Fire technical assessment

Name of sponsor:	**SAINT-GOBAIN ISOVER**		
Product name:	Rectangular steel ventilation duct systems insulated with U Protect Slab 4.0		
File no.:	PHA10683A		
Date:	08-03-2016		
Pages:	10	**Encl.:**	27
Ref:	ADR / TDJ		

Danish Institute of Fire and Security Technology

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Introduction

This report presents an appraisal of the fire resistance performance of ISOVER insulated horizontal and vertical rectangular steel ventilation duct systems for duct sizes up to 1250 mm x 1000 mm [width x height], and for other modifications and alternative construction details as listed in the following.

Standard solution to rectangular fire resistant ventilation ducts:

- Steel duct
  - Duct sections
  - Stiffening system
  - Duct joints.
- Insulation
  - Type
  - Fixation
  - Aluminum facings
- Penetration
  - Standard rigid wall penetration
  - Standard flexible wall penetration
  - Simplified penetration for vertical rectangular ducts

Alternative solutions to rectangular fire resistant ventilation ducts:

- Use of double layer solution
- Additional insulation on top of fire resistance insulation
- One, two and three sided ducts.
- Installation of access panel
- Replacing the stiffening system

Solution to rectangular smoke extraction ventilation ducts

Alternative solutions to rectangular smoke extraction ventilation ducts

The proposed duct assemblies are required to provide a fire resistance of up to 120 minutes in terms of the integrity [E], insulation [I] and smoke leakage [S] criteria, in horizontal [ho] and vertical [ve] direction for the fire scenarios *fire from inside to outside* and *fire from outside to inside* [i ↔ o] as specified in EN 1366-1:2014 *Fire resistance for service installations - Part 1. Ventilation ducts*.

For the fire from outside to inside scenario, the system is applicable for an under-pressure up to 300 Pa.

The proposed duct assemblies can also be used for multi-compartment smoke extraction ducts as specified in EN 1366-8:2004 *Fire resistance for service installations - Part 8. Smoke extraction ducts,* as specified under the chapter *Solution to rectangular smoke extraction ventilation ducts*

This appraisal consists of a main part, that describes the fire resistant ventilation system and the possible variations, technical drawings and specifications, and an annex A that presents the technical arguments for the appraised variations.

Standard system for fire resistant rectangular ducts

Steel duct sections

Duct:

Duct of hot dipped galvanised steel sheets, the longitudinal seam is closed with a folded seam. The duct sections shall have a minimum tightness class B, according to EN 1507:2006 in cold condition.

Minimum steel thickness 0.7 mm.
Maximum section length
Ducts with fire resistance up to and including 90 minutes = 1500 mm.
Ducts with fire resistance 120 minutes = 1250 mm.

Maximum internal width 1250 mm.
Maximum internal height 1000 mm.

Duct joint:

Steel flanges of minimum 30 x 30 mm and steel thickness minimum 0.8 mm fixed to the duct using spot welding or steel screws c/c 150 mm. The flanges must not contain any grease for tightness.

The flanges shall be held together using steel clamps (M8 bolts).

Maximum distance from the corners to the first clamp:
Duct sides <= 500mm = 100 mm.
Duct sides > 500mm = 135 mm.

Maximum distance between each clamp 265 mm (see also enclosure 1.5).

Corner profiles
In the corners, the flanges are fitted with corner profiles bolted together using one M8 bolt and nuts in each corner.

Sealing tape:

3 x 20 mm inorganic chemistry tape
Fixed between the flanges.

Stiffener:

Stiffeners shall be fitted perpendicular to any side length that exceeds 500 mm. The stiffeners shall be positioned at midpoint in each duct segment.

The stiffeners shall be of the type:
Steel thread rod, minimum Ø8 mm fixed to the ducts using 4 pieces of M70 mm washers with thickness 1 mm and M8 nuts.

Or

Steel pipe, minimum Ø16 mm and thickness 2 mm. The steel pipe must be fixed to the ducts using 4 pieces of M72 mm washers with thickness 1 mm and minimum M6 bolts.

Suspension system

Hangers:

Steel drop rods. The tension in the rods in cold condition should not exceed:

9 N/mm² for resistance to fire times equal to or lower than 60 minutes and
6 N/mm² for resistance to fire times higher than 60 minutes.

The maximum distance between the suspensions should not exceed 1500 mm for duct with fire resistance up to and including 90 minutes and 1250 mm for 120 minutes.

The hangers and support profile shall be positioned approx. 50 mm from the duct joints.

Support profile: A perforated U-profile with minimum dimensions 30 x 30 x 3 mm
The flanges were perforated:
Lower flange Ø 11 c/c 25 mm.
Upper flange Slit holes 35 x 11 mm c/c 50 mm.

Other steel profiles can be used with higher moment of inertia.

Cladding

Fixing: Steel welding pins with fixed washer.
Pin diameter minimum 2.7 mm, washer minimum 30 mm, pin length corresponding to the insulation thickness.

- The maximum distance between the pins should not exceed 260 mm.
- The maximum distance between the edge of the ducts and the first pin should not exceed 80 mm.
- The maximum distance between the slab joints and the first pin should not exceed 80 mm.
- No pin is used for the top slab on horizontal ducts

See also the illustrations on enclosures 2.0 – 2.7

Insulation: U Protect slab 4.0 with a nominal density of 66 kg/m³ and maximum slab dimensions of 1200 mm x 600 mm.

The minimum thickness needed for the different application is:

Ducts penetrating a rigid supporting construction:

Horizontal duct B, EI xx (ho i → o)						
Thickness [mm]	30	40	50	60	70	80
RF -time [minutes]	15	30	45	60	90	120

Vertical duct B, EI xx (ve i → o)						
Insulation Thickness [mm]	35	50	65	80	90	100
RF -time [minutes]	15	30	45	60	90	120

Horizontal or vertical duct A, EI xx (ve ho o → i)						
Insulation Thickness [mm]	30	30	30	30	70	80
RF -time [minutes]	15	30	45	60	90	120

Ducts penetrating a flexible supporting construction:

Horizontal, duct B, EI xx (ho i → o)						
Insulation Thickness [mm]	30	40	50	70	80	90
RF -time [minutes]	15	30	45	60	90	120

Horizontal, duct A, EI xx (ho o → i)						
Insulation Thickness [mm]	30	30	30	40	70	80
RF -time [minutes]	15	30	45	60	90	120

Ducts penetrating a rigid or flexible supporting construction (all applications)

Horizontal or vertical direction, duct type A or B, EI xx (ve ho o ↔ i)						
Insulation Thickness [mm]	35	50	65	80	90	100
RF -time [minutes]	15	30	45	60	90	120

For all resistance to fire times except the 120 minutes the smoke criterion (S) is also fulfilled with the thicknesses listed above.

The insulation boards should be fixed to each other using fire screws type Fire Protect screws from Saint-Gobain ISOVER as shown on enclosure 1.8 and 1.9.

The boards should be positioned with staggered joints as shown on enclosure 1.8 and 1.9.

For insulation thicknesses less than 60 mm, a 30 mm collar with width 120 mm should be added over the duct joints to cover the flanges as shown on enclosure 1.6 and 1.7.

Facing: Black reinforced aluminium foil type Alu1 or Glass tissue type V1 can be added to the surface of the insulation.

The insulation with aluminium foil is named U Protect Slab 4.0 Alu1

The insulation with glass tissue is named U Protect Slab 4.0 V1

Sides of the slabs and joints between slabs can be covered with tape type ISOVER Protect Black Tape.

Penetration through rigid walls

Distance: The distance from the steel duct to the penetrated wall cannot exceed 50 mm but can be decreased.

Wall: Rigid walls with density higher than 575 kg/m³ and a fire resistance equal to or greater than the fire resistance of the ducts.

For ducts with fire resistance equal to or lower than 90 minutes, the wall thickness must be minimum 100 mm.

For ducts with fire resistance of 120 minutes, the wall thickness must be minimum 150 mm.

Drawing: The penetration must be constructed as shown on enclosure 1.0 - 1.1 and the part list on enclosure 1.10.

Penetration through flexible walls

Distance: The distance from the steel duct to the penetrated wall can not exceed 50 mm but can be decreased.

Wall: Flexible walls consisting of steel studs with boards on both sides and with a resistance to fire equal to or greater than the resistance to fire of the ducts.

Drawing: The penetration must be constructed as shown on enclosure 1.2 - 1.3 and the part list on enclosure 1.10.

Penetration through rigid floors

Distance: The distance from the steel duct to the penetrated floor can not exceed 50 mm but can be decreased.

Floor: The duct can penetrate rigid floors with density higher than 575 kg/m³ and a resistance to fire equal to or greater than the resistance to fire of the duct and a thickness equal to or greater than 150 mm.

Drawing: The penetration must be constructed as shown on enclosure 1.4 and 1.1 and the part list on enclosure 1.10.

Alternative solutions for rectangular fire resistant duct system

This chapter describes alternative solutions that can be used in combination with the standard system for rectangular ducts, on the conditions required for each solutions.

Use of double layer insulation
A double insulation layer solution can be used for the insulation described under the *Insulation* for the standard system for rectangular ducts on the following conditions:

- A maximum of 5 pins is used is used to hold the inner slabs.
- A distance of minimum 200 mm is used between the joints in the two layers

  or

- The total thickness of the double layer is minimum 10 mm more than the thickness defined under *Insulation* for the standard system for rectangular ducts.

Additional insulation on top of the fire protection insulation
Additional insulation can be added on top of the fire technical insulation for the standard system under the following conditions:

- The additional insulation fulfils the reaction to fire requirements for an A2-s1,d0 material.
- The additional insulation is mounted independently of the fire technical insulation.
- The weight of the additional insulation shall not subject the suspension devices to a higher tensile or shearing stress than specified for the hangers as described under the standard system.

One two and three sided rectangular ducts
The penetration solution shown on enclosure 1.11 and 1.12 can be used in combination with the standard system for rectangular ducts when the distance to the wall or floor is less than 300 mm.

Installation of access panel
An access panel as shown on enclosure 1.15 can be included in the standard system on condition:

- The access panel is made of steel.
- The access panel hatch is mechanical fixed in each end using steel hardware.
- The frame size of the access panel should not exceed 290 x 420 mm.
- The EPDM-sealing shall be removed from the access panel.
- 3 x 20 mm inorganic chemistry tape must be added between the access panel frame and the duct and on the frame as replacement for the EPDM-sealing.
- The access panel frame shall be fixed to the duct using steel screws, 3 in each corner and approx. per c/c 60 mm along the sides.
- The insulation covering the access panel shall be fixed as prescribed on enclosure 1.15.

Replacing the stiffening system
The center stiffeners can be replaced with 30 x 30 x 2 mm steel profiles fixed on the outer side around the duct midway on each section on condition that:

- The L-profiles are fixed to the duct using self-drilling screws or steel rivets with c/c 100 mm.
- The center stiffener in the penetration still remains or a 1 mm steel plate with 30 mm width as shown on enclosure 1.13 is installed on both sides of the penetration.

Rectangular fire resistant ducts insulated with U Protect Wired Mat 4.0
Rectangular fire resistant ducts insulated with U Protect Wired Mat 4.0 equals the standard system for fire resistant ducts with the exception of the cladding. The cladding is described in the following.

Cladding

Insulation: Insulation type Ultimate U Protect Wired Mat 4.0 with a nominal density of 66 kg/m^3.

The maximum width of the mat is 600 mm.

The minimum thickness needed for the different application is:

Ducts penetrating a rigid or flexible supporting construction (all applications)

Horizontal or vertical direction, duct type A or B, EI xx (ve ho o ↔ i)

Insulation Thickness [mm]	40	60	70	100
RF -time [minutes]	15	30	45	60

No values above 60 minutes have been determined.

Fixing: The insulation is fixed by winding steel wire around the edges of the wire net.

Pins
The insulation mat shall be fixed with pins
Distance to mat edge = maximum 150 mm.
Distance to duct corners = maximum 200 mm.
Distance between pins 300 mm.

The above rule is illustrated on drawing no. 1.14

Steel welding pins with fixed washer.
Pin diameter minimum 2.7 mm,
Washer minimum 30 mm,
Pin length insulation thickness + 8 mm.

No pins are needed if the distance between the duct corners is less than 200 mm.
No pins are needed for the top surface of horizontal ducts
If the width of the insulation mat is less than 150 mm but the distance between the duct corners is more than 200 mm then pins shall still be used.

Standard system for rectangular smoke extraction ducts

This chapter describes the standard system for rectangular multi-compartment smoke extraction ducts with pressure level 1.
The smoke extraction duct equals the standard system for fire resistant ducts with the exception of the steel duct sections. The steel duct sections are described in the following.

Steel duct sections

Duct:

Duct of hot dipped galvanised steel sheets, the longitudinal seam is closed with a folded seam. The duct sections shall have a minimum tightness class B, according to EN 1507:2006 in cold condition.

Maximum section length 1500 mm.
Maximum internal width 1250 mm.
Maximum internal height 1000 mm.

For ducts smoke extraction ability up to and including 90 minutes the minimum steel thickness is 0.7 mm.

For ducts with 120 minutes smoke extraction ability, the minimum steel thickness is 1 mm.

Duct joint:

Steel flanges of minimum 30 x 30 mm and steel thickness minimum 0.8 mm fixed to the duct using spot welding or steel screws c/c 150 mm. The flanges must not contain any grease for tightness.

The flanges shall be held together using steel clamps (M8 bolts).

Clamps
Maximum distance from the corners to the first clamp:
Duct sides <= 500mm = 100 mm.
Duct sides > 500mm = 135 mm.

Maximum distance between each clamp 265 mm.

Corner profiles
In the corners the flanges are fitted with corner profiles bolted together using one M8 bolt and nuts in each corner.

For ducts with 120 minutes smoke extraction ability, C-profiles with minimum steel thickness 1 mm shall be used over the steel flanges, together with the clamps described above.

Sealing tape:

3 x 20 mm inorganic chemistry tape
Fixed between the flanges.

Stiffener:

Stiffeners shall be fitted perpendicular to any side where both dimensions exceed 500 mm. One stiffener per every 0.3 [m²] surface of the duct side shall be added.

Ex. A horizontal duct with width 1000 mm, height 400 mm and section length 1500 mm
Has a top and bottom surface of 1 m x 1.5 m = 1.5 m².
The number of stiffeners to apply is: 1.5 [m²] / 0.3 [m²/stiffener] = 5 stiffeners.

No stiffeners is needed perpendicular to the side surfaces (with dimensions: height 400 mm and length 1500 mm) because both dimensions do not exceed 500 mm.

The stiffeners shall be evenly distributed over the surface.

The stiffeners shall be of the type:
Steel thread rod diameter 8 mm, inside a 3/8" steel pipe outer diameter 17.5 mm thickness 2.35 mm.

Or

A stiffener made of steel with an equal stiffness as the above described.

The steel rod shall be fixed to the ducts using 4 pieces of M70 mm washers with thickness 1 mm and M8 nuts.

Alternative solutions for rectangular smoke extraction ducts

This chapter describes alternative solutions that can be used in combination with the standard system for rectangular multi-compartment smoke extraction ducts, on the conditions required for each solutions.

All the alternative solutions described for fire resistant rectangular ducts apply to rectangular smoke extraction ducts with the exception of.

- Installation of access panel
- Replacing the stiffening system

Remarks

This assessment is issued on the basis of test data and information to hand at the time of issue. If contradictory evidence becomes available to the assessing authority the assessment will be unconditionally withdrawn and the applicant will be notified in writing. Similarly the assessment is invalidated if the assessed construction is subsequently tested since actual test data is deemed to take precedence over an expressed opinion. This assessment is only valid for a period of 5 years, after which time it is recommended that it be submitted to the assessing authority for re-appraisal.

This assessment is only valid for the country where it is produced and as far as national rules are satisfied. Validity in other countries is subject to acceptance by the relevant national authorities/regulations.

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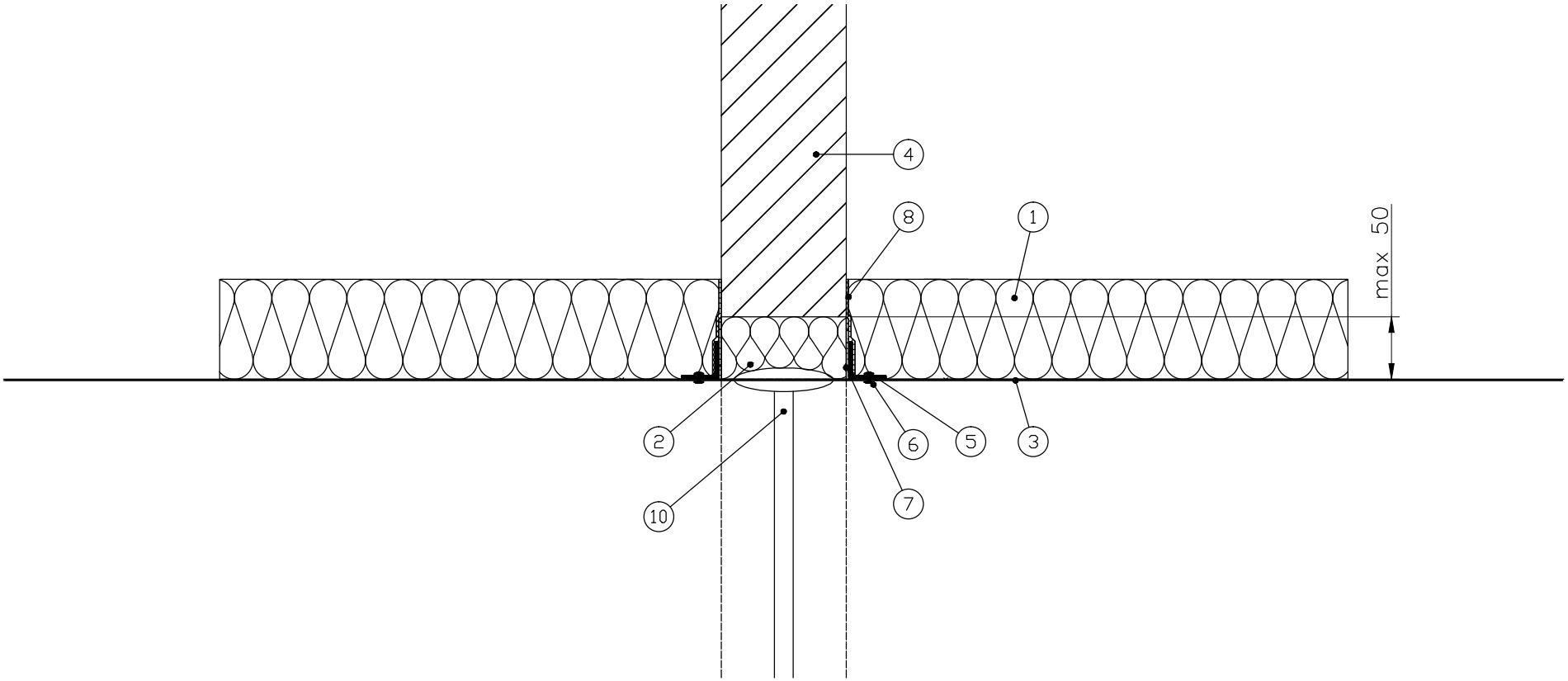


Detail of penetration through rigid wall

All measurements are in mm

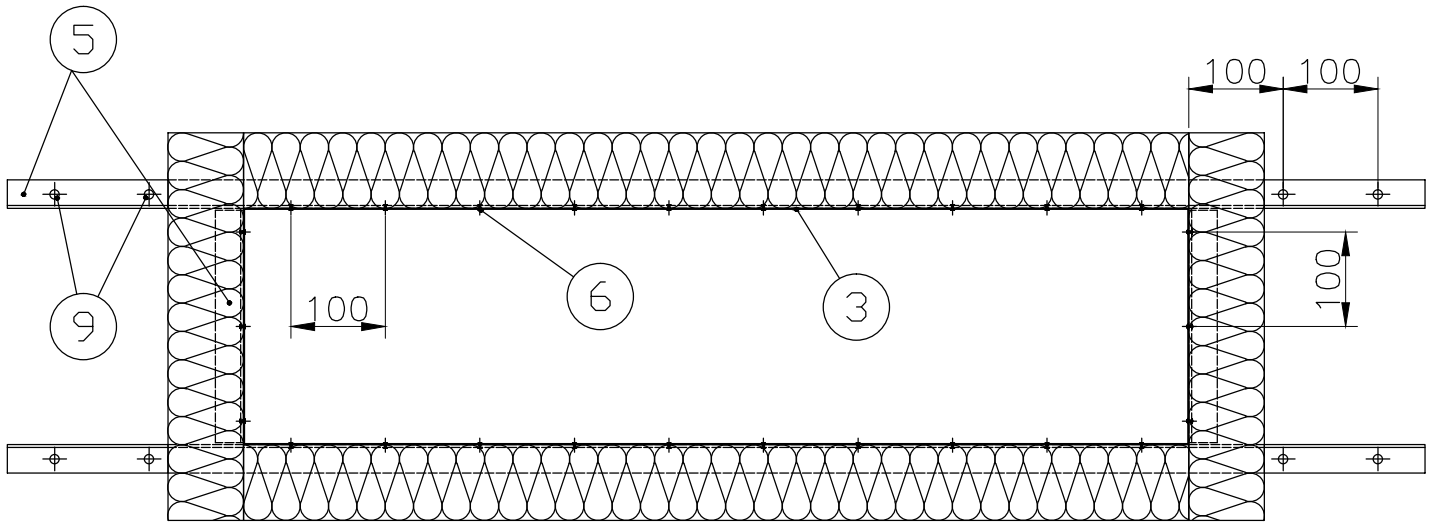
Danish Institute of Fire and security Technology

Sponsor: Saint-Gobain Isover

Subject: Penetration through rigid walls

File No.: PHA10683A

Enclosure: 1.0



Fixing of duct to rigid wall or floor

All measurements are in mm

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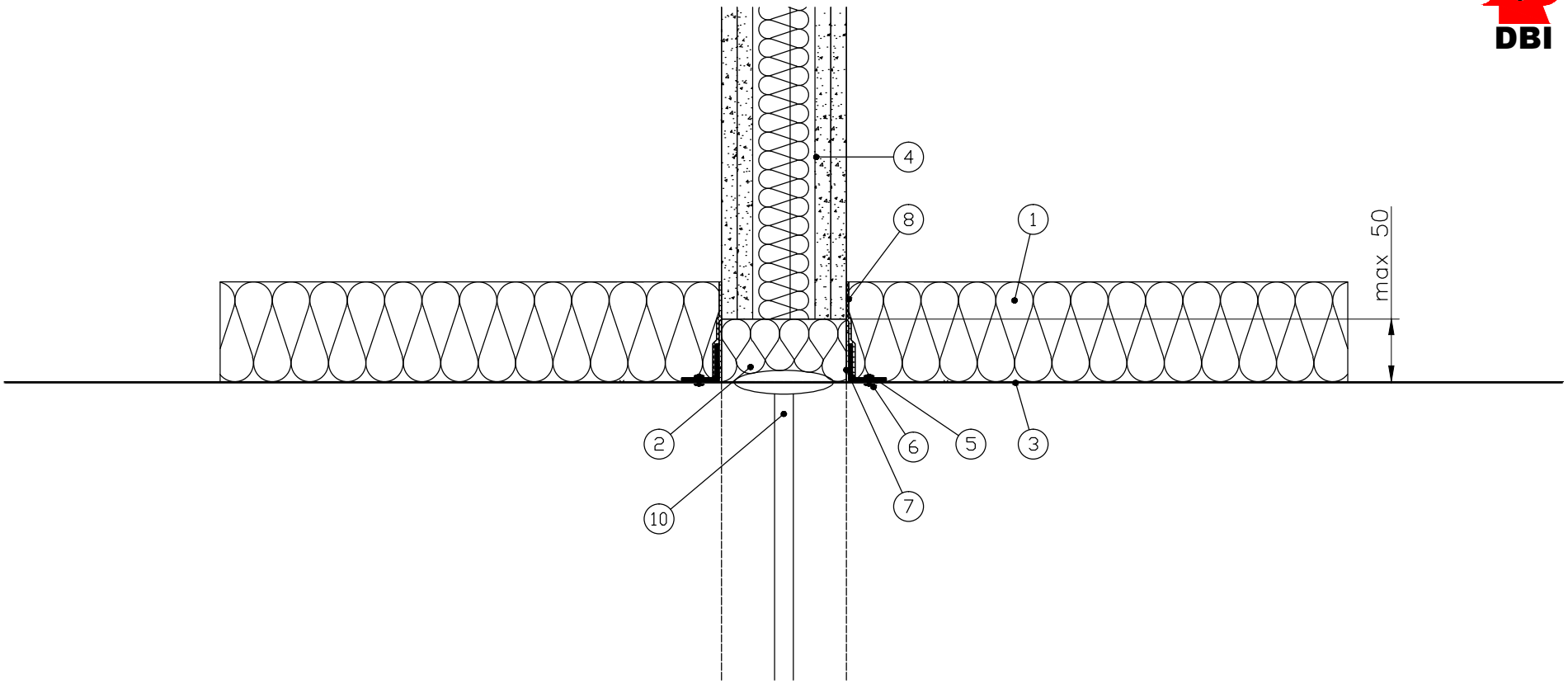
Sponsor: Saint-Gobain Isover

Subject: Penetration through rigid walls

File No.: PHA10683A

Enclosure: 1.1



Detail of penetration through flexible wall

All measurements are in mm

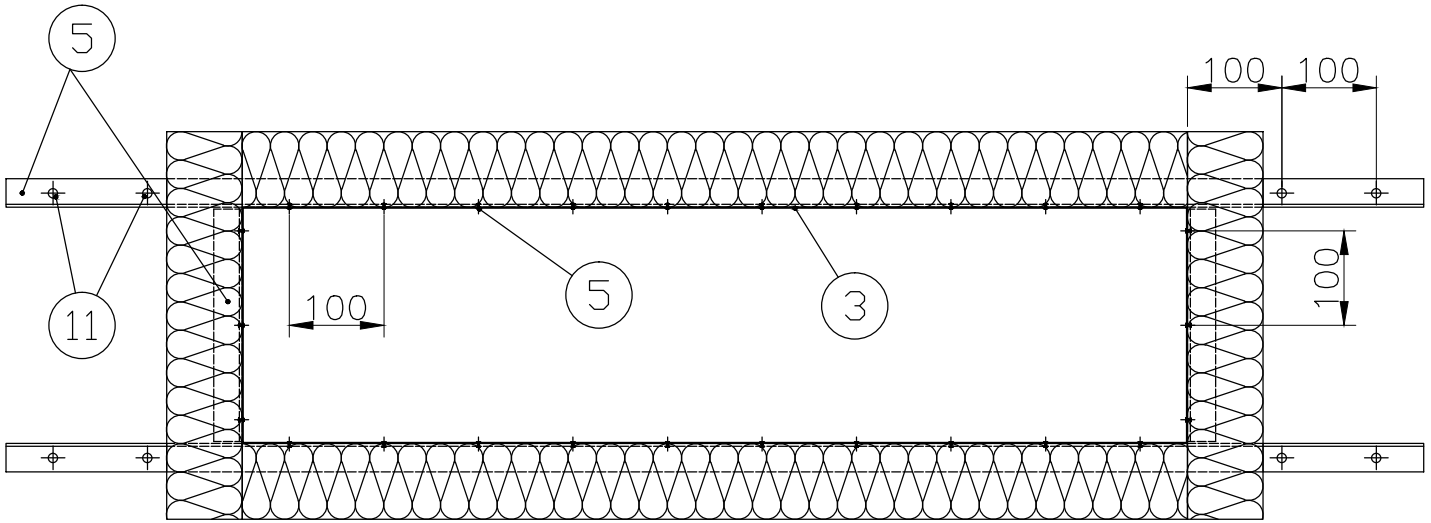
Danish Institute of Fire and security Technology

File No.: PHA10683A

Sponsor: Saint-Gobain Isover

Subject: Penetration through flexible walls

Enclosure: 1.2



Fixing of duct to flexible wall

All measurements are in mm

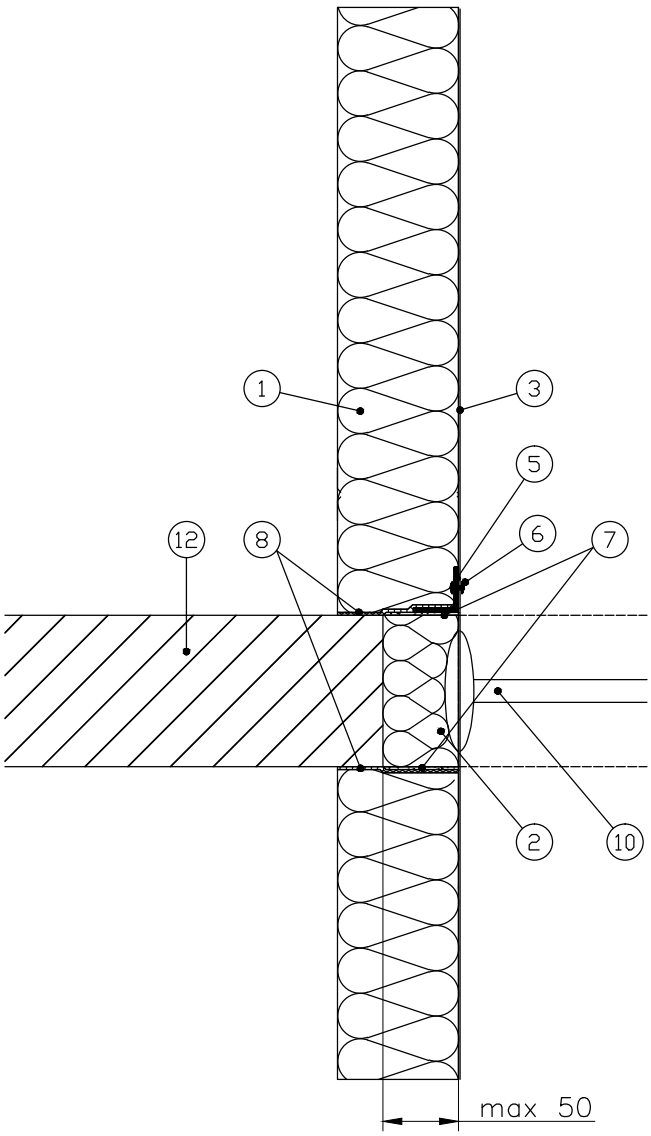
Danish Institute of Fire and security Technology

Sponsor: Saint-Gobain Isover

Subject: Penetration through flexible walls

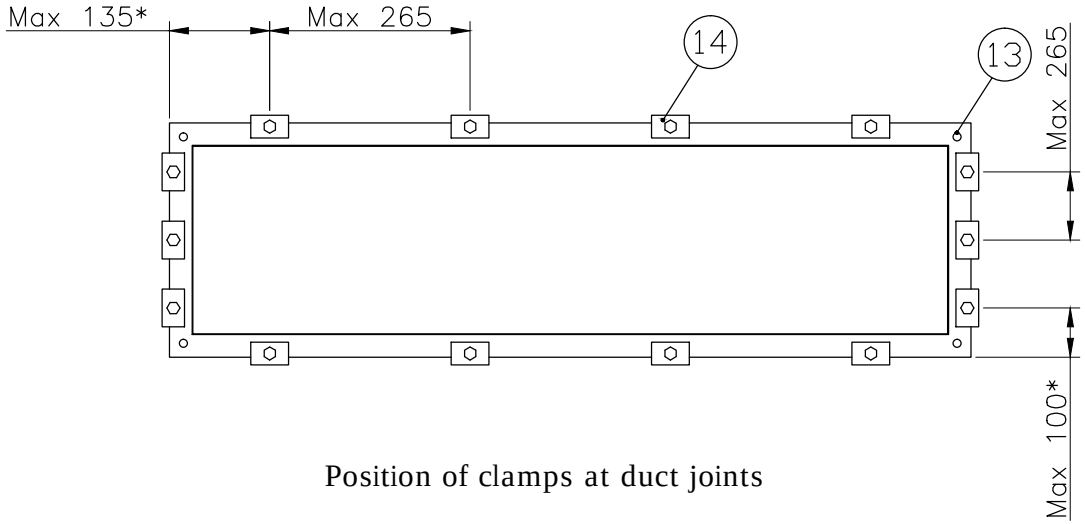
File No.: PHA10683A

Enclosure: 1.3



Detail of penetrationthrough rigid floor

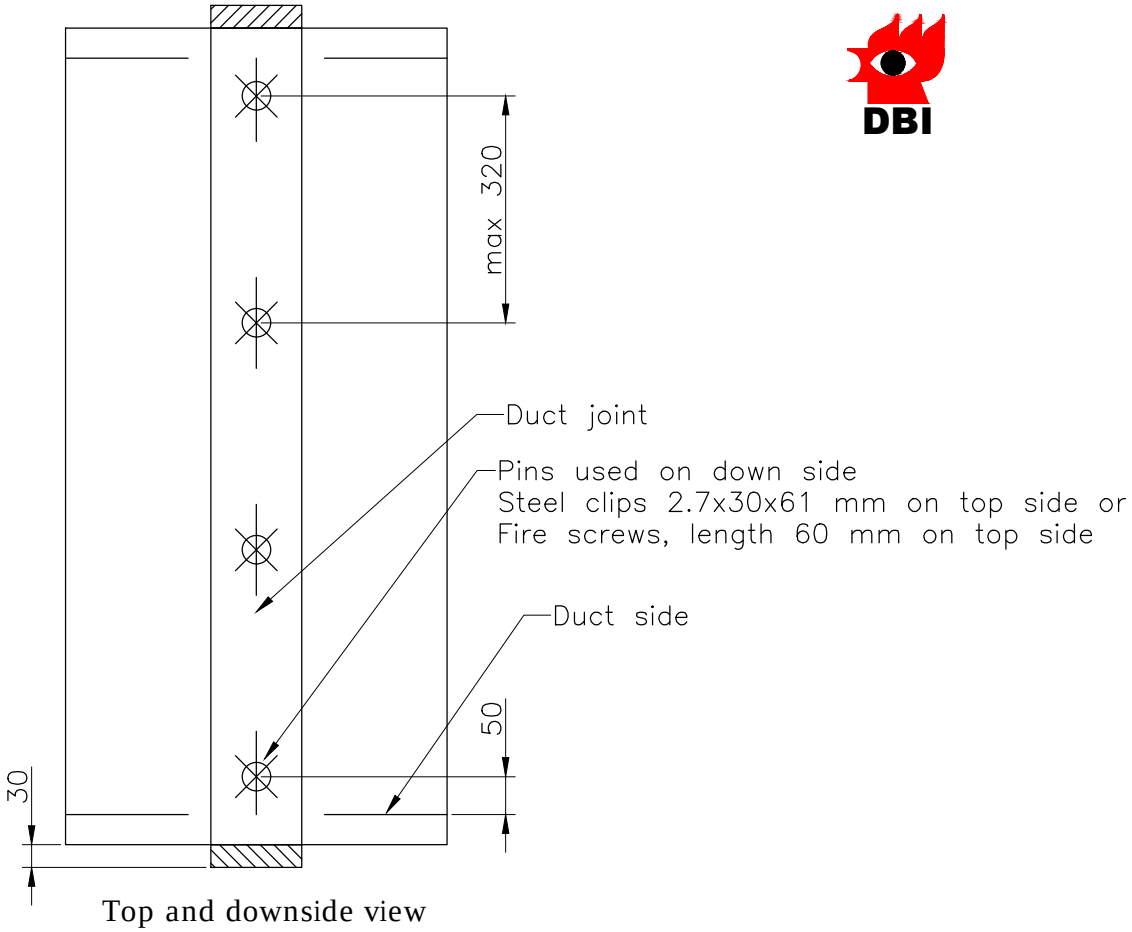
All measurements are in mm



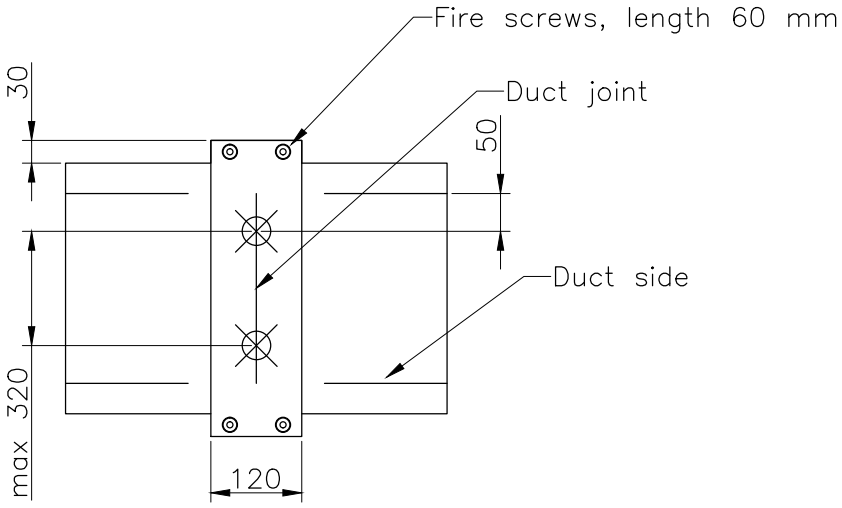
Position of clamps at duct joints

* 100 mm for duct sides ≤ 500 mm
135 mm for duct sides > 500 mm

All measurements are in mm

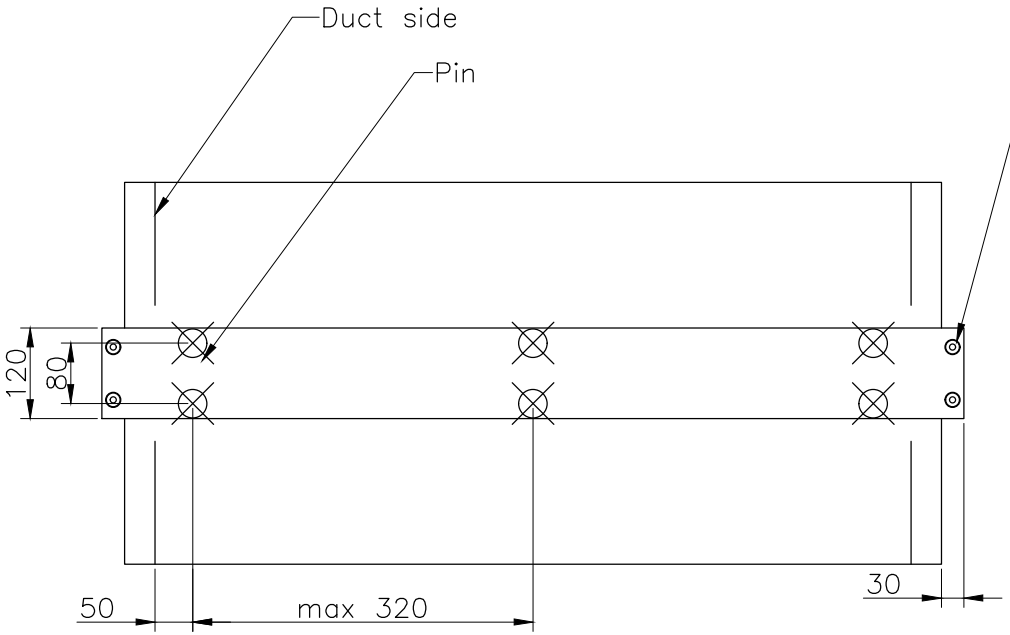


Top and downside view

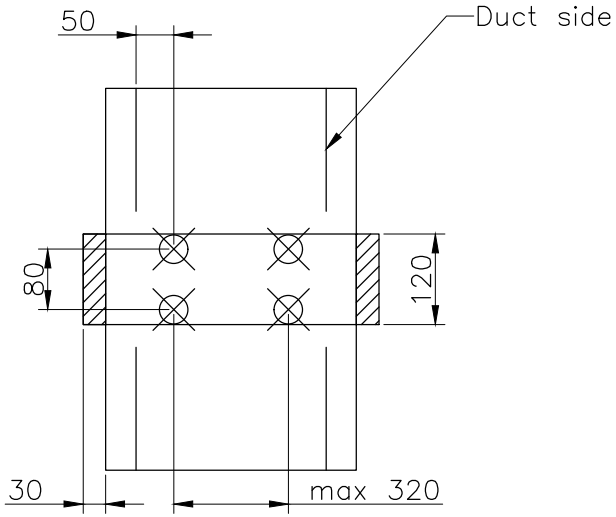


Side view

All measurements are in mm



Wide side view



Short Side view

All measurements are in mm

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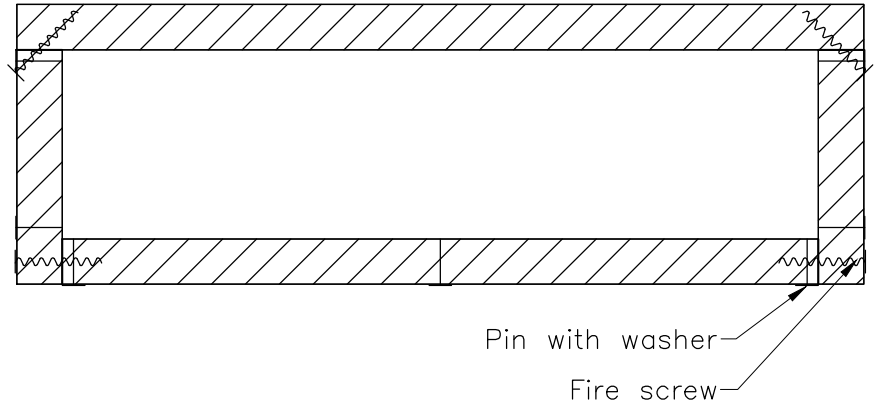
Sponsor: Saint-Gobain Isover

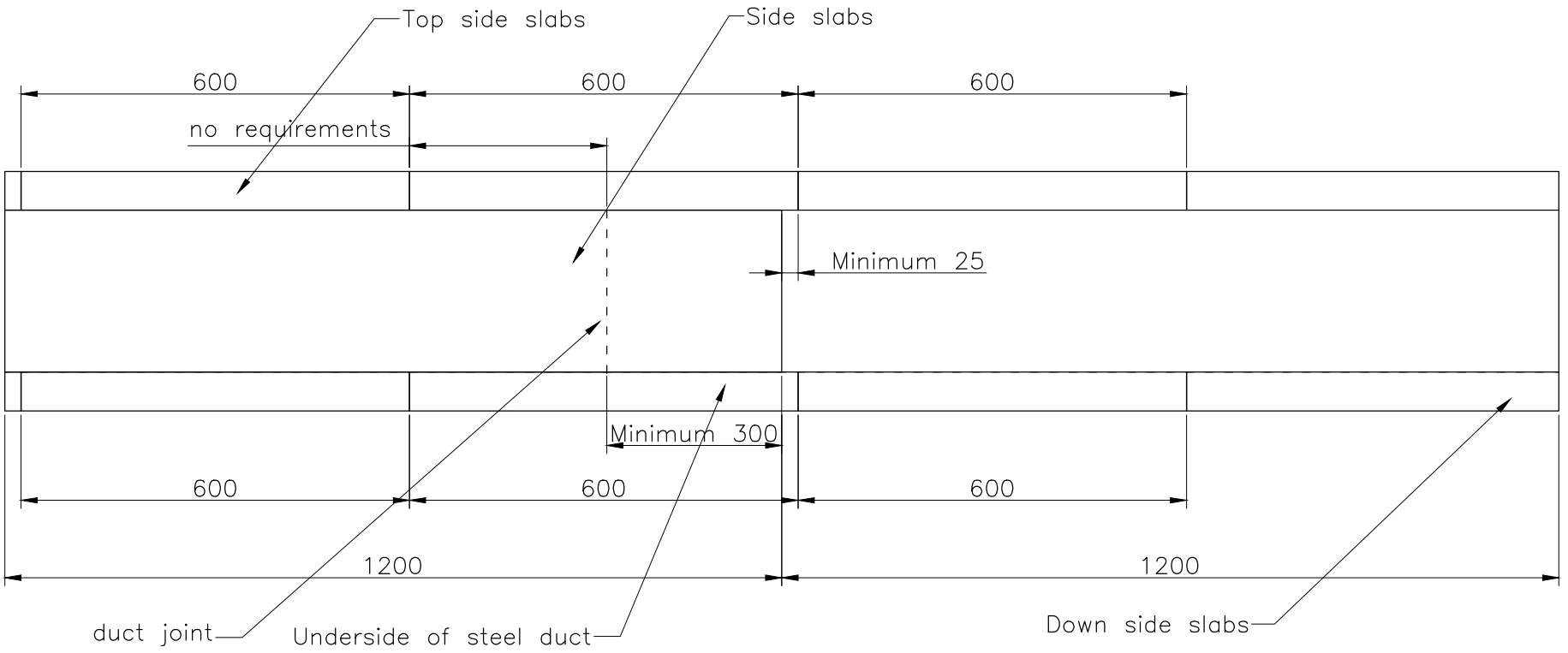
Subject: Collar over duct joint for vertical ducts

File No.: PHA10683A

Enclosure: 1.7



Minimum distance between slab joints



All measurements are in mm

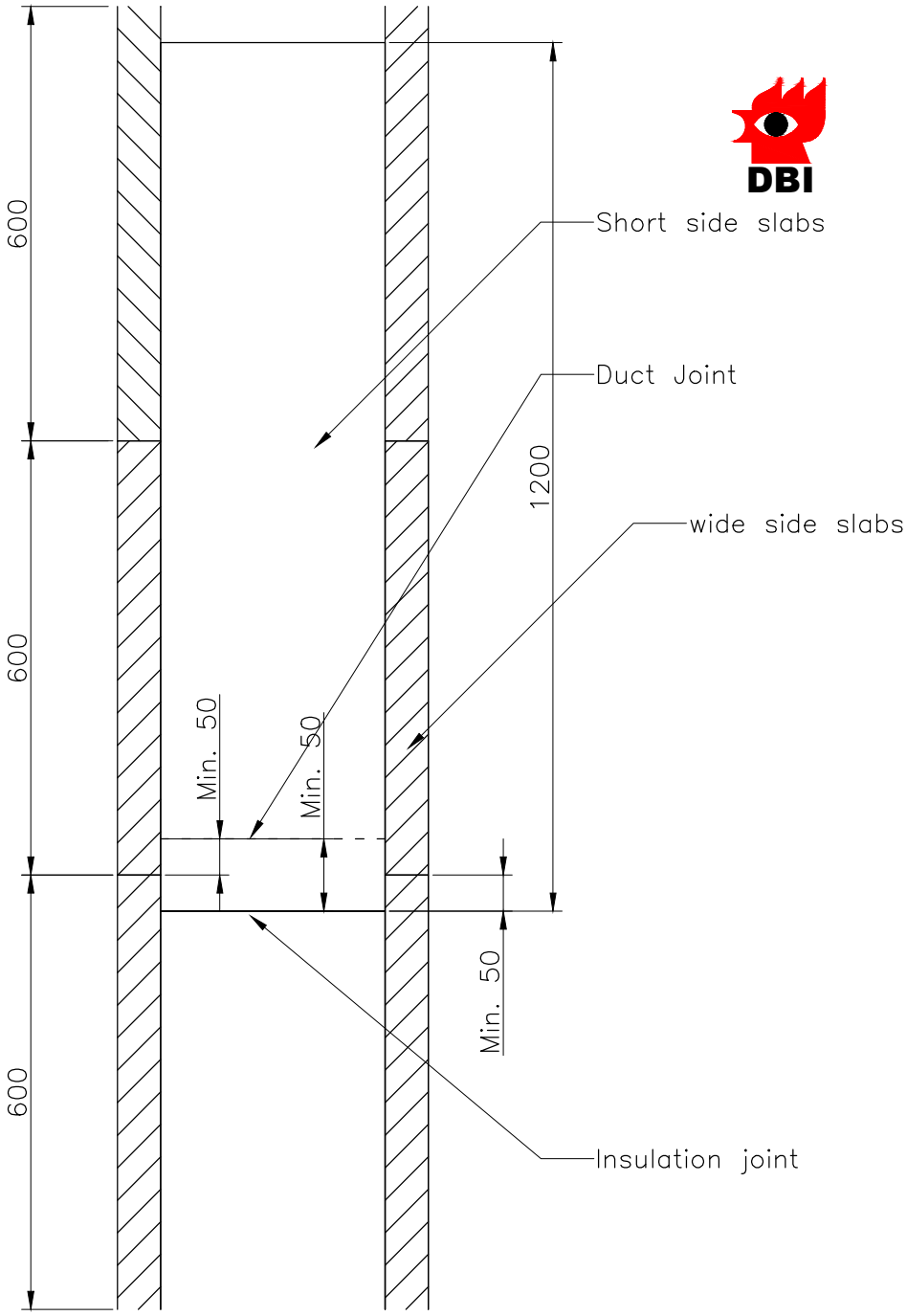
Danish Institute of Fire and security Technology

Sponsor: Saint-Gobain Isover

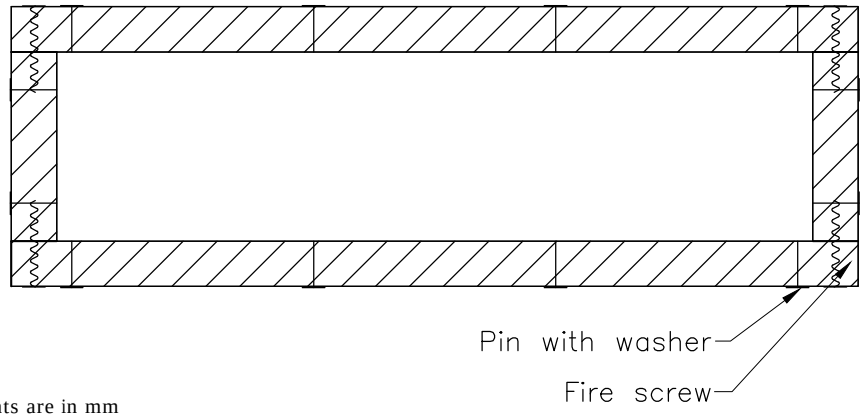
Subject: Insulation joints in horizontal ducts

File No.: PHA10683A

Enclosure: 1.8



Minimum distance between slab joints



All measurements are in mm

Enclosure 1.10
Part list for rectangular duct system

File: PHA10683A

Part lists for drawings on enclosure 1.0 to 1.9

Number	Description	Specification
1	Insulation	U Protect Slab 4.0, nominal density 66kg/m^3
2	Insulation	U Protect Slab 4.0, nominal density 66kg/m^3 Compressed
3	Ventilation duct	Steel duct, thickness 0.7 mm
4	Wall	Rigid wall construction density higher than 575 kg/m³ and a resistance to fire equal to or greater than the resistance to fire of the ducts. For ducts with fire resistance equal to or lower than 90 minutes the wall thickness must be minimum 100 mm. For ducts with fire resistance of 120 minutes the wall thickness must be minimum 150 mm.
5	L-profile	Steel, 30 × 30 × 3 mm
6	Rivet/Screw	Steel, 3.2 ×10 mm or self-drilling screws
7	Intumescent paint	ISOVER Protect BSF Application thickness ≥ 2 mm
8	Glue	ISOVER Protect BSK
9	Screw	Steel, 7.5 × 60 mm
10	Stiffener	See, Steel duct sections, Stiffener
11	Screw	Hollow wall anchor, M6 x 65/34 mm, steel
12	floor	The duct can penetrate rigid floors with density higher than 575 kg/m³ and a resistance to fire equal to or greater than the resistance to fire of the duct and a thickness equal to or greater than 150 mm
13	Bolts	M8 Steel bolt
14	Clamps	Steel clamps with M8 bolts

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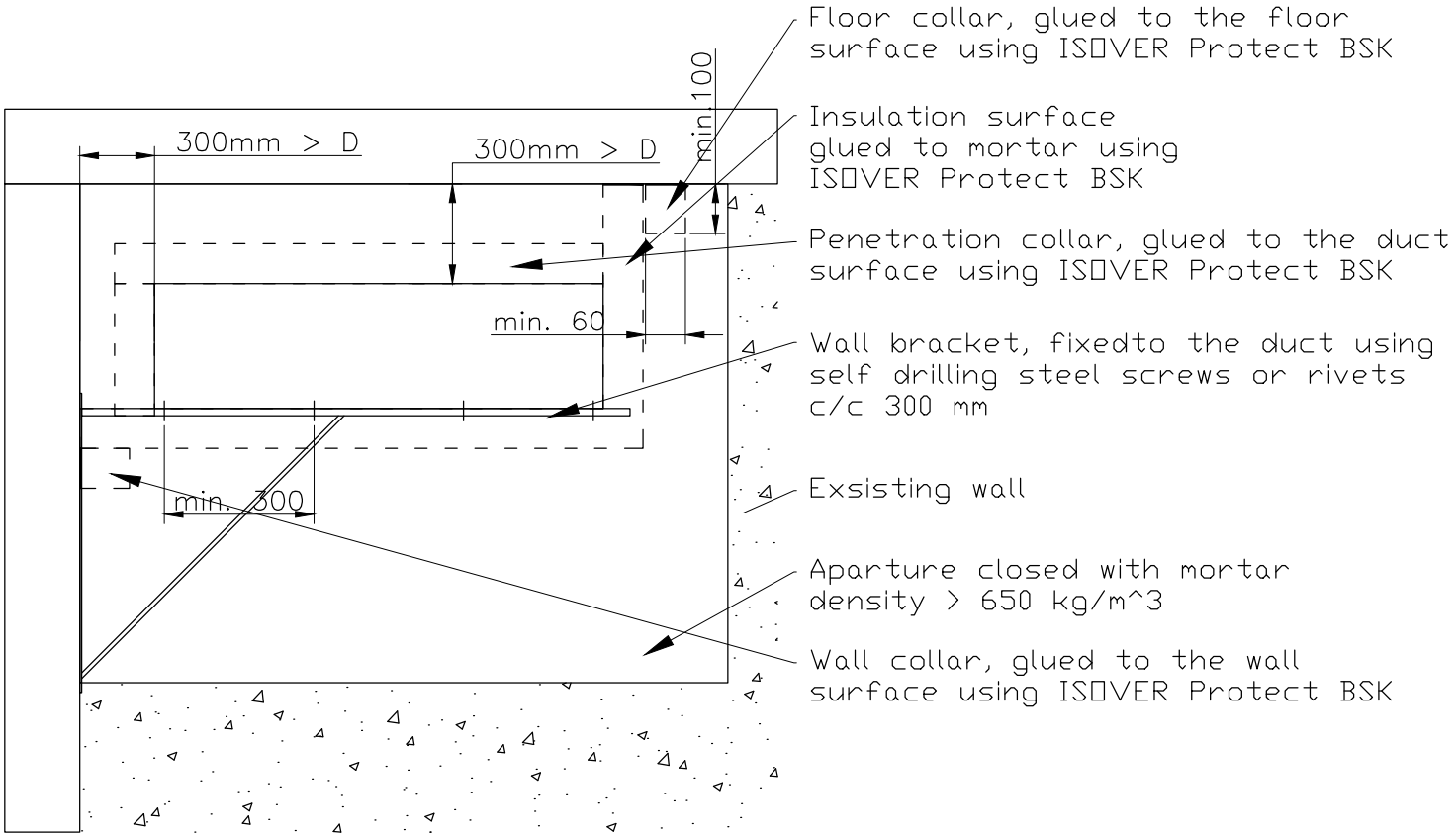
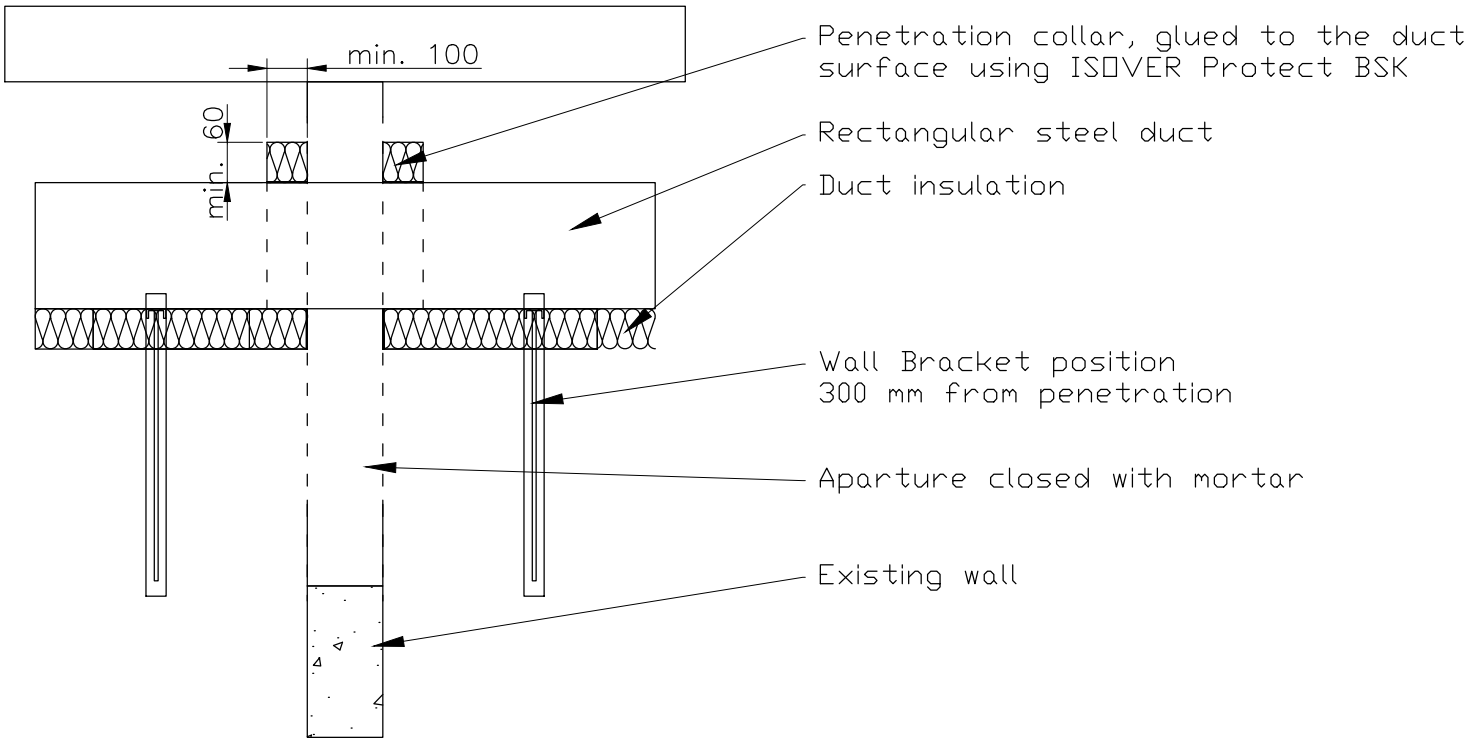
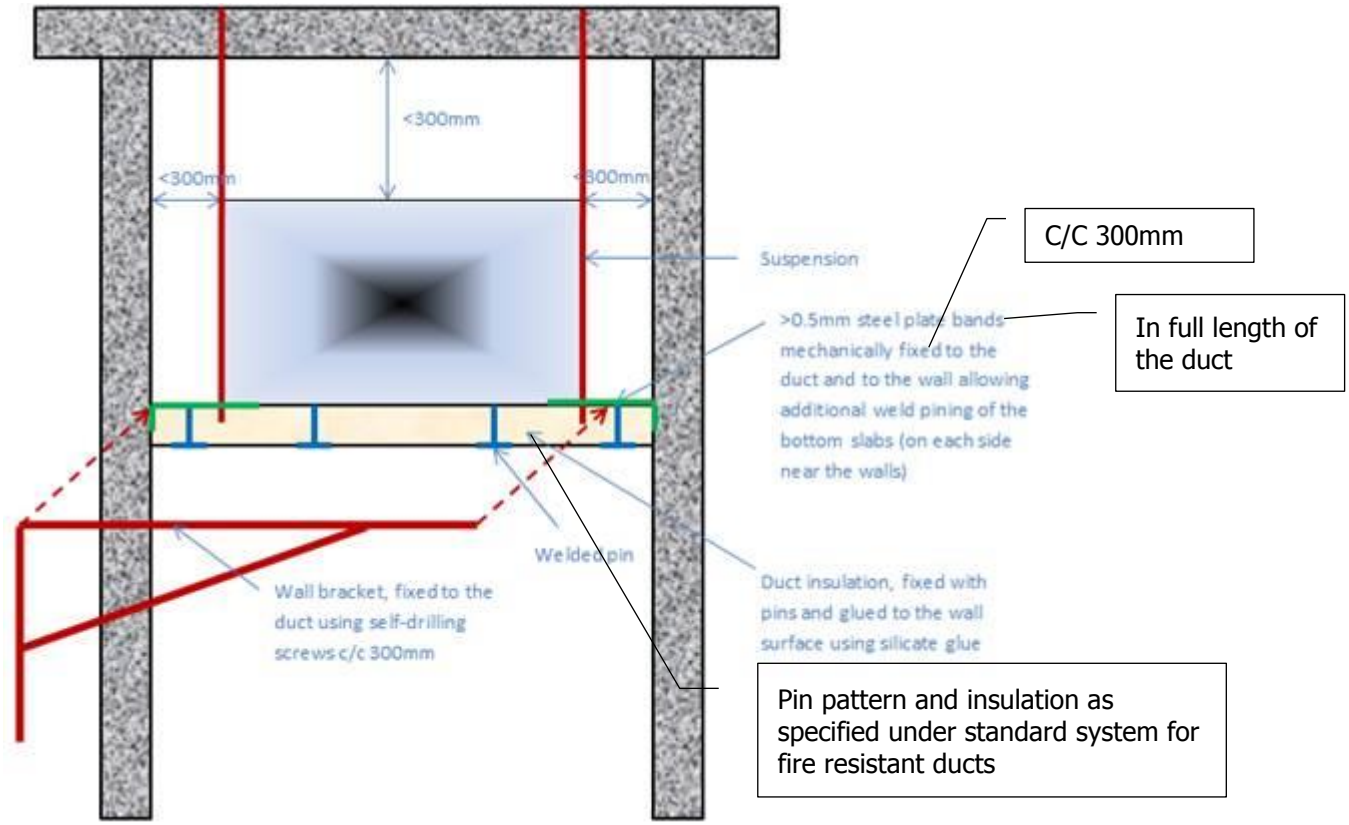
Rectangular duct: 2 and 3 sided installation

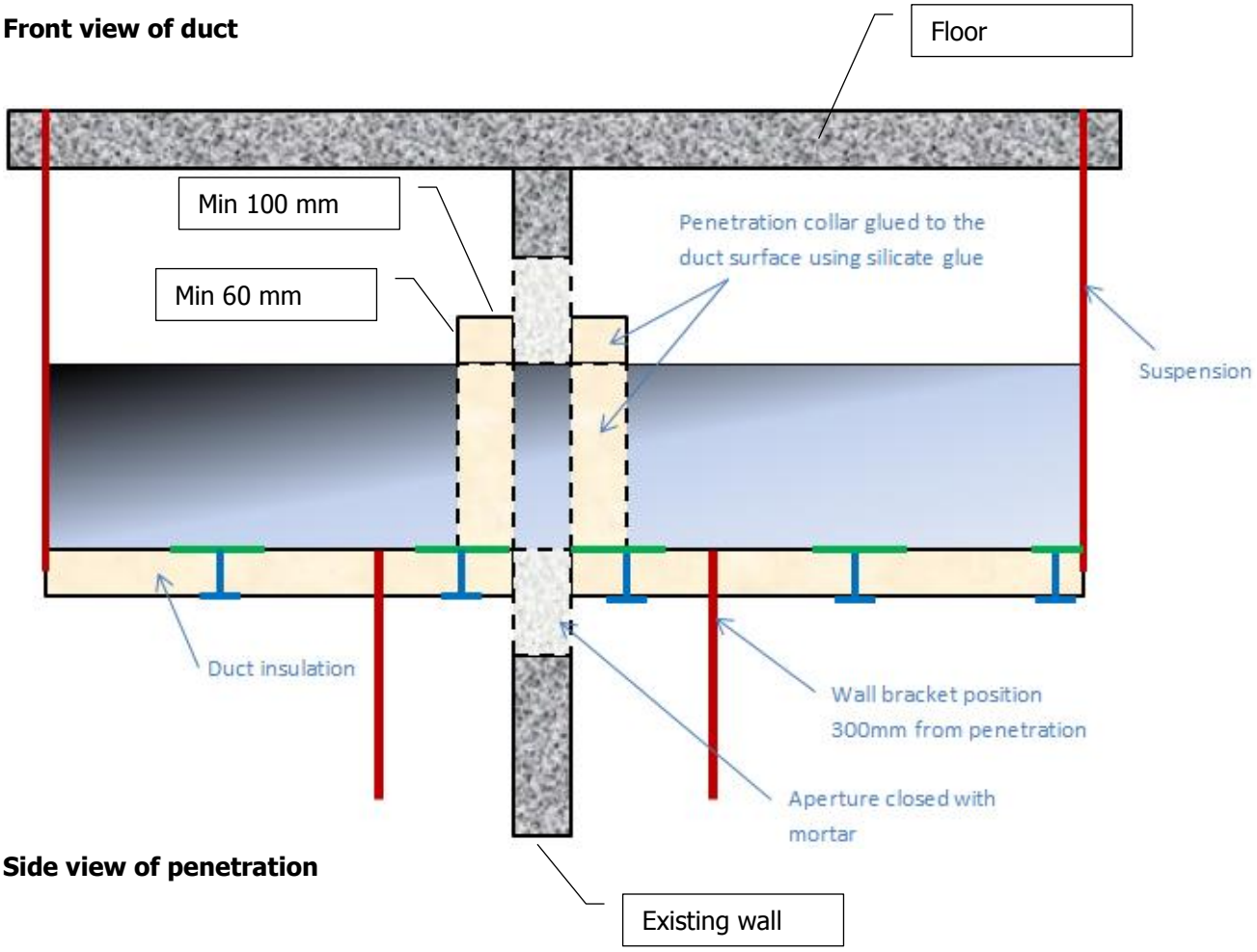




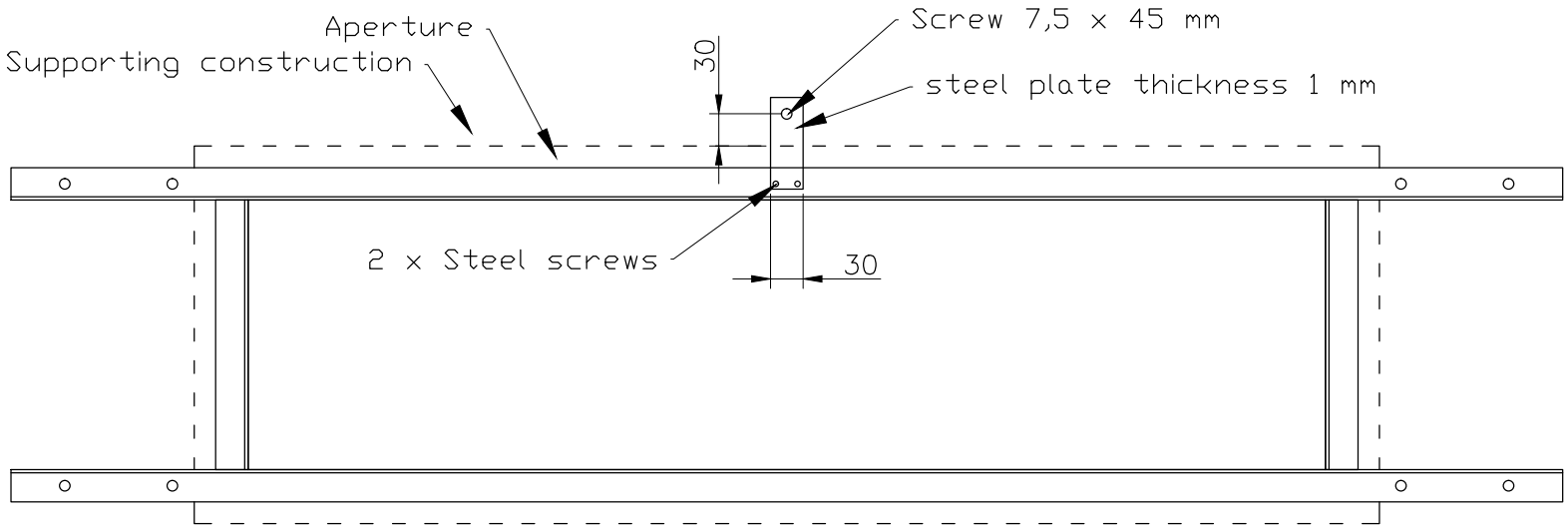
All measurements are in mm



Front view of duct

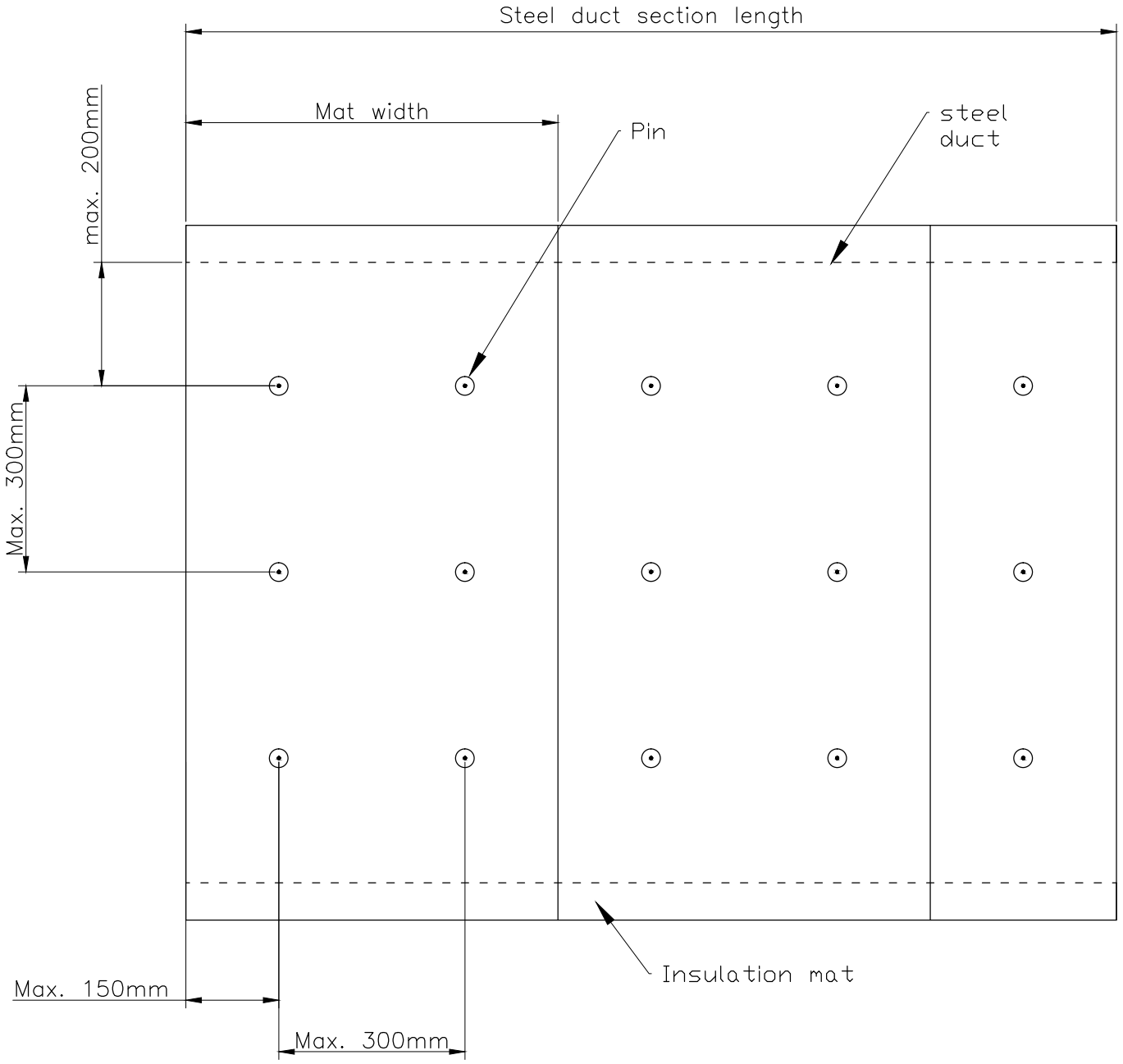


Side view of penetration



A plate as shown should be fixed on both sides of the penetration

All measurements are in mm



All measurements are in mm

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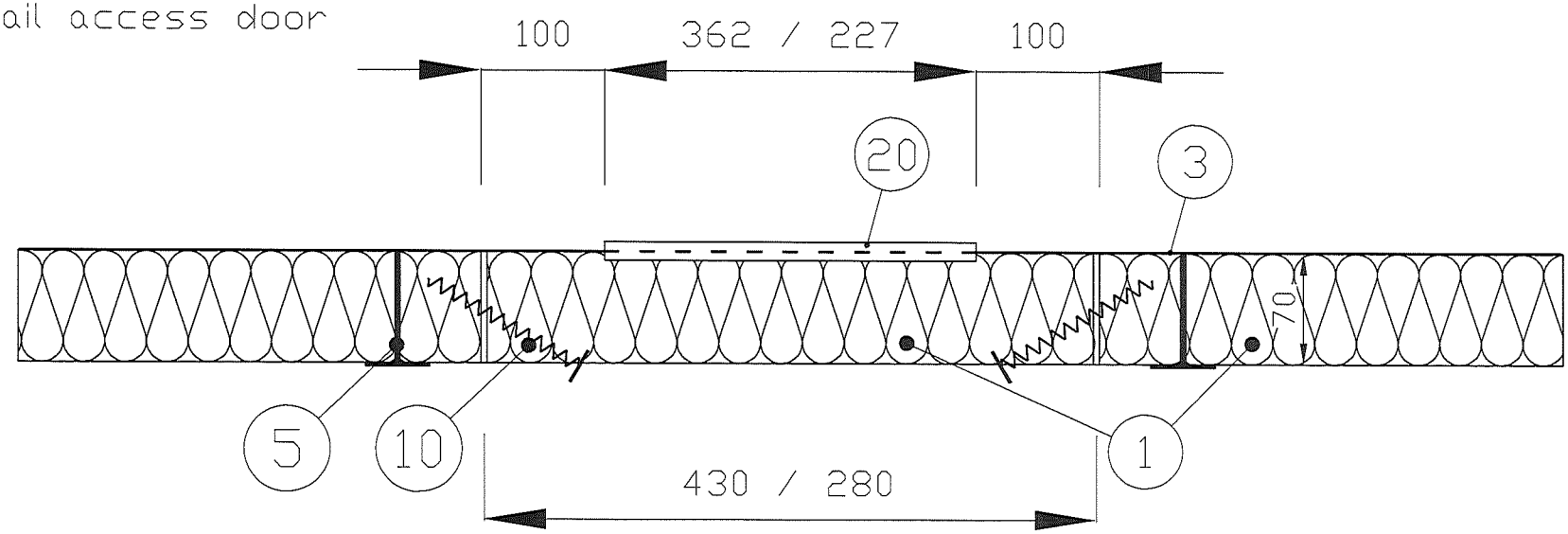
Sponsor: Saint-Gobain Isover

Subject: Position of pins for insulation mats

File No.: PHA10683A

Enclosure: 1.14

detail access door



1	Insulation	ULTIMATE U Protect Slab 4.0N 70mm	
3	ventilation duct	steel sheet, d=0.7 mm flanges type RJFP30	duct system Lindab AB
5	welding pins	steel, 3.0-76mm, washer 30mm	
10	FireProtect screw	l=140mm	Isover AB
20	access door Lindab IPL 362/227		

ISOVER SAINT-GOBAIN ISOVER

	Änderungen / Modifications	Datum /Date
E		
D		
C		
B		
A		

EI90-B-R-H-70 (2011_06_29)
U Protect Slab 4.0N 70mm
Drawing for test report 4/4

Maßstab / Scale	Gezeichnet / Drawn	Geprüft/Checked	Datum / Date	Klass. Nr. / Class. No.	Zeichnung Nr. /Drawing No.	Index
A3	A. Köhler		29.06.11	PGA10020	AK1724	

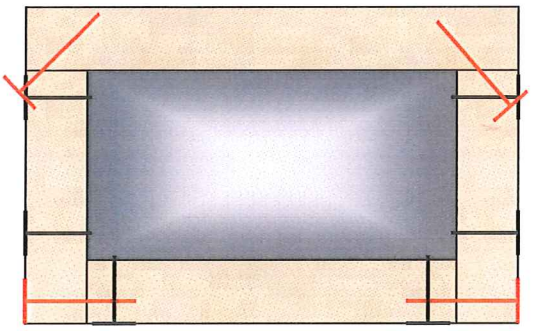
Anlage 15

Enclosure 20

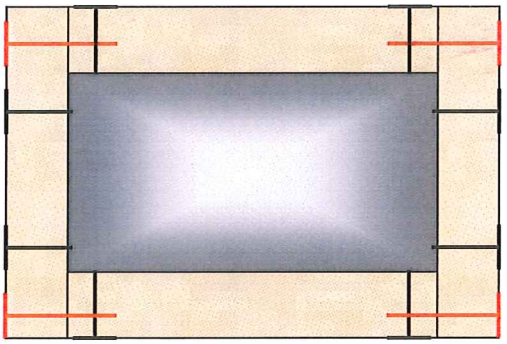
Pin Pattern for ventilation air duct – U PROTECT SLAB 4.0

Taking into account:

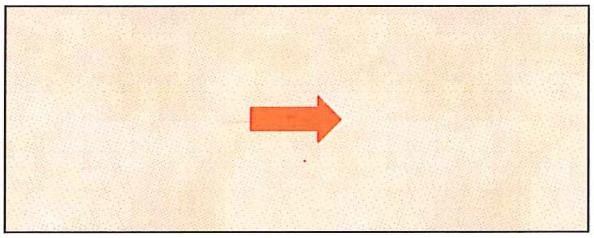
- The positioning of the slabs for rectangular horizontal ducts



- The positioning of the slabs for rectangular vertical ducts:



- The size of the slabs: 1200mm x 600mm



And using 2 single rules:

- **Distance of the pins to the duct's edges or slab joints: 80mm**
- **Maximum distance between pins: 260mm**

Nota:

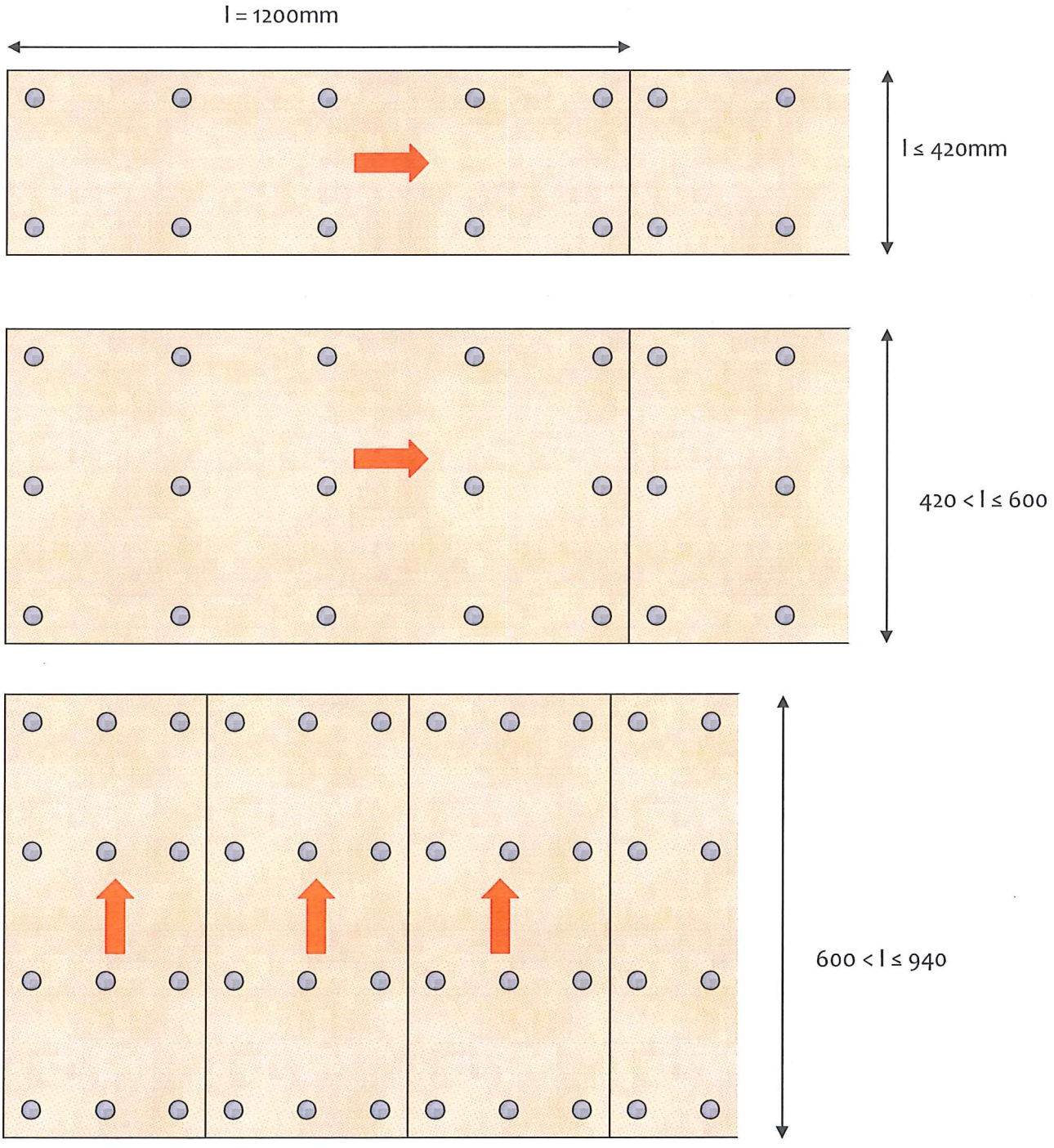
= pins

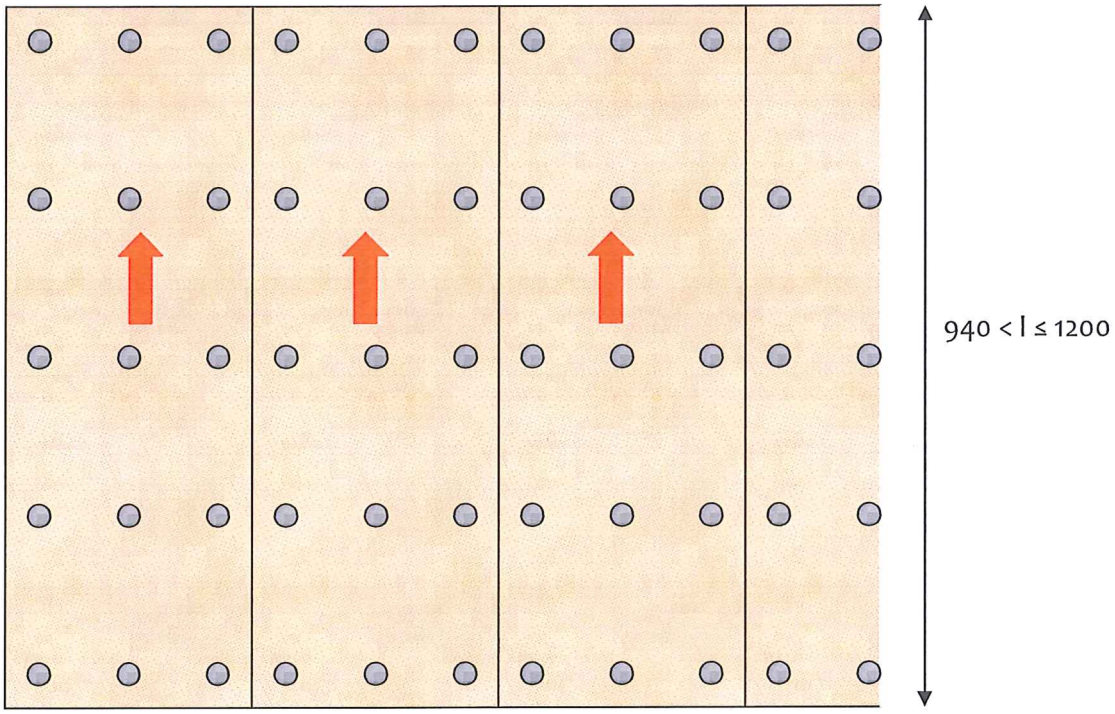
= Fire screws

Enclosure 2.1

Rectangular Horizontal ducts

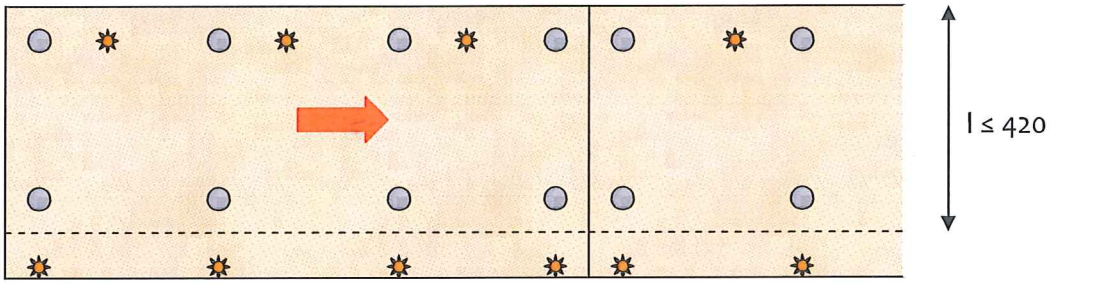
Downside slabs

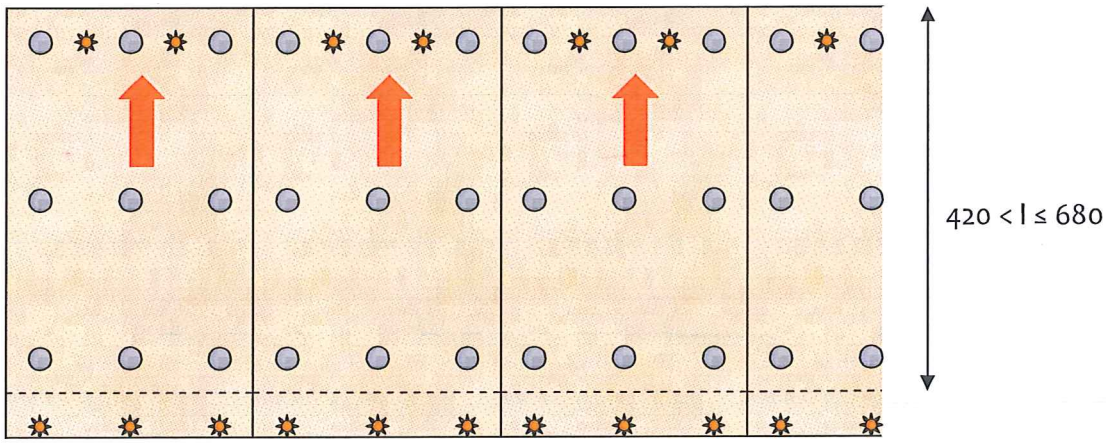


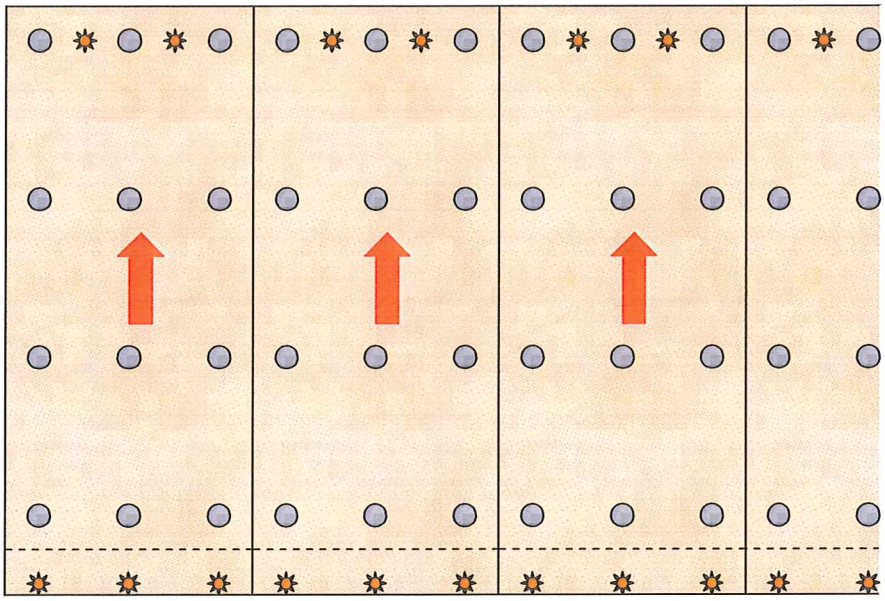


Side slabs

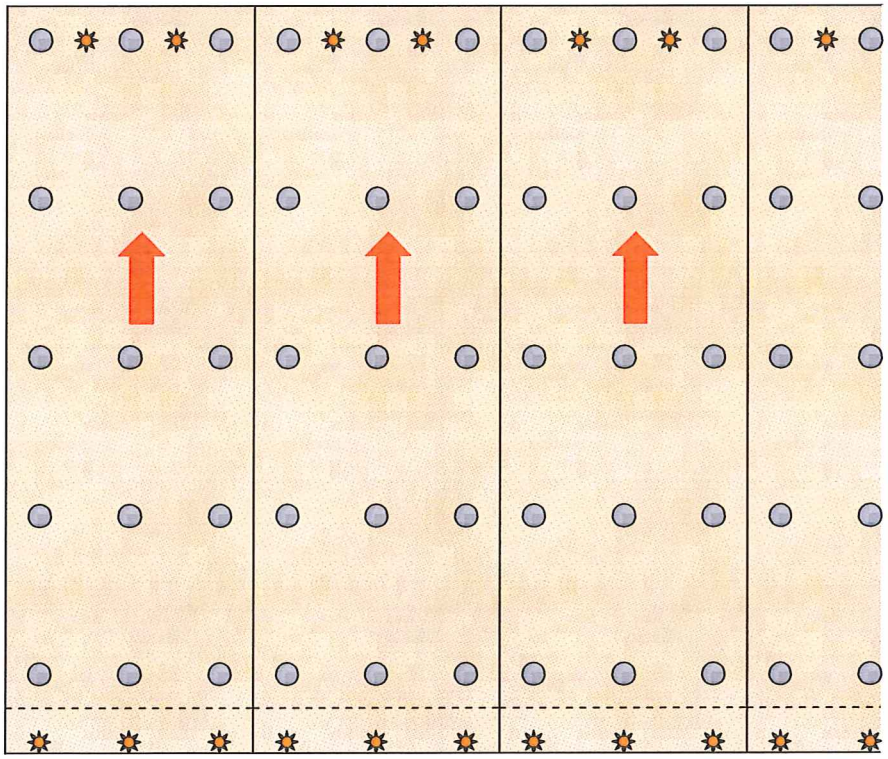
Overlapping of the side slabs on the downside slabs







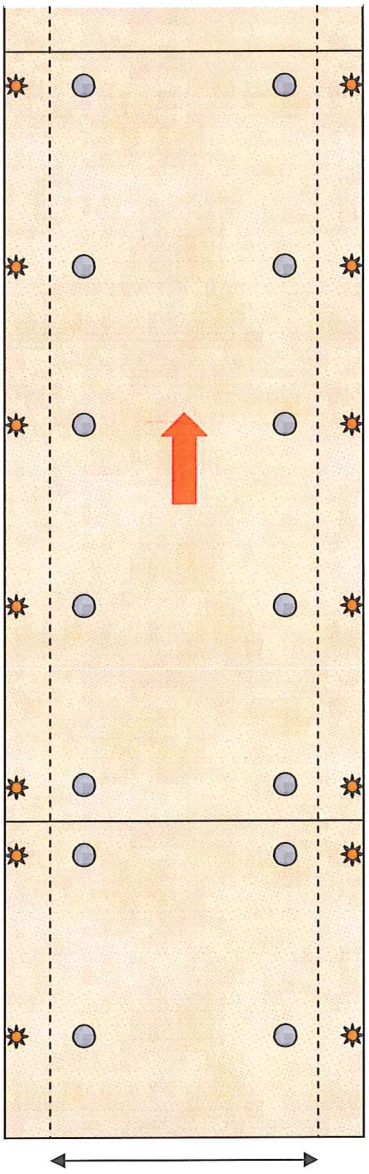
600 < l ≤ 940



940 < l ≤ 1200

Rectangular Vertical ducts

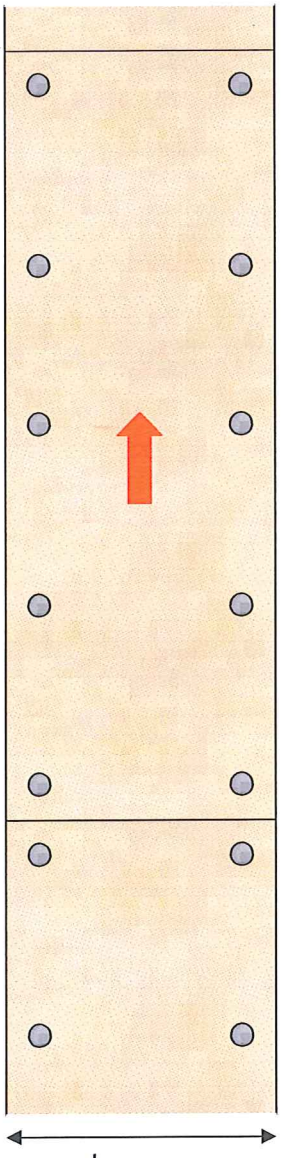
Slabs with overlapping



l = 1200

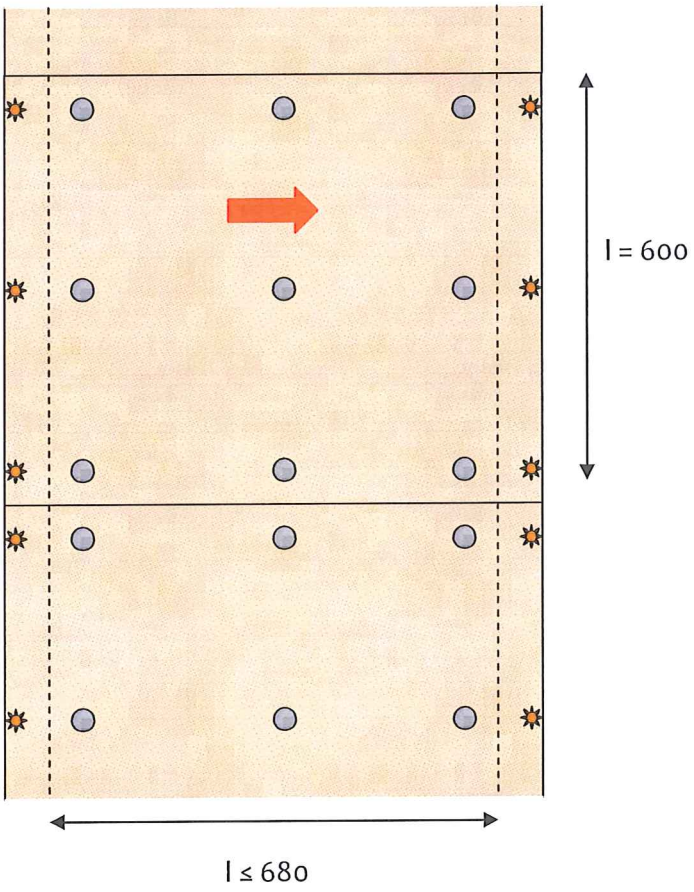
l ≤ 420 & Wool thickness ≤ 90
or
l ≤ 400 & Wool thickness = 100
or
l ≤ 380 & Wool thickness = 110
or
l ≤ 360 & Wool thickness = 120

Slabs without overlapping

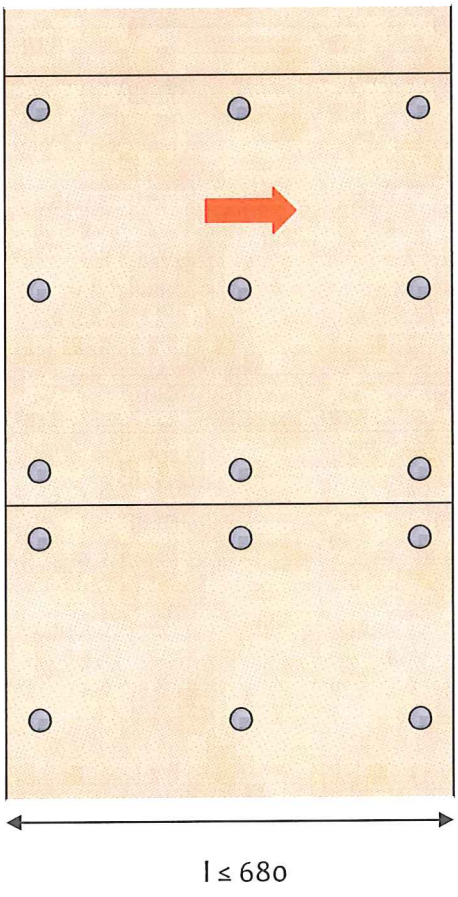


l ≤ 420

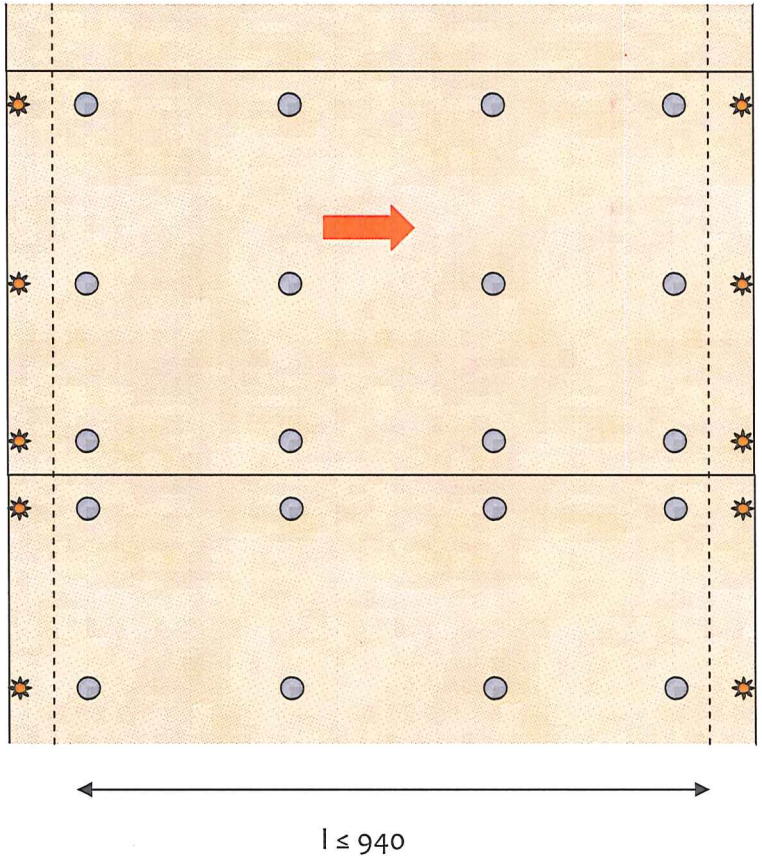
Slabs with overlapping



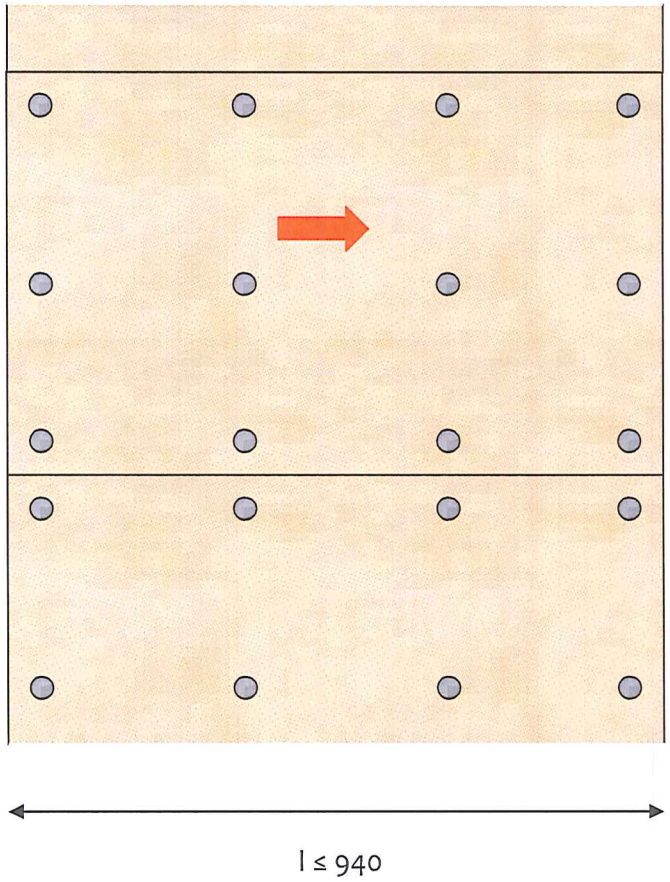
Slabs without overlapping



Slabs with overlapping

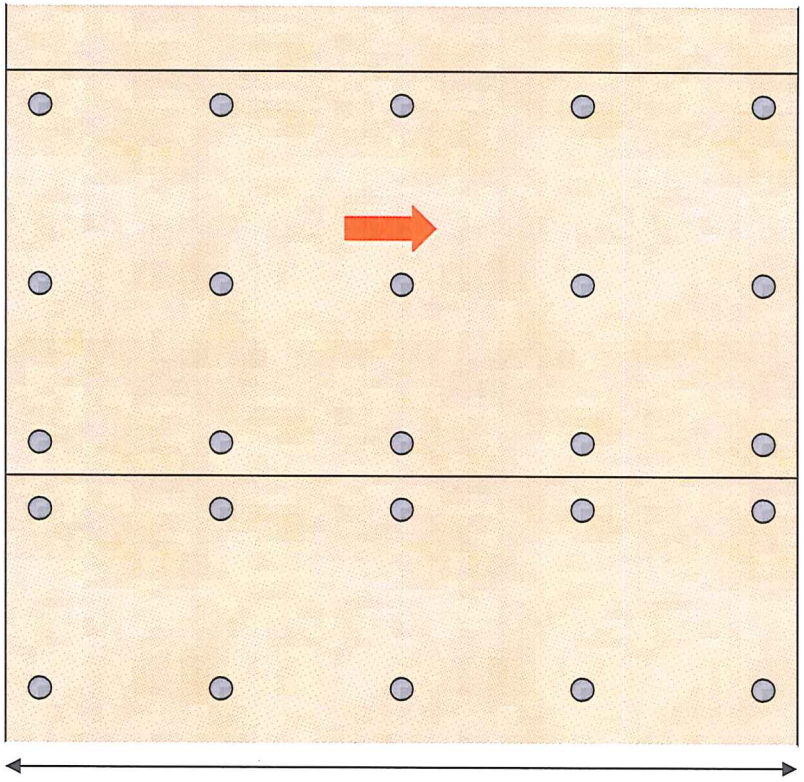


Slabs without overlapping



Enclosure 2.6

Slabs without overlapping



Enclosure 27

Annex A

Standard system for fire resistant rectangular ducts

Technical argumentation

Assessment: PH13513 - 21/05/2010 General assessment for rectangular ducts

- Assessment PH13183v2 - 25/02/2009 Rectangular horizontal ducts B
  - Report: PG11756 - 25/02/2008 Test report RHB 30mm
  - Report: PG11758 - 29/01/2008 Test report RHB 60mm
  - Report: PG11721 - 02/10/2007 Test report RHB 70mm
    - Assessment: PH13182 – 13/02/2008 Assessment of joint for PG11721

- Assessment PH13186v2 - 07/04/2009 Rectangular vertical ducts B
  - Report: PG11760 - 12/02/2008 Test report RVB 30mm
  - Report: PG11762 - 08/04/2008 Test report RVB 80mm
  - Report: PG11765 - 29/01/2008 Test report RVB 100mm (70+30)

- Assessment PH13188v2 - 25/02/2009 Rectangular horizontal & vertical ducts A
  - Report: PG11757 - 25/02/2008 Test report RHA 30mm
  - Report: PG11755 - 23/10/2007 Test report RHA 60mm
  - Report: PG11759 - 22/10/2007 Test report RHA 70mm
  - Report: PG11698 - 24/10/2007 Test report RHA 80mm
  - Report: PG11761 - 13/02/2008 Test report RVA 30mm
  - Report: PG11763 - 29/01/2008 Test report RVA 80mm

Assessment: PH13514v2 - 11/01/2013 Pin pattern

- Report: PG12244 - 01/10/2010 Test report RVB 90mm
- Assessment:PHA10182- 05/10/2012 Pin pattern change
  - Report: PG12149 - 13/12/2010 Test report RHA 70mm
  - Report: PGA10063 - 27/01/2012 Test report RHB 80mm

Assessment: PH13605 - 20/12/2010 Washers 30mm and fire screws every 260mm

- Report: PG11759 - 22/10/2007 Test report RHA 70mm
- Report: PG12149 - 13/12/2010 Test report RHA 70mm
- Report: PG12244 - 01/10/2010 Test report RVB 90mm
- Report: PG12260 - 03/01/2011 Test report RVA 70mm
- Report: PG12271 - 09/12/2010 Test report RVA 70mm

Assessment: PHA10593 - 07/11/2014 - Clarification of diameter on welding pins

Assessment: PH13606 - 24/05/2011 - Simplified penetration for vertical rectangular ducts

- Report: PG12244 - 01/10/2010 Test report RVB 90mm
- Report: PG12260 - 03/01/2011 Test report RVA 70mm

Assessment: PHA10001 - 03/05/2011 - Change in rivets size for fixing the L-profiles to the rectangular ducts

- PG12149 - 13/12/2010 Test report RHA 70mm
- PG12259 - 05/10/2010 Test report RVB 90mm
- PG12260 - 03/01/2011 Test report RVA 70mm
- PG12271 - 09/12/2010 Test report RVA 70mm
- PG12325 - 17/03/2011 Test report RHB 70mm

Assessment: PHA10170rev2 – 07/05/2012: Rectangular ducts through flexible wall

- PGA10071 - 18/04/2012 Test report RHB 80mm
- PG11761 - 13/02/2008 Test report RVA 30mm

Assessment: PH13613v1 - 23/03/2012 Aluminium facings

- PG12245 - 04/10/2010 Test report RVB 90mm
- PG12259 - 05/10/2010 Test report RVB 90mm

Alternative solutions for rectangular fire resistant duct system

Use of double layer insulation
Technical argumentation:
Using a double layer solution with staggered jointing improves the resistance to fire performance because it reduces the possibility of the heat to travel from the hot steel duct to the outer surface of the insulation in the joints. If the joints are not staggered an additional 10 mm thickness shall be added to in sure that double layer solution do not reduce the resistance to fire performance.

The maximum number of pins in the inner layer is set to 5 to reduce the heat transfer through the pins. The 5 pins are only there to insure that the slab I held in place until the outer layer is fixed.

Additional insulation on top of the fire protection insulation
Technical argumentation:
Assessment PHA10177 - 03/05/2012: Additional insulation on top of ULTIMATE

One two and three sided rectangular ducts
Technical argumentation for 2 and 3 sided:
Assessment PH13620b v2 - 12/06/2013: Rectangular ducts 2 and 3 sided

Technical argumentation for 1 sided duct:
The buildup of the penetration for the 1 sided ducts follows the same principles as for the 2 and 3 sided rectangular ducts.

For the duct itself a plane horizontal surface is established by fixing angle profiles in the side of the duct and fixing them to the walls. This will correspond to the lower surface of a horizontal duct. As shown on enclosure no. 1.11.

Installation of access panel
Technical argumentation
Assessment PHA10316 - 18/12/2012: Access panel in a rectangular duct system

- Report: PGA10020 - 16/12/2011 Test report RHB 70mm
- Report: PGA10166 - 10/10/2012 Test report Mid-scale revision openings

Replacing the stiffening system
Technical argumentation
Assessment PHA10318 - 24/04/2013 Replacing the stiffening system

- Report: PG11759 - 22/10/2007 Test report RHA 70mm
- Report: PGA10161 - 10/10/2012 Test report RHA 70mm

Rectangular fire resistant ducts insulated with U Protect Wired Mat 4.0
Technical argumentation

- Report: PGA10607 - 16/03/2015 – Test report RHB 70mm
- Report: PGA10684A – 30/06/2015 - Test report RHB 90mm
- Report: PGA10740A – 01-10-2015 – Test report RVB 100mm

Standard system for rectangular smoke extraction ducts

Technical argumentation

- Report: PGA10739A - 29/09/2015 – Test report RHA 80mm, 500 Pa
- Report: PGA10763A – 13/01/2016 - Test report RHA 80mm, 500 Pa and C-profiles
- Report: PGA10690A – 17/07/2015 - Test report RHC 70mm, Pressure level 1