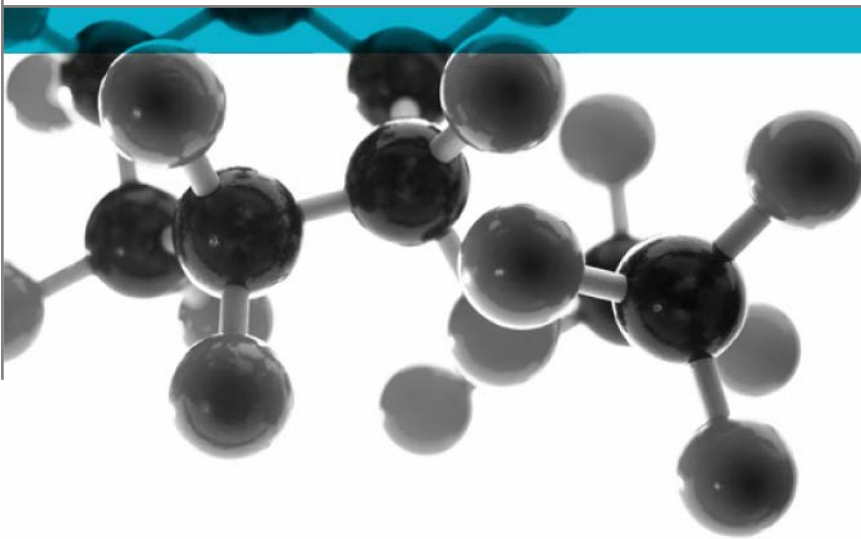


Investigation on the capability of a Watermist System to control a fire utilising the principles of the test procedure defined in BS 8458:2015: Annex C



Investigation on the capability of a Watermist System to control a fire utilising the principles of the test procedure defined in BS 8458:2015: Annex C

A Report To: Ultimate Fire Systems Limited

Document Reference: 394925

Date: 25th May 2018

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Page 1

**Testing
Advising
Assuring**

Executive Summary

Objective To demonstrate the capability of a watermist system to control a fire when tested utilising the principles of the test procedure defined in BS 8458:2015: Annex C.

Generic Description	Product reference	Thickness / diameter / spray angle	Weight per unit area or density
High pressure water mist system	"Fire Commando"	Not applicable	Not applicable
Individual components used to manufacture the system:			
Nozzle	"UFS N3"	105° ±5°	Not applicable
Glass bulb	"JOB (Germany)"	Not applicable	Not applicable
Pipework	"12mm stainless steel pipework"	External: Ø 12mm	0.25kg/m
Flexible hose	"12mm hydraulic rubber flexis"	External: Ø 18mm	Unwilling to provide
Pump	"P001-P series pump"	Not applicable	Not applicable
Please see page 6 of this test report for the full description of the system tested			

Test Sponsor Ultimate Fire Systems Limited, Stanley House, West Road, Ransomes Europark, Ipswich, Suffolk, IP3 9SX

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
75mm below the underside of the ceiling	290	70	62	89
1.6m above the floor, close to fire (if applicable)	33	34	N/A	33
1.6m above the floor, centre (if applicable)	40	N/A	45	35
1.6m above the floor, furthest from fire	35	33	39	34

Key:

Test 1 – Corner.

Test 2 – Between two nozzles.

Test 3 – Beneath a nozzle.

Test 4 – Corner ventilation 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.

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.

Date of Test 7th and 8th February 2018

Signatories

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

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

Report Issued: 25th May 2018

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Test Details

Purpose of test	To determine the performance of a system when tested utilising the principles of the test procedure defined in BS 8458:2015 "Code of practice for design and installation" Annex C "Room fire tests for watermist systems with automatic nozzles".
Deviation from test standard	<p>BS 8458:2015: Annex C.3 details that nozzle arrangements, other than the 4m spacing two-nozzle arrangement are permitted, providing that it is symmetrical in the room.</p> <p>At the request of the sponsor a two-nozzle arrangement was used with a reduced spacing of 3m that was not symmetrical to the room (to provide a coverage of 9m² per nozzle). The nozzles were positioned as detailed in Figures 5, 6, 7 and 8.</p> <p>The deviation from the test standard as detailed above should be considered carefully when assessing the results obtained against specific requirements.</p>
Instruction to test	The test was conducted on the 7 th and 8 th February 2018 at the request of Ultimate Fire Systems Limited, 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	<p>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.</p> <p>The cribs were conditioned, such that the moisture content was 10 ± 2%, 3 mm below the wood stick surface prior to testing.</p>
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 approximately 95 bar (when one nozzle activated) and dropped to approximately 80 bar (when both nozzles activated) which gradually risen back to approximately 95 bar over a 25 minute period. The operating pressures throughout the tests are presented in Figures 1, 2, 3 and 4.
Water flow rate	The systems water flow rate at operation was 11.8 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 (°C)	Humidity (%)
1	15.1	50.6
2	15.0	69.5
3	15.0	68.0
4	15.0	37.7

Description of system

The description of the specimens given below has been prepared from information provided by the sponsor of the test. This information has not been independently verified by **Exova Warringtonfire**. All values quoted are nominal, unless tolerances are given.

General description		High pressure water mist system
System reference		"Fire Commando"
Design manual reference (version/date issued)		1 - 2017
Name of manufacturer		Ultimate Fire Systems Ltd
Detailed description		Pumped water mist system
Nozzle	Product reference	"UFS N3"
	General description	Stainless steel nozzle
	Name of manufacturer	Associated Fire Systems Ltd
	Outlet orifice angle from nozzle axis	30°
	Spray angle	105° ±5°
	Nozzle positions	Ceiling, 1.5 metres from wall, each head 3 metres apart
	Distance between the ceiling and nozzle outlet orifice	16mm
	Colour reference	"Stainless steel/silver"
	Photograph	
Glass bulb	Product reference	"JOB (Germany)"
	General description	57° mercury filled heat bulb
	Name of manufacturer	Job (Germany)
	Colour reference	"Orange"

Pipework	Product reference	"12mm stainless steel pipework"
	Generic type	Stainless steel
	Name of manufacturer	Eastern Hydraulics
	Diameter	External: Ø 12mm
	Wall thickness	1mm
	Length (used for test)	10 metres
	Weight per unit length	0.25kg/m
	Colour reference	"Stainless steel (silver)"
	Flame retardant details	The component is inherently flame retardant
Flexible hose	Product reference	"12mm hydraulic rubber flexis"
	General description	Hydraulic flexible rubber hose
	Name of manufacturer	Eastern Hydraulics
	Diameter	External: Ø 18mm
	Wall thickness	See Note 1 below
	Length (used for test)	1m
	Weight per unit length	See Note 1 below
	Colour reference	"Black"
	Flame retardant details	See Note 1 below
	Photograph (pipework and flexible hose)	
Pump	Product reference	"P001-P series pump"
	General description	High pressure water mist pump
	Name of manufacturer	Associated Fire Systems Ltd
	Power supply	19 AMP single phase
	Electrical connection	Uninterrupted dedicated power supply
	Photograph	
	Brief description of manufacturing process	All work carried out within our workshops. Manufactured and controlled to ISO 9001

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

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
75mm below the underside of the ceiling	290	70	62	89
1.6m above the floor, close to fire (if applicable)	33	34	N/A	33
1.6m above the floor, centre (if applicable)	40	N/A	45	35
1.6m above the floor, furthest from fire	35	33	39	34

Key:

Test 1 – Corner.

Test 2 – Between two nozzles.

Test 3 – Beneath a nozzle.

Test 4 – Corner ventilation 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.

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.

Criteria

The criteria specified in Clause 6.1 (a), (b) & (c) of BS 8458:2015 are:

- Clause 6.1 (a);
 - 1) automatic watermist nozzles should be capable of suppressing the test fires for a discharge duration of 10 min for domestic premises or 30 min
 - 2) within 2 min from the operation of the first nozzle, the mean recorded temperatures 75 mm below the underside of the ceiling should remain steady or decrease.
- Clause 6.1 (b);

From the start of the test, the recorded temperatures should not exceed the values indicated in Table 2.
- Clause 6.1 (c);

The third nozzle, external to the room, should not operate.

The deviation from the test standard as detailed in this report should be considered carefully when assessing the results obtained against these specific requirements.

- Observations** The visual observations taken during the tests are shown in Appendix 1.
- Temperatures** The rolling average 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.
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Appendix 1

Observations during test of Test 1

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

01:03 Nozzle 1 activated.

31:03 Test terminated.

Observations during test of Test 2

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

00:58 Nozzle 2 activated.

03:55 Nozzle 1 activated.

30:58 Test terminated.

Observations during test of Test 3

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

01:07 Nozzle 1 activated.

31:07 Test terminated.

Observations during test of Test 4

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

00:51 Nozzle 1 activated.

30:51 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

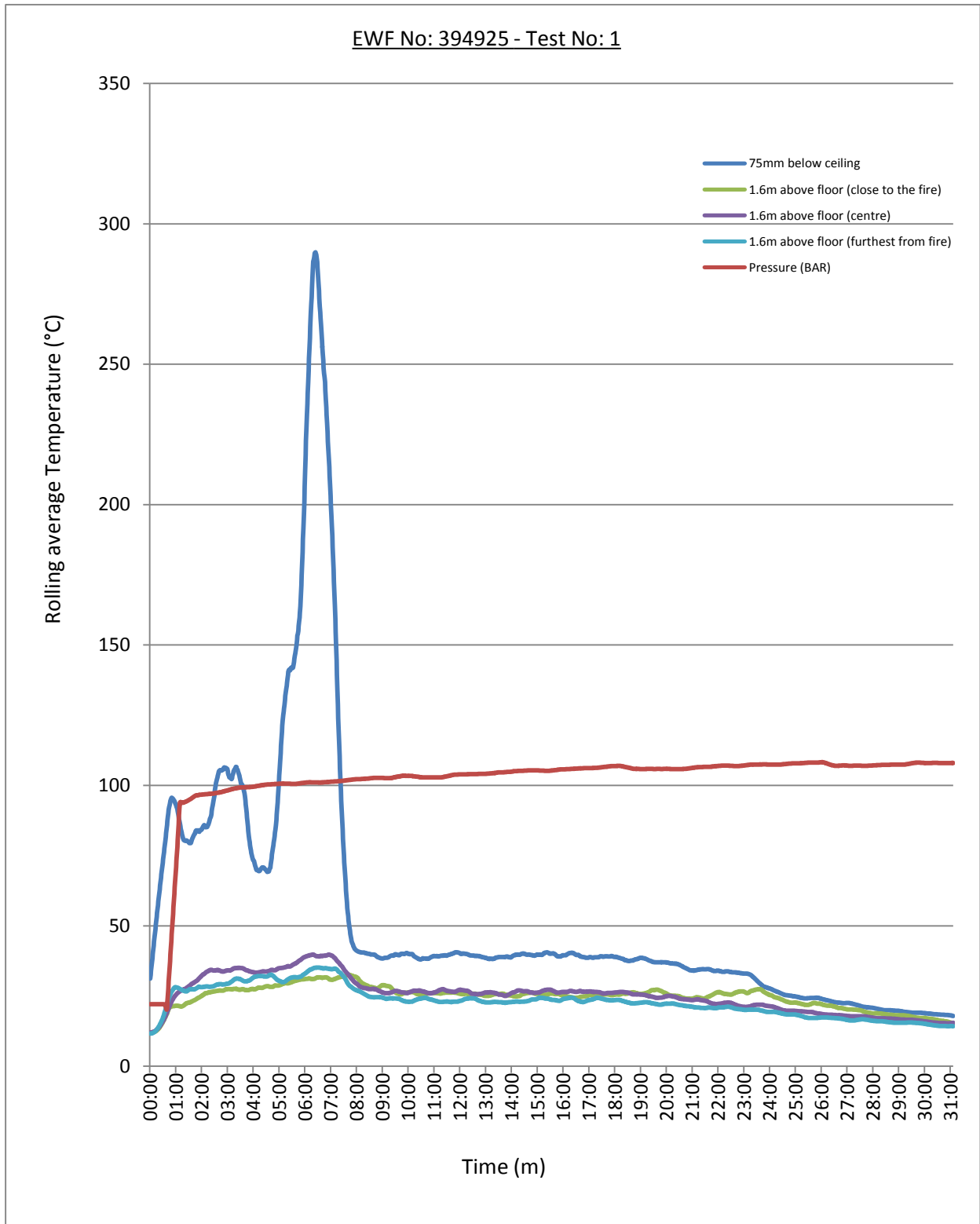


Figure 2

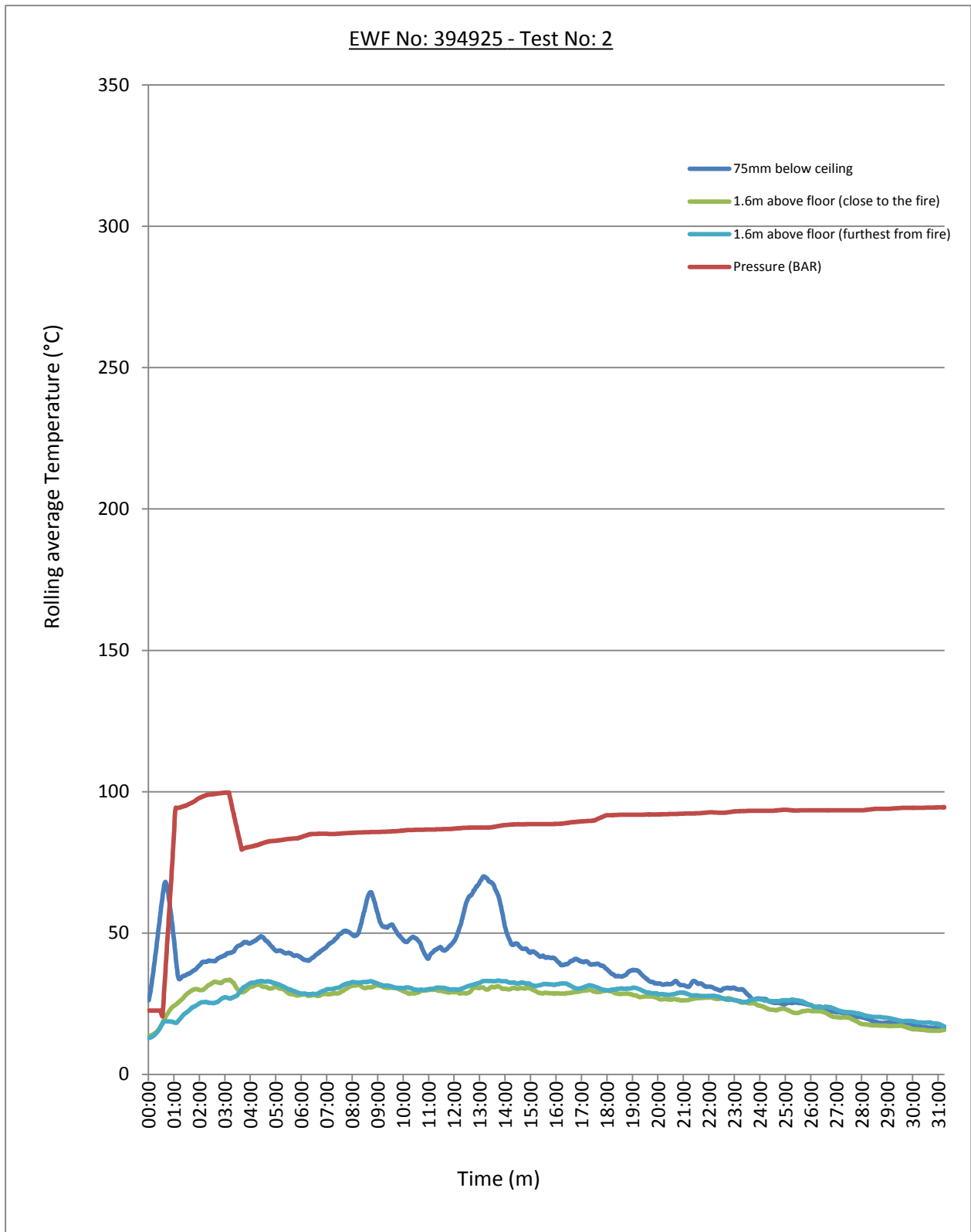


Figure 3

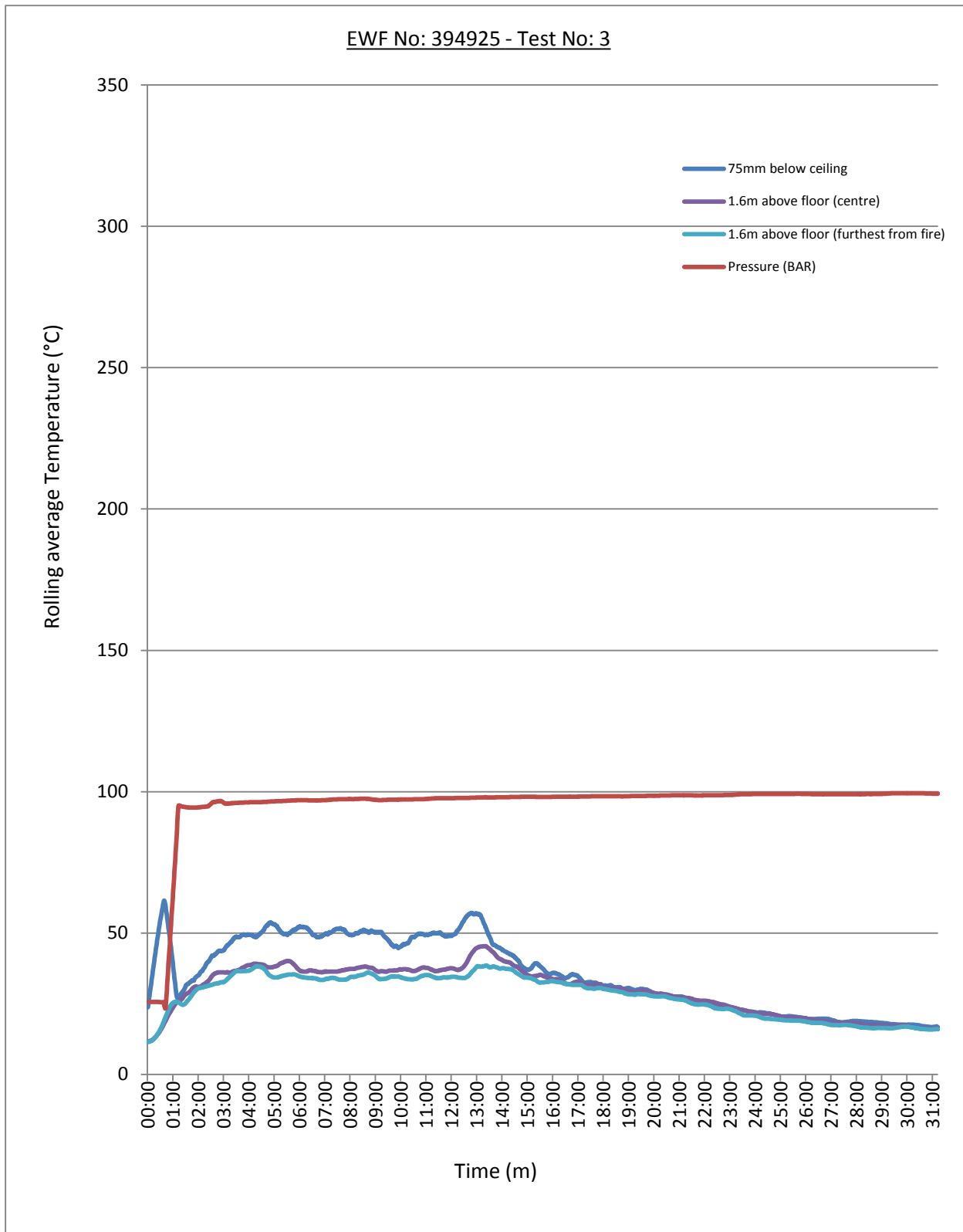


Figure 4

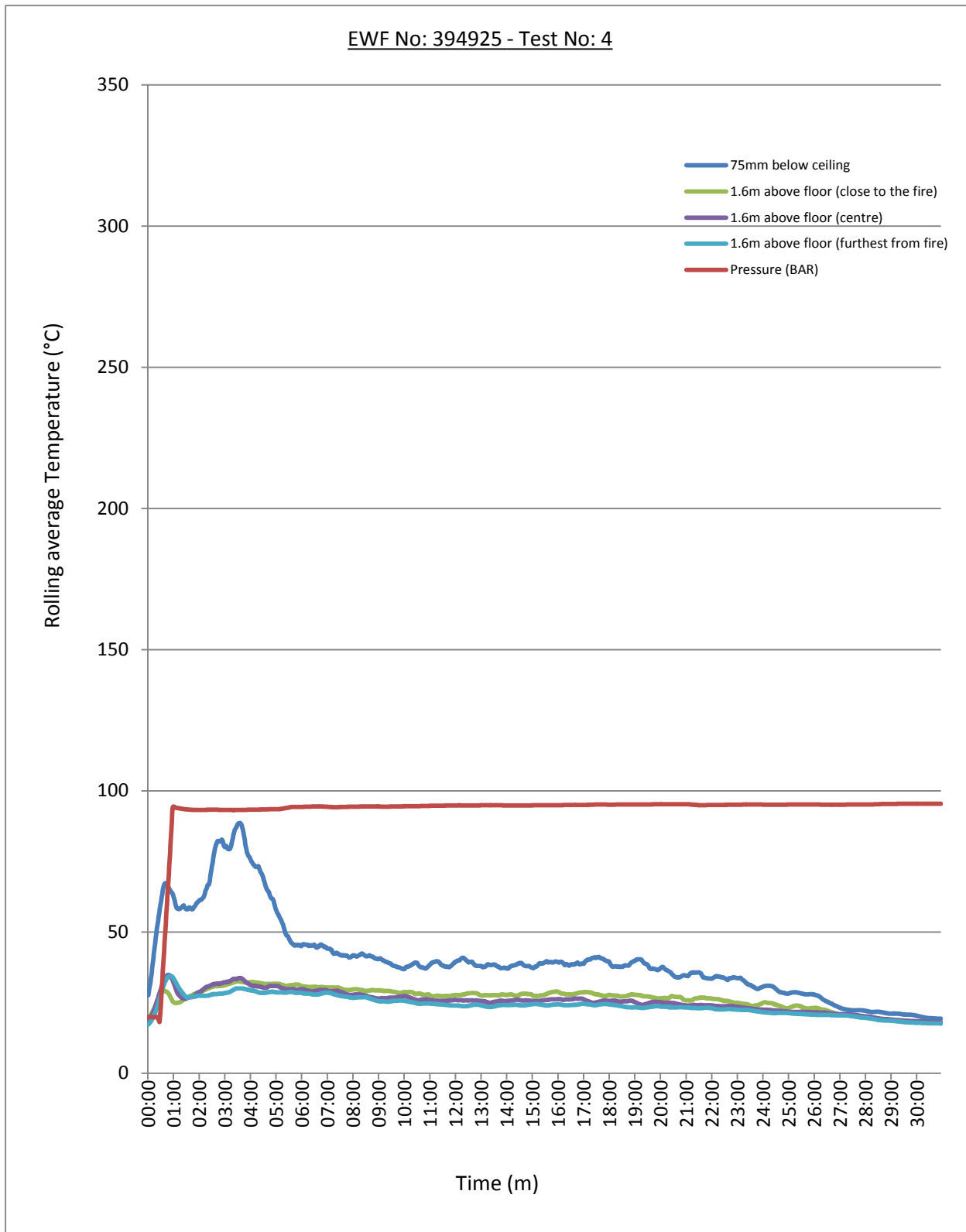
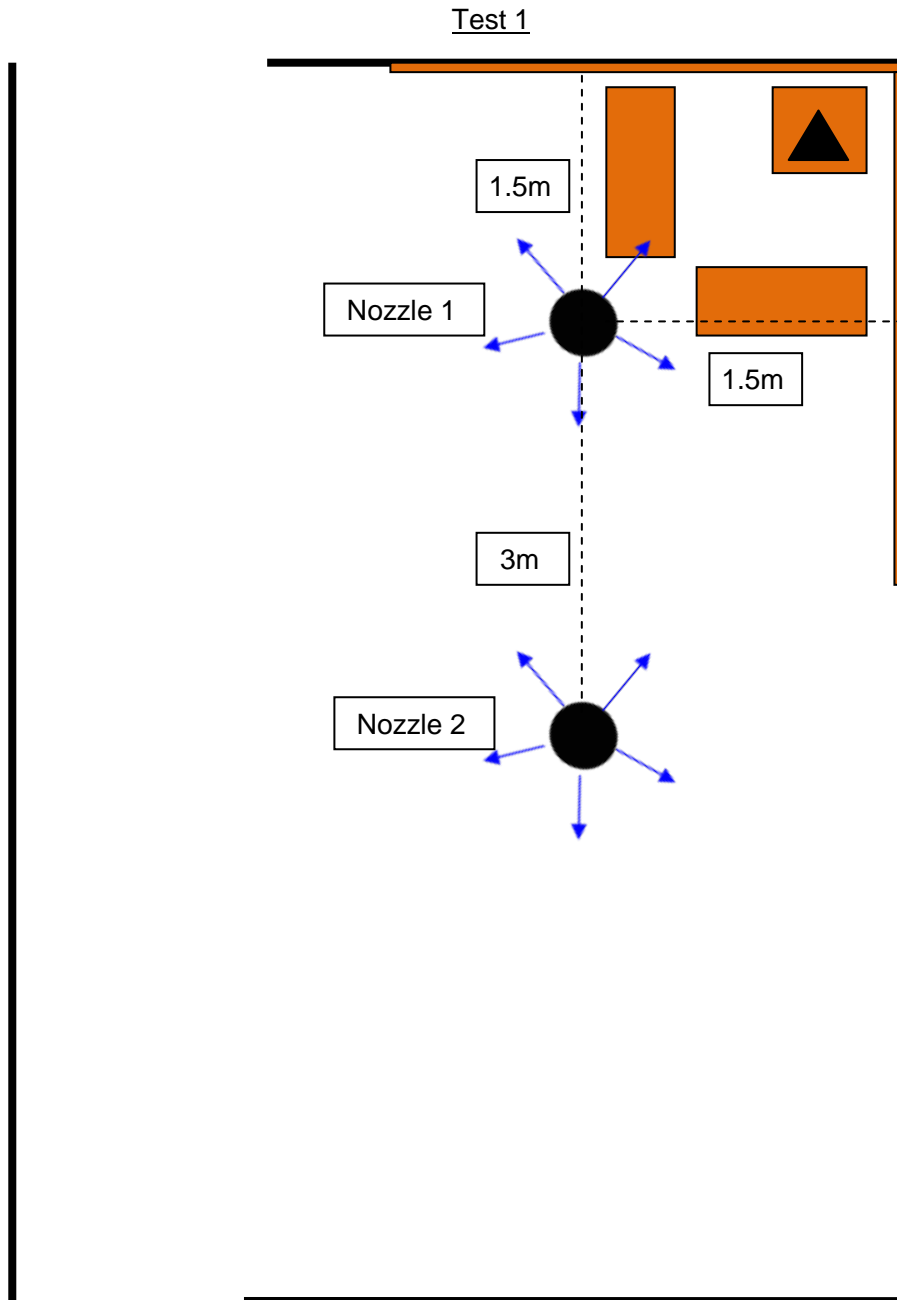


Figure 5



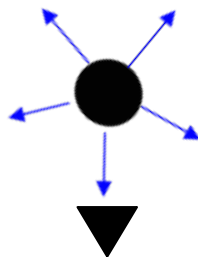
Key



Corner, ignition and fuel package



Thermocouple



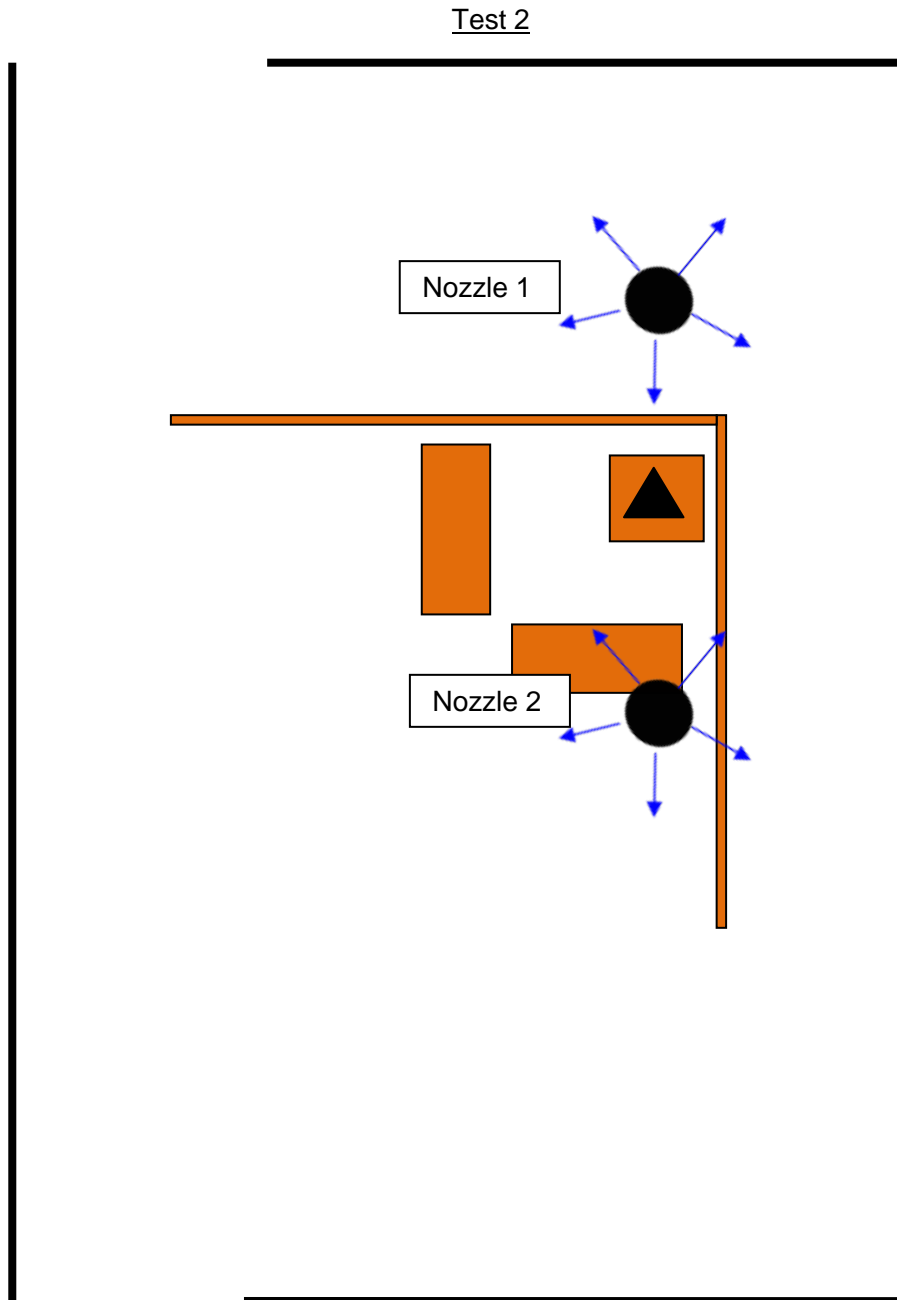
Nozzle (Inc. discharge angle)



Replicated nozzle

Drawing not to scale

Figure 6



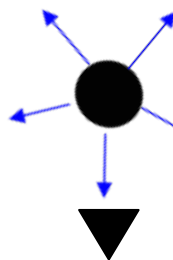
Key



Between two nozzles,
ignition and fuel package



Thermocouple



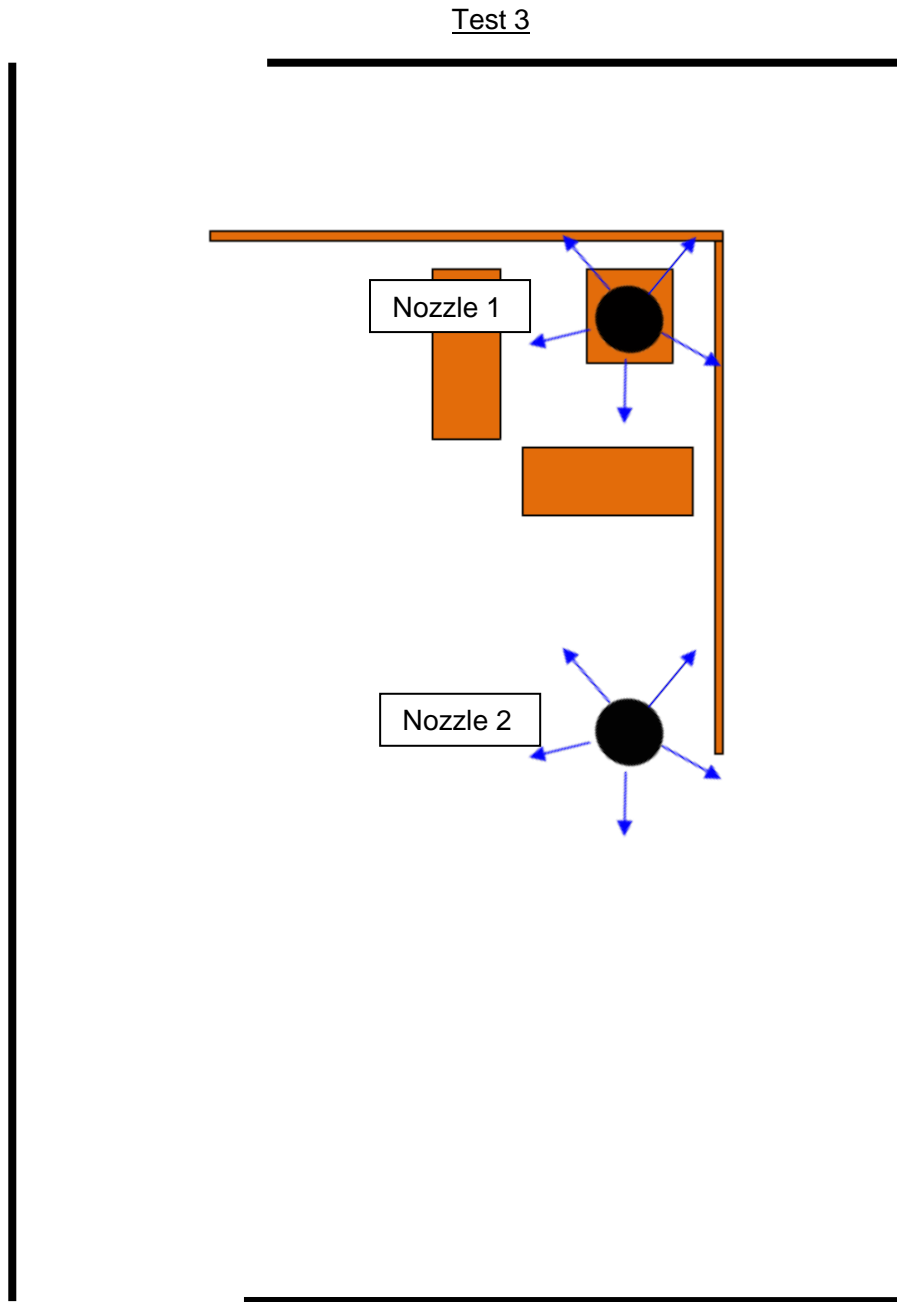
Nozzle (Inc. discharge angle)

Note 1: All nozzles are at the same spacing's as Test 1


Replicated nozzle

Drawing not to scale

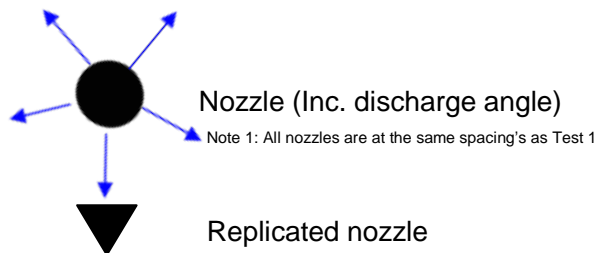
Figure 7



Key

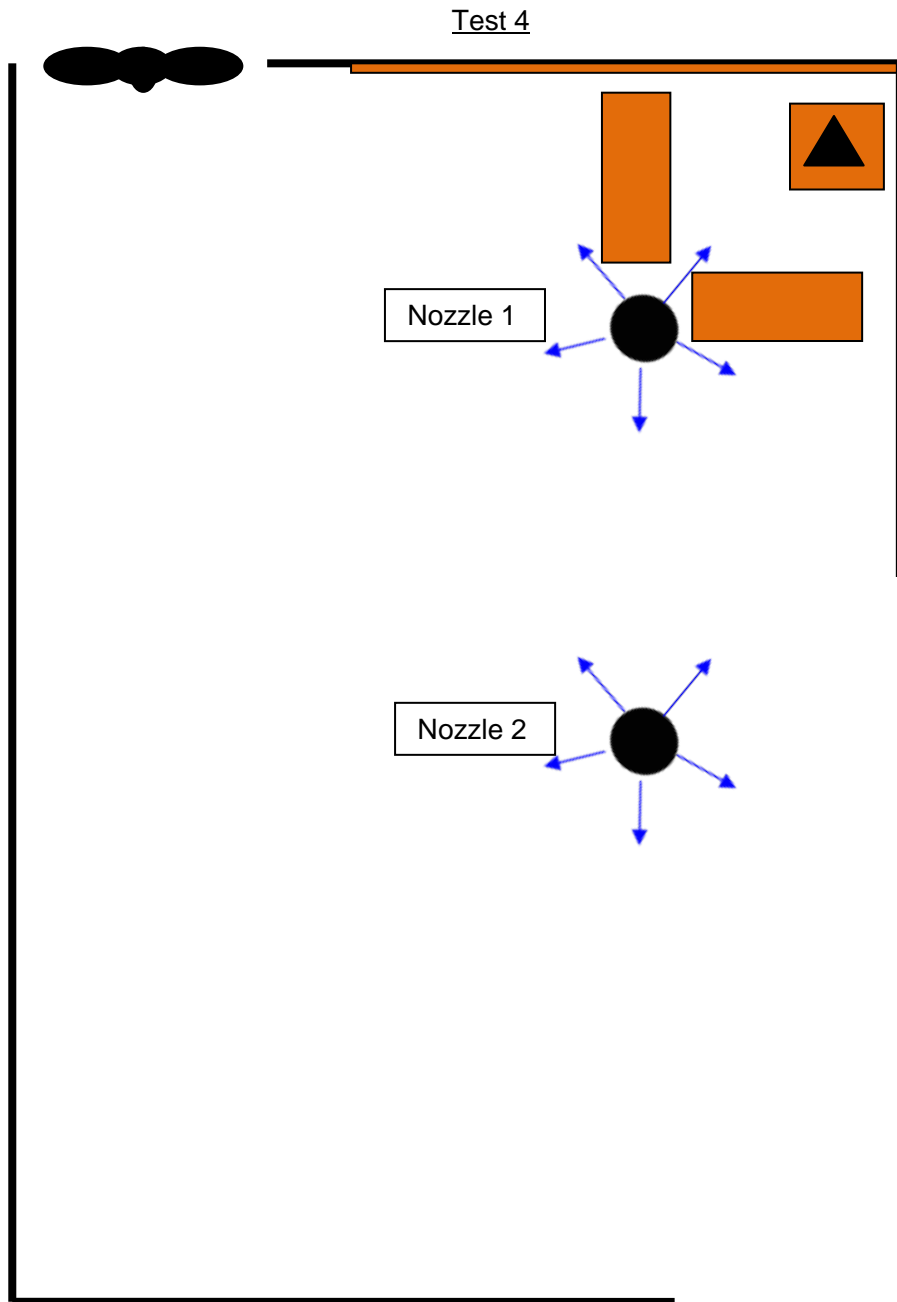
 Beneath a nozzle
ignition and fuel package

 Thermocouple



Drawing not to scale

Figure 8



Key



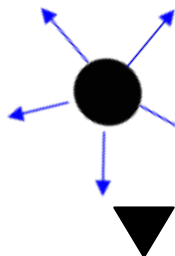
Corner, ignition and fuel package



Thermocouple



Fan



Nozzle (Inc. discharge angle)

Note 1: All nozzles are at the same spacing's as Test 1

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 1

Revision History

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

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Revised By:	Approved By:
Reason for Revision:	