



BRANZ

1222 Moonshine Road
Judgeford RD1
Porirua 5381
New Zealand
T +64 4 237 1170
F +64 4 237 1171
branz@branz.co.nz
www.branz.co.nz



FIRE ASSESSMENT REPORT

FAR 4844

FIRE RESISTANCE OF MAXILITE PANELS WITH PENETRATIONS ON THE UNDERSIDE OF CONCRETE FLOOR SLABS

CLIENT

Fire Containment Pty Ltd
26a Ferndell Street
South Granville
NSW 2142
Australia

PROJECT NUMBER:

FC4844

ISSUE DATE:

12 March 2018

PAGE:

1 of 13

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.
EXTRACTS OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

ASSESSMENT OBJECTIVE

To assess Maxilite panels secured to the underside of concrete floor slabs with various penetrations and installation details if tested in accordance with AS 1530.4-2014.

CONCLUSION

It is considered that the cast-in conduits up to a maximum of 50 mm diameter with cables installed as shown in Figure 1 and Figure 2 would achieve an FRL of at least -/120/120 if tested in accordance with AS 1530.4-2014 with the following conditions:

- The effective concrete thickness must be at least 120 mm thick along the length of the cast-in conduit or a 60 mm thick Maxilite panel is secured to the underside of the slab.
- Conduits up to 50 mm diameter maximum with or without a single cable up to 25 mm diameter or multiple cables up to 40 mm diameter.
- Penetration sealed with either Traflagar Fyreflex sealant to the full depth of the Maxilite panel and finished with a 30 mm x 30 mm fillet or a 25 mm, 32 mm, 40 mm or 50 mm Fyrechoke collar.
- The concrete slab must be designed in accordance with AS 3600 and be designed for cast-in deck boxes up to a maximum size of 800 mm x 800 mm.
- The nominal concrete thickness from the bottom of the deck box is 100 mm and the Maxilite panel is to be secured to the underside of the concrete floor slab and overlap the box by at least 100 mm. Where the concrete is less than 100 mm the overall concrete/Maxilite thickness must be at least 160 mm.
- A specific configuration which has been tested and achieved Integrity and Insulation of at least 120 minutes with a different thickness of Maxilite and/or concrete thickness is also acceptable.



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

2 of 13

PJC

A handwritten signature in blue ink, appearing to be "PJC".

ES

A handwritten signature in blue ink, appearing to be "ES".

LIMITATION

This report is subject to the accuracy and completeness of the information supplied.

BRANZ reserves the right to amend or withdraw this assessment if information becomes available which indicates the stated fire performance may not be achieved.

This assessment report may only be quoted or reproduced in full.

TERMS AND CONDITIONS

This report is issued in accordance with the Terms and Conditions as detailed and agreed in the BRANZ Services Agreement for this work.

Property of Trafalgar Group



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

3 of 13

PJC

A blue ink signature of PJC inside a rectangular box.

ES

A blue ink signature of ES inside a rectangular box.

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.
EXTRACTS OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

CONTENTS

SIGNATORIES	5
DOCUMENT REVISION STATUS	5
1. INTRODUCTION	6
2. BACKGROUND	6
3. DISCUSSION	7
3.1 AS 1530.4-1985 vs 2005 vs 2014.....	7
3.1.1 General	7
3.1.2 Furnace pressure	7
3.1.3 Integrity criteria.....	7
3.1.4 Insulation criteria.....	8
3.2 Deck box installation configuration.....	8
3.3 Maxilite panel.....	8
3.4 Concrete floor slab effective thickness.....	8
3.5 Specific installations.....	9
3.5.1 Figure 1 Fyreflex sealant	9
3.5.2 Figure 2 Fyrechoke collars	10
4. CONCLUSION.....	11

FIGURES

Figure 1: Client supplied drawing – Cast-in services drawing No. 3	12
Figure 2: Client supplied drawing – Cast-in services drawing No. 6	13



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

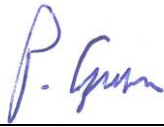
PAGE:

4 of 13

PJC

ES

SIGNATORIES



Author

P. Chapman
Senior Fire Testing Engineer



Reviewer

E. Soja
Senior Fire Safety Engineer

DOCUMENT REVISION STATUS

ISSUE NO.	DATE ISSUED	DESCRIPTION
1	12 March 2018	Initial Issue



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

5 of 13

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.
EXTRACTS OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

1. INTRODUCTION

This report gives BRANZ's assessment on the fire resistance of Maxilite panels secured to the underside of concrete floor slabs with various penetrations as follows:

- Single cables up to 25 mm diameter
- Multiple cables up to 40 mm diameter
- uPVC conduits up to maximum 50 mm diameter

The Maxilite is to be secured to the underside of the concrete slab which may include a cast-in deck box into the slab which is open to either the underside of the slab or top side of the slab. The penetrations may exit the slab or are cast into the slab exiting in another compartment. See Figure 1 to Figure 2 for details.

This assessment does not include the specific design of the floor slabs. It is assumed the floor slabs have been designed to meet the requirements of AS 3600 for structural stability, Integrity and Insulation. Where the cast-in deck box and penetrations are included in the slab this assessment addresses the Integrity and Insulation performance of the penetration only.

2. BACKGROUND

In BRANZ fire resistance test FR 3981 a number of penetrations were tested in a 120 mm thick concrete floor slab in accordance with AS 1530.4-2005. Penetration T consisted of an opening in the slab with a 60 mm thick Maxilite panel secured to the underside of the slab with a 25 mm and 32 mm uPVC conduit and Fyreachoke collars. The two penetrations through the Maxilite maintained the Integrity and Insulation criteria for at least 120 minutes.

In BRANZ fire resistance test FP 4344 a horizontal Maxilite panel nominally 1,080 mm x 1,000 mm x 30 mm thick was tested secured to steel framing. The panel was secured at nominal 200 mm centres and maintained the Integrity criteria for the 250 minute duration of the test and exceeded the Insulation criteria after 58 minutes.

In Fire Research Laboratories fire resistance test NI 1089 a number of penetrations were tested in a concrete floor in accordance with AS 1530.4-1985. Specimen B consisted of a 46 mm diameter power cable, 16 mm diameter power cable and six 15 mm diameter communication cables installed in a 110 mm diameter hole in the element. The penetration was then sealed with Trafalgar Fyreflex sealant to a depth of 100 mm finishing with a 50 mm x 50 mm fillet on the unexposed face. The penetration maintained the Integrity criteria for the 240 minute duration of the test and Insulation for 110 minutes.

In Fire Research Laboratories fire resistance test NI 2689 a number of penetrations were tested in a 75 mm thick E-Core panel in accordance with AS 1530.4-1985. The test included a number of cable penetrations sealed with Trafalgar Fyreflex sealant.



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

6 of 13

PJC

ES

The penetrations maintained the Integrity criteria for the 123 minute duration of the test.

In CSIRO fire resistance test FSP 1709 a number of penetrations were tested in a 150 mm thick concrete floor slab. A 25 mm, 40 mm and 50 mm uPVC conduit with Trafalgar Fyrechoke collars were tested and maintained the Integrity and Insulation performance for the 121 minute test duration.

In CSIRO fire resistance test FSP 1729 a number of penetrations were tested in a steel stud plasterboard wall in accordance with AS 1530.4-2014. Specimen 2 consisted of three TPS power cables and two CAT6 cables sealed with Trafalgar Fyreflex sealant. The penetration maintained the Integrity criteria for the 121 minute test duration and exceeded the Insulation criteria on the wall after 94 minutes.

3. DISCUSSION

3.1 AS 1530.4-1985 vs 2005 vs 2014

3.1.1 General

A comparison between different versions of the test standard has been undertaken in relation to penetrations and any differences discussed below. This comparison is in relation to fire resistance tests NI 1089 and NI 2689 which were tested in accordance with the 1985 version of AS 1530.4.

The 2005 and 2014 versions of the test standard are essentially the same for testing penetrations with respect to furnace conditions, instrumentation and failure criteria. The following is with respect to comparing the 1985 and 2014 versions.

3.1.2 Furnace pressure

The underside of the horizontal elements were tested with a furnace pressure of between 8 to 12 Pa measured 100 mm below the underside of the element. The 2014 version requires a pressure to be 20 Pa measured at the same location. Therefore the pressure conditions are slightly less onerous than the 2014 requirements. The difference in furnace pressure is considered to be more significant for test specimens that erode and degrade during fire exposure. The relevant specimens consisted of Fyreflex sealant and cable penetrations. Some of the penetrations maintained the Integrity criteria for 240 minutes which is significantly longer than the required 120 minutes discussed in this assessment. Based on the observations from the test reports it is considered that the difference in pressure requirements would not have influenced the specimen performance before at least 120 minutes.

3.1.3 Integrity criteria

To test for passage of hot gases from the exposed to unexposed face of the test specimen the 2014 version of the test standard requires that a cotton pad test be applied to any gaps which develop in the specimen during the fire exposure. Integrity



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

7 of 13

PJC

ES

failure to the 1985 version was determined by vision into the furnace through the specimen. Based on the tested results it is considered that a cotton pad would not have been applied before the reported Integrity results. Therefore it is expected that at least a similar Integrity performance would be expected if tested in accordance with the 2014 version of the test standard.

3.1.4 Insulation criteria

The thermocouple positions as tested and Insulation failure criteria of 180 K temperature rise is the same between versions of the test standard. Therefore it is expected that a similar Insulation performance would be expected that the specimens been tested in accordance with AS 1530.4-2014.

3.2 Deck box installation configuration

It is proposed to cast conduits into a concrete floor slab with a deck box opening to the top surface of the slab. A 60 mm thick panel of Maxilite is to be secured to the underside of the slab extending at least 100 mm past the deck box in all directions. Penetrations will pass through the Maxilite either to the slab above (through the deck box) or along the plane of the slab through cast-in conduits and exit in a separate fire compartment also with a Maxilite panel. See Figure 1 and Figure 2 for details. The depth of concrete below the deck box will be nominally 100 mm thick. If the concrete below the deck is less than 100 mm additional layers of Maxilite can be used to build up the overall thickness to a minimum of 160 mm. The combined concrete/Maxilite thickness must not be less than 160 mm.

The cast-in deck box is open to the top surface of the slab. Conduits up to a maximum diameter of 50 mm are cast into the slab starting at the deck box and exiting the underside of the slab in another fire compartment. To the underside of the deck box the nominally 60 mm thick Maxilite panel is secured to the underside of the floor slab with M6 masonry anchors at maximum 400 mm centres.

Note the slab must be designed to maintain the structural requirements with the inclusion of the deck box up to 800 mm x 800 mm.

3.3 Maxilite panel

In fire resistance test FP 4344 a 30 mm thick Maxilite panel nominally 1,080 mm x 1,000 mm was tested and maintained the Integrity criteria for the 250 minute duration of the test. The proposed installation is to be a maximum opening in the slab for the deck box of 800 mm x 800 mm (overall size 1,000 mm x 1,000 mm) x 60 mm thick. Based on the performance of the 30 mm thick panel it is expected the 60 mm thick Maxilite panel would remain in place for at least 120 minutes.

3.4 Concrete floor slab effective thickness

In AS 3600-2001 the minimum effective thickness of a floor slab to achieve a fire resistance level of at least 120 minutes is 120 mm.



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

8 of 13

PJC

ES

Where there are penetrations cast into the slab the effective concrete thickness must be at least 120 mm. If the effective thickness is less than 120 minutes a layer of 60 mm thick Maxilite panel shall be secured to the underside of the slab for the length of the penetration.

The specific design of the concrete floor slab is outside the scope of this assessment and must be designed for the inclusion of the cast-in penetrations and the deck boxes up to a maximum size of 800 mm x 800 mm.

3.5 Specific installations

3.5.1 Figure 1 Fyreflex sealant

The installation detailed in Figure 1 consists of uPVC conduits cast into a floor slab where each end exits in an adjacent fire compartment. To the underside of the concrete slab where the conduit exits the slab a 60 mm thick Maxilite panel is installed and sealed to full depth with Trafalgar Fyreflex sealant and finished with a 30 mm fillet. The other end of the conduits exits into a deck box which is open to the compartment above. There is nominally 100 mm thick concrete between the bottom of the deck box and underside of the floor slab.

It is proposed to seal cable penetrations through the 60 mm thick Maxilite panel with Trafalgar Fyreflex sealant to the full depth of the Maxilite. The cables may be either a single cable up to a maximum diameter of 25 mm or multiple cables up to a maximum diameter of 40 mm.

In fire resistance test NI 2689 a number of cable penetrations sealed with Fyreflex were tested in a nominal 75 mm thick E-core panel including a single 38 mm diameter power cable and multiple cable penetrations. The Fyreflex was generally installed full depth of the panel (75 mm) with a fillet to the top surface nominally 50 mm x 50 mm. The penetrations maintained the Integrity criteria for the 123 minute duration of the test. The temperature of the cable penetrations were not measured in this test.

In fire resistance test NI 1089 a nominal 115 mm thick floor slab was tested with a cable penetration consisting of a single 46 mm OD power cable, one 16 mm diameter power cable and six 15 mm diameter communication cables. The cables were sealed to a depth of 100 mm with a 20 mm high x 50 mm wide fillet and maintained the Integrity criteria for 240 minutes and Insulation for 110 minutes.

In fire resistance test FSP 1729 a cable penetration sealed with Fyreflex sealant was tested in a steel stud plasterboard wall nominally 96 mm thick. The penetration failed the insulation criteria on the plasterboard after 94 minutes and maintained the criteria on the sealant and cable for the 121 test duration.

In the proposed installation the cable penetrations will be sealed to the full depth of the Maxilite panel with a 30 mm x 30 mm fillet. Fire resistance test NI 2689 demonstrates that the cables will maintain the Integrity criteria for at least 120 minutes in a 75 mm thick element. The proposed installation consists of a minimum 60 mm



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

9 of 13

PJC

ES

thick Maxilite plus 100 mm thick slab. It is considered that the proposed installations would maintain the Integrity criteria for at least 120 minutes.

The minimum distance from the fire exposed face to the unexposed face is nominally 160 mm (60 mm Maxilite + 100 mm floor slab). In fire resistance test NI 1089 the multiple cable penetration maintained the Insulation for 110 minutes in a 115 mm thick floor slab. In FSP 1729 the cable penetration maintained the Insulation criteria on the cable and sealant for 121 minutes. Therefore it is considered by increasing the overall thickness of the element and reducing the maximum diameter of the cables the proposed configuration would maintain the Insulation criteria for at least 120 minutes.

It is also considered where a specific configuration has been tested and achieved Integrity and Insulation of at least 120 minutes with a different thickness of Maxilite and/or concrete thickness is also acceptable.

Where fire exposure is from the underside of the slab without the cast-in deck box above. The conduit runs horizontally along the plane of the slab past a fire rated wall and exits the side of the box. Due to the additional distance from the exposed face this is considered to be a less severe fire exposure condition and therefore would also maintain the Integrity and Insulation criteria for at least 120 minutes.

3.5.2 Figure 2 Fyrechoke collars

The installation detailed in Figure 2 is essentially the same as in Figure 1 except where the penetration exits the Maxilite panel it is sealed with a Trafalgar Fyrechoke collar.

It is proposed to seal uPVC conduits through 60 mm thick Maxilite panels with Trafalgar Fyrechoke collars. For conduits up to 25 mm diameter using the 25 mm Fyrechoke collar, between 25 mm to 32 mm diameter using the 32 mm Fyrechoke collar, 40 mm diameter with a 40 mm Fyrechoke collar and 50 mm diameter with a 50 mm Fyrechoke collar.

In CSIRO fire resistance test FSP 1709, 25 mm, 40 mm and 50 mm Fyrechoke collars were tested with uPVC conduits in a nominal 150 mm thick floor slab. The penetrations maintained the Integrity and Insulation criteria for the 121 minute duration of the fire test.

In fire resistance test FR 3981 a 25 mm and 32 mm Fyrechoke collar with uPVC conduits were tested in a 60 mm thick Maxilite panel. The Maxilite panel was secured to the underside of a concrete floor slab. Both penetrations maintained the Integrity and Insulation criteria for at least 120 minutes. Based on the performance of the Fyrechoke collars in elements nominally 60 mm and 150 mm thick it is considered the proposed composite installation (Maxilite + concrete) nominally 160 mm thick would maintain the Integrity and Insulation criteria for at least 120 minutes.



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

10 of 13

PJC

ES

It is also considered that a specific configuration which has been tested and achieved Integrity and Insulation of at least 120 minutes with a different thickness of Maxilite and/or concrete thickness is also acceptable.

4. CONCLUSION

It is considered that the cast-in conduits up to a maximum of 50 mm diameter with cables installed as shown in Figure 1 and Figure 2 would achieve an FRL of at least -/120/120 if tested in accordance with AS 1530.4-2014 with the following conditions:

- The effective concrete thickness must be at least 120 mm thick along the length of the cast-in conduit or a 60 mm thick Maxilite panel is secured to the underside of the slab.
- Conduits up to 50 mm diameter maximum with or without a single cable up to 25 mm diameter or multiple cables up to 40 mm diameter.
- Penetration sealed with either Traflagar Fyreflex sealant to the full depth of the Maxilite panel and finished with a 30 mm x 30 mm fillet or a 25 mm, 32 mm, 40 mm or 50 mm Fyrechoke collar.
- The concrete slab must be designed in accordance with AS 3600 and be designed for cast-in deck boxes up to a maximum size of 800 mm x 800 mm.
- The nominal concrete thickness from the bottom of the deck box is 100 mm and the Maxilite panel is to be secured to the underside of the concrete floor slab and overlap the box by at least 100 mm. Where the concrete is less than 100 mm the overall concrete/Maxilite thickness must be at least 160 mm.
- A specific configuration which has been tested and achieved Integrity and Insulation of at least 120 minutes with a different thickness of Maxilite and/or concrete thickness is also acceptable.



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

11 of 13

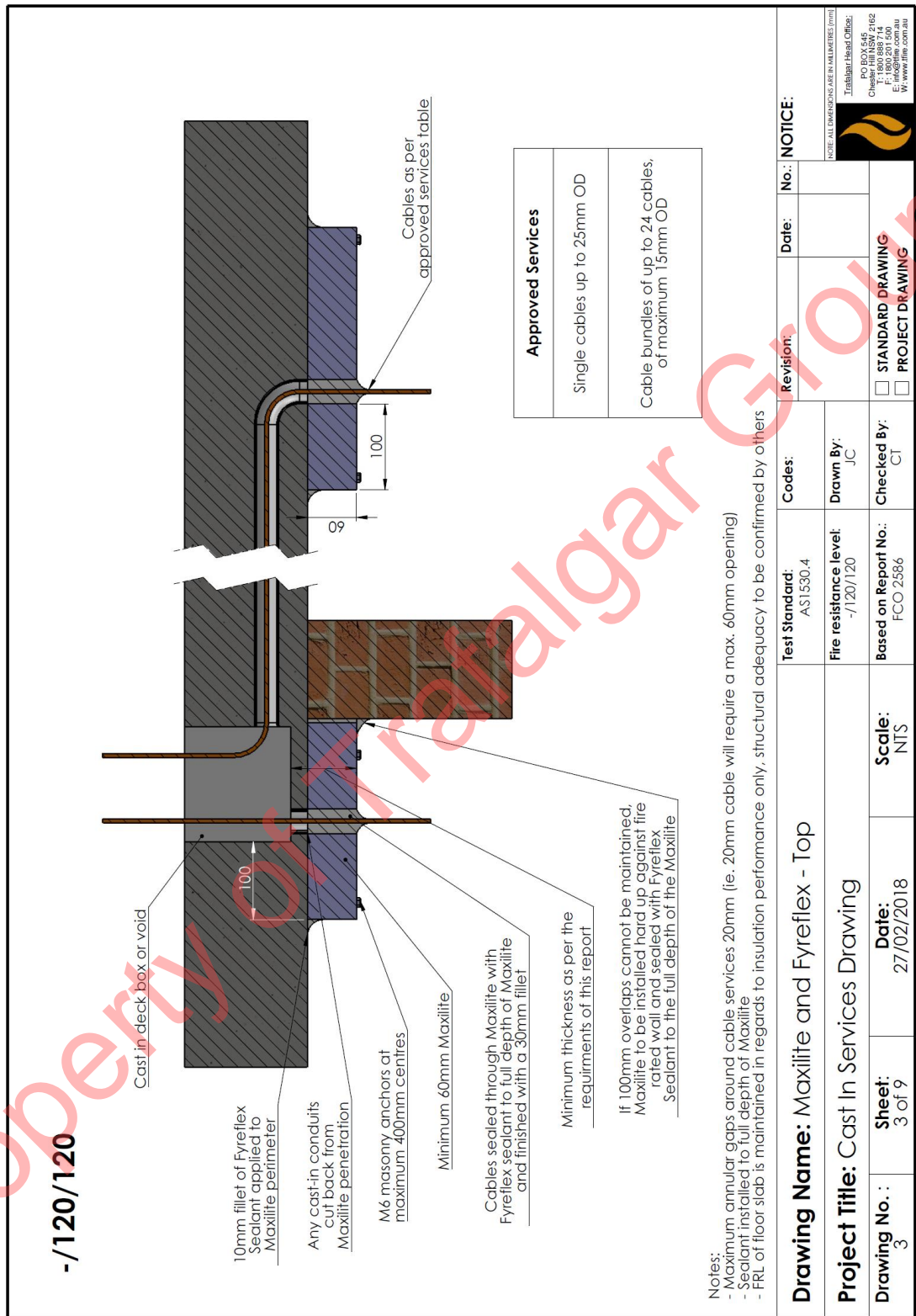
PJC

A blue ink signature of PJC inside a rectangular box.

ES

A blue ink signature of ES inside a rectangular box.

Figure 1: Client supplied drawing – Cast-in services drawing No. 3



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

12 of 13

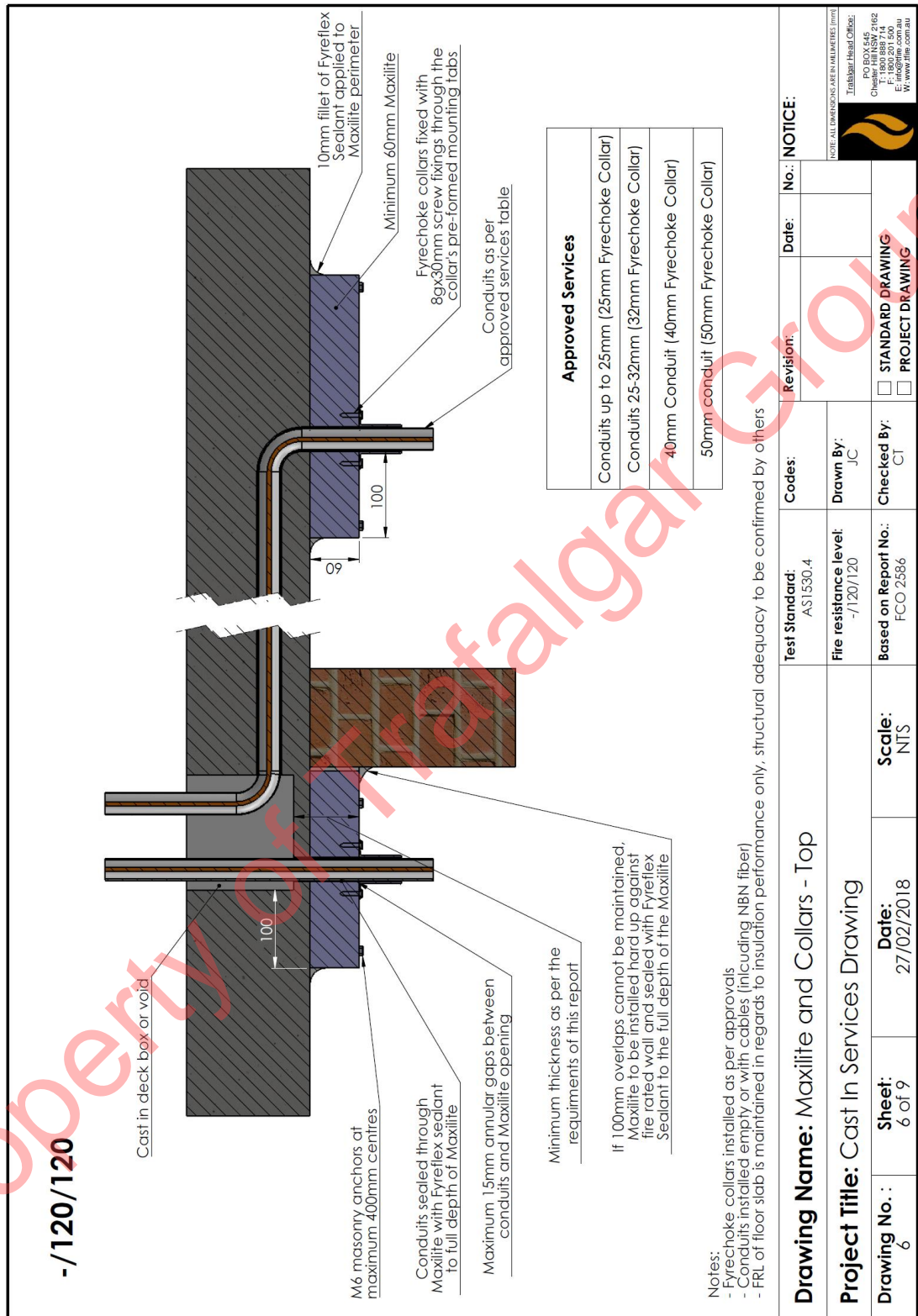
PJC

PSL

ES

ES

Figure 2: Client supplied drawing – Cast-in services drawing No. 6



REPORT NUMBER:

FAR 4844

ISSUE DATE:

12 March 2018

PAGE:

13 of 13

PJC

ES