REGULATORY INFORMATION REPORT

Fire resistance test in accordance with AS 1530.4- 2014 of 15-off pipes in a 103mm thick fire resistance wall system protected by various 3M fire protection systems.

EWFA Report No:

RIR 45239800.1

Report Sponsor:

3M Australia Pty Ltd
Bldg A, 1 Rivett Road
North Ryde, NSW 2113

Test Date:

28 October 2016

DOCUMENT REVISION STATUS

Date Issued	Issue No	Description
24/03/2017	RIR 45239800.1	Initial Issue

CONTACT INFORMATION

Exova Warringtonfire Aus Pty Ltd - ABN 81 050 241 524

NATA Registered Laboratory

Unit 2, 409-411 Hammond Road
Dandenong Victoria 3175
Australia

T: +61 (0)3 9767 1000

New South Wales

Suite 2002a, Level 20, 44 Market Street,
Sydney NSW 2000
Australia

T: +61 (0)2 8270 7600

Queensland

Northpoint, Unit 29, Level 6
231 North Quay
Brisbane QLD 4000
Australia

T: +61 (0)7 3238 1700

SIGNATORIES

Prepared by

Patrick Chan

Patrick Chan

Reviewed by

Steven Halliday

GENERAL CONDITIONS OF USE

This report may only be reproduced in full without modifications by the report sponsor only. Copies, extracts or abridgments of this report in any form shall not be made distributed or published by other organisations or individuals without the permission in writing from a Director of Exova Warringtonfire Aus Pty Ltd.

© Exova Warringtonfire Aus Pty Ltd 2017

CONTENTS

© Exova Warringtonfire Aus Pty Ltd 2017

1 CONSTRUCTION DETAILS

TEST ASSEMBLY

The test assembly comprised of 15 different penetration systems penetrating through a nominal 1600mm wide × 1600mm high × 103mm thick wall system. Three of these are contained in this report.

The wall was restrained at all edges.

TEST SPECIMENS

The wall system consisted of a 51mm thick 0.5BMT steel frame system clad with 2 layers of 13mm Gyprock Fyrchek fire-rated plasterboard on both the exposed and unexposed sides.

The penetration system consisted of the services as described below.

The full description of the specimen is provided in Figures A1.1 to A1.5 and the 'Schedule of Components' in Section 2.

Service	Services	Main fire stopping system	Core Hole size (mm)
F	16mm PEX Pipe	25mm × 25mm 3000WT Sealant fillet	35
G	20mm PEX Pipe		40
H	26mm PEX Pipe		44

ASSEMBLY AND INSTALLATION METHODS

The wall system was constructed on the 5th October 2016.

ORIENTATION

The assembly was asymmetric due to the services being supported on the unexposed side only and the pipes being capped on the fire side except for service C which was installed asymmetrically.

© Exova Warringtonfire Aus Pty Ltd 2017

2 SCHEDULE OF COMPONENTS

Item	Description	
SERVICE F		
1	**Pipe System**	
	Product name	16mm AUSPEX PEX Pipe
	Pipe dimensions	Outside Diameter (OD) 16.2mm (measured) × 2.0 mm thick (measured) pipe that protruded nominally 530 mm on the exposed side and 2000 mm on the unexposed side. The pipe was capped on the exposed side with metal PEX plug.
	Pipe Support	The pipe was supported on the unexposed side with metal pipe clamps at approximately 450 mm and 1500 mm from the unexposed face.
	Core hole diameter	Ø35 mm
2	**Primary Penetration Protection**	
	Product name	3M Fire Barrier Water Tight Sealant 3000WT
	Installation	The sealant was applied in the annular gap (9.5mm) between pipe and aperture on both sides of the separating element to a depth of 26 mm and had a 25mm × 25mm sealant fillet on both sides. See Figure A1.3 in Appendix 1 for more details.
SERVICE G		
3	**Product name**	20mm AUSPEX PEX Pipe
	Pipe dimensions	Outside Diameter (OD) 20.4mm (measured) × 2.6 mm thick (measured) pipe that protruded nominally 530 mm on the exposed side and 2000 mm on the unexposed side. The pipe was capped on the exposed side with metal PEX plug.
	Pipe Support	The pipe was supported on the unexposed side with metal pipe clamps at approximately 450 mm and 1500 mm from the unexposed face.
	Core hole diameter	Ø40 mm
4	**Primary Penetration Protection**	
	Product name	3M Fire Barrier Water Tight Sealant 3000WT
	Installation	The sealant was applied in the annular gap (10 mm) between pipe and aperture on both sides of the separating element to a depth of 26 mm and had a 25mm × 25mm sealant fillet on both sides. See Figure A1.4 in Appendix 1 for more details.
SERVICE H		
5	**Product name**	25mm AUSPEX PEX Pipe
	Pipe dimensions	Outside Diameter (OD) 24.9mm (measured) × 3.2 mm thick (measured) pipe that protruded nominally 530 mm on the exposed side and 2000 mm on the unexposed side. The pipe was capped on the exposed side with metal PEX plug.
	Pipe Support	The pipe was supported on the unexposed side with metal pipe clamps at approximately 450 mm and 1500 mm from the unexposed face.
	Core hole diameter	Ø44 mm

© Exova Warringtonfire Aus Pty Ltd 2017

Item	Description	
6	**Primary Penetration Protection**	
	Product name	3M Fire Barrier Water Tight Sealant 3000WT
	Installation	The sealant was applied in the annular gap (9 mm) between pipe and aperture on both sides of the separating element to a depth of 26 mm and had a 25mm × 25mm sealant fillet on both sides. See Figure A1.5 in Appendix 1 for more details.
Separating Element		
7	**Product**	13mm Gyprock Fyrchek fire-rated plasterboard
	Size	26 mm thick wall incorporating 2-off 13 mm thick sheets with 51 mm wide steel studs and 51 mm deflection head.
	Density	833 kg/m^3
	Specification	Perimeter studs and tracks were fixed to the concrete blockwork using Ø6.5mm × 55mm Sleeve Anchor Hex Head fasteners. Inner sheets were fixed to metal framing using 6g × 25mm, Bugle Head, Needle Point, Fine Thread, Zinc-Yellow screws at 300mm nominal centres. Outer sheets were fixed to metal framing using 6g × 40mm Bugle Head Needle Point Fine Thread Zinc-Yellow screws at nominal 300mm centres. Rockwool were installed in the spacing between the flanges of the studs and noggings.

© Exova Warringtonfire Aus Pty Ltd 2017

3 TEST PROCEDURE

STATEMENT OF COMPLIANCE

The test was performed in accordance with the requirements of AS 1530.4-2014 Sections 2 & 10 subject to the variations below.

VARIATIONS TO TEST METHOD

Specimen C was not installed symmetrically so the assigned FRL is applicable to the direction of exposure present during the test.

PRE-TEST CONDITIONING

The construction of the specimens were finished on the 5th of October 2016 and were tested on 28th of October 2016. During this period the test specimens were subject to normal laboratory temperatures and relative humidity conditions.

SAMPLING / SPECIMEN SELECTION

The laboratory was not involved in the sampling or selection of the test specimen for the fire resistance test.

AMBIENT TEMPERATURE

The ambient temperature at the start of the test was 21°C and did not vary significantly throughout the duration the test.

TEST DURATION

The test duration was 180 minutes.

INSTRUMENTATION AND EQUIPMENT

The instrumentation was provided in accordance with AS 1530.4-2014 and as detailed below:

The furnace temperature was measured by 4-off mineral insulated metal sheathed Type K thermocouples with wire diameters not greater than 1mm and overall diameter of 3mm with the measuring junction insulated from the sheath. The thermocouples protruded a minimum of 25mm from steel supporting tubes.

The non-fire side specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5mm soldered to 12mm diameter × 0.2mm thick copper discs covered by 30mm × 30mm × 2.0 mm inorganic insulating pads.

A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples.

The furnace pressure was measured at the mid-height of lowest service.

Cotton pads were available during the test to assess the performance under the criteria for integrity.

© Exova Warringtonfire Aus Pty Ltd 2017

4 TEST RESULTS

The specimens listed below achieved the following performance when tested in accordance with AS 1530.4-2014, Section 2 & 10 subject to the variations listed in Section 3.

Service	Criteria	Result
F	Structural Adequacy	Not applicable
	Integrity	No failure at 180 minutes
	Insulation	Failure at 166 minutes
	FRL	**-/180/120**
G	Structural Adequacy	Not applicable
	Integrity	No failure at 178 minutes
	Insulation	Failure at 165 minutes
	FRL	**-/120/120**
H	Structural Adequacy	Not applicable
	Integrity	No failure at 180 minutes
	Insulation	Failure at 164 minutes
	FRL	**-/180/120**

5 APPLICATION OF TEST RESULTS

TEST LIMITATIONS

The results of this fire test may be used to directly assess fire hazard, but it should be recognized that a single test method will not provide a full assessment of fire hazard under all fire conditions. The results only relate to the behaviour of the specimen of the element of the construction under the particular conditions of the test; they are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they necessarily reflect the actual behaviour in fires**.**

VARIATIONS FROM THE TESTED SPECIMENS

This report details the methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the general procedure outlined in AS1530.4. Any significant variation with respect to size, constructional details, loads, stresses, edge or end conditions, other than those allowed under the field of direct application in the relevant test method, is not addressed by this report. It is recommended that any proposed variation to the tested configuration other than as permitted under the field of direct application specified in Appendix 3 should be referred to the test sponsor in the first instance to obtain appropriate documentary evidence of compliance from Exova Warringtonfire Aus Pty Ltd or another Registered Testing Authority.

UNCERTAINTY OF MEASUREMENT

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

© Exova Warringtonfire Aus Pty Ltd 2017

APPENDIX 1 DRAWINGS OF TEST ASSEMBLY

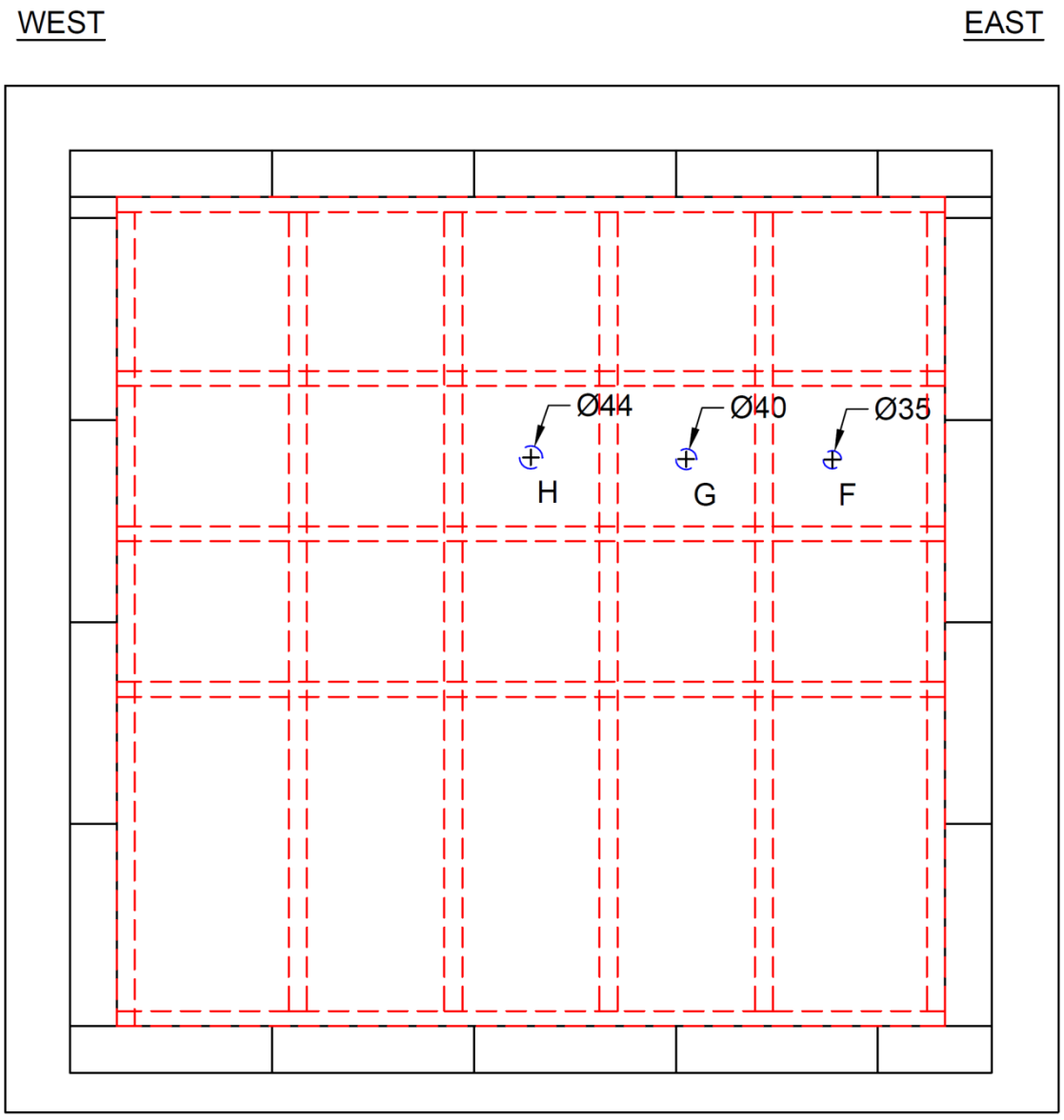

Figure A1.1: Elevation of Test Specimen (Core Hole)

© Exova Warringtonfire Aus Pty Ltd 2017

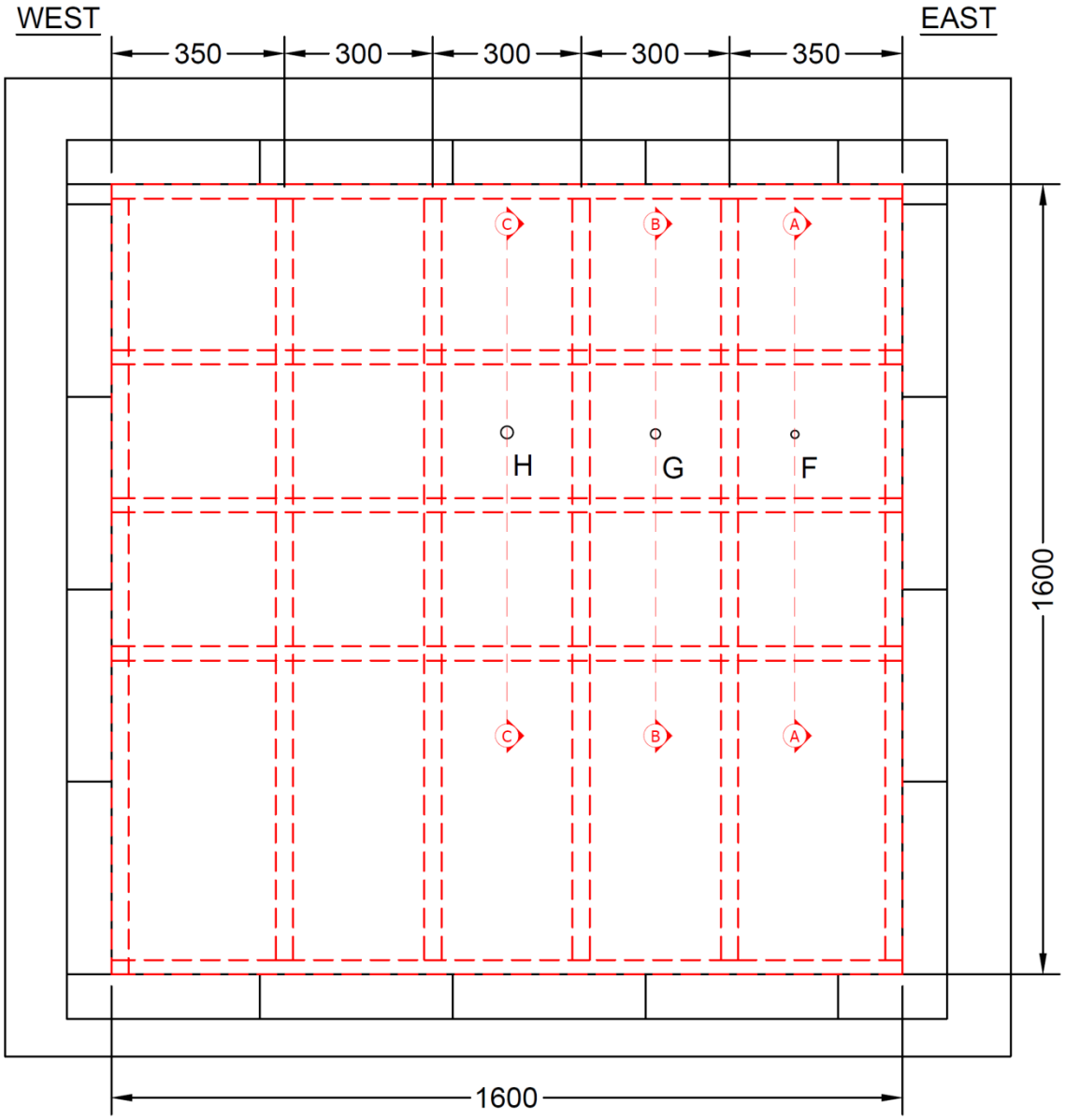

Figure A1.2: Elevation of Test Specimen (Plan)

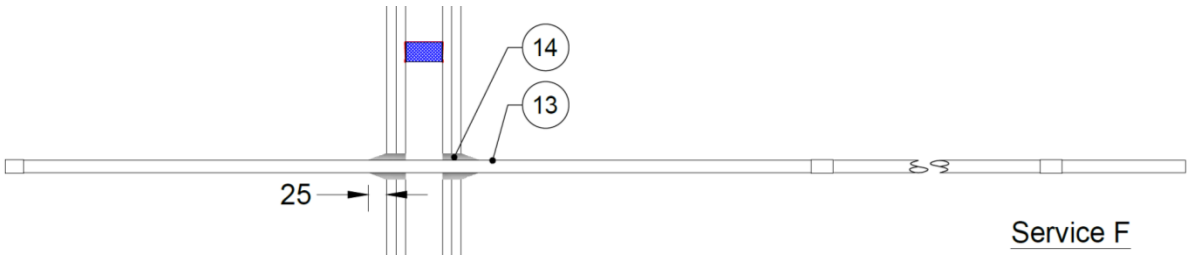

Figure A1.3: Vertical Cross-Section A-A

© Exova Warringtonfire Aus Pty Ltd 2017

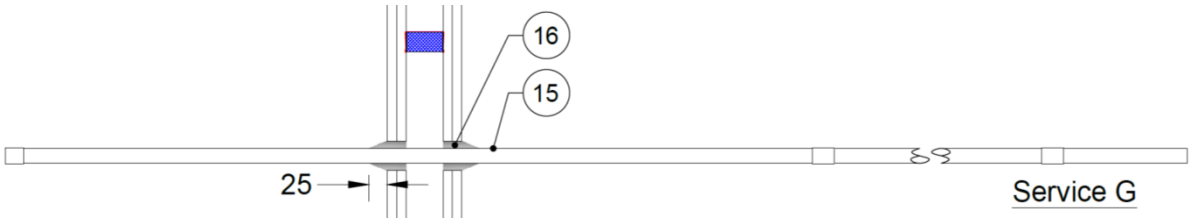

Figure A1.4: Vertical Cross-Section B-B

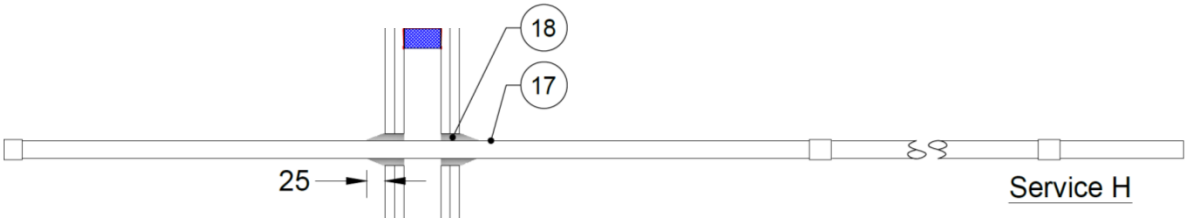

Figure A1.5: Vertical Cross-Section C-C

© Exova Warringtonfire Aus Pty Ltd 2017

APPENDIX 2 TEST OBSERVATIONS

The following include observations of the significant behaviour of the specimen.

Time		Observations
min	sec	
		Service F
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
13	48	The pipe had deformed near the separating element.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4-2014.
59	00	Smoke was venting from the end of the pipe.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4-2014.
120	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4-2014.
133	52	Smoke venting from the end of the pipe had stopped.
166	**20**	**TC 054 on the wall, 25mm away from the pipe recorded a temperature of 201°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 054 exceeded the initial temperature by more than 180°C.**
180	00	Specimen continued to maintain integrity in accordance with AS1530.4-2014.
181	00	Test stopped at the request of the sponsor.
		Service G
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
13	48	The pipe had deformed near the separating element.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4-2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4-2014.
62	02	Smoke was venting from the end of the pipe.
81	44	Dark colour liquid was leaking from the end of the pipe.
106	46	The smoke venting had stopped
120	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4-2014.
161	32	Smoke was venting from the end of the pipe.
165	**15**	**TC 059 on the wall, 25mm away from the pipe recorded a temperature of 202°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 059 exceeded the initial temperature by more than 180°C.**
178	**00**	**Flaming for greater than 10 seconds had become evident on the bottom of the pipe due to the flaming of Service L.** **Integrity failure in accordance with AS 1530.4-2014 Clause 2.13.2.4 due to flaming for more than 10 seconds on the unexposed side due to the inability to decouple the failure from Service L.**
181	00	Test stopped at the request of the sponsor.
		Service H
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
16	23	The pipe had deformed on the pipe near the separating element.

© Exova Warringtonfire Aus Pty Ltd 2017

Time		Observations
min	sec	
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4-2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4-2014.
70	49	Dark colour liquid was leaking from the end of the pipe.
120	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4-2014.
164	**45**	**TC 104 on the wall, 25mm away from the pipe recorded a temperature of 201°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 104 exceeded the initial temperature by more than 180°C.**
180	00	Specimen continued to maintain integrity in accordance with AS1530.4-2014.
181	00	Test terminated at the request of the sponsor.

© Exova Warringtonfire Aus Pty Ltd 2017

APPENDIX 3 DIRECT FIELD OF APPLICATION

A 3.1 GENERAL

AS 1530.4- 2014 indicates that the results of the fire test contained in the test report are directly applicable without reference to the testing authority to similar constructions where one or more of the changes have been made:

A 3.2 SEPARATING ELEMENTS

Results obtained for sealing systems in various types of masonry and concrete construction may be applied as follows:

a) For elements manufactured from similar types of concrete or masonry, the results of the prototype test may be applied to materials of density within ±15% of the tested specimen. For greater variations, the opinion of a registered testing authority shall be obtained.

b) Test results obtained in conjunction with hollow concrete blocks may be used in a solid concrete element of the same overall thickness. The reverse does not apply.

c) Results obtained from framed wall systems may be applied to the performance of a system in concrete, masonry or solid gypsum blocks of greater or equal thickness to that of the tested prototype. The reverse does not apply.

d) Results obtained from framed wall systems may be applied to similar walls having studs of the same material with sizes greater than the tested prototype.

e) Results obtained from a prototype test may be applied to framed wall systems of similar construction but having thicker facings of the same material applied to the studs.

A 3.3 METAL PIPES

A 3.3.1 Sealing systems tested using standard configurations

The results may be applied to brass pipes of the same composition up to maximum outside diameter of 101.6 mm (normally 70/30 arsenical brass) and to copper and ferrous metal pipes having wall thicknesses greater than or equal to those listed in Table 10.12.3.1, provided the same penetration sealing system was used for the above penetrations in the same type of separating element and all the specimens achieved the required FRL.

NOTE: For information on standard configurations, see Appendix F.

TABLE 10.12.3.1

METAL PIPE DEEMED TO HAVE EQUIVALENT FIRE RESISTANCE LEVELS

Nominal size mm	Actual OD (outside diameter) mm	Actual wall thickness mm
32	31.75	0.91
40	38.10	0.91
50	50.80	0.91
65	63.50	0.91
80	76.20	1.22
90	88.90	1.22
100	101.60	1.22
125	127.00	1.42
150	152.40	1.63

© Exova Warringtonfire Aus Pty Ltd 2017

A 3.3.2 Sealing systems tested not using standard configurations

Results obtained with a penetration sealing system protecting the opening around copper or brass pipes may be applied to pipes of the same material and to ferrous metal pipes having outside diameters not greater than the tested diameter, and wall thicknesses not less than the tested thickness.

NOTE: For information on standard configurations for metal pipes, see Appendix F.

A 3.3.3 Shape and size of openings for penetration seals

For mineral-fibre, cast and gun-applied mastic seals, results obtained in openings with a smooth surface texture may be applied to openings having a rough surface texture.

A 3.3.4 Insulated (lagged) metal pipes

Where fire test data on the insulation system are not available, penetration sealing systems that have been subjected to the standard test with uninsulated metal pipes may be used, provided the appropriate requirements of Clause A 3.3.2 are satisfied and the following procedures are followed:

a) If the insulation is non-combustible or is manufactured solely from mineral fibre, it shall be cut away where the service penetrates the separating element, and the opening shall be fire-stopped in accordance with the tested method.

b) If the insulation is combustible, it shall be cut away for 1000 mm either side of the separating element (provided the pipe did not vent hot gases during the fire resistance test), and the pipe shall be fire-stopped in accordance with the tested method. A non-combustible lagging may be placed over the bare pipe. If venting occurs during the fire-resistance test at a time less than the required FRL, a fire test shall be carried out to evaluate the insulated pipe system.

A 3.3.5 Alternative pipe materials

If an element is penetrated by—

a) a pipe other than brass, copper or ferrous alloys;

b) a pipe of cross-section other than circular; or

c) a pipe outside the field of application specified in this Standard for the standard test configuration,

then the results obtained from a single tested system may be applied to these pipes provided the—

i. melting point of the material is equal to or greater than the tested specimen;

ii. surface area to mass ratio of a cross-section of the pipe is equal to or less than the tested specimen; and

iii. thermal conductivity is equal to or less than the tested specimen diffusivity of the material.

A 3.4 ELECTRICAL AND COMMUNICATION CABLES

Where standard configurations are used for electrical and communication cables, the results of tests may be applied to all PVC and XLPE insulated and PVC sheathed power and communication cables with copper conductors, provided the results are for the same penetration sealing system in the same separating element and all of the specimens achieved the designated FRL or greater.

NOTE: For information on recommended standard configurations for electrical and communication cables, see Appendix D.

A 3.5 PLASTICS PIPES

A 3.5.1 General

In addition to the requirements of Clause 10.12.2 of standard, test results may be directly applied to masonry and concrete elements thicker than the tested prototype when installed in accordance with Figure 10.12.5.1 (AS 1530.4).

© Exova Warringtonfire Aus Pty Ltd 2017

Results obtained from a particular test shall not be applied to plastics pipes of different diameters, wall thicknesses or material types.

Results obtained from tests on penetrations through vertical separating elements shall not be used to assess performance in horizontal elements, and vice versa.

As penetration seals for plastics pipes are dependent for activation upon exposure to fire conditions, they shall always be installed with the same orientation and fire exposure as was established in the fire-resistance test.

A 3.5.2 Services not perpendicular to the fire separation

Penetrations not perpendicular to the plane of the element are acceptable, provided the fire-stopping system has similar exposure and dimensions to the tested prototype.

© Exova Warringtonfire Aus Pty Ltd 2017