

# Engineering Judgement (Assessment)

**Ref:** EJ 210707

**Client:** Firestop Centre Ltd

**Project:** Hawkins Construction- Wakefield Hospital Stage 1- Wellington

**Title:** Proposal for firestopping HDPE plastic pipe (160mm diameter) where fusion coupler (195mm diameter) abuts a gypsum board wall (minimum thickness 195mm thick) with oversized Protecta FR Collars (200mm diameter) - Fire resistance - (FRR -/60/60)

**Date:** 07/07/2021

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## About Engineering Judgments

Firestop systems are intended to deter or prevent the passage of fire, toxic gasses and smoke through openings created for the passage of building service supplies, blank seals and joint systems. Penetration Firestop Sealing Systems are required to be Tested, Rated and Certified to the approved AS Standard. Such Penetration Firestop Sealing Systems are required by building regulations and codes to be tested and rated as part of an assembly. All elements of the tested and certified Penetration Firestop Sealing Systems, including proprietary systems into which the Penetration Firestop Sealing Systems is installed, form a specific and inseparable engineered system which must be used as such.

Where construction site constraints, unanticipated hindrances or conditions differing from original design are encountered and such conditions cannot easily or cost effectively be redesigned or reconstructed, design assessments can be made to propose an alternative method that ensures performance of the firestop system is not compromised.

These are referred to as Engineering Judgements.



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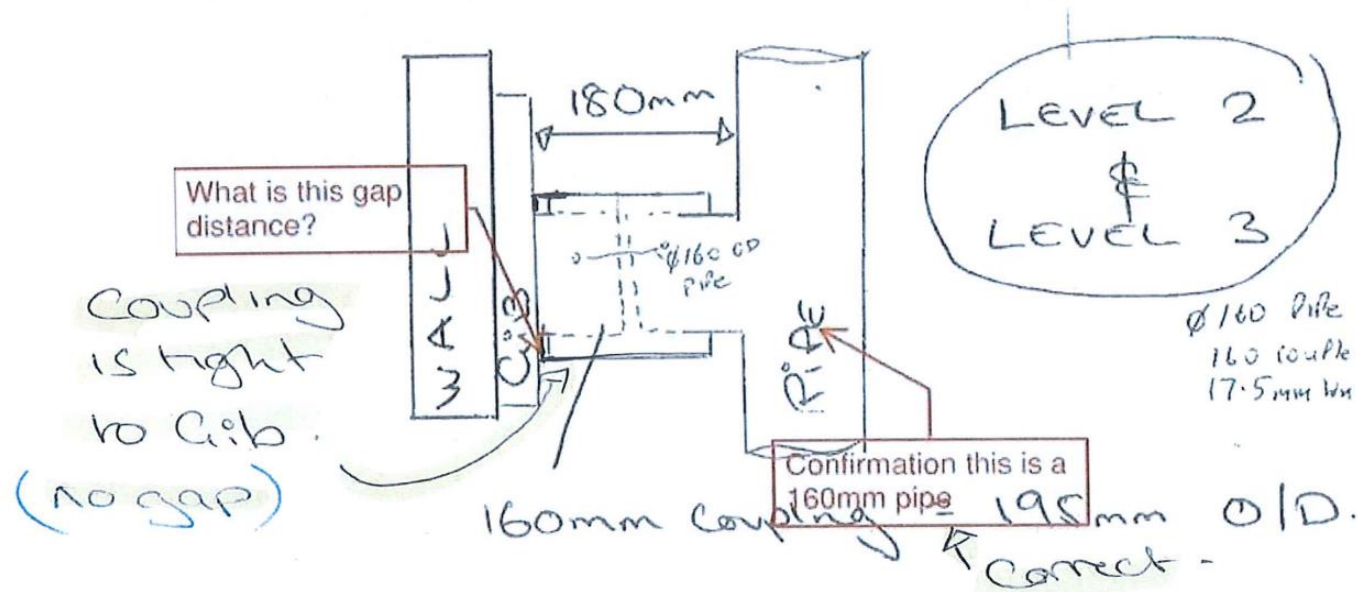
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## 1. Scope of EJ

Firestop Centre Ltd have been asked to provide a solution for firestopping HDPE plastic pipes (160 mm diameter/ pipe wall thickness 17.5mm) penetrating a gypsum board wall (128mm depth) comprising of 76mm steel KOROK stud and 2 layers of 13mm thick Fyrelime gypsum board on both faces of the stud.

Wall elements are required to be otherwise tested or assessed by others for the required fire resistance period for -/60/60.

The HDPE fusion pipe coupler (195mm diameter approximately/ 35mm combined pipe wall thickness) for 160mm diameter HDPE pipe tightly abutts up to the face of the outermost gypsum board as shown below:



The sketch above was provided to us by Firestop Centre Ltd.

We are proposing that a Protecta collar (200mm diameter/60mm depth) can be fitted to the face of the wall leaving an acceptable annular space between the inside of the collar and the pipe/ coupler.

## **2. Fire test evidence to support the proposed fire seal**

All fire test evidence is drawn from:

**Fire assessment report:** Warrington Fire Australia Assessment Report - Service Penetrations protected with Protecta FR Collars in accordance with AS1530.4:2014 and AS 4072.1:2005

**Sponsor:** Polyseam Ltd

**Report number:** 5147800B

**Revision:** R3.2

**Reference number:** FAS190125

**Issued date:** 21 May 2021

**Expiry date:** 30 April 2026

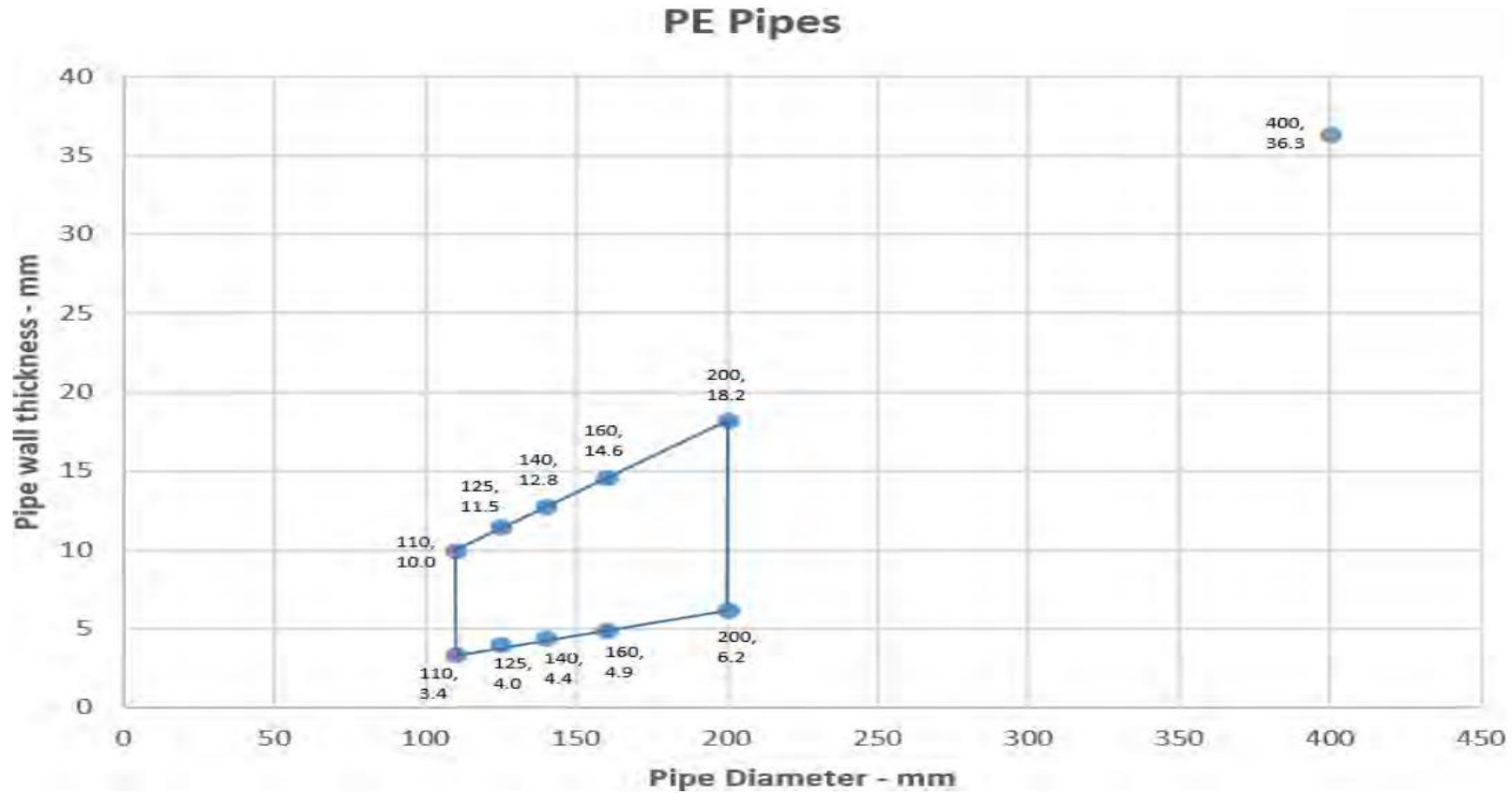
### **Key references:**

#### **Pages 8-9 of 159 .... Point 5**

Where PE pipes are mentioned, this includes PE-LD, PE-MD, PE-HD, PE-X and similar. The tested PE-HD pipe was confirmed by report sponsor and pipe manufacturer to be similar to HDPE pipes. Therefore, the FRLs shown for PE-HD pipes in section 6 are applicable to HDPE pipes. Therefore, the FRLs shown for PE-HD pipes in section 6 are applicable to HDPE pipes.

**Table 18 PE pipes (diameter 110 – 160 mm) protected with Protecta FR collar installed at both sides of the wall**

Services	Collar Inlay	FRL
<b>PE pipe</b>		
Diameter 110 mm, wall thickness 3.4-10.0 mm*	60 × 6.0 mm	-/90/60 U/U, C/U, U/C, C/C
Diameter 125 mm, wall thickness 4.0-11.5 mm*	60 × 8.8 mm	
Diameter 140 mm, wall thickness 4.4-12.8 mm*	60 × 11.5 mm	
Diameter 160 mm, wall thickness 4.9-14.6 mm*	60 × 15.0 mm	-/90/90 U/U, C/U, U/C, C/C
Diameter 200 mm, wall thickness 6.2-18.2 mm*	60 × 18.0 mm	-/120/90 U/C, C/C
Diameter 400 mm, wall thickness 36.3 mm*	100 × 40.0 mm	-/90/90 C/C
*Typical pipe diameters shown, see below graph for intermediate sizes		



**Figure 14 Intermediate pipe wall thicknesses for PE pipe diameters**

The 200mm Protecta FR Collar has been tested with 200mm HDPE pipe with pipe wall thickness ranging from 6.2 – 18.2mm.

We do not have any direct fire test evidence with 200mm HDPE pipe with a combined pipe wall thickness of 35mm for the pipe and pipe coupler.

However, we do have test evidence with a significantly larger HDPE pipe 400mm diameter with a pipe wall thickness of 36.3mm. Obviously the specification of this collar is different to the 200mm collar having 40mm thickness of intumescent as opposed to 18mm and a greater depth of seal (100mm vs 60mm)

What the test data does show is that pipes of this thickness of pipe wall can be fire stopped. As a rule of thumb, we have found that thinner walled pipes are more difficult to seal, as the plastic burns away quickly leaving a void to fill. In larger diameter pipes (greater than 160mm diameter), this is a problem as the intumescent needs to expand fast to bulk up the density of char. Whilst this is happening, the fire is eroding the intumescent char sometimes leading to early failure.

Early failure can occur with larger diameter thick walled pipes with collars which have spot welded toggle fastener closers on the collars. If the pipe is thicker it takes longer for the fire to soften and break through the pipe. However, the intumescent material contained within the collar activates and starts to build a pressure. If the pipe hasn't softened, the developed pressure can ping off the toggle fastener leading to the collar opening out and spilling the intumescent into the furnace.

The Protecta FR Collar is installed in two parts slid together and then mechanically fixed, with no spot-welded components. The test data supports the idea that our collars can be used with thicker pipes.

Tests carried out with different wall thicknesses of PE pipes than shown in the approvals have been shown to fail before thicker walled PE pipes:

Tables to show absolute fire ratings achieved with different diameter PE pipes with a range of wall thicknesses

Pipe diameter (in mm)	Pipe wall thickness (in mm)	Integrity (E)	Insulation (I)
200	6.2	120	100
	18.2	120	117
315	9.7	49	38
	18.7	241	241
400	9.8	53	41
	36.3	104	104

This trend suggests that we get better results with thicker walled PE pipes and that the -/60/60 would have a significant safety factor.

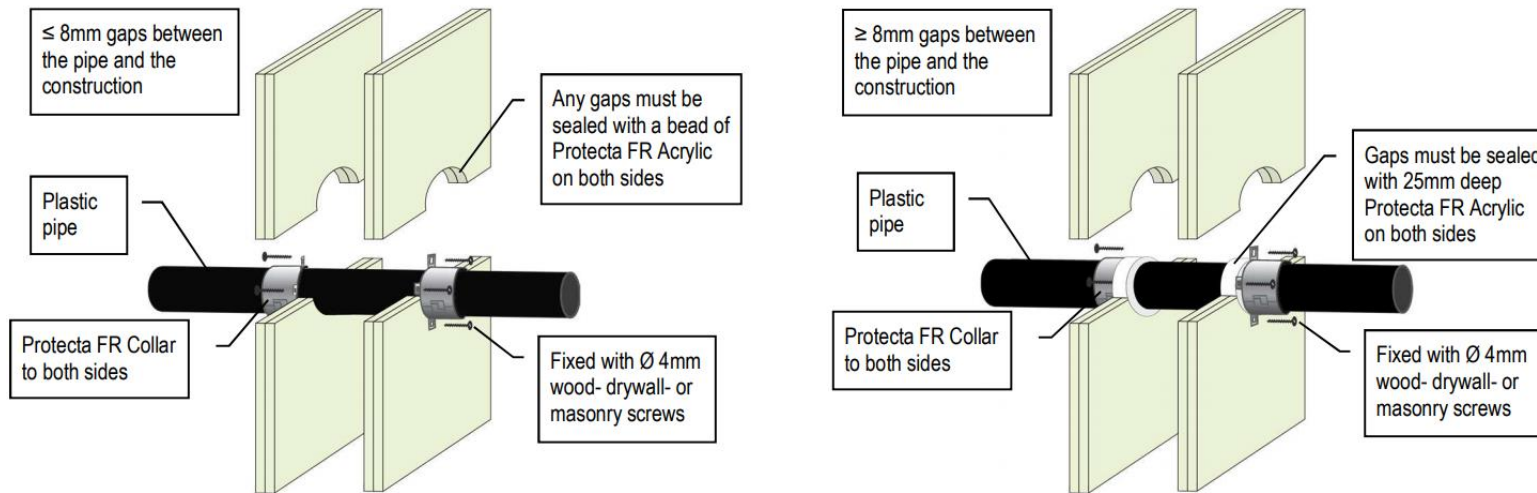
### 3. Proposals

We believe that the HDPE pipes/couplers wall penetrations can be resolved by affixing Protecta FR Collars on both sides of the dry wall.

The annular space between the pipe couplers/pipe and dry wall must be made good and the FR Collars affixed to the wall as described within the latest installation instructions.

Any annular space between the pipe and the inside of the collar must not be filled with any sealant/stone wool as it is crucial for the intumescent within the collar to get hot and expand freely within the confines of the collar shell.

#### ≥ 100MM DRYWALLS, MASONRY OR CONCRETE WALLS



To summarise, based on direct and indirect fire test evidence, in the opinion of Polyseam Ltd, the fitting of Protecta FR Collars (200mm diameter x 60mm depth) to HDPE pipe coupler (195mm diameter/ 35mm combined pipe wall thickness) will provide an FRR of -/60/60 with gypsum board wall (128mm depth) comprising of 76mm steel KOROK stud and 2 layers of 13mm thick Fyrelite gypsum board on both faces of the stud.

## **7. Disclaimer:**

This document is solely to be used for the purpose of and as an Engineering Judgement and as such the following guidelines MUST BE ADHERED TO:

Not be used in lieu of AS Tested systems when available;

Only be issued by a firestop manufacturer's technical personnel or qualified internal engineer or third-party certified engineer appointed solely by Polyseam Ltd;

1. Be based upon interpolation of previously Polyseam Ltd. AS1530.4:2014 Tested/Assessed Penetration Firestop Sealing System that are sufficiently similar in nature and clearly state the conditions upon which this Engineering Judgement is made;
2. Be based on full knowledge of the elements of the constructed system. Such information to be supplied by the approved contractor /architect / controlling body and such information will be deemed to be a correctly represent in its entirety of the constructed system as is or as will be. Any deviation from the information found after this Engineering Judgement is produced / implemented will result in the withdrawal of this Engineering Judgement as supporting data;
3. Be based upon full knowledge of the elements of construction to be protected and the understanding of the probable behaviour of that construction and the recommended Polyseam Ltd Protecta Brand Penetration Firestop Sealing Systems as if it were subjected to the appropriate AS Standard Testing Method. Such information to be supplied by the approved contractor / architect / controlling body and such information will be deemed to be a correct representation of the constructed / installed system as is or as will be. Any deviation from the information found after this Engineering Judgement is implemented will result in the withdrawal of this Engineering Judgement as supporting data;
4. Be limited to the specific conditions and configuration upon which the Engineering Judgement is intended, based on reasonable performance expectations for the recommended Polyseam Ltd Firestop Sealing System under AS Testing Methods;
5. Be accepted for a single specific job, site location / project location, this Engineering Judgement is none transferable to any other job, site location / project location.

THE ASSESSMENT HELD WITHIN THIS DOCUMENT IS FOR THE SOLE PURPOSES TO FORM AN ENGINEERING JUDGEMENT, BASED ON THE AFOREMENTIONED GUIDELINES STATED UNDER TITLE – PURPOSES OF THIS DOCUMENT. NO DEVIATION FROM THE PURPOSE AND GUIDELINES WILL BE RECOGNISED AS FORMING ANY OR PART OF THIS ENGINEERING JUDGEMENT. THIS ENGINEERING JUDGEMENT IS MADE SPECIFICALLY FOR THE PURPOSES OF A SINGLE PENETRATION FOR THE SPECIFIC SITE AND LOCATION INDICATED AND SIGNED FOR BELOW. ALL INFORMATION HELD WITHIN THIS ENGINEERING JUDGEMENT IS BASED UPON EVIDENCE GIVEN BY THE APPROPRIATE CONTRACTOR / ARCHITECT RESPONSIBLE / RESPONSIBLE PERSON FOR THIS SPECIFIC PROJECT. ANY INFORMATION GIVEN BY AN UNAUTHORISED PERSON OR PERSONS OR MISREPRESENTATION OR IS SUBSEQUENTLY SHOWN TO BE INCORRECT THEREAFTER WILL BE DEEMED TO FALL OUTSIDE OF THE ENGINEERING JUDGEMENT AND WILL THUS RENDER THIS ENGINEERING JUDGEMENT VOID THE CONSEQUENCES OF WHICH POLYSEAM LTD WILL NOT BE RESPONSIBLE. POLYSEAM LIMITED IN PRODUCING THIS ENGINEERING JUDGEMENT DO SO IN GOOD FAITH OF THE AFOREMENTIONED AND AS SUCH CANNOT BE HELD RESPONSIBLE FOR ANY INCONSISTENCIES, MISINFORMATION OR DIRECTLY INTENTIONAL UNTRUE INFORMATION.




**Sub-Contractor Section**

Company	Requested by Authorised Representative Position and Name:	Site	Location Reference	Date	Signature accepting all information given for the purposes of this Engineering Judgement are correct

**Main Contractor / Architect / Designer Section / Company**

Company	Requested by Authorised Representative Position and Name:	Site	Location Reference	Date	Signature accepting all information given for the purposes of this Engineering Judgement are correct

**Polyseam Limited Section**

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Company	Authorised By Position and Name:	Date	Signature in no way accepts liability for false or inaccurate information
Polyseam Limited	Technical Manager Duncan Alabaster	07.07.2021	