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Our ref: FCO-3041/CO4376

Mr Lorenzo Fazzini
L & A Fazzini Manufacturing Pty Ltd
23-25 Wentworth Street
GREENACRE NSW 2190

Dear Mr Fazzini,

IGNIDUCT EXO-CORTEX FIRE TILE SYSTEM
Assessment No. FCO-3041
Your e-mail of 2 December 2013.

INTRODUCTION

We have examined the information referenced by you on the likely performance of your insulation system when applied to air handling ducting and subjected to test in accordance with BS 476 Part 24. The information included:-

- British Standard 476, Fire tests on building materials and structures, Part 20:1987, Method for the determination of the fire resistance of elements of construction (general principles);
- British Standard 476, Fire tests on building materials and structures, Part 24:1987, Method for the determination of the fire resistance of ventilation ducts;
- CSIRO assessment reports numbered FCO-1500, FCO-1468 and FCO-1096;
- CSIRO Sponsored Investigation reports numbered: FSH 0236 (test date 18 December 1992); FSH 0230 (test date 20 August 1992); FSH 0092 (test date 23 August 1990); FSH 0540 (test date 28 January 1998) on air-handling ducts;
- CSIRO Sponsored Investigation Report FSH 0649 (test date 22 December 1998) on spray insulated elements with duct and penetrations.
- CSIRO Sponsored Investigation reports numbered FSH 1036 (test date 28 February 2004) and FSH 0970 (test dated 10 May 2003) on air-handling ducts tested in accordance with BS 476:24-1987 and
- CSIRO Sponsored Investigation report numbered FSP 1604 (test date 27 August 2013) on vertical air-handling duct in accordance with AS1530.4-2005.
- Igniduct specification numbered LAF M-100 (Revision 1, undated) by L&A Fazzini Manufacturing Pty Ltd.

We have retained this information.

You have requested an assessment as to the performance of your tested duct systems based on national Standards and those conducted in accordance with BS476 Part 24.

ANALYSIS**CSIRO Sponsored Investigation report numbered FSH 0540**

On 28 January 1998 this Division conducted a full-scale fire-resistance test on duct systems. The specimen comprised six ducts fabricated from galvanised sheet steel 0.8 mm thick and protected with Vermiduct sprayed insulation reinforced with square steel mesh and two steel ducts protected with Vermiduct sprayed insulation without the aid of mechanical reinforcement.

Duct V1 was 2300 mm long and was fixed vertically into a 1650 mm x 650 mm opening in the 200 mm thick Hebel slab. The duct projected 100 mm into the furnace chamber and 2000 mm above the Hebel panel. The duct was fixed to the slab with 8 mm masonry anchors through 1.6 mm steel angles which were in turn fixed to the ducts with self tapping screws at 300 mm centres as shown in drawings numbered 0197-003 and 0197-004. The duct incorporated slip on propriety flange (SPF) joints and specifically TDF joints, had 10 mm polystyrene sheeting adhered to its perimeter by means of self adhesive double-sided tape, as well as 25 mm x 25 mm x 1 mm square mesh wrapped to its perimeter.

The duct was protected on the outside with Vermiduct sprayed insulation and was exposed to the fire from the inside. The average sprayed thickness of Vermiduct on the duct (including polystyrene sheeting) ranged from 50 mm to 65 mm with an average of 58.6 mm.

Duct V2 was of similar construction to Duct V1 except for the following differences. Duct V2 incorporated Integrated Machine Rolled Flange (IMRF) joints and specifically 25 mm MEZ joints.

The duct was protected on the outside with Vermiduct sprayed insulation and was exposed to the fire from the inside. The average sprayed thickness of Vermiduct on 50 mm. The duct was clad with 0.55 mm thick galvanised steel sheeting, which was fixed to the duct with self tapping hex screws at 200 mm centres.

Duct H1 was 2350 mm long and was fixed horizontally into a 1650 mm x 650 mm opening in a 230 mm thick brick wall with 100 mm of ductwork projecting into the furnace chamber and 2250 mm outside the furnace. The duct was fixed to the wall with 8 mm masonry anchors through 1.6 mm steel angles which were in turn fixed to the ducts with self tapping screws at 300 mm centres as shown in drawings numbered 0197-001, 0197-002 and 0197-003. The duct had appended, at the end of the horizontal run, a vertical riser duct, this portion of the duct was not sprayed as shown on drawing numbered 0197-003. The duct incorporated slip on propriety flange (SPF) joints and specifically 25 mm MEZ joints, had 25 mm x 25 mm x 1 mm square mesh wrapped to its perimeter tensioned by means of plastic inserts. The duct was supported by trapeze hangers with 8 mm diameter threaded rods and 40 mm x 40 mm x 5 mm steel angle, and incorporated one access panel measuring 600 mm x 600 mm.

The duct was protected on the outside with Vermiduct sprayed insulation and was exposed to the fire from the inside. The average sprayed thickness of Vermiduct on the duct ranged from 45 mm to 62 mm with an average of 53.9 mm.

Duct H2 was of similar construction to Duct H1 except the following differences. The duct had 10 mm thick polystyrene sheeting adhered to its perimeter by means of self adhesive double-sided tape, as well as 25 mm x 25 mm x 1 mm square mesh wrapped to its perimeter and fixed with self tapping screws.

The duct was protected on the outside with Vermiduct sprayed insulation and was exposed to the fire from the inside. The average sprayed thickness of Vermiduct on the duct (including polystyrene sheeting) ranged from 52 mm to 67 mm with an average of 61.2 mm.

Duct H3 was 5220 mm long and was fixed horizontally at both ends into 1650 mm x 650 mm openings in a 230 mm thick brick wall with 100 mm of ductwork projecting outside the furnace on each end. The duct was fixed to the wall with 6 mm masonry anchors through 1.6 mm steel angles which were in turn fixed to the ducts with self tapping screws at 300 mm centres as shown in drawings numbered 0197-001 and 0197-004. The duct incorporated Drive Slip (DS) joints, one access panel measuring 600 mm x 600 mm, and was supported by trapeze hangers with 10 mm diameter threaded rods and 40 mm x 40 mm x 5 mm steel angle.

The duct was protected on the outside with Vermiduct sprayed insulation sprayed directly to contour without any mechanical reinforcement and was exposed to the fire from the outside. The average sprayed thickness of Vermiduct on the duct ranged from 35 mm to 49 mm with an average of 42.5 mm.

Duct H4 was of similar construction to Duct H3 except the following differences. Duct H4 had 25 mm x 25 mm x 1 mm square mesh wrapped to its perimeter and tensioned by means of plastic inserts.

The duct was protected on the outside with Vermiduct sprayed insulation and was exposed to the fire from the outside. The average sprayed thickness of Vermiduct on the duct ranged from 35 mm to 59 mm with an average of 48.5 mm.

A full description of the test specimen and the test results are detailed in CSIRO Sponsored Investigation report numbered **FSH 0540**.

CSIRO Sponsored Investigation report numbered FSH 0649

On 22 December 1998 this Division conducted a full-scale fire-resistance test on spray insulated elements with duct and penetrations. The duct was compositely built using a 1000 mm high x 1000 mm wide x 2600 mm long x 0.8 mm thick sheet metal duct on the northern half. The southern half was Trimesh R100 panels which were 30 mm thick with no core with a layer of aluminium foil fixed to its inner surface with 5 mm aluminium speed clips at 300-400 mm centres. Internal clearance dimensions of the Trimesh duct were 1000 mm high x 1000 mm wide x 2600 mm long. The overall thickness of both sections was 40 mm when sprayed with Vermiduct.

The duct maintained structural adequacy for the 241 minute duration of the test and failed the integrity criterion at 205 minutes. The duct failed insulation after 151 minutes of testing and achieved an FRL of 240/180/120.

A full description of the test specimen and the test results are detailed in CSIRO Sponsored Investigation report numbered **FSH 0649**.

CSIRO Sponsored Investigation report numbered FSH 0970

Subsequent to this, on 10 May 2003 this Division conducted a full-scale fire-resistance test in accordance with BS 476 Part 24 on three duct systems.

The three ducts consisted of two horizontal ducts, Duct H1-B was subjected to internal fire exposure and H2-A and V1-C were subjected to external fire exposure.

The ducts were constructed from nominal 0.8-mm thick galvanized steel sheeting with all longitudinal seams of the Pittsburgh lock type. The transverse joint consisted of Integrated Machine Rolled Flange (IMRF), or 38-mm TDF. The IMRF joints were sealed with closed cell fire retarded foam tape. Each duct section was of variable length and nominally 1000-mm wide x 250-mm deep.

Duct V1 consisted of a nominal 4500-mm high duct with nominally 2000-mm above the furnace roof. The hole in the roof was nominally 1050-mm wide x 300-mm deep and did not have any packing except for the Vermiduct[®] spray.

The duct was secured to the furnace roof, above and below, with nominal angles 75 mm x 75 mm x 1.6-mm thick along all sides. The angle was secured to the roof with 12 masonry anchors and to the duct with self tapping screws.

Duct H1-B was nominally 6340-mm long and installed horizontally into a 1050-mm wide x 800-mm high opening in a brickwork wall. The length of duct inside the furnace was nominally 3610 mm and outside the furnace was nominally 2500 mm. The end of the duct was then connected into a transition piece which then fed into an exhaust fan. The flow rate through the duct was set to 3 m/s before the start of the test. Inside the furnace the duct had an opening in accordance with BS476:24 for internal exposure for type B ducts.

The duct was supported by trapeze hangers with 8-mm diameter threaded rods and 40 mm x 40 mm x 5 mm angles. The duct also had two access panels measuring nominally 198-mm x 332-mm, one inside the furnace the other outside the furnace.

Duct H2-A was of similar construction to Duct H1-B except it had a T-Junction and a 90° bend as shown in drawing HA-1073-1 and was closed to the furnace. Before the start of the test the pressure was set inside the duct to minus 300 Pa below laboratory pressure.

The Vermiduct® Fire Spray material was then applied as per the manufactures instructions in layers up to 20-mm thick until the required thickness was achieved. The applied density of the Vermiduct® was nominally 293kg/m³. The ducts were sprayed at the following thickness:

- Duct V1-C sprayed to 30-mm thickness
- Duct H1-B sprayed to 50-mm thickness
- Duct H2-A sprayed to 60-mm thickness.

The spray was applied so that the joints were not visible i.e. the thickness over the joints was of reduced thickness.

A full description of the test specimen and the test results are detailed in CSIRO Sponsored Investigation report numbered **FSH 0970**.

CSIRO Sponsored Investigation report numbered FSH 1036

Subsequent to this, on 28 February 2004 this Division conducted a full-scale fire-resistance test in accordance with BS 476 Part 24 on two duct systems.

Duct A subjected to external fire exposure and Duct B was subjected to internal fire exposure.

The ducts were constructed from nominal 0.8-mm thick galvanized steel sheeting with all longitudinal seams of the Pittsburgh lock type. The transverse joint consisted of Integrated Machine Rolled Flange (IMRF), or 38-mm TDF. The IMRF joints were sealed with closed cell fire retarded foam tape. Each duct section was of variable length and nominally 1000-mm wide x 250-mm deep.

Duct B was nominally 6340-mm long and installed horizontally into a 1050-mm wide x 300-mm high opening in a brickwork wall. The length of duct inside the furnace was nominally 3610 mm and outside the furnace was nominally 2500 mm. The end of the duct was then connected into a transition piece which then fed into an exhaust fan. The flow rate through the duct was set to 3 m/s before the start of the test. Inside the furnace the duct had an opening in accordance with BS476:24 for internal exposure for type B ducts.

The duct was supported by trapeze hangers with 12-mm diameter threaded rods and 40 mm x 40 mm x 5 mm angles. The duct also had two access panels measuring nominally 198-mm x 332-mm, one inside the furnace the other outside the furnace

Duct A was of similar construction to Duct B except it had a T-Junction and a 90° bend and was closed to the furnace. Before the start of the test the pressure was set inside the duct to minus 300 Pa below laboratory pressure.

The Vermiduct® Fire Spray material was then applied as per the manufactures instructions in a single layer at least 20-mm thick. The applied density of the Vermiduct® was nominally 293kg/m³. Duct B failed insulation over one of the support hangers due to a reduced thickness in spray in this area. If the spray had the specified minimum 20 mm thickness over the support bracket then it is considered insulation failure would not have occurred until the next temperature recorded, in excess of the test failure criteria, at 115 minutes.

A full description of the test specimen and the test results are detailed in CSIRO Sponsored Investigation report numbered **FSH 1036**.

CSIRO Sponsored Investigation report numbered FSP 1604

On 27 August 2013 this Division conducted a full-scale fire-resistance test in accordance with AS 1530.4-2005 on a vertical duct system exposed to internal fire.

The duct was constructed from nominal 0.8-mm thick galvanized steel sheeting with all longitudinal seams of the Pittsburgh lock type. The transverse joint consisted of TDF flanges bolted together with 4 off M10 bolts and sealed with Igniseal PE foam liner. Each duct section was nominally 1420-mm in length and nominally 720-mm wide x 180-mm deep. A steel frame supported the 2050-mm length of duct on the unexposed face of the concrete slab.

The vertical duct penetrated a 800-mm x 260-mm hole in a 150-mm thick concrete slab and extended a distance of 100-mm into the furnace chamber. A 50-mm x 100-mm x 1-mm thick galvanized steel angle was used to seal the 20-mm wide hole between the duct and the slab on the exposed face. A layer of Quickmesh folded into a Z shape was placed in the gap between the concrete slab and the steel duct prior to the void being filled with Vermiduct and finished flush with the slab. A galvanized steel angle was then fitted around the base of the steel duct and fixed to the slab.

The steel duct was protected with two layers of 20-mm thick Igniduct Exo-cortex fire tiles which were fixed to the duct work using steel Quickpins and speed clips. The Quickpins were fixed to the steel duct using an adhesive base at nominally 300-mm centres. Each external corner of the duct was fitted with RG2 mesh folder around the corner and taped into place. The first layer of Igniduct Exo-cortex fire tiles were pinned to duct with the aluminium foil side facing the steel duct. A minimum of one Quickpin and speed clip was used to secure the first layer of tiles with the Quickpin located at the centre of each tile. All gaps between tiles were filled using Igniduct Tienax 2F compound. The Igniduct Exo-cortex fire tiles measured nominally 300-mm x 300-mm x 20-mm thick with a 0.3-mm thick aluminium foil facing. The Igniduct Exo-cortex fire tiles comprised Vermiduct spray material mixed with polystyrene beads cast into an aluminium foil tray. The tile edges were treated with one coat of Ignitex intumescent coating. A 75-mm wide gap was maintained on either side of the steel duct TDF flange.

Prior to the fitting of the second layer of Igniduct Exo-cortex fire tiles, a layer of Igniduct Tienax 2F compound was plastered over the face of the first layer of tiles. The Igniduct Tienax 2F was also applied to the second layer of ties prior to installation. The second layer of Igniduct Exo-cortex fire tiles was fitted with the foil side facing out, with steel Quickpins located at each tile corner and held in place with 50-mm x 50-mm metal speed clips. Any gaps between tiles were filled using Igniduct Tienax 2F compound. A collar comprising of two layers of Igniduct Exo-cortex fire tiles was placed over the gap at the TDF flange and held in position with 2 x steel Quickpins and speed clips. Galvanized steel angle sections, 75-mm x 75-mm x 0.8-mm were fitted to the corners of the duct over the Igniduct Exo-cortex fire tiles.

Vermibloc Torqduct panels were used to form a collar at the base of the duct. The Torqduct panels were mortared in position using Igniduct Tienax 2F compound and held using galvanised steel Z-angles fixed to the slab with masonry anchors. Ferrocor steel straps were used around the assembly at nominal 300-mm centres and held with crimps. Two Ferrocor steel straps were also used around the Igniduct Exo-cortex fire tiles used to form a collar around the TDF flange connecting the duct sections. The Ferrocor straps were located at the centre of the Igniduct tiles between the speed clips.

The duct system as tested satisfied the structural adequacy criterion for the 241 minute duration of the test. Integrity was lost at 221 minutes due to ignition of the cotton wool pad test applied above the duct collar protecting the TDF flange. An insulation failure was recorded at 102 minutes on the unexposed face of the Igniduct tile above the duct collar. Test observations recorded a gap forming between the duct collars and the Igniduct tiles due to differential movement between the fire tiles and collar. A maximum temperature rise failure was recorded over a joint between the Igniduct tiles after 114 minutes of testing.

CSIRO test report FSH 0649, dated 22 December 1998 has demonstrated that 40-mm thick Vermiduct spray insulation achieved FRL 240/180/120 with the insulation criterion satisfied for a 151 minutes. It is expected that two layers of Igniduct Exo-cortex fire tiles (total thickness of 40-mm) would achieve at least 120 minutes for insulation if the fire tiles were cast using the same Vermiduct formulation as used in test FSH 0649 .

The critical performance requirements for your Igniduct Exo-cortex fire tiles and that of any protection method attached to ducting is the ability to restrict the temperature rise within the duct or on the unexposed face of the protection system. This performance is a factor of the thermal conductivity of the protection material, the thickness of the protection material and the ability of the protection material to remain in place.

Based on these factors it is the assessment of this Division that the Igniduct Exo-cortex fire tiles would be likely to provide a FRL of 120/120/120 if tested in accordance with BS476 Part 24 provided:

- The void associated with the TDF flange at duct joints is completely filled with Igniduct Tienax 2F or Vermiduct compound to the level of the Igniduct Exo-cortex fire tiles;
- The Igniduct Exo-cortex duct collar and Vermibloc Torqduct panels are mechanically fixed to the Igniduct Exo-cortex fire tiles using metal cleats or laminating screws at 300-mm centres;
- Welded Pins are used in place of the adhesive Quickpins to secure the Igniduct Exo-cortex fire tiles on ducts that are to be protected from external fire exposure.

Below is a summary of these tests in table form.

TABLE 1

REPORT NO.	TEST DATE	DUCT	SIZE (mm)	MODE	FIRE SIDE	THICKNESS (mm)	Fire Resistance	
							With Access Panel	Without Access Panel
FSH 0540	28/01/98	H-1	1600 x 600	HORIZ	INT	54	120/120/90	120/120/90
FSH 0540	28/01/98	H-2	1600 x 600	HORIZ	INT	62*	120/120/60	120/120/60
FSH 0540	28/01/98	H-3	1600 x 600	HORIZ	EXT	43	120/120/60	120/120/60
FSH 0540	28/01/98	H-4	1600 x 600	HORIZ	EXT	49	120/120/90	120/120/60
FSH 0540	28/01/98	V-1	1600 x 600	VERTI	INT	59	120/120/120	120/120/120
FSH 0540	28/01/98	V-2	1600 x 600	VERTI	INT	50	120/120/120	120/120/120
FSH 0649	23/12/98	H	1000 x 1000	HORIZ	EXT	40	120/120/120	120/120/120
FSH 0970	10/05/03	H1-B	1000 x 250	HORIZ	INT	50	240/240/185	N/A
FSH 0970	10/05/03	H2-A	1000 x 250	HORIZ	EXT	60	145/145/16	N/A
FSH 0970	10/05/03	V1-C	1000 x 250	VERTI	INT	30	240/240/240	N/A
FSP 1604	27/08/13	V1	720 x 180	VERT	INT	40*	N/A	240/221/102

* Note: (FSH 0540) Spray Thickness incorporated a 10 mm layer of sacrificial/ material/ designed to vaporize during fire conditions.

FSP 1604 (test number FS4271/3697) Duct protection comprised 2 x 20-mm thick Igniduct Exo-cortex fire tiles.

TABLE 2 Test in accordance with BS 476: 24-1987

REPORT No.	TEST DATE	DUCT	SIZE (mm)	MODE	FIRE SIDE	THICKNESS (mm)	Fire resistance	
							With Access Panel	Without Access Panel
FSH 0970	10/05/03	H1-B	1000 x 250	HORIZ	INT	50	240/185	N/A
FSH 0970	10/05/03	H2-A	1000 x 250	HORIZ	EXT	60	229/229	N/A
FSH 0970	10/05/03	V1-C	1000 x 250	VERTI	INT	30	240/240	N/A
FSH 1036	28/02/04	A	1000 x 250	HORIZ	EXT	20	200/155	N/A
FSH 1036	28/02/04	B	1000 x 250	HORIZ	INT	20	240/27	N/A

As can be seen from the results the structural adequacy and integrity of the systems were of little concern in the test reported in FSH 0540 and observations documented that no failure under these criteria were imminent at the time the testing was terminated. For the test reported in FSH 0970 observations made during and after the completion of the test show that the failures occurred because

- (i) H1-B
 - a. Insulation failure at 185 minute occurred at a thermocouple located over the joint. As the Vermiduct material had not been profiled over the joint the thickness of the Vermiduct at this point was approximately 12 mm (38 mm TDF joints).
 - b. Subsequent insulation failure occurred at 227 minutes when a roving thermocouple was positioned at a point where the insulation had cracked due to the sagging of the duct at the mid-point between supports.
- (ii) H2-A.
 - a. At 229 minutes the portion of the duct A inside the furnace collapsed due failure of the 8-mm thick support rods. Increasing these rods to 10 mm would increase the loadbearing capacity by 56% as well as reducing the surface areas-to-mass ratio (a measure of the heat intake of the rod) 20%

The critical performance requirements for your spray insulation and that of any protection method attached to ducting is the ability to restrict the temperature rise within the duct. This performance is a factor of the thermal conductivity of the protection material, the thickness of the protection material, the ability of the protection material to remain in place (called stickability) and the severity of the fire exposure.

For the test reported in FSH 1036 observations made after the completion of the test showed that the thickness of the spray at the point of insulation failure of Duct B was due to a reduced thickness of spray over one of the support angles in the underside of the duct. If the spray had been the specified thickness then it is considered that the duct would have in fact failed insulation, at the next temperature recorded in excess of the test failure criteria which was, at 115 minutes. Based on previous test evidence if the thickness of the spray is increased to at least 30 mm where the duct exits both sides of the wall it is considered that the insulation failure would have occurred at the thermocouples positioned further away from the wall. The next insulation failures occurred at 151 minutes.

CONCLUSION/ASSESSMENT

Based on the test data and the factors related to the construction detailed above, it is the assessment of this Division that the Igniduct Exo-cortex Fire Tile System as detailed in your specification listed above and reported in CSIRO Sponsored Investigation report numbered FSP 1604 would achieve the following fire-resistance levels in accordance with BS 476 Part 24.

TABLE 3**IGNIDUCT Exo-cortex fire tiles**

Maximum SIZE (mm)	ORIENTATION	FIRE SIDE	MINIMUM THICKNESS (mm)	FRL Integrity only	MINIMUM THICKNESS (mm)	FRL Integrity & Insulation
1600 x 1600	Horizontal / Vertical	Internal / External	1 x 20	60/ -	2 x 20	60/60
1600 x 1600	Horizontal / Vertical	Internal / External	1 x 20	90/ -	2 x 20	90/90
1600 x 1600	Horizontal / Vertical	Internal / External	2 x 20	120/ -	2 x 20	120/120
1600 x 1600	Horizontal / Vertical	Internal / External	2 x 20	180/ -	n/a	n/a
1600 x 1600	Horizontal / Vertical	Internal / External	n/a	n/a	n/a	n/a

- a) To comply with the Insulation criteria IGNIDUCT shall be manufactured from the Vermiduct formulation tested by CSIRO in FSH 0540, FSH 0649, FSH 0970, FSH 0972, FSH 1036 and FSH 1042;
- b) Ducts not to exceed the dimensions of 1600 x 1600 mm;
- c) Ductwork construction to be in accordance with AS 4254 or BS EN 1505:1998 using minimum 0.6 mm galvanised sheet metal for maximum 750 mm wide ducts and 0.8 mm thereafter all as reported in LAF IGNIDUCT Construction Standard DWG M400-405;
- d) Vermiduct Tienax 2FF adhesive mortar is to be applied in a 1.5 mm thickness on both the face of the tile already fixed to the duct, as well as the second tile being fixed (overall thickness 43mm)
- e) Trapeze support centres at 1520 mm centres comprising 50 x 50 x 5 mm angles supported by minimum 10 mm diameter rods where the load stress level does not exceed 6 N/mm² for 3 hours and 10 N/mm² for the FRL of 2 hrs;
- f) Tested Joints as follows: Drive Slip @ 2.4m max. c's; Mez Joint @ 1.52 m max. c's; TDF or TDC @ 1.52 m max c's;
- g) Igniseal access panels as distributed by LAF with rebated edges and non-combustible Fire seal all as per tested prototype are sanctioned for use with IGNIDUCT however the gap between the IGNIDUCT tiles and the IGNISEAL Access Panel shall be filled with Vermiduct as tested;
- h) Quikmesh reinforcement is to be used and secured with adhesive pins whenever using Vermiduct as the fire protective coating;
- i) Welded Pins are to be used to secure the IGNIDUCT tiles on ducts that are to be protected from external fire exposure (i.e. Supply Air ducts);
- j) Intermediate support to be used in accordance with Tie Rod attachments SMACNA Fig 2 & 1-3 or AS4254 Fig 2.3(C) Tie Rod;
- k) Vermibloc Torqduct panels comprising 300 mm wide Trimesh R100 (30 mm thick) and 2,280 mm long and cast with 40 mm Vermiduct to be used at all wall or slab penetrations.
- l) Any gap left to allow for Trapeze Angles, Stiffeners or at each Duct Joint must be filled with Vermiduct Tienax 2FF level with the tiles (40mm).
- m) The Joint Collar (Tile and/or Vermibloc Torqduct panel) must be secured by means of metal cleats or laminating screws to the pre-fixed second layer of tiles.

TERM OF VALIDITY

This assessment report will lapse on 31 December 2018. Should you wish us to re-examine this assessment with a view to the possible extension of its term of validity, would you please apply to us three to four months before the date of expiry. This Division reserves the right at any time to amend or withdraw this report in the light of new knowledge.

Yours faithfully,



Brett Roddy
Team Leader, Fire Testing

12 December 2013



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REVISION: I

IGNIDUCT EXO-CORTEX FIRE TILES

LAF - M400

1. VERTICAL TIE RODS WITH TUBE SPACERS TO BE USED WHERE THE WIDTH OF DUCTWORK REQUIRES SUPPORT TO PREVENT SAGGING AND MANDATORY FOR FIRE RATED DUCTS PASSING THROUGH FIRE RATED AND NON FIRE RATED WALLS (REF Page 29 OF AS-4254 OR REFER TO BS EN 1505:1998).
2. FORM FLANGE DUCT JOINTS MUST BE 35mm (MIN) CONNECTED WITH 150mm LONG STEEL CLIPS AT 380mm CENTRES (MAX). CORNERS MUST BE BOLTED TOGETHER WITH 10mm STEEL BOLTS
3. FIRE RATED KITCHEN EXHAUST DUCT JOINTS AND ACCESS PANELS ARE TO BE SEALED WITH HILASTIC 88 OR FIRESEAL. OTHER SYSTEMS CAN BE JOINED WITH IGNISEAL PPC SELF ADHESIVE FOAM TAPE CODEX PPC 8305 IXPE. UN FIRE-RATED KITCHEN EXHAUST DUCTS SHEETMETAL TO BE 1.2mm GAUGE OR REFER TO BS EN 1505:1998 FOR DETAILS. FIRE RATED KITCHEN EXHAUST DUCT SHEETMETAL TO BE 1.0mm GAUGE OR REFER TO EN:1505:1998.
4. IN THE EVENT THAT A FORM FLANGE MUST BE CUT OFF THE DUCT TO ALLOW THE DUCT TO PASS THROUGH A WALL PENETRATION, THE REFIXING OF THE FALSE FORM FLANGE TO THE DUCT MUST BE BY 6mm BOLTS AND NUTS AT 100mm CENTERS (MAX). HOLES TO ACCOMMODATE THE BOLTS MUST NOT BE CLOSER THAN 20mm FROM SHEETMETAL EDGE.
5. WHERE A DUCT IS TO TERMINATE AT A WALL IT MUST PASS THROUGH THE WALL BY A MINIMUM OF 100mm.
6. THE BUILDER (OR THEIR REPRESENTATIVE) MUST ENSURE THAT THE WALL AND SLAB PENETRATIONS (FOR FIRE RATED DUCTWORK) ARE CONSTRUCTED IN ACCORDANCE WITH THE PARAMETERS SPECIFIED BY THE MANUFACTURER OF THE FIRE PROTECTIVE SYSTEM TO BE INSTALLED ALL AS APPROVED BY A NATA ACCREDITED LABORATORY SUCH AS CSIRO OR BY THE RELEVANT LOCAL AUTHORITY HAVING JURISDICTION OVER SUCH DETAILS.
7. PENETRATIONS SHOULD BE SIZED SO THAT THERE IS A 12.5mm GAP BETWEEN THE DUCT SIDES /FLANGE OR THE FIRE PROTECTIVE COATING (WHICHEVER THE GREATER) AND THE INSIDE OF THE WALL OPENING. ALL SERVICE PENETRATIONS, INCLUDING FIRE DAMPERS, SHALL COMPLY WITH THE NON-COMBUSTIBILITY RULES OF THE BUILDING CODE OF AUSTRALIA SPECIFICATION 3.15 AND HAVE AN APPROVED COMPRESSIBLE PERIMETER LINING. ALL SEALING OF WALL PENETRATIONS IS BY THE NOMINATED SHEETMETAL DUCT INSTALLATION SUBCONTRACTOR.
8. IGNISEAL ACCESS PANELS SHALL BE USED FOR ALL FIRE RATED DUCTWORK ACCESS POINTS. IGNISEAL SHALL GENERALLY BE RECESSED INTO DUCT. WHEN USING IGNISEAL FOR FIRE RATED KITCHEN EXHAUST DUCT THE PANELS SHALL BE FITTED PROUD OF AIR STREAM TO PREVENT GREASE TRAPS. IGNISEAL HAVE BEEN TESTED TO AS1682.1-1990 SECTION 5.3 FOR AIR LEAKAGE. DO NOT USE ACCESS PANELS WHICH ARE SECURED WITH SCREWS OR BOLT FIXINGS. USE A/P WITH NON-COMBUSTIBLE SEALS.
9. PLEASE NOTE THAT DW 144, SMACNA OR AS 4254-2002 DUCT STANDARD CONSTRUCTION REQUIREMENTS TO CATER FOR VARIOUS PRESSURES TAKE PRECEDENCE OVER LAF SANCTIONED CONSTRUCTION DETAILS AND SUPPORTS. THE OTHER STANDARDS ARE CONSERVATIVE IN NATURE
10. VERMIBLOC TORQDUCT COLLAR IS TO BE INSTALLED ON ONE SIDE OF A WALL PENETRATION AND THE UPPER SIDE OF A SLAB PENETRATION. APPLY 3mm VERMIDUCT TIENAX 2FF TO WALL AND SLAB BEFORE SECURING PANEL WITH MASONRY ANCHORS. ALTERNATIVELY
11. IGNISEAL PPC SELF ADHESIVE FOAM TAPE CODEX PPC 8305 IXPE IS TO BE APPLIED TO ALL DUCT FLANGES.
12. TWO OFF METAL FERROCOR STEEL STRAPPING BANDS SHALL BE USED AT EACH DUCT JOINT COLLAR WHERE THE COLLAR INCLUDES VERMIBLOC TORQDUCT OR IGNIDUCT TILES.
13. IGNIDUCT TILES AND OR QUIKMESH SHALL BE SECURED ONTO THE SHEETMETAL DUCT WITH LAF'S PROPRIETARY QUIKPIN AND QUIKCLIPS.



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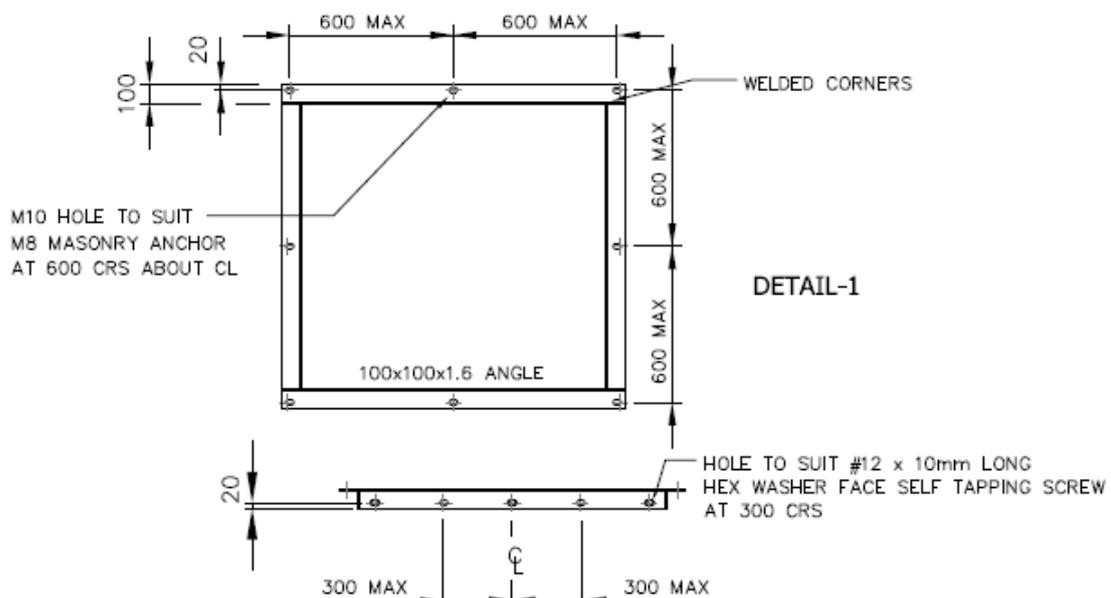
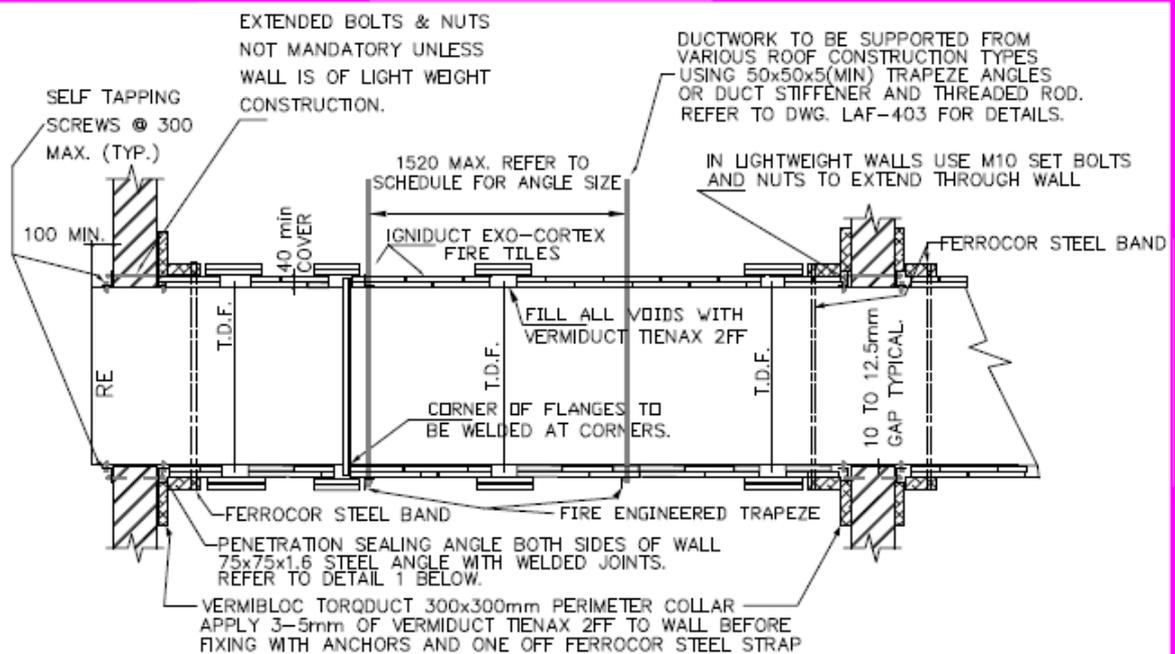
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IGNIDUCT FIRE RATED DUCTWORK SYSTEM WITH SUPPORTS AT 1520mm MAXIMUM LAF - M401





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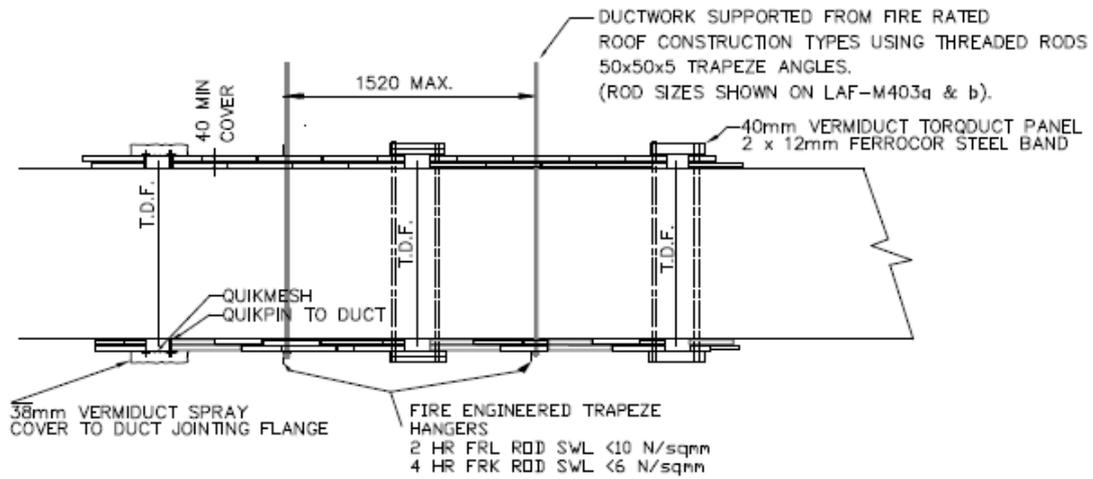
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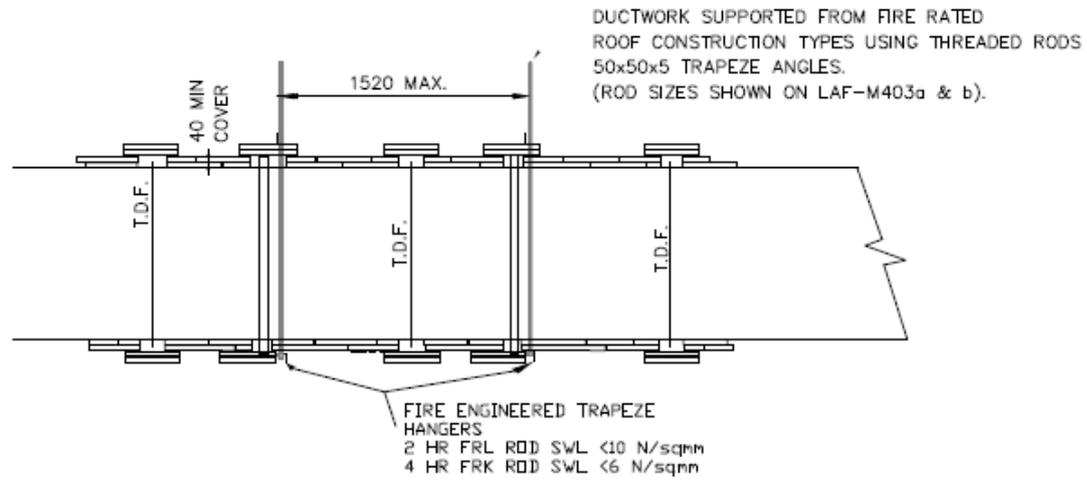
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IGNIDUCT TYPICAL FIRE RATED DUCTWORK SUPPORTS AND JOINT DETAILS

HA - M402



REGULAR TRAPEZE SUPPORT TYPE-1



REGULAR TRAPEZE SUPPORT TYPE-2

(USING INTERMEDIATE STIFFENERS)



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**IGNIDUCT EXOCORTEX FIRE RATED TILE SYSTEM
DUCTWORK TRAPEZE ROD SIZES TO ACHIEVE A 2 HOUR FRL**

LAF - M403a

FIRE-ENGINEERED DUCT TRAPEZE HANGING RODS												
2 HR DUCT COATED WITH max 30mm VERMIDUCT @ (320Kg/m ³)							2 HR VDT @30mm (320Kg/m ³)					
HANGING RODS @750 mm C/S.							HANGING RODS @1,500 mm C/S.					
FRL	DEPTH	WIDTH	3000	2500	2000	1500	1000	500	WIDTH	1400	1000	500
	3000	WEIGHT (Kg)	229.32	209.34	189.36	169.38	149.40	129.42	WEIGHT (Kg)	325.896	295.32	257.1
		AREA (mm ²)	382.20	348.90	315.60	282.30	249.00	215.70	AREA (mm ²)	543.16	492.2	428.5
		AREA/2 (mm ²)	191.10	174.45	157.80	141.15	124.50	107.85	AREA/2 (mm ²)	162.948	147.66	128.55
2HRS		DIA. (mm)	16	16	14	14	14	12	DIA. (mm)	18	18	16
	2500	WEIGHT (Kg)	211.08	191.10	171.12	151.14	131.16	111.18	WEIGHT (Kg)	289.416	258.84	220.62
		AREA (mm ²)	351.80	318.50	285.20	251.90	218.60	185.30	AREA (mm ²)	482.36	431.4	367.7
		AREA/2 (mm ²)	175.90	159.25	142.60	125.95	109.30	92.65	AREA/2 (mm ²)	144.708	129.42	110.31
2HRS		DIA. (mm)	16	14	14	14	12	12	DIA. (mm)	18	16	16
	2000	WEIGHT (Kg)	192.84	172.86	152.88	132.90	112.92	92.94	WEIGHT (Kg)	252.936	222.36	184.14
		AREA (mm ²)	321.40	288.10	254.80	221.50	188.20	154.90	AREA (mm ²)	421.56	370.6	306.9
		AREA/2 (mm ²)	160.70	144.05	127.40	110.75	94.10	77.45	AREA/2 (mm ²)	126.468	111.18	92.07
2HRS		DIA. (mm)	14	14	14	12	12	10	DIA. (mm)	16	16	14
	1500	WEIGHT (Kg)	174.60	154.62	134.64	114.66	94.68	74.70	WEIGHT (Kg)	216.456	185.88	147.66
		AREA (mm ²)	291.00	257.70	224.40	191.10	157.80	124.50	AREA (mm ²)	360.76	309.8	246.1
		AREA/2 (mm ²)	145.50	128.85	112.20	95.55	78.90	62.25	AREA/2 (mm ²)	108.228	92.94	73.83
2HRS		DIA. (mm)	14	14	12	12	10	10	DIA. (mm)	16	14	14
	1000	WEIGHT (Kg)	156.36	136.38	116.40	96.42	76.44	56.46	WEIGHT (Kg)	179.976	149.4	111.18
		AREA (mm ²)	260.60	227.30	194.00	160.70	127.40	94.10	AREA (mm ²)	299.96	249	185.3
		AREA/2 (mm ²)	130.30	113.65	97.00	80.35	63.70	47.05	AREA/2 (mm ²)	89.988	74.7	55.59
2HRS		DIA. (mm)	14	12	12	10	10	8	DIA. (mm)	14	14	12
	500	WEIGHT (Kg)	138.12	118.14	98.16	78.18	58.20	38.22	WEIGHT (Kg)	143.496	112.92	74.7
		AREA (mm ²)	230.20	196.90	163.60	130.30	97.00	63.70	AREA (mm ²)	239.16	188.2	124.5
		AREA/2 (mm ²)	115.10	98.45	81.80	65.15	48.50	31.85	AREA/2 (mm ²)	71.748	56.46	37.35
2HRS		DIA. (mm)	12	12	10	10	8	8	DIA. (mm)	12	12	10

FIRE RATED A.C. DUCT HANGERS DIAMETER ASSUMPTIONS:

- A.C. DUCT WALL THICKNESS = 1.2mm.
- ROD SIZE CALCULATED AT EFFECTIVE DIAMETER EXCLUDING THREAD
- DENSITY ALLOWS 15% MARGIN FOR MIXER/THICKNESS & A/PANELS



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IGNIDUCT EXOCORTEX FIRE RATED TILE SYSTEM
DUCTWORK TRAPEZE ROD SIZES TO ACHIEVE A 4 HOUR FRL

LAF - M403b

FIRE-ENGINEERED DUCT TRAPEZE HANGING RODS												
4 HR DUCT COATED WITH max 75mm VERMIDUCT @ (320Kg/m ³)							4 HR VDT @75mm (320Kg/m ³)					
HANGING RODS @750 mm C.T.S.												
FRL	WIDTH	DEPTH	3000	2500	2000	1500	1000	500	1400	1000	500	
	3000	WEIGHT (Kg)	311.22	284.42	257.61	230.81	204.00	177.20	WEIGHT (Kg)	446.016	403.56	352.65
		AREA (mm ²)	518.70	474.03	429.35	384.68	340.00	295.33	AREA (mm ²)	743.36	672.60	587.75
		AREA/2 (mm ²)	259.35	237.01	214.68	192.34	170.00	147.66	AREA/2 (mm ²)	371.68	336.30	293.88
4HRS		DIA. (mm)	22	22	20	20	20	20	DIA. (mm)	27	27	24
	2500	WEIGHT (Kg)	286.16	259.35	232.55	205.74	178.94	152.13	WEIGHT (Kg)	395.888	354.39	302.52
		AREA (mm ²)	476.93	432.25	387.58	342.90	298.23	253.55	AREA (mm ²)	659.81	590.65	504.20
		AREA/2 (mm ²)	238.46	216.13	193.79	171.45	149.11	126.78	AREA/2 (mm ²)	329.91	295.33	252.10
4HRS		DIA. (mm)	22	22	20	20	18	16	DIA. (mm)	27	24	22
	2000	WEIGHT (Kg)	261.09	234.29	207.48	180.68	153.87	127.07	WEIGHT (Kg)	345.756	304.26	252.39
		AREA (mm ²)	435.15	390.48	345.80	301.13	256.45	211.78	AREA (mm ²)	576.26	507.10	420.65
		AREA/2 (mm ²)	217.58	195.24	172.90	150.56	128.23	105.89	AREA/2 (mm ²)	288.13	253.55	210.33
4HRS		DIA. (mm)	22	20	20	18	16	16	DIA. (mm)	24	22	20
	1500	WEIGHT (Kg)	236.03	209.22	182.42	155.61	128.81	102.00	WEIGHT (Kg)	295.626	254.13	202.26
		AREA (mm ²)	393.38	348.70	304.03	259.35	214.68	170.00	AREA (mm ²)	492.71	423.55	337.10
		AREA/2 (mm ²)	196.69	174.35	152.01	129.68	107.34	85.00	AREA/2 (mm ²)	246.36	211.78	168.55
4HRS		DIA. (mm)	20	20	18	16	16	14	DIA. (mm)	22	20	20
	1000	WEIGHT (Kg)	210.96	184.16	157.35	130.55	103.74	76.94	WEIGHT (Kg)	245.496	204	152.13
		AREA (mm ²)	351.60	306.93	262.25	217.58	172.90	128.23	AREA (mm ²)	409.16	340.00	283.55
		AREA/2 (mm ²)	175.80	153.46	131.13	108.79	86.45	64.11	AREA/2 (mm ²)	204.58	170.00	126.78
4HRS		DIA. (mm)	20	18	16	16	14	12	DIA. (mm)	20	18	16
	500	WEIGHT (Kg)	185.90	159.09	132.29	105.48	78.68	51.87	WEIGHT (Kg)	195.366	153.87	102
		AREA (mm ²)	309.83	265.15	220.48	175.80	131.13	86.45	AREA (mm ²)	325.61	256.45	170.00
		AREA/2 (mm ²)	154.91	132.58	110.24	87.90	65.56	43.23	AREA/2 (mm ²)	162.81	128.23	85.00
4HRS		DIA. (mm)	18	16	16	14	12	10	DIA. (mm)	18	16	14

FIRE RATED A.C. DUCT HANGERS DIAMETER ASSUMPTIONS:

- A.C. DUCT WALL THICKNESS = 1.2mm.
- ROD SIZE CALCULATED AT EFFECTIVE DIAMETER EXCLUDING THREAD
- DENSITY ALLOWS 15% MARGIN FOR MIXER/THICKNESS & A/PANELS



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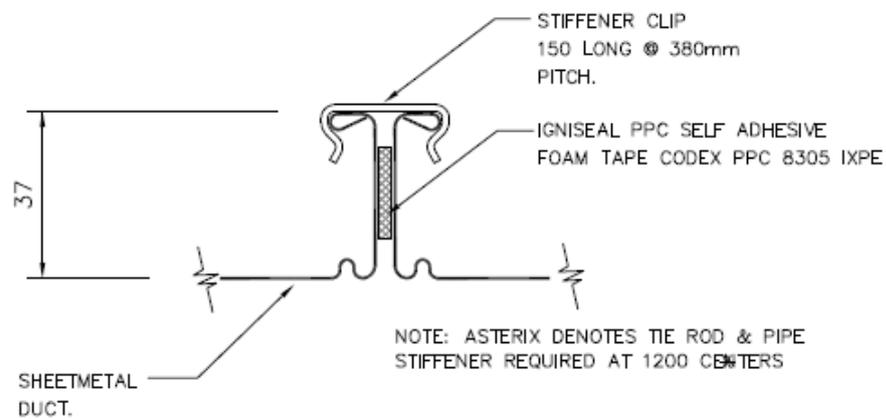
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**FIRE RATED RECTANGULAR: 0 TO 1000 Pa PRESSURE
 TRANSVERSE JOINT T.D.F**

LAF - M404



NOTES:

- 1 – ALL DUCTWORK MANUFACTURED IN T.D.F. SHALL HAVE A MINIMUM DEPTH OF 300mm WITH THE OPTION OF 200mm IF THE WIDTH OF THAT DUCT EXCEEDS 300mm. FOR ALL OTHER DUCT EMPLOY DRIVE SLIP JOINTS
- 2 – THIS SCHEDULE COMPLIES WITH LAF TESTED SYSTEMS INCLUDING IGNIDUCT AND VERMIDUCT AS REPORTED IN ASSESSMENTS FCO 2247 AND FCO 2233. AIR DUCT PRESSURE 0 – 1000 Pa

FORM FLANGE (T.D.F.) DUCT CONSTRUCTION TABLE
RECTANGULAR DUCT MANUFACTURED IN GALVANISED SHEETMETAL

LONG DUCT DIMENSION (mm)	SHEETMETAL THICKNESS (mm)	MAX DUCT MODULE (mm)	TRANSVERSE JOINT REINFORCEMENT	INTERMEDIATE STIFFENING
300-750	0.6	1520	NIL	BEADED
751-1200	0.8	1520	NIL	BEADED
1201-1350	0.8	1520	NIL	BEADED
1351-1500	1.0	1520	NIL	BEADED 50X5 DURAGAL @ 750 mm CENTRES
1501-1800	1.0	1520	(*)	BEADED 50X5 DURAGAL @ 750 mm CENTRES
1801-2100	1.0	1520	(*)	BEADED 50X5 DURAGAL @ 750 mm CENTRES
2101-2400	1.0	1520	(*)	BEADED 50X5 DURAGAL @ 750 mm CENTRES ⁽¹⁾
2401-3000	1.2	1520	(*)	BEADED 50X5 DURAGAL @ 750 mm CENTRES ⁽¹⁾

50x5 DURAGAL APPLIES TO ALLFOUR SIDES REGARDLESS OF SHORTER DUCT DIMENSIONS.



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TRAPEZE SUPPORT FRAME FOR FIRE RATED DUCTWORK TO 1000 Pa PRESSURE
 TRANSVERSE JOINT T.D.F

LAF - M405

TRAPEZE SUPPORT FRAME SECTIONS

DUCT WIDTH (mm)	TDF CONNECTION SUPPORT FRAME MEMBER SIZE WITH H/RODS @ 750 mm C'S	TDF CONNECTION SUPPORT FRAME MEMBER SIZE WITH H/RODS @ 1,520 mm C'S
3000	75x50x6	
2900	75x50x6 or 65x50x8	
2800	75x50x6 or 65x50x8	
2700	75x50x6 or 65x50x8	
2600	75x50x5 or 65x50x6	
2500	65x50x6	
2400	65x50x6	
2300	65x50x6	
2200	65x50x6	
2100	55x55x6 or 50x50x8	
2000	55x55x6 or 50x50x8	
1900	55x55x6 or 50x50x8	
1800	55x55x5 or 50x50x6	
1700	55x55x5 or 50x50x6	
1600	50x50x5 or 45x45x6	
1500	50x50x5 or 45x45x6	
1400	45x45x5	55x55x6
1300	50x50x3 or 45x45x5 or 40x40x6	55x55x6
1200	50x50x3 or 40x40x5	55x55x5 or 50x50x6
1100	45x45x3 or 40x40x5	50x50x5 or 45x45x6
1000	45x45x3 or 40x40x5	45x45x5
900	40x40x3 or 30x30x6	45x45x5 or 40x40x6
800	40x40x3 or 30x30x5	40x40x5
700	30x30x3 or 25x25x5	40x40x3 or 30x30x6
600	30x30x3 or 25x25x5	30x30x5
500	25x25x3	25x25x5

SUGGESTED ANGLE SECTIONS – PLEASE REFER TO AS 4254 OR BSEN 1605-1998 - FOR HIGH PRESSURE OR FOR ADDITIONAL DETAILS. NOTE THESE DETAILS DO NOT OVERRIDE AS, BS OR EN STANDARD REQUIREMENTS