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Fire assessment report

Trafalgar FyreBATT in accordance with AS 1530.4:2014

Sponsor: Trafalgar Group

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Quality management

Version	Date	Information about the report			
R1.0	Issue: 21/05/2021	Reason for issue	Report issued to Trafalgar Group for review and comment.		
			Prepared by	**Reviewed by**	**Authorised by**
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			Prepared by	**Reviewed by**	**Authorised by**
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			Prepared by	**Reviewed by**	**Authorised by**
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			Prepared by	**Reviewed by**	**Authorised by**
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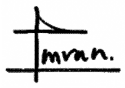
		Signature			

Executive summary

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of Trafalgar FyreBATT – in accordance with AS 1530.4:2014 and AS 4072.1:2005.

Trafalgar FyreBATT is described as a coated mineral fibre product, designed for use as a fire seal to protect aperture in building constructions.

The analysis in section 5 of this report found that the proposed systems together with the described variations are expected to achieve FRLs as shown in Table 1 to Table 5, in accordance with AS 1530.4:2014 and AS 4072.1:2005.

Table 1 Single layer Trafalgar FyreBATT as blank seal

Blank seal	Separating element	Maximum aperture size	Batt configuration	Seal fitting and details	Reference test	Reference figure	FRL	System reference
Trafalgar FyreBATT	Concrete/masonry wall	1200 mm high × 1200 mm wide	1 × 60 mm FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Friction fitted into the aperture. Perimeter sealed with Trafalgar FyreFlex	F16150	Figure 1	-/240/90	TBS1
		1200 mm high × unlimited width (1200 mm × 600 mm repeating units)	1 × 60 mm FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Friction fitted into the aperture. A primer is applied to the four ends. Trafalgar FyreFlex applied at the perimeter	WARRES 317711		-/240/90	TBS2
	Concrete/masonry floor	1200 mm long × 600 mm wide	1 × 60 mm FyreBATT	Friction fitted into the aperture. Trafalgar FyreFlex applied at the perimeter	WF375797	Figure 9 and Figure 10	-/180/120	TBS3
Note – FRL of the blank seal will be governed by the established FRL of the separating element.								

Table 2 Double layer Trafalgar FyreBATT as blank seal

Blank seal	Separating element	Maximum aperture size	Batt Configuration	Seal fitting and details	Reference test	Reference figure	FRL	System reference
Trafalgar FyreBATT	Concrete/masonry wall	1200 mm high × 1200 mm wide	2 × 60 mm FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Friction fitted flush on both faces or applied back-to-back. Perimeter sealed with Trafalgar FyreFlex	F16150	Figure 2 and Figure 3	-/240/240	TBD1
	Double layer plasterboard or Shaftliner wall system	1200 mm high × 2400 mm wide	2 × minimum 50 mm thick FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Friction fitted into the aperture flush on each face. Optionally can be installed as pattress fit or with a cavity (for thicker walls). Trafalgar FyreFlex applied at the perimeter. For pattress fit FyreBATT, an additional 25 mm × 25 mm Trafalgar FyreFlex needs to be applied at the perimeter of the face fitted FyreBATT	WF 317718	Figure 4 to Figure 7	Up to - /120/120	TBD2
	Single layer plasterboard wall system	1000 mm high × 1200 mm wide	2 × 60 mm FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Pattress fit into the aperture and Trafalgar FyreFlex applied at the perimeter. Additionally, 25 mm × 25 mm Trafalgar FyreFlex applied at the perimeter of the face fitted FyreBATT	FRT210436 R1.0	Figure 8	Up to - /90/90	TBD3
	Speedpanel, Hebel and Walsc AAC panels	1000 mm high × 1200 mm wide	2 × 60 mm FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Pattress fit into the aperture and Trafalgar FyreFlex applied at the perimeter. Additionally, 25 mm × 25 mm Trafalgar FyreFlex applied at the perimeter of the face fitted FyreBATT	FRT210436 R1.0	Figure 8	Up to - /120/120	TBD4
	Concrete/Masonry floor	1200 mm long × 600 mm wide	2 × 60 mm FyreBATT	Friction fitted into the aperture on each face with a cavity in between or applied back-to-back. Trafalgar FyreFlex sealant applied at the perimeter	WF375797	Figure 11 and Figure 12	-/180/180	TBD5
Note – FRL of the blank seal will be governed by the established FRL of the separating element.								

Table 3 Assessed FRL of the services protected with single layer of Trafalgar FyreBATT in walls

Services	Service description	Aperture size	Sealing system	Insulation	Reference test	Reference figure	FRL	System reference
Electrical and communication cable	AS 1530.4:2014 appendix D2 communication cables on 300 mm wide cable tray	Cut to fit service	Trafalgar FyreFlex to seal the annular gap and in 30 mm × 30 mm cone applied on both sides	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on each side	FRT200329 R1.3	Figure 13	-/120/90	TPS1
	AS 1530.4:2014 appendix D1 power cables on 300 mm wide cable tray	Cut to fit service						TPS2
Mixed bundle	Up to 3 × 3/8 + 5/8 pair coils with 19 mm FR insulation, 3 × CAT6 cable, 3 × electrical cables, 1 × Ø25 mm PVC drainpipe	Nominally 150 mm	Trafalgar FyreBOX Mini R-150 mm	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on each side	FRT200329 R1.3, FRT200397 R1.2 and FRT200384 R1.3	Figure 14	-/120/60	TPS3
Conduit	25 mm uPVC conduit	Nominally 25 mm	Trafalgar Fyrechoke – micro collar on both sides	NA	FRT200329 R1.3	Figure 15	-/120/60	TPS4
Plastic pipes	Ø20 mm PE-Xa, wall thickness 3 mm	Nominally 20 mm	Trafalgar Fyrechoke – micro collar on both sides	NA	FRT200329 R1.3	Figure 15	-/120/60	TPS5
	Ø20 mm PE-Xb, Wall thickness 3 mm						-/120/90	TPS6
	Ø20 mm PE-Xa/AL/PE, wall thickness 3 mm						-/120/60	TPS7
Metal pipes	32 mm – 100 mm MD steel pipe, wall thickness 4 mm	Maximum 135 mm	Trafalgar FyreFlex to seal the annular gap and in 30 mm × 30 mm cone applied on both sides	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on each side	FRT200329 R1.3	Figure 16	-/120/90	TPS8
	32 mm – 100 mm type B copper pipes, wall thickness 1.63 mm	Maximum 120 mm	Trafalgar FyreFlex to seal the annular gap and in 30 mm × 30 mm cone applied on both sides	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on each side	FRT200329 R1.3		-/120/90	TPS9

Services	Service description	Aperture size	Sealing system	Insulation	Reference test	Reference figure	FRL	System reference

Notes –

- It is understood that the services will be installed in blank seals protected with single layer of Trafalgar FyreBATT as summarised in Table 1. As such, the system FRL must be determined with consideration to the expected performance of the blank seal and the service penetration as a combination. The lowest indices in terms of integrity and insulation for particular blank seal and penetration service combination will be the applicable FRL of the system.
- As cable stipulated in Appendix D1 and D2 were tested, the assessed FRL is applicable to all PVC and XLPE insulated and sheathed power and communication cables with copper conductors.
- The annular gap between the metal pipes and the separating element must not exceed 20 mm.
- Insulation performance will be limited to 120 minutes if MonoWrap is used.
- Minimum separation between the services must be 40 mm as per the stipulation of AS 4072.1:2005[1].

Table 4 Assessed FRL of services protected with double layers FyreBATT in walls

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
Electrical and communication cables	AS 1530.4:2014 appendix D2 communication cables on 300 mm wide cable tray	Cut to fit service	Trafalgar FyreFlex to seal the annular gap and in 30 mm × 30 mm cone applied on both sides	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on both side	FRT200329 R1.3	Figure 17	-/120/120	TPD1
	AS 1530.4:2014 appendix D1 power cables on 300 mm wide cable tray	Cut to fit service					-/120/90	TPD2
	AS 1530.4:2014 appendix D1 power cables on 300 mm wide cable tray	Cut to fit service		25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on both side	FRT180392 R1.1	Figure 17	-/120/120	TPD3
	Up to 15 × TPS (2.5 mm^2) cable bundle	Cut to fit service	Trafalgar FyreFlex to seal the annular gap and in 50 mm ×	25 mm thick Trafalgar TWrap or 40 mm thick	FRT200331 R1.2	Figure 17	-/120/120	TPD4

[1] Standards Australia, 2005, Components for the protection of openings in fire-resistant separating elements: Service penetrations and control joints, AS 4072.1:2005, Standards Australia, NSW.

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
			50 mm cone on both sides	MonoWrap 300 mm on both side				
	Up to 15 × Fire alarm (1.5 mm²) cable bundle	Cut to fit service		NA	FRT200331 R1.2	Figure 18	-/120/120	TPD5
	Up to 15 × CAT6 cable bundle	Cut to fit service		NA	FRT200331 R1.2	Figure 18	-/120/120	TPD6
	Up to 5 × TPS cables, up to 5 × Fire alarm cables and up to 5 × CAT6 cables; either single or in bundle	Cut to fit service	Trafalgar FyreFlex applied to seal the annular gap and in 50 mm × 50 mm cone on the unexposed sides	NA	FRT200331 R1.2	Figure 19	-/120/120 (One-way FRL)	TPD7
	Up to 5 × TPS cables, up to 5 × Fire alarm cables, up to 5 × CAT6 cables; either single or in bundle	Cut to fit service	Trafalgar FyreFlex applied to seal the annular gap and in 50 mm × 50 mm cone on both sides	NA	FRT200331 R1.2	Figure 18	-/120/120	TPD8
	Up to 5 × TPS cables, up to 5 × Fire alarm cables, up to 5 × CAT6 cables; either single or in bundle	Cut to fit service	Trafalgar FyreFlex applied to seal the annular gap and in 50 mm × 50 mm cone on exposed sides	NA	FRT200331 R1.2	Figure 19	-/120/90 (One-way FRL)	TPD9
	1 × 3/8 + 3/4 pair coil with 19 mm FR insulation	Nominally 100 mm	Trafalgar FyrePEX HP sealant applied up to 100 mm depth	NA	FRT200331 R1.2	Figure 20	-/120/120	TPD10
	1 × 1/4 + 1/2 pair coil with 13 mm insulation	Nominally 100 mm		NA	FRT200331 R1.2		-/120/120	TPD11

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
Mixed bundle	Up to 3 × 3/8 + 5/8 pair coils with 19 mm FR insulation, 3 × CAT6 cable, 3 × electrical cables, 3 × Ø20 mm PVC drainpipe	Nominally 170 mm	Trafalgar FyreBOX Mini R-150 and Trafalgar FyreFlex sealant to the full depth	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on each side	FRT200329 R1.3, FRT200397 R1.2 and FRT200384 R1.3	Figure 22	-/240/120	TPD12
Conduit	Ø25 mm conduit, wall thickness 2 mm	Nominally 65 mm	Trafalgar FyrePEX HP sealant filled to the full depth	NA	FRT200331 R1.2	Figure 20	-/120/120	TPD13
	Ø40 mm PVC conduit, wall thickness 2.6 mm	Nominally 45 mm	Ø40 mm Trafalgar FyreCHOKE collar both sides	NA	FRT200397 R1.2	Figure 23	-/240/120	TPD14
Plastic pipes	Ø20 mm PE- Xa pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant filled to the full depth	NA	FRT200331 R1.2	Figure 20	-/120/120	TPD15
	Ø20 mm PE- Xb pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant filled to the full depth	NA	FRT200331 R1.2	Figure 20	-/120/120	TPD16
	Ø20 mm PE-Xa/AL/PE, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant filled to the full depth	NA	FRT200331 R1.2	Figure 20	-/120/60	TPD17
	Ø20 mm PE-Xa/AL/PE, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant filled to the full depth	25 mm thick Trafalgar TWrap 300 mm on each side	FRT200331 R1.2	Figure 20	-/120/120	TPD18
	Ø20 mm PE-Xa/AL/PE pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 25 mm × 25 mm cone configuration around the service	NA	FRT200397 R1.2	Figure 21	-/240/60	TPD19

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
	Ø20 mm PE-Xa/AL/PE pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 25 mm × 25 mm cone configuration around the service	25 mm thick Trafalgar TWrap 300 mm on each side	FRT200331 R1.2 and FRT200397 R1.2	Figure 21	-/240/120	TPD20
	Ø50 mm uPVC pipe, wall thickness 2 mm	Nominally 56 mm	Ø50 mm Trafalgar FyreCHOKE collar on both sides	NA	FRT200397 R1.2	Figure 23	-/240/120	TPD21
	Ø100 mm uPVC pipe, wall thickness 4 mm	Nominally 110 mm	Ø100 mm Trafalgar FyreCHOKE collar on both side	NA	FRT200397 R1.2	Figure 23	-/240/60	TPD22
Metal pipes	32 mm copper pipe or steel pipe, wall thickness 1.22 mm	Nominally 110 mm	Trafalgar FyrePEX HP sealant to the full depth	25 mm FR insulation to the full length	FRT200397 R1.2	Figure 20	-/240/90	TPD23
	32 mm copper pipe or steel pipe, wall thickness 1.22 mm	Nominally 110 mm	Trafalgar FyrePEX HP sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm FR insulation to the full length	FRT200397 R1.2	Figure 21	-/240/120	TPD24
	100 mm copper pipe or steel pipe, wall thickness 1.63 mm	Nominally 135 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on the exposed side and 600 mm on the unexposed side	FRT200397 R1.2	Figure 17	-/240/120 (One-way FRL)	TPD25
	100 mm copper pipe or steel pipe, wall thickness 1.63 mm	Nominally 135 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on both sides	FRT200397 R1.2	Figure 17	-/240/120	TPD26

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
	50 mm copper pipe or steel pipe, wall thickness 1.22 mm	Nominally 80 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on both sides	FRT200397 R1.2	Figure 17	-/240/120	TPD27
	80 mm copper pipe or steel pipe, wall thickness 1.63 mm	Nominally 100 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on the exposed side and 600 mm on the unexposed side	FRT200397 R1.2	Figure 17	-/240/120 (One-way FRL)	TPD28
	80 mm copper pipe or steel pipe, wall thickness 1.63 mm	Nominally 100 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on both sides	FRT200397 R1.2	Figure 17	- /240/120	TPD29
	150 mm galvanised steel pipe, wall thickness 4.9 mm	Nominally 190 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on the exposed side and 450 mm on the unexposed side	FRT200397 R1.2	Figure 17	-/240/90 (One-way FRL)	TPD30
	150 mm galvanised steel pipe, wall thickness, 4.9 mm	Nominally 190 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on both sides	FRT200397 R1.2	Figure 17	-/240/90	TPD31
	150 mm galvanised steel pipe, wall thickness, 4.9 mm	Nominally 190 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on both sides	FRT200397 R1.2	Figure 17	-/240/120	TPD32

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
	150 mm copper pipe or steel pipe, wall thickness 2.03 mm	Nominally 180 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	One layer of 25 mm thick Twrap or 40 mm thick MonoWrap 300 mm on the exposed side and 1100 mm on the unexposed side. Additionally, one layer of 25 mm thick Twrap or 65 mm Monowrap 300 mm on the unexposed side	FRT200397 R1.2	Figure 17	Up to - /240/240 (One-way FRL)	TPD33
	150 mm copper pipe or steel pipe, wall thickness 2.03 mm	Nominally 180 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	One layer of 25 mm thick Twrap or 40 mm thick MonoWrap 1100 mm on both sides. Additionally, one layer of 25 mm thick Twrap or 40 mm thick MonoWrap 300 mm on both sides	FRT200397 R1.2	Figure 17	Up to - /240/240	TPD34

Notes –

- It is understood that the services will be installed in blank seals protected with single layer of Trafalgar FyreBATT as summarised in Table 2. As such, the system FRL must be determined with consideration to the expected performance of the blank seal and the service penetration as a combination. The lowest indices in terms of integrity and insulation for particular blank seal and penetration service combination will be the applicable FRL of the system.
- As cable stipulated in Appendix D1 and D2 were tested, the assessed FRL is applicable to all PVC and XLPE insulated and sheathed power and communication cables with copper conductors.
- Insulation performance will be limited to 120 minutes if MonoWrap is used.
- The annular gap between the metal pipes and the separating element must not exceed 20 mm.
- Minimum separation between services must be 40 mm as per the stipulation of AS 4072.1:2005.

Table 5 Assessed FRL of services protected with double layers FyreBATT in floors

Service type	Description	Aperture	Sealant/ protection	Insulation wrap		Reference figure	FRL	System reference
Electrical and communication cables	AS 1530.4:2014 appendix D1 power cables with 300 mm cable tray	Cut to fit service	Trafalgar FyreFlex, applied to seal the annular gap and in 30 mm × 30 mm cone on unexposed side	Trafalgar TWrap up to 450 mm on the unexposed side	FRT190292 R4.0	Figure 24	-/120/90	TPD35
	AS 1530.4:2014 appendix D1 power cables with 300 mm cable tray	Cut to fit service	Trafalgar FyreFlex, applied to seal the annular gap and in 30 mm × 30 mm cone on the unexposed side	Trafalgar TWrap up to 600 mm on the unexposed side	FRT190292 R4.0	Figure 24	-/120/120*	TPD36
	AS 1530.4:2014 appendix D2 communication cables with 300 mm cable tray	Cut to fit service	Trafalgar FyreFlex, applied to seal the annular gap and 50 mm × 50 mm cone on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on the unexposed side	FRT200384 R1.3	Figure 24	-/180/90	TPD37
	AS 1530.4:2014 appendix D2 communication cables with 300 mm cable tray cut short of the penetration	Cut to fit service	Trafalgar FyreFlex, applied to seal the annular gap and 50 mm × 50 mm cone on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on the unexposed side	FRT200384 R1.3	Figure 24	-/180/120	TPD38
Mixed bundle	1 × 3/8 + 3/4 pair coils with 19 mm FR insulation, 1 × CAT6 cable, 1 × electrical cables, 1 × Ø20 mm PVC drainpipe	Nominally 100 mm	Trafalgar FyrePEX HP sealant up to 100 mm depth	NA	FRT200384 R1.3	Figure 25	-/180/120	TPD39
Electrical and communication cables	15 × TPS cables, 1 × fibre optic NBN cable	Cut to fit service	Trafalgar FyreFlex, applied in 30 mm × 30 mm cone configuration on the unexposed side	NA	FRT200384 R1.3	Figure 27	-/180/120	TPD40
Mixed bundle	1 × 3/8 + 3/4 pair coils with 19 mm FR insulation, 1 × CAT6 cable, 1 × electrical cable, 1 × Ø20 mm PE-Xa/AL/PE, Ø20 mm PE-Xb pipe, 3 × Ø25 mm conduit	Nominally 170 mm	Trafalgar FyreBOX Mini R- 150 and Trafalgar FyreFlex sealant to the full depth	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on the unexposed side	FRT200384 R1.3	Figure 28	Up to - /180/180	TPD41
	Up to 3 × 3/8 + 3/4 pair coils with 19 mm FR insulation, 1 × CAT6 cable,	170 mm	Trafalgar FyreBOX Mini R-150 and	25 mm thick Trafalgar TWrap or 40 mm	FRT200384 R1.3	Figure 28	-/180/120	TPD42

Service type	Description	Aperture	Sealant/ protection	Insulation wrap		Reference figure	FRL	System reference
	1 × electrical cable, 1 × Ø20 mm PE-Xa/AL/PE, Ø20 mm PE-Xb pipe, 3 × Ø25 mm conduit		Trafalgar FyreFlex sealant to the full depth	thick MonoWrap 300 mm on each side				
Conduit	Ø40 mm PVC conduit, wall thickness 2.6 mm	Nominally 44 mm	Trafalgar FyreCHOKE collar – Ø40 mm on the exposed side	NA	FRT200384 R1.3	Figure 29	-/120/120	TPD43
	Ø25 mm conduit, wall thickness 2 mm	Nominally 65 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	FRT200385 R1.2	Figure 26	-/240/180	TPD44
Plastic pipes	Ø20 mm PE-Xa/AL/PE pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	FRT200385 R1.2	Figure 26	-/240/90	TPD45
	Ø20 mm PE-Xa/AL/PE pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on the unexposed side	FRT200385 R1.2	Figure 26	-/240/120	TPD46
	Ø20 mm PE-Xb pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	FRT200385 R1.2	Figure 26	-/180/180	TPD47
	Ø20 mm PE-Xa pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	FRT200385 R1.2	Figure 26	-/180/180	TPD48
	Ø50 mm uPVC pipe, wall thickness 2 mm	Nominally 60 mm	Trafalgar FyreCHOKE collar – Ø50 mm on the exposed side	NA	FRT200384 R1.3	Figure 29	-/180/180	TPD49
Metal pipes	32 mm –150 mm galvanised steel pipe, wall thickness 4.9 mm	Nominally 190 mm	Trafalgar FyreFlex, applied to the full depth and in 50 mm × 50 mm cone	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on the unexposed side	FRT200384 R1.3	Figure 24	-/180/120	TPD50

Service type	Description	Aperture	Sealant/ protection	Insulation wrap		Reference figure	FRL	System reference
			configuration on the unexposed side.					
	32 mm – 100 mm galvanised steel pipe, wall thickness 4.8 mm	Nominally 135 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on the unexposed side	FRT200385 R1.2	Figure 24	-/240/120	TPD51
	50 mm copper or steel pipes, wall thickness 1.22 mm	Nominally 80 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on the unexposed side	FRT200385 R1.2	Figure 24	-/240/120	TPD52
	80 mm copper or steel pipes, wall thickness 1.63 mm	Nominally 100 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on the unexposed side	FRT200385 R1.2	Figure 24	-/240/120	TPD53
	100 mm copper or steel pipes, wall thickness 1.63 mm	Nominally 135 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on the unexposed side	FRT200385 R1.2	Figure 24	-/240/120	TPD54
	Up to 150 mm copper or steel pipes, wall thickness 2.03 mm	Nominally 180 mm	Trafalgar FyreFlex sealant to the full depth and in 30 mm × 30 mm cone configuration on the unexposed side	Trafalgar Uniguard 600 mm on the unexposed side	FRT200385 R1.2	Figure 24	-/180/180	TPD55

Notes –

- It is understood that the services will be installed in blank seals protected with single layer of Trafalgar FyreBATT as summarised Table 2. As such, the system FRL must be determined with consideration to the expected performance of the blank seal and the service penetration as a combination. The lowest indices in terms of integrity and insulation for particular blank seal and penetration service combination will be the applicable FRL of the system.
- As cable stipulated in Appendix D1 and D2 were tested, the assessed FRL is applicable to all PVC and XLPE insulated and sheathed power and communication cables with copper conductors.

Service type	Description	Aperture	Sealant/ protection	Insulation wrap	Reference figure	FRL	System reference

- The annular gap between the metal pipes and the separating element must not exceed 20 mm.
- The insulation performance will be limited to 120 minutes if Trafalgar MonoWrap is used.
- Minimum separation between services must be 40 mm as per the stipulation of AS 4072.1:2005.
- All penetrations may be installed in an aperture protected with a single layer of FyreBATT with an extra layer of FyreBATT built up extending a minimum of 100 mm from the service in all directions as illustrated in Figure 30. The maximum size of the local patch must not exceed 400 mm × 400 mm. The FRL for these systems is limited by the FRL specified for single layer floor systems in Table 1.
- The double layer FyreBATTs can also be surface mounted as illustrated in Figure 31. In such case, the overlap between the edge of the floor and FyreBATT must be at least 120 mm for -/120/120 and 150 mm for -/180/180.
- Services can also be installed into the aperture protected with a single layer of surface mounted FyreBATT with an extra layer of FyreBATT built up extending a minimum of 100 mm from the service in all directions as illustrated in Figure 32. The maximum size of the local patch must not exceed 400 mm × 400 mm. In such case, only one service is permitted with local patching in a blank seal. The FRL for these systems is limited by the FRL specified for single layer floor systems in Table 1. The overlap between the edge of the floor and FyreBATT must be at least 120 mm for -/120/120 and 150 mm for -/180/180.
- D1 and D2 cable configurations can be installed as constructed in FRT200256 R1.1 (specimen A1) with protection on 3 sides and rigid wall element on one side. The FRL of these systems is limited to -/180/180. The cable tray can also be optionally installed against a plasterboard wall. In such case, the plasterboard wall must have an established FRL that matches the FRL of the relevant service. The system construction is illustrated in Figure 33.

*Single and multi-copper core power cables with cores up to 185 mm^2 – 450 mm wrap on the top side

*Single core copper cables with core size greater than 185 mm^2 – 600 mm wrap on the top side

The variations and outcome of this assessment are subject to the limitations and requirements described in sections 2, 3 and 7 of this report. The results of this report are valid until 31 March 2027.

Contents

1. Introduction

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of Trafalgar FyreBATT in accordance with AS 1530.4:2014[2] and AS 4072.1:2005[3] .

This assessment was carried out at the request of Trafalgar Group. The sponsor details are included in Table 6.

Table 6 Sponsor details

Sponsor	Address
Trafalgar Group	26a Ferndell Street South Granville NSW 2142 Australia

2. Framework for the assessment

2.1 Assessment approach

An assessment is an opinion about the expected performance of a component or element of structure if it was subject to a fire test.

No specific framework, methodology, standard or guidance documents exists in Australia for doing these assessments. We have therefore followed the 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the Passive Fire Protection Forum (PFPF) in the UK in 2021[4].

This guide provides a framework for undertaking assessments in the absence of specific fire test results. Some areas where assessments may be offered are:

- Where a modification is made to a construction which has already been tested
- The interpolation or extrapolation of results of a series of fire resistance tests, or utilisation of a series of fire test results to evaluate a range of variables in a construction design or a product
- Where, for various reasons – eg size or configuration – it is not possible to subject a construction or a product to a fire test.

Assessments will vary from relatively simple judgements on small changes to a product or construction through to detailed and often complex engineering assessments of large or sophisticated constructions.

This assessment uses established empirical methods and our experience of fire testing similar products to extend the scope of application by determining the limits for the design based on the tested constructions and performances obtained. The assessment is an evaluation of the potential fire resistance performance if the elements were to be tested in accordance with AS 1530.4:2014.

This assessment has been written using appropriate test evidence generated at accredited laboratories to the relevant test standard. The supporting test evidence has been deemed appropriate to support the manufacturer's stated design.

[2] Standards Australia, 2014, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction, AS 1530.4:2014, Standards Australia, NSW.
[3] Standards Australia, 2005, Components for the protection of openings in fire-resistant separating elements: Service penetrations and control joints (Reconfirmed 2016), AS 4072.1:2005 (R2016), Standards Australia, NSW.
[4] Passive Fire Protection Forum (PFPF), 2021, Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence, Passive Fire Protection Forum (PFPF), UK.

2.2 Compliance with the National Construction Code

This assessment report has been prepared to meet the evidence of suitability requirements of the National Construction Code Volumes One and Two – Building Code of Australia (NCC) 2019 including Amendments[5] under A5.2 (1) (d).

This assessment has been written in accordance with the general principles outlined in EN 15725:2010[6] for extended application reports on the fire performance of construction products and building elements. It also references test evidence for meeting a performance requirement or deemed to satisfy (DTS) provisions of the NCC under A5.4 for fire resistance levels, as applicable to the assessed systems.

This assessment report may also be used to demonstrate compliance with the requirements for evidence of suitability under NCC 2016 including Amendments[7].

2.3 Declaration

The 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the PFPF in the UK requires a declaration from the report sponsor. By accepting our fee proposal on 22 April 2021, Trafalgar Group confirmed that:

- To their knowledge the component or element of structure, which is the subject of this assessment, has not been subjected to a fire test to the standard against which this assessment is being made.
- They agree to withdraw this assessment from circulation if the component or element of structure is the subject of a fire test by a test authority in accordance with the standard against which this assessment is being made and the results are not in agreement with this assessment.
- They are not aware of any information that could adversely affect the conclusions of this assessment and – if they subsequently become aware of any such information – they agree to ask the assessing authority to withdraw the assessment.

3. Limitations of this assessment

- The scope of this report is limited to an assessment of the variations to the tested systems described in section 4.3.
- This report details the methods of construction, test conditions and assessed results that are expected if the systems were tested in accordance with AS 1530.4:2014.
- The results of this assessment are applicable to fire exposure from each side for the assessed services through wall systems. For services through floors, the applicable direction of fire is from below where horizontal elements is exposed to heat from the underside only.
- FRL of the blank seal and services will be governed by the established FRL of the separating element.
  - Concrete and masonry walls/floors must have an established FRL through test or assessment. Alternatively, must be designed in accordance with AS 3600:2018[8] or AS 3700:2018[9], respectively.
  - The double layer plasterboard wall must be minimum 116 mm thick and constructed of 2 × 13 mm or 2 × 16 mm plasteboard on each side. The wall must be tested or assessed for the required FRL.

[5] National Construction Code Volumes One and Two - Building Code of Australia 2019 including Amendments, Australian Building Codes Board, Australia
[6] European Committee for Standardization, 2010, Extended application reports on the fire performance of construction products and building elements, EN 15725:2010, European Committee for Standardization, Brussels, Belgium.
[7] National Construction Code Volumes One and Two - Building Code of Australia 2016 including Amendments, Australian Building Codes Board, Australia
[8] Standards Australia, 2018, Concrete structures, AS 3600:2018 (Incorporating Amendment No. 1), Standards Australia, NSW.
[9] Standards Australia, 2018, Masonry structures, AS 3700:2018, Standards Australia, NSW.

  - The single layer plasterboard wall must be minimum 90 mm thick and constructed of 1 × 13 mm or 1 × 16 mm plasterboard on each side. The wall must be tested or assessed for the required FRL. The aperture size will be limited to 600 mm high × 600 mm wide in 1 × 13 mm pasteboard wall systems.
  - Speedpanel system FRL will be restricted to -/60/60, -/90/90 and -/120/120 for 51 mm, 64 mm and 78 mm thick walls, respectively. The aperture size will be limited to 600 mm high × 600 mm wide in 51 mm Speedpanel wall.
  - Hebel and Walsc wall must be minimum 75 mm thick and must be tested or assessed for the required FRL.

- This report is only valid for the assessed systems and must not be used for any other purpose. Any changes with respect to size, construction details, loads, stresses, edge or end conditions – other than those identified in this report – may invalidate the findings of this assessment. If there are changes to the system, a reassessment will need to be done by an Accredited Testing Laboratory (ATL).
- The documentation that forms the basis for this report is listed in Appendix A .
- This report has been prepared based on information provided by others. Warringtonfire has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may be incorporated into this report as a result.
- This assessment is based on the proposed systems being constructed under comprehensive quality control practices and following appropriate industry regulations and Australian Standards on quality of materials, design of structures, guidance on workmanship and the expert handling, placing and finishing of the products on site. These variables are beyond the control and consideration of this report.

4. Description of the specimen and variations

4.1 System description

The proposed systems consist of aperture and penetration services protected with Trafalgar FyreBATT. The FyreBATT is installed into a variety of wall and floor systems. The services are protected locally with Trafalgar sealants or other fire stopping elements as appropriate.

4.2 Referenced test data

The assessment of the variation to the tested system and the determination of the expected performance is based on the results of the fire tests documented in the reports summarised in Table 7. Further details of the tested systems are included in Appendix A.

Table 7 Referenced test data

Report/Assessment report number	Test sponsor	Test date	Testing authority
FRT200329 R1.3	Trafalgar Group	29 October 2020	Warringtonfire Australia
FRT180392 R1.1		27 November 2018	
FRT200331 R1.2		28 October 2020	
FRT200397 R1.2		22 December 2020	
FRT200384 R1.3		18 December 2020	
FRT180385 R1.2		21 December 2020	
FRT210436 R1.0		10 January 2022	
FRT210260 R2.0		22 October 2021	
FRT210467 R1.0		09 February 2022	
FRT190292 R4.0	Trafalgar Fire	16 January 2020	

WF 375797	Report sponsor known to Warringtonfire. Permission received from sponsor to review and reference these reports.	9 March 2017	Warringtonfire UK
WARRES 317711		09 July 2012	
WARRES 317718		12 September 2012	
F16150	Report sponsor known to Warringtonfire. Permission received from sponsor to review and reference these reports.	20 May 2016	
FSV 2145	CSR Building Products Limited (Permission granted from the sponsor)	14 October 2020	Infrastructure Technologies
NI 0687	Wormald Fire Systems (Permission granted from the sponsor)	02 April 1987	Fire Research Laboratories
EWFA 21622-31	Speedpanel (VIC) Pty Ltd	14 February 2019	Warringtonfire Australia

4.3 Variations to the tested systems

An identical system has not been subject to a fire test. We have therefore assessed the systems using baseline test information for similar systems. The variations to the tested systems – together with the referenced standard fire tests – are described in Table 8.

Table 8 Variations to tested systems

Item	Reference test	Description	Variations
Blank seals	F16150, WARRES 317711, WF375797	Trafalgar FyreBATT was tested in 150 mm thick concrete walls and floors.	It is proposed that, the applicability of the separating element is extended to include concrete or masonry walls and floors equal or greater than 120 mm, 150 mm and 175 mm thick.
	WF 317718, FRT210436 R1.0	Trafalgar FyreBATT was tested as aperture seal in a 2 × 12.5 mm plasterboard wall system.	It is proposed that, the applicability of the pasteboard wall is extended to include 1 × 13 mm and 1 × 16 mm plasterboard wall systems, and 25 mm shaftliner wall with 1 × 16 mm fire rated plasterboard.
	FRT210436 R1.0	Trafalgar FyreBATT was tested as aperture seal in 78 mm thick Speedpanel wall.	It is proposed that, the applicability of the wall system is extended to include 51 mm and 64 mm Speedpanel walls, and 75 mm Hebel and Walsc AAC walls.
Penetration services	FRT200329 R1.3, FRT200331 R1.2, FRT200397 R1.2, FRT200384 R1.3 and FRT200385 R1.2	A series of penetration services were tested while passing through single or double layers of Trafalgar FyreBATT. The FyreBATT was installed in either plasterboard, Speedpanel, or concrete walls or floors.	It is proposed that, these services will be installed while passing through single or double layers of FyreBATT when the FyreBATT is installed in plasterboard, Shaftliner, Hebel, Walsc AAC, masonry or concrete walls, or concrete floor systems.

4.4 Test and assessment standards

AS 1530.4:2014 sets out method for fire tests on building materials, components and structures and other elements of construction. AS 1530.4:2014 section 10 further stipulates the testing procedure of service penetrations.

AS 4072.1:2005 sets out the minimum requirements for the construction, installation and application of fire resistance tests to a sealing system.

4.5 Illustration of the assessed systems

4.5.1 Blank seals

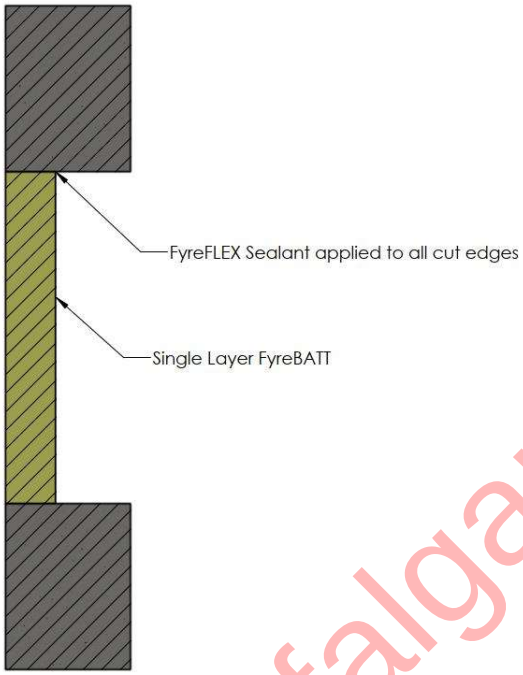


Figure 1 Blank seal protected with single layer of FyreBATT in concrete / masonry wall

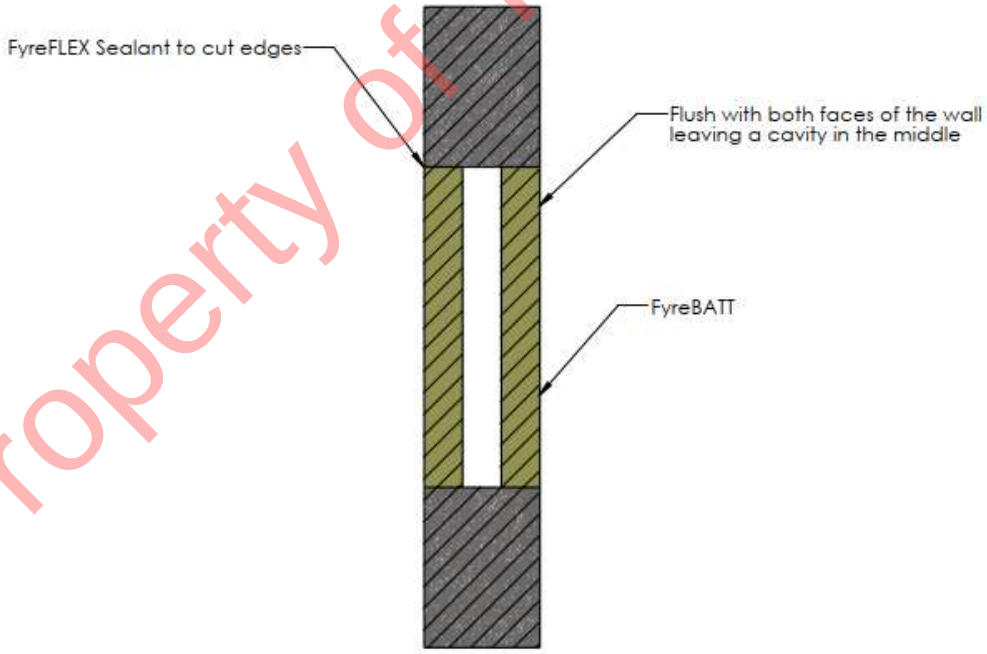


Figure 2 Blank seal protected with two layers of FyreBATT in concrete / masonry wall

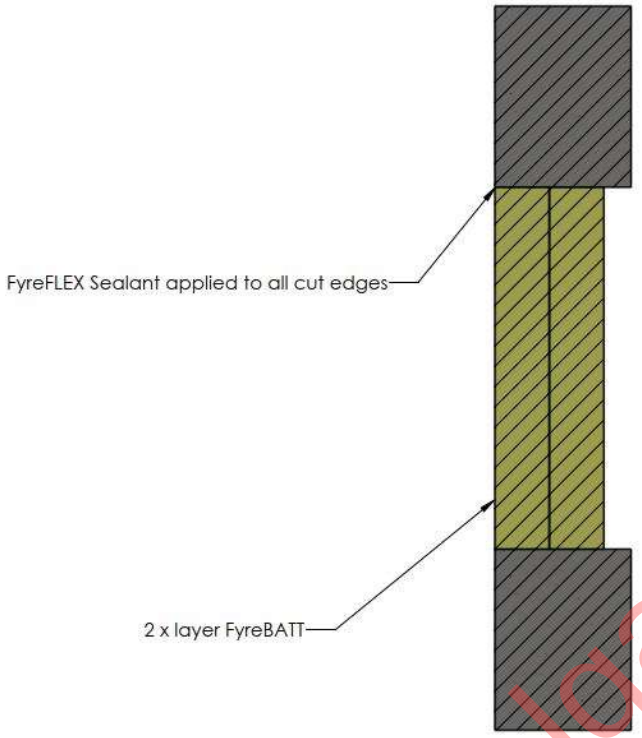


Figure 3 Blank seal protected with two layers of FyreBATT in concrete / masonry wall – applied back-to-back

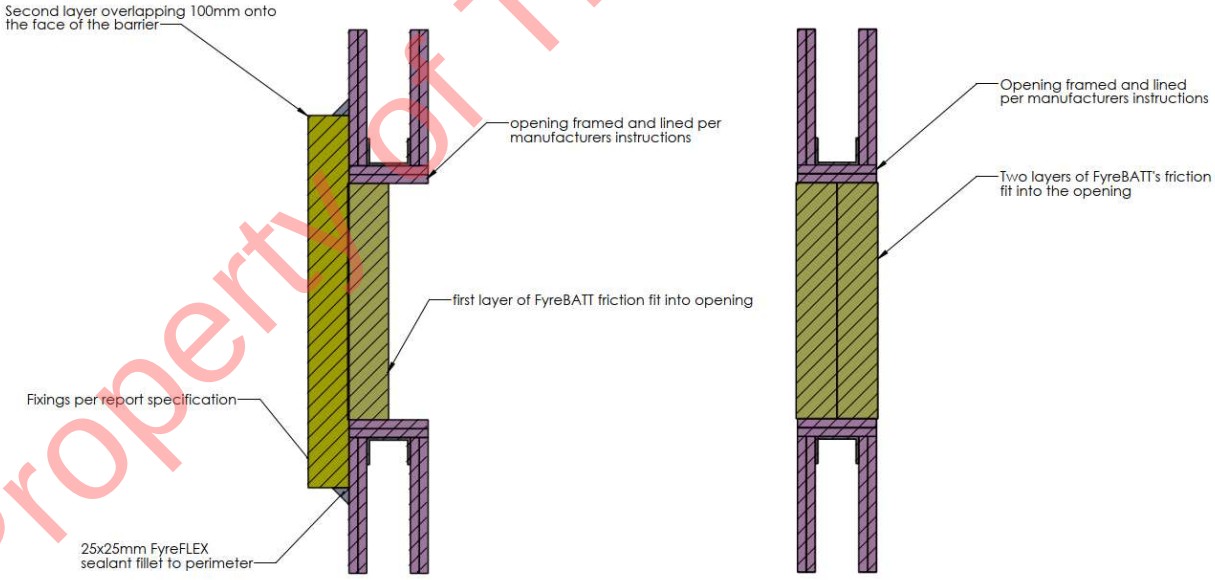


Figure 4 Blank seal protected with two layers of FyreBATT in plasterboard wall system

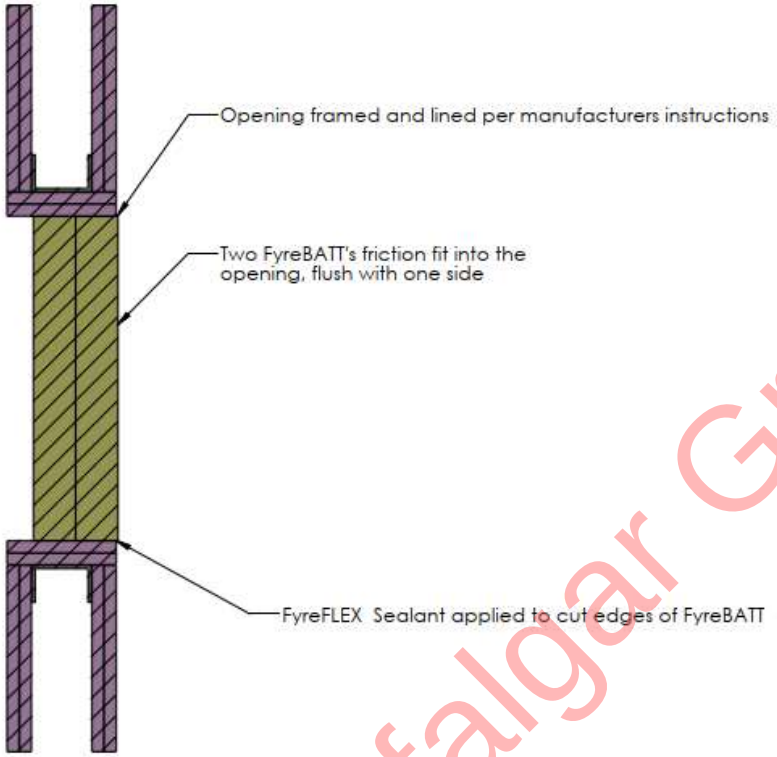


Figure 5 **Blank seal protected with two layers of FyreBATT in plasterboard wall system**

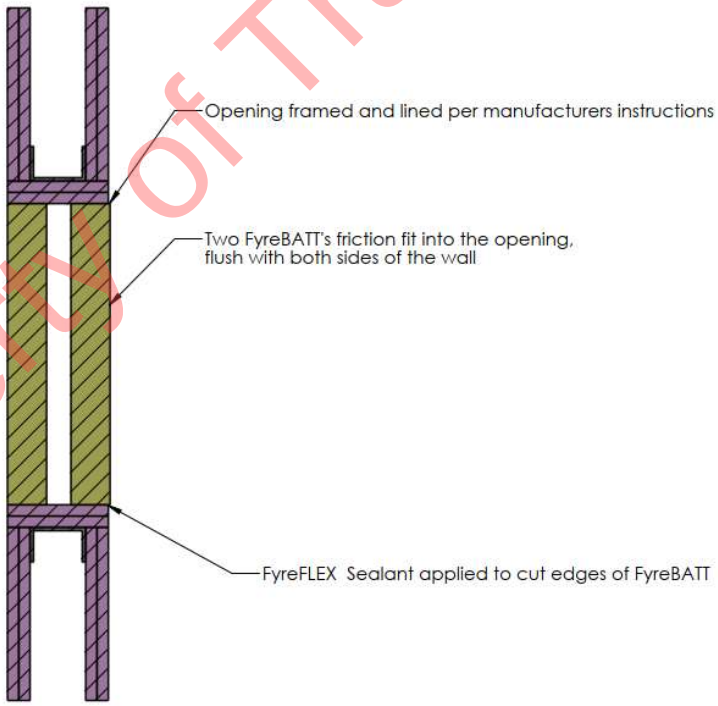


Figure 6 **Blank seal protected with two layers of FyreBATT in plasterboard wall system – installed with a cavity**

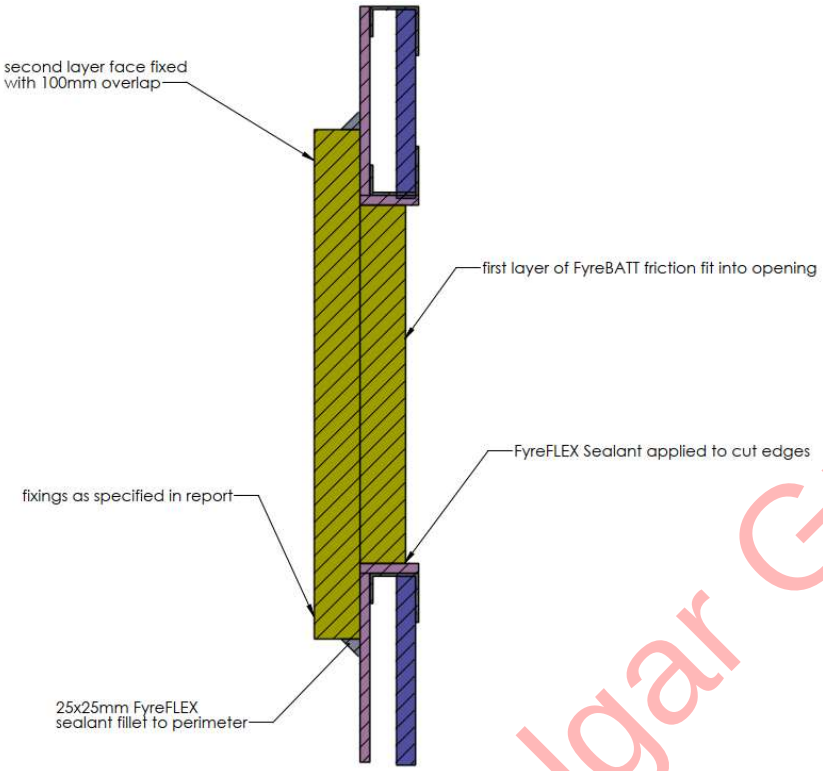


Figure 7 Pattress fit FyreBATT in Shaftliner wall system

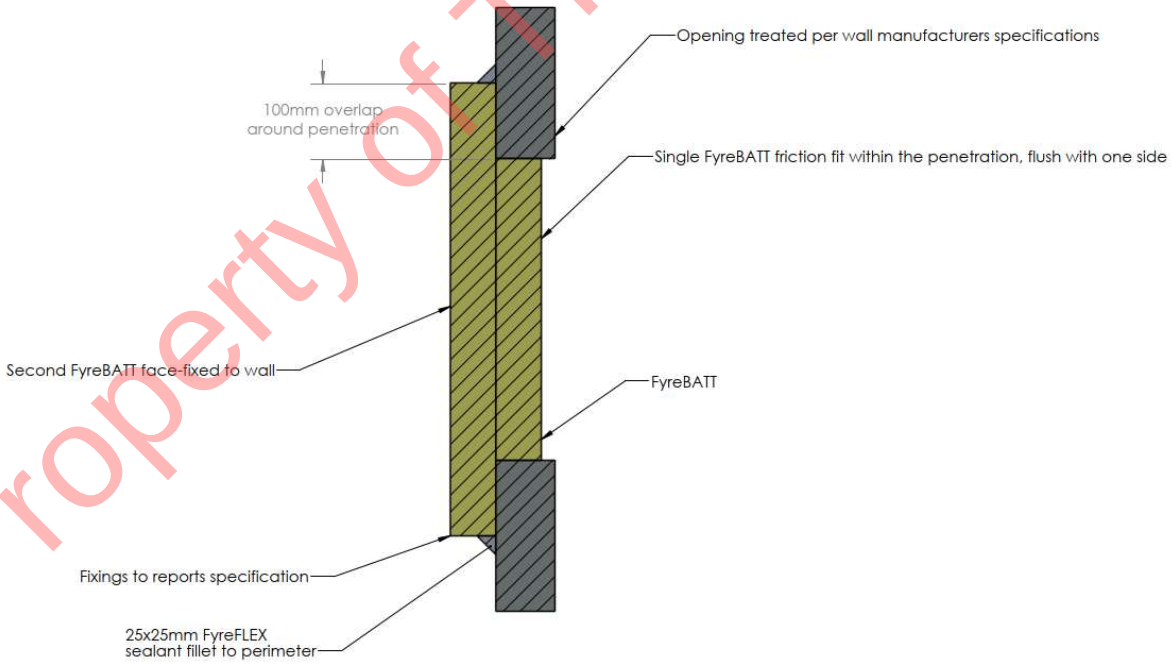


Figure 8 Blank seal protected with pattress fit FyreBATT in Speedpanel, Hebel, Walsc and 1 × 13 mm or 16 mm plasterboard wall

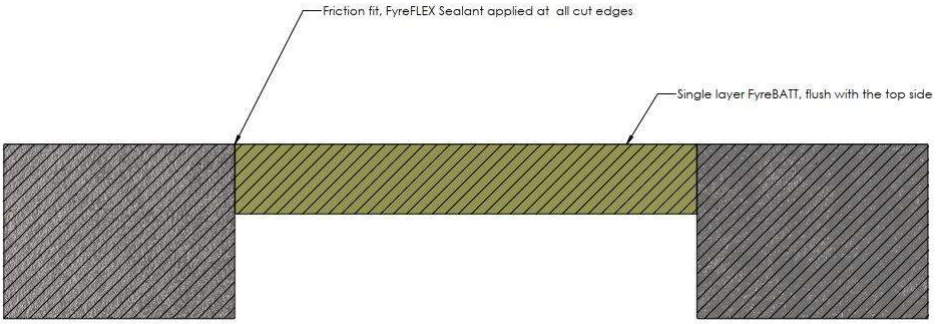


Figure 9 Blank seal protected with single layer of Trafalgar FyreBATT in floors

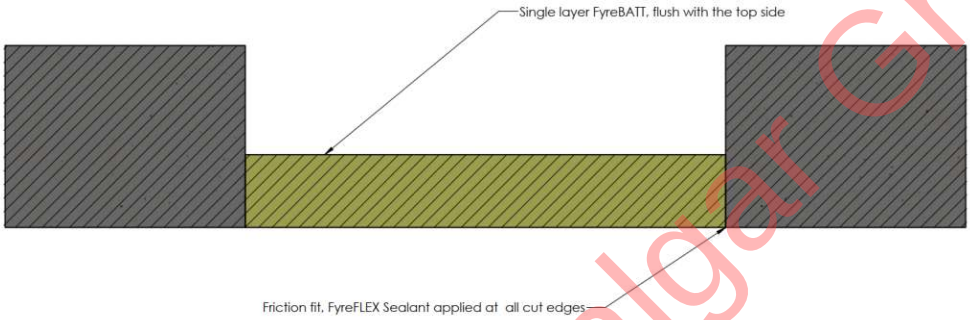


Figure 10 Blank seal protected with single layer of Trafalgar FyreBATT in floors

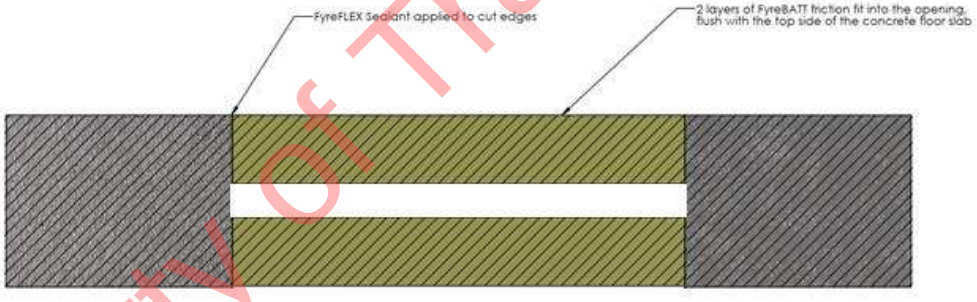


Figure 11 Blank seal protected with double layers of Trafalgar FyreBATT in floors with cavity

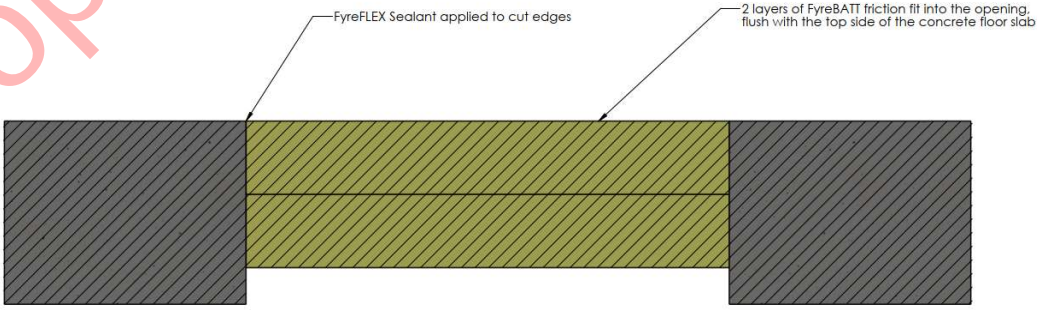


Figure 12 Blank seal protected with double layers of Trafalgar FyreBATT in floors– applied back-to-back

4.5.2 Service passing through Trafalgar FyreBATT

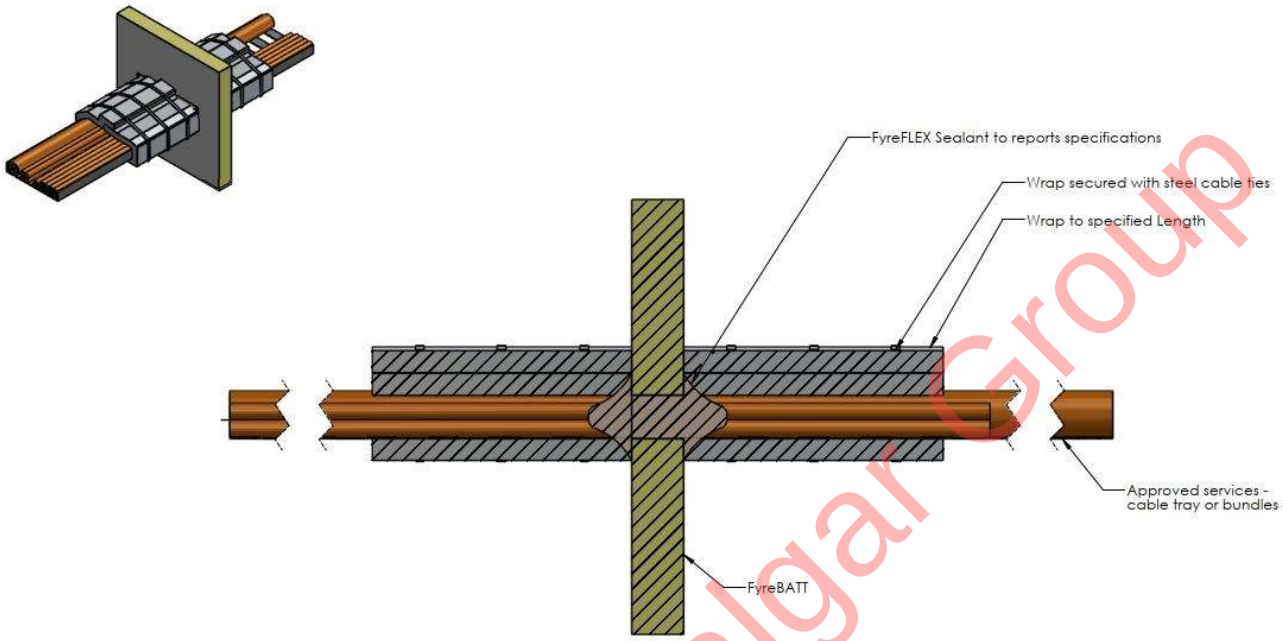


Figure 13 Service protected with sealant and Wrap in single layer BATT system

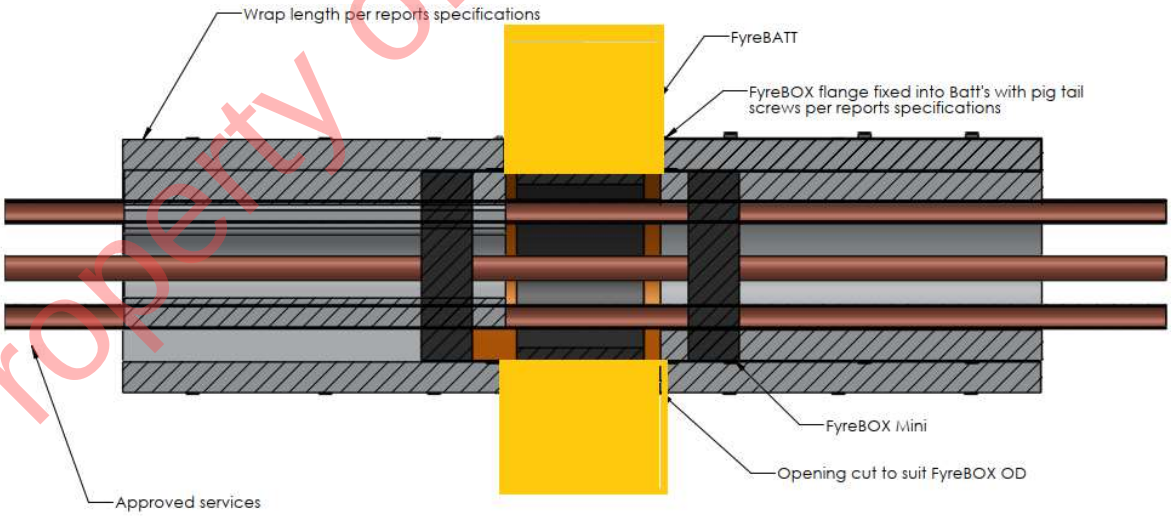


Figure 14 Services protected with FyreBOX Mini in single layer BATT system

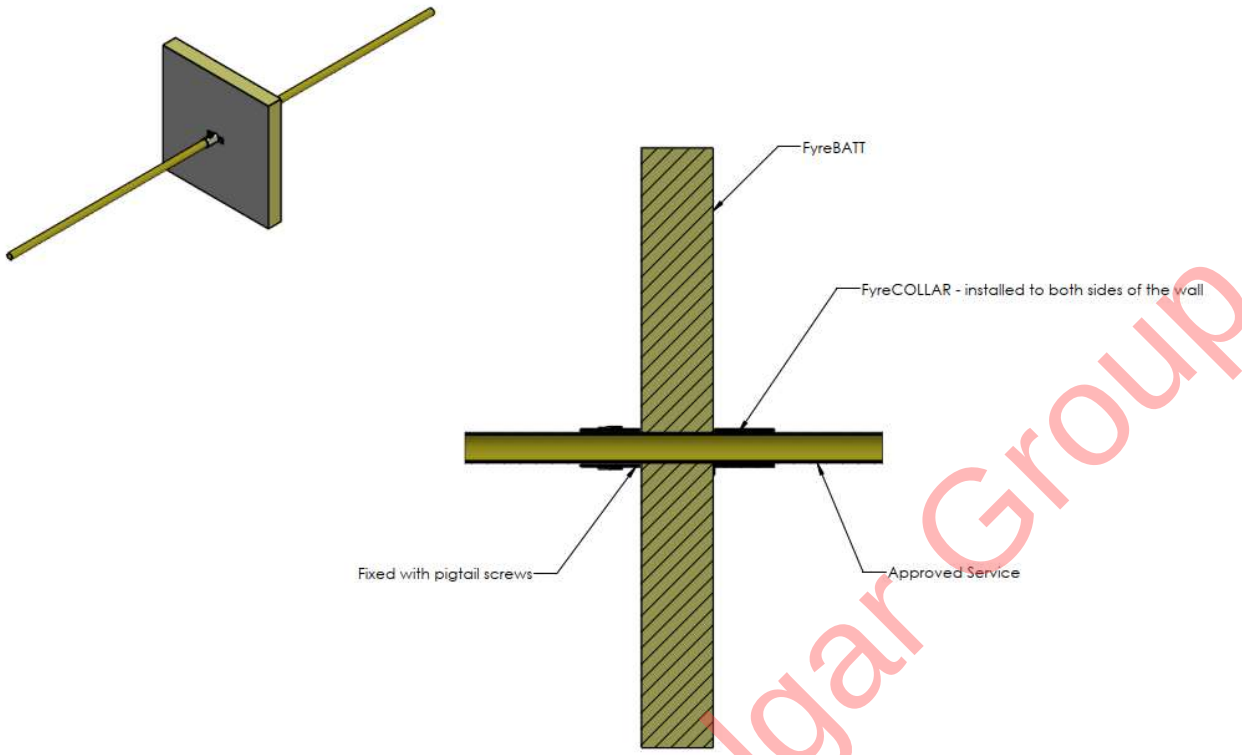


Figure 15 Service protected with Fyrechoke – micro collar in single layer FyreBATT system

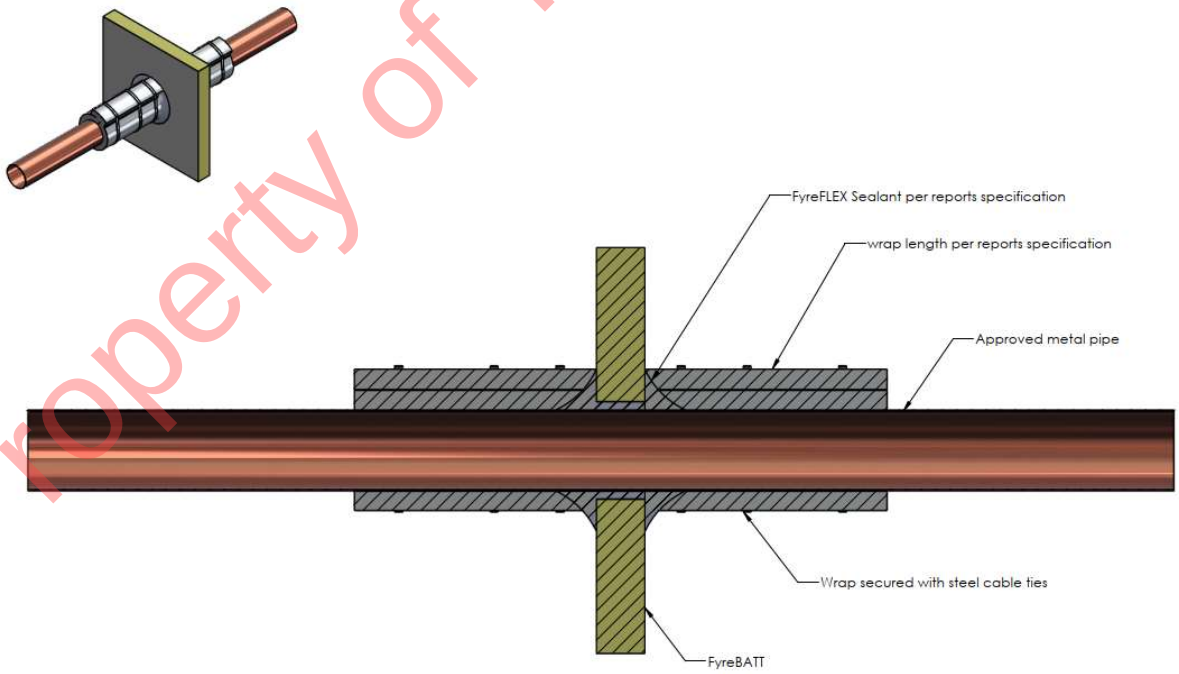


Figure 16 Metal pipe protected with sealant and Wrap in single layer BATT system

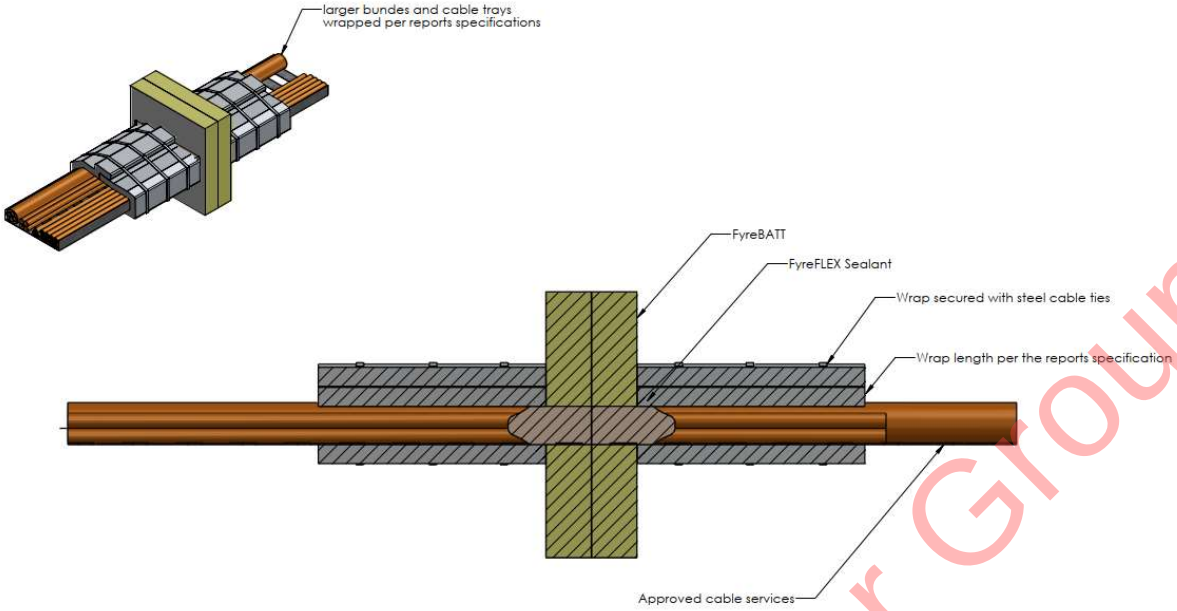


Figure 17 Services protected with sealant and wrap in double layers BATT system

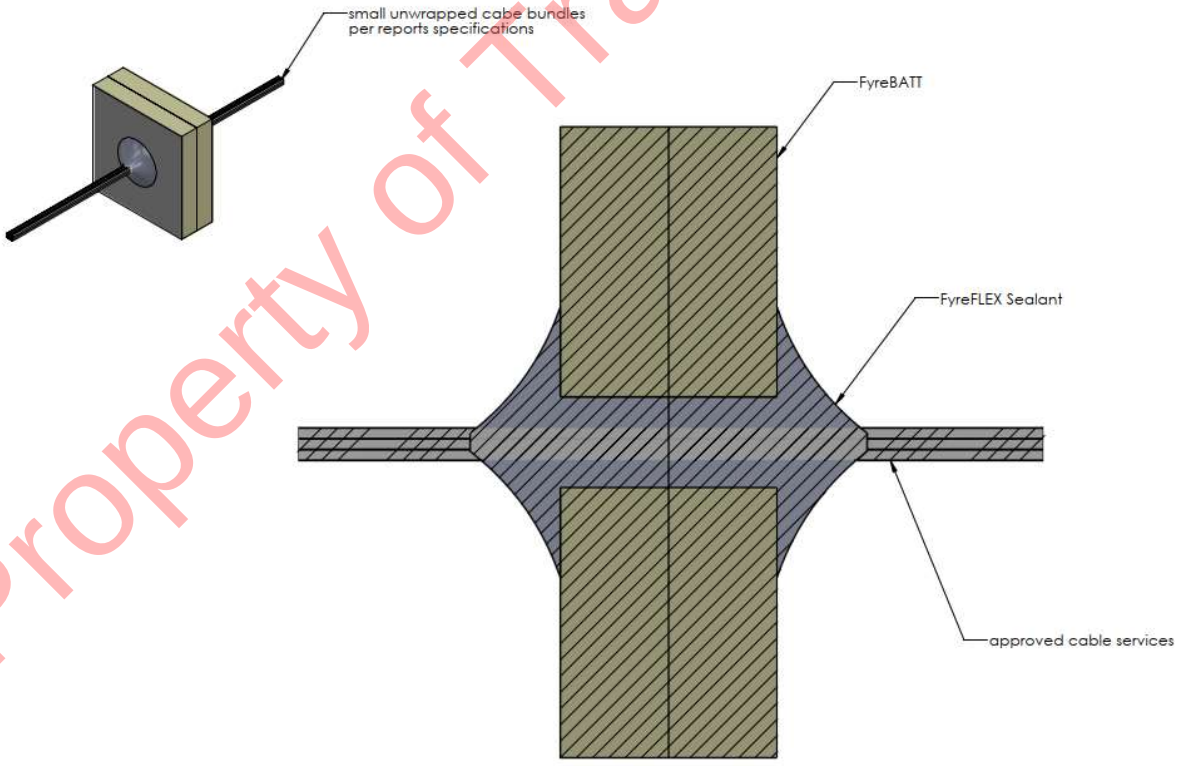


Figure 18 Services protected with FyreFlex sealant in double layers BATT system

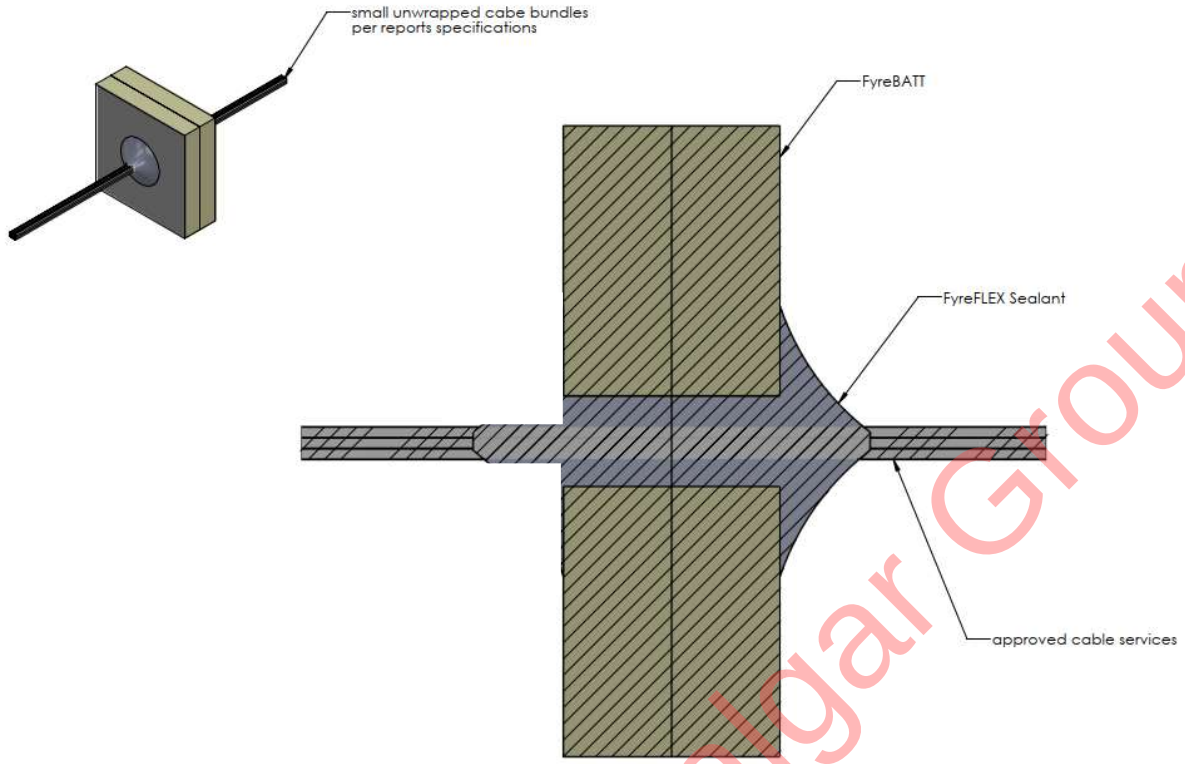


Figure 19 Services protected with FyreFlex sealant in double layers BATT system

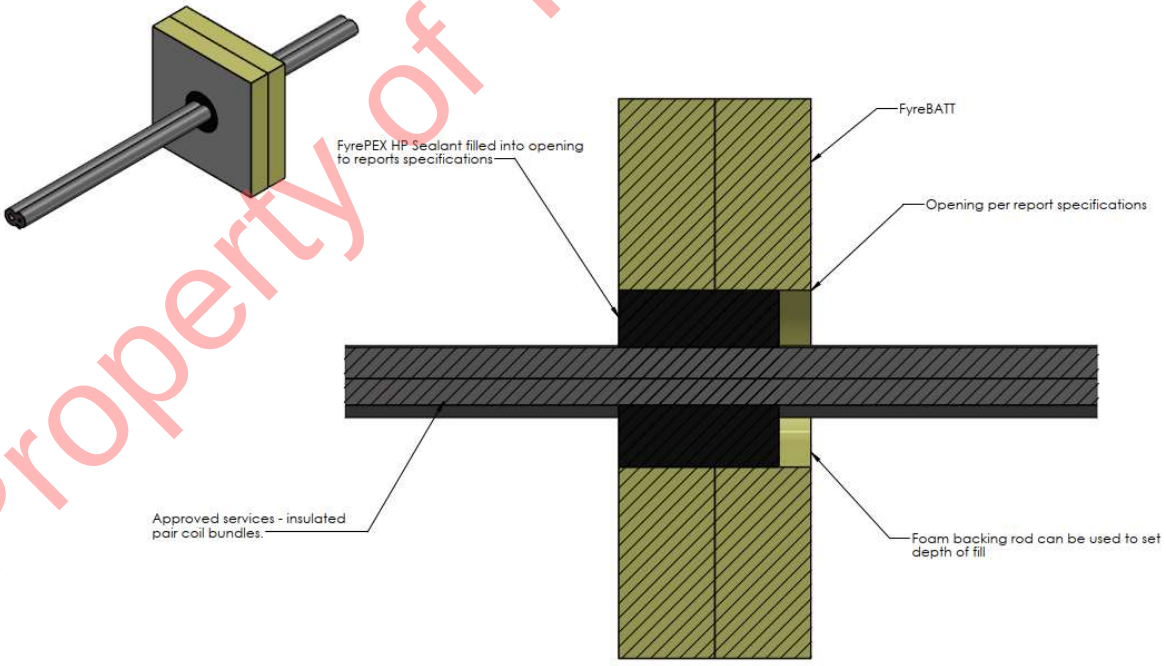


Figure 20 Services protected with FyrePEX HP sealant in double layers BATT system

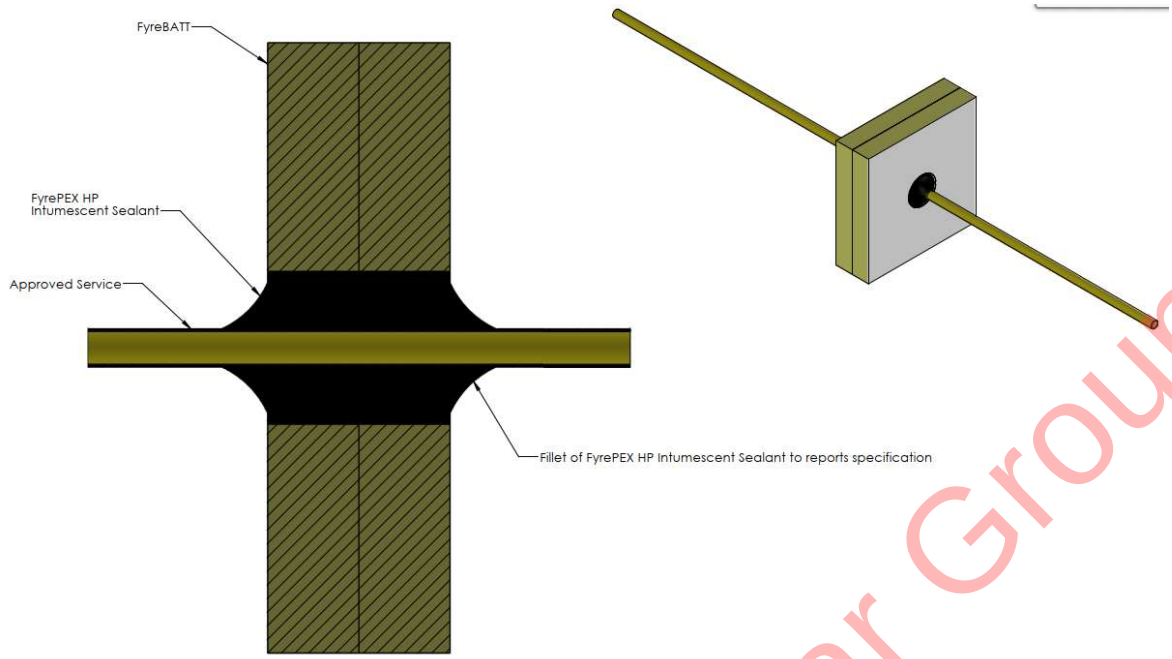


Figure 21 Services protected with FyrePEX HP sealant with additional cone in double layers BATT system

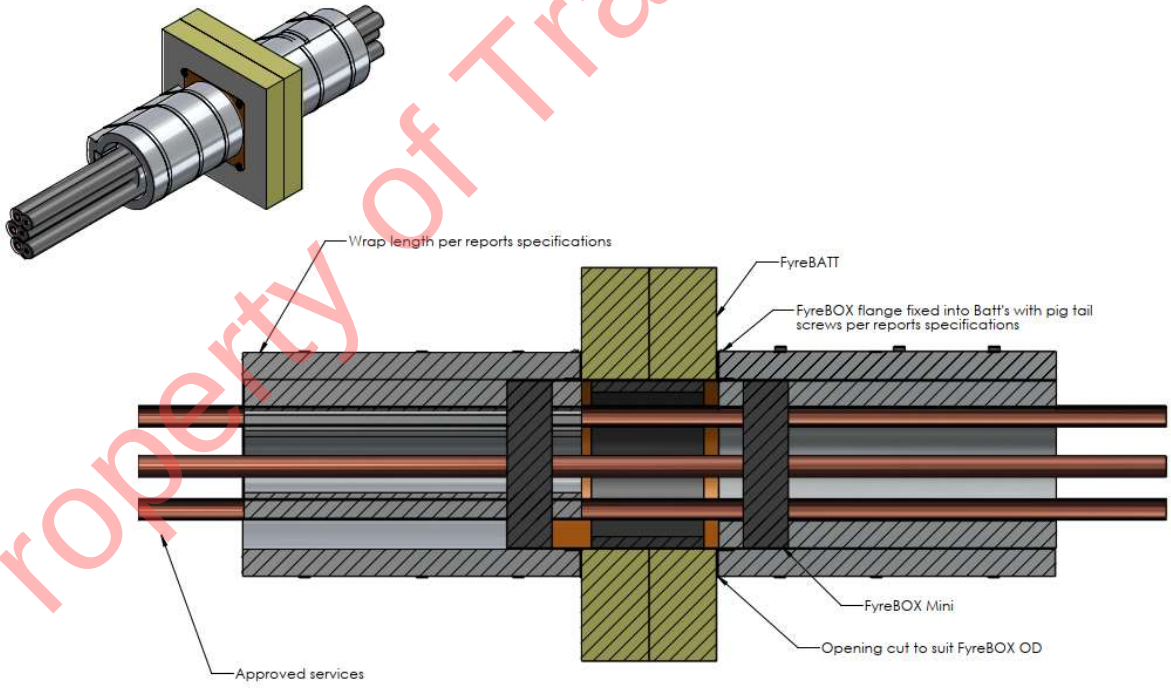


Figure 22 Services protected with FyreBOX in double layers BATT systems

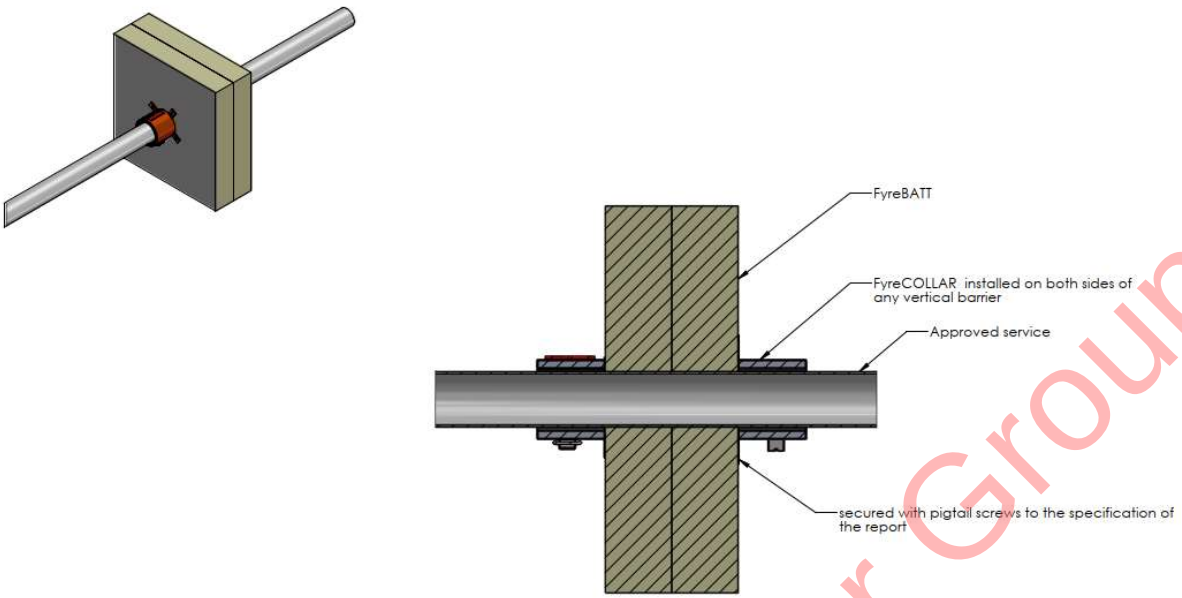


Figure 23 Services protected with FyreCHOKE collar in double layers BATT systems

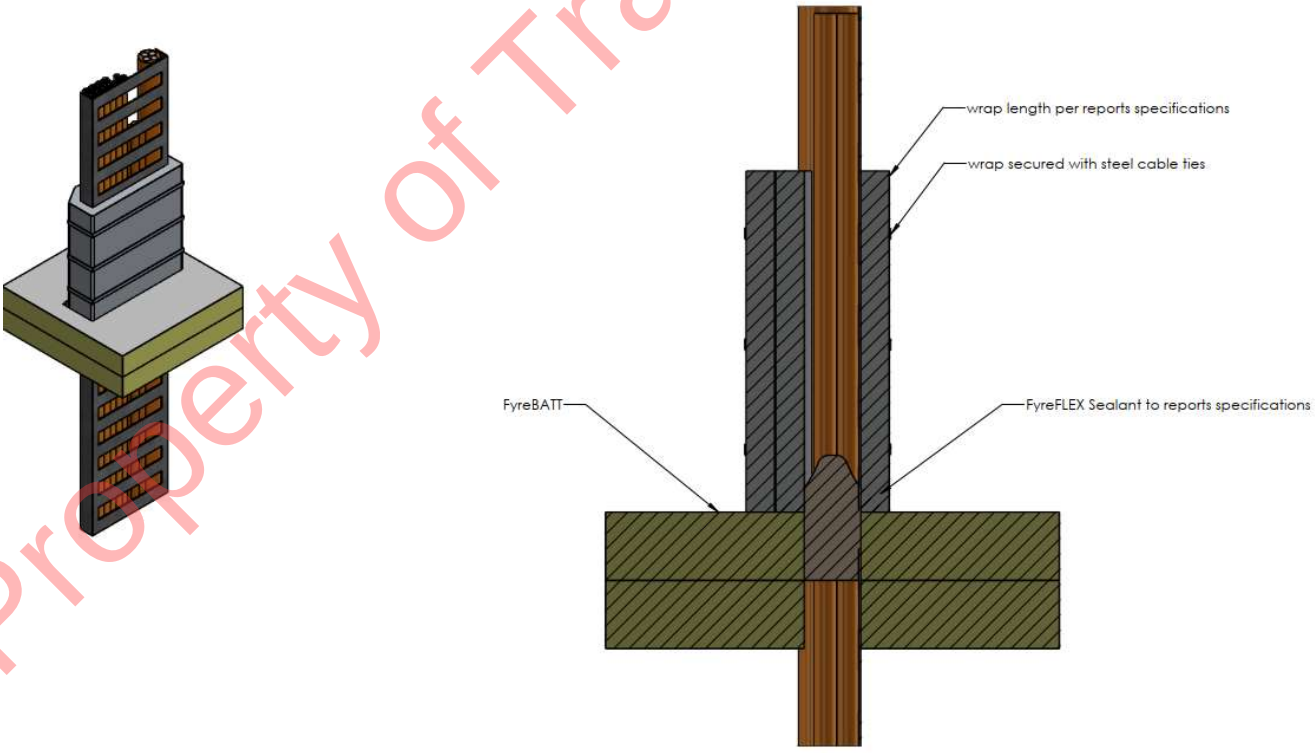
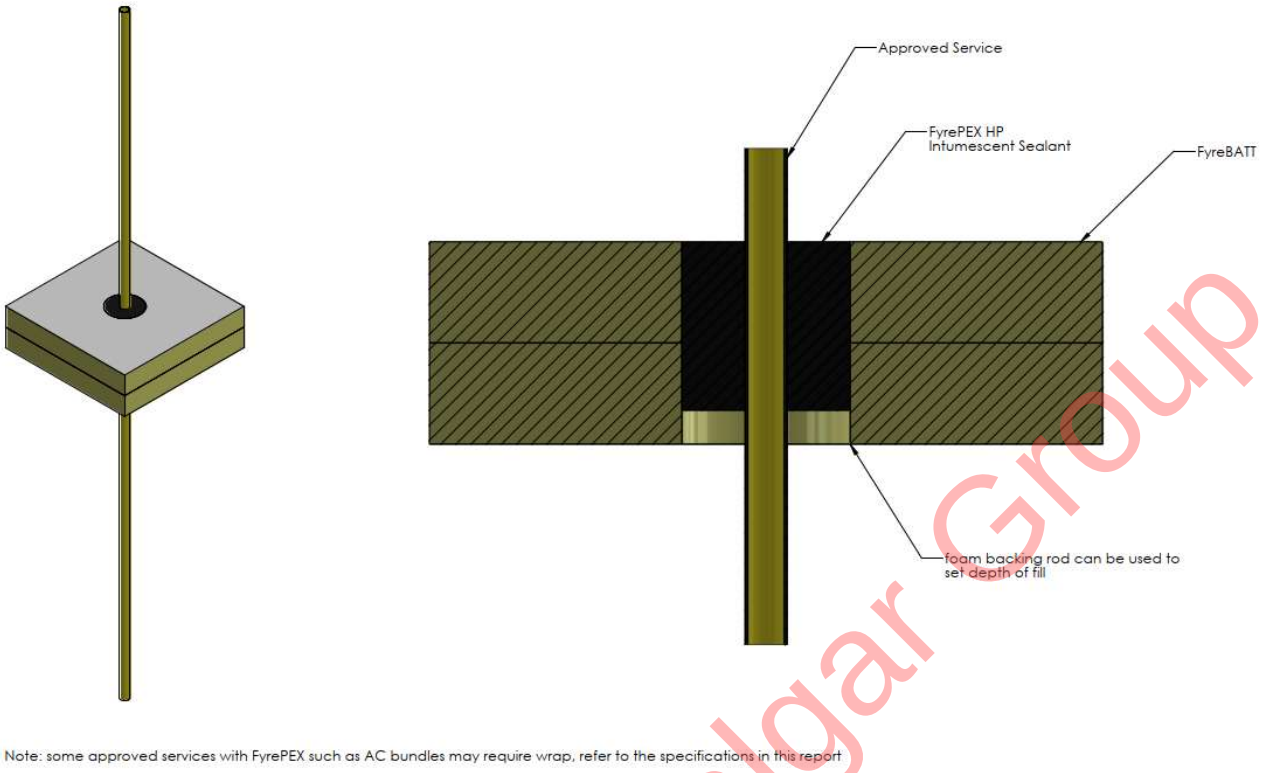


Figure 24 Services protected with sealant and wrap in floor



Note: some approved services with FyrePEX such as AC bundles may require wrap, refer to the specifications in this report

Figure 25 Services protected with FyrePEX HP in floors

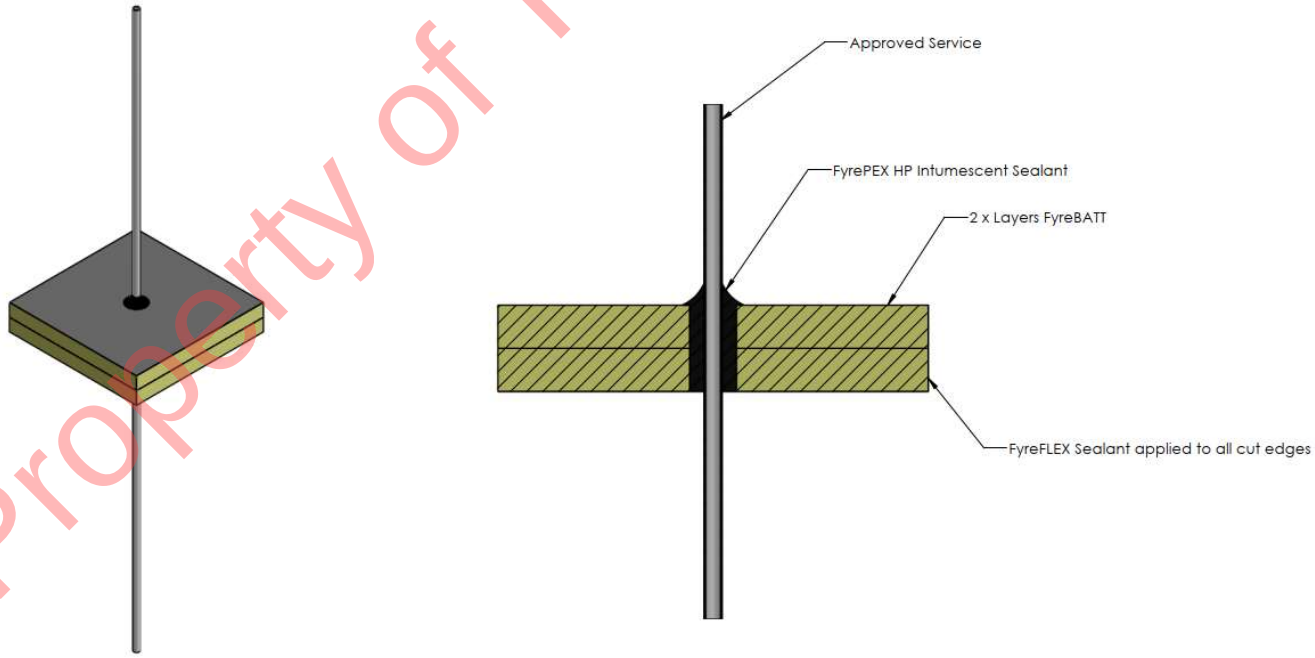


Figure 26 Services protected with FyrePEX HP sealant in floors with additional conning

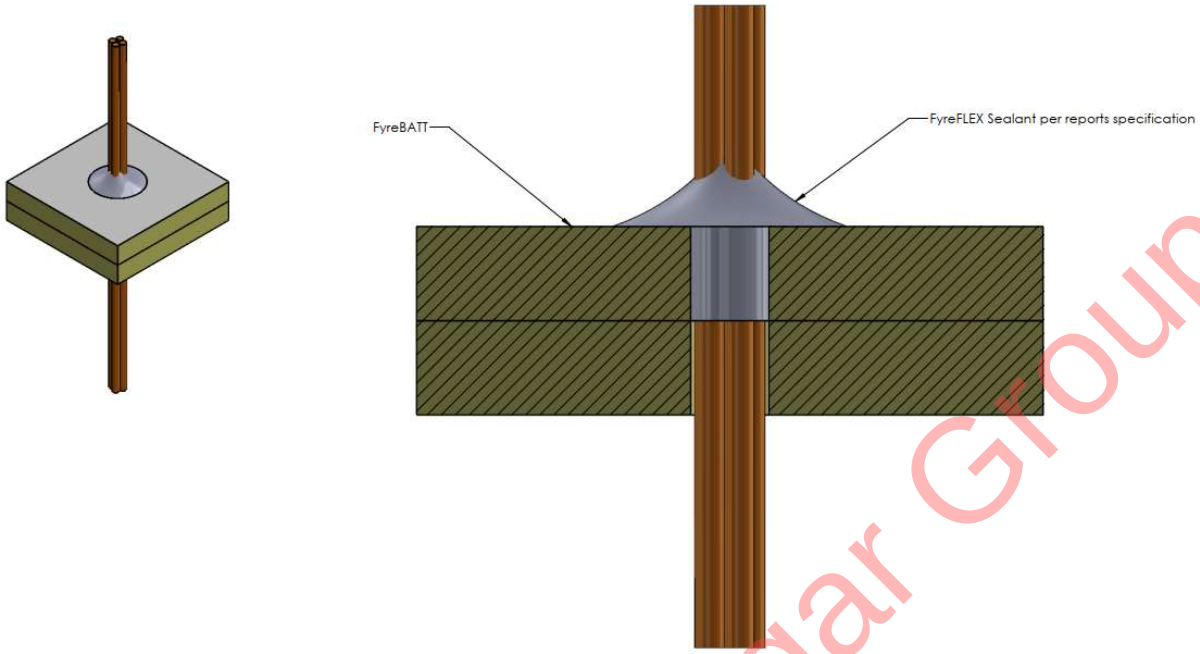


Figure 27 Services protected with sealant in floor

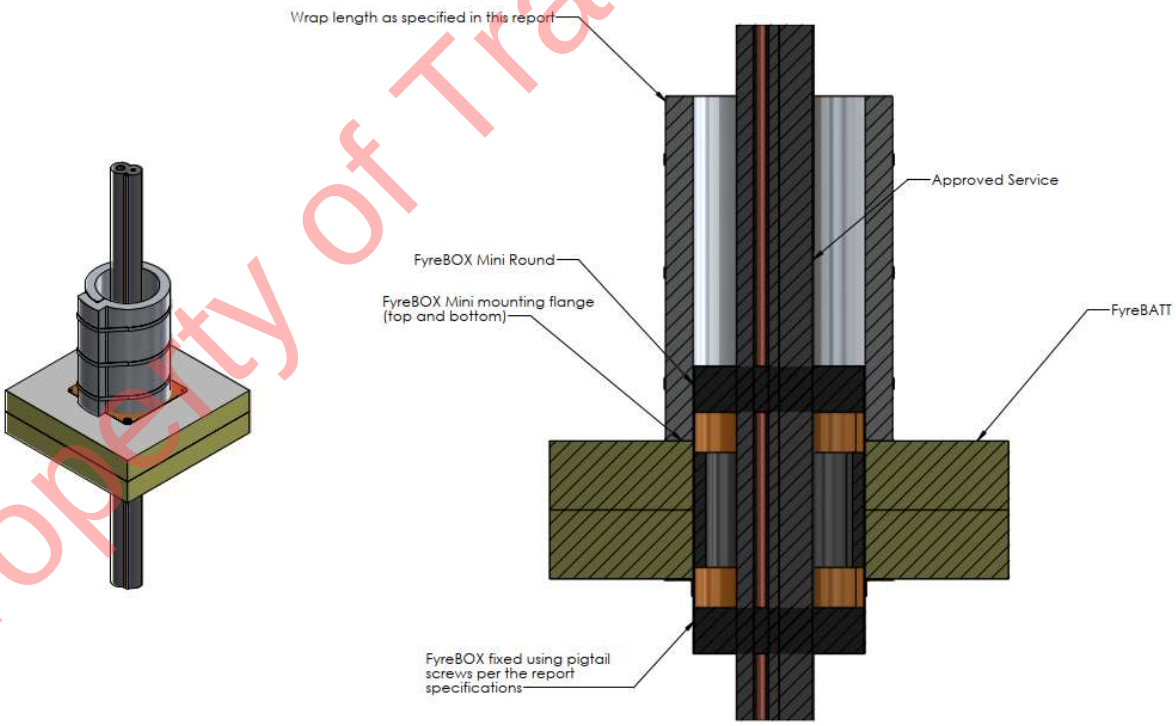


Figure 28 Services protected with FyreBOX in floors

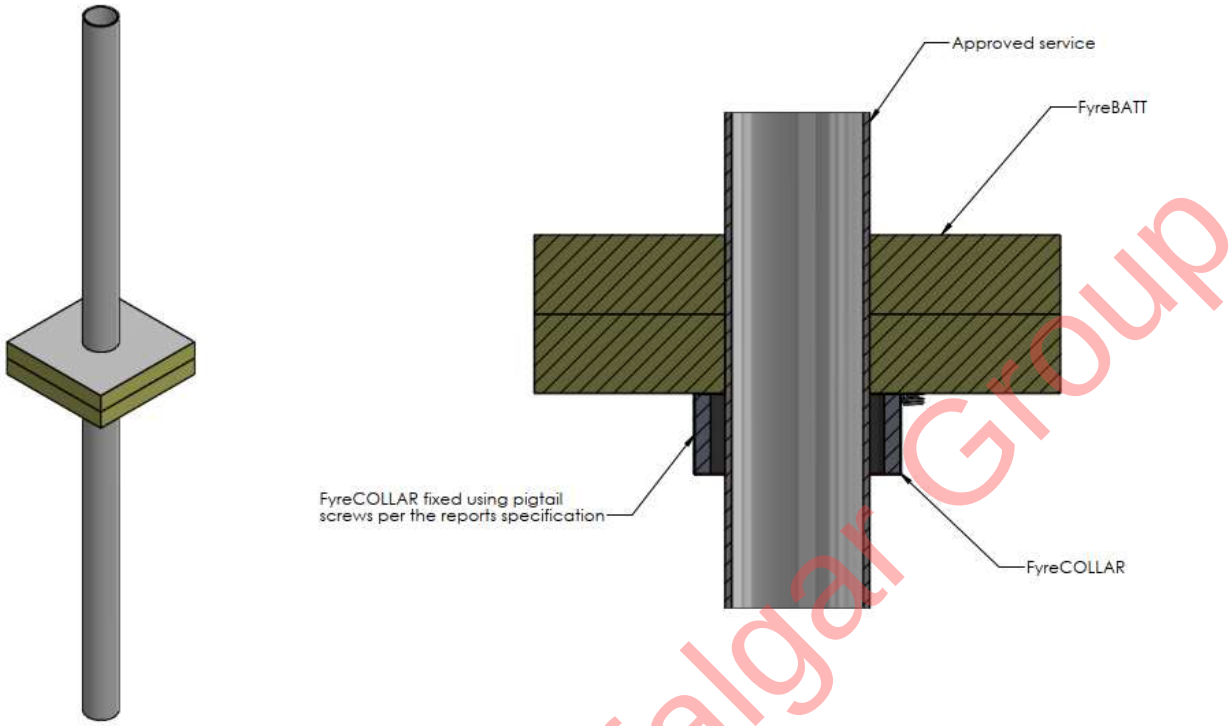


Figure 29 Services protected with FyreCOLLAR in floors

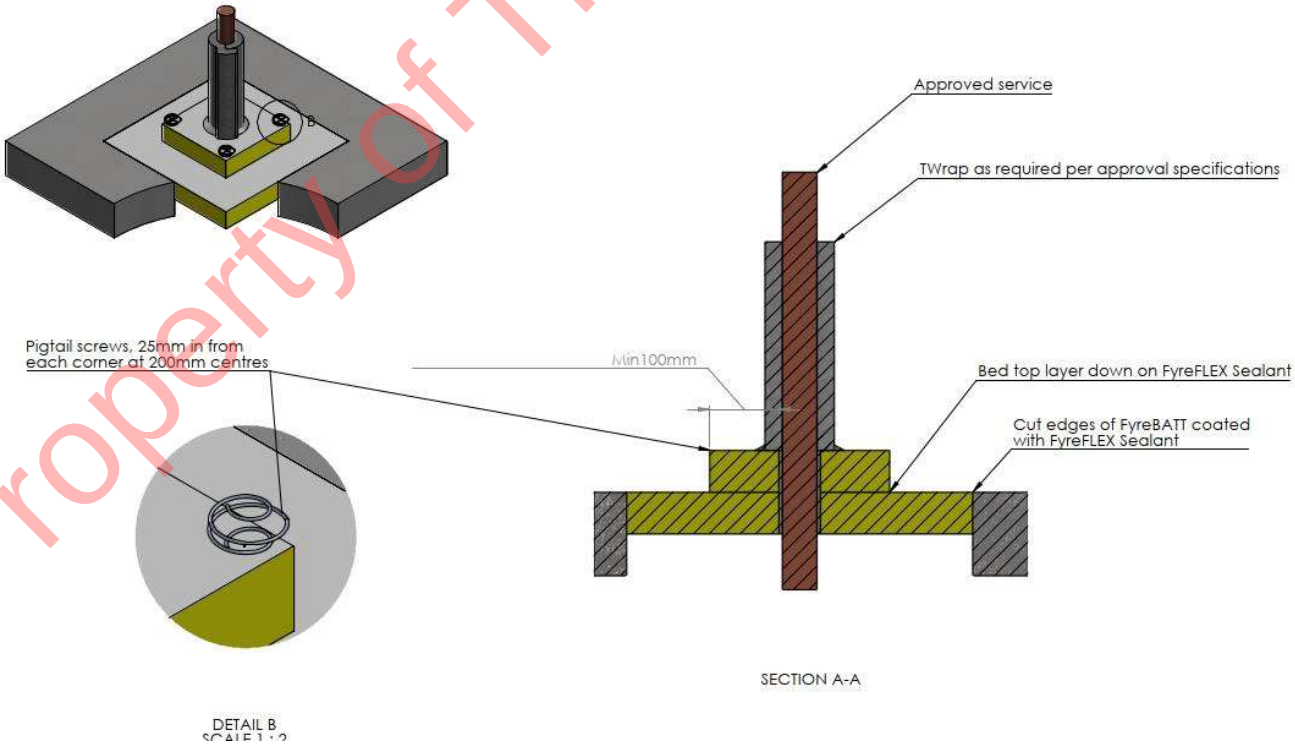


Figure 30 Services installed with local patch. Maximum size of the local patch must not exceed 400 mm × 400 mm.

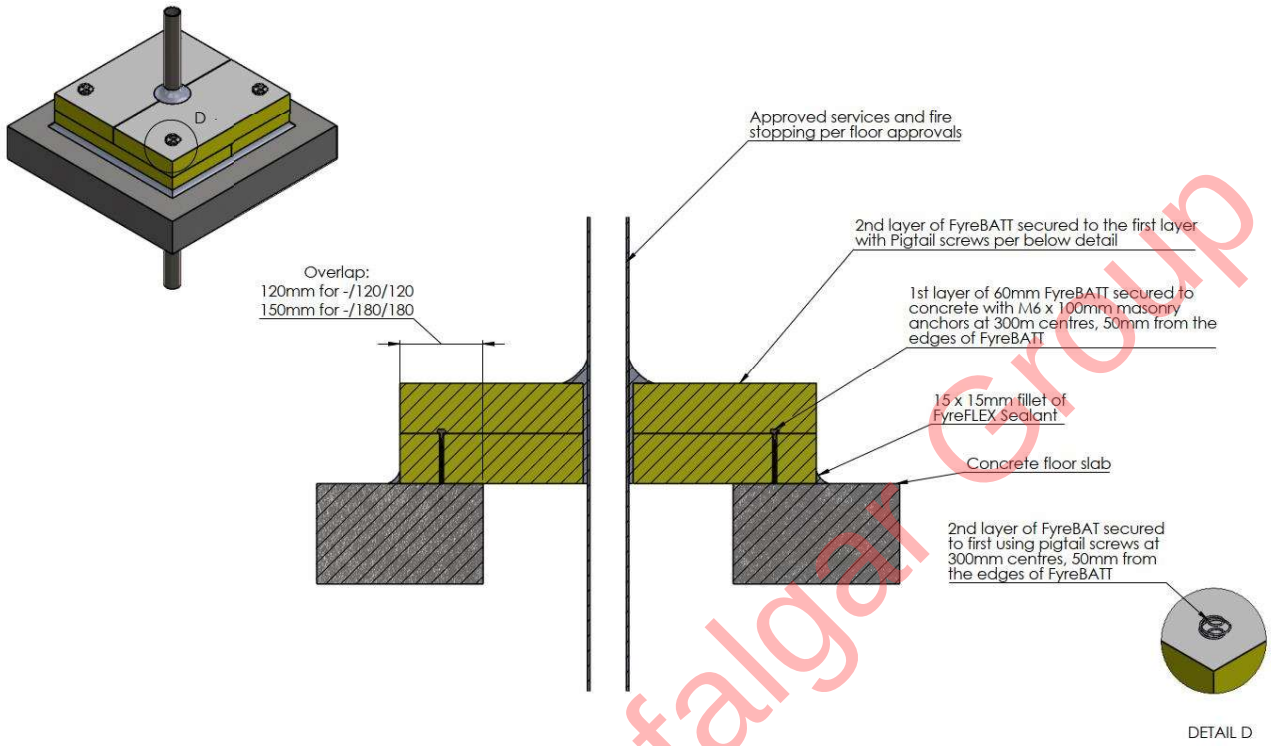


Figure 31 Surface mounted double layer FyreBATT

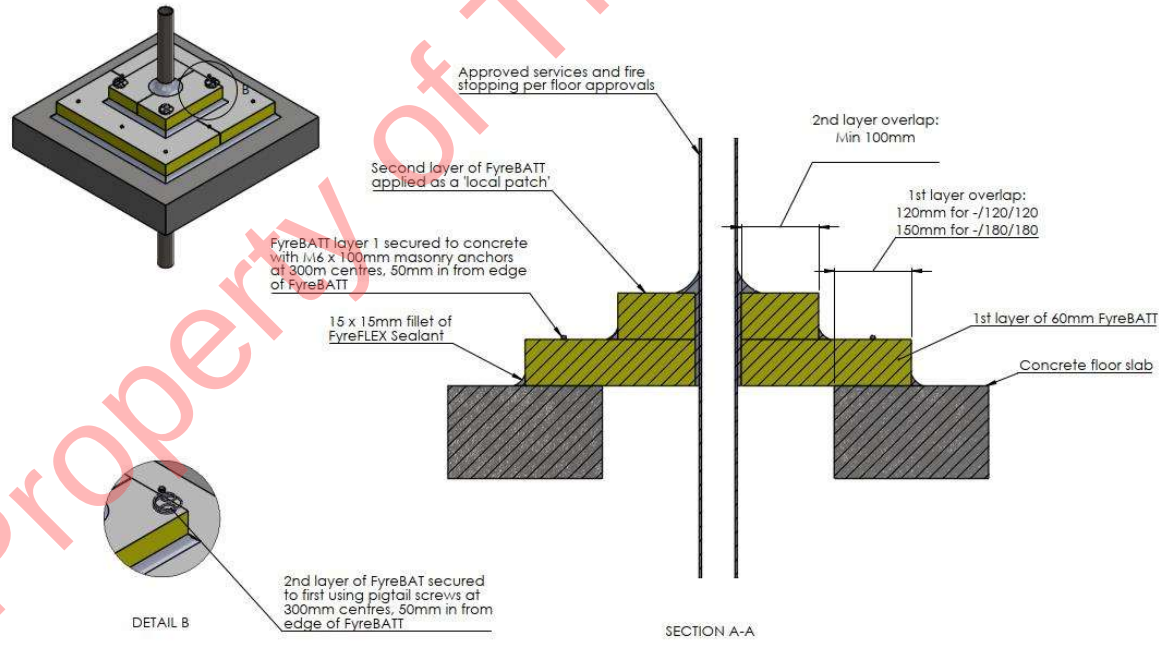


Figure 32 Surface mounted single layer FyreBATT with local patching. Maximum size of the local patch must not exceed 400 mm × 400 mm.

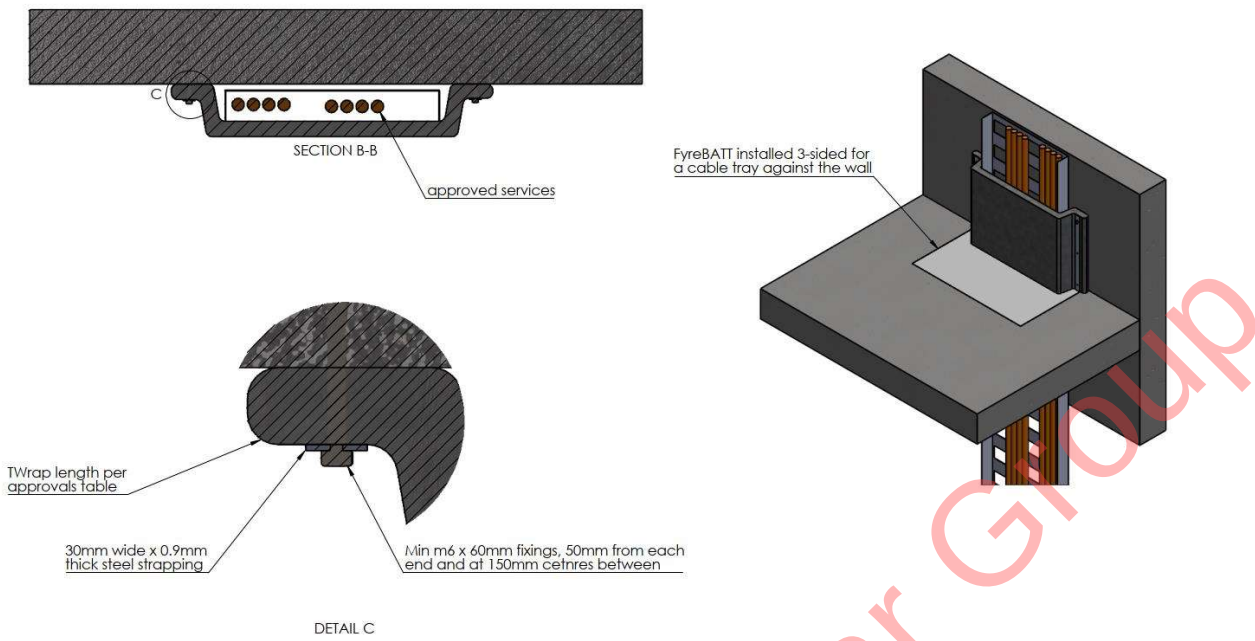


Figure 33 3-sided batt installation

5. Assessment – Trafalgar FyreBATT

5.1 Description of variation

The tested systems included a series of penetration services passing through single or double layers of mineral wool boards. Additionally, a range of apertures protected with mineral wool boards in various separating elements was tested. It is proposed that the tested penetration services will be installed in tested apertures protected with mineral wool boards. It has been confirmed by Trafalgar that the source of the raw materials for the FyreBATT has been updated.

The services were locally protected with Trafalgar sealants or other firestopping elements as appropriate. It is proposed that the applicability of the services is extended to include a variety of separating elements, and a range of local fire protection systems.

This report analyses the available test data and assesses the proposed variations to determine the applicable FRLs.

5.2 Methodology

The method of assessment used is summarised in Table 9.

Table 9 Method of assessment

Assessment method	
Level of complexity	Intermediate assessment
Type of assessment	Qualitative – interpolation/Comparative

5.3 Trafalgar FyreBATT system

A series of penetration services passing through mineral wool boards were tested in FRT200329 R1.3, FRT200331 R1.2, FRT200397 R1.2, FRT200384 R1.3 and FRT200385 R1.2. In addition, a range of apertures protected with mineral wool boards were tested in F16150, WARRES 317711, WF 317718, WF375797. It is understood that the raw materials of the FyreBATT for penetration and blank seal tests were sourced from two separate sources. The penetration tests were conducted using the old source while the blank seal tests were conducted using the new source. These sources are known to Warringtonfire and kept in confidential files for records. It has been confirmed by Trafalgar that the new source will be used for all the applications from the issue date of this report.

The performance of FyreBATT sourced from both sources is discussed in this section. In test FRT210260 R2.0, both old and new mineral wool boards were tested side by side as 568 mm × 595 mm blank seals in a 150 mm thick concrete floor. Both boards were recorded to be 60 mm thick and were friction fitted into the aperture – finishing flush on the unexposed side. It is noted that, specimen D, which is from the old source, maintained integrity performance up to 181 minutes and failed insulation at 100 minutes. The insulation failure at 100 minutes was recorded at the centre of the board. However, specimen E, which is from the new source, maintained integrity performance up to 181 minutes and failed insulation at 127 minutes. The insulation failure at 127 minutes was recorded at the centre of the board.

Based on the above test data, it is concluded that, specimen E is likely to perform similarly or better than specimen D. It has been confirmed by Trafalgar that, the composition of Trafalgar FyreBATT will be identical to specimen E for future use. As such, the performance of the tested blank seals can be considered for assessment of the penetration services.

It is also understood that the perimeter and the butt joints between the mineral wool boards will be sealed with Trafalgar FyreFlex. The performance of the Trafalgar FyreFlex was closely analysed using the results of FRT210206 R2.0. It was observed that, the recorded temperature at the perimeter protected with Trafalgar FyreFlex remained similar and, on occasion, lower than the temperature recorded at the perimeter of specimen E. Therefore, it is concluded that if the mineral wool boards were sealed with Trafalgar FyreFlex, the performance of the boards would not be negatively impacted. As such, Trafalgar FyreFlex is positively assessed as a joint and perimeter seal.

5.4 Assessment – Blank seals

Trafalgar FyreBATT – which constitutes of mineral wool board supplied by Polyseam – were tested as blank seal in concrete, plasterboard and Speedpanel separating elements in tests F16150, WARRES 317711, WF 317718, WF375797 and FRT210436 R1.0. The test construction and achieved performance are summarised in Table 10.

Table 10 Trafalgar FyreBATT blank seal test outcome summary

Test reference	Separating element	Aperture size	Batt configuration	Seal fitting and details	Fire performance
F16150	150 mm thick concrete wall	1200 mm high × 1200 mm wide	2 × 60 mm FyreBATT butted together. Joint sealed with Protecta sealant	Friction fitted flush on both faces. Perimeter sealed with Protecta sealant	-/241/241
			1 × 60 mm FyreBATT butted together. Joint sealed with Protecta sealant	Friction fitted flush on the exposed side. Perimeter sealed with Protecta sealant.	-/241/92
WARRES 317711	150 mm thick concrete wall	1200 mm high × 2400 mm wide (1200 × 600 repeating unit)	1 × 60 mm FyreBATT butt jointed together. Joint sealed with Protecta sealant	Friction fitted into the aperture on the exposed side. A primer is applied to the four ends. Protecta sealant applied at the perimeter.	-/260/90
WF 317718	100 mm thick, 2 × 12.5 mm plasterboard wall	1200 mm high × 2400 mm wide	2 × 50 mm FyreBATT butt jointed together. Joint sealed with Protecta sealant	Friction fitted into the aperture. Protecta sealant applied at the perimeter.	-/132/132
WF375797	150 mm thick concrete floor	1200 mm long × 600 mm wide	2 × 60 mm FyreBATT	Friction fitted into the aperture on each face. Protecta sealant applied at the perimeter.	-/217/207
			1 × 60 mm FyreBATT	Friction fitted into the aperture on the exposed face. Protecta sealant applied at the perimeter.	-/241/142
FRT210436 R1.0	78 mm thick Speedpanel wall	1000 mm high × 1200 mm wide	2 × 60 mm FyreBATT butt joined together. Joint sealed with Protecta sealant Trafalgar FyreFlex	Pattress fit into the aperture. Trafalgar FyreFlex applied at the perimeter.	-/196/96

5.4.1 Concrete/masonry walls and floors

Trafalgar FyreBATT in concrete walls were tested in F16150 and WARRES 317711. It is noted that double layers FyreBATT has demonstrated its ability to achieve 241 minutes of integrity and 241 minutes of insulation performance. Additionally, single layer FyreBATT has demonstrated its ability to achieve 241 minutes of integrity and 90 minutes of insulation performance. The double layers system tested in F16150 was observed to be symmetric. Hence, the tested performance will be applicable from both directions. The single layer systems tested in F16150 and WARRES 317711 were installed on the exposed side. In test WF375797 and FRT210260 Trafalgar FyreBATT was tested while installed both on the exposed and the unexposed side. Both constructions maintained 180 minutes of integrity and 120 minutes of insulation performance. From this test data, it is concluded that, for single layer FyreBATT the direction of exposure will not negatively impact the fire performance. Based on the above, the FyreBATT is assessed to be installed on both the exposed and the unexposed side.

It is proposed that the FyreBATT will be installed in 120 mm, 150 mm and 175 mm thick concrete or masonry walls. The overall system performance will need to be considered based on the performance of the wall and blank seal in combination. As per AS 3600:2018, the 120 mm, 150 mm and 175 mm concrete walls are expected to achieve FRL of -/120/120, -/180/180 and -/240/240, respectively. As such, the system FRLs will be restricted to the FRL of the wall system.

It is noted that in test WARRES 317711, four 1200 mm high × 600 mm wide boards were butt jointed together to achieve 1200 mm high × 2400 mm wide aperture size. The boards were friction fitted into the aperture. A primer is applied to the four ends. Protecta sealant was applied at the perimeter. This construction achieved 260 minutes of integrity and 90 minutes of insulation performance. The batts were restrained in place primarily by the compression exerted on to the boards at the top and bottom aperture edges. The repeating nature of the batts allow a finite width of the tested aperture seal to be isolated and scrutinised to identify its performance as a repeating unit. For instance, a 1200 mm wide portion of the aperture seal – centred at the aperture – represents a basic unit on each side of the friction fitted aperture seal as illustrated in Figure 34. Considering this repeating nature, the fire resistance performance within the field of a wider aperture seal is unlikely to change from that observed in a single unit in the referenced fire test. Based on the above, the single layer FyreBATT system tested in WARRES 317711 is assessed to unlimited width.

Trafalgar FyreBATT in concrete floors were tested in WF375797. It is noted that double layers FyreBATT has demonstrated its ability to achieve 217 minutes integrity and 207 minutes of insulation performance. Additionally, single layer FyreBATT has demonstrated its ability to achieve 241 minutes of integrity and 142 minutes of insulation performance. It is proposed that the FyreBATT will be installed in 120 mm, 150 mm and 175 mm thick concrete or masonry floor. As discussed above, the overall system performance will need to be considered based on the performance of the floor and blank seal in combination. As per AS 3600:2018, the 120 mm, 150 mm and 175 mm concrete floors are expected to achieve FRL of -/120/120, -/180/180 and -/240/240 respectively. As such, the system FRLs will be restricted to the FRL of the floor system where the performance of the blank seal exceeds the performance of floor.

It is further proposed that, the double layers of FyreBATT will be applied back-to-back instead of a cavity in between. In test WF375797, double layers FyreBATT was applied with a cavity in concrete floor and achieved 217 minutes of integrity and 207 minutes of insulation performance. Additionally, in test WF375797, a single layer FyreBATT was installed in a concrete floor and achieved 241 minutes of integrity and 142 minutes of insulation performance. As a single layer FyreBATT maintained integrity up to 241 minutes and double layers of FyreBATT achieved 217 minutes of integrity, it is reasonable to estimate that, double layers of FyreBATT if applied back-to-back will also maintain integrity at least up to 180 minutes in concrete floor.

It is noted that, the insulation failure in test WF375797 was recorded at 142 minutes. For double layers system, the insulation performance is expected to increase. For conservative estimation of the expected insulation performance, it is assumed that the first layer of FyreBATT will fall off at 142 minutes and the second layer will start to undergo standard fire exposure of the furnace. As such, the second layer can be assumed to maintain insulation for further 142 minutes. However, it is understood that, during the first 142 minutes, the second layer will experience a certain extent of pre-heating. The equivalent standard fire exposure time of this pre-heating can be empirically estimated by considering the area underneath the temperature curve. The quarter point average temperature on the unexposed side of the FyreBATT is plotted against time and the area under the curve at 142

minutes is calculated. The time taken to achieve the same area when exposed to furnace temperature curve is considered as the equivalent standard fire exposure time of the FyreBATT. Based on this, second layer of FyreBATT is estimated to have been exposed to the furnace temperature in accordance with AS 1530.4:2014 for 20 minutes. The proposed system is therefore expected to maintain insulation performance for at least 122 additional minutes (142-20) and hence the total estimated insulation performance will be 142+122 = 264 minutes. However, this estimation is valid under the assumption that, the system integrity will be maintained for the required period. It is noted that the expected integrity performance of the double layers FyreBATT in concrete floor is 180 minutes. Based on the above, the systems are assessed for -/180/180 with back-to-back FyreBATT in floor systems.

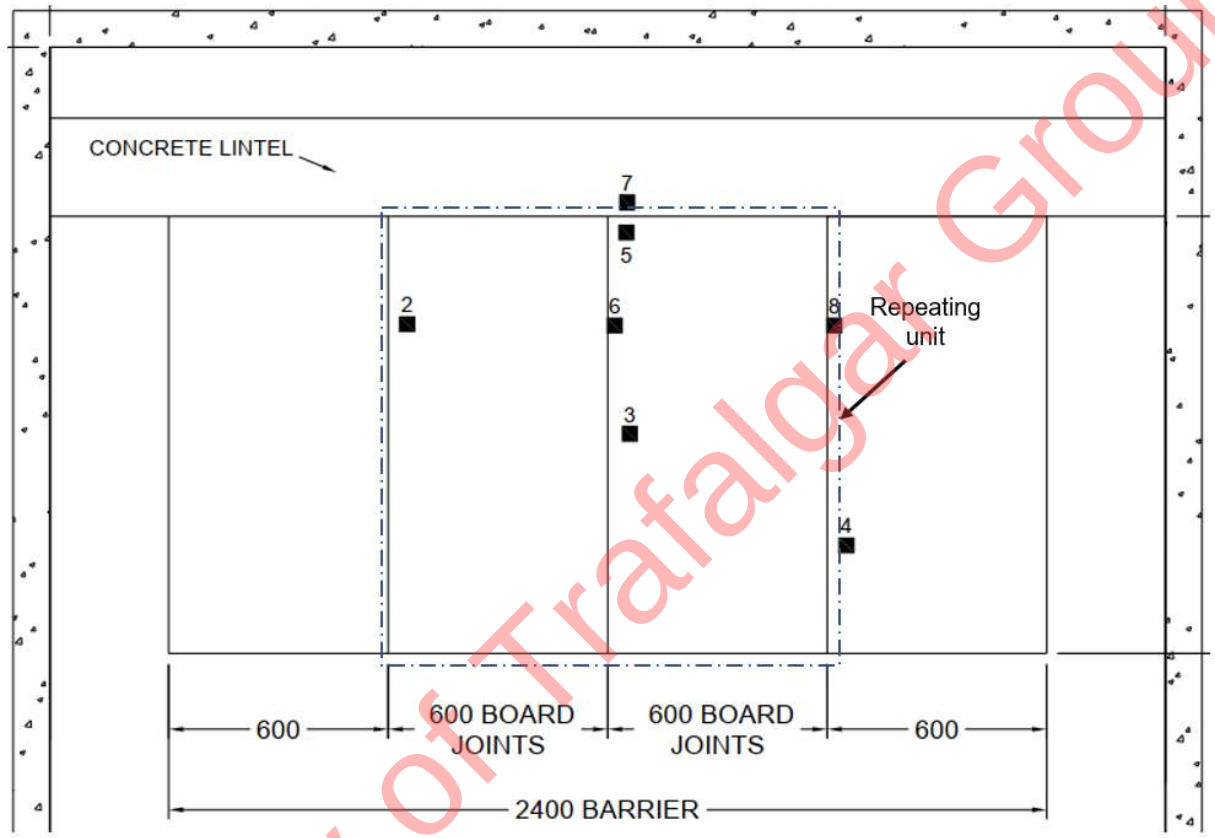


Figure 34 Repeating unit tested in WARRES 317711 (image reproduced)

In test F16150, both single and double layers FyreBATTs have demonstrated their ability to achieve 241 minutes of integrity performance. Therefore, double layers of FyreBATT if applied back-to-back is also expected to achieve 241 minutes of integrity. As the double layers of FyreBATT is estimated to achieve at least 264 minutes of insulation performance in concrete floor, same performance is expected if installed in concrete walls while applied back-to-back. Based on the above, double layers of FyreBATT if applied back-to-back is positively assessed up to 241 minutes of insulation performance.

Based on the above discussion, the assessed Trafalgar FyreBATT systems in concrete walls and floors are listed in Table 15 and Table 16.

5.4.2 Speedpanel, Hebel and Walsc walls

In test FRT210436 R1.0, 1000 mm high × 1200 mm wide aperture protected with Trafalgar FyreBATT was tested in 78 mm thick Speedpanel wall. The FyreBATT on the unexposed side was face fitted with mechanical fixing while the FyreBATT on the exposed side was friction fitted. This construction achieved 196 minutes of integrity and 94 minutes of insulation performance. As the friction fitted FyreBATT is on the unexposed side, the tested FyreBATT configuration represents the most onerous construction. As such, it is reasonable to estimate that the obtained test data will be applicable for exposure from both sides.

The insulation failure at 94 minutes was recorded on the separating element, 25 mm away from the edge of the FyreBATT. Further insulation failure was also recorded at 95 minutes and 119 minutes on the separating element. In order to identify the cause of these insulation failures, the test report was closely analysed. It was noted that these insulation failures were recorded on the separating element on the east side at 94 and 95 minutes. However, no such failure was recorded on the thermocouple placed on the west side. From the test images it was observed that the sealant applied between edge of the FyreBATT and the separating element on the west side remained in place and maintained connection between the FyreBATT and wall. In contrast, sealant applied on the east side was not sufficient to maintain connection between the FyreBATT and separating element which led to failure at 94 and 95 minutes. A similar behaviour was also observed at the bottom centre edge where insulation failure was recorded at 119 minutes due to insufficient sealant application. It is proposed that, a 25 mm × 25 mm Trafalgar FyreFlex sealant fillet is applied around the perimeter of the face fitted FyreBATT. It is considered that the proposed sealant configuration will be adequate to maintain connection between the FyreBATT and the wall and will extend the insulation performance of the system at least up to 120 minutes. Based on the above discussion, Trafalgar FyreBATT is positively assessed for FRL of -/120/120 in 78 mm Speedpanel wall.

It is proposed that Trafalgar FyreBATT will be installed as blank seal in 51 mm and 64 mm Speedpanel walls. 51 mm, 64 mm and 78 mm Speedpanel walls were previously tested and assessed for FRL of -/60/60, -/90/90 and -/120/120 respectively. It is understood that the Speedpanel walls will be constructed as per Speedpanel's relevant assessment reports and therefore are likely to retain respective FRLs. From test FRT210436 R1.0, it is concluded that, the installation of FyreBATT will not prejudice the establish FRL of the separating element. It is noted that, the system exceeded the established integrity performance of the 78 mm Speedpanel wall with a significant margin of safety. Therefore, it is reasonable to estimate that, the installation of Trafalgar FyreBATT will not prejudice the established FRL of 51 mm and 64 mm Speedpanel walls. Further confidence for this assessment was archived from test FRT200331 R1.2 where a series of cables and pipes passing through 2 × 60 mm thick Trafalgar FyreBATT were tested in a 51 mm thick Speedpanel wall system. The aperture size protected with FyreBATT was recorded to be 600 mm high × 600 mm wide. The FyreBATT maintained integrity for the duration of the test and failed insulation at 70 minutes. Based on the above, Trafalgar FyreBATT is positively assessed for FRL of -/60/60 and -/90/90 in 51 mm and 64 mm Speedpanel walls. To maintain a conservative approach, the aperture size is restricted to 600 mm × 600 mm in the 51 mm Speedpanel wall system based on test FRT200331 R1.2.

It is proposed that, Trafalgar FyreBATT will be installed in minimum 75 mm thick Hebel and Walsc wall systems. It is stipulated that, 75 mm thick Hebel and Walsc wall system will be tested or assessed for required period of FRL. Proposed Hebel and Walsc wall systems are generally similar in construction to the tested 78 mm Speedpanel wall systems with similar thickness of AAC rigid core. The Speedpanel walls include an additional steel shell and generally demonstrate a more severe deflection characteristics than Hebel and Walsc wall systems. As the FyreBATT has demonstrated its ability achieve FRL of -/120/120 with additional sealant fillet in 78 mm Speedpanel wall, it is reasonable to estimate similar or better performance will be achieved if installed in 75 mm Hebel and Walsc wall system. Based on the above, 75 mm thick Hebel and Walsc wall systems are positively assessed.

Based on the above discussion, the assessed Trafalgar FyreBATT systems in Speedpanel, Hebel and Walsc walls are listed in Table 16.

5.4.3 Plasterboard and Shaftliner wall

In test WF317718, 1200 mm high × 2400 mm wide aperture protected with Trafalgar FyreBATT was tested in 2 × 12.5 mm plasterboard wall system. This construction achieved 132 minutes of integrity and 132 minutes of insulation performance. It is proposed that, the tested FyreBATT will be installed in a minimum 116 mm thick, 2 × 13 mm or 16 mm plasterboard wall systems. The tested wall system in WF317718 was constructed in accordance with clause 7.2.2.1.1 of BS EN 1366-3:2009[10] for the required period of FRL. It is stipulated that the proposed, 2 × 13 mm or 2 × 16 mm plasterboard wall system must be tested or assessed for FRL of -/120/120. This requirement establishes equivalent performance between the tested and the proposed wall systems. Therefore, it is reasonable to estimate that if the blank seal tested in WF317718 is installed in the proposed 2 × 13 mm or 2 ×

[10] European Committee for Standardization, 2009, Fire resistance tests for service installations. Penetration seals, BS EN 1366-3:2009, European Committee for Standardization, Brussels, Belgium.

16 mm plasterboard wall system, the fire resistance performance will not be affected detrimentally. Based on the above, Trafalgar FyreBATT is assessed in 2 × 13 mm or 2 × 16 mm plasterboard wall systems.

It is proposed that, the FyreBATT will also be installed in 25 mm thick Shaftliner walls system with 1 × 16 mm fire rated plasterboard. It is stipulated that, the Shaftliner wall system will be tested or assessed to achieve at least -/120/120. As such, it is understood that equivalent performance will be established with tested 2 × 12.5 mm plasterboard wall system. Therefore, no deviation is expected in the fire resistance performance if the FyreBATT is installed in 1 × 25 mm shaftliner walls. Based on the above, the Shaftliner wall system is positively assessed.

It is also proposed where double layers of FyreBATT is required to be applied, instead of installing back-to-back, the FyreBATT will be installed flush on both sides leaving a cavity in between or installed as pattress fit- with one FyreBATT face fitted, and the other friction fitted internally. The pattress fit FyreBATT has been assessed to achieve 120 minutes of integrity and insulation performance with additional 25 mm × 25 mm Trafalgar FyreFlex based on FRT210436 R1.0. Hence, pattress fit FyreBATT system in double layer plasterboard wall is positively assessed. The proposed construction where the FyreBATT will be fitted flush on both side with cavity is applicable to systems with the separating element thickness exceeding the thickness of two layers of FyreBATT. For such constructions, the fire performance of the separating element is likely to be superior to the tested system. As a cavity is left between the FyreBATT, the heat transfer through conduction is eliminated and will only occur through radiation or convection. As such, the FyreBATT on the unexposed side is likely to take longer to heat up. Based on the above, it is considered that the proposed construction is not expected to be detrimental to the overall fire resistance performance and is positively assessed.

It is further proposed that Trafalgar FyreBATT will be installed in 1 × 13 mm or 1 × 16 mm plasterboard wall which are tested or assessed for -/60/60 and -/90/90 respectively. It is noted that, the Trafalgar FyreBATT has not been tested in 1 × 13 mm or 1 × 16 mm plasterboard wall systems. However, the FyreBATT has been tested in Speedpanel walls in FRT210436 R1.0, FRT200331 R1.2 and FRT200397 R1.2. Based on these test data, Trafalgar FyreBATT was assessed in 51 mm and 64 mm Speedpanel walls in section 5.4.2. Noting the comparative performance, it is considered that, 51 mm Speedpanel wall can be representative of likely performance of 1 × 13 mm plasterboard wall and 64 mm Speedpanel wall can be representative of likely performance of 1 × 16 mm plasterboard wall as they are tested or assessed for the same FRL.

It is noted that, FyreBATT has been assessed to achieve -/60/60 if installed in 51 mm Speedpanel wall. The proposed 1 × 13 mm plasterboard wall will be minimum 90 mm thick constructed of steel studs cladded with 13 mm thick fire rated plasterboard on each side. As such, the proposed plasterboard wall will be significantly thicker than the Speedpanel wall. The steel studs are expected to offer significant rigidity to the plasterboard wall system. Additionally, the plasterboard panels are likely to delay exposure of the steel studs to heat. Overall, the plasterboard walls are expected to resist deflection for longer periods and hence are expected perform at least similarly or better than the 51 mm thick Speedpanel wall. Based on the above, 1 × 13 mm plasterboard wall is positively assessed for an FRL of -/60/60.

Additionally, FyreBATT has been assessed to achieve -/90/90 if installed in 64 mm Speedpanel wall. The proposed 1 × 16 mm plasterboard wall will be minimum 96 mm thick constructed of steel studs cladded with 16 mm thick fire rated plasterboard on each side. As discussed, the proposed plasterboard wall will be significantly thicker than the 64 mm thick Speedpanel wall and the steel studs are expected to offer significant rigidity to the plasterboard wall system. Overall, the plasterboard walls are expected to resist deflection for longer periods and hence are expected to perform at least similarly or better than the 64 mm thick Speedpanel wall. Based on the above, 1 × 16 mm plasterboard wall is positively assessed for an FRL of -/90/90. Based on the above discussion, the assessed Trafalgar FyreBATT systems in plasterboard walls are listed in Table 16.

5.5 Assessment – Penetration services

A series of penetration services passing through plasterboard and Speedpanel walls, and concrete floor were tested in test reports FRT200329 R1.3, FRT200331 R1.2, FRT200397 R1.2 and FRT200384 R1.3. This section assesses the expected performance of the penetration services in accordance with AS 1530.4:2014 based on the test data. It is understood that the penetration services will be installed through FyreBATT seals as assessed in section 5.4. As such, the system FRL will need to be determined with consideration to the assigned FRL of the blank seal construction and penetration services as a combination. The lowest indices in terms of integrity and insulation for a given blank seal and penetration service combination will be the applicable FRL of the system.

5.5.1 Services passing through walls protected with single layer of FyreBATT

The tested service penetrations passing through vertical separating elements while protected with single layer of Trafalgar FyreBATT are listed in Table 11.

Table 11 Tested penetration services passing through single layer of FyreBATT

Services type	Tested specimen	Description	Aperture size	Sealing system	Insulation	FRL	Reference test
Electrical and communication cables	A1	AS 1530.4:2014 appendix D2 power cables on 300 mm wide cable tray	Cut to fit service	Trafalgar FyreFlex in 30 mm × 30 mm cone applied on both sides	25 mm thick Trafalgar TWrap up to 300 mm on each side	-/120/90	FRT200329 R1.3
	A2	AS1530.4:2014 appendix D1 comms cables on 300 mm wide cable tray	Cut to fit service				FRT200329 R1.3
	A3	3 × 3/8 + 5/8 pair coils with 19 mm FR insulation, 3 × CAT6 cable, 3 × electrical cables, 1 × Ø25 mm PVC drainpipe	150 mm	Trafalgar FyreBOX Mini R-150 mm	25 mm thick Trafalgar TWrap up to 300 mm on each side	-/120/60	FRT200329 R1.3
Conduits	B1	Ø25 mm uPVC conduit	25 mm	Trafalgar Fyrechoke – micro collar on both sides	NA	-/120/60	FRT200329 R1.3
Metal pipes	A4	Ø100 mm MD steel pipe with 4 mm wall thickness	135 mm	Trafalgar FyreFlex in 30 mm × 30 mm cone applied on both sides	25 mm thick Trafalgar TWrap up to 300 mm on each side	-/120/90	FRT200329 R1.3
	A5	Ø100 mm type B copper pipes with 1.63 mm wall thickness	120 mm	Trafalgar FyreFlex in 30 mm × 30 mm cone applied on both sides	25 mm thick Trafalgar TWrap up to 300 mm on exposed side and 600 mm on the unexposed side	-/120/90	FRT200329 R1.3

Services type	Tested specimen	Description	Aperture size	Sealing system	Insulation	FRL	Reference test
Plastic pipes	B3	Ø20 mm PE-Xa with 3 mm wall thickness	20 mm	Trafalgar Fyrechoke – micro collar on both sides	NA	-/120/60	FRT200329 R1.3
	B4	Ø20 mm PE-Xb with 3 mm wall thickness				-/120/90	FRT200329 R1.3
	B5	Ø20 mm PE-Xa/AL/PE with 3 mm wall thickness				-/120/60	FRT200329 R1.3

Ø100 mm medium duty galvanised steel pipe and 100 mm type B copper pipe were tested in FRT200329 R1.3. The pipes were sealed with Trafalgar FyreFlex and insulated with Trafalgar TWrap and achieved FRLs of -/120/90. It is proposed that the pipe diameter is reduced up to 32 mm. The proposed reduction in diameter will reduce the heat conductor size and as such the insulation performance is expected to improve. As the wall thickness remains unchanged, pipe is expected to retain its rigidity, hence the integrity performance is expected to be maintained. Therefore, it is concluded that the proposed reduction is not expected to be detrimental to the fire resistance performance of the steel and copper pipes.

It is noted that, some services were insulated with Trafalgar TWrap. It is proposed that, these services will be optionally insulated with Trafalgar MonoWrap. For this assessment, the comparative performance between the TWrap and MonoWrap needs to be established. In test FRT210467, two Ø40 mm copper pipes – marked as specimen F and specimen G were tested while passing through Trafalgar FyreBATT in a 150 mm thick concrete floor. The annular gap between the pipe and separating element was sealed with Trafalgar FyreFlex sealant. Additionally, specimen F was insulated with Trafalgar MonoWrap and specimen G was insulated with Trafalgar TWrap. The recorded temperature on the Wraps is listed in Table 12.

Table 12 Recorded temperature on Trafalgar TWrap and MonoWrap

Penetration system/ Control joint	T/C #	Description[1]	Temp (°C) at t (minutes)							Limit[2] (minutes)
			t=0	t=30	t=60	t=90	t=120	t=180	t=240	
F	030	On the wrap, south side, 25 mm away from the slab	24	43	66	82	95	206	172	169
	031	On the wrap, east side, 25 mm away from the slab	24	39	58	74	86	197	212	220
	032	On the wrap, south side, 25 mm away from the end of the wrap	24	35	46	52	57	162	146	-
	033	On the wrap, east side, 25 mm away from the end of the wrap	24	34	46	54	61	183	139	183

Penetration system/ Control joint	T/C #	Description[1]	Temp (°C) at t (minutes)							Limit[2] (minutes)
			t=0	t=30	t=60	t=90	t=120	t=180	t=240	
G	038	On the wrap, south side, 25 mm away from the slab	24	47	67	85	100	145	233	204
	039	On the wrap, east side, 25 mm away from the slab	24	51	74	91	109	167	275	195
	040	On the wrap, south side, 25 mm away from the end of the wrap	24	41	55	61	68	110	201	216
	041	On the wrap, east side, 25 mm away from the end of the wrap	24	44	62	66	73	119	215	209

From the recorded data, it is noted that, the temperature on MonoWrap remains similar or lower than TWrap up to 120 minutes. However, the temperature on MonoWrap exceeds the temperature of TWrap from 180 minutes onwards. Based on the above, it can be conservatively estimated that, the services protected with Trafalgar TWrap will perform similarly or better if they are protected with Trafalgar MonoWrap instead, at least up to 120 minutes. Based on the above, services protected with Trafalgar MonoWrap are positively assessed for 120 minutes of insulation performance.

The 3/8 + 5/8 pair coil penetrations were tested in a bunch of 3 in FRT200329 R1.3. It is proposed that the pair coil penetrations be applied in any number up to 3 and assessed to the FRL obtained in FRT200329 R1.3. As a reduced number of cables in the bunch results in a reduced conductor area the pair coils can be positively assessed for up to 3 × 3/8 + 5/8 pair coils. Based on the above discussion and the test results from FRT200329 R1.3 and FRT200384 R1.3, provided that the annular gap is maintained as tested, the reduced cable load can be positively assessed.

Based on the above, the assessed FRL of the tested services are listed in Table 17

5.5.2 Services passing through walls protected with double layers of FyreBATT

The tested service penetrations passing through vertical separating elements while protected with two layers of Trafalgar FyreBATT are listed in Table 13.

Table 13 Tested penetration services passing through double layers of FyreBATT

Services type	Tested specimen	Description	Wall thickness	Aperture	Sealant/protection	Insulation wrap	FRL	Reference test
Electrical and communication cables	A1	15 × TPS (2.5 mm²) Cable bundle	NA	Cut to fit service	Trafalgar FyreFlex applied in 50 mm × 50 mm cone configuration on both sides.	Trafalgar TWrap up to 300 mm on both side	-/120/120	FRT200331 R1.2
	A2	15 × Fire (1.5 mm²) Alarm cable bundle	NA	Cut to fit service		NA	-/120/120	FRT200331 R1.2

Services type	Tested specimen	Description	Wall thickness	Aperture	Sealant/protection	Insulation wrap	FRL	Reference test
	A3	15 × CAT6 cable bundle	NA	Cut to fit service		NA	-/120/120	FRT200331 R1.2
	A4	5 × TPS cables, 5 × Fire alarm cables, 5 × CAT6 cables	NA	Cut to fit service	Trafalgar FyreFlex applied in 50 mm × 50 mm cone configuration on the unexposed sides.	NA	-/120/120	FRT200331 R1.2
	A5	5 × TPS cables, 5 × Fire alarm cables, 5 × CAT6 cables	NA	Cut to fit service	Trafalgar FyreFlex applied in 50 mm × 50 mm cone configuration on exposed sides.	NA	-/120/90	FRT200331 R1.2
	A6	1 × 3/8 + 3/4 pair coil with 19 mm FR insulation	NA	100 mm	Trafalgar FyrePEX HP sealant filled to the depth with backing rod from unexposed side	NA	-/120/120	FRT200331 R1.2
	A8	1 × 1/4 + 1/2 pair coil with 13 mm insulation	NA	100 mm	Trafalgar FyrePEX HP sealant filled to the depth with backing rod from unexposed side	NA	-/120/120	FRT200331 R1.2
	A6	3 × 3/8 + 5/8 pair coils with 19 mm FR insulation, 3 × CAT6 cable, 3 × electrical cables, 3 × Ø20 mm PVC drainpipe	NA	170 mm	Trafalgar FyreBOX Mini R-150 and Trafalgar FyreFlex sealant to the full depth	Trafalgar TWrap up to 300 mm on each side	-/240/120	FRT200397 R1.2
Conduit	A7	Ø25 mm conduit	2 mm	65 mm	Trafalgar FyrePEX HP sealant filled to the depth with backing rod from unexposed side	NA	-/120/120	FRT200331 R1.2
	A5	Ø40 mm PVC conduit	2.6 mm	45 mm	Ø40 mm Trafalgar FyreCHOKE collar both sides	NA	-/240/120	FRT200397 R1.2
Plastic pipes	A9	Ø20 mm PE- Xa pipe	3 mm	60 mm	Trafalgar FyrePEX HP sealant filled to the depth with backing rod from unexposed side	NA	-/120/120	FRT200331 R1.2

Services type	Tested specimen	Description	Wall thickness	Aperture	Sealant/protection	Insulation wrap	FRL	Reference test
	A10	Ø20 mm PE- Xb pipe	3 mm	60 mm	Trafalgar FyrePEX HP sealant filled to the depth with backing rod from unexposed side	NA	-/120/120	FRT200331 R1.2
	A11	Ø20 mm PE-Xa/AL/PE	3 mm	60 mm	Trafalgar FyrePEX HP sealant filled to the depth with backing rod from unexposed side	NA	-/120/60	FRT200331 R1.2
	A1	Ø20 mm PE-Xa/AL/PE pipe	3 mm	60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 25 mm × 25 mm cone configuration around the service	NA	-/240/60	FRT200397 R1.2
	A2	Ø50 mm uPVC pipe	2 mm	56 mm	Ø50 mm Trafalgar FyreCHOKE collar on both sides	NA	-/240/120	FRT200397 R1.2
	A3	Ø100 mm uPVC pipe	4 mm	110 mm	Ø100 mm Trafalgar FyreCHOKE collar on both side	NA	-/240/60	FRT200397 R1.2
Metal pipes	A4	32 mm copper pipe	1.22 mm	110 mm	Trafalgar FyrePEX HP sealant to the full depth	25 mm FR insulation to the full length	-/240/90	FRT200397 R1.2
	A7	100 mm copper pipe	1.63 mm	135 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	Trafalgar TWrap up to 300 mm on the exposed side and 600 mm on the unexposed side	-/240/120	FRT200397 R1.2
	A8	50 mm copper pipe	1.22 mm	80 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	Trafalgar TWrap up to 300 mm on both sides	-/240/120	FRT200397 R1.2

Services type	Tested specimen	Description	Wall thickness	Aperture	Sealant/protection	Insulation wrap	FRL	Reference test
	A9	80 mm copper pipe	1.63 mm	100 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	Trafalgar TWrap up to 300 mm on the exposed side and 600 mm on the unexposed side	-/240/120	FRT200397 R1.2
	A10	150 mm galvanised steel pipe	4.9 mm	190 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	Trafalgar TWrap up to 300 mm on the exposed side and 450 mm on the unexposed side	-/240/90	FRT200397 R1.2
	A11	150 mm copper pipe	2.03 mm	180 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	Trafalgar TWrap up to 300 mm on the exposed side. 2 × Trafalgar TWrap up to 300 mm. 1 × Trafalgar TWrap up to 1100 mm	-/240/240	FRT200397 R1.2

It is noted that, the cables were tested in bundles. It is proposed that the cables will be installed either as single or in bundles (up to the maximum number tested). It is understood that the cable conductors are the primary source of heat transfer from the fire to the non-fire side, hence the performance of the service will depend on the conductor size. The reduction in the number of cables will reduce the overall conductor size and will improve the performance of the service. Based on the above, the cables are assessed to be either single or up to the maximum number tested.

Appendix D1 and D2 cables were tested while passing through a single layer of FyreBATT in FRT200329 R1.3 and achieved an FRL of -/120/90. It is proposed that these cables will be installed while passing through a double layer of FyreBATT. The additional layer of FyreBATT is expected to provide added protection and not is likely to prejudice the performance of the cables. Based on the above, Appendix D1 and D2 cables passing through double layer FyreBATT are positively assessed.

The 3/8 + 5/8 pair coil penetrations were tested in a bunch of 3 in FRT200329 R1.3. It is proposed that the pair coil penetrations be applied in any number up to 3 and assessed to the FRL obtained in FRT200329 R1.3. As a reduced number of cables in the bunch results in a reduced conductor area the pair coils can be positively assessed for up to 3 × 3/8 + 5/8 pair coils. Based on the above discussion and the test results from FRT200329 R1.3 and FRT200384 R1.3, provided that the annular gap is maintained as tested, the reduced cable load can be positively assessed.

Ø20 mm PE-Xa/AL/PE pipe with a wall thickness 3 mm was tested in FRT200397 for an FRL of -/240/60. TPS cables tested in FRT200331 R1.2, 3 × 3/8 cable bundle tested in FRT200397 R1.2 and 50 mm copper pipe tested in FRT200397 R1.2 included a 25 mm thick Trafalgar TWrap on each side of the

penetration to achieve insulation performance on 120 minutes. It is therefore expected that the inclusion of 25 mm thick Trafalgar TWrap on each side will adequately improve the insulation performance of the Ø20 mm PE-Xa/AL/PE pipe to achieve an FRL of -/240/120.

32 mm copper pipe with wall thickness 1.22 mm was tested in FRT200397 R1.2 for an FRL of -/240/90. The failure was observed on the batt while the temperature on the services remained relatively low. It is considered that adding a 50 × 50 sealant cone to the annular gap between the service and separating element will improve the insulation performance. The 32 mm copper pipe penetrations can be positively assessed to achieve an FRL of -/240/120 with extra sealnt cone applied.

150 mm galvanised steel pipe with wall thickness of 4.9 mm was tested in FRT200397 R1.2 for an FRL of -/240/90. The insulation failed at the thermocouple located 25 mm from the end of the 450 mm long Twrap, i.e 475 mm from the separating element, at 119 minutes. It is proposed that increasing the length of TWrap to 600 mm will improve the insulation performance. Due to the improvement at the site of failure in the tested system, it is expected that the increased TWrap span, which will place the theromocouple 625 mm from the separating element, will increased FRL of the system to -/240/120.

In referenced test FRT200329 R1.3 the D2 cables failed insulation criteria at 98 minutes on the single layer FyreBATT system. It has been demonstrated that a double layer FyreBATT blank seal will achive insulation performance of 120 minutes. As failure was recorded on the FyreBATT and not the penetratrion, it can be positively assessed that the D2 cables insulation performance will extend to 120 minutes in a double layer FyreBATT system. The D1 cables in the same referenced test failed insulation at 114 minutes on the 630 mm^2 cable with the system achieving an FRL of -/120/90. Test report FRT180392 R1.1 included D1 cables installed in 2 × 60 mm FyreBATT system and wrapped for 300 mm on both sides of the wall. In this test the 630 mm^2 cable failed at 116 minutes however the thermocouple located 400 mm from the separating element was only 86 °C at 2 hours which is below failure criteria. Based off this additional test result it is deemed that additional wrap length to 450 mm on both sides of the wall will achieve integrity and insulation performance of no less than 120 minutes.

In section 5.5.1, the expected performance of Trafalgar TWrap and MonoWrap was analysed. It was concluded that, services are expected to perform similarly or better if insulated with Trafalgar MonoWrap instead of TWrap at least up to 120 minutes. Based on this, Trafalgar MonoWrap are positively assessed for 120 minutes of insulation performance. Based on the above, assessed services passing through walls protected with double layers FyreBATT are listed in Table 18.

5.5.3 Services passing through floors protected with double layers of FyreBATT

The tested service penetrations passing through horizontal separating elements while protected with two layers of Trafalgar FyreBATT are listed in Table 14.

Table 14 Tested services passing through floor protected with two layers of FyreBATT

Service type	Tested specimen	Description	Wall thickness	Aperture	Sealant/ protection	Insulation wrap	FRL of service	Reference test
Electrical and communication cables	J2	AS1530.4:2014 appendix D1 power cables with 300 mm cable tray	NA	Cut to fit service	Trafalgar FyreFlex, applied on unexposed side in 30 mm × 30 mm cone configuration	Trafalgar TWrap up to 450 mm on the unexposed side	-/120/90	FRT190292 R4.0
	A1	AS1530.4:2014 appendix D2 comms cables with 300 mm cable tray	NA	Cut to fit service	Trafalgar FyreFlex, applied on unexposed side in 50 mm × 50 mm cone configuration	Trafalgar TWrap up to 300 mm on the unexposed side	-/180/90	FRT200384 R1.3
	A2	1 × 3/8 + 3/4 pair coils with 19 mm FR insulation, 1 × CAT6 cable, 1 × electrical cables, 1 × Ø20 mm PVC drainpipe	NA	100 mm	Trafalgar FyrePEX HP sealant up to 100 mm depth	NA	-/180/120	FRT200384 R1.3
	A7	15 × TPS cables, 1 × fibre optic NBN cable	NA	Cut to fit service	Trafalgar FyreFlex, applied in 30 mm × 30 mm cone configuration on the unexposed side	NA	-/180/120	FRT200384 R1.3
	A8	1 × 3/8 + 3/4 pair coils with 19 mm FR insulation, 1 × CAT6 cable, 1 × electrical cable, 1 × Ø20 mm PE-Xa/AL/PE, Ø20 mm PE-Xb pipe, 3 × Ø25 mm conduit	NA	170 mm	Trafalgar FyreBOX Mini R- 150 and Trafalgar FyreFlex sealant to the full depth	Trafalgar TWrap up to 300 mm on the unexposed side	-/180/180	FRT200384 R1.3
Conduits	A3	Ø40 mm PVC conduit	2.6 mm	44 mm	Trafalgar FyreCHOKE collar – Ø40 mm on the exposed side	NA	-/120/120	FRT200384 R1.3
	A4	Ø25 mm conduit	2 mm	65 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	-/240/180	FRT200385

Service type	Tested specimen	Description	Wall thickness	Aperture	Sealant/ protection	Insulation wrap	FRL of service	Reference test
Plastic pipes	A1	Ø20 mm PE-Xa/AL/PE pipe	3 mm	60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	-/240/90	FRT200385
	A2	Ø20 mm PE-Xb pipe	3 mm	60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	-/180/180	FRT200385
	A3	Ø20 mm PE-Xa pipe	3 mm	60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	-/180/180	FRT200385
	A5	Ø50 mm uPVC pipe	2 mm	60 mm	Trafalgar FyreCHOKE collar – Ø50 mm on the exposed side	NA	-/180/180	FRT200384 R1.3
Metal pipes	A6	NB 150 galvanised steel pipe	4.9 mm	190 mm	Trafalgar FyreFlex, applied to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side.	Trafalgar TWrap up to 600 mm on the unexposed side	-/180/120	FRT200384 R1.3
	A5	NB 100 mm galvanised steel pipe	4.8 mm	135 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	Trafalgar TWrap up to 450 mm on the unexposed side	-/240/120	FRT200385 R1.2
	A6	DN 50 type B copper pipe	1.22 mm	80 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	Trafalgar TWrap up to 450 mm on the unexposed side	-/240/120	FRT200385 R1.2
	A7	DN 80 type B copper pipes	1.63 mm	100 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	Trafalgar TWrap up to 600 mm on the unexposed side	-/240/120	FRT200385 R1.2
	A8	DN 100 type B copper pipe	1.63 mm	135 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm	Trafalgar TWrap up to 600 mm on the unexposed side	-/240/120	FRT200385 R1.2

Service type	Tested specimen	Description	Wall thickness	Aperture	Sealant/ protection	Insulation wrap	FRL of service	Reference test
					cone configuration on the unexposed side			
	A9	DN 150 type B copper pipe	2.03 mm	180 mm	Trafalgar FyreFlex sealant to the full depth and in 30 mm × 30 mm cone configuration on the unexposed side	Trafalgar Uniguard up to 600 mm on the unexposed side	-/180/180	FRT200385 R1.2

The proposed 3/8 + 3/4 pair coil penetrations were tested in a bunch of 3. The proposed system can be assessed for up to 3 × 3/8 + 3/4 pair coils to the FRL obtained in FRT200397 R1.2. If the aperture size is reduced as appropriate while the protection detail maintained the reduced cable load can be positively assessed for the FRL stipulated in Table 19.

150 mm galvanised steel pipe was tested in FRT200384 R1.3 and achieved an FRL of -/180/120. Additionally, 100 mm galvanised steel pipe was tested in FRT200385 R1.2 and achieved an FRL of -/240/120. It is proposed that the pipe diameter will be reduced to 32 mm. As previously discussed, the proposed reduction in diameter will reduce the conductor size and as such the insulation performance is expected to improve. As the wall thickness remains unchanged, the metal pipe is expected to retain its rigidity and hence is likely to maintain integrity. Therefore, it is concluded that the proposed reduction is not expected to be detrimental to the fire resistance performance of the steel pipes.

It further proposed that the applicability of the copper pipe systems is extended to include steel pipes. Steel pipes has higher melting point (1550ºC compared with 1080ºC) and significantly lower thermal conductivity (50 W/m.K compared with 330 at 20 ºC) than copper pipes as stipulated in AS 4072.1:2005. As such, heat conduction through steel pipe is likely to occur significantly slower. Additionally, higher temperature will be required for thermal degradation of the pipes. Therefore, thermal performance of steel pipes is expected to be at least similar or better than the copper pipes. Based on the above, the applicability of the tested copper pipe systems is extended to include steel pipes.

In referenced test FRT200384 R1.3 the D2 cables failed insulation criteria at 100 minutes on the on the cable tray. It is considered that if the cable tray is stopped short of the penetration on both sides with the wrap increase to 450 mm distance on the unexposed side the insulation performance would be improved to reach and FRL of -/120/120. In referenced test FRT190292 R4.0, D1 cables were tested in 175 mm concrete floor with the 630 mm^2 cable failed insulation at 113 minutes. As such, the service can be assessed for -/120/90 in a 2-layer FyreBATT system. Based on the referenced test result it is further considered that if the protection detail from the wrap length is applied to 450 mm on the unexposed side for single and multi-copper core power cables with cores up to 185 mm^2, and 600 mm on the unexposed side for single core copper cables with core size greater than 185 mm^2, the FRL can be extended to - /120/120.

In referenced test FRT200385 R1.2 a Ø20 mm PE-Xa/AL/PE pipe failed insulation criteria at 112 minutes. It is considered that if the insulation on the pipe is improved by increasing the length of TWrap up to 450 mm on the unexposed side the insulation performance will be adequately improved to allocate the system with an FRL of -/240/120.

Copper and steel pipes were tested in a variety of diameters in referenced test FRT200385 R1.2. Based on the test data obtained in the referenced test for the 150 mm diameter pipes, it is considered that the copper or steel pipes with wall thickness 2.03 mm can be assessed to an FRL of -/180/180 for up to 150 mm diameters. It is considered that a reduced diameter results in a reduced conductor area and a less onerous insulation failure risk. Provided that the

proposed system is protected with Trafalgar FyreFlex sealant to the full depth and in 30 mm × 30 mm cone configuration on the unexposed side and 25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on the unexposed side, it can be positively assessed for a FRL of -/180/180.

In section 5.5.1, the expected performance of Trafalgar TWrap and MonoWrap were analysed. It was concluded that, services are expected to perform similarly or better if insulated with Trafalgar MonoWrap instead of TWrap at least up to 120 minutes. Based on this, Trafalgar MonoWrap is positively assessed for 120 minutes of insulation performance.

It is proposed that, the services will be installed into the aperture protected with single layer FyreBATT with an extra layer of FyreBATT built up extending a minimum of 100 mm from the service in all directions. The maximum size of the local patch must be 400 mm × 400 mm. Such build up ensures the protection around the service remains identical to the tested system. As such, the performance of the service is expected to be retained. However, as the primary fire barrier still remains as single layer FyreBATT, it is stipulated that the system FRL will be dictated by the assessed FRL of the blank seal which is listed in Table 1.

It is further proposed that, double layer FyreBATT will be installed as surface mounted as illustrated in Figure 31. For such construction, the interface between the FyreBATT and separating element is considered as the most onerous area. It is noted that, the interface will be sealed with 15 mm × 15 mm FyreFlex sealant. Additionally, the overlap between the edge of the floor and FyreBATT is stipulated be at least 120 mm for -/120/120 and 150 mm for -/180/180. With consideration to the sealing and overlap, it is concluded that, the proposed construction will not be detrimental to the performance of the FyreBATT system or services. Based on the above, the proposal is positively assessed.

Services are also proposed to be installed into the aperture protected with a single layer of surface mounted FyreBATT with an extra layer of FyreBATT built up extending a minimum of 100 mm from the service in all directions as illustrated in Figure 32. The maximum size of the local patch must be 400 mm × 400 mm. As discussed above, the local patch is expected provide adequate protection to retain the performance of the services. However, the system FRL will be dictated by the assessed FRL of the blank seal which is listed in Table 1. In addition, considering the additional load applied on the batt, it is stipulated that, only one service is permitted with local patching in a blank seal. Such construction is not expected to induce any integrity related failure if tested. Based on the above, surface mounted single layer batt with local patching is positively assessed.

It is proposed that, D1 and D2 cables will be installed with 3 sides protected with insulation and one side resting against a rigid wall as illustrated in Figure 33. In test FRT200256 R1.1, D1 power cables with 300 mm cable tray insulated from 3 sides and one side resting against a masonry block was tested. This construction achieved -/180/180. Based on the test data, the proposal is positively assessed.

It is further proposed that, wall will optionally be constructed with plasterboard. It is noted that, the wall contributes to fire protection from one side. As such, the performance of the wall needs to be taken into account while assessing the system FRL. It is stipulated that; the plasterboard wall must have an established FRL that matches the FRL of the services. In such case, the plasterboard wall is not expected to prejudice the FRL of the services. Based on the above, the plasterboard wall is positively assessed.

Based on the above, assessed services passing through floors protected with double layers FyreBATT is listed in Table 19.

6. Assessment outcome

This assessment demonstrates that the Trafalgar FyreBATT is expected to achieve the FRLs as shown in Table 15 to Table 19 if it were tested in accordance with AS 1530.4:2014 and assessed in accordance with AS 4072.1:2005.

Table 15 Single layer Trafalgar FyreBATT as blank seal

Blank seal	Separating element	Maximum aperture size	Batt configuration	Seal fitting and details	Reference test	Reference figure	FRL	System reference
Trafalgar FyreBATT	Concrete/masonry wall	1200 mm high × 1200 mm wide	1 × 60 mm FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Friction fitted into the aperture. Perimeter sealed with Trafalgar FyreFlex.	F16150	Figure 1	-/240/90	TBS1
		1200 mm high × unlimited width (1200 mm × 600 mm repeating units)	1 × 60 mm FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Friction fitted into the aperture. A primer is applied to the four ends. Trafalgar FyreFlex applied at the perimeter.	WARRES 317711		-/240/90	TBS2
	Concrete/masonry floor	1200 mm long × 600 mm wide	1 × 60 mm FyreBATT	Friction fitted into the aperture. Trafalgar FyreFlex applied at the perimeter.	WF375797	Figure 9 and Figure 10	-/180/120	TBS3
Note – FRL of the blank seal will be governed by the established FRL of the separating element.								

Table 16 Double layer Trafalgar FyreBATT as blank seal

Blank seal	Separating element	Maximum aperture size	Batt Configuration	Seal fitting and details	Reference test	Reference figure	FRL	System reference
Trafalgar FyreBATT	Concrete/masonry wall	1200 mm high × 1200 mm wide	2 × 60 mm FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Friction fitted flush on both faces or applied back-to-back. Perimeter sealed with Trafalgar FyreFlex	F16150	Figure 2 and Figure 3	-/240/240	TBD1
	Double layer plasterboard or Shaftliner wall system	1200 mm high × 2400 mm wide	2 × minimum 50 mm thick FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Friction fitted into the aperture flush on each face. Optionally can be installed as pattress fit or with a cavity (for thicker walls). Trafalgar FyreFlex applied at the perimeter. For pattress fit FyreBATT, an additional 25 mm × 25 mm Trafalgar FyreFlex needs to be applied at the perimeter of the face fitted FyreBATT.	WF 317718	Figure 4 to Figure 7	Up to - /120/120	TBD2
	Single layer plasterboard wall system	1000 mm high × 1200 mm wide	2 × 60 mm FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Pattress fit into the aperture and Trafalgar FyreFlex applied at the perimeter. Additionally, 25 mm × 25 mm Trafalgar FyreFlex applied at the perimeter of the face fitted FyreBATT.	FRT210436 R1.0	Figure 8	Up to - /90/90	TBD3
	Speedpanel, Hebel and Walsc AAC panels	1000 mm high × 1200 mm wide	2 × 60 mm FyreBATT Any butt joints must be sealed with Trafalgar FyreFlex	Pattress fit into the aperture and Trafalgar FyreFlex applied at the perimeter. Additionally, 25 mm × 25 mm Trafalgar FyreFlex applied at the perimeter of the face fitted FyreBATT.	FRT210436 R1.0	Figure 8	Up to - /120/120	TBD4
	Concrete/Masonry floor	1200 mm long × 600 mm wide	2 × 60 mm FyreBATT	Friction fitted into the aperture on each face with a cavity in between or applied back-to-back. Trafalgar FyreFlex sealant applied at the perimeter.	WF375797	Figure 11 and Figure 12	-/180/180	TBD5

Note – FRL of the blank seal will be governed by the established FRL of the separating element.

Table 17 Assessed FRL of the services protected with single layer of Trafalgar FyreBATT in walls

Services	Service description	Aperture size	Sealing system	Insulation	Reference test	Reference figure	FRL	System reference
Electrical and communication cable	AS 1530.4:2014 appendix D2 communication cables on 300 mm wide cable tray	Cut to fit service	Trafalgar FyreFlex to seal the annular gap and in 30 mm × 30 mm cone applied on both sides	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on each side	FRT200329 R1.3	Figure 13	-/120/90	TPS1
	AS 1530.4:2014 appendix D1 power cables on 300 mm wide cable tray	Cut to fit service						TPS2
Mixed bundle	Up to 3 × 3/8 + 5/8 pair coils with 19 mm FR insulation, 3 × CAT6 cable, 3 × electrical cables, 1 × Ø25 mm PVC drainpipe	Nominally 150 mm	Trafalgar FyreBOX Mini R-150 mm	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on each side	FRT200329 R1.3, FRT200397 R1.2 and FRT200384 R1.3	Figure 14	-/120/60	TPS3
Conduit	25 mm uPVC conduit	Nominally 25 mm	Trafalgar Fyrechoke – micro collar on both sides	NA	FRT200329 R1.3	Figure 15	-/120/60	TPS4
Plastic pipes	Ø20 mm PE-Xa, wall thickness 3 mm	Nominally 20 mm	Trafalgar Fyrechoke – micro collar on both sides	NA	FRT200329 R1.3	Figure 15	-/120/60	TPS5
	Ø20 mm PE-Xb, Wall thickness 3 mm						-/120/90	TPS6
	Ø20 mm PE-Xa/AL/PE, wall thickness 3 mm						-/120/60	TPS7
Metal pipes	32 mm – 100 mm MD steel pipe, wall thickness 4 mm	Maximum 135 mm	Trafalgar FyreFlex to seal the annular gap and in 30 mm × 30 mm cone applied on both sides	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on each side	FRT200329 R1.3	Figure 16	-/120/90	TPS8
	32 mm – 100 mm type B copper pipes, wall thickness 1.63 mm	Maximum 120 mm	Trafalgar FyreFlex to seal the annular gap and in 30 mm × 30 mm	25 mm thick Trafalgar TWrap or 40 mm thick	FRT200329 R1.3		-/120/90	TPS9

Services	Service description	Aperture size	Sealing system	Insulation	Reference test	Reference figure	FRL	System reference
			cone applied on both sides	MonoWrap 600 mm on each side				

Notes –

- It is understood that the services will be installed in blank seals protected with single layer of Trafalgar FyreBATT as summarised in Table 1. As such, the system FRL must be determined with consideration to the expected performance of the blank seal and the service penetration as a combination. The lowest indices in terms of integrity and insulation for particular blank seal and penetration service combination will be the applicable FRL of the system.
- As cable stipulated in Appendix D1 and D2 were tested, the assessed FRL is applicable to all PVC and XLPE insulated and sheathed power and communication cables with copper conductors.
- The annular gap between the metal pipes and the separating element must not exceed 20 mm.
- Insulation performance will be limited to 120 minutes if MonoWrap is used.
- Minimum separation between the services must be 40 mm as per the stipulation of AS 4072.1:2005.

Table 18 Assessed FRL of services protected with double layers FyreBATT in walls

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
Electrical and communication cables	AS 1530.4:2014 appendix D2 communication cables on 300 mm wide cable tray	Cut to fit service	Trafalgar FyreFlex to seal the annular gap and in 30 mm × 30 mm cone applied on both sides	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on both side	FRT200329 R1.3	Figure 17	-/120/120	TPD1
	AS 1530.4:2014 appendix D1 power cables on 300 mm wide cable tray	Cut to fit service					-/120/90	TPD2
	AS 1530.4:2014 appendix D1 power cables on 300 mm wide cable tray	Cut to fit service		25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on both side	FRT180392 R1.1	Figure 17	-/120/120	TPD3

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
	Up to 15 × TPS (2.5 mm²) cable bundle	Cut to fit service	Trafalgar FyreFlex to seal the annular gap and in 50 mm × 50 mm cone on both sides	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on both side	FRT200331 R1.2	Figure 17	-/120/120	TPD4
	Up to 15 × Fire alarm (1.5 mm²) cable bundle	Cut to fit service		NA	FRT200331 R1.2	Figure 18	-/120/120	TPD5
	Up to 15 × CAT6 cable bundle	Cut to fit service		NA	FRT200331 R1.2	Figure 18	-/120/120	TPD6
	Up to 5 × TPS cables, up to 5 × Fire alarm cables and up to 5 × CAT6 cables; either single or in bundle	Cut to fit service	Trafalgar FyreFlex applied to seal the annular gap and in 50 mm × 50 mm cone on the unexposed sides	NA	FRT200331 R1.2	Figure 19	-/120/120 (One-way FRL)	TPD7
	Up to 5 × TPS cables, up to 5 × Fire alarm cables, up to 5 × CAT6 cables; either single or in bundle	Cut to fit service	Trafalgar FyreFlex applied to seal the annular gap and in 50 mm × 50 mm cone on both sides	NA	FRT200331 R1.2	Figure 18	-/120/120	TPD8
	Up to 5 × TPS cables, up to 5 × Fire alarm cables, up to 5 × CAT6 cables; either single or in bundle	Cut to fit service	Trafalgar FyreFlex applied to seal the annular gap and in 50 mm × 50 mm cone on exposed sides	NA	FRT200331 R1.2	Figure 19	-/120/90 (One-way FRL)	TPD9
	1 × 3/8 + 3/4 pair coil with 19 mm FR insulation	Nominally 100 mm	Trafalgar FyrePEX HP sealant applied up to 100 mm depth	NA	FRT200331 R1.2	Figure 20	-/120/120	TPD10

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
	1 × 1/4 + 1/2 pair coil with 13 mm insulation	Nominally 100 mm		NA	FRT200331 R1.2		-/120/120	TPD11
Mixed bundle	Up to 3 × 3/8 + 5/8 pair coils with 19 mm FR insulation, 3 × CAT6 cable, 3 × electrical cables, 3 × Ø20 mm PVC drainpipe	Nominally 170 mm	Trafalgar FyreBOX Mini R-150 and Trafalgar FyreFlex sealant to the full depth	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on each side	FRT200329 R1.3, FRT200397 R1.2 and FRT200384 R1.3	Figure 22	-/240/120	TPD12
Conduit	Ø25 mm conduit, wall thickness 2 mm	Nominally 65 mm	Trafalgar FyrePEX HP sealant filled to the full depth	NA	FRT200331 R1.2	Figure 20	-/120/120	TPD13
	Ø40 mm PVC conduit, wall thickness 2.6 mm	Nominally 45 mm	Ø40 mm Trafalgar FyreCHOKE collar both sides	NA	FRT200397 R1.2	Figure 23	-/240/120	TPD14
Plastic pipes	Ø20 mm PE- Xa pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant filled to the full depth	NA	FRT200331 R1.2	Figure 20	-/120/120	TPD15
	Ø20 mm PE- Xb pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant filled to the full depth	NA	FRT200331 R1.2	Figure 20	-/120/120	TPD16
	Ø20 mm PE-Xa/AL/PE, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant filled to the full depth	NA	FRT200331 R1.2	Figure 20	-/120/60	TPD17
	Ø20 mm PE-Xa/AL/PE, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant filled to the full depth	25 mm thick Trafalgar TWrap 300 mm on each side	FRT200331 R1.2	Figure 20	-/120/120	TPD18
	Ø20 mm PE-Xa/AL/PE pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in	NA	FRT200397 R1.2	Figure 21	-/240/60	TPD19

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
			25 mm × 25 mm cone configuration around the service					
	Ø20 mm PE-Xa/AL/PE pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 25 mm × 25 mm cone configuration around the service	25 mm thick Trafalgar TWrap 300 mm on each side	FRT200331 R1.2 and FRT200397 R1.2	Figure 21	-/240/120	TPD20
	Ø50 mm uPVC pipe, wall thickness 2 mm	Nominally 56 mm	Ø50 mm Trafalgar FyreCHOKE collar on both sides	NA	FRT200397 R1.2	Figure 23	-/240/120	TPD21
	Ø100 mm uPVC pipe, wall thickness 4 mm	Nominally 110 mm	Ø100 mm Trafalgar FyreCHOKE collar on both side	NA	FRT200397 R1.2	Figure 23	-/240/60	TPD22
Metal pipes	32 mm copper pipe or steel pipe, wall thickness 1.22 mm	Nominally 110 mm	Trafalgar FyrePEX HP sealant to the full depth	25 mm FR insulation to the full length	FRT200397 R1.2	Figure 20	-/240/90	TPD23
	32 mm copper pipe or steel pipe, wall thickness 1.22 mm	Nominally 110 mm	Trafalgar FyrePEX HP sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm FR insulation to the full length	FRT200397 R1.2	Figure 21	-/240/120	TPD24
	100 mm copper pipe or steel pipe, wall thickness 1.63 mm	Nominally 135 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on the exposed side and 600 mm on the	FRT200397 R1.2	Figure 17	-/240/120 (One-way FRL)	TPD25

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
				unexposed side				
	100 mm copper pipe or steel pipe, wall thickness 1.63 mm	Nominally 135 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on both sides	FRT200397 R1.2	Figure 17	-/240/120	TPD26
	50 mm copper pipe or steel pipe, wall thickness 1.22 mm	Nominally 80 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on both sides	FRT200397 R1.2	Figure 17	-/240/120	TPD27
	80 mm copper pipe or steel pipe, wall thickness 1.63 mm	Nominally100 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on the exposed side and 600 mm on the unexposed side	FRT200397 R1.2	Figure 17	-/240/120 (One-way FRL)	TPD28
	80 mm copper pipe or steel pipe, wall thickness 1.63 mm	Nominally100 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on both sides	FRT200397 R1.2	Figure 17	- /240/120	TPD29

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
	150 mm galvanised steel pipe, wall thickness 4.9 mm	Nominally 190 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on the exposed side and 450 mm on the unexposed side	FRT200397 R1.2	Figure 17	-/240/90 (One-way FRL)	TPD30
	150 mm galvanised steel pipe, wall thickness, 4.9 mm	Nominally 190 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on both sides	FRT200397 R1.2	Figure 17	-/240/90	TPD31
	150 mm galvanised steel pipe, wall thickness, 4.9 mm	Nominally 190 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on both sides	FRT200397 R1.2	Figure 17	-/240/120	TPD32
	150 mm copper pipe or steel pipe, wall thickness 2.03 mm	Nominally 180 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	One layer of 25 mm thick Twrap or 40 mm thick MonoWrap 300 mm on the exposed side and 1100 mm on the unexposed side. Additionally, one layer of	FRT200397 R1.2	Figure 17	Up to - /240/240 (One-way FRL)	TPD33

Service type	Service description	Aperture	Sealant	Insulation wrap	Reference test	Reference figure	FRL	System reference
				25 mm thick Twrap or 65 mm Monowrap 300 mm on the unexposed side				
	150 mm copper pipe or steel pipe, wall thickness 2.03 mm	Nominally 180 mm	Trafalgar FyreFlex sealant to the full depth and 50 mm × 50 mm in cone configuration around the penetration	One layer of 25 mm thick Twrap or 40 mm thick MonoWrap 1100 mm on both sides. Additionally, one layer of 25 mm thick Twrap or 40 mm thick MonoWrap 300 mm on both sides	FRT200397 R1.2	Figure 17	Up to - /240/240	TPD34

Notes –

- It is understood that the services will be installed in blank seals protected with single layer of Trafalgar FyreBATT as summarised in Table 2. As such, the system FRL must be determined with consideration to the expected performance of the blank seal and the service penetration as a combination. The lowest indices in terms of integrity and insulation for particular blank seal and penetration service combination will be the applicable FRL of the system.
- As cable stipulated in Appendix D1 and D2 were tested, the assessed FRL is applicable to all PVC and XLPE insulated and sheathed power and communication cables with copper conductors.
- Insulation performance will be limited to 120 minutes if MonoWrap is used.
- The annular gap between the metal pipes and the separating element must not exceed 20 mm.
- Minimum separation between services must be 40 mm as per the stipulation of AS 4072.1:2005.

Table 19 Assessed FRL of services protected with double layers FyreBATT in floors

Service type	Description	Aperture	Sealant/ protection	Insulation wrap		Reference figure	FRL	System reference
Electrical and communication cables	AS 1530.4:2014 appendix D1 power cables with 300 mm cable tray	Cut to fit service	Trafalgar FyreFlex, applied to seal the annular gap and in 30 mm × 30 mm cone on unexposed side	Trafalgar TWrap up to 450 mm on the unexposed side	FRT190292 R4.0	Figure 24	-/120/90	TPD35
	AS 1530.4:2014 appendix D1 power cables with 300 mm cable tray	Cut to fit service	Trafalgar FyreFlex, applied to seal the annular gap and in 30 mm × 30 mm cone on the unexposed side	Trafalgar TWrap up to 600 mm on the unexposed side	FRT190292 R4.0	Figure 24	-/120/120*	TPD36
	AS 1530.4:2014 appendix D2 communication cables with 300 mm cable tray	Cut to fit service	Trafalgar FyreFlex, applied to seal the annular gap and 50 mm × 50 mm cone on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on the unexposed side	FRT200384 R1.3	Figure 24	-/180/90	TPD37
	AS 1530.4:2014 appendix D2 communication cables with 300 mm cable tray cut short of the penetration	Cut to fit service	Trafalgar FyreFlex, applied to seal the annular gap and 50 mm × 50 mm cone on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on the unexposed side	FRT200384 R1.3	Figure 24	-/180/120	TPD38
Mixed bundle	1 × 3/8 + 3/4 pair coils with 19 mm FR insulation, 1 × CAT6 cable, 1 × electrical cables, 1 × Ø20 mm PVC drainpipe	Nominally 100 mm	Trafalgar FyrePEX HP sealant up to 100 mm depth	NA	FRT200384 R1.3	Figure 25	-/180/120	TPD39
Electrical and communication cables	15 × TPS cables, 1 × fibre optic NBN cable	Cut to fit service	Trafalgar FyreFlex, applied in 30 mm × 30 mm cone configuration on the unexposed side	NA	FRT200384 R1.3	Figure 27	-/180/120	TPD40
Mixed bundle	1 × 3/8 + 3/4 pair coils with 19 mm FR insulation, 1 × CAT6 cable, 1 × electrical cable, 1 × Ø20 mm PE-Xa/AL/PE, Ø20 mm PE-Xb pipe, 3 × Ø25 mm conduit	Nominally 170 mm	Trafalgar FyreBOX Mini R-150 and Trafalgar FyreFlex sealant to the full depth	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 300 mm on the unexposed side	FRT200384 R1.3	Figure 28	Up to - /180/180	TPD41
	Up to 3 × 3/8 + 3/4 pair coils with 19 mm FR insulation, 1 × CAT6 cable, 1 × electrical cable, 1 ×	170 mm	Trafalgar FyreBOX Mini R-150 and Trafalgar FyreFlex sealant to the full depth	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap	FRT200384 R1.3	Figure 28	-/180/120	TPD42

Service type	Description	Aperture	Sealant/ protection	Insulation wrap		Reference figure	FRL	System reference
	Ø20 mm PE-Xa/AL/PE, Ø20 mm PE-Xb pipe, 3 × Ø25 mm conduit			300 mm on each side				
Conduit	Ø40 mm PVC conduit, wall thickness 2.6 mm	Nominally 44 mm	Trafalgar FyreCHOKE collar – Ø40 mm on the exposed side	NA	FRT200384 R1.3	Figure 29	-/120/120	TPD43
	Ø25 mm conduit, wall thickness 2 mm	Nominally 65 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	FRT200385 R1.2	Figure 26	-/240/180	TPD44
Plastic pipes	Ø20 mm PE-Xa/AL/PE pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	FRT200385 R1.2	Figure 26	-/240/90	TPD45
	Ø20 mm PE-Xa/AL/PE pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on the unexposed side	FRT200385 R1.2	Figure 26	-/240/120	TPD46
	Ø20 mm PE-Xb pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	FRT200385 R1.2	Figure 26	-/180/180	TPD47
	Ø20 mm PE-Xa pipe, wall thickness 3 mm	Nominally 60 mm	Trafalgar FyrePEX HP sealant to the full depth and in 30 mm × 30 mm on the unexposed side	NA	FRT200385 R1.2	Figure 26	-/180/180	TPD48
	Ø50 mm uPVC pipe, wall thickness 2 mm	Nominally 60 mm	Trafalgar FyreCHOKE collar – Ø50 mm on the exposed side	NA	FRT200384 R1.3	Figure 29	-/180/180	TPD49
Metal pipes	32 mm –150 mm galvanised steel pipe, wall thickness 4.9 mm	Nominally 190 mm	Trafalgar FyreFlex, applied to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side.	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on the unexposed side	FRT200384 R1.3	Figure 24	-/180/120	TPD50

Service type	Description	Aperture	Sealant/ protection	Insulation wrap		Reference figure	FRL	System reference
	32 mm – 100 mm galvanised steel pipe, wall thickness 4.8 mm	Nominally 135 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on the unexposed side	FRT200385 R1.2	Figure 24	-/240/120	TPD51
	50 mm copper or steel pipes, wall thickness 1.22 mm	Nominally 80 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 450 mm on the unexposed side	FRT200385 R1.2	Figure 24	-/240/120	TPD52
	80 mm copper or steel pipes, wall thickness 1.63 mm	Nominally 100 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on the unexposed side	FRT200385 R1.2	Figure 24	-/240/120	TPD53
	100 mm copper or steel pipes, wall thickness 1.63 mm	Nominally 135 mm	Trafalgar FyreFlex sealant to the full depth and in 50 mm × 50 mm cone configuration on the unexposed side	25 mm thick Trafalgar TWrap or 40 mm thick MonoWrap 600 mm on the unexposed side	FRT200385 R1.2	Figure 24	-/240/120	TPD54
	Up to 150 mm copper or steel pipes, wall thickness 2.03 mm	Nominally 180 mm	Trafalgar FyreFlex sealant to the full depth and in 30 mm × 30 mm cone configuration on the unexposed side	Trafalgar Uniguard 600 mm on the unexposed side	FRT200385 R1.2	Figure 24	-/180/180	TPD55

Notes –

- It is understood that the services will be installed in blank seals protected with single layer of Trafalgar FyreBATT as summarised Table 2. As such, the system FRL must be determined with consideration to the expected performance of the blank seal and the service penetration as a combination. The lowest indices in terms of integrity and insulation for particular blank seal and penetration service combination will be the applicable FRL of the system.
- As cable stipulated in Appendix D1 and D2 were tested, the assessed FRL is applicable to all PVC and XLPE insulated and sheathed power and communication cables with copper conductors.
- The annular gap between the metal pipes and the separating element must not exceed 20 mm.
- The insulation performance will be limited to 120 minutes if Trafalgar MonoWrap is used.

Service type	Description	Aperture	Sealant/ protection	Insulation wrap	Reference figure	FRL	System reference

- Minimum separation between services must be 40 mm as per the stipulation of AS 4072.1:2005.
- All penetrations may be installed in an aperture protected with a single layer of FyreBATT with an extra layer of FyreBATT built up extending a minimum of 100 mm from the service in all directions as illustrated in Figure 30. The maximum size of the local patch must not exceed 400 mm × 400 mm. The FRL for these systems is limited by the FRL specified for single layer floor systems in Table 1.
- The double layer FyreBATTs can also be surface mounted as illustrated in Figure 31. In such case, the overlap between the edge of the floor and FyreBATT must be at least 120 mm for -/120/120 and 150 mm for -/180/180.
- Services can also be installed into the aperture protected with a single layer of surface mounted FyreBATT with an extra layer of FyreBATT built up extending a minimum of 100 mm from the service in all directions as illustrated in Figure 32. The maximum size of the local patch must not exceed 400 mm × 400 mm. In such case, only one service is permitted with local patching in a blank seal. The FRL for these systems is limited by the FRL specified for single layer floor systems in Table 1. The overlap between the edge of the floor and FyreBATT must be at least 120 mm for -/120/120 and 150 mm for -/180/180.
- D1 and D2 cable configurations can be installed as constructed in FRT200256 R1.1 (specimen A1) with protection on 3 sides and rigid wall element on one side. The FRL of these systems is limited to -/180/180. The cable tray can also be optionally installed against a plasterboard wall. In such case, the plasterboard wall must have an established FRL that matches the FRL of the relevant service. The system construction is illustrated in Figure 33.

*Single and multi-copper core power cables with cores up to 185 mm^2 – 450 mm wrap on the top side

*Single core copper cables with core size greater than 185 mm^2 – 600 mm wrap on the top side

7. Validity

Warringtonfire Australia does not endorse the tested or assessed product in any way. The conclusions of this assessment may be used to directly assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazard under all conditions.

Due to the nature of fire testing and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

This assessment is based on information and experience available at the time of preparation. The published procedures for the conduct of tests and the assessment of test results are subject to constant review and improvement. It is therefore recommended that this report be reviewed on, or before, the stated expiry date.

This assessment represents our opinion about the performance expected to be demonstrated in a test in accordance with AS 1530.4:2014, based on the evidence referred to in this report.

This assessment is provided to Trafalgar Group for their own specific purposes. This report may be used as Evidence of Suitability in accordance with the requirements of the relevant National Construction Code. Building certifiers and other third parties are responsible for deciding if systems listed within this assessment are accepted for a particular installation.

Appendix A Summary of supporting test data

A.1 Test report – FRT200329 R1.3

Table 20 Information about test report

<table>
<tr><th>Item</th><th colspan="6">Information about test report</th></tr>
<tr><td>Report sponsor</td><td colspan="6">Trafalgar Group</td></tr>
<tr><td>Test laboratory</td><td colspan="6">Warringtonfire Australia, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.</td></tr>
<tr><td>Test date</td><td colspan="6">The fire resistance test was completed on 29 October 2020.</td></tr>
<tr><td>Test standards</td><td colspan="6">The test was done in accordance with AS 1530.4:2014.</td></tr>
<tr><td>Variation to test standards</td><td colspan="6">The pressure was up to 1 Pa above the limits prescribed in the standard during the 30-35 minute period. The pressure and temperature were within the limits for the rest of the test. This overpressure resulted in more onerous test conditions, so would not have invalidated the test result.</td></tr>
<tr><td>General description of tested specimen</td><td colspan="6">The following services were tested in 16 mm thick fire-rated plasterboard wall system with 64 mm steel framing.
<table>
<tr><th colspan="2">Penetration system</th><th>Service</th><th>Local fire-stopping protection</th><th>Main fire-stopping protection</th><th>Local aperture size (mm)</th><th>Main aperture size (mm)</th></tr>
<tr><td>A</td><td>1</td><td>• 1 × D2 communication cable group
• 1 × 300 mm cable tray</td><td>• Trafalgar FyreFlex™ sealant
• Trafalgar TWrap</td><td rowspan="5">• One layer of Trafalgar FyreBatts double coated
• Trafalgar FyreFlex™ sealant</td><td>To fit service</td><td rowspan="5">1200 mm wide × 600 mm high</td></tr>
<tr><td></td><td>2</td><td>• 1 × D1 power cable group
• 1 × 300 mm cable tray</td><td>• Trafalgar FyreFlex™ sealant
• Trafalgar TWrap</td><td>To fit service</td></tr>
<tr><td></td><td>3</td><td>• 3 × 3/8 + 5/8 pair coils with 19 mm insulation
• 3 × CAT 6 cables
• 3 × Electrical cables
• 1 × Ø25 mm PVC pipe</td><td>• Trafalgar FyreBOX Mini R-150
• Trafalgar TWrap</td><td>Ø150</td></tr>
<tr><td></td><td>4</td><td>• 1 × NB 100 MD steel pipe</td><td>• Trafalgar FyreFlex™ sealant
• Trafalgar TWrap</td><td>Ø135</td></tr>
<tr><td></td><td>5</td><td>• 1 × DN 100 type B copper pipe</td><td>• Trafalgar FyreFlex™ sealant
• Trafalgar TWrap</td><td>Ø120</td></tr>
<tr><td>B</td><td>1</td><td>• 1 × Ø25 mm conduit</td><td>• Trafalgar Fyrechoke</td><td></td><td>Ø25</td><td></td></tr>
</table>
</td></tr>
</table>

				– micro collar	• One layer of Trafalgar FyreBatts double coated • Trafalgar FyreFlex™ sealant		600 mm wide × 400 mm high
		2	• 1 × DN 50 type B copper pipe	• Trafalgar FyreFlex™ sealant • Trafalgar TWrap		Ø70	
		3	• 1 × Ø20 mm PE-Xa	• Trafalgar Fyrechoke – micro collar		Ø20	
		4	• 1 × Ø20 mm PE-Xb	• Trafalgar Fyrechoke – micro collar		Ø20	
		5	• 1 × Ø20 mm PE-Xa/AL/PE	• Trafalgar Fyrechoke – micro collar		Ø20	
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.						

The test specimen achieved the following results – see Table 21.

Table 21 Results summary for this test report

Penetration system		Criteria	Results	Fire resistance level (FRL)
A	Main fire-stopping protection	Structural adequacy	Not applicable	**-/120/60**
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 84 minutes	
	1	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 98 minutes	
	2	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 114 minutes	
	3	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 79 minutes	
	4	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 92 minutes	
	5	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 96 minutes	

B	Main fire-stopping protection	Structural adequacy	Not applicable	-/120/60
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 67 minutes	
	1	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 80 minutes	
	2	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 85 minutes	
	3	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 74 minutes	
	4	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 98 minutes	
	5	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 85 minutes	

A.2 Test report – FRT180392 R1.1

Table 22 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Group
Test laboratory	Warringtonfire Australia, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was completed on 27 November 2018.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	The percentage deviation in the area of the curve of the average temperature recorded by the specified furnace thermocouples versus time from the standard time-temperature curve was up to 8% below the limits prescribed in the standard from the 5th to the 33rd minute period. The test period was extended for a further 10 minutes, during which no penetration system failures occurred. The pressure was up to 12 Pa above the limits prescribed in the standard during the 5-15-, and 114-120-minute periods. The pressure was also up to 4 Pa below the limits prescribed in the standard during the 15-20-, and 120-125-minute periods. The pressure and temperature were within the limits for the rest of the test duration. The overpressure resulted in a more onerous test conditions, and due to the nature of the specimen and the fact that no significant events occurred during these time periods, these deviations are unlikely to have invalidated the test results.
General description of tested specimen	The wall system consisted of two layers of 13 mm thick CSR Fyrchek fire-rated plasterboard fixed onto both sides of a 64 mm 0.50BMT steel stud to construct a wall at 116 mm total thickness with studs located at nominal 600 mm centres with a vertical joint between the plasterboard sheets. Service E – D1 Group A Power Cables protected by, two layers of Trafalgar double coated Trafalgar FyreBATTs – was tested in accordance

	with AS 1530.4:2014. The size of the BATT was recorded to be 540mm wide × 430mm high.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results – see Table 23.

Table 23 Results summary for this test report

Penetration system	Criteria	Results	Fire resistance level (FRL)
E	Structural adequacy	Not applicable	**-/120/90**
	Integrity	No failure at 130 minutes	
	Insulation	Failure at 116 minutes	

A.3 Test report – FRT200331 R1.2

Table 24 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Group
Test laboratory	Warringtonfire Australia, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was completed on 28 October 2020.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	None
General description of tested specimen	The following services were tested in a 51 mm Speedpanel wall.

Penetration system		Service	Local fire-stopping protection	Main fire-stopping protection	Local aperture size (mm)	Main aperture size (mm)
A	1	• 15 × TPS cables	• Trafalgar TWrap • Trafalgar FyreFlex™ sealant	• Two layers of Trafalgar FyreBatts single coated • Trafalgar FyreFlex™ sealant	To fit service	600 × 600
	2	• 15 × fire alarm cables	• Trafalgar FyreFlex™ sealant		To fit service	
	3	• 15 × CAT 6 cables	• Trafalgar FyreFlex™ sealant		To fit service	
	4	• 5 × TPS cables • 5 × fire alarm cables • 5 × CAT 6 cables	• Trafalgar FyreFlex™ sealant		To fit service	
	5	• 5 × TPS cables • 5 × fire alarm cables	• Trafalgar FyreFlex™ sealant		To fit service	

			• 5 × CAT 6 cables			
		6	• 1 × 3/8 + 3/4 pair coil with 19 mm insulation	• Trafalgar FyrePEX™ HP intumescent sealant		Ø100
		7	• 1 × Ø25 mm conduit	• Trafalgar FyrePEX™ HP intumescent sealant		Ø65
		8	• 1 × 1/4 + 1/2 pair coil with 13 mm insulation	• Trafalgar FyrePEX™ HP intumescent sealant		Ø100
		9	• 1 × Ø20 mm PE-Xa	• Trafalgar FyrePEX™ HP intumescent sealant		Ø60
		10	• 1 × Ø20 mm PE-Xb	• Trafalgar FyrePEX™ HP intumescent sealant		Ø60
		11	• 1 × Ø20 mm PE-Xa/AL/PE	• Trafalgar FyrePEX™ HP intumescent sealant		Ø60
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.					

The test specimen achieved the following results – see Table 25.

Table 25 Results summary for this test report

Penetration system		Criteria	Results	Fire resistance level (FRL)
A	Main fire-stopping protection	Structural adequacy	Not applicable	**-/120/60**
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 70 minutes	
	1	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	No failure at 121 minutes	
	2	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	No failure at 121 minutes	
	3	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	No failure at 121 minutes	
	4	Structural adequacy	Not applicable	

		Integrity	No failure at 121 minutes	
		Insulation	No failure at 121 minutes	
	5	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 119 minutes	
	6	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	No failure at 121 minutes	
	7	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	No failure at 121 minutes	
	8	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	No failure at 121 minutes	
	9	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	No failure at 121 minutes	
	10	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	No failure at 121 minutes	
	11	Structural adequacy	Not applicable	
		Integrity	No failure at 121 minutes	
		Insulation	Failure at 72 minutes	

A.4 Test report – FRT200397 R1.2

Table 26 Information about test report

<table>
<tr><th>Item</th><th>Information about test report</th></tr>
<tr><td>Report sponsor</td><td>Trafalgar Group</td></tr>
<tr><td>Test laboratory</td><td>Warringtonfire Australia, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.</td></tr>
<tr><td>Test date</td><td>The fire resistance test was completed on 22 December 2020.</td></tr>
<tr><td>Test standards</td><td>The test was done in accordance with AS 1530.4:2014.</td></tr>
<tr><td>Variation to test standards</td><td>The pressure was up to 3 Pa above the limits prescribed in the standard during the 60-65 and the 115–120-minute periods. The pressure and temperature were within the limits for the rest of the test. This overpressure resulted in more onerous test conditions, so would not have invalidated the test result.</td></tr>
<tr><td>General description of tested specimen</td><td>The following services were tested in a 78 mm Speedpanel wall system.
<table>
<tr><th colspan="2">Penetration system</th><th>Service</th><th>Local fire-stopping protection</th><th>Main fire-stopping protection</th><th>Local aperture size (mm)</th><th>Main aperture size (mm)</th></tr>
<tr><td>A</td><td>1</td><td>1 × Ø20 mm PE-Xa/AL/PE pipe</td><td>Trafalgar FyrePEX HP sealant</td><td>• Two layers of Trafalgar</td><td>Ø60 mm</td><td>1200 mm wide ×</td></tr>
</table></td></tr>
</table>

		2	1 × Ø50 mm uPVC pipe	Trafalgar FyreCHOKE collar – Ø50 mm	• FyreBatts single coated • Trafalgar FyreFlex sealant	Ø56 mm	600 mm high
		3	1 × Ø100 mm uPVC pipe	Trafalgar FyreCHOKE collar – Ø100 mm		Ø110 mm	
		4	• 1 × DN 32 type B copper pipe • 1 × FR insulation	Trafalgar FyrePEX HP sealant		Ø110 mm	
		5	1 × Ø40 mm PVC conduit	Trafalgar FyreCHOKE collar – Ø40 mm		Ø45 mm	
		6	• 3 × 3/8 + 5/8 pair coils with 13 mm FR insulation • 3 × Ø20 mm drainpipes • 3 × CAT 6 cables • 3 × Power cables	• Trafalgar FyreBOX Mini R-150 • Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø170 mm	
		7	1 × DN 100 type B copper pipe	• Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø135 mm	
		8	1 × DN 50 type B copper pipe	• Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø80 mm	
		9	1 × DN 80 type B copper pipe	• Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø100 mm	
		10	1 × NB 150 galvanised steel pipe	• Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø190 mm	
		11	1 × DN 150 type B copper pipe	• Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø180 mm	
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.						

The test specimen achieved the following results – see Table 27 .

Table 27 Results summary for this test report

Penetration system		Criteria	Results	Fire resistance level (FRL)
A	Main fire-stopping protection	Structural adequacy	Not applicable	**-/240/60**
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 114 minutes	
	1	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 71 minutes	
	2	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 168 minutes	
	3	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 65 minutes	
	4	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 93 minutes	
	5	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 169 minutes	
	6	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 146 minutes	
	7	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 175 minutes	
	8	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 159 minutes	
	9	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 179 minutes	
	10	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 119 minutes	
	11	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	No failure at 241 minutes	

A.5 Test report – FRT200384 R1.3

Table 28 Information about test report

<table>
<tr><th>Item</th><th colspan="7">Information about test report</th></tr>
<tr><td>Report sponsor</td><td colspan="7">Trafalgar Group</td></tr>
<tr><td>Test laboratory</td><td colspan="7">Warringtonfire Australia, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.</td></tr>
<tr><td>Test date</td><td colspan="7">The fire resistance test was completed on 18 December 2020.</td></tr>
<tr><td>Test standards</td><td colspan="7">The test was done in accordance with AS 1530.4:2014.</td></tr>
<tr><td>Variation to test standards</td><td colspan="7">None</td></tr>
<tr><td>General description of tested specimen</td><td colspan="7">The following services were tested in a 120 mm thick concrete floor.
<table>
<tr><th>Penetration system</th><th></th><th>Service</th><th>Local fire-stopping protection</th><th>Main fire-stopping protection</th><th>Local aperture size (mm)</th><th>Main aperture size (mm)</th></tr>
<tr><td rowspan="6">A</td><td>1</td><td>• 1 × D2 communication cable group
• 1 × 300 mm cable tray</td><td>• Trafalgar FyreFlex sealant
• Trafalgar TWrap</td><td rowspan="6">• Two layers of Trafalgar FyreBatts singled coated
• Trafalgar FyreFlex sealant</td><td>To fit service</td><td rowspan="6">800 mm wide × 600 mm long</td></tr>
<tr><td>2</td><td>• 1 × 3/8 + 3/4 pair coil with 13 mm FR insulation
• 1 × Ø20 mm drainpipe
• 1 × CAT 6 cable
• 1 × power cable</td><td>• Trafalgar FyrePEX HP sealant</td><td>Ø100 mm</td></tr>
<tr><td>3</td><td>1 × Ø40 mm PVC conduit</td><td>• Trafalgar FyreCHOKE collar – Ø40 mm</td><td>Ø44 mm</td></tr>
<tr><td>4</td><td>1 × Ø100 mm uPVC pipe</td><td>• Trafalgar FyreCHOKE collar – Ø100 mm</td><td>Ø110 mm</td></tr>
<tr><td>5</td><td>1 × Ø50 mm uPVC pipe</td><td>• Trafalgar FyreCHOKE collar – Ø50 mm</td><td>Ø60 mm</td></tr>
<tr><td>6</td><td>1 × NB 150 galvanised steel pipe</td><td>• Trafalgar FyreFlex sealant
• Trafalgar TWrap</td><td>Ø190 mm</td></tr>
</table></td></tr>
</table>

			7	• 15 × TPS cables • 1 × fibre optic NBN cable	• Trafalgar FyreFlex sealant		To fit service	
			8	• 1 × 3/8 + 3/4 pair coil with 13 mm FR insulation • 1 × CAT 6 cable • 1 × power cable • 1 × Ø20 mm PE-Xa/AL/PE pipe • 1 × Ø20 mm PE-Xb pipe • 3 × Ø25 mm conduit	• Trafalgar FyreBOX Mini R-150 • Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø170 mm	
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.							

The test specimen achieved the following results – see Table 29 .

Table 29 Results summary for this test report

Penetration system		Criteria	Results	Fire resistance level (FRL)
A	Main fire-stopping protection	Structural adequacy	Not applicable	-/45/45
		Integrity	Failure at 205 minutes	
		Insulation	Failure at 89 minutes	
	1	Structural adequacy	Not applicable	
		Integrity	Failure at 196 minutes	
		Insulation	Failure at 100 minutes	
	2	Structural adequacy	Not applicable	
		Integrity	Failure at 205 minutes	
		Insulation	Failure at 165 minutes	
	3	Structural adequacy	Not applicable	
		Integrity	Failure at 172 minutes	
		Insulation	Failure at 172 minutes	
	4	Structural adequacy	Not applicable	
		Integrity	Failure at 57 minutes	
		Insulation	Failure at 55 minutes	
	5	Structural adequacy	Not applicable	
		Integrity	Failure at 196 minutes	
		Insulation	Failure at 193 minutes	
	6	Structural adequacy	Not applicable	
		Integrity	Failure at 187 minutes	
		Insulation	Failure at 133 minutes	
	7	Structural adequacy	Not applicable	

		Integrity	Failure at 205 minutes	
		Insulation	Failure at 121 minutes	
	8	Structural adequacy	Not applicable	
		Integrity	Failure at 205 minutes	
		Insulation	Failure at 196 minutes	

A.6 Test report – FRT180385 R1.2

Table 30 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Group
Test laboratory	Warringtonfire Australia, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was completed on 21 December 2020.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	The pressure was up to 11 Pa below the limits prescribed in the standard during the 125-130, 210-215 and 235-240 minute periods. The pressure and temperature were within the limits for the rest of the test. Due to the nature of the specimen and the fact that no significant events occurred during these time periods, this under pressure is unlikely to have invalidated the test result.
General description of tested specimen	Following services were tested in a 180 mm thick concrete floor system.

Penetration system		Service	Local fire-stopping protection	Main fire-stopping protection	Local aperture size (mm)	Main aperture size (mm)
A	1	1 × Ø20 mm PE-Xa/Al/PE pipe	Trafalgar FyrePEX HP sealant	• Two layers of FyreBatts single coated • Trafalgar FyreFlex sealant	Ø60 mm	1200 mm wide × 600 mm long
	2	1 × Ø20 mm PE-Xb pipe	Trafalgar FyrePEX HP sealant		Ø60 mm	
	3	1 × Ø20 mm PE-Xa pipe	Trafalgar FyrePEX HP sealant		Ø60 mm	
	4	1 × Ø25 mm conduit	Trafalgar FyrePEX HP sealant		Ø65 mm	
	5	1 × NB 100 galvanised steel pipe	• Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø135 mm	
	6	1 × DN 50 type B copper pipe	• Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø80 mm	
	7	1 × DN 80 type B copper pipe	• Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø100 mm	

		8	1 × DN 100 type B copper pipe	• Trafalgar FyreFlex sealant • Trafalgar TWrap		Ø135 mm	
		9	1 × DN 150 type B copper pipe	• Trafalgar FyreFlex sealant • Trafalgar Uniguard		Ø180 mm	
	B	1	1 × DN 65 type B copper pipe	-	• Trafalgar Maxilite board 60 mm • Trafalgar Uniguard • Trafalgar FyreFlex sealant	Ø85 mm	400 mm wide × 200 mm long
		2	1 × DN 100 type B copper pipe	-		Ø135 mm	
		3	• 1 × NB 100 galvanised steel pipe • 1 × Power cable • 1 × Fire alarm cable	-		Ø135 mm	
Instrumentation			The test report states that the instrumentation was in accordance with AS 1530.4:2014.				

The test specimen achieved the following results – see Table 31 .

Table 31 Results summary for this test report

Penetration system		Criteria	Results	Fire resistance level (FRL)
A	Main fire-stopping protection	Structural adequacy	Not applicable	-/180/90
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 177 minutes	
	1	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 112 minutes	
	2	Structural adequacy	Not applicable	
		Integrity	Failure at 217 minutes	
		Insulation	Failure at 192 minutes	
	3	Structural adequacy	Not applicable	
		Integrity	Failure at 224 minutes	
		Insulation	Failure at 223 minutes	
	4	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 180 minutes	
	5	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	

		Insulation	Failure at 171 minutes	
	6	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 134 minutes	
	7	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 145 minutes	
	8	Structural adequacy	Not applicable	
		Integrity	No failure at 241 minutes	
		Insulation	Failure at 163 minutes	
	9	Structural adequacy	Not applicable	
		Integrity	Failure at 211 minutes	
		Insulation	Failure at 192 minutes	
B		Structural adequacy	Not applicable	**-/120/90**
		Integrity	Failure at 162 minutes	
		Insulation	Failure at 107 minutes	

A.7 Test report – FSV 2145

Table 32 Information about test report

Item	Information about test report
Report sponsor	CSR Building Products Limited
Test laboratory	Infrastructure Technologies, 14 Julius Avenue, North Ryde, NSW 2113
Test date	The fire resistance test was done on 14 October 2020.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	None
General description of tested specimen	A 400 mm × 400 mm aperture protected with an insulated blanket installed into a framed 75 mm thick Hebel powerpanel wall was tested.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4: 2014.

The test specimen achieved the following results – see Table 33

Table 33 Results summary for this test report

Service	Integrity	Insulation	Location of failure
P	131 minutes	38	At the centre of insulated blanket

A.8 Test report – NI 0687

Table 34 Information about test report

Item	Information about test report
Report sponsor	Wormald Fire Systems
Test laboratory	Fire Research Laboratories, 59 Normanby Road, VIC 3168
Test date	The fire resistance test was done on 02 April 1987.
Test standards	The test was done in accordance with AS 1530.4:1985.

Variation to test standards	None
General description of tested specimen	1800 mm high × 1000 mm wide aperture protected with Trafalgar FyreBATT in a 140 mm hollow core concrete masonry block was tested.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:1985.

The test specimen achieved the following results – see Table 35.

Table 35 Results summary for this test report

Service	Integrity	Insulation
FyreBATT	122 minutes	122 minutes

A.9 Test report – WF 375797

Table 36 Information about test report

Item	Information about test report
Report sponsor	Polyseam AS, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 9 March 2017.
Test standards	The test was done in accordance with BS EN 1366-3:2009 and BS EN 1366-4:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 4000 mm × 3000 mm × 150 mm thick aerated concrete floor. The services referenced in this assessment report are B and C. The construction details and achieved performance are presented in the Table below.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-4:2009.

The test specimen achieved the following results – see Table 37.

Table 37 Results summary for this test report

Specimen	Seal type	FRL
B	1200 mm long by 600 mm wide aperture. The aperture was sealed with two 60 mm thick Polyseam "Protecta" FR Board 60 2-S ablative coated batts, with a nominal density of 160 kg/m^3. The batt seal was friction fitted into the aperture with a nominal 10 mm wide bead of Protecta FR Acrylic applied. The batts were fitted flush to the exposed and unexposed face with a 30 mm air gap.	-/180/180
C	1200 mm long by 600 mm wide aperture. The aperture was sealed with one 60 mm thick Polyseam "Protecta" FR Board 60 2-S ablative coated batts, with a nominal density of 160 kg/m^3. The batt seal was friction fitted into the aperture with a nominal 10 mm wide bead of Protecta FR Acrylic applied. The batts were fitted flush to the exposed and unexposed face with a 30 mm air gap.	-/240/120

A.10 Test report – F16150

Table 38 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 20 May 2016.

Test standards	The test was done in accordance with BS EN 1366-3:2009 and BS EN 1366-4:2006.
Variation to test standards	None.
General description of tested specimen	Four horizontal linear joint sealing systems and two blank seals were tested when installed within a reinforced aerated concrete lintel and blockwork wall. The referenced services in this assessment report are service E and service F. The construction details and achieved performance are presented in the Table below.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012.

The test specimen achieved the following results – see Table 39 .

Table 39 Results summary for this test report

Specimen	Seal type	FRL
E	1200 mm high × 1200 mm wide aperture protected with 2 × 60 mm FyreBATT butted together. Joint sealed with Protecta sealant.	-/240/240
F	1200 mm high × 1200 mm wide aperture protected with 1 × 60 mm FyreBATT butted together. Joint sealed with Protecta sealant.	-/240/90

A.11 Test report – WARRES 317711

Table 40 Information about test report

Item	Information about test report
Report sponsor	Protecta AS
Test laboratory	Warringtonfire, Holmesfield Road, Warrington, WA1 2DS, UK
Test date	The fire resistance test was completed on 09 July 2012.
Test standards	The test was done in accordance with BS EN 1366-3:2009
Variation to test standards	None.
General description of tested specimen	The wall construction had overall nominal dimensions of 3000 mm high by 3000 mm wide by 150 mm thick and incorporated an aperture of nominal 2400 mm wide and 1200 mm high. The aperture was sealed with four 60 mm thick Protecta FR boards. The boards were friction fitted into the aperture and butt joined together. The perimeter edges and joints were sealed with Protecta FR Acrylic sealant
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 41 .

Table 41 Results summary for this test report

Specimen	Integrity	Insulation
Blank seal	260 minutes	92 minutes

A.12 Test report – WARRES 317718

Table 42 Information about test report

Item	Information about test report
Report sponsor	Protecta AS
Test laboratory	Warringtonfire, Holmesfield Road, Warrington, WA1 2DS, UK
Test date	The fire resistance test was completed on 12 September 2012.

Test standards	The test was done in accordance with BS EN 1366-3:2009
Variation to test standards	None.
General description of tested specimen	The wall construction included 50 mm wide galvanised mild steel studs at 600 mm centres cladded with two layers of 12.5 mm thick pasteboards. The wall included an aperture of 2400 mm wide and 1200 mm high. The aperture was sealed with two layers of 50 mm thick Protecta FR boards. The joints and the perimeters were sealed with Protecta FR Acrylic.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 43.

Table 43 Results summary for this test report

Specimen	Integrity	Insulation
Blank seal	132 minutes	132 minutes

A.13 est report – FRT210436 R1.0

Table 44 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Group
Test laboratory	Warringtonfire, 2/409-411 Hammond Rd, Dandenong South VIC 3175
Test date	The fire resistance test was completed on 10 January 2022.
Test standards	The test was done in accordance with AS 1530.4:2014
Variation to test standards	None.
General description of tested specimen	A 1200 mm wide and 1000 mm high aperture protected with two layers of 60 mm thick single coated FyreBATT was tested in 78 mm Speedpanel wall. The exposed side batts were friction fitted into the aperture and unexposed side batts were face fitted with 100 mm overlap.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results – see Table 45.

Table 45 Results summary for this test report

Specimen	Integrity	Insulation
Blank seal	196 minutes	96 minutes

A.14 Test report – FRT210260 R2.0

Table 46 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Group
Test laboratory	Warringtonfire, 2/409-411 Hammond Rd, Dandenong South VIC 3175
Test date	The fire resistance test was completed on 22 October 2021.
Test standards	The test was done in accordance with AS 1530.4:2014
Variation to test standards	None
General description of tested specimen	Two blank seals protected with mineral wool boards were tested in 150 mm thick concrete floor. The perimeter of the boards were sealed with fire rated sealants. The local aperture size is recorded to be 568 mm × 595 mm.

Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results – see Table 47.

Table 47 Results summary for this test report

Specimen	Integrity	Insulation
Specimen D	181 minutes	100 minutes
Specimen E	181 minutes	127 minutes

A.15 Test report – FRT210467 R1.0

Table 48 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Group
Test laboratory	Warringtonfire, 2/409-411 Hammond Rd, Dandenong South VIC 3175
Test date	The fire resistance test was completed on 09 February 2022.
Test standards	The test was done in accordance with AS 1530.4:2014
Variation to test standards	None.
General description of tested specimen	Two Ø40 mm copper pipes passing through Trafalgar FyreBATT was tested in 150 mm thick concrete floor. The annular gap between the pipe and the separating element was sealed with Trafalgar FyreFlex. The pipes were insulated with Trafalgar TWrap and MonoWrap respectively.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results – see Table 49.

Table 49 Results summary for this test report

Specimen	Integrity	Insulation
Copper pipe insulated with TWrap	241 minutes	169 minutes
Copper pipe insulated with MonoWrap	241 minutes	155 minutes

A.16 Test report – FRT190292 R4.0

Table 50 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Fire
Test laboratory	Warringtonfire, 2/409-411 Hammond Rd, Dandenong South VIC 3175
Test date	The fire resistance test was completed on 16 January 2020.
Test standards	The test was done in accordance with AS 1530.4:2014
Variation to test standards	None
General description of tested specimen	A series of penetration systems and control joints were tested through a 175 mm thick concrete floor. The specimen considered from this test was Appendix D1 power cables passing through two layers of Trafalgar FyreBATT. The interface was sealed with Trafalgar FyreFlex and the cables were wrapped with Trafalgar Twrap.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results – see Table 51.

Table 51 Results summary for this test report

Specimen	Integrity	Insulation
Appendix D1 power cables on 300 mm cable tray	120 minutes	113 minutes

A.17 Test report – FRT200256 R1.1

Table 52 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Group
Test laboratory	Warringtonfire Australia, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was completed on 1 October 2020.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	The pressure was up to 10 Pa below the limits prescribed in the standard during the 135-145 minute period, and up to 1 Pa above the limits prescribed in the standard during the 155-170 minute period. The pressure and temperature were within the limits for the rest of the test. Due to the nature of the specimen and the fact that no significant events occurred during these time periods, this under pressure is unlikely to have invalidated the test result. The overpressure resulted in more onerous conditions, so would not have invalidated the test results.
General description of tested specimen	The floor system consisted of a 120 mm thick concrete slab 1760 mm wide × 1200 mm long. An aperture of 450 mm wide × 450 mm long and an aperture of Ø200 mm was cut to allow for the two penetration systems. The penetration detail relevant to this assessment is detailed below: Penetration system A1 – D1 power cable group was secured to the cable tray with stainless steel cable ties. The base of the cable tray was installed flush with the northern edge of the main aperture, with the vertical edges 75 mm from the western and eastern edges of the main aperture. The services extended 500 mm from the exposed side and 790 mm from the unexposed side of the separating element.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results – see Table 53

Table 53 Results summary for this test report

Penetration system	Criteria	Results	Fire resistance level (FRL)
A1	Structural adequacy	Not applicable	**-/240/120**
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 210 minutes	

A.18 Relevance of AS 1530.4:1985 test data with respect to AS 1530.4:2014

The referenced fire resistance test NI 0687 was conducted in accordance with AS 1530.4:1985, which differs slightly from AS 1530.4:2014. These variations and their potential effect on the fire resistance performance of the referenced test specimens are discussed below.

Discussion

Furnace temperature regime

The furnace heating regime in fire resistance tests conducted in accordance with AS 1530.4:2014 follows a similar trend to that in AS 1530.4:1985. The specified specimen heating rate in AS 1530.4:1990 is given by:

$$T_t - T_0 = 345log_{10}(8t + 1)$$

AS 1530.4:2014 specifies furnace temperature follows the trend below:

$$T_{AS1530.4-2014} = 345log_{10}(8t + 1) + 20$$

Where:

T_t = furnace temperature at time t, in °C.

T_0 = initial furnace temperature at time t, in °C, ≥10°C and ≤ 40°C.

t = time into the test, measured from the ignition of the furnace, in minutes.

The heating regimes in AS 1530.4:1985 and AS 1530.4:2014 vary, in that the former is an expression of the temperature rise in the furnace above an initial ambient temperature, but the latter (although similar) assumes that the initial furnace temperature (T_0) is 20°C irrespective of the actual ambient temperature. The ambient temperature for test NI 0687 was recorded to be 19°C which is unlikely to introduce variations in test results.

The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4:2014 and AS 1530.4:1985 are not appreciably different.

Furnace overpressure

AS 1530.4:2014 requires a minimum pressure differential of 8 Pa above the laboratory atmosphere for both vertical and horizontal specimens.

In test NI 0687 internal furnace pressure was kept between 8 – 10 Pa. This is not expected to introduce variations in test results.

Performance criteria

AS 1530.4:2014 specifies the following performance criteria for building materials and structures:

- structural adequacy
- integrity
- insulation.

Structural adequacy

The structural adequacy criteria are not relevant to this test.

Integrity

The specimen shall be deemed to have failed regarding the service penetrations, in accordance with AS 1530.4:2014, if the specimen:

- collapses.
- sustains flaming on the non-fire side in excess of 10 seconds.

- ignites a cotton pad within 30 seconds when applied.

The integrity criterion varies slightly between AS 1530.4:1985 and AS 1530.4:2014. The specimen is deemed to have failed to AS 1530.4:1985 if the specimen:

- collapses.
- develops cracks, fissures or, other openings through which flames or hot gases can pass.
- sustained flaming on the non-fire side in excess of 10 seconds.

The integrity criterion in accordance with AS 1530.4:1985 is generally more stringent. Integrity failure would normally occur prior to failure in accordance with AS 1530.4:2014.

Insulation

The insulation criteria of AS 1530.4:1985 and AS 1530.4:2014 remain the same, although the location of thermocouples has been revised. These differences are not considered relevant to performance of the proposed construction.

Application of the test data to AS 1530.4:2014

Based on the above discussion, it is considered that test results recorded in NI 0687 can be applicable to the proposed construction if tested in accordance with AS 1530.4:2014.

A.19 Relevance of EN test data with respect to AS 1530.4:2014

The referenced fire resistance tests WF 375797, F16150, WARRES 317711 and WARRES 317718 were conducted in accordance with BS EN 1363-1:2012, BS EN 1366:3 2009 and BS EN 1366-4:2006. These standards differ from AS 1530.4:2014. The effect these differences have on the fire resistance performance of the test specimens if tested in accordance with AS 1530.4:2014 is discussed below.

Furnace temperature measurement

The furnace thermocouples specified in AS 1530.4:2014 are type K, mineral insulated metal sheathed (MIMS), with a stainless-steel sheath having a wire of diameter of less than 1.0 mm and an overall diameter of 3 mm. The measuring junction protrudes at least 25 mm from the supporting heat resistant tube.

The furnace thermocouples specified in EN 1363-1:2012 are plate thermometers comprised of an assembly of a folded nickel alloy plate, a thermocouple fixed to it and insulation material. A thermocouple is fixed to the side of the plate facing the specimen, with the thermocouple hot junction protected by a pad of insulating material.

The plate is to be constructed from 150 ± 1 mm long by 100 ± 1 mm wide by 0.7 ± 0.1 mm thick austenitic nickel-based superalloy strips.

The measuring junction is to consist of nickel chromium/nickel aluminium (Type K) wire as defined in EN 60584-1, contained within mineral insulation in a heat-resisting steel alloy sheath of nominal diameter 1 mm to 3 mm, with the hot junctions electrically insulated from the sheath.

The thermocouple hot junction is to be fixed to the geometric centre of the plate in the position by a small steel strip made from the same material as the plate. The steel strip can be welded to the plate – or may be screwed to it – to facilitate replacement of the thermocouple. The strip should be approximately 18 mm by 6 mm if it is spot-welded to the plate and nominally 25 mm by 6 mm if it is to be screwed to the plate. The screw is to be 2 mm in diameter.

The assembly of plate and thermocouple should be fitted with a pad of inorganic insulation material 97 ± 1 mm by 97 ± 1 mm by 10 ± 1 mm thick with a density of 280 ± 30 kg/m^3.

EN 1363-1:2012 specifies that each plate thermometer shall be at least 100 ± 50 mm from the nearest point of the exposed face of the test construction, whereas AS 1530.4:2014 stipulates a distance of 100 ± 10 mm.

The furnace control thermocouples required by EN 1363-1:2012 are less responsive than those specified by AS 1530.4:2014. This variation in sensitivity can produce a potentially more onerous heating condition for specimens tested to EN 1363-1:2012, particularly when the furnace temperature is changing quickly in the early stages of the test. Furnace temperature regime

The furnace temperature regime for fire resistance tests conducted in accordance with AS1530.4-2014 follows the same trend as EN1363-1:2012

The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4:2014 and BS EN1363-1:2012 are not appreciably different.

Furnace pressure measurement

It is a requirement of both AS 1530.4:2014 and EN 1363-1:2012 that for vertical elements, the furnace shall be operated so that the neutral pressure plane (a pressure of 0 Pa) is established at a height 500 mm above the notional floor level.

For wall penetrations, AS 1530.4:2014 requires that – if the separating element has a height greater than 1 m – it shall be tested with a pressure of 20 ± 3 Pa at the top of the separating element and that the horizontal penetrating services shall be included in the zone where positive pressure exceeds 10 Pa. EN 1366-3:2009 specifies that a minimum pressure of 20 Pa shall be maintained at the top of the uppermost penetration seal in a vertical supporting construction and that services shall only be included in the zone where the positive pressure exceeds 10 Pa.

Therefore, both standards require that a minimum pressure of 10 Pa be maintained at the lowest point of the lowest service.

It is a requirement of both AS 1530.4:2014 and EN 1363-1:2012 that for horizontal elements, a furnace gauge pressure of 20 Pa is established at a height 100 mm below the floor soffit level.

The parameters outlining the accuracy of control of the furnace pressure in AS 1530.4:2014 and EN 1363.1-:2012 are also not appreciably different.

Integrity

In accordance with AS 1530.4:2014, while a specimen maintains its insulation performance, the specimen shall be deemed to have failed the integrity criterion if it collapses or sustains flaming on the unexposed face, which can ignite a cotton pad when applied for up to 30 seconds.

A specimen shall be deemed to have failed the integrity criterion in accordance with AS 1530.4:2014 when any of the following occur:

- Sustained flaming for 10 seconds.
- A gap forms that allows the passage of hot gases to the unexposed face and ignites the cotton pad when applied for up to 30 seconds.
- A gap forms that allows the penetration of a 25 mm gap gauge anywhere on the specimen.
- A gap forms that allows a 6 mm × 150 mm gap gauge to penetrate the specimen anywhere on the specimen.

Except for minor variations the integrity criteria in EN 1363.1:2012 are generally applied in a comparable manner.

Insulation

The general insulation criteria of AS 1530.4:2014 and BS EN 1363.1:2012 are not appreciably different.

Applicability of test data to AS 1530.4:2014

The variations in furnace heating regimes, furnace thermocouples and the responses of the different thermocouple types to the furnace conditions are not expected to have a significant effect on the outcome of the referenced fire resistance test.

Based on the above discussion, it is considered that the results relating to the integrity and insulation performance of the referenced tests can be used as a basis to assess the FRL of the specimens if tested in accordance with AS 1530.4:2014.

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