

TECHNICAL ASSESSMENT 2017-A-035

based on an analysis of test results

SPONSOR

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SUBJECT

Evaluation of the fire resistance according to the European Standard EN 13501-3:2005+A1:2009 of rectangular steel ventilation ducts, protected by means of mineral wool slabs of the Ultimate Protect type.

This document has been drawn up as part of an analysis of test results as described in the RD of 13/06/2007.

1. TEST REPORTS

1.1. Reports

Name of the laboratory	Number of the test report	Date of the test report	Owner of the test report	Test standard
DBI	PG11759	22/10/2007	Saint-Gobain Isover SA	EN 1363-1:1999 EN 1366-1:1999
	PG11763	29/01/2008		
	PG12244	01/10/2010		
	PG12260	03/01/2011		
	PGA10063	27/01/2012		
	PGA10763A	13/01/2016		EN 1363-1:2012 EN 1366-1:2014

1.2. Description of the tested elements

Test Report No. PG11759 gives the description and the results of a fire resistance test carried out according to the European Standards EN 1363-1:1999 and EN 1366-1:1999 on a horizontal rectangular steel ventilation duct (dimensions (width x height): 1000 x 500 mm; steel thickness: 0.7 mm; length of a duct segment: 1250 mm) through a cellular concrete wall (thickness: 100 mm). The steel ventilation duct was protected by means of mineral wool slabs of the Ultimate U TPN 66-70 type (current commercial denomination according to your declarations: **U Protect 4.0**; thickness: 70 mm; nominal density: 66 kg/m³). One stiffener (steel pipe; length: 500 mm) was applied at midpoint of each duct segment. The fire was located outside the ventilation duct (duct A). An underpressure of 300 Pa was realized in the ventilation duct.

Test Report No. PG11763 gives the description and the results of a fire resistance test carried out according to the European Standards EN 1363-1:1999 and EN 1366-1:1999 on a vertical rectangular steel ventilation duct (dimensions (width x height): 1000 x 500 mm; steel thickness: 0.7 mm; length of a duct segment: 1250 mm) through a cellular concrete floor (thickness: 150 mm). The steel ventilation duct was protected by means of mineral wool slabs of the Ultimate U TPN 66-80 type (current commercial denomination according to your declarations: **U Protect 4.0**; thickness: 80 mm; nominal density: 66 kg/m³). One stiffener (steel pipe; length: 500 mm) was applied at midpoint of each duct segment. The fire was located outside the ventilation duct (duct A). An underpressure of 300 Pa was realized in the ventilation duct.

Test Report No. PG12244 gives the description and the results of a fire resistance test carried out according to the European Standards EN 1363-1:1999 and EN 1366-1:1999 on a vertical rectangular steel ventilation duct (dimensions (width x height): 1000 x 250 mm; steel thickness: 0.7 mm; length of a duct segment: 1250 mm) through a cellular concrete floor (thickness: 150 mm). The steel ventilation duct was protected by means of mineral wool slabs of the **U Protect 4.0** type (thickness: 90 mm; nominal density: 66 kg/m³). One stiffener (steel threaded rod; length: 250 mm) was applied at midpoint of each duct segment. The fire was located inside the ventilation duct (duct B).

Test Report No. PG12260 gives the description and the results of a fire resistance test carried out according to the European Standards EN 1363-1:1999 and EN 1366-1:1999 on a vertical rectangular steel ventilation duct (dimensions (width x height): 1000 x 500 mm; steel thickness: 0.7 mm; length of a duct segment: 1250 mm) through a cellular concrete floor (thickness: 150 mm). The steel ventilation duct was protected by means of mineral wool slabs of the **U Protect 4.0** type (thickness: 70 mm; nominal density: 66 kg/m³). One stiffener (steel threaded rod; length: 500 mm) was applied at midpoint of each duct segment. The fire was located outside the ventilation duct (duct A). An underpressure of 300 Pa was realized in the ventilation duct.

Test Report No. PGA10063 gives the description and the results of a fire resistance test carried out according to the European Standards EN 1363-1:1999 and EN 1366-1:1999 on a horizontal rectangular steel ventilation duct (dimensions (width x height): 1000 x 250 mm; steel thickness: 0.7 mm; length of a duct segment: 1250 mm) through a cellular concrete wall (thickness: 100 mm). The steel ventilation duct was protected by means of mineral wool slabs of the **U Protect 4.0** type (thickness: 80 mm; nominal density: 66 kg/m³). One stiffener (steel threaded rod; length: 250 mm) was applied at midpoint of each duct segment. An access panel of the IPL type (length x width: 362 x 227 mm) was applied at the bottom of the steel ventilation duct at the non-exposed side. The fire was located inside the ventilation duct (duct B).

Test Report No. PGA10763A gives the description and the results of a fire resistance test carried out according to the European Standards EN 1363-1:2012 and EN 1366-1:2014 on a horizontal rectangular steel ventilation duct (dimensions (width x height): 1000 x 500 mm; steel thickness: 1 mm; length of a duct segment: 1500 mm) through a cellular concrete wall (thickness: 150 mm). The steel ventilation duct was protected by means of mineral wool slabs of the **U Protect 4.0** type (thickness: 80 mm; nominal density: 66 kg/m³). Five stiffeners (steel threaded rod in a steel pipe; length: 500 mm) were applied in each duct segment (evenly distributed). The fire was located outside the ventilation duct (duct A). An underpressure of 500 Pa was realized in the ventilation duct.

2. RESULTS

The results obtained during the above-mentioned tests are given in the tables below:

Test report No.	PG11759	PGA10763A	PGA10063
Orientation duct	horizontal	horizontal	horizontal
Number of stiffeners	1	5	1
Steel thickness	0.7 mm	1 mm	0.7 mm
Location fire	outside (duct A)	outside (duct A)	inside (duct B)
Thickness mineral wool slab	70 mm	80 mm	80 mm
Access panel	no	no	yes
Underpressure	300 Pa	500 Pa	-
Passage	cellular concrete wall	cellular concrete wall	cellular concrete wall
Criteria	Time in minutes		
Thermal insulation (I)	97	≥ 130	132
Integrity (E)	97	≥ 130	≥ 151
Smoke leakage (S)	97	≥ 130	n/a
Test duration	99	130	151

Test report No.	PG11763	PG12260	PG12244
Orientation duct	vertical	vertical	vertical
Number of stiffeners	1	1	1
Steel thickness	0.7 mm	0.7 mm	0.7 mm
Location fire	outside (duct A)	outside (duct A)	inside (duct B)
Thickness mineral wool slab	80 mm	70 mm	90 mm
Access panel	no	no	no
Underpressure	300 Pa	300 Pa	-
Passage	cellular concrete floor	cellular concrete floor	cellular concrete floor
Criteria	Time in minutes		
Thermal insulation (I)	≥ 130	≥ 185	≥ 122
Integrity (E)	≥ 130	≥ 185	≥ 122
Smoke leakage (S)	≥ 130	182	n/a
Test duration	130	185	122

3. FIELD OF APPLICATION

Based on the above-mentioned results we are of the opinion that the **fire resistance** of rectangular steel ventilation ducts, composed and protected as described below, will not be inferior to the following classifications according to the European Standard EN 13501-3:2005+A1:2009 unless stated differently in the present assessment:

- steel ventilation ducts with a thickness of 0.7 mm, composed as described in § 3.1.1: **EI 90 (ve ho i ↔ o) S**. In this case the over- and underpressure are limited to 300 Pa;
- steel ventilation ducts with a thickness of 1 mm, composed as described in § 3.1.2: **EI 120 (ve ho i ↔ o) S**. In this case the over- and underpressure are limited to 500 Pa.

3.1. Composition of the steel ventilation ducts

The steel ventilation ducts (dimensions (width x height): max. 1250 x 1000 mm) are composed as described below.

3.1.1. Steel ventilation ducts with a thickness of 0.7 mm

The steel ventilation ducts (length of a duct segment: max. 1250 mm) are composed as follows:

- steel thickness: 0.7 mm;
- steel flanges of the Lindab RJFP 30 type (section: 30 x 30 mm; steel thickness: 0.8 mm), fixed to the steel ventilation duct using spot welding (center-to-center distance: max. 150 mm);
- a ceramic tape of the Fiberfrax FT type (section: 3 x 20 mm) is fixed between the flanges;
- the flanges are held together by means of steel bolt clamps of the Lindab LSMS 30 type and M10 bolts as described below:
 - at least two clamps are applied at each side of the ventilation duct;
 - distance from the corner (if duct side ≤ 500 mm): max. 100 mm;
 - distance from the corner (if duct side > 500 mm): max. 110 mm;
 - center-to-center distance: max. 265 mm.

The corners of the flanges are fixed to each other by means of steel M10 bolts and nuts;

- one stiffener of one of the following types is applied at midpoint of each duct segment (and perpendicular to the width of the steel duct):
 - steel threaded rod (min. Ø 8 mm), fixed to the ducts using four pieces of M70 mm steel washers (thickness: 1 mm) and corresponding nuts;
 - steel pipe (Ø 16 mm; wall thickness: min. 2 mm), fixed to the ducts using four pieces of M72 mm steel washers (thickness: 1 mm) and corresponding bolts.

No stiffener is required if the width of the steel duct is less than 500 mm.

3.1.2. Steel ventilation ducts with a thickness of 1 mm

The steel ventilation ducts (length of a duct segment: max. 1500 mm) are composed as follows:

- steel thickness: 1 mm;
- steel flanges of the Lindab RJFP 30 type (section: 30 x 30 mm; steel thickness: 0.8 mm), fixed to the steel ventilation duct using spot welding (center-to-center distance: max. 150 mm);
- a ceramic tape of the Fiberfrax FT type (section: 3 x 20 mm) is fixed between the flanges;
- the flanges are held together by means of C-profiles of the Lindab RJSP type (thickness: 1 mm) and steel bolt clamps of the Lindab RJBC 30 type and M8 bolts as described below:
 - at least two clamps are applied at each side of the ventilation duct;
 - distance from the corner (if duct side ≤ 500 mm): max. 100 mm;
 - distance from the corner (if duct side > 500 mm): max. 135 mm;
 - center-to-center distance: max. 265 mm.

The corners of the flanges are fixed to each other by means of steel M10 bolts and nuts;

- stiffeners (steel threaded rods (min. $\varnothing 8$ mm) in a steel pipe (\varnothing_{ext} 17,5 mm; wall thickness: min. 2.35 mm) are applied in each duct segment (and perpendicular to the width of the steel duct) as mentioned in the table below:

Width of the steel duct	Number of stiffeners
width ≤ 290 mm	0
290 mm < width ≤ 420 mm	1 (at midpoint)
420 mm < width ≤ 500 mm	2 (center-to-center distance: max. 900 mm)
500 mm < width ≤ 710 mm	3 (center-to-center distance: max. 450 mm)
width > 710 mm	5 (evenly distributed)

The steel threaded rods are fixed to the ducts using four pieces of M70 mm steel washers (thickness: 1 mm) and corresponding nuts.

3.2. Protection of the steel ventilation ducts

The steel duct segments are protected externally by means of mineral wool slabs of the U Protect 4.0 Slab type (thickness: 80 mm (horizontal ducts) or 90 mm (vertical ducts); nominal density: 66 kg/m³), applied as follows:

- the slabs are fixed to steel welding pins. The welding pins (min. Ø 2,7 mm; length = thickness of the protection) with steel washers (min. Ø 30 mm) are fixed to the steel ventilation ducts as described below:
 - distance from the edge of the duct segments joints: max. 80 mm;
 - distance from the slab joints: max. 80 mm;
 - center-to-center distance: max. 260 mm;
 - number of pins per m² of an individual slab: min. 20;

In case of horizontal steel ventilation ducts no welding pins are applied on top of the ventilation duct;

- the slabs are applied with staggered joints and fixed to each other by means of steel screws (length: 160 mm; center-to-center distance: max. 260 mm).

3.3. Suspension of horizontal steel ventilation ducts

The horizontal steel ventilation ducts are suspended to a concrete floor (fire resistance classification according to EN 13501-2:2016: min. R 120) as described below:

- the horizontal ventilation ducts are suspended by means of steel supporting U-profiles of the Hilti U3x2000 type (section: min. 30 x 30 x 30 mm; steel thickness: min. 3 mm) and threaded rods (tensile stress: max. 6 N/mm²), which are located as follows:
 - at a maximum distance of 50 mm from the joint between two adjacent duct segments;
 - at a maximum distance of 10 mm from the unprotected vertical side of the ventilation duct.

The steel supporting profiles are protected as described in § 3.2 where the remaining thickness of the mineral wool slabs at the location of the steel supporting profiles (and hence the joint between adjacent duct segments) is at least 50 mm;

- the threaded rods are fixed to the steel supporting profiles by means of corresponding steel nuts;
- additional steel supporting profiles can be applied in between the above mentioned steel supporting profiles.

3.4. Passage through a wall

The wall is composed of stony material (e.g. concrete, aerated concrete, masonry...; density: min. 650 kg/m³) with the following thickness:

- in case of fire resistance classification EI 90 (ho i ↔ o) S: min. 100 mm;
- in case of fire resistance classification EI 120 (ho i ↔ o) S: min. 150 mm.

3.4.1. Four sided protection

A four sided protection is realized as follows:

- steel L-profiles (section: 30 x 30 mm; steel thickness: min. 3 mm) are applied at both sides of the wall as follows:
 - the steel profiles are fixed to all sides of the steel ventilation ducts by means of steel rivets (min. Ø 3 x 10 mm; center-to-center distance: max. 100 mm);
 - the length of the steel L-profiles at the vertical side of the steel ventilation duct is the height of the steel ventilation ducts decreased by 50 mm;
 - the length of the steel L-profiles at the horizontal side of the steel ventilation duct is the width of the steel ventilation ducts increased with at least 440 mm. These horizontal steel L-profiles are fixed to the wall by means of at least two screws (min. Ø 7,5 x 62 mm) per end;
- a stiffener as described in § 3.1.1 or § 3.1.2 (depending on the required fire resistance classification) is applied vertically in the middle of the duct and centrally with respect to the thickness of the wall;
- the opening between the unprotected steel ventilation duct and the wall (width of the opening: max. 50 mm) is completely filled with compressed mineral wool of the Isover Ultimate, U Protect Slab 4.0 type (nominal density: 66 kg/m³; compression: min. 20 %) and finished at both sides of the wall by means of intumescent paint of the ISOVER Protect BSF type (thickness: approx. 2 mm);
- the protection of the steel ventilation duct is glued to the compressed mineral wool and the wall by means of silicate glue of the ISOVER Protect BSK type.

3.5. Passage through a floor

The floor is composed of stony material (e.g. concrete, aerated concrete, masonry...; density: min. 650 kg/m³; thickness: min. 150 mm).

3.5.1. Four sided protection

A four sided protection is realized as follows:

- steel L-profiles (section: 30 x 30 mm; steel thickness: min. 3 mm) are applied at the top of the floor as follows:
 - the steel profiles are fixed to all sides of the steel ventilation ducts by means of steel rivets (min. Ø 3 x 10 mm; center-to-center distance: max. 100 mm);
 - the length of the steel L-profiles at the short side of the steel ventilation duct is the height of the steel ventilation ducts decreased by 50 mm;
 - the length of the steel L-profiles at the long side of the steel ventilation duct is the width of the steel ventilation ducts increased with at least 440 mm. These long steel L-profiles are fixed to the floor by means of at least two screws (min. Ø 7,5 x 62 mm) per end;
- a stiffener as described in § 3.1.1 or § 3.1.2 (depending on the required fire resistance classification) is applied in the middle of the duct and centrally with respect to the thickness of the floor;
- the opening between the unprotected steel ventilation duct and the floor (width of the opening: max. 50 mm) is completely filled with compressed mineral wool of the Isover Ultimate, U Protect Slab 4.0 type (nominal density: 66 kg/m³; compression: min. 20 %) and finished at both sides of the floor by means of intumescent paint of the ISOVER Protect BSF type (thickness: approx. 2 mm);
- the protection of the steel ventilation duct is glued to the compressed mineral wool and the floor by means of silicate glue of the ISOVER Protect BSK type.

3.6. Access panel

A steel access panel of the Lindab IPL type (dimensions (length x width): max. 362 x 227 mm) can be applied in the steel ventilation duct as follows:

- the access panel is fixed to the steel ventilation duct by means of steel screws (min. \varnothing 4.2 x 16 mm; center-to-center distance: max. 60 mm);
- a ceramic tape of the Fiberfrax FT type (section: 3 x 20 mm) is fixed between the access panel and the steel ventilation duct;
- the access panel is covered with a mineral wool slab as described in § 3.2 (dimensions (length x width): approx. 420 x 290 mm). This slab is fixed to the adjacent protection on the steel ventilation duct by means of two steel screws (length: 160 mm) per side.

If an access panel is applied, the fire resistance classification of the protected steel ventilation ducts is limited to:

- **EI 90 (ve ho i → o)** for steel ventilation ducts with a thickness of 0.7 mm, composed as described in § 3.1.1;
- **EI 120 (ve ho i → o)** for steel ventilation ducts with a thickness of 1 mm, composed as described in § 3.1.2.

4. CONDITIONS FOR THE USE OF THE PRESENT ASSESSMENT

The present assessment is only valid insofar as the stability of the construction, composed as described in § 3, is guaranteed under normal conditions according to the standards in force.

This assessment is only valid insofar as the composition of the products has not been modified with respect to that of the products subjected to the above-referenced tests.

This assessment is only valid when accompanied by the above-referenced test reports.

This technical assessment cannot be combined with another technical assessment, except when mentioned explicitly.

This assessment is issued on the basis of test data and information handed over at the time of the demand by the sponsor. If contradictory evidence becomes available afterwards, the assessment will be unconditionally withdrawn and the sponsor will be notified on this.

The duration of validity of the present assessment is limited to 5 years starting from the issuing date of this assessment and may be extended after a favourable exam.

The sponsor has the right to use the above-referenced test reports and has also confirmed that he has not been informed about any non-public information which could influence this assessment, and in consequence the obtained conclusions.

If the sponsor is informed afterwards about such information, he agrees to withdraw the assessment above and its use for regulated purposes – if applicable.

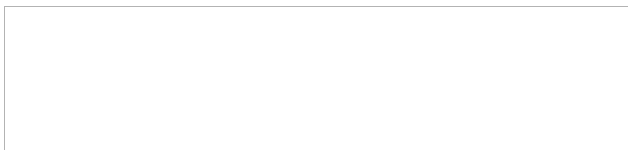
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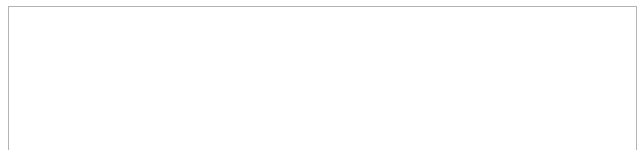
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