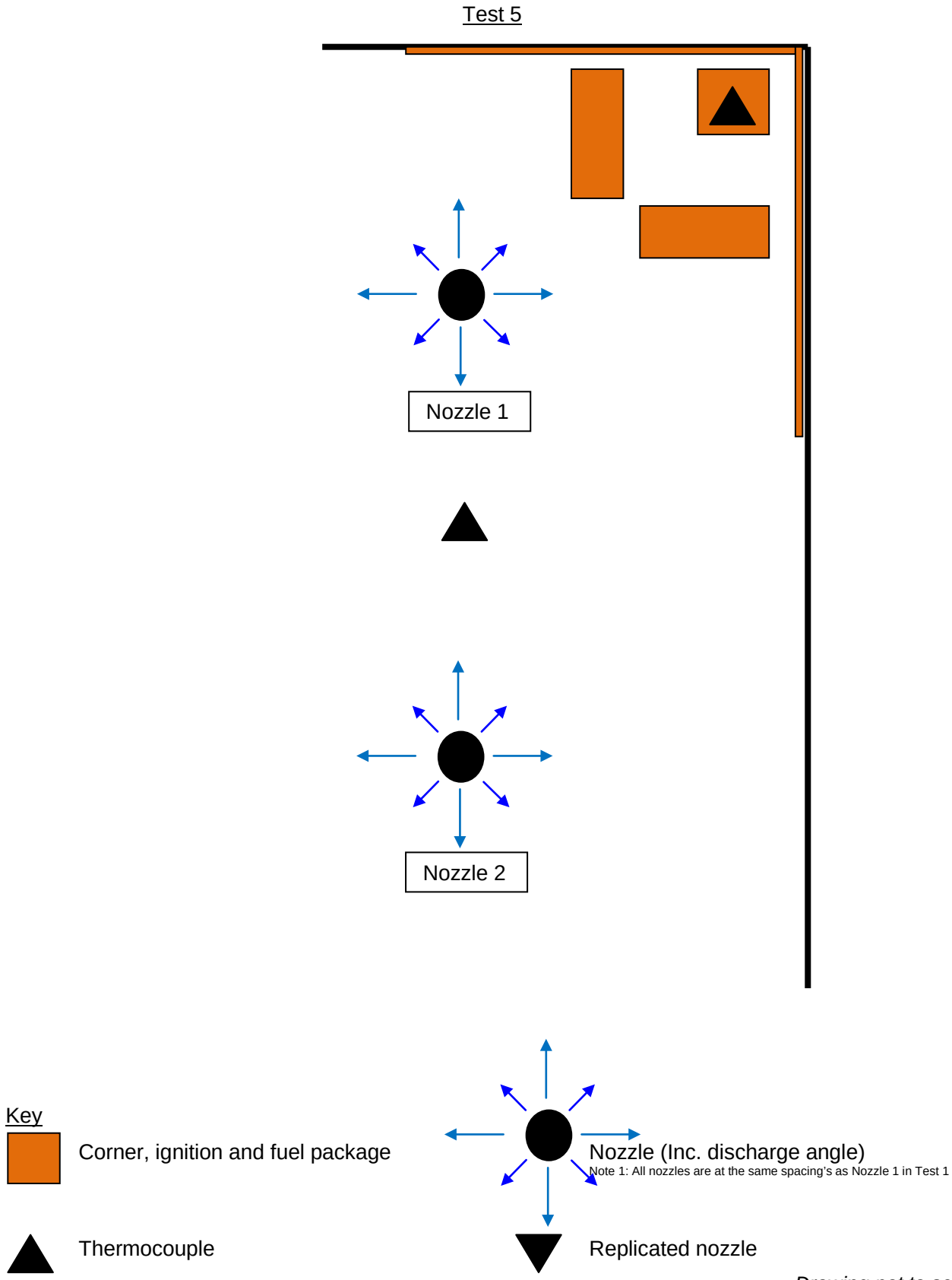
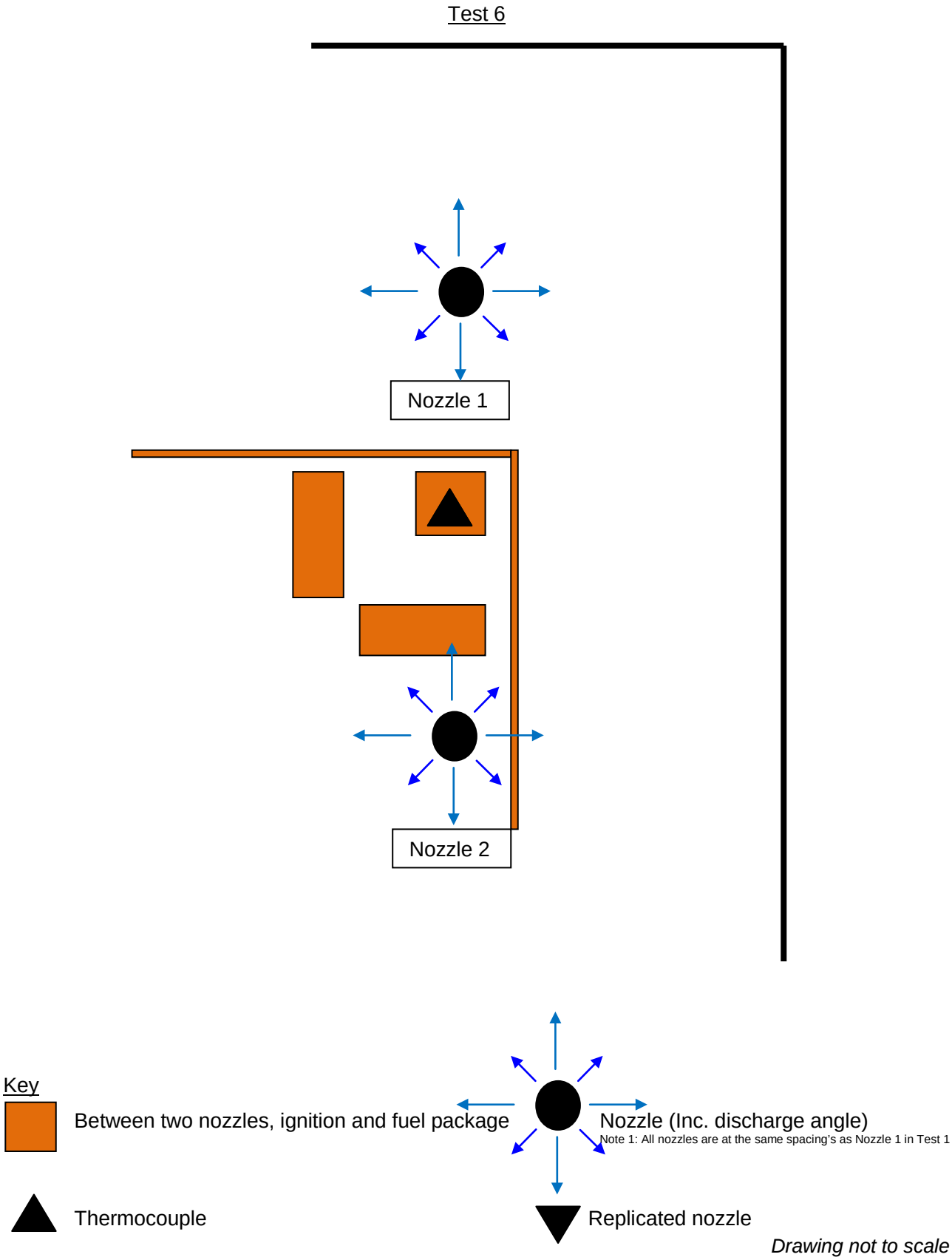

Test 5
Nozzle 1
Nozzle 2
Key
Corner, ignition and fuel package
Thermocouple
Nozzle (Inc. discharge angle)
Note 1: All nozzles are at the same spacing's as Nozzle 1 in Test 1
Replicated nozzle
Drawing not to scale

Figure 12


Test 6
Nozzle 1
Nozzle 2
Key
Between two nozzles, ignition and fuel package
Nozzle (Inc. discharge angle)
Note 1: All nozzles are at the same spacing's as Nozzle 1 in Test 1
Thermocouple
Replicated nozzle
Drawing not to scale

Photographs

Photographs of ignition and fuel package before a test

Photograph of nozzle before a test

Photograph of system during test 5

Revision History

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

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