

GLOBAL BUILDING



FIREGUARD

CALCIUM SILICATE BOARDS



**PASSIVE FIRE PROTECTION SYSTEMS
ESCLUSIVE SOLUTIONS EURONORM APPROVED**

A faint, light gray background illustration of a knight in full plate armor. The knight is standing, facing forward, and holding a large shield on his left arm and a mallet in his right hand. The mallet has a large, curved head and a long handle. The knight's armor is detailed with various plates and joints.

PASSIVE FIRE PROTECTION SYSTEMS

EXCLUSIVE SOLUTION

EURONORM APPROVED

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FIREGUARD

CALCIUM SILICATE BOARDS

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TECHNICAL DATA SHEETS





FIREGUARD® 13



Use: structural protections, wall linings, walls, ceilings.

Description: FIREGUARD® 13 boards consist of calcium silicates and sulphates, asbestos-free, are produced by lamination under controlled drying conditions. They guarantee a high thermal insulation in case of fire, and are suitable in all cases where it is necessary a passive fire protection.

They are rated as non-combustible (Class A1 fire reaction). The FIREGUARD® 13 boards provide mechanical strength and high resistance to moisture and weathering.

Application: FIREGUARD® 13 boards are secured by mechanical fasteners (screws or expansion bolts).

It is necessary to comply with the instructions contained in specific certifications, in relation to the types taken. In the case of wall upgrading the FIREGUARD® 13 boards are certified without the joint treatment. If, for aesthetic reason, the joint treatment is required, it is necessary to place the fastening system at 250 mm centres, along the edges of the board and at the centerline.

You must use FIREGUARD COMPOUND gypsum-based plaster applied with mesh tape or fiberglass joint tape.

TECHNICAL DATA	VALUES
CE mark	EN 15283-1
Thickness	12,7 mm
Width	1200 mm
Length	2000 mm
Weight	10,2 kg/m ²
E-modul	>2500 MPa
Compressive strength	>8,5 MPa
Bending strength	>7,6 MPa
Extraction nail test	>850 N
Ball impact resistance	No damage
Linear tolerances	+ /- 3 mm
Thickness tolerances	+ /- 0,8 mm
Square	square
Longitudinal joint depth	1,5 mm
Linear thermal expansion	0,011 mm/C°/m
Thermal conductivity	0,30 W/mC°
Resistance to freeze-thaw cycles	25 cycles
Resistance to bacteria	0 (no growth)
Fungal resistance	0 (no growth)
Reaction to fire	A1 (non-combustible)

FIREGUARD® 25



Use: structural protections, wall linings, walls, ceilings, service ducts.

Description: FIREGUARD® 25 boards consist of calcium silicates and sulphates, asbestos-free, are produced by lamination under controlled drying conditions. They guarantee a high thermal insulation in case of fire, and are suitable in all cases where it is necessary a passive fire protection.

They are rated as non-combustible (Class A1 fire reaction). The FIREGUARD® 25 boards provide mechanical strength and high resistance to moisture and weathering.

Application: FIREGUARD® 25 boards are secured by mechanical fasteners (screws or expansion bolts).

It is necessary to comply with the instructions contained in specific certifications, in relation to the types taken. In the case of wall upgrading the FIREGUARD® 25 boards are certified without the joint treatment. If, for aesthetic reason, the joint treatment is required, it is necessary to place the fastening system at 250 mm centres, along the edges of the board and at the centerline.

You must use FIREGUARD COMPOUND gypsum-based plaster applied with mesh tape or fiberglass joint tape.

TECHNICAL DATA	VALUES
CE mark	EN 15283-1
Thickness	25,4 mm
Width	600 mm
Length	2200 mm
Weight	20,4 kg/m ²
E-modul	>2500 MPa
Compressive strength	>8,5 MPa
Bending strength	>7,6 MPa
Extraction nail test	>850 N
Ball impact resistance	No damage
Linear tolerances	+ /- 3 mm
Thickness tolerances	+ /- 0,8 mm
Square	square
Longitudinal joint depth	1,5 mm
Linear thermal expansion	0,011 mm/C°/m
Thermal conductivity	0,30 W/mC°
Resistance to freeze-thaw cycles	25 cycles
Resistance to bacteria	0 (no growth)
Fungal resistance	0 (no growth)
Reaction to fire	A1 (non-combustible)



FIREGUARD® S



Use: wall renovation.

Description: FIREGUARD® S boards consist of a calcium silicate cementitious matrix, asbestos-free, produced by autoclaving.

They guarantee a high thermal insulation and integrity in case of fire, and are suitable in all cases where it is necessary a passive fire protection. They are rated as non-combustible (Class A1 fire reaction). The FIREGUARD® S boards provide mechanical strength and high resistance to moisture.

Application: FIREGUARD® S boards are secured by mechanical fasteners (expansion bolts).

It is necessary to comply with the instructions contained in specific certifications, in relation to the types taken. In the case of wall upgrading the FIREGUARD® S boards are certified without the joint treatment. If, for aesthetic reason, the joint treatment is required, it is necessary to place the fastening system at 250 mm centres, along the edges of the board and at the centerline.

You must use FIREGUARD COMPOUND gypsum-based plaster applied with mesh tape or fiberglass joint tape.

TECHNICAL DATA	VALUES
Thickness	8 mm
Width	1200 mm
Length	2400 mm
Weight	9,8 kg/m ²
E-modul	>4000 MPa
Compressive strength	>9,1 MPa
Bending strength	>5,5 MPa
Extraction nail test	>850 N
Linear tolerances	+ /- 3 mm
Thickness tolerances	+ /- 0,8 mm
Square	square
Linear thermal expansion	>0,19%
Thermal conductivity	0,15 W/mC°
Reaction to fire	A1 (non-combustible)

NAPER S 12



Use: suspended ceilings.

Description: NAPER S 12 boards consist of a calcium silicate cementitious matrix, asbestos-free, produced by autoclaving. They guarantee a high thermal insulation and integrity in case of fire, and are suitable in all cases where it is necessary a passive fire protection. They are rated as non-combustible (Class A1 fire reaction).

The NAPER S 12 boards provide mechanical strength and high resistance to moisture.

Application: NAPER S 12 boards are secured by mechanical fasteners (screws). You must comply with the instructions contained in specific certifications, in relation to the types taken.

The finishing of joints and screws heads should be done using FIREGUARD COMPOUND gypsum based plaster, applied with mesh tape or fiberglass joint tape.

TECHNICAL DATA	VALUES
Thickness	12 mm
Width	1200 mm
Length	2000 mm
Weight	14,3 kg/m ²
E-modul	>4000 MPa
Compressive strength	>9,1 MPa
Bending strength	>5,5 MPa
Extraction nail test	>850 N
Linear tolerances	+ /- 3 mm
Thickness tolerances	+ /- 0,8 mm
Square	square
Linear thermal expansion	>0,19%
Thermal conductivity	0,15 W/mC°
Reaction to fire	A1 (non-combustible)



NAPER S 8 BOARDS – NAPER S 6 BOARDS



Use: modular suspended ceilings.

Description: NAPER S 8 and NAPER S 6 boards consist of a silicates cementitious matrix, asbestos-free, produced by autoclaving. They guarantee a high thermal insulation and integrity in case of fire, and are suitable in all cases where it is necessary a passive fire protection. They are rated as non-combustible (Class A1 fire reaction).

The NAPER S 8 and NAPER S 6 boards provide mechanical strength and high resistance to moisture.

Application: NAPER S 8 and NAPER S 6 boards are simply laid on the visible support structure. It is necessary to comply with the instructions of the specific certifications, in relation to the types taken.

TECHNICAL DATA		VALUES
Thickness	NAPER S 8	8 mm
	NAPER S 6	6 mm
Width		595 mm
Length		595 mm
Weight	NAPER S 8	9,8 kg/m ²
	NAPER S 6	7,9 kg/m ²
Elasticity Modulus		>4000 MPa
Compressive strength		>9,1 MPa
Bending strength		>5,5 MPa
Resistance to nail		>850 N
Linear Tolerances		+ /- 3 mm
Thickness tolerances		+ /- 0,8 mm
Square		Square
Linear thermal expansion		>0,19%
Thermal conductivity		0,15 W/mC°
Reaction to fire		A1 (non-combustible)

FIREGUARD® 45



Use: ventilation and smoke extraction ducts.

Description: FIREGUARD® 45 boards are self-supporting panels totally asbestos-free composed of calcium silicate, selected fibers and inert additives. They undergo a treatment that makes the finished product totally stable in case of fire, with high mechanical strength and resistance to atmospheric moisture. They are non-combustible (Class A1 fire reaction).

The FIREGUARD® 45 boards are supplied in rigid and self-supporting panels having high mechanical stability, abrasion resistance and good performance to heat and temperature.

Application: thanks to their high mechanical strength the FIREGUARD® 45 boards could be used in the most severe conditions. They can be easily machined by hand or by using tools. The modern power tools such as circular saws are recommended when speed and accuracy are requested in the processing of the product. The sheets are glued at the edges with FIREGUARD GLUE and screwed together.

TECHNICAL DATA		VALUES
Thickness		45 mm
Width		1200 mm
Length		2000 mm
Weight		700 kg/m ³
E-modul		>1200 MPa
Compressive strength		>2,4 MPa
Bending strength		>3,2 MPa
Extraction nail test		>850 N
Ball impact resistance		No damage
Linear tolerances		+ /- 3 mm
Thickness tolerances		+ /- 0,5 mm
Square		square
Longitudinal joint depth		/
Linear thermal expansion		0,013 mm/C°/m
Thermal conductivity		0,135 W/mC°
Resistance to freeze-thaw cycles		/
Resistance to bacteria		0 (no growth)
Fungal resistance		0 (no growth)
Reaction to fire		A1 (non-combustible)
PH – Alkalinity degree		11



UNIPAN 12,5/16



Use: exterior walls, photovoltaic installations protection.

Description: UNIPAN® boards are produced in a continuous cycle and obtained from a mixture of Portland cement and aggregates, with the two faces, front and back, Reinforced by fiber glass mesh with polymeric coating. The longitudinal edges are thinned and have smooth finish and are strengthened through EDGETECH® technology. The extremities (head borders) are squared. UNIPAN® boards are suitable for the construction of walls into external environment or in places where high resistance to water, to moisture and high impact resistance are required.

Application: It is necessary to apply UNIPAN® boards in order that the ends and borders are flush, but without forcing. The boards should be place horizontally, in a way that the longitudinal edge is orthogonal to the metal frame. It is necessary to stagger the head joints of the boards.

Secure UNIPAN® boards to the metal structure using UNIVIS screws.

Proceed screwing the board from its center and continuing in the direction of the ends and edges. In applying the UNIVIS screws, keep the UNIPAN® board firmly in contact with the support structure. UNIVIS screws should be placed at 200 mm maximum interval for walls and 150 mm for false ceilings.

The UNIVIS screws must be screwed at a distance between 1 and 2 cm, along the board longitudinal edges and ends.

Adjust the screwing in such a way that the base of the head of the screw is flush with the surface of the UNIPAN® boards so as to obtain a firm anchoring of the panel to the metal frame.

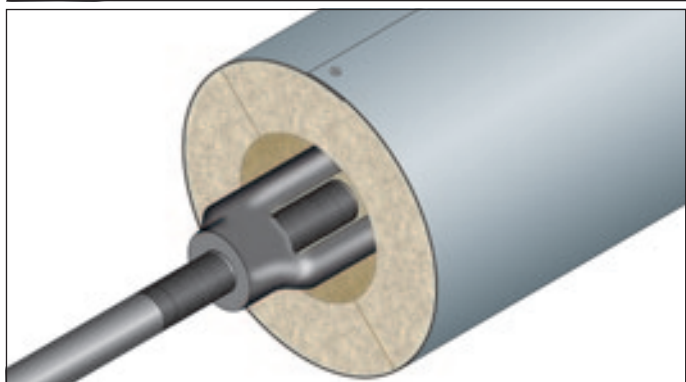
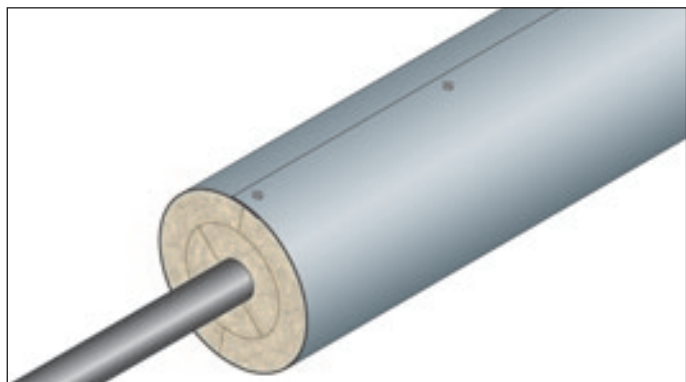
TECHNICAL DATA	VALUES
CE mark	EN 12467
Thickness	12,5 / 16 mm
Width	1200 mm
Length	2000 mm
Weight	14,2 / 17,9 kg/m ²
E-modul MoE	>3500 MPa
Bending strength MoR	>8,3 MPa
Extraction nail test	>850 N
Ball impact resistance	No damage
Linear tolerances	+ / - 3 mm
Thickness tolerances	+ / - 0,8 mm
Square	square
Longitudinal joint depth	1,5 mm
Linear thermal expansion	0,013 mm/C°/m
Thermal conductivity	0,39 W/mC°
Resistance to freeze-thaw cycles	100 cycles
Resistance to bacteria	0 ((no growth)
Fungal resistance	0 ((no growth)
Reaction to fire	A1 (non-combustibile)
Wind load (12.5/16 mm boards, profiles 400 mm intervals.)	3,6 kPa
Water vapor transmission	1975 g/h m ²
Curvature radius	1,5 m

Do not screw or insert the hardware too deep into the boards.

The UNIPAN® boards can be cut to size using a cutter or a rip saw with a line. You can use a power saw with the dust collection device. It is necessary to comply with the instructions contained in specific certifications, in relation to the types taken.



TIE ROD AND TURNBUCKLES COVERS "T-REX"

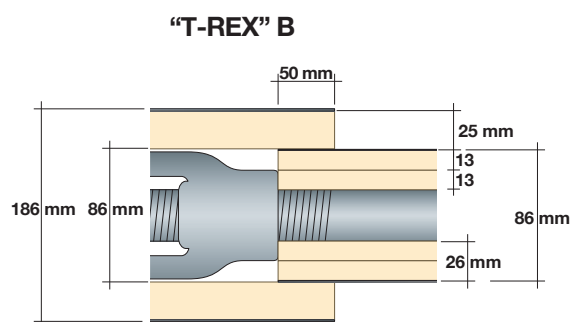
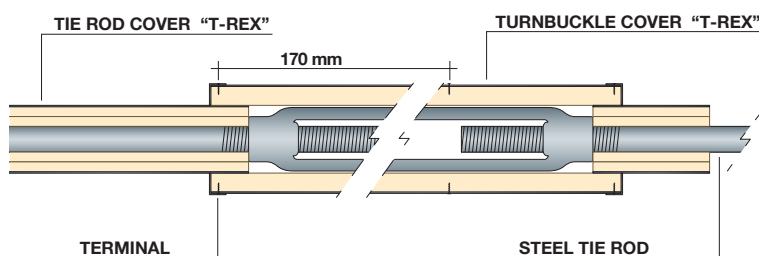


TECHNICAL DATA TIE ROD COVERS	"T-REX" A 13 mm in thickness	"T-REX" B 2x13 mm in thickness	"T-REX" C 2x25 mm in thickness
Fire resistance	R 30/60	R 60/120	R 120/180
Insulation thickness	13 mm	26 mm	50 mm
Insulation density	100 kg/m ³ ± 10%		
External diameter	60 mm	86 mm	134 mm
Internal diameter	34 mm	34 mm	34 mm
Length	1000 mm		
Weight	0,6 kg/m	1,1 kg/m	2,1 kg/m
Thermal conductivity	0,02 W/mK at 200 °C	0,05 W/mK at 400 °C	0,08 W/mK at 600 °C

TECHNICAL DATA TURNBUCKLES COVERS	"T-REX" A 25 mm in thickness	"T-REX" B 50 mm in thickness	"T-REX" C 50 mm in thickness
Fire resistance	R 30/60	R 60/120	R 120/180
Insulation thickness	25 mm	50 mm	50 mm
Insulation density	100 kg/m ³ ± 10%		
External diameter	110 mm	186 mm	284 mm
Internal diameter	60 mm	86 mm	134 mm
Length	500 mm		
Weight	1,22 kg/pcs		
Thermal conductivity	0,02 W/mK at 200 °C	0,05 W/mK at 400 °C	0,08 W/mK at 600 °C

Use: tie rod and turnbuckles fire protection.

Description: The TIE ROD AND TURNBUCKLES COVERS "T-REX" are made of bio-soluble ceramic fibers felt additivated with mixtures of silicon and magnesium calcium oxide, coated with a galvanized sheet steel. They are suitable for R 30/180 fire protection of all types of metallic tie rod up to 34 mm in diameter. The TIE ROD AND TURNBUCKLES COVERS "T-REX" are class A1 rated according to fire reaction, they are unalterable and very easy to assemble.



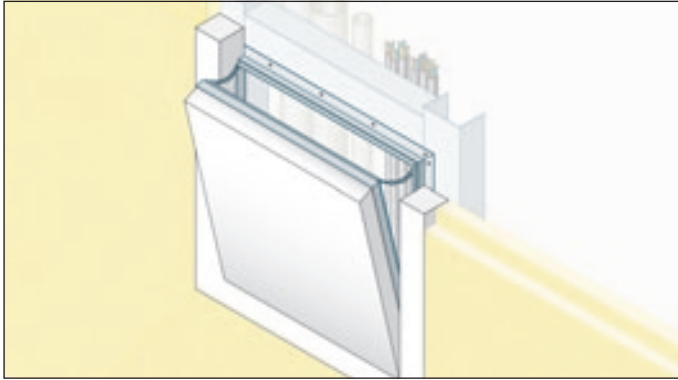
Application: slightly open the metal shell with insulating material and insert the rod, tighten the metal shell using the self-tapping screws placed at 170 mm center using the prepared holes. Then slide the cover from a side. Take the next cover, insert the rod and compress insulating material towards the cover already mounted so that with a slight slip of the metal shell will be an overlapping of the same cover previously mounted. At this point, putting the self-drilling screw in order to fix the covers

together.

In the vicinity of tensioner bring the covers as close as possible to the tensioner itself on the two sides, then enlarge the the turnbuckle cover so as to wrap the tensioner and overcome the plates, and tighten the turnbuckle with the self-drilling screw. Place on the two sides of the turnbuckle cover the aluminum terminals, and secure them with the self-drilling screws using the predrilled holes at both ends of the turnbuckle cover.



INSPECTION HATCH FOR PARTITIONS/SHAFTS "GB"



Use: inspection door for partitions/shafts

Description: the INSPECTION HATCH FOR PARTITIONS/SHAFTS "GB" is a hatch for the inspection of plant networks with a specific certification for use in partitions.

It consists of aluminium profiles with 50 mm thickness fireproof plasterboard. The two frames of the inspection hatch are composed of four profiles solidly welded to one another by means of a special procedure with the addition of a fireproof plasterboard frame with 55 mm outer width and 25 mm inner. Thanks to the double back layer the due protection is achieved.

The hatch is provided with two or more safety chains to hang up after each opening so as to avoid accidents. Between the frame and the door a leak of 1,5 mm is left in order to install a fireproof profiled gasket (expansion type). Thanks to the invisible snap closures, the inspection hatch could be opened by simply pressing it.

Application: Firewalls and walls with calcium silicate boards or plasterboard page 126

TECHNICAL DATA

Fire resistance

EI 120

Dimensions

AxB:
200x200 mm, 300x300 mm,
400x400 mm, 450x450 mm,
500x500 mm, 600x600 mm,
1000x1500 mm.

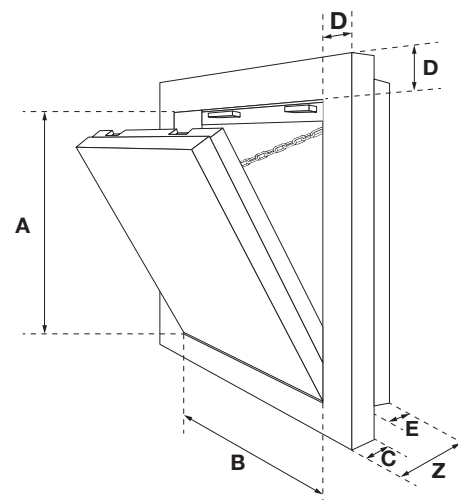
Wall hole:
door measure + 110 mm

Clear opening:
door measure – 55 mm

D: 55 mm

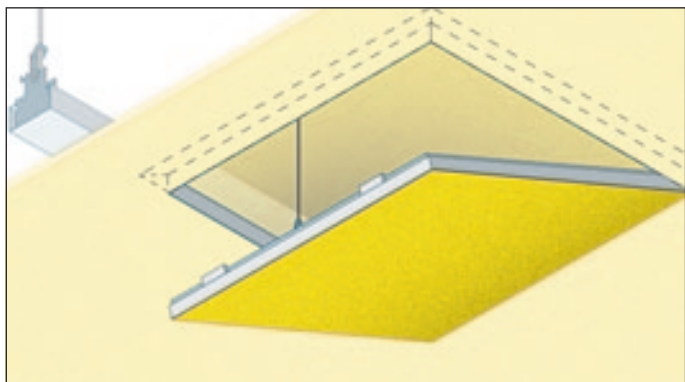
E: 30 mm

Z: 80 mm





INSPECTION HATCH FOR REI 120 CEILING “GB-REI 120”



Use: inspection door for REI 120 ceiling

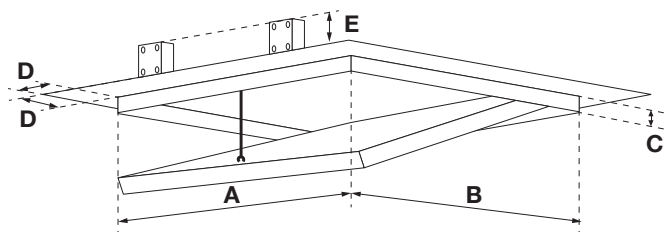
Description: the INSPECTION HATCH FOR CEILING “GB-REI 120” is a hatch for the inspection of plant networks with a specific certification for use in suspended ceilings.

It consists of aluminum profiles with FIREGUARD® 13 board, in thickness 12,7 mm and two snap closures. The two frames of the inspection hatch are composed of four profiles solidly welded to one another by means of a special procedure. By the measuring 300x300 mm, the hatch is provided with a security cable to hang up after every opening of the door in order to avoid accidents. Between the frame and the door a leak of 1,5 mm is left.

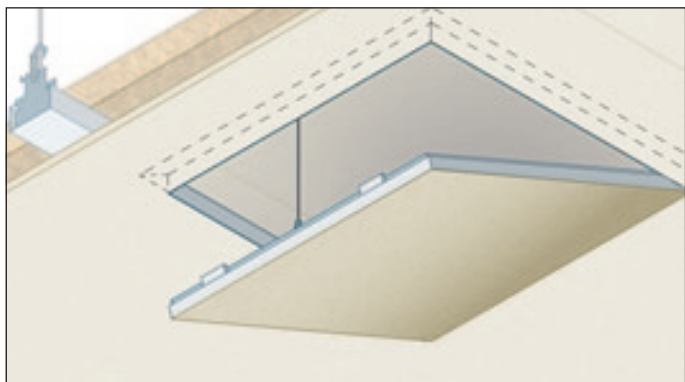
Thanks to the invisible snap closures, the inspection hatch could be opened by simply pressing it.

Application: Ceilings page 129

TECHNICAL DATA	
Fire resistance	REI 120
Dimensions	AxB: 200x200 mm, 300x300 mm, 400x400 mm, 500x500 mm, 600x600 mm.
	C: 13 mm D: 26 mm E: 40 mm



INSPECTION HATCH FOR REI 180 CEILING “GB-REI 180”



Use: inspection door for REI 180 ceiling

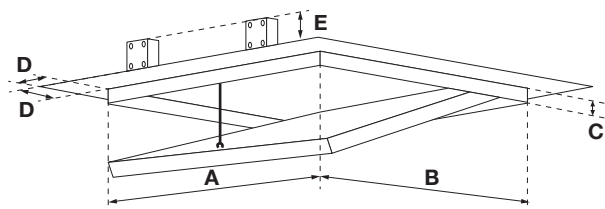
Description: the INSPECTION HATCH FOR CEILING “GB-REI 180” is a hatch for the inspection of plant networks with a specific certification for use in suspended ceilings.

It consists of aluminium profiles with NAPER S 12 board in thickness 12 mm and two snap closures. The two frames of the inspection hatch are composed of four profiles solidly welded to one another by means of a special procedure. By the measuring 300x300 mm, the hatch is provided with a security cable to hang up after each opening of the door in order to avoid accidents. Between the frame and the door a leak of 1,5 mm is left.

Thanks to the invisible snap closures, the inspection hatch could be open by simply pressing it.

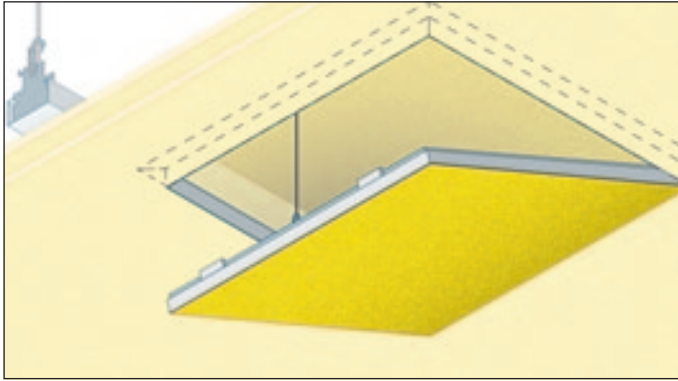
Application: Ceilings page 130

TECHNICAL DATA	
Fire resistance	REI 180
Dimensions	AxB: 200x200 mm, 300x300 mm, 400x400 mm, 500x500 mm, 600x600 mm.
	C: 13 mm D: 26 mm E: 40 mm





INSPECTION HATCH FOR EI 60 MEMBRANE CEILING “GB-EI 60”



Use: inspection door for EI 60 membrane ceiling

Description: the INSPECTION HATCH FOR MEMBRANE CEILING “GB-EI 60” is a hatch for the inspection of plant networks with a specific certification for use in membrane ceiling. It consists of aluminium profiles with FIREGUARD® 13 boards in thickness 12,7 mm and two snap closures. The two frames of the inspection hatch are composed of four profiles solidly welded to one another by means of a special procedure. Starting from the measuring 300x300 mm the hatch is provided with a security cable to hang up after each opening of the door so as to avoid accidents. Between the frame and the door is left a leak of 1,5 mm.

Thanks to the invisible snap closures, the inspection hatch could be open with by simply pressing it.

Application: Ceilings page 127

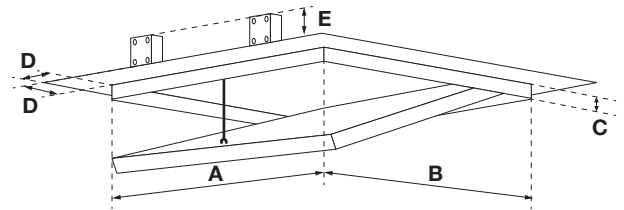
TECHNICAL DATA

Fire resistance

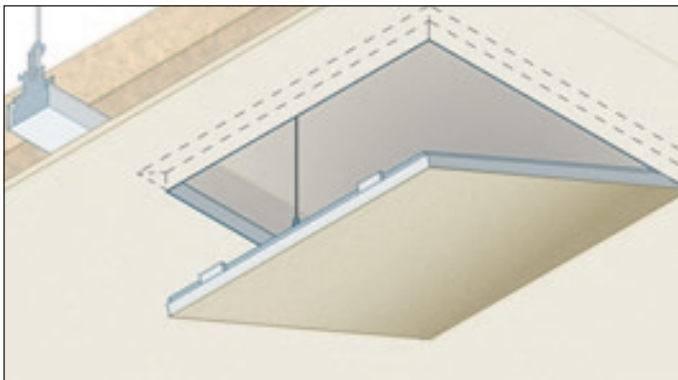
EI 60

Dimensions

AxB:
200x200 mm, 300x300 mm,
400x400 mm, 500x500 mm,
600x600 mm.
C: 13 mm
D: 26 mm
E: 40 mm



INSPECTION HATCH FOR EI 120 MEMBRANE CEILING “GB-EI 120”



Use: inspection door for EI 60 membrane ceiling

Description: the INSPECTION HATCH FOR MEMBRANE CEILING “GB-EI 60” is a hatch for the inspection of plant networks with a specific certification for use in membrane ceiling. It consists of aluminium profiles with FIREGUARD® 13 boards in thickness 12,7 mm and two snap closures. The two frames of the inspection hatch are composed of four profiles solidly welded to one another by means of a special procedure. Starting from the measuring 300x300 mm the hatch is provided with a security cable to hang up after each opening of the door so as to avoid accidents. Between the frame and the door is left a leak of 1,5 mm.

Thanks to the invisible snap closures, the inspection hatch could be open with by simply pressing it.

Application: Ceilings page 128

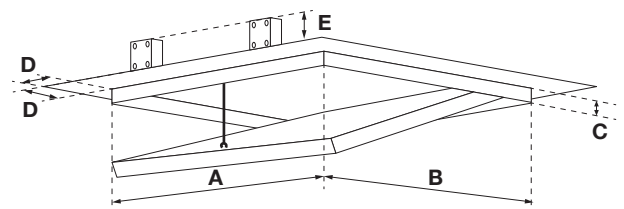
TECHNICAL DATA

Fire resistance

EI 120

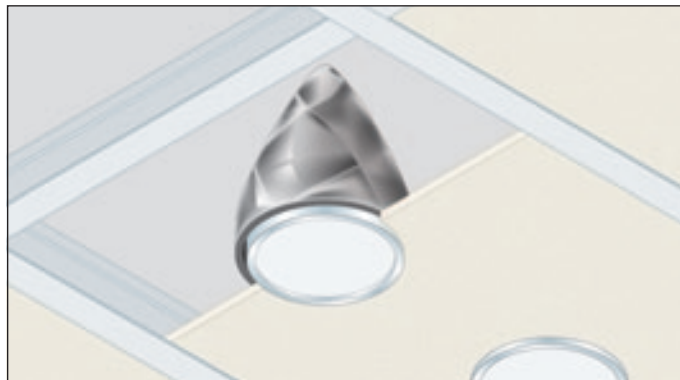
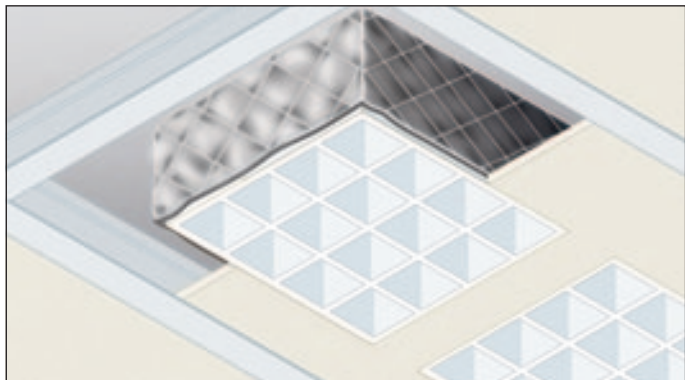
Dimensions

AxB:
200x200 mm, 300x300 mm,
400x400 mm, 500x500 mm,
600x600 mm.
C: 13 mm
D: 26 mm
E: 40 mm





CEILING LIGHTS/SPOTLIGHTS PROTECTION "GB-LIGHT"



Use: lights and spotlights protection

Description: the CEILING LIGHTS/SPOTLIGHTS PROTECTION "GB-LIGHT" is a protection specifically designed to make possible the insertion lighting point (spotlights or ceiling light) on REI ceilings, ensuring their fire resistance that would otherwise be compromised.

It consists of a preassembled mat made of incombustible fabric treated with a flame retardant agent.

It allows obtaining a fire resistant false ceiling even in the presence of recessed lighting bodies.

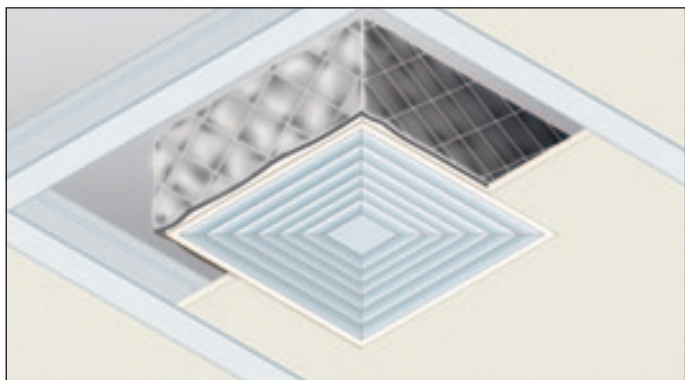
Suitable for use on fire resisting ceilings with the exception of diaphragm ceilings.

Application: Ceilings page 132

TECHNICAL DATA

Fire resistance	EI 120 on a mineral fiber false ceiling that protect a hollow slab concrete floor
Spotlight dimensions	d: 150 mm, h: 150 mm (conical) d: 250 mm, h: 150 mm (conical) 300x300x250 mm
Ceiling light dimensions	600x600x150 mm 600x1200x150 mm

CEILING AIR DIFFUSER PROTECTION "GB-AIR"



Use: ceiling air diffuser protection

Description: the CEILING AIR DIFFUSER PROTECTION "GB-AIR" is a protection specifically designed to make possible the insertion air diffusion or air intake point on REI ceilings, ensuring their fire resistance that would otherwise be compromised.

It is particularly indicated for the protection of air diffuser installed on fire-resistant false ceilings, membrane ceilings excluded.

It Improves the thermal and acoustic insulation of the ceiling, does not require a maintenance and is easy to remove and re-install during the maintenance interventions .

The CEILING AIR DIFFUSER PROTECTION "GB-AIR" is dimensioned in order to cover a wide range of anemostats on the market.

It consists of a mineral wool mat contained between two layers of glass cloth . The outside is aluminized, the inner mat is treated

TECHNICAL DATA

Fire resistance	EI 120 on a mineral fiber false ceiling that protect a hollow slab concrete floor
Dimensions 600 x 600 x 150 mm	Suitable for: air pipe diameter Ø 160 mm air pipe diameter Ø 200 mm air pipe diameter Ø 250 mm air pipe diameter Ø 315 mm

with a special intumescent paint. For the protection of the air supply/air intake hose coiled, a special collar comes in order to be applied on the airdiffuser, securing it with a simple metal clamp.

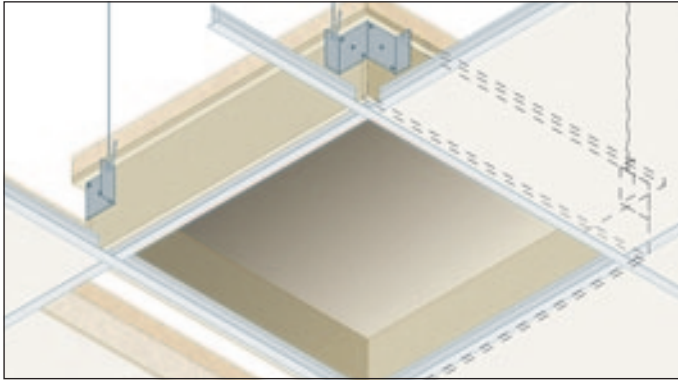
The product is flexible and designed to fit all types of air diffuser. With the CEILING AIR DIFFUSER PROTECTION "GB-AIR" the ceiling design of affected by the fire resistance integrity constraint.

The light weight and flexibility of the product allow an easy installation without overloading the ceiling grid

Application: Ceilings page 133



CEILING LIGHTS PROTECTION "GB-LIGHT-S"



Use: ceiling lights protection

Description: CEILING LIGHTS PROTECTION "GB-LIGHT-S" is a protection specifically designed to make possible the insertion lighting point (ceiling light) on REI ceilings, ensuring its fire resistance that would otherwise be compromised. It consists of a pre-assembled box composed by NAPER S 8 boards - 8 mm in thickness, and a layer of rock wool 40 mm thick, 60 Kg/m³ in density. It is indicated for the use on fire resistant false ceiling even in the presence of recessed lighting bodies. Suitable for use on fire resistant false ceilings with the exception of diaphragm false ceiling.

Application: Ceilings page 131

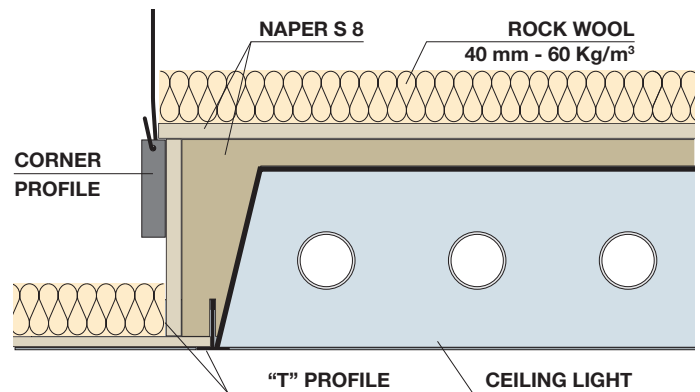
TECHNICAL DATA

Fire resistance

- EI 180**
on the following floor types:
- reinforced concrete slab in thickness 100 mm and metal beams
 - reinforced concrete or prestressed reinforced concrete tiles with slab in thickness 100 mm
 - reinforced concrete slab in thickness 100 mm, corrugated metal sheet and metal beams
 - hollow slab concrete floor in thickness 160 mm
- EI 120**
on the following floor types:
- reinforced concrete slab in thickness 100 mm, plank and wood beams

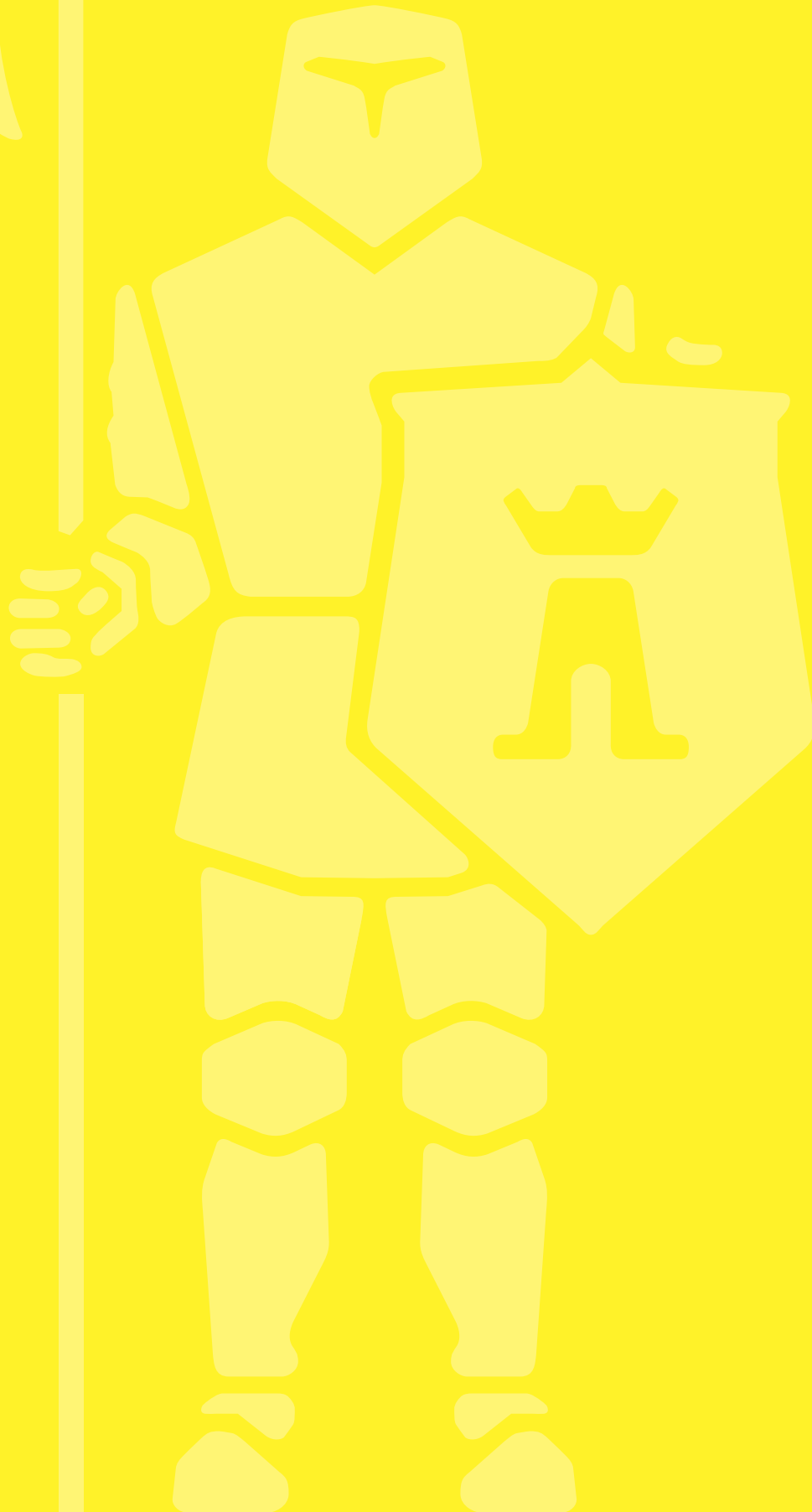
Dimensions

600x600x150 mm





STEEL STRUCTURE PROTECTION





BEHAVIOR OF STEEL UNDER THE ACTION OF FIRE

Steel is a non-combustible material, does not release smoke or toxic gases, but its mechanical characteristics decrease with temperature. A steel structure, subjected to the action of the loads and simultaneously to fire, loses its load bearing capacity and after a certain time collapses.

This phenomenon is governed by certain basic parameters, such as: the thermal jump, the temperature of the element, the heat transmission coefficient, the massivity factor S/V (that is the ratio between the surface area exposed to the fire and its volume) and the class ductility.

METHODS FOR THE DETERMINATION OF THE CLASSES OF FIRE RESISTANCE “R”

EVALUATION BASED ON THE RESULTS OF CALCULATIONS:

The fire resistance of a metal structure can be analytically evaluated by the methods of calculation specified in the standard **EN 1993-1-2: “Design of steel structures - Part 1-2: General rules - Structural fireproof design.”**

This rule specifies that the evaluation of the resistance of the steel structural elements under the action of a fire may be accomplished by different methods or combination thereof:

- complete calculation models (design methods in which engineering principles are applied in a realistic manner for specific applications)
- simplified calculation models referred to each element (simplified design methods applicable to individual elements, based on precautionary assumptions)

Complete calculation models are based on finite element method: the rods or their cross sections are discretized into a number of 2D or 3D type elements. To them are applied the thermal action due to the fire in the form of heat flow or fire curve and the boundary conditions, thus obtaining both the temperature into each element and its thermal expansion and deformation.

The simplified methods are calculation procedures based on simple equations that allow to determine the temperature in an approximate manner: for steel structures they generally are based on the assumption of uniform temperature across the cross section or in the parts where it can be divided.

We will present here only the simplified method as defined in EN 1993-1-2 norm, called “critical temperature method”.

The calculation is based on the identification of some basic parameters:

- The sections ductility class
- The critical temperature
- The factor section (or massiveness)

CRITICAL TEMPERATURE

For each element of a structure is possible to determine a temperature over which the same is no longer able to fulfill its supporting function, this temperature is called the **critical temperature θ_{cr}** : temperature at which the design resistance “ $R_{fi,d}$ ” is equal to the design stress “ $E_{fi,d}$ ” due to applied loads in fire conditions, and therefore we expect the collapse of the steel structural element.

Assuming that the temperature inside the section of the structural element is uniform and that is not required the verification of the structure deformability, that is, that the resistance of the element is not affected by phenomena of instability or buckling under fire conditions, the determination of the critical temperature of the steel is done taking into account:

- the degree of use μ_0 , defined as the ratio between the action of the project in case of fire and the design resistance in case of fire calculated for the initial instant,
- the ductility class of the section element.

The steel structural elements sections are divided into ductility classes identified by the numbers from 1 to 4 depending on the plastic rotation capacity of the sections, on the geometric characteristics of the parts that compose it, on the type of stress to which they are subjected and on the mechanical characteristics of the material used. Are distinguished in:

- Class 1: sections for which may occur the complete formation of a plastic hinge;
- Class 2: sections for which has expected for the complete formation of a plastic hinge, but with limited deformation capacity;
- Class 3: sections for which, due to local buckling, it is not possible the distribution of tensions in the plastic section and the last time coincides with that of the conventional elastic limit;
- Class 4: sections for which, due to important phenomena of local instability, the last time is less than the conventional elastic limit.



The critical temperature is given by the formula:

$$\theta_{a,cr} = 39,19 \ln \left[\frac{1}{0,9674 \mu_0^{3,833}} - 1 \right] + 482$$

The degree of use at the initial instant μ_0 for tense or inflected elements in class 1, 2 and 3 can be calculated with the following relationship:

$$\mu_0 = \frac{E_{d,fi}}{R_{d,fi,0}}$$

where $E_{d,fi}$ is the design stress in case of fire and $R_{d,fi,0}$ is the design resistance in case of fire at time $t=0$. Alternatively for tense elements and for beams for which the flexure-torsional instability is not a potential failure mode, the utilization factor can be obtained as:

$$\mu_0 = \eta_{fi} \frac{\gamma_{M,fi}}{\gamma_{M,0}}$$

Where η_{fi} is the reduction factor of the design loads for the fire situation, $\gamma_{M,0}$ is the partial safety factor for the resistance at ordinary temperature, $\gamma_{M,fi}$ is the partial safety factor for the resistance in case of fire ($=1,0$).

For class 1, 2 and 3 sections with μ_0 between 0,22 and 0,80, the critical temperature in °C takes the values in the table, while for sections of class 4, the critical temperature must be limited to 350 °C.

THE CRITICAL TEMPERATURE $\theta_{a,cr}$ ACCORDING TO THE UTILIZATION RATE μ_0

μ_0	$\theta_{a,cr}$	μ_0	$\theta_{a,cr}$	μ_0	$\theta_{a,cr}$	μ_0	$\theta_{a,cr}$	μ_0	$\theta_{a,cr}$	μ_0	$\theta_{a,cr}$
0,22	711	0,32	654	0,42	612	0,52	578	0,62	549	0,72	520
0,24	698	0,34	645	0,44	605	0,54	572	0,64	543	0,74	514
0,26	685	0,36	636	0,46	598	0,56	566	0,66	537	0,76	508
0,28	674	0,38	628	0,48	591	0,58	560	0,68	531	0,78	502
0,30	664	0,40	620	0,50	585	0,60	554	0,70	526	0,80	495



SECTION FACTOR (O MASSIVENESS)

The section factor, for a given element, is the ratio between the surface exposed to the fire and the volume of the element itself. For surface exposed to fire is meant the effective surface area through which the thermal exchange occurs, so the section factor will be different:

- depending on the positioning of the element (total or partial exposure to fire)
- depending on the type of protection (in adherence, box-like, etc.).

In the case of elements with constant cross section, the section factor has given by the ratio between the perimeter of the cross section and the area of the same.

Below are some examples of section factor calculation and the list of values for this parameter for the profiles on the market.

Section factor A_p/V for steel elements isolated with fire protection material		
	Description	Factor section (A_p/V)
	Box-like coating with uniform thickness*	$\frac{2(b+h)}{A}$
	Box-like coating with uniform thickness* exposed to fire on three sides	$\frac{2h+b}{A}$

* - The c_1 and c_2 dimensions should not normally exceed $h/4$
 A = steel cross-section area

SIZING OF THE PROTECTIVE COATING

The annex "A" of the Ministerial Decree 16/02/2007 specifies that the laboratory tests for the evaluation of the fire resistance of structural steel elements shall be conducted in accordance with EN 13381-4: "Testing methods of the contribution to the fire resistance of structural elements: Part 4: protective coatings applied to steel structure", which has the purpose to determine the thickness of the protective material in order to obtain a specific fire resistance. The result of tests conducted according to EN 13381-4 is not a true and proper classification of the element, but a procedure (assessment) for the determination of the required thicknesses depending on the type of element to be protected.

The procedure for the evaluation of the effect of protection could be divided in two phases:

- tests to run in the oven according to the standardized procedures defined by the standard
- the processing of the experimental data in order to extend the results to real cases.

Through repetition of the same tests on elements with different massiveness and with different coating thicknesses is possible to obtained schedules which allow to extrapolate the thicknesses of the coating for all profile types. In particular, there are three sets of samples:

- the minimum range of samples that are not loaded
- the range of samples for the verification of stickability, than is for the determination of the effectiveness of adhesion and adherence of the protective system to the structural element to which it is imposed an initial deformation
- the number of additional samples



The tested samples are steel beams and columns type I and H, loaded and unloaded. Each test continues until the steel does not reach the temperature of 750 °C. The tests results are made by the temperatures values recorded at various samples locations throughout the test, and are reworked in order to evaluate the behavior of the protective material in real situations.

The standard provides three methods of analysis:

- differential equations method,
- numerical regression method,
- graphical method.

By the numerical regression method is defined an equation that expresses the time necessary to achieve a specific design temperature according to the thickness of the protective material and to the factor section. The graphical method is based, instead, on the tracking of a series of curves which allow to understand the contribution of the protective. The results are expressed in the form of tables in which the protective thickness are indicated as a function of the section factor, in order that the steel temperature is maintained below the design values. The tables contained into the assessment report allow the professional to size the thickness of the protective materials in order to guarantee the designed fire resistance.

The steps are:

- **determination of the critical temperature** of the structural element according to the load conditions, the scheme of constraint and the type of profile. The critical temperature method is described in the preceding pages.
- **determination of section factor** of the protected profile according of exposure to fire (3 or 4 sides).
- **determining of the thickness of the protective material** known the resistance to fire class required, according to the experimental abacus from the laboratory assessment report.

Appendix B of EN 13381-4 gives guidance on the applicability of the results to profiles with different sections by “I” or “H”; in particular:

- In the case of the box-shaped protection is not necessary to change the thickness of the protective material. More precisely, the thickness of the box-shaped protection of a hollow section profile with a given section factor A_p/V will be the same as in the case of box-shaped protection of a profile with “I” or “H” section with the same factor A_p/V .
- In the case of profiled protection it is necessary a variation of the thickness of the protective coating on the basis of the value of the section factor of the hollow section profile, with the following modalities:
 - a) establish the value of the section factor A_p/V of the structural hollow section;
 - b) verify the thickness of the protective material d_p according on the “I” and “H” sections data.
 - c) the thickness is changed in the following way:

$$\text{changed thickness} = d_p \left(1 + \frac{A_p / V}{1000} \right)$$

For values of A_p/V up to 250 m⁻¹.

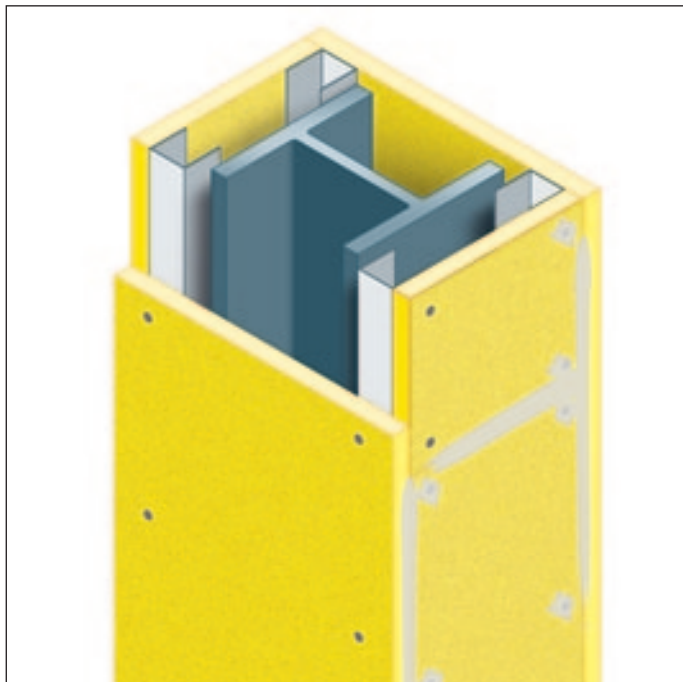
For values of A_p/V greater than 250 m⁻¹ the changed thickness change is equal to 1,25 d_p .

Shown below are the thickness of the protective coating using FIREGUARD® boards necessary for the R15, R30, R45, R60, R90, R120, R180, R240 and R300 fire protection of steel beams and columns according to the profiles section factor and critical temperature.

These data are certified through the assessment report Applus 11-2720-730 M1 performed in accordance with EN 13381-4.



STEEL COLUMNS



SYSTEM SPECIFICATIONS

Construction of a fire protection cladding to steel columns for fire resistance R 15/30/45/60/90/120/180/240 using FIREGUARD® boards in thickness according to chart, in maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2720-730 M1 according to norm EN 13381-4.

REACTION TO FIRE: A1

FIRE RESISTANCE: R30-240

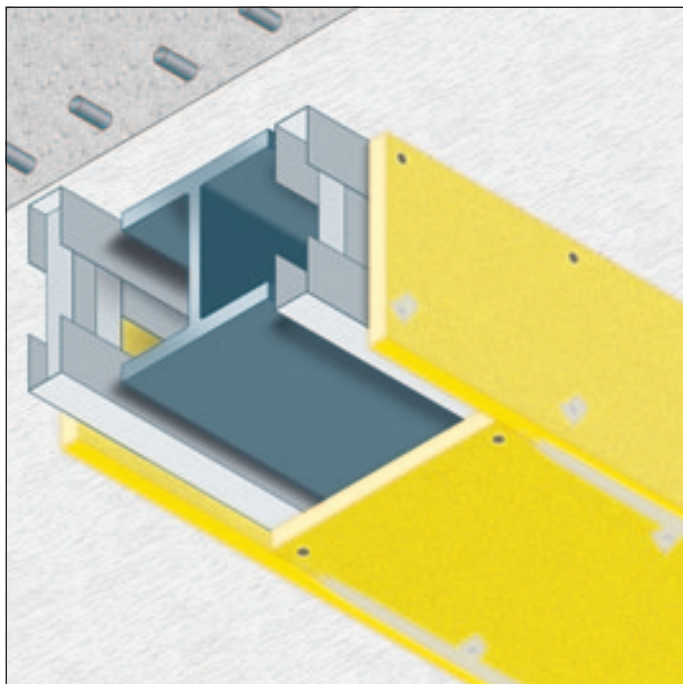
- **Base structure:** steel columns
- **Supporting structure:** vertical steel angles "C" 50x50x0,6 mm positioned at the corners of the steel column, and inserted at its bottom and top ends in steel angles "U" 50x40x0,6 mm
- **Fire protection:** boards type FIREGUARD® (see chart)
- **Fastening:** self-tapping phosphated screws 3,5 mm in diameter, placed at 250 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads

Assesment report Applus 11-2720-730 M1
Fire Testing Norm: EN 13381-4

The boards are to be fastened to vertical steel angles "C" 50x50x0,6 mm positioned at the corners of the steel column, and inserted at the bottom and top ends in steel angles "U" 50x40x0,6 mm, with self-tapping phosphated screws in thickness 3,5 mm and appropriate lengths at 250 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

STEEL BEAMS



SYSTEM SPECIFICATIONS

Construction of a fire protection cladding to steel beams for fire resistance R 15/30/45/60/90/120/180/240 using FIREGUARD® boards in thickness according to chart, in maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2720-730 M1 according to norm EN 13381-4.

The boards are to be fastened to vertical steel angles "C" 75x50x0,6 mm

REACTION TO FIRE: A1

FIRE RESISTANCE: R30-240

- **Base structure:** steel beams
- **Supporting structure:** vertical steel angles "C" 75x50x0,6 mm positioned at the sides of the steel beam at 550 mm centres, and inserted in steel angles "U" 75x40x0,6 mm underneath the ceiling and at the bottom of the beams
- **Fire protection:** boards type FIREGUARD® (see chart)
- **Fastening:** self-tapping phosphated screws 3,5 mm in diameter, placed at 250 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads

Assesment report Applus 11-2720-730 M1
Fire Testing Norm: EN 13381-4

positioned at the sides of the steel beam at 550 mm centres, and inserted in steel angles "U" 75x40x0,6 mm underneath the ceiling and at the bottom of the beams, using self-tapping phosphated screws in thickness 3,5 mm and appropriate lengths at 250 mm centres.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

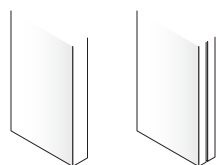


CRITICAL TEMPERATURE Θ_{CR} 350° C

FOR PROFILES WITH CLASS 4 DUCTILITY



12,7



25,4



38,1



50,8



63,5



76,2



88,9

Section factor	FIRE PROTECTION OF BEAMS AND COLUMNS WITH 3 OR 4 SIDES OF FIRE EXPOSURE RESISTANCE TO FIRE CLASSIFICATION “R”								
m-1	R15	R30	R45	R60	R90	R120	R180	R240	R300
45	12,7	12,7	12,7	12,7	25,4	25,4	50,8	76,2	
50	12,7	12,7	12,7	12,7	25,4	38,1	50,8	76,2	
60	12,7	12,7	12,7	12,7	25,4	38,1	50,8	76,2	
70	12,7	12,7	12,7	25,4	25,4	38,1	63,5	76,2	
80	12,7	12,7	12,7	25,4	25,4	38,1	63,5	76,2	
90	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
100	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
110	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
120	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
130	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
140	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
150	12,7	12,7	25,4	25,4	38,1	50,8	63,5	76,2	
160	12,7	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
170	12,7	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
180	12,7	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
190	12,7	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
200	12,7	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
210	12,7	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
220	12,7	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
230	12,7	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
240	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
250	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
260	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
270	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
280	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
290	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
300	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
310	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
320	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
330	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
340	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
350	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
360	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
370	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
380	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
390	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
400	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
410	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
420	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
430	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
440	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
450	25,4	25,4	25,4	38,1	38,1	50,8	76,2		



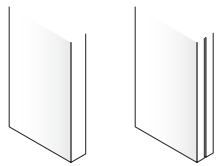
CRITICAL TEMPERATURE Θ_{CR} 500° C

FOR PROFILES WITH CLASS 1/2/3 DUCTILITY – USE FACTOR $\mu = 0,8$

Sizing of protection layer thickness with FIREGUARD® boards according to EN 13381-4 norm.



12,7



25,4



38,1



50,8



63,5



76,2



88,9

Section factor	FIRE PROTECTION OF BEAMS AND COLUMNS WITH 3 OR 4 SIDES OF FIRE EXPOSURE RESISTANCE TO FIRE CLASSIFICATION “R”								
m-1	R15	R30	R45	R60	R90	R120	R180	R240	R300
45	12,7	12,7	12,7	12,7	12,7	25,4	38,1	63,5	76,2
50	12,7	12,7	12,7	12,7	12,7	25,4	38,1	63,5	88,9
60	12,7	12,7	12,7	12,7	25,4	25,4	50,8	63,5	
70	12,7	12,7	12,7	12,7	25,4	38,1	50,8	63,5	
80	12,7	12,7	12,7	12,7	25,4	38,1	50,8	76,2	
90	12,7	12,7	12,7	12,7	25,4	38,1	50,8	76,2	
100	12,7	12,7	12,7	25,4	25,4	38,1	50,8	76,2	
110	12,7	12,7	12,7	25,4	25,4	38,1	50,8	76,2	
120	12,7	12,7	12,7	25,4	25,4	38,1	63,5	76,2	
130	12,7	12,7	12,7	25,4	25,4	38,1	63,5	76,2	
140	12,7	12,7	12,7	25,4	25,4	38,1	63,5	76,2	
150	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
160	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
170	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
180	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
190	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
200	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
210	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
220	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
230	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
240	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
250	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
260	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
270	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
280	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
290	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
300	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
310	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
320	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
330	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
340	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
350	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
360	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
370	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
380	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
390	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
400	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
410	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
420	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
430	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
440	25,4	25,4	25,4	38,1	38,1	50,8	76,2		
450	25,4	25,4	25,4	38,1	38,1	50,8	76,2		



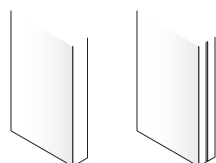
CRITICAL TEMPERATURE $\Theta_{CR} 550^{\circ} \text{C}$

FOR PROFILES WITH CLASS 1/2/3 DUCTILITY – USE FACTOR $\mu = 0,6$

Sizing of protection layer thickness with FIREGUARD® boards according to EN 13381-4 norm.



12,7



25,4



38,1



50,8



63,5



76,2



88,9

Section factor	FIRE PROTECTION OF BEAMS AND COLUMNS WITH 3 OR 4 SIDES OF FIRE EXPOSURE RESISTANCE TO FIRE CLASSIFICATION "R"								
m-1	R15	R30	R45	R60	R90	R120	R180	R240	R300
45	12,7	12,7	12,7	12,7	12,7	12,7	38,1	63,5	76,2
50	12,7	12,7	12,7	12,7	12,7	25,4	38,1	63,5	76,2
60	12,7	12,7	12,7	12,7	12,7	25,4	50,8	63,5	88,9
70	12,7	12,7	12,7	12,7	25,4	25,4	50,8	63,5	
80	12,7	12,7	12,7	12,7	25,4	38,1	50,8	63,5	
90	12,7	12,7	12,7	12,7	25,4	38,1	50,8	76,2	
100	12,7	12,7	12,7	12,7	25,4	38,1	50,8	76,2	
110	12,7	12,7	12,7	12,7	25,4	38,1	50,8	76,2	
120	12,7	12,7	12,7	25,4	25,4	38,1	50,8	76,2	
130	12,7	12,7	12,7	25,4	25,4	38,1	50,8	76,2	
140	12,7	12,7	12,7	25,4	25,4	38,1	50,8	76,2	
150	12,7	12,7	12,7	25,4	25,4	38,1	63,5	76,2	
160	12,7	12,7	12,7	25,4	25,4	38,1	63,5	76,2	
170	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
180	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
190	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
200	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
210	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
220	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
230	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
240	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
250	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
260	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
270	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
280	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
290	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
300	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
310	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
320	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
330	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
340	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
350	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
360	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
370	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
380	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
390	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
400	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
410	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
420	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
430	25,4	25,4	25,4	25,4	38,1	50,8	63,5		
440	25,4	25,4	25,4	38,1	38,1	50,8	63,5		
450	25,4	25,4	25,4	38,1	38,1	50,8	63,5		



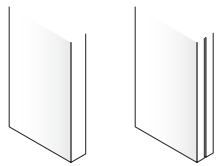
CRITICAL TEMPERATURE Θ_{CR} 630° C

FOR PROFILES WITH CLASS 1/2/3 DUCTILITY – USE FACTOR $\mu = 0,38$

Sizing of protection layer thickness with FIREGUARD® boards according to EN 13381-4 norm.



12,7



25,4



38,1



50,8



63,5



76,2



88,9

Section factor	FIRE PROTECTION OF BEAMS AND COLUMNS WITH 3 OR 4 SIDES OF FIRE EXPOSURE RESISTANCE TO FIRE CLASSIFICATION "R"								
m-1	R15	R30	R45	R60	R90	R120	R180	R240	R300
45	12,7	12,7	12,7	12,7	12,7	12,7	38,1	50,8	76,2
50	12,7	12,7	12,7	12,7	12,7	12,7	38,1	50,8	76,2
60	12,7	12,7	12,7	12,7	12,7	25,4	38,1	63,5	76,2
70	12,7	12,7	12,7	12,7	12,7	25,4	50,8	63,5	88,9
80	12,7	12,7	12,7	12,7	25,4	25,4	50,8	63,5	88,9
90	12,7	12,7	12,7	12,7	25,4	25,4	50,8	63,5	
100	12,7	12,7	12,7	12,7	25,4	38,1	50,8	63,5	
110	12,7	12,7	12,7	12,7	25,4	38,1	50,8	76,2	
120	12,7	12,7	12,7	12,7	25,4	38,1	50,8	76,2	
130	12,7	12,7	12,7	12,7	25,4	38,1	50,8	76,2	
140	12,7	12,7	12,7	25,4	25,4	38,1	50,8	76,2	
150	12,7	12,7	12,7	25,4	25,4	38,1	50,8	76,2	
160	12,7	12,7	12,7	25,4	25,4	38,1	50,8	76,2	
170	12,7	12,7	12,7	25,4	25,4	38,1	50,8	76,2	
180	12,7	12,7	12,7	25,4	25,4	38,1	50,8	76,2	
190	12,7	12,7	12,7	25,4	25,4	38,1	63,5	76,2	
200	12,7	12,7	12,7	25,4	25,4	38,1	63,5	76,2	
210	12,7	12,7	12,7	25,4	25,4	38,1	63,5	76,2	
220	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
230	12,7	12,7	25,4	25,4	38,1	38,1	63,5	76,2	
240	25,4	25,4	25,4	25,4	38,1	38,1	63,5	76,2	
250	25,4	25,4	25,4	25,4	38,1	38,1	63,5	76,2	
260	25,4	25,4	25,4	25,4	38,1	38,1	63,5	76,2	
270	25,4	25,4	25,4	25,4	38,1	38,1	63,5	76,2	
280	25,4	25,4	25,4	25,4	38,1	38,1	63,5	76,2	
290	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
300	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
310	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
320	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
330	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
340	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
350	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
360	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
370	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
380	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
390	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
400	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
410	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
420	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
430	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
440	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	
450	25,4	25,4	25,4	25,4	38,1	50,8	63,5	76,2	



VALUES OF FACTOR SECTION AND DUCTILITY CLASS OF LAMINATED PROFILES



PROFILE TYPE			FLEXION			COMPRESSION		
C	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
C 75 x 6,1	241	286	1	1		1	1	
C 75 x 7,4	201	240	1	1		1	1	
C 75 x 8,9	170	205	1	1		1	1	
C 100 x 8	239	278	1	1		1	1	
C 100 x 10,8	179	210	1	1		1	1	
C 130 x 10,4	227	263	1	1		1	1	
C 130 x 13	177	205	1	1		1	1	
C 150 x 12,2	227	258	1	1		1	1	
C 150 x 15,6	179	205	1	1		1	1	
C 150 x 19,3	146	168	1	1		1	1	
C 180 x 14,6	220	248	1	1		1	1	
C 180 x 18,2	177	201	1	1		1	1	
C 180 x 22	148	168	1	1		1	1	
C 200 x 17,1	213	240	1	1		1	2	
C 200 x 20,5	179	202	1	1		1	1	
C 200 x 27,9	132	150	1	1		1	1	
C 230 x 19,9	204	228	1	1		1	2	
C 230 x 22	183	205	1	1		1	1	
C 230 x 30	138	156	1	1		1	1	
C 250 x 22,8	199	222	1	1		2	3	
C 250 x 30	153	171	1	1		1	1	
C 250 x 37	128	144	1	1		1	1	
C 250 x 45	103	116	1	1		1	1	
C 310 x 30,8	174	193	1	1		2	4	
C 310 x 37	146	162	1	1		1	1	
C 310 x 45	121	135	1	1		1	1	
C 380 x 50,4	132	145	1	1		1	2	
C 380 x 60	112	124	1	1		1	1	
C 380 x 74	90	100	1	1		1	1	



PROFILE TYPE			FLEXION			COMPRESSION		
CH	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
CH 76x38x7	221	265	1	1		1	1	
CH 102x51x10	193	232	1	1		1	1	
CH 127x64x15	169	203	1	1		1	1	
CH 152x76x18	169	203	1	1		1	1	
CH 152x89x24	131	161	1	1		1	1	
CH 178x76x21	164	192	1	1		1	1	
CH 178x89x27	132	158	1	1		1	1	
CH 203x76x24	159	185	1	1		1	1	
CH 203x89x30	132	155	1	1		1	1	
CH 229x76x26	161	184	1	1		1	1	
CH 229x89x33	132	153	1	1		1	1	
CH 245x76x28	163	184	1	1		1	1	
CH 245x89x36	132	151	1	1		1	1	
CH 305x89x42	132	149	1	1		1	1	
CH 305x102x46	122	140	1	1		1	1	
CH 305x102x55	124	139	1	1		1	2	
CH 432x102x65	117	130	1	1		1	2	



PROFILE TYPE			FLEXION			COMPRESSION		
H	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
H 100x100x6x8	139	185	1	1		1	1	
H 125x125x6,5x9	125	167	1	1		1	1	
H 150x75x5x7	210	252	1	1		1	1	
H 150x150x7x10	113	151	1	1		1	1	
H 175x175x7,5x11	102	136	1	1		1	1	
H 200x100x4,5x7	218	262	1	1		2	4	
H 200x100x5,5x8	187	225	1	1		1	2	
H 200x200x8x12	94	126	1	2		1	2	
H 200x200x12x12	84	113	1	2		1	2	
H 250x125x5x8	194	233	1	1		4	4	
H 250x125x6x9	169	203	1	1		2	4	
H 250x250x11x11	91	122	3	3		3	3	
H 250x250x9x14	82	109	1	2		1	2	
H 250x250x14x14	73	97	1	3		1	3	
H 300x150x5,5x8	183	219	1	3		4	4	
H 300x150x6,5x9	160	192	1	2		3	4	
H 300x300x12x12	84	112	3	4		3	4	
H 300x300x10x15	76	101	1	3		1	3	
H 300x300x15x15	68	91	2	3		2	3	
H 350x175x6x9	165	198	1	3		4	4	
H 350x175x7x11	139	167	1	1		4	4	
H 350x350x13x13	77	103	3	4		3	4	
H 350x350x10x16	72	96	2	3		2	3	
H 350x350x16x16	63	85	3	3		3	3	
H 350x350x12x19	61	81	1	3		1	3	
H 350x350x19x19	54	72	1	3		1	3	
H 400x300x10x16	81	104	1	3		2	3	
H 400x400x15x15	66	89	3	4		3	4	
H 400x400x11x18	63	85	3	3		3	3	
H 400x400x18x18	56	75	3	3		3	3	
H 400x400x13x21	55	73	1	3		1	3	
H 400x400x21x21	48	64	1	3		1	3	
H 400x400x18x28	42	55	1	1		1	1	
H 400x400x20x35	35	46	1	1		1	1	
H 400x400x30x50	25	33	1	1		1	1	
H 500x200x9x14	120	140	1	1		4	4	
H 500x200x10x16	107	125	1	1		4	4	
H 500x200x11x19	94	109	1	1		3	4	
H 500x300x11x15	90	111	1	3		3	4	
H 500x300x11x18	80	99	1	2		3	4	
H 600x300x12x17	87	104	1	2		4	4	
H 600x300x12x20	79	95	1	1		4	4	
H 600x300x14x23	69	83	1	1		2	4	
H 700x300x13x20	81	96	1	1		4	4	
H 700x300x13x24	73	86	1	1		4	4	
H 800x300x14x22	79	91	1	1		4	4	
H 800x300x14x26	72	83	1	1		4	4	
H 900x300x15x23	78	89	1	1		4	4	
H 900x300x16x28	69	78	1	1		4	4	
H 900x300x18x34	59	67	1	1		4	4	



VALUES OF FACTOR SECTION AND DUCTILITY CLASS OF LAMINATED PROFILES



PROFILE TYPE			FLEXION			COMPRESSION		
HD	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
HD 260 x 68,2	88	117	2	3	3	2	3	3
HD 260 x 93,0	66	88	1	1	2	1	1	2
HD 260 x 114	55	73	1	1	1	1	1	1
HD 260 x 142	46	60	1	1	1	1	1	1
HD 260 x 172	39	51	1	1	1	1	1	1
HD 320 x 74,2	95	127	3	4	4	3	4	4
HD 320 x 97,6	74	98	1	3	3	1	3	3
HD 320 x 127	58	77	1	1	2	1	1	2
HD 320 x 158	48	63	1	1	1	1	1	1
HD 320 x 198	39	51	1	1	1	1	1	1
HD 320 x 245	33	43	1	1	1	1	1	1
HD 320 x 300	28	36	1	1	1	1	1	1
HD 360 x 134	63	85	2	3	3	2	3	3
HD 360 x 147	58	78	1	3	3	1	3	3
HD 360 x 162	53	71	1	2	3	1	2	3
HD 360 x 179	49	65	1	1	2	1	1	2
HD 360 x 196	45	60	1	1	1	1	1	1
HD 400 x 187	47	64	1	2	3	1	2	3
HD 400 x 216	42	56	1	1	1	1	1	1
HD 400 x 237	38	52	1	1	1	1	1	1
HD 400 x 262	35	47	1	1	1	1	1	1
HD 400 x 287	32	43	1	1	1	1	1	1
HD 400 x 314	30	40	1	1	1	1	1	1
HD 400 x 347	28	37	1	1	1	1	1	1
HD 400 x 382	25	34	1	1	1	1	1	1
HD 400 x 421	23	31	1	1	1	1	1	1
HD 400 x 463	22	29	1	1	1	1	1	1
HD 400 x 509	20	27	1	1	1	1	1	1
HD 400 x 551	19	25	1	1	1	1	1	1
HD 400 x 592	18	23	1	1	1	1	1	1
HD 400 x 634	17	22	1	1	1	1	1	1
HD 400 x 677	16	21	1	1	1	1	1	1
HD 400 x 744	15	20	1	1	1	1	1	1
HD 400 x 818	14	18	1	1	1	1	1	1
HD 400 x 900	13	17	1	1	1	1	1	1
HD 400 x 990	12	16	1	1	1	1	1	1
HD 400 x 1086	11	15	1	1	1	1	1	1



PROFILE TYPE			FLEXION			COMPRESSION		
HE	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
HE 100 AA	181	245	1	3	3	1	3	3
HE 100 A	138	185	1	1	1	1	1	1
HE 100 B	115	154	1	1	1	1	1	1
HE 100 M	65	85	1	1	1	1	1	1
HE 120 AA	182	247	2	3	4	2	3	4
HE 120 A	137	185	1	1	2	1	1	2
HE 120 B	106	141	1	1	1	1	1	1
HE 120 M	61	80	1	1	1	1	1	1
HE 140 AA	172	233	3	3	4	3	3	4



PROFILE TYPE			FLEXION			COMPRESSION		
HE	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
HE 140 A	129	174	1	2	3	1	2	3
HE 140 B	98	130	1	1	1	1	1	1
HE 140 M	58	76	1	1	1	1	1	1
HE 160 AA	150	203	3	3	4	3	3	4
HE 160 A	120	161	1	2	3	1	2	3
HE 160 B	88	118	1	1	1	1	1	1
HE 160 M	54	71	1	1	1	1	1	1
HE 180 AA	141	190	3	3	4	3	3	4
HE 180 A	115	155	1	3	3	1	3	3
HE 180 B	83	110	1	1	1	1	1	1
HE 180 M	52	68	1	1	1	1	1	1
HE 200 AA	130	175	3	4	4	3	4	4
HE 200 A	108	145	1	3	3	1	3	3
HE 200 B	77	102	1	1	1	1	1	1
HE 200 M	49	65	1	1	1	1	1	1
HE 220 AA	122	165	3	4	4	3	4	4
HE 220 A	99	134	1	3	3	1	3	3
HE 220 B	72	97	1	1	1	1	1	1
HE 220 M	47	62	1	1	1	1	1	1
HE 240 AA	114	154	3	4	4	3	4	4
HE 240 A	91	122	1	3	3	1	3	3
HE 240 B	68	91	1	1	1	1	1	1
HE 240 M	39	52	1	1	-	1	1	-
HE 260 AA	108	146	3	4	4	3	4	4
HE 260 A	88	117	2	3	3	2	3	3
HE 260 B	66	88	1	1	2	1	1	2
HE 260 M	39	51	1	1	1	1	1	1
HE 280 AA	104	139	3	4	4	3	4	4-
HE 280 A	84	113	2	3	4	2	3	4
HE 280 B	64	85	1	1	2	1	1	2
HE 280 M	38	50	1	1	1	1	1	1
HE 300 AA	97	131	3	4	4	3	4	4
HE 300 A	78	105	2	3	3	2	3	3
HE 300 B	60	80	1	1	3	1	1	3
HE 300 M	33	43	1	1	1	1	1	1
HE 320 AA	95	127	3	4	4	3	4	4
HE 320 A	74	98	1	3	3	1	3	3
HE 320 B	58	77	1	1	2	1	1	2
HE 320 M	33	43	1	1	1	1	1	1
HE 340 AA	94	123	3	4	4	3	4	4
HE 340 A	72	94	1	3	3	1	3	3
HE 340 B	57	75	1	1	1	1	1	1
HE 340 M	34	43	1	1	1	1	1	1
HE 360 AA	92	120	3	4	4	3	4	4
HE 360 A	70	91	1	2	3	1	2	3
HE 360 B	56	73	1	1	1	1	1	1
HE 360 M	34	44	1	1	1	1	1	1
HE 400 AA	90	115	3	3	4	3	3	4
HE 400 A	68	87	1	1	3	1	2	3
HE 400 B	56	71	1	1	1	1	1	1
HE 400 M	36	45	1	1	1	1	1	1
HE 450 AA	91	114	3	3	4	3	4	4
HE 450 A	66	83	1	1	1	1	2	3



VALUES OF FACTOR SECTION AND DUCTILITY CLASS OF LAMINATED PROFILES



PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
HE 450 B	55	69	1	1	1	1	1	2
HE 450 M	38	47	1	1	1	1	1	1
HE 500 AA	91	113	2	3	3	2	4	4
HE 500 A	65	80	1	1	1	1	3	4
HE 500 B	54	67	1	1	1	1	2	2
HE 500 M	39	48	1	1	1	1	1	1
HE 550 AA	88	108	1	3	3	3	4	4
HE 550 A	65	79	1	1	1	2	4	4
HE 550 B	55	67	1	1	1	1	2	3
HE 550 M	41	50	1	1	1	1	1	1
HE 600 AA	88	106	1	3	3	3	4	4
HE 600 A	65	79	1	1	1	2	4	4
HE 600 B	56	67	1	1	1	1	3	4
HE 600 M	42	51	1	1	1	1	1	1
HE 600 x 337	37	44	1	1	1	1	1	1
HE 600 x 399	32	38	1	1	1	1	1	1
HE 650 AA	88	105	1	3	3	4	4	4
HE 650 A	65	78	1	1	1	3	4	4
HE 650 B	56	66	1	1	1	2	3	4
HE 650 M	44	52	1	1	1	1	1	2
HE 650 x 343	38	45	1	1	1	1	1	1
HE 650 x 407	33	39	1	1	1	1	1	1
HE 700 AA	86	102	1	2	3	4	4	4
HE 700 A	64	76	1	1	1	3	4	4
HE 700 B	55	65	1	1	1	2	4	4
HE 700 M	45	53	1	1	1	1	2	3
HE 700 x 352	39	46	1	1	1	1	1	1
HE 700 x 418	34	40	1	1	1	1	1	1
HE 800 AA	84	98	1	2	3	4	4	4
HE 800 A	66	76	1	1	1	4	4	4
HE 800 B	57	66	1	1	1	3	4	4
HE 800 M	48	55	1	1	1	1	3	4
HE 800 x 373	41	48	1	1	1	1	2	2
HE 800 x 444	35	41	1	1	1	1	1	1
HE 900 AA	81	93	1	1	2	4	4	4
HE 900 A	65	74	1	1	1	4	4	4
HE 900 B	57	65	1	1	1	3	4	4
HE 900 M	50	57	1	1	1	2	4	4
HE 900 x 391	43	49	1	1	1	1	3	4
HE 900 x 466	37	42	1	1	1	1	1	2
HE 1000 AA	79	90	1	1	-	4	4	-
HE 1000 x 249	71	81	1	1	2	4	4	4
HE 1000 A	66	74	1	1	2	4	4	4
HE 1000 B	57	65	1	1	1	4	4	4
HE 1000 M	52	59	1	1	1	3	4	4
HE 1000 x 393	47	53	1	1	1	2	4	4
HE 1000 x 415	44	50	1	1	1	2	3	4
HE 1000 x 438	42	48	1	1	1	1	3	4
HE 1000 x 494	38	43	1	1	1	1	2	3
HE 1000 x 584	33	37	1	1	1	1	1	2



PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
HL 920 x 345	52	62	1	1	1	4	4	4
HL 920 x 368	49	58	1	1	1	3	4	4
HL 920 x 390	46	55	1	1	1	3	4	4
HL 920 x 420	43	51	1	1	1	2	4	4
HL 920 x 449	41	48	1	1	1	2	4	4
HL 920 x 491	37	44	1	1	1	1	3	4
HL 920 x 537	35	41	1	1	1	1	2	3
HL 920 x 588	32	37	1	1	1	1	1	2
HL 920 x 656	29	34	1	1	1	1	1	2
HL 920 x 725	26	31	1	1	1	1	1	1
HL 920 x 787	25	29	1	1	1	1	1	1
HL 920 x 970	20	24	1	1	1	1	1	1
HL 1000 AA	63	73	1	1	2	4	4	4
HL 1000 A	58	68	1	1	2	4	4	4
HL 1000 B	51	59	1	1	1	4	4	4
HL 1000 M	46	54	1	1	1	3	4	4
HL 1000 x 443	43	50	1	1	1	2	4	4
HL 1000 x 483	40	46	1	1	1	2	4	4
HL 1000 x 539	36	42	1	1	1	1	2	4
HL 1000 x 554	35	41	1	1	1	1	2	3
HL 1000 x 591	33	39	1	1	1	1	2	3
HL 1000 x 642	31	36	1	1	1	1	1	2
HL 1000 x 748	27	31	1	1	1	1	1	1
HL 1000 x 883	23	27	1	1	-	1	1	-
HL 1100 A	59	68	1	1	2	4	4	4
HL 1100 B	52	60	1	1	1	4	4	4
HL 1100 M	47	55	1	1	1	4	4	4
HL 1100 R	42	48	1	1	1	2	4	4



PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
HP 200 x 43	112	150	3	3	4	3	3	4
HP 200 x 53	90	121	1	3	3	1	3	3
HP 220 x 57	88	119	2	3	3	2	3	3
HP 260 x 75	80	108	3	3	4	3	3	4
HP 260 x 87	70	94	1	3	3	1	3	3
HP 305 x 79	91	121	3	4	4	3	4	4
HP 305 x 88	81	109	3	4	4	3	4	4
HP 305 x 95	76	101	3	3	4	3	3	4
HP 305 x 110	66	88	2	3	3	2	3	3
HP 305 x 126	58	78	1	2	3	1	2	3
HP 305 x 149	50	67	1	1	2	1	1	2
HP 305 x 180	42	56	1	1	1	1	1	1
HP 305 x 186	41	55	1	1	1	1	1	1
HP 305 x 223	35	47	1	1	1	1	1	1
HP 320 x 88	81	108	3	4	4	3	4	4



VALUES OF FACTOR SECTION AND DUCTILITY CLASS OF LAMINATED PROFILES

PROFILE TYPE			FLEXION			COMPRESSION		
HP	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
HP 320 x 103	70	94	2	3	4	2	3	4
HP 320 x 117	62	83	1	3	3	1	3	3
HP 320 x 147	51	68	1	1	2	1	1	2
HP 320 x 184	42	55	1	1	1	1	1	1
HP 360 x 84	98	132	4	4	4	4	4	4
HP 360 x 109	77	103	3	4	4	3	4	4
HP 360 x 133	64	86	3	3	4	3	3	4
HP 360 x 152	56	76	2	3	3	2	3	3
HP 360 x 174	50	67	1	3	3	1	3	3
HP 360 x 180	48	65	1	3	3	1	3	3
HP 400 x 122	70	95	3	4	4	3	4	4
HP 400 x 140	61	83	3	4	4	3	4	4
HP 400 x 158	55	74	2	3	4	2	3	4
HP 400 x 176	50	67	1	3	3	1	3	3
HP 400 x 194	46	62	1	3	3	1	3	3
HP 400 x 213	42	57	1	2	3	1	2	3
HP 400 x 231	39	53	1	1	2	1	1	2

PROFILE TYPE			FLEXION			COMPRESSION		
INP	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
INP 80	266	322	4	4		4	4	
INP 100	236	283	1	1		1	1	
INP 120	210	251	1	1		1	1	
INP 140	189	225	1	1		1	1	
INP 160	173	205	1	1		1	1	
INP 180	158	188	1	1		1	1	
INP 200	147	174	1	1		1	1	
INP 220	136	161	1	1		1	1	
INP 240	127	150	1	1		1	1	
INP 260	119	140	1	1		1	1	
INP 280	111	131	1	1		1	1	
INP 300	105	123	1	1		1	1	
INP 320	99	116	1	1		1	1	
INP 340	94	110	1	1		1	1	
INP 360	89	104	1	1		1	1	
INP 380	85	99	1	1		1	1	
INP 400	81	94	1	1		1	1	
INP 450	73	84	1	1		1	1	
INP 500	66	77	1	1		1	1	
INP 550	61	71	1	1		1	1	
INP 600	56	64	1	1		1	1	

PROFILE TYPE			FLEXION			COMPRESSION		
IPE	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
IPE 80 A	317	389	1	1	-	1	1	-
IPE 80	270	330	1	1	-	1	1	-
IPE A 100	286	349	1	1	-	1	1	-
IPE 100	247	300	1	1	-	1	1	-
IPE A 120	271	329	1	1	1	1	1	2
IPE 120	230	279	1	1	1	1	1	1
IPE A 140	260	314	1	1	1	1	2	3
IPE 140	215	259	1	1	1	1	1	2
IPE A 160	245	295	1	1	1	1	3	4
IPE 160	200	241	1	1	1	1	1	2
IPE A 180	227	274	1	1	1	2	3	4
IPE 180	188	226	1	1	1	1	2	3
IPE O 180	168	202	1	1	1	1	1	2
IPE A 200	210	253	1	1	1	2	4	4
IPE 200	176	211	1	1	1	1	2	3
IPE O 200	158	190	1	1	1	1	1	2
IPE A 220	193	231	1	1	1	2	4	4
IPE 220	165	198	1	1	1	1	2	4
IPE O 220	149	179	1	1	1	1	2	2
IPE A 240	178	214	1	1	2	2	4	4
IPE 240	153	184	1	1	1	1	2	4
IPE O 240	139	167	1	1	1	1	2	3
IPE A 270	171	205	1	1	2	3	4	4
IPE 270	147	176	1	1	1	2	3	4
IPE O 270	127	152	1	1	1	1	2	3
IPE A 300	160	192	1	2	3	3	4	4
IPE 300	139	167	1	1	1	2	4	4
IPE O 300	121	145	1	1	1	1	3	4
IPE A 330	149	178	1	1	2	3	4	4
IPE 330	131	157	1	1	1	2	4	4
IPE O 330	114	137	1	1	1	1	3	4
IPE A 360	138	165	1	1	2	4	4	4
IPE 360	122	146	1	1	1	2	4	4
IPE O 360	107	127	1	1	1	1	3	4
IPE A 400	133	158	1	1	2	4	4	4
IPE 400	116	137	1	1	1	3	4	4
IPE O 400	103	122	1	1	1	2	3	4
IPE A 450	127	149	1	1	2	4	4	4
IPE 450	110	130	1	1	1	3	4	4
IPE O 450	94	110	1	1	1	2	4	4
IPE A 500	118	138	1	1	1	4	4	4
IPE 500	104	121	1	1	1	3	4	4
IPE O 500	89	104	1	1	1	2	4	4
IPE A 550	111	129	1	1	2	4	4	4
IPE 550	97	113	1	1	1	4	4	4
IPE O 550	85	98	1	1	1	2	4	4
IPE A 600	103	119	1	1	2	4	4	4
IPE 600	91	105	1	1	1	4	4	4
IPE O 600	73	85	1	1	1	2	4	4
750 x 137	101	116	1	2	-	4	4	-
750 x 147	94	109	1	1	2	4	4	4
750 x 173	81	93	1	1	1	4	4	4
750 x 196	72	83	1	1	1	4	4	4



VALUES OF FACTOR SECTION AND DUCTILITY CLASS OF LAMINATED PROFILES

PROFILE TYPE			FLEXION			COMPRESSION		
J	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
J 76 x 76 x 13	142	190	1	1		1	1	
J 76 x 76 x 15	123	166	1	1		1	1	
J 89 x 89 x 19	109	146	1	1		1	1	
J 102 x 44 x 7	263	311	1	1		1	1	
J 102 x 102 x 23	106	141	1	1		1	1	
J 114 x 114 x 27	101	135	1	1		1	1	
J 127 x 76 x 16	158	195	1	1		1	1	
J 127 x 114 x 27	109	143	1	1		1	1	
J 127 x 114 x 29	100	131	1	1		1	1	
J 152 x 127 x 37	92	119	1	1		1	1	
J 203 x 152 x 52	85	108	1	1		1	1	
J 254 x 114 x 37	133	157	1	1		1	1	
J 254 x 203 x 82	68	88	1	1		1	1	

PROFILE TYPE			FLEXION			COMPRESSION		
MC	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
MC 150 x 17,9	161	189	1	1		1	1	
MC 150 x 22,5	132	158	1	1		1	1	
MC 150 x 22,8	135	165	1	1		1	1	
MC 150 x 24,3	123	147	1	1		1	1	
MC 150 x 26,8	115	141	1	1		1	1	
MC 180 x 28,4	122	146	1	1		1	1	
MC 180 x 33,8	104	125	1	1		1	1	
MC 200 x 12,6	282	311	1	1		2	4	
MC 200 x 27,8	136	157	1	1		1	1	
MC 200 x 29,8	127	147	1	1		1	1	
MC 200 x 31,8	122	143	1	1		1	1	
MC 200 x 33,9	115	135	1	1		1	1	
MC 230 x 35,6	120	139	1	1		1	1	
MC 230 x 37,8	113	132	1	1		1	1	
MC 250 x 12,5	342	365	1	1		4	4	
MC 250 x 33	141	161	1	1		1	1	
MC 250 x 37	126	144	1	1		1	1	
MC 250 x 42,4	113	131	1	1		1	1	
MC 250 x 50	96	113	1	1		1	1	
MC 250 x 61,2	79	93	1	1		1	1	
MC 310 x 15,8	322	341	1	1		4	4	
MC 310 x 46	121	137	1	1		1	1	
MC 310 x 52	107	121	1	1		1	1	
MC 310 x 60	93	106	1	1		1	1	
MC 310 x 67	83	95	1	1		1	1	
MC 310 x 74	76	87	1	1		1	1	
MC 330 x 47,3	126	143	1	1		1	1	
MC 330 x 52	115	131	1	1		1	1	
MC 330 x 60	101	115	1	1		1	1	
MC 330 x 74	82	94	1	1		1	1	
MC 460 x 63,5	125	138	1	1		1	3	
MC 460 x 68,2	117	129	1	1		1	2	
MC 460 x 77,2	104	114	1	1		1	1	
MC 460 x 86	93	103	1	1		1	1	

PROFILE TYPE			FLEXION			COMPRESSION		
PFC	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
PFC 100x50x10	192	231	1	1		1	1	
PFC 125x65x15	168	202	1	1		1	1	
PFC 150x75x18	165	198	1	1		1	1	
PFC 150x90x24	128	158	1	1		1	1	
PFC 180x75x20	168	197	1	1		1	1	
PFC 180x90x26	136	163	1	1		1	1	
PFC 200x75x23	159	184	1	1		1	1	
PFC 200x90x30	129	153	1	1		1	1	
PFC 230x75x26	164	187	1	1		1	2	
PFC 230x90x32	134	156	1	1		1	1	
PFC 260x75x28	169	191	1	1		1	2	
PFC 260x90x35	137	158	1	1		1	1	
PFC 300x90x41	131	148	1	1		1	2	
PFC 300x100x46	121	138	1	1		1	1	
PFC 380x100x54	125	140	1	1		2	3	
PFC 430x100x64	117	129	1	1		1	3	

PROFILE TYPE			FLEXION			COMPRESSION		
S	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
S 75 x 8,5	195	249	1	1		1	1	
S 75 x 11,2	151	196	1	1		1	1	
S 100 x 11,5	186	232	1	1		1	1	
S 100 x 14,1	153	193	1	1		1	1	
S 130 x 15	175	215	1	1		1	1	
S 150 x 18,6	165	201	1	1		1	1	
S 150 x 25,7	121	149	1	1		1	1	
S 200 x 27,4	146	175	1	1		1	1	
S 200 x 34	117	142	1	1		1	1	
S 250 x 37,8	130	155	1	1		1	1	
S 250 x 52	95	114	1	1		1	1	
S 310 x 47,3	122	143	1	1		1	2	
S 310 x 52	111	131	1	1		1	1	
S 310 x 60,7	96	113	1	1		1	1	
S 310 x 74	79	94	1	1		1	1	
S 380 x 64	111	128	1	1		1	3	
S 380 x 74	95	111	1	1		1	1	
S 460 x 81,4	103	117	1	1		2	3	
S 460 x 104	81	93	1	1		1	1	
S 510 x 98,2	94	107	1	1		2	3	
S 510 x 112	83	95	1	1		1	2	
S 510 x 128	74	85	1	1		1	1	
S 510 x 143	67	77	1	1		1	1	
S 610 x 119	92	104	1	1		4	4	
S 610 x 134	82	93	1	1		2	3	
S 610 x 149	74	84	1	1		1	2	
S 610 x 158	72	82	1	1		2	3	
S 610 x 180	63	72	1	1		1	1	



VALUES OF FACTOR SECTION AND DUCTILITY CLASS OF LAMINATED PROFILES

PROFILE TYPE			FLEXION			COMPRESSION		
U	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
U 40 x 20	273	328	1	1		1	1	
U 50 x 25	254	305	1	1		1	1	
U 60 x 30	232	279	1	1		1	1	
U 65 x 42	190	237	1	1		1	1	

PROFILE TYPE			FLEXION			COMPRESSION		
UB	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
UB 127 x 76 x 13	200	246	1	1	-	1	1	-
UB 152 x 89 x 16	194	237	1	1	-	1	2	-
UB 178 x 102 x 19	188	230	1	1	1	1	2	4
UB 203 x 102 x 23	173	207	1	1	1	1	3	4
UB 203 x 133 x 25	169	210	1	2	3	1	2	4
UB 203 x 133 x 30	143	178	1	1	1	1	2	2
UB 254 x 102 x 22	218	254	1	1	-	3	4	-
UB 254 x 102 x 25	192	224	1	1	-	2	4	-
UB 254 x 102 x 28	173	201	1	1	-	2	4	-
UB 254 x 146 x 31	164	200	1	2	-	2	4	-
UB 254 x 146 x 37	140	171	1	1	-	2	4	-
UB 254 x 146 x 43	122	149	1	1	-	1	2	-
UB 305 x 102 x 25	225	257	1	1	-	4	4	-
UB 305 x 102 x 28	200	229	1	1	-	4	4	-
UB 305 x 102 x 33	174	198	1	1	-	3	4	-
UB 305 x 127 x 37	155	181	1	1	-	2	4	-
UB 305 x 127 x 42	138	162	1	1	-	2	3	-
UB 305 x 127 x 48	122	143	1	1	-	1	2	-
UB 305 x 165 x 40	150	183	1	1	-	4	4	-
UB 305 x 165 x 46	133	161	1	1	-	3	4	-
UB 305 x 165 x 54	115	139	1	1	-	2	3	-
UB 356 x 127 x 33	195	225	1	1	-	4	4	-
UB 356 x 127 x 39	167	193	1	1	-	4	4	-
UB 356 x 171 x 45	152	182	1	2	-	4	4	-
UB 356 x 171 x 51	136	162	1	1	-	4	4	-
UB 356 x 171 x 57	122	146	1	1	-	3	4	-
UB 356 x 171 x 67	105	126	1	1	-	2	4	-
UB 406 x 140 x 39	189	217	1	2	-	4	4	-
UB 406 x 140 x 46	162	186	1	1	-	4	4	-
UB 406 x 178 x 54	143	168	1	2	3	4	4	4
UB 406 x 178 x 60	129	153	1	1	1	4	4	4
UB 406 x 178 x 67	117	138	1	1	1	3	4	4
UB 406 x 178 x 74	106	125	1	1	1	2	4	4
UB 457 x 152 x 52	158	181	1	1	2	4	4	4
UB 457 x 152 x 60	139	159	1	1	1	4	4	4
UB 457 x 152 x 67	125	143	1	1	1	4	4	4
UB 457 x 152 x 74	114	130	1	1	1	4	4	4
UB 457 x 152 x 82	104	119	1	1	1	3	4	4
UB 457 x 191 x 67	128	150	1	1	2	4	4	4
UB 457 x 191 x 74	117	137	1	1	1	4	4	4
UB 457 x 191 x 82	106	125	1	1	1	3	4	4
UB 457 x 191 x 89	98	115	1	1	1	3	4	4

PROFILE TYPE			FLEXION			COMPRESSION		
UB	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
UB 457 x 191 x 98	90	105	1	1	1	2	4	4
UB 533 x 210 x 82	121	141	1	1	3	4	4	4
UB 533 x 210 x 92	109	126	1	1	1	4	4	4
UB 533 x 210 x 101	100	116	1	1	1	4	4	4
UB 533 x 210 x 109	93	108	1	1	1	3	4	4
UB 533 x 210 x 122	84	97	1	1	1	2	4	4
UB 610 x 229 x 101	111	129	1	1	2	4	4	4
UB 610 x 229 x 113	100	116	1	1	1	4	4	4
UB 610 x 229 x 125	91	106	1	1	1	4	4	4
UB 610 x 229 x 140	82	95	1	1	1	3	4	4
UB 610 x 305 x 149	80	97	1	1	2	4	4	4
UB 610 x 305 x 179	68	81	1	1	1	3	4	4
UB 610 x 305 x 238	52	62	1	1	1	1	2	3
UB 686 x 254 x 125	101	117	1	1	2	4	4	4
UB 686 x 254 x 140	91	105	1	1	1	4	4	4
UB 686 x 254 x 152	84	97	1	1	1	4	4	4
UB 686 x 254 x 170	76	88	1	1	1	4	4	4
UB 762 x 267 x 147	95	109	1	1	2	4	4	4
UB 762 x 267 x 173	81	93	1	1	1	4	4	4
UB 762 x 267 x 197	72	83	1	1	1	4	4	4
UB 838 x 292 x 176	88	101	1	1	2	4	4	4
UB 838 x 292 x 194	80	92	1	1	2	4	4	4
UB 838 x 292 x 226	69	79	1	1	1	4	4	4
UB 914 x 305 x 201	82	94	1	1	-	4	4	-
UB 914 x 305 x 224	74	85	1	1	2	4	4	4
UB 914 x 305 x 253	66	76	1	1	1	4	4	4
UB 914 x 305 x 289	59	67	1	1	1	4	4	4
UB 914 x 419 x 343	51	61	1	1	1	3	4	4
UB 914 x 419 x 388	46	54	1	1	1	2	4	4
UB1016 x 305 x 222	79	90	1	1	-	4	4	-
UB1016 x 305 x 249	71	81	1	1	2	4	4	4
UB1016 x 305 x 272	66	74	1	1	2	4	4	4
UB1016 x 305 x 314	58	65	1	1	1	4	4	4
UB1016 x 305 x 349	52	59	1	1	1	3	4	4
UB1016 x 305 x 393	47	53	1	1	1	2	4	4
UB1016 x 305 x 415	44	50	1	1	1	2	3	4
UB1016 x 305 x 438	42	48	1	1	1	1	3	4
UB1016 x 305 x 494	38	43	1	1	1	1	2	3
UB1016 x 305 x 584	33	37	1	1	1	1	1	2

PROFILE TYPE			FLEXION			COMPRESSION		
UBP	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
UBP 203x203x45	106	142	2	3	4	2	3	4
UBP 203x203x54	90	120	1	3	3	1	3	3
UBP 254x254x63	94	126	3	3	4	3	3	4
UBP 254x254x71	84	112	2	3	4	2	3	4
UBP 254x254x85	71	95	1	3	3	1	3	3
UBP 305x305x79	90	121	3	4	4	3	4	4
UBP 305x305x88	81	109	3	4	4	3	4	4



VALUES OF FACTOR SECTION AND DUCTILITY CLASS OF LAMINATED PROFILES

PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
UBP								
UBP 305x305x95	76	101	3	3	4	3	3	4
UBP 305x305x110	66	88	2	3	3	2	3	3
UBP 305x305x126	58	78	1	2	3	1	2	3
UBP 305x305x149	50	67	1	1	2	1	1	2
UBP 305x305x186	41	55	1	1	1	1	1	1
UBP 305x305x223	35	47	1	1	1	1	1	1
UBP 356x368x109	77	103	3	4	4	3	4	4
UBP 356x368x133	64	86	3	3	4	3	3	4
UBP 356x368x152	56	76	2	3	3	2	3	3
UBP 356x368x174	50	67	1	3	3	1	3	3

PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
UC								
UC 152 x 152 x 23	156	208	3	3	4	3	3	4
UC 152 x 152 x 30	122	162	1	1	3	1	1	3
UC 152 x 152 x 37	101	134	1	1	1	1	1	1
UC 203 x 203 x 46	104	139	1	3	3	1	3	3
UC 203 x 203 x 52	93	124	1	2	3	1	2	3
UC 203 x 203 x 60	82	109	1	1	2	1	1	2
UC 203 x 203 x 71	71	93	1	1	1	1	1	1
UC 203 x 203 x 86	60	79	1	1	1	1	1	1
UC 254 x 254 x 73	82	109	1	3	3	1	3	3
UC 254 x 254 x 89	69	91	1	1	2	1	1	2
UC 254 x 254 x 107	58	77	1	1	1	1	1	1
UC 254 x 254 x 132	48	64	1	1	1	1	1	1
UC 254 x 254 x 167	40	52	1	1	1	1	1	1
UC 305 x 305 x 97	75	99	1	3	3	1	3	3
UC 305 x 305 x 118	62	83	1	2	3	1	2	3
UC 305 x 305 x 137	54	72	1	1	1	1	1	1
UC 305 x 305 x 158	48	63	1	1	1	1	1	1
UC 305 x 305 x 198	39	52	1	1	1	1	1	1
UC 305 x 305 x 240	33	44	1	1	1	1	1	1
UC 305 x 305 x 283	29	38	1	1	1	1	1	1
UC 356 x 368 x 129	66	88	2	3	3	2	3	3
UC 356 x 368 x 153	56	75	1	2	3	1	2	3
UC 356 x 368 x 177	49	66	1	1	2	1	1	2
UC 356 x 368 x 202	44	58	1	1	1	1	1	1
UC 356 x 406 x 235	39	52	1	1	1	1	1	1
UC 356 x 406 x 287	32	43	1	1	1	1	1	1
UC 356 x 406 x 340	28	37	1	1	1	1	1	1
UC 356 x 406 x 393	25	33	1	1	1	1	1	1
UC 356 x 406 x 467	22	29	1	1	1	1	1	1
UC 356 x 406 x 551	19	25	1	1	1	1	1	1
UC 356 x 406 x 634	17	22	1	1	1	1	1	1



PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
UPE								
UPE 80	209	258	1	1		1	1	
UPE 100	204	248	1	1		1	1	
UPE 120	195	233	1	1		1	1	
UPE 140	187	223	1	1		1	1	
UPE 160	180	212	1	1		1	1	
UPE 180	173	203	1	1		1	1	
UPE 200	165	193	1	1		1	1	
UPE 220	155	180	1	1		1	1	
UPE 240	148	171	1	1		1	1	
UPE 270	142	163	1	1		1	2	
UPE 300	124	141	1	1		1	1	
UPE 330	113	128	1	1		1	1	
UPE 360	107	121	1	1		1	1	
UPE 400	100	112	1	1		1	1	



PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
UPN								
UPN 80	186	227	1	1		1	1	
UPN 100	185	222	1	1		1	1	
UPN 120	174	206	1	1		1	1	
UPN 140	167	196	1	1		1	1	
UPN 160	160	188	1	1		1	1	
UPN 180	154	179	1	1		1	1	
UPN 200	148	171	1	1		1	1	
UPN 220	139	160	1	1		1	1	
UPN 240	134	154	1	1		1	1	
UPN 260	126	145	1	1		1	1	
UPN 280	123	141	1	1		1	1	
UPN 300	119	136	1	1		1	1	
UPN 320	98	111	1	1		1	1	
UPN 350	103	116	1	1		1	1	
UPN 380	107	120	1	1		1	1	
UPN 400	99	111	1	1		1	1	

PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
W								
W 100 x 100 x 19.3	127	169	1	1	-	1	1	-
W 130 x 130 x 23.8	126	168	1	1	-	1	1	-
W 130 x 130 x 28.1	109	144	1	1	-	1	1	-
W 150 x 100 x 13.5	231	289	1	3	-	1	3	-
W 150 x 100 x 18.0	175	219	1	1	-	1	1	-
W 150 x 100 x 24.0	138	172	1	1	-	1	1	-
W 150 x 150 x 22.5	160	213	3	3	4	3	3	4
W 150 x 150 x 29.8	123	164	1	2	3	1	2	3
W 150 x 150 x 37.1	101	134	1	1	1	1	1	1





VALUES OF FACTOR SECTION AND DUCTILITY CLASS OF LAMINATED PROFILES



PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
W 200 x 100 x 15.0	261	313	1	3	-	3	4	-
W 200 x 100 x 19.3	204	245	1	1	-	1	2	-
W 200 x 100 x 22.5	179	215	1	1	-	1	2	-
W 200 x 135 x 26.6	161	200	1	1	3	1	2	4
W 200 x 135 x 31.3	139	172	1	1	1	1	2	2
W 200 x 165 x 35.9	124	160	1	1	3	1	1	3
W 200 x 165 x 41.7	108	140	1	1	1	1	1	1
W 200 x 200 x 46.1	104	139	1	3	3	1	3	3
W 200 x 200 x 52	93	123	1	1	3	1	1	3
W 200 x 200 x 59	83	110	1	1	2	1	1	2
W 200 x 200 x 71	70	93	1	1	1	1	1	1
W 200 x 200 x 86	59	78	1	1	1	1	1	1
W 200 x 200 x 100	53	69	1	1	1	1	1	1
W 250 x 100 x 17.9	264	308	1	3	-	4	4	-
W 250 x 100 x 22.3	213	248	1	1	-	3	4	-
W 250 x 100 x 25.3	190	222	1	1	-	2	4	-
W 250 x 100 x 28.4	172	200	1	1	-	2	4	-
W 250 x 145 x 32.7	159	194	1	1	-	2	4	-
W 250 x 145 x 38.5	136	166	1	1	-	2	3	-
W 250 x 145 x 44.8	119	144	1	1	-	1	2	-
W 250 x 200 x 49.1	111	144	1	3	-	1	3	-
W 250 x 200 x 58	95	123	1	1	-	1	1	-
W 250 x 200 x 67	84	108	1	1	-	1	1	-
W 250 x 250 x 73	82	109	1	2	3	1	2	3
W 250 x 250 x 80	75	100	1	2	3	1	2	3
W 250 x 250 x 89	68	90	1	1	2	1	1	2
W 250 x 250 x 101	61	81	1	1	1	1	1	1
W 250 x 250 x 115	55	72	1	1	1	1	1	1
W 250 x 250 x 131	49	64	1	1	1	1	1	1
W 250 x 250 x 149	44	57	1	1	1	1	1	1
W 250 x 250 x 167	40	52	1	1	1	1	1	1
W 310 x 100 x 21.0	263	301	1	2	-	4	4	-
W 310 x 100 x 23.8	234	267	1	1	-	4	4	-
W 310 x 100 x 28.3	200	228	1	1	-	4	4	-
W 310 x 100 x 32.7	174	198	1	1	-	3	4	-
W 310 x 165 x 38.7	158	192	1	2	-	4	4	-
W 310 x 165 x 44.5	139	168	1	1	-	3	4	-
W 310 x 165 x 52	120	145	1	1	-	2	4	-
W 310 x 200 x 60	107	133	1	1	-	1	3	-
W 310 x 200 x 67	96	120	1	1	-	1	2	-
W 310 x 200 x 74	87	109	1	1	-	1	1	-
W 310 x 250 x 79	86	111	1	2	-	1	2	-
W 310 x 250 x 86	79	103	1	1	-	1	2	-
W 310 x 310 x 97	75	99	1	3	3	1	3	3
W 310 x 310 x 107	68	91	1	3	3	1	3	3
W 310 x 310 x 117	62	83	1	2	3	1	2	3
W 310 x 310 x 129	57	76	1	1	2	1	1	2
W 310 x 310 x 143	52	69	1	1	1	1	1	1
W 310 x 310 x 158	48	64	1	1	1	1	1	1
W 310 x 310 x 179	43	57	1	1	1	1	1	1
W 310 x 310 x 202	39	51	1	1	1	1	1	1
W 310 x 310 x 226	35	46	1	1	1	1	1	1
W 310 x 310 x 253	32	42	1	1	1	1	1	1
W 310 x 310 x 283	29	38	1	1	1	1	1	1

PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
W 310 x 310 x 313	27	35	1	1	1	1	1	1
W 310 x 310 x 342	25	32	1	1	1	1	1	1
W 360 x 130 x 32.9	198	228	1	1	-	4	4	-
W 360 x 130 x 39.0	167	193	1	1	-	4	4	-
W 360 x 170 x 44	153	183	1	2	-	4	4	-
W 360 x 170 x 51	136	163	1	1	-	4	4	-
W 360 x 170 x 57.8	123	147	1	1	-	3	4	-
W 360 x 200 x 64	110	135	1	1	-	2	4	-
W 360 x 200 x 72	99	122	1	1	-	2	3	-
W 360 x 200 x 79+	90	111	1	1	-	1	2	-
W 360 x 250 x 91	83	105	1	1	-	1	2	-
W 360 x 250 x 101	75	95	1	1	-	1	2	-
W 360 x 250 x 110	70	88	1	1	-	1	1	-
W 360 x 250 x 122	63	80	1	1	-	1	1	-
W 360 x 370 x 134	63	85	2	3	3	2	3	3
W 360 x 370 x 147	58	78	1	3	3	1	3	3
W 360 x 370 x 162	53	71	1	2	3	1	2	3
W 360 x 370 x 179	49	65	1	1	2	1	1	2
W 360 x 370 x 196	45	60	1	1	1	1	1	1
W 360 x 410 x 216	42	56	1	1	1	1	1	1
W 360 x 410 x 237	38	52	1	1	1	1	1	1
W 360 x 410 x 262	35	47	1	1	1	1	1	1
W 360 x 410 x 287	32	43	1	1	1	1	1	1
W 360 x 410 x 314	30	40	1	1	1	1	1	1
W 360 x 410 x 347	28	37	1	1	1	1	1	1
W 360 x 410 x 382	25	34	1	1	1	1	1	1
W 360 x 410 x 421	23	31	1	1	1	1	1	1
W 360 x 410 x 463	22	29	1	1	1	1	1	1
W 360 x 410 x 509	20	27	1	1	1	1	1	1
W 360 x 410 x 551	19	25	1	1	1	1	1	1
W 360 x 410 x 592	18	23	1	1	1	1	1	1
W 360 x 410 x 634	17	22	1	1	1	1	1	1
W 360 x 410 x 677	16	21	1	1	1	1	1	1
W 360 x 410 x 744	15	20	1	1	1	1	1	1
W 360 x 410 x 818	14	18	1	1	1	1	1	1
W 360 x 410 x 900	13	17	1	1	1	1	1	1
W 360 x 410 x 990	12	16	1	1	1	1	1	1
W 360 x 410 x 1086	11	15	1	1	1	1	1	1
W 410 x 140 x 38.8	189	217	1	1	-	4	4	-
W 410 x 140 x 46.1	161	185	1	1	-	4	4	-
W 410 x 180 x 53	145	171	1	1	3	4	4	4
W 410 x 180 x 60	131	154	1	1	1	4	4	4
W 410 x 180 x 67	116	137	1	1	1	3	4	4
W 410 x 180 x 75	106	125	1	1	1	2	4	4
W 410 x 180 x 85	94	110	1	1	1	2	3	4
W 410 x 260 x 100	86	106	1	1	-	2	4	-
W 410 x 260 x 114	76	93	1	1	-	1	3	-
W 410 x 260 x 132	66	82	1	1	-	1	2	-
W 410 x 260 x 149	59	73	1	1	-	1	1	-
W 460 x 150 x 52	159	182	1	1	2	4	4	4
W 460 x 150 x 60	140	160	1	1	1	4	4	4
W 460 x 150 x 68	123	141	1	1	1	4	4	4
W 460 x 190 x 74	117	137	1	1	1	4	4	4
W 460 x 190 x 82	106	125	1	1	1	3	4	4



VALUES OF FACTOR SECTION AND DUCTILITY CLASS OF LAMINATED PROFILES

PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
W 460 x 190 x 89	98	115	1	1	1	3	4	4
W 460 x 190 x 97	91	107	1	1	1	2	4	4
W 460 x 190 x 106	84	99	1	1	1	1	3	4
W 460 x 280 x 113	84	103	1	1	-	2	4	-
W 460 x 280 x 128	74	92	1	1	-	2	3	-
W 460 x 280 x 144	67	82	1	1	-	1	2	-
W 460 x 280 x 158	62	76	1	1	-	1	2	-
W 460 x 280 x 177	55	68	1	1	-	1	1	-
W 460 x 280 x 193	51	63	1	1	-	1	1	-
W 460 x 280 x 213	47	58	1	1	-	1	1	-
W 460 x 280 x 235	43	53	1	1	-	1	1	-
W 460 x 280 x 260	39	48	1	1	-	1	1	-
W 530 x 165 x 66	145	165	1	1	-	4	4	-
W 530 x 165 x 74	128	146	1	1	-	4	4	-
W 530 x 165 x 85	115	130	1	1	-	4	4	-
W 530 x 210 x 92	108	126	1	1	-	4	4	-
W 530 x 210 x 101	99	115	1	1	-	4	4	-
W 530 x 210 x 109	93	108	1	1	-	3	4	-
W 530 x 210 x 123	83	96	1	1	-	2	4	-
W 530 x 210 x 138	74	87	1	1	-	1	3	-
W 530 x 315 x 150	73	89	1	1	-	2	4	-
W 530 x 315 x 165	67	82	1	1	-	2	3	-
W 530 x 315 x 182	61	75	1	1	-	1	3	-
W 530 x 315 x 196	57	69	1	1	-	1	2	-
W 530 x 315 x 219	52	63	1	1	-	1	1	-
W 530 x 315 x 248	46	56	1	1	-	1	1	-
W 530 x 315 x 272	42	52	1	1	-	1	1	-
W 530 x 315 x 300	39	47	1	1	-	1	1	-
W 610 x 180 x 82	132	149	1	1	-	4	4	-
W 610 x 180 x 92	118	133	1	1	-	4	4	-
W 610 x 230 x 101	110	128	1	1	-	4	4	-
W 610 x 230 x 113	100	116	1	1	-	4	4	-
W 610 x 230 x 125	91	105	1	1	1	4	4	4
W 610 x 230 x 140	82	95	1	1	1	3	4	4
W 610 x 230 x 153	75	87	1	1	1	3	4	4
W 610 x 325 x 155	78	95	1	2	3	4	4	4
W 610 x 325 x 174	70	85	1	1	2	3	4	4
W 610 x 325 x 195	63	76	1	1	1	2	4	4
W 610 x 325 x 217	57	69	1	1	1	2	3	4
W 610 x 325 x 241	53	64	1	1	1	1	3	4
W 610 x 325 x 262	48	58	1	1	1	1	2	3
W 610 x 325 x 285	45	54	1	1	1	1	1	2
W 610 x 325 x 341	38	46	1	1	1	1	1	1
W 610 x 325 x 415	32	38	1	1	1	1	1	1
W 610 x 325 x 455	30	36	1	1	1	1	1	1
W 610 x 325 x 498	27	33	1	1	1	1	1	1
W 610 x 325 x 551	25	30	1	1	1	1	1	1
W 690 x 250 x 125	101	116	1	1	-	4	4	-
W 690 x 250 x 140	91	105	1	1	-	4	4	-
W 690 x 250 x 152	84	97	1	1	1	4	4	4
W 690 x 250 x 170	76	88	1	1	1	4	4	4
W 690 x 250 x 192	68	78	1	1	1	3	4	4
W 760 x 265 x 147	94	109	1	1	-	4	4	-
W 760 x 265 x 161	87	100	1	1	1	4	4	4

PROFILE TYPE			FLEXION			COMPRESSION		
	(m-1)	(m-1)	S235	S355	S460	S235	S355	S460
W 760 x 265 x 173	81	93	1	1	1	4	4	4
W 760 x 265 x 185	76	88	1	1	1	4	4	4
W 760 x 265 x 196	72	83	1	1	1	4	4	4
W 760 x 265 x 220	65	74	1	1	1	3	4	4
W 840 x 295 x 176	88	101	1	1	-	4	4	-
W 840 x 295 x 193	80	92	1	1	2	4	4	4
W 840 x 295 x 210	74	85	1	1	1	4	4	4
W 840 x 295 x 226	69	79	1	1	1	4	4	4
W 840 x 295 x 251	63	72	1	1	1	4	4	4
W 920 x 310 x 201	82	94	1	1	-	4	4	-
W 920 x 310 x 223	74	85	1	1	2	4	4	4
W 920 x 310 x 238	70	80	1	1	1	4	4	4
W 920 x 310 x 253	66	76	1	1	1	4	4	4
W 920 x 310 x 271	62	71	1	1	1	4	4	4
W 920 x 310 x 289	59	67	1	1	1	4	4	4
W 920 x 310 x 313	55	62	1	1	1	3	4	4
W 920 x 420 x 345	52	62	1	1	1	4	4	4
W 920 x 420 x 368	49	58	1	1	1	3	4	4
W 920 x 420 x 390	46	55	1	1	1	3	4	4
W 920 x 420 x 420	43	51	1	1	1	2	4	4
W 920 x 420 x 449	41	48	1	1	1	2	4	4
W 920 x 420 x 491	37	44	1	1	1	1	3	4
W 920 x 420 x 537	35	41	1	1	1	1	2	3
W 920 x 420 x 588	32	37	1	1	1	1	1	2
W 920 x 420 x 656	29	34	1	1	1	1	1	2
W 920 x 420 x 725	26	31	1	1	1	1	1	1
W 920 x 420 x 787	25	29	1	1	1	1	1	1
W 920 x 420 x 970	20	24	1	1	1	1	1	1
W 1000 x 300 x 222	79	90	1	1	-	4	4	-
W 1000 x 300 x 249	71	81	1	1	2	4	4	4
W 1000 x 300 x 272	66	74	1	1	2	4	4	4
W 1000 x 300 x 314	57	65	1	1	1	4	4	4
W 1000 x 300 x 350	52	59	1	1	1	3	4	4
W 1000 x 300 x 393	47	53	1	1	1	2	4	4
W 1000 x 300 x 415	44	50	1	1	1	2	3	4
W 1000 x 300 x 438	42	48	1	1	1	1	3	4
W 1000 x 300 x 494	38	43	1	1	1	1	2	3
W 1000 x 300 x 584	33	37	1	1	1	1	1	2
W 1000 x 400 x 296	63	73	1	1	2	4	4	4
W 1000 x 400 x 321	58	68	1	1	2	4	4	4
W 1000 x 400 x 371	51	59	1	1	1	4	4	4
W 1000 x 400 x 412	46	54	1	1	1	3	4	4
W 1000 x 400 x 443	43	50	1	1	1	2	4	4
W 1000 x 400 x 483	40	46	1	1	1	2	4	4
W 1000 x 400 x 539	36	42	1	1	1	1	2	4
W 1000 x 400 x 554	35	41	1	1	1	1	2	3
W 1000 x 400 x 591	33	38	1	1	1	1	2	3
W 1000 x 400 x 642	31	36	1	1	1	1	1	2
W 1000 x 400 x 748	27	31	1	1	1	1	1	1
W 1000 x 400 x 883	23	27	1	1	-	1	1	-
W 1100 x 400 x 343	59	68	1	1	2	4	4	4
W 1100 x 400 x 390	52	60	1	1	1	4	4	4
W 1100 x 400 x 433	47	55	1	1	1	4	4	4
W 1100 x 400 x 499	42	48	1	1	1	2	4	4



TIE ROD FIRE RESISTANCE

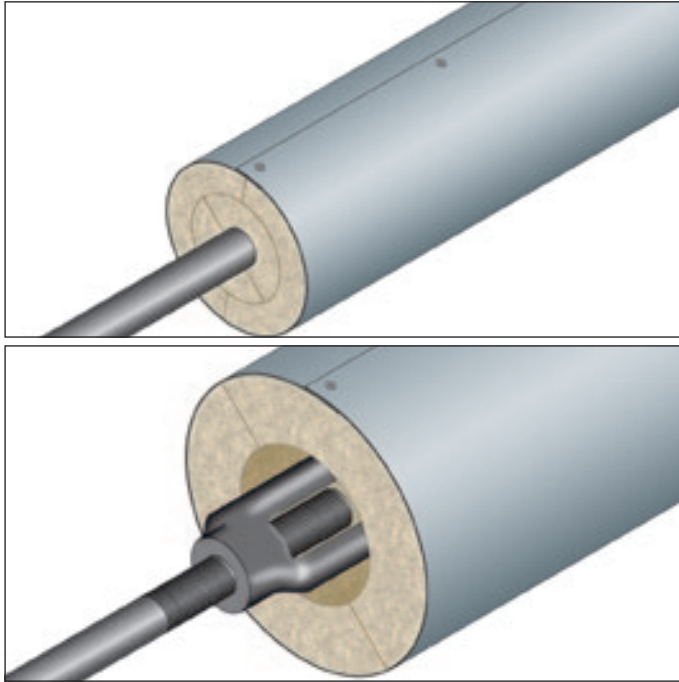
According to the European Rules related to the fire resistance tests, at the moment it is not available a test protocol for the testing of steel structural elements subjected to tensile; in particular for the steel rods. Due to the fact that this construction element is still very widespread in Italy, there is the need to be able of testing the relative protective systems with a test methodology that, for inspiration to technical bases, is as close as possible to the spirit of European Standards.

For this reason we chose to work with the test systems, furnace calibration and temperature sensing in accordance with EN 1363-1 and to follow the evaluation of results, excluding interpolations, reported in the standard EN 13381-4 (test methods To establish the contribution to the fire resistance of structural members - Applied protection to steel members). This approach is in line with the spirit of 16 February 2007 Ministerial Decree.

The evaluation of the results has led to the development of a table used by a licensed professionals according to 818 law, for the preparation of CERT REI models. The assessment is not a Technical Report according to 16 February 2007 Ministerial Decree, point B.8, but is rather an analytical assessment of experimental tests results carried out in accordance with EN 1363-1.



TIE ROD AND TURNBUCKLES COVERS "T-REX"



REACTION TO FIRE: A1

FIRE RESISTANCE: R 30/180

- **Base structure:** tie rod with a maximum diameter of 34 mm
- **Fire protection:** TIE ROD COVER "T-REX"
- **Fastening:** self-tapping phosphated screws 4,2x13 mm, placed at 170 mm centres
- **Surface finish:** finished product

Test Report: I.G. 302364 - 25/01/2013
Evaluation report: CP-T REX - 10/2013
Fire Testing Norm: EN 13381-4

SYSTEM SPECIFICATIONS

Construction of a fire protection for steel tie rod and turnbuckles for fire resistance R30/180 using TIE ROD AND TURNBUCKLES COVERS "T-REX", composed of a bio-soluble ceramic fibers felt, additivated with mixtures of silicon and magnesium calcium oxide, coated with a galvanized

sheet steel 0.25 mm in thickness.

The TIE ROD AND TURNBUCKLES COVERS "T-REX" will be applied with phosphated self-drilling screw placed at 170 mm center. Special turnbuckles covers "T-REX" are included. For further details see the "Installation Manual".

CRITICAL TEMPERATURE (°C)	200	250	300	350	400	450	500	550
Elongation (mm/m)	2,32	3,01	3,72	4,45	5,20	5,97	6,76	7,57
"T-REX" A (13 mm in thickness)	R 30	R 30	R 60	R 60	R 60	R 60	R 60	R 60
"T-REX" B (26 mm in thickness)	R 60	R 90	R 90	R 120	R 120	R 120	R 120	R 120
"T-REX" C (50 mm in thickness)	R 120	R 120	R 180	R 180	R 180	R 180	R 180	R 180

* NOTE: At the moment it is not available a test protocol for the testing of steel structural elements subjected to tensile (steel tie rods), for this reason a test methodology has been developed in accordance with EN 1363-1, in addition to an assessment carried out in accordance with EN / V 13381-4

APPLICATION

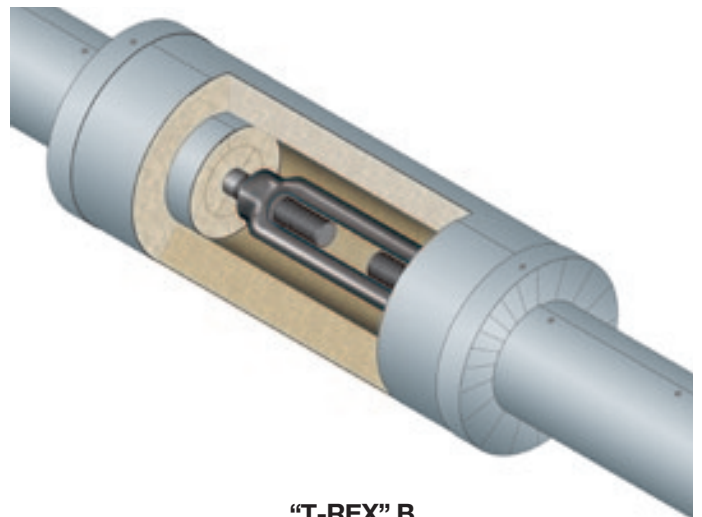
Slightly open the metal shell with insulating material and insert the rod, tighten the metal shell using the self-tapping screws placed at 170 mm center using the prepared holes. Then slide the cover from a side.

Take the next cover, insert the rod and compress insulating material towards the cover already mounted so that with a slight slip of the metal shell will be an overlapping of the same cover previously mounted.

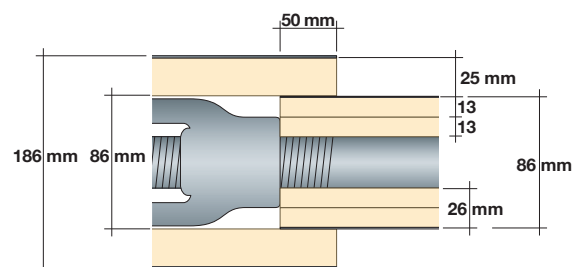
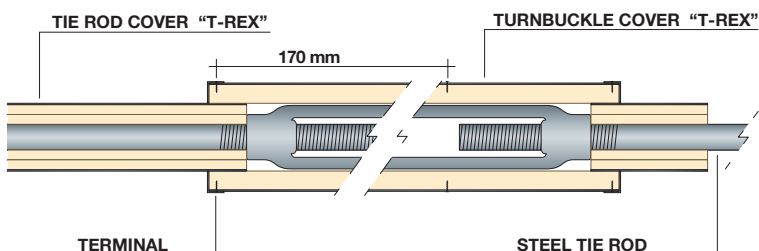
At this point, putting the self-drilling screw in order to fix the covers together.

In the vicinity of tensioner bring the covers as close as possible to the tensioner itself on the two sides, then enlarge the turnbuckle cover so as to wrap the tensioner and overcome the plates, and tighten the turnbuckle with the self-drilling screw.

Place on the two sides of the turnbuckle cover the aluminum terminals, and secure them with the self-drilling screws using the predrilled holes at both ends of the turnbuckle cover.

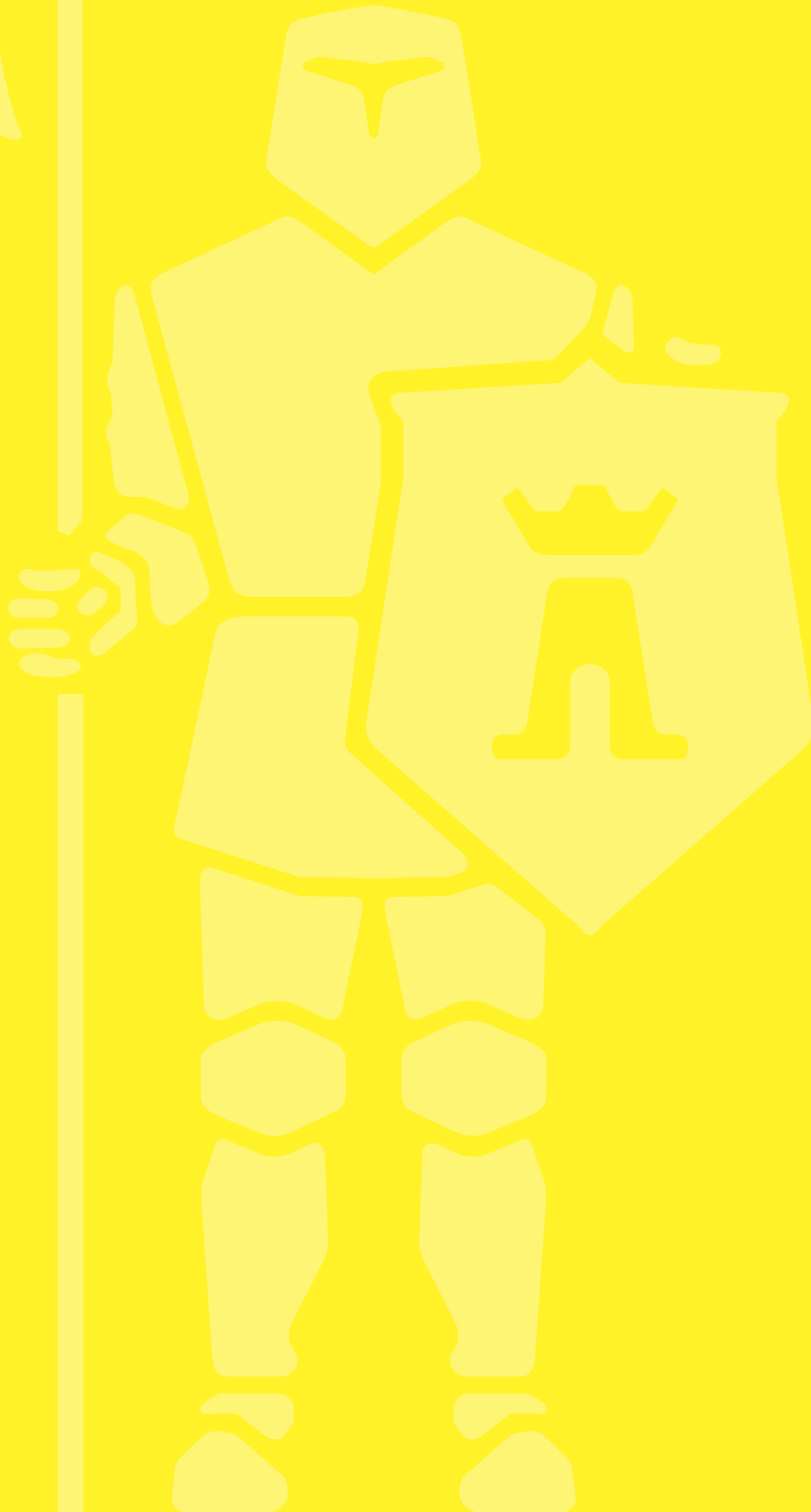


"T-REX" B





REINFORCED CONCRETE PROTECTION





BEHAVIOR OF CONCRETE UNDER THE ACTION OF FIRE

The concrete has a good behavior in case of fire; the presence of water and the low thermal conductivity slow down the heating of the sections. The sections, moreover, present high thicknesses, thus the overall heating is reduced even for exposures to long-lasting fire. Nevertheless even for the reinforced concrete structures punctual checks of fire resistance, which take into account the heating and behavior of reinforcing bars, are necessary.

The collapse mechanisms can be different: failure due to bending, shear, failure of the bearings, etc. In most cases the loss of the bearing capacity is due to the loss of strength of the reinforcing steel, especially when, in the design phase, were not taken explicitly into account the action of the fire and was not appropriately oversized the concrete cover. The failure due to concrete crisis is rare, because generally the thicknesses are high enough to allow a more gradual heating of the inner layers of the resistant section, causing the loss of resistance to compression occurs after with respect to the failure of the reinforcement.

As a result, the elements with superficial armor or those that are very slim are more vulnerable to fire, because they may benefit less from the low thermal conductivity of the concrete.

METHODS FOR THE DETERMINATION OF THE FIRE RESISTANCE CLASSES "R"

The fire resistance of a concrete structure can be evaluated according to the results of calculations.

The fire resistance of a reinforced concrete structure can be evaluated analytically by the calculation methods specified in the EN 1992-1-2 norm:

"Design of concrete structures - Part 1-2: General rules - Structural fireproof design."

The calculation methods that can be adopted to verify the fire resistance of reinforced concrete structures defined for by the above mentioned rule can be distinguished in:

- simplified calculation methods,
- advanced calculation methods,
- calculation methods deriving from the comparison with tables.

Simplified calculation methods

The EN 1992-1-2 Eurocode includes two simplified calculation methods for the verification of reinforced concrete sections:

- 500 °C isotherm method
- zone method

Advanced calculation methods

Can be used for individual structural elements, for subsets, for the structure as a whole and for each type of cross section. These methods provide a realistic analysis of the structure exposed to fire. They are based on recognized principles and assumptions of the theory of heat diffusion and structural mechanics in order to obtain a reliably approximation of the expected behavior of the specific structural component in the fire situation.

Calculation methods deriving from the comparison with the tables

The EN 1992-1-2 Eurocode also contains tables that can be used in the verification of the fire resistance of reinforced concrete structures. Clearly it is necessary to verify the compliance with the conditions of use and limitations relating to them.

The method is based on testing for individual items and with exposure only to the standard fire curve (ISO 384).

In case of using the tabular method checks regarding the resistance to shear and torsion and the anchoring of the bars are not necessary; also checks regarding spalling are not necessary, provided that, in the case of distances of the bars from the concrete surface greater than or equal to 70 mm, an additional reinforcement armature having a mesh not more greater than 100 x 100 mm and with diameter of the bars not less than 4 mm, is prepared.

The use of each table requires the preliminary calculation of the use coefficient μ_{fi} which is the ratio between the action that stress the element itself in fire conditions and the corresponding cold resistance.

$$\mu_{fi} = \frac{N_{Ed,fi}}{N_{Rd}}$$

Where $N_{Ed,fi}$ is the design axial load in the fire situation, N_{Rd} is the design strength of the section at room temperature.

The EN 1992-1-2 Eurocode provides tables for columns, walls, beams, slabs and floors.

Below are application solutions with FIREGUARD® BOARDS using this method and integrating the required concrete cover thickness with equivalent thickness experimentally determined according to EN 13381-3 norm.



Upgrading of concrete structures using protective

The protection systems are applied to reinforced concrete structures in order to improve the performance of the structure itself. It is possible to take account of the presence of insulating protection, applied as a coating of the surface of the structural elements, based on the equivalence ratio between the protective material and cement mix, defined as the “minimum thickness of cement conglomerate capable of producing the same insulating effect of 1 cm of protective material “

The values of the equivalence ratio of protective materials must be calculated only by using the methods specified in EN 13381-3: “Test methods for determining the contribution to the fire resistance of structural elements. Part 3: Applied protection to concrete elements “; the result of the tests conducted according to EN 13381-3 is not a true and proper classification of the element, but a procedure (assessment) for the determination of the equivalent thicknesses according to the type of element to be protected and the required fire resistance. Note how the equivalence ratio, being a function also of the characteristics of adhesion of the protective support, is variable with the required fire resistance.

Therefore, transforming the expected protective thickness into “concrete cover equivalent” is possible to trace back to the generic reinforced concrete section and use the corresponding thermal mapping.

The test methodology requires that the equivalence ratio is determined on the base of the actual conditions of use, placing the following limits of applicability:

- tests on horizontal slabs can be extended to applications on vertical walls
- tests on horizontal beams are extensible to columns

The applicability limits of the results, however, are reported in the assessment report for monitoring by the professionals.

Laboratory tests with equivalence ratios determined arbitrarily or by professionals are considered to be outside the law.

Global Building has determined the following equivalence ratios for FIREGUARD® 13 boards through tests carried out in accordance with the EN 13381-3.

Slabs and walls - Assesment Report Applus 11-2267-877 M1

Concrete equivalent thickness (mm)						
T (min)	30'	60'	90'	120'	180'	240'
thk (mm)	39	52	63	67	61	21

Columns and beams - Assesment Report Applus 12-2267-543 M1

Concrete equivalent thickness (mm)						
T (min)			90'	120'	180'	240'
thk (mm)			50	54	50	15

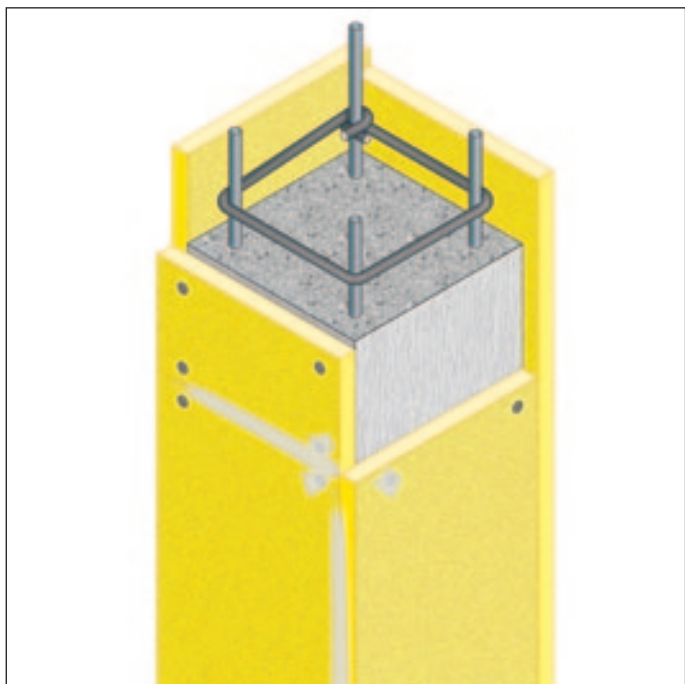
Dimensioning of protective

To dimensions the protection is necessary to:

- 1 - Proceed to the determination of the necessary concrete cover according to the required fire resistance, to the type of the reinforcement and to the minimum cross-sections, through the analytical methods or by the verification of the tables described previously.
- 2 - Integrate existing concrete coverings with the calculation values by means of an equivalent thickness of the protective, which characteristics have been determined experimentally through the assessment report under the EN 13381-3.



REINFORCED CONCRETE COLUMNS



REACTION TO FIRE : **A1** FIRE RESISTANCE: **R30-240**

- **Base structure:** reinforced concrete columns
- **Fire protection:** boards type FIREGUARD® (see chart)
- **Fastening:** using metal expansion anchor bolts 6 mm in diameter, placed at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and anchor bolt heads

EQUIVALENT THICKNESS OF CONCRETE (mm) RELATED TO FIREGUARD® 13 (mm) BOARDS

Time (min)	90'	120'	180'	240'
Thickness (mm)	50	54	50	15

Assesment report Applus 12-2267-543 Fire Testing Norm: EN 13381-3 – EN 1992-1-2

SYSTEM SPECIFICATIONS

Construction of a fire protection cladding to reinforced concrete columns for fire resistance R 30/60/90/120/180/240 using FIREGUARD® boards in thickness according to chart, in maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 12-2267-543 according to EN 13381-3 norm.

The boards are to be fastened with metal expansion anchor bolts with diameter 6 mm and length 40 mm at 500 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and anchor bolt heads.

For further details see the "Installation Manual".

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.2a of EN 1992-1-2 norm,
- considering a factor of utilization of $\mu_i = 0,7$,
- 4-side exposure with existing concrete cover = 0 cm.

MINIMUM COLUMN SIZE (mm)	CONCRETE COVER = 0 cm HEIGHT < 3 m					
	R30	R60	R90	R120	R180	R240
200 x 200	12,7	12,7	25,4	25,4	*	*
250 x 250	12,7	12,7	12,7	25,4	25,4	*
300 x 300	12,7	12,7	12,7	12,7	25,4	*
350 x 350	12,7	12,7	12,7	12,7	25,4	*

* - check with our technical department

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.2a of EN 1992-1-2 norm,
- considering a factor of utilization of $\mu_i = 0,7$,
- 4-side exposure with existing concrete cover = 1 cm.

MINIMUM COLUMN SIZE (mm)	CONCRETE COVER = 1 cm HEIGHT < 3 m					
	R30	R60	R90	R120	R180	R240
200 x 200	12,7	12,7	25,4	25,4	*	*
250 x 250	12,7	12,7	12,7	12,7	25,4	*
300 x 300	12,7	12,7	12,7	12,7	25,4	*
350 x 350	12,7	12,7	12,7	12,7	12,7	*

* - check with our technical department

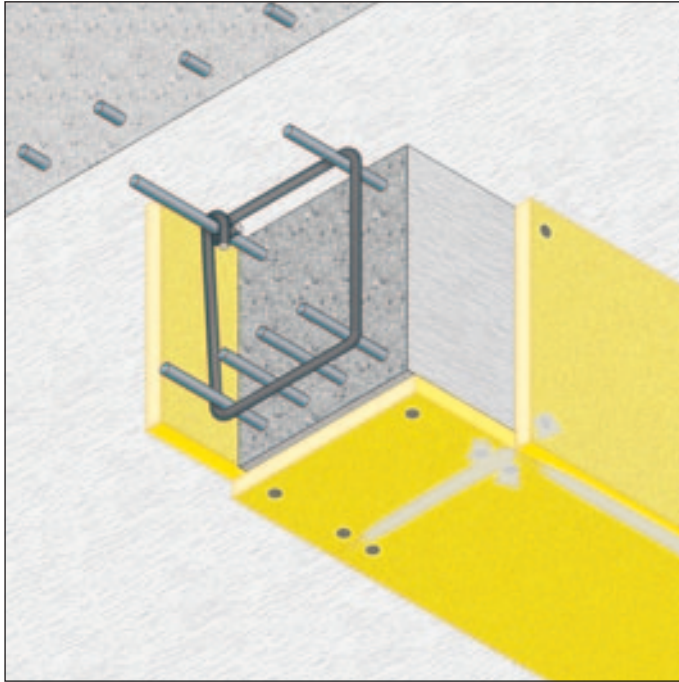
Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.2b of EN 1992-1-2 norm,
- considering a factor of utilization of $\mu_i = 0,7$,
- slenderness ratio < 30,
- mechanical reinforcement ratio $\epsilon = 0,5$,
- 4-side exposure with existing concrete cover = 0 cm.

MINIMUM COLUMN SIZE (mm)	CONCRETE COVER = 0 cm HEIGHT > 3 m					
	R30	R60	R90	R120	R180	R240
200 x 200	12,7	25,4	*	*	*	*
250 x 250	12,7	12,7	*	*	*	*
300 x 300	12,7	12,7	25,4	25,4	*	*
350 x 350	12,7	12,7	25,4	25,4	*	*
400 x 400	12,7	12,7	12,7	25,4	25,4	*
500 x 500	12,7	12,7	12,7	25,4	25,4	*
600 x 600	12,7	12,7	12,7	25,4	25,4	*

* - check with our technical department



REINFORCED CONCRETE BEAMS



SYSTEM SPECIFICATIONS

Construction of a fire protection cladding to reinforced concrete beams for fire resistance R 30/60/90/120/180/240 using FIREGUARD® boards in thickness according to table, in max. size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 12-2267-543 according to EN 13381-3 norm.

REACTION TO FIRE : A1 FIRE RESISTANCE: R30-240

- **Base structure:** reinforced concrete beams
- **Fire protection:** boards type FIREGUARD® (see chart)
- **Fastening:** using metal expansion anchor bolts 6 mm in diameter, placed at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and anchor bolt heads

EQUIVALENT THICKNESS OF CONCRETE (mm) RELATED TO FIREGUARD® 13 (mm) BOARDS

Time (min)	90'	120'	180'	240'
Thickness (mm)	50	54	50	15

Assesment report Applus 12-2267-543 Fire Testing Norm: EN 13381-3 – EN 1992-1-2

The boards are to be fastened with metal expansion anchor bolts with diameter 6 mm and length 40 mm at 500 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and anchor bolt heads.

For further details see the "Installation Manual".

STANDARD REINFORCED CONCRETE BEAMS WITH RECTANGULAR SECTION

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.5 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 0 cm.

MINIMUM BEAM WIDTH (mm)	BEAMS SIMPLY SUPPORTED					
	CONCRETE COVER = 0 cm					
	R30	R60	R90	R120	R180	R240
120	12,7	12,7	12,7	25,4	25,4	*
160	12,7	12,7	12,7	12,7	25,4	*
200	12,7	12,7	12,7	12,7	25,4	*
240	12,7	12,7	12,7	12,7	25,4	*
300	12,7	12,7	12,7	12,7	25,4	*
400	12,7	12,7	12,7	12,7	25,4	*
600	12,7	12,7	12,7	12,7	12,7	*

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.5 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 1 cm.

MINIMUM BEAM WIDTH (mm)	BEAMS SIMPLY SUPPORTED					
	CONCRETE COVER = 1 cm					
	R30	R60	R90	R120	R180	R240
120	12,7	12,7	12,7	25,4	25,4	*
160	12,7	12,7	12,7	12,7	25,4	*
200	12,7	12,7	12,7	12,7	12,7	*
240	12,7	12,7	12,7	12,7	12,7	*
300	12,7	12,7	12,7	12,7	12,7	*
400	12,7	12,7	12,7	12,7	12,7	*
600	12,7	12,7	12,7	12,7	12,7	*

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.6 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 0 cm.

MINIMUM BEAM WIDTH (mm)	CONTINUOUS BEAMS					
	CONCRETE COVER = 0 cm					
	R30	R60	R90	R120	R180	R240
160	12,7	12,7	12,7	12,7	12,7	*
200	12,7	12,7	12,7	12,7	12,7	*
240	12,7	12,7	12,7	12,7	12,7	*
300	12,7	12,7	12,7	12,7	12,7	*
400	12,7	12,7	12,7	12,7	12,7	*
600	12,7	12,7	12,7	12,7	12,7	*

* - check with our technical department

NOTE: In the case of minor sections or "H" shaped sections check with our technical department



REINFORCED CONCRETE BEAMS GIRDER IN BARS WITH RECTANGULAR SECTION

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.5 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 1 cm.

MINIMUM BEAM WIDTH (mm)	BEAMS SIMPLY SUPPORTED					
	CONCRETE COVER = 1 cm					
	R30	R60	R90	R120	R180	R240
120	12,7	12,7	12,7	25,4	25,4	*
160	12,7	12,7	12,7	12,7	25,4	*
200	12,7	12,7	12,7	12,7	25,4	*
240	12,7	12,7	12,7	12,7	25,4	*
300	12,7	12,7	12,7	12,7	25,4	*
400	12,7	12,7	12,7	12,7	25,4	*
600	12,7	12,7	12,7	12,7	12,7	*

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.6 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 0 cm.

MINIMUM BEAM WIDTH (mm)	CONTINUOUS BEAMS					
	CONCRETE COVER = 0 cm					
	R30	R60	R90	R120	R180	R240
160	12,7	12,7	12,7	12,7	25,4	*
200	12,7	12,7	12,7	12,7	25,4	*
240	12,7	12,7	12,7	12,7	25,4	*
300	12,7	12,7	12,7	12,7	25,4	*
400	12,7	12,7	12,7	12,7	12,7	*
600	12,7	12,7	12,7	12,7	12,7	*

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.5 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 2 cm.

MINIMUM BEAM WIDTH (mm)	BEAMS SIMPLY SUPPORTED					
	CONCRETE COVER = 2 cm					
	R30	R60	R90	R120	R180	R240
120	12,7	12,7	12,7	25,4	25,4	*
160	12,7	12,7	12,7	12,7	25,4	*
200	12,7	12,7	12,7	12,7	12,7	*
240	12,7	12,7	12,7	12,7	12,7	*
300	12,7	12,7	12,7	12,7	12,7	*
400	12,7	12,7	12,7	12,7	12,7	*
600	12,7	12,7	12,7	12,7	12,7	*

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.6 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 1 cm.

MINIMUM BEAM WIDTH (mm)	CONTINUOUS BEAMS					
	CONCRETE COVER = 1 cm					
	R30	R60	R90	R120	R180	R240
160	12,7	12,7	12,7	12,7	12,7	*
200	12,7	12,7	12,7	12,7	12,7	*
240	12,7	12,7	12,7	12,7	12,7	*
300	12,7	12,7	12,7	12,7	12,7	*
400	12,7	12,7	12,7	12,7	12,7	*
600	12,7	12,7	12,7	12,7	12,7	*

STEEL REINFORCED CONCRETE BEAMS PRESTRESSED WITH STRAND AND WIRES WITH RECTANGULAR SECTION

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.5 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 2 cm.

MINIMUM BEAM WIDTH (mm)	BEAMS SIMPLY SUPPORTED					
	CONCRETE COVER = 2 cm					
	R30	R60	R90	R120	R180	R240
120	12,7	12,7	12,7	25,4	25,4	*
160	12,7	12,7	12,7	12,7	25,4	*
200	12,7	12,7	12,7	12,7	25,4	*
240	12,7	12,7	12,7	12,7	25,4	*
300	12,7	12,7	12,7	12,7	25,4	*
400	12,7	12,7	12,7	12,7	12,7	*
600	12,7	12,7	12,7	12,7	12,7	*

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.6 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 1 cm.

MINIMUM BEAM WIDTH (mm)	CONTINUOUS BEAMS					
	CONCRETE COVER = 1 cm					
	R30	R60	R90	R120	R180	R240
160	12,7	12,7	12,7	12,7	25,4	*
200	12,7	12,7	12,7	12,7	25,4	*
240	12,7	12,7	12,7	12,7	25,4	*
300	12,7	12,7	12,7	12,7	25,4	*
400	12,7	12,7	12,7	12,7	12,7	*
600	12,7	12,7	12,7	12,7	12,7	*

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.5 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 3 cm.

MINIMUM BEAM WIDTH (mm)	BEAMS SIMPLY SUPPORTED					
	CONCRETE COVER = 3 cm					
	R30	R60	R90	R120	R180	R240
120	12,7	12,7	12,7	25,4	25,4	*
160	12,7	12,7	12,7	12,7	25,4	*
200	12,7	12,7	12,7	12,7	12,7	*
240	12,7	12,7	12,7	12,7	12,7	*
300	12,7	12,7	12,7	12,7	12,7	*
400	12,7	12,7	12,7	12,7	12,7	*
600	12,7	12,7	12,7	12,7	12,7	*

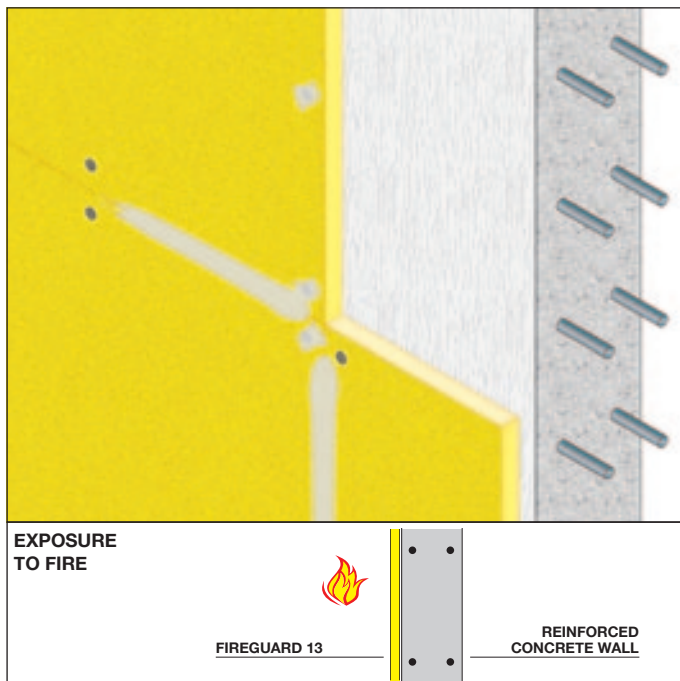
Thickness of FIREGUARD® fire protection boards depending on the required fire resistance according to chart 5.6 of EN 1992-1-2 norm, considering a factor of utilization of $\mu_{fi} = 0,7$; with existing concrete cover = 2 cm.

MINIMUM BEAM WIDTH (mm)	CONTINUOUS BEAMS					
	CONCRETE COVER = 2 cm					
	R30	R60	R90	R120	R180	R240
160	12,7	12,7	12,7	12,7	25,4	*
200	12,7	12,7	12,7	12,7	12,7	*
240	12,7	12,7	12,7	12,7	12,7	*
300	12,7	12,7	12,7	12,7	12,7	*
400	12,7	12,7	12,7	12,7	12,7	*
600	12,7	12,7	12,7	12,7	12,7	*

* - check with our technical department NOTE: In the case of minor sections or "H" shaped sections check with our technical department.



REINFORCED CONCRETE WALLS



REACTION TO FIRE : A1 FIRE RESISTANCE: R30-240

- **Exposure to fire:** on 1 or 2 sides
- **Type of wall:** reinforced concrete wall
- **Fire protection:** boards type FIREGUARD® (see chart)
- **Fastening:** metal expansion anchor bolts 9 mm in diameter, placed at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and anchor bolt heads

EQUIVALENT THICKNESS OF CONCRETE (mm) RELATED TO FIREGUARD® 13 (mm) BOARDS

Time (min)	30'	60'	90'	120'	180'	240'
Thickness (mm)	39	52	63	67	61	21

Assesment report Applus 11-2267-877 M1 Fire Testing Norm: EN 13381-3 – EN 1992-1-2

SYSTEM SPECIFICATIONS

Construction of a fire protection cladding to reinforced concrete walls for fire resistance REI 30/60/90/120/180/240 using FIREGUARD® boards in thickness according to chart, in maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2267-877 M1 according to norm EN 13381-3.

The boards are to be fastened with metal expansion anchor bolts with diameter 9 mm and length 40 mm at 500 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and anchor bolt heads.

For further details see the "Installation Manual".

NON LOAD BEARING WALLS

Thickness of FIREGUARD® fire protection boards depending on the required fire resistance and the wall's thickness according to chart 5.3 of EN 1992-1-2 norm, slenderness < 40.

MINIMUM THICKNESS OF REINFORCED CONCRETE WALL (mm)	MAXIMUM HEIGHT (m)	EI 30	EI 60	EI 90	EI 120	EI 180	EI 240
60	2,4	/	12,7	12,7	12,7	25,4	*
65	2,6	/	12,7	12,7	12,7	25,4	*
70	2,8	/	12,7	12,7	12,7	25,4	*
75	3,0	/	12,7	12,7	12,7	25,4	*
80	3,2	/	/	12,7	12,7	25,4	*
90	3,6	/	/	12,7	12,7	12,7	*

* - check with our technical department

LOAD BEARING WALLS OF SUBDIVISION (EXPOSURE TO FIRE ON ONE SIDE)

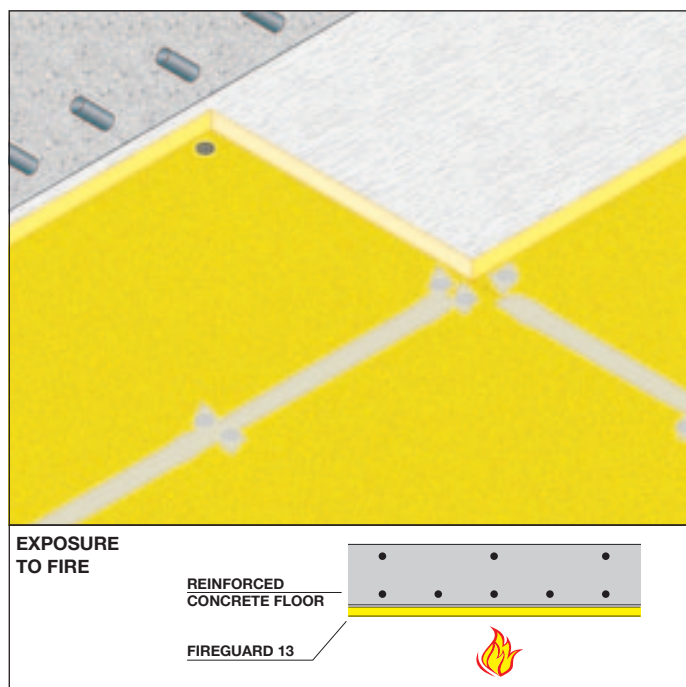
Thickness of FIREGUARD® fire protection boards depending on the required fire resistance and the wall's thickness according to chart 5.4 of EN 1992-1-2 norm, considering a factor of utilization of μ_{fi} = 0,7; slenderness < 40.

MINIMUM THICKNESS OF REINFORCED CONCRETE WALL (mm)	MAXIMUM HEIGHT (m)	REI 30	REI 60	REI 90	REI 120	REI 180	REI 240
100	4,0	/	12,7	12,7	12,7	25,4	*
110	4,4	/	12,7	12,7	12,7	25,4	*
120	4,8	/	12,7	12,7	12,7	25,4	*
130	5,2	/	/	12,7	12,7	25,4	*
140	5,6	/	/	12,7	12,7	25,4	*
150	6,0	/	/	12,7	12,7	12,7	*

* - check with our technical department - For lower utilization factors check with our technical department.



REINFORCED CONCRETE FLOOR



REACTION TO FIRE : **A1** FIRE RESISTANCE: **REI 30-240**

- **Type of floor:** reinforced concrete floor
- **Fire protection:** boards type FIREGUARD® (see chart)
- **Fastening:** metal expansion anchor bolts 9 mm in diameter, placed at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and anchor bolt heads

EQUIVALENT THICKNESS OF CONCRETE (mm) RELATED TO FIREGUARD® 13 (mm) BOARDS

Time (min)	30'	60'	90'	120'	180'	240'
Thickness (mm)	39	52	63	67	61	21

Assesment report Applus 11-2267-877 M1 Fire Testing Norm: EN 13381-3 – EN 1992-1-2

SYSTEM SPECIFICATIONS

Construction of a fire protection cladding to reinforced concrete floors for fire resistance REI 30/60/90/120/180/240 using FIREGUARD® boards in thickness according to chart, in maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2267-877 M1 according to norm EN 13381-3.

The boards are to be fastened with metal expansion anchor bolts with diameter 9 mm and length 40 mm at 500 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and anchor bolt heads.

For further details see the "Installation Manual".

STANDARD REINFORCED CONCRETE FLOOR SIMPLY SUPPORTED

Thickness of FIREGUARD® fire protection boards depending on the fire resistance required and the thickness of the floor, according to chart 5.8 of norm EN 1992-1-2.

* - check with our technical department

MINIMUM FLOOR THICKNESS (mm)	CONCRETE COVER = 0 cm					
	REI 30	REI 60	REI 90	REI 120	REI 180	REI 240
60	12,7	12,7	12,7	12,7	25,4	*
80	12,7	12,7	12,7	12,7	25,4	*
100	12,7	12,7	12,7	12,7	12,7	*

PRESTRESSED REINFORCED CONCRETE FLOOR SIMPLY SUPPORTED

Thickness of FIREGUARD® fire protection boards depending on the fire resistance required and the thickness of the floor, according to chart 5.8 of norm EN 1992-1-2.

* - check with our technical department

MINIMUM FLOOR THICKNESS (mm)	CONCRETE COVER = 0 cm					
	REI 30	REI 60	REI 90	REI 120	REI 180	REI 240
60	12,7	12,7	12,7	12,7	25,4	*
80	12,7	12,7	12,7	12,7	25,4	*
100	12,7	12,7	12,7	12,7	25,4	*

STANDARD AND PRESTRESSED REINFORCED CONCRETE FLOOR WITH MORE SUPPORTS

Thickness of FIREGUARD® fire protection boards depending on the fire resistance required and the thickness of the floor, according to chart 5.9 of norm EN 1992-1-2.

* - check with our technical department

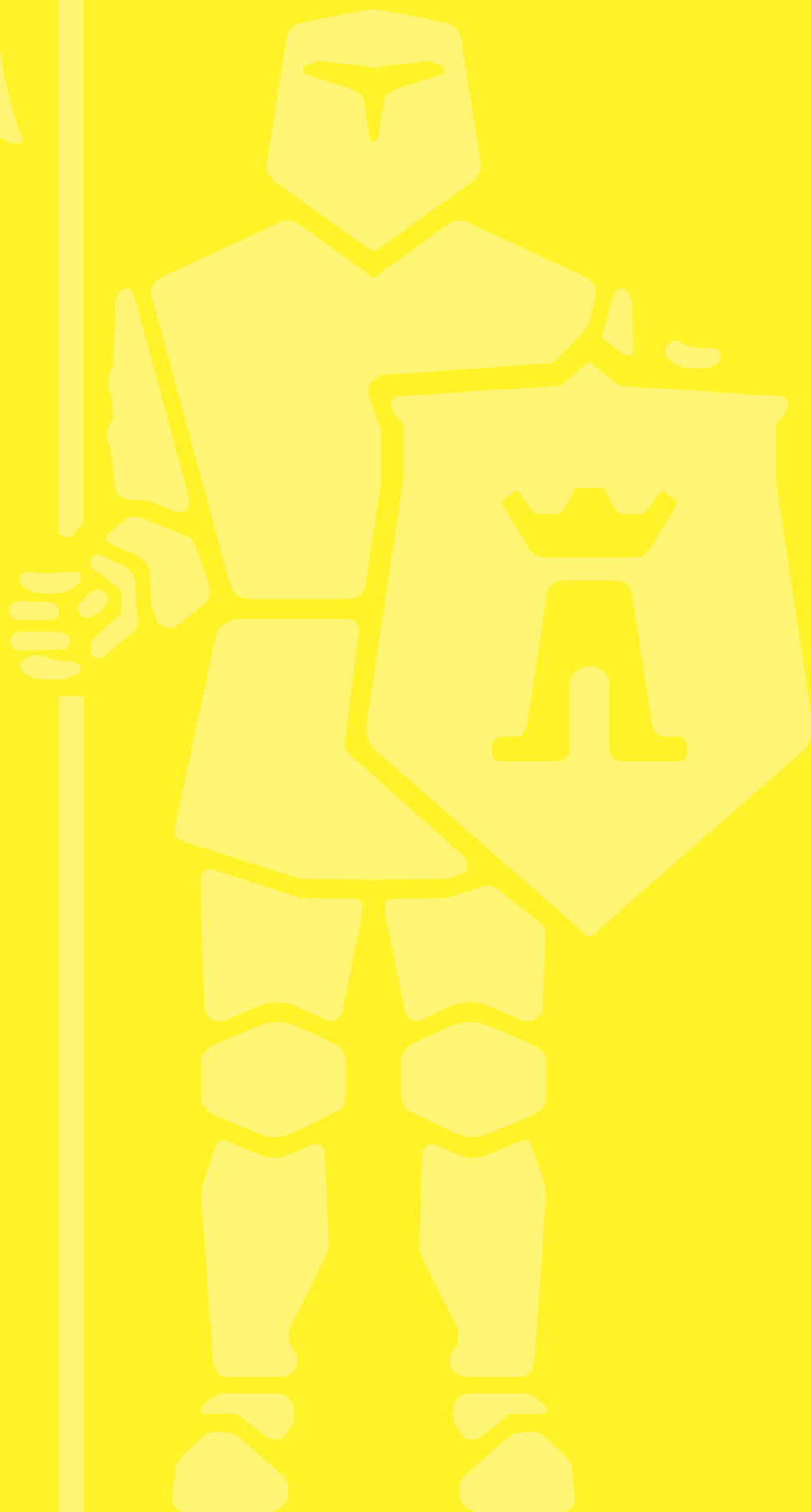
NOTE: In the case of ribbed slabs check with our technical department.

MINIMUM FLOOR THICKNESS (mm)	CONCRETE COVER = 0 cm					
	REI 30	REI 60	REI 90	REI 120	REI 180	REI 240
150	12,7	12,7	12,7	12,7	12,7	*
175	12,7	12,7	12,7	12,7	12,7	*





WOOD STRUCTURE PROTECTION





BEHAVIOR OF WOOD UNDER THE ACTION OF FIRE

Wood is one of the first building materials used in construction, has a high resistance to aging, weathering and mechanical stress. The problem related to its fire resistance occurs therefore in both new construction and historic buildings.

The wood structural elements have unique characteristics: they are combustible and have a low coefficient of thermal conductivity (about 0,15 W/mK), that is they burn but possess excellent insulation characteristics. The loss of bearing capacity due to the fire was due to the decrease of the resistant section due to charring. The combustion mechanism of the wood is known:

1. Warm-up phase: with temperatures up to 200 °C. It assists the evaporation of water and the issue of non-combustible gases, with no change in mechanical strength.
2. Development of endothermic reactions resulting in the presence of flammable gases and ignition that occurs with temperatures between 250 and 280 °C.
3. Development of exothermic reactions with the emission of heat and gases at temperatures between 300 and 500 °C, this is the stage of carbonization and incineration of wood.

The carbonization may arise even when the timber has in contact with hot surfaces which determine the ignition at temperatures even lower than those of ignition. So in the case of continuous contact, the temperature of the body contiguous with the wood, as a precaution, should not exceed 100 °C. Important for ignition are also the dimensional aspects: small pieces heat up more quickly than the big ones.

From a structural viewpoint the carbonization takes place rather slowly due to the low conductivity of the wood and also the charred superficial part constitutes a protective element for the inner layers that therefore retain their load-bearing capacity.

METHODS FOR THE DETERMINATION OF THE RESISTANCE TO FIRE CLASSES “R” OF PROTECTED STRUCTURES

The analytical method, in accordance with EN 1995-1-2: “Design of timber structures”, needs to be used.

There are no tabular methods, and experimental tests on single elements have poor implementation in practice due to the limitations of the extensions. The EN 1995-1-2 norm examines the case of structures (beams and columns) protected with boards. In this case the wood rate of carbonization has a particular behavior because:

- the beginning of carbonization is postponed;
- charring may start before the break of fire protection, but with a slower speed with respect to the unprotected case;
- after the breaking of the fire protection the charring rate increases compared to the unprotected case, this phenomenon takes place until the depth of carbonization is equals to the depth of carbonization of the unprotected condition, or when it reaches 25 mm.

The parameters that describe the behavior of protective coatings shall be determined on an experimental basis by the standards EN 13381-7: “Test methods for determining the contribution to the fire resistance of structural elements. - Protection Applied to wood elements”; between them, for example, there are:

- the starting moment of carbonization of the element;
- the time of the fall of the protection material;
- the charring rate before the failure of the protection.

In the absence of experimental evidence, some indications about the behavior of protective boards are however provided by EN 1995-1-2.



TIMBER COLUMNS



SYSTEM SPECIFICATIONS

Construction of a fire protection cladding to timber columns for fire resistance R 30/45/60/90/120/180 using FIREGUARD® 13 boards in thickness 12,7 mm and FIREGUARD® 25 in thickness 25,4 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire.

REACTION TO FIRE : A1 FIRE RESISTANCE: **R30-180**

- **Base structure:** timber columns
- **Fire protection:** boards type FIREGUARD® (see chart)
- **Fastening:** self-tapping phosphated screws at 250 to 600 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads

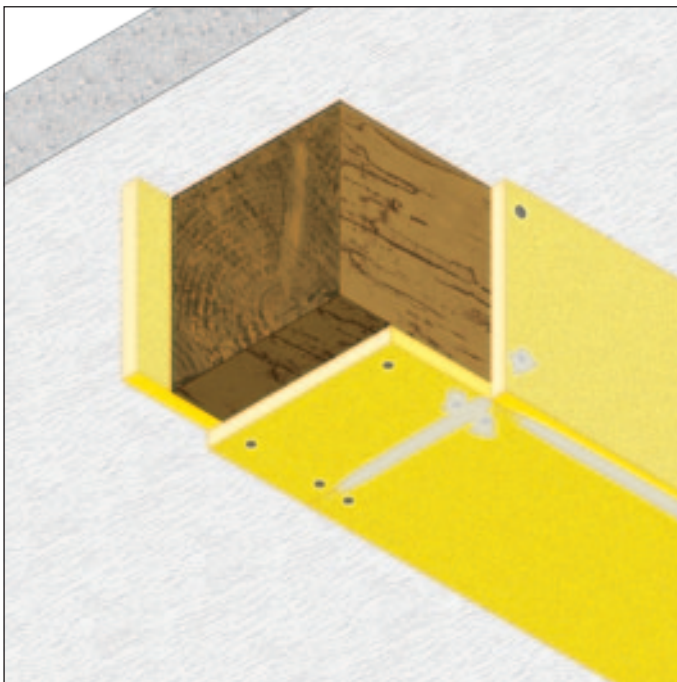
FIRE RESISTANCE WITH FIREGUARD® BOARDS (thickness in mm)			
R30	2 x 12,7 *	R90	2 x 25,4 *
R45	2 x 12,7 *	R120	2 x 25,4 *
R60	2 x 12,7 *	R180	3 x 25,4 *

* Thicknesses are calculated based on a factor of utilization of 80% on sections with minimum size 20x40 cm. For special cases please check with our technical department.

Analytical assessment
Norm: EN 1995-1-2

The boards are to be fastened with self-tapping phosphated screws at 250 to 600 mm centres.
FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.
For further details see the "Installation Manual".

TIMBER BEAMS



SYSTEM SPECIFICATIONS

Construction of a fire protection cladding to timber beams for fire resistance R 30/45/60/90/120/180 using FIREGUARD® 13 boards in thickness 12,7 mm and FIREGUARD® 25 in thickness 25,4 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire.

REACTION TO FIRE : A1 FIRE RESISTANCE: **R30-180**

- **Base structure:** timber beams
- **Fire protection:** boards type FIREGUARD® (see chart)
- **Fastening:** self-tapping phosphated screws at 250 to 600 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads

FIRE RESISTANCE WITH FIREGUARD® BOARDS (thickness in mm)			
R30	2 x 12,7 *	R90	2 x 25,4 *
R45	2 x 12,7 *	R120	2 x 25,4 *
R60	2 x 12,7 *	R180	3 x 25,4 *

* Thicknesses are calculated based on a factor of utilization of 80% on sections with minimum size 20x40 cm. For special cases please check with our technical department.

Analytical assessment
Norm: EN 1995-1-2

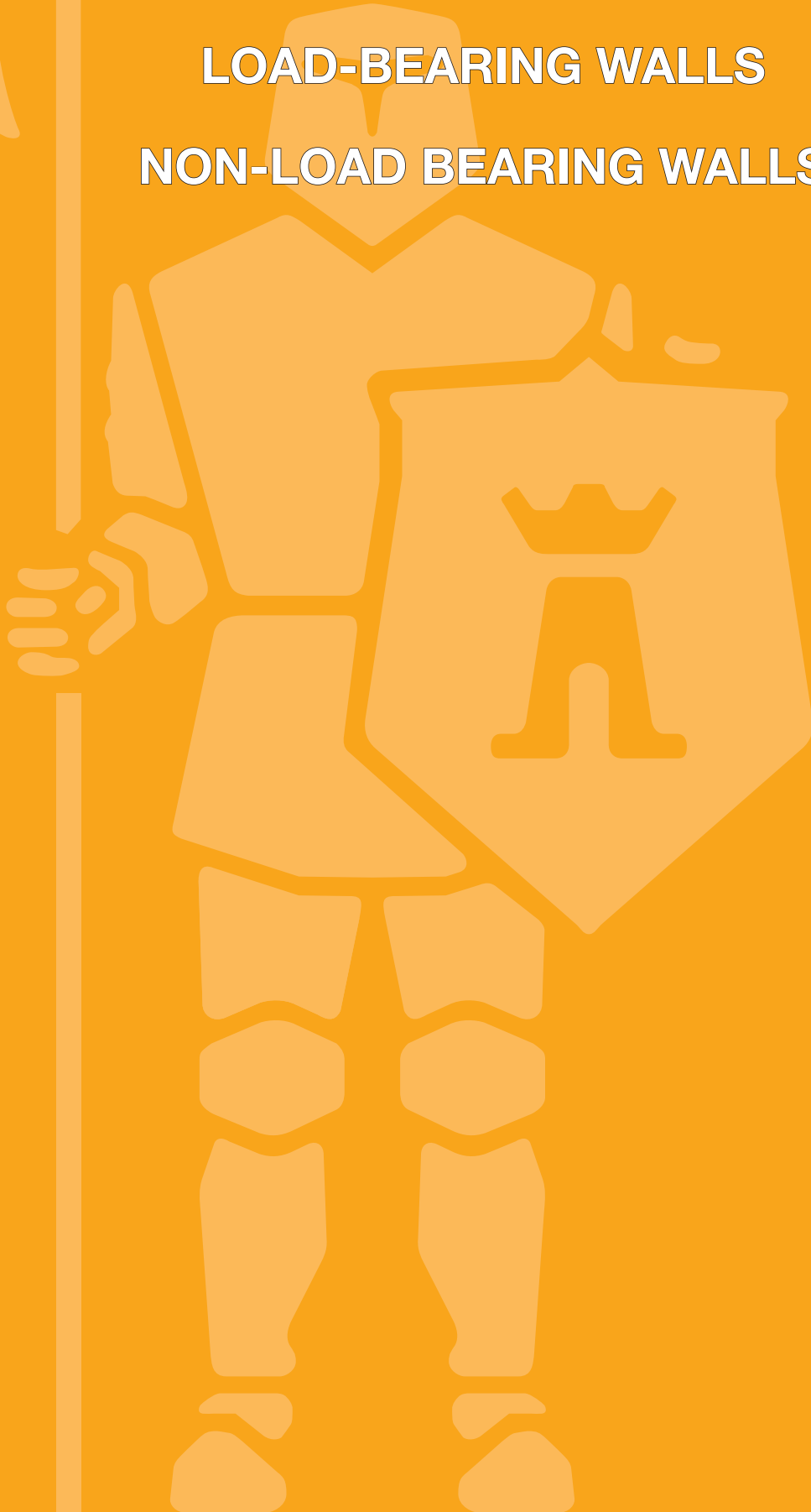
The boards are to be fastened with self-tapping phosphated screws at 250 to 600 mm centres.
FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.
For further details see the "Installation Manual".



PARTITIONS

LOAD-BEARING WALLS

NON-LOAD BEARING WALLS





FIREPROOF COMPARTMENT

A fireproof compartment is defined as a part of the building delimited by horizontal and vertical construction elements having determined fire resistance, in practice it is a box that has a certain fire resistance.

A fire compartment is also defined as “a part of the building, organized to meet the needs of safety in case of fire and bounded by building elements that ensure, under the action of the fire and for a given period of time, the ability of subdivision, understood as “the ability of a building element to keep under the action of the fire, in addition to its stability, a sufficient thermal insulation and a sufficient seal to combustion hot gases, as well as other required performances.”

Therefore, a compartment is a part of the building in which it is expected that the entire duration of a fire, until the exhaustion of the combustible material or until the arrival of the fire brigade, remains confined inside it, without causing any risk of spreading to other areas or adjacent compartments. A compartment must be completely isolated from the others and does not have parts that do not withstand the entire fire.

The communication between the compartments should be obtained by fire doors, having necessarily the same class of fire resistance of the separation elements.

We distinguish therefore a:

- horizontal type partition, made by horizontal closing and partition elements, load-bearing and non-load bearing (floors and ceilings)
- vertical type partition, made by vertical closing and partition elements, load-bearing and non-bearing (inner and outer walls).

The horizontal partitioning has the purpose of limiting the spread of fire toward the upper/lower floors and is made with fire-resistant floors.

The vertical partitioning has the purpose of limiting the spread of fire to other areas of the same floor of the building and is made with fire resistant partitions which extend from floor to floor slab.

These partitions must not have discontinuities that allow the passage of flame, heat and smoke; including all the gates for the passage of pipes, electrical cables and networks plant that must be treated with suitable intumescent products acts to ensure the sealing of the compartment.

A compartment must be durable for the duration of the theoretical fire in order to maintain its mechanical stability (in the case of load-bearing elements) defined by the “R feature”, its resistance to hot gases and flames “E feature” and thermal insulation, in order to prevent the propagation by conduction or radiation “I feature”.

Other new features such as “M - mechanical action”, the “W - radiation” and all other properties are required for specific applications and cases and take into account the characteristics and problems of each individual construction as defined by test reference rules

The extension of the compartment depends on various factors, the main ones are:

- fire load;
- building type;
- manufacturing process;
- presence of fire extinguishing systems;
- easy access for Fire Department

They are defined by specific rules or individual territorial issues.



LOAD-BEARING WALLS

The load-bearing partition walls can act as a fire resistant barrier; this feature may be indicated by the letters RE, REI, REI-M, RE-W.

The methods for determining the fire resistance performance for the vertical load-bearing compartments, are based on:

- test results: experimental method
- results of calculations: analytical method

Results of tests: experimental method

The reference norm for determining the fire resistance performance of load-bearing walls is EN 1365-1: "Testing of fire resistance for load-bearing elements - Walls."

The results of these tests allow to obtain the classification used in EN 13501-2: "Fire classification of construction products and building elements - Part 2: Classification on the base of fire resistance tests, excluding ventilation systems" in terms of "RE", "REI", "REI-M", "REW".

Only the walls with "REI", "REI-M" classifications are considered as partitioning walls.

In the case of loadbearing vertical compartments the UNI EN 1365-1 defines the field of direct application in the following way: "The results of the fire resistance tests are directly applicable to similar constructions in which have been carried out one or more of the changes indicated below and that continue to comply with the appropriate design code in terms of rigidity and stability."

The changes are:

- a. Reduction in height
- b. Increase in the thickness of the wall
- c. Increase in the thickness of the component materials
- d. Reduction in linear dimensions of the panels, but not the thickness
- e. Reduction of the space between the stiffeners
- f. Reducing of the distance between the constraints
- g. Increasing the number of horizontal joints in the case of the test with only one joint at a distance not greater than 500 mm from the top edge.
- h. Reduction of the applied load
- i. Increase of the width (length of the wall), provided that the specimen has been tested over its entire width, or over a width of 3 meters, whichever is greater.

Results of calculations: analytical method

Analytical calculations are allowed according to EN 1996-1-2: "Design of masonry structures - Part 1-2: General rules - Structural fireproof design."

In fact, "the Italian decisions" consider Appendices A, C, D, F with only informational value and Appendix B has been considered invalid.

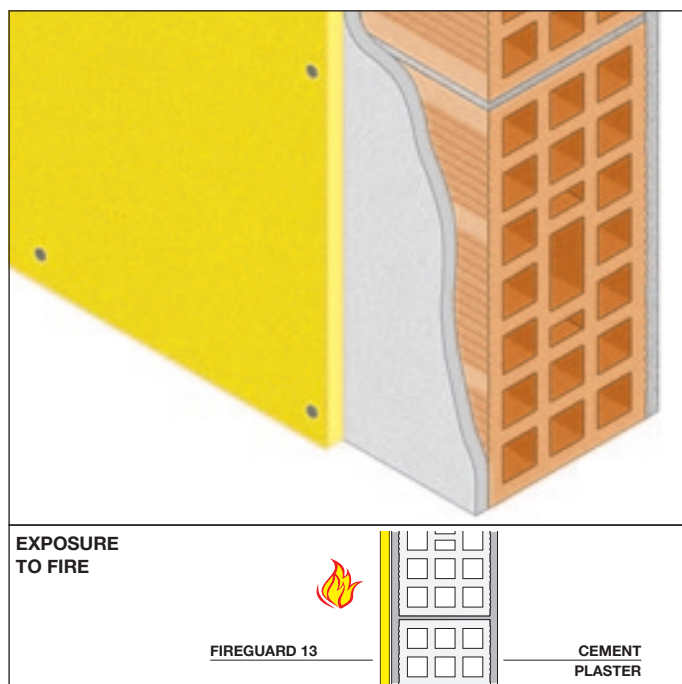
The application of this method is currently very difficult because the values of "thermal expansion" and the "specific heat", to be used in the procedures provided by the standard, can be determined only experimentally by the EN 1364-1 for non-loadbearing walls and EN 1365-1 for loadbearing walls, so they are not easily available.

For sure is not possible to apply analytical calculations and mathematical models arbitrarily made on light walls with metal frames and cladding.





LOAD-BEARING WALLS PROTECTION



SYSTEM SPECIFICATIONS

Construction of a cladding to load-bearing brick walls 115 mm in thickness with plaster 10 mm in thickness on the both side, for fire resistance REI 180 using FIREGUARD® 13 board in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 295052 – 3413 FR.

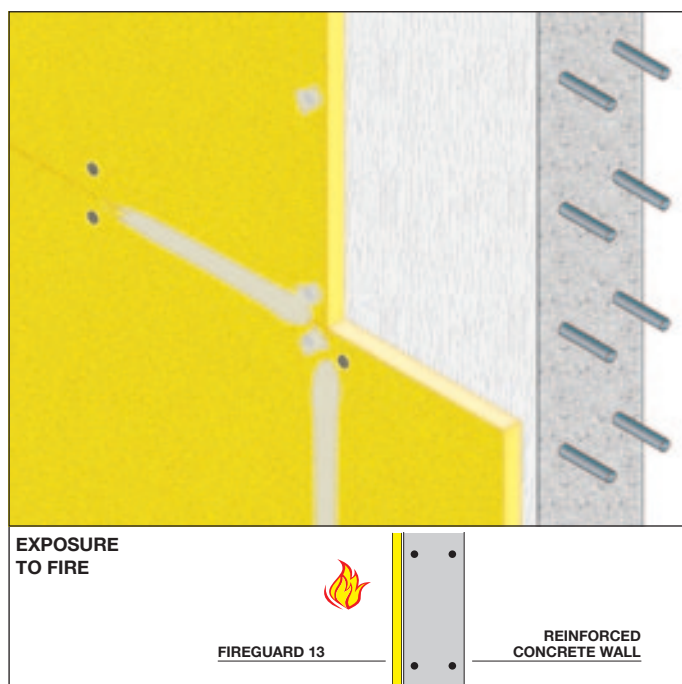
REACTION TO FIRE: A1**FIRE RESISTANCE: REI 180**

- **Base structure:** load-bearing brick wall in thickness 115 mm with plaster on both sides
- **Fire protection:** FIREGUARD® 13 boards in thickness 1x12,7 mm to be anchored
- **Fastening:** metal expansion anchor bolts 9 mm in diameter at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 3 m
maximum applied load: 794,6 kN, $\sigma = 1,96 \text{ N/mm}^2$ penetration by electrical installations: permissible only with specific certification
- **Extended applications based on technical instruction No. 304602 approved by Istituto Giordano**
maximum height: 8 m - please check with our technical department

Classification report: I.G. 295052 – 3413 FR
Fire Testing Norm: EN 1365-1

The boards are installed vertically using metal expansion anchor bolts 9 mm in diameter and 40 mm length at 500 mm centres. For further details see the "Installation Manual".

LOAD-BEARING REINFORCED CONCRETE WALLS



**SEE THE SECTION ON
THE PROTECTION OF
REINFORCED CONCRETE STRUCTURES
(p. 46).**



LIGHT LOADBEARING WALLS

The load-bearing partition walls can act as a fire resistant barrier; this feature may be indicated by the letters RE, REI, REI-M, RE-W.

The Ministerial Decree February 16, 2007 provides three methods for determining the fire resistance performance for the vertical load-bearing compartments, according to:

- test results: experimental method
- comparison with tables: not allowed in this case
- results of calculations: not allowed in this case

Results of tests: experimental method

The reference norm for determining the fire resistance performance of load-bearing walls is EN 1365-1: "Testing of fire resistance for load-bearing elements - Walls."

The results of these tests allow to obtain the classification used in EN 13501-2: "Fire classification of construction products and building elements - Part 2: Classification on the base of fire resistance tests, excluding ventilation systems" in terms of "RE", "REI", "REI-M", "REW".

Only the walls with "REI", "REI-M" classifications are considered as partitioning walls.

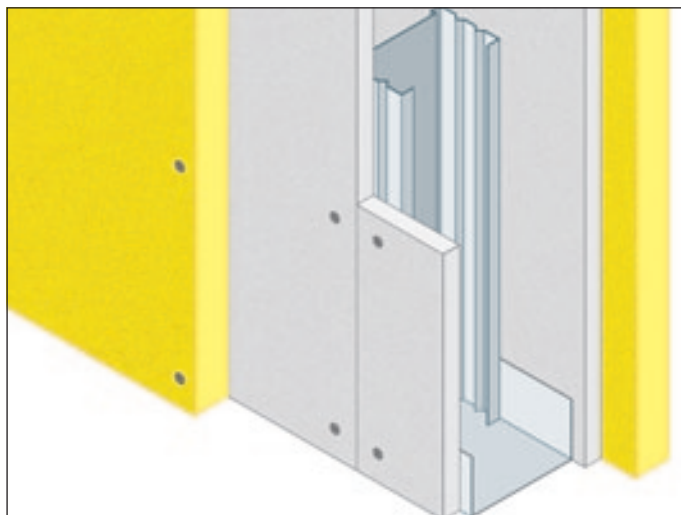
In the case of loadbearing vertical compartments the UNI EN 1365-1 defines the field of direct application in the following way: "The results of the fire resistance tests are directly applicable to similar constructions in which have been carried out one or more of the changes indicated below and that continue to comply with the appropriate design code in terms of rigidity and stability."

The changes are:

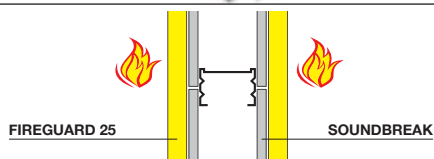
- a. Reduction in height
- b. Increase in the thickness of the wall
- c. Increase in the thickness of the component materials
- d. Reduction in linear dimensions of the panels, but not the thickness
- e. Reduction of the space between the stiffeners
- f. Reducing of the distance between the constraints
- g. Increasing the number of horizontal joints in the case of the test with only one joint at a distance not greater than 500 mm from the top edge.
- h. Reduction of the applied load
- i. Increase of the width (length of the wall), provided that the specimen has been tested over its entire width, or over a width of 3 meters, whichever is greater.



LIGHT LOADBEARING WALLS



EXPOSURE TO FIRE



SYSTEM SPECIFICATIONS

Construction of load bearing partition with fire resistance REI 120 using on each side one FIREGUARD® 25 board in thickness 25,4 mm, maximum size 610x2200 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and one SOUNDBREAK board in thickness 12,5 mm, maximum size 1200x3000 mm consisting of high density plasterboard (1010 Kg/m³), and conforming to classification report I.G. 308829-3583 FR.

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 120

- **Support structure:** vertical steel studs "C" 75x50x0,8 mm at 550 mm centres
- **Fire protection:** FIREGUARD® 25 boards in thk 2x25,4 mm and SOUNDBREAK board in thickness 2x12,5 mm
- **Fastening:** self-tapping phosphated screws 3,5 mm in diameter fastened on vertical steel studs "C"
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads
- **Applications:**
maximum height: 3 m
maximum applied load: 3,05 KN/m

Classification report: I.G. 308829-3583 FR
Fire Testing Norm: EN 1365-1

The boards are installed horizontally with staggered joints for the external layer and fastened using self-tapping phosphated screws 3,5 mm in diameter and appropriate length to vertical steel studs "C" 75x50x0,8 mm which are positioned at 550 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".



NON LOAD-BEARING WALLS

The interventions aimed at the construction of non-loadbearing vertical compartmentalization elements are the following:

- construction of fireproof walls or partition
- fireproof upgrading of existing wall through cladding or counterwall.

The methods for determining the fire resistance performance for non-loadbearing vertical compartmentalization, are based on:

- test results: experimental method
- results of calculations: analytical method

Results of tests: experimental method

The reference norm for the determination of the fire resistance performance of non-loadbearing walls is EN 1364-1: "Fire resistance tests for non-loadbearing elements - Walls."

The results of these tests lead to obtain the classification used in EN 13501-2: "Fire classification of construction products and building elements - Part 2: Classification on the base of fire resistance tests, excluding ventilation systems", in terms of "E", "EI", "EI-M", "EW."

Only the walls with "EI", "EI-M" classifications are considered as partitioning walls.

In the case of non-loadbearing vertical compartments the EN 1364-1 norm defines the field of direct application in the following way: "The results of the fire resistance test are directly applicable to similar constructions in which have been carried out one or more of the changes indicated below and that they continue to comply with the appropriate design code in terms of rigidity and stability."

The changes are:

- a. Reduction in height
- b. Increase in the thickness of the wall
- c. Increase in the thickness of the component materials
- d. Reduction in linear dimensions of the panes, but not the thickness
- e. Reduction of the space between the stiffeners
- f. Reduction of the distance between the constraints
- g. Increase of the number of the horizontal joints in the case of the test performed with only one joint at a distance not greater than 500 mm from the top edge
- h. Use of installations and accessories applied to the surface
- i. Horizontal and/or vertical joints, of the type under test

Increase in width

The rule in this case defines the length of the wall; the length of identical construction can be increased if the specimen under test has a nominal width of minimum 3 m, with a vertical edge not stuck, free.

Increase of height

The minimum height of 3 m of the construction under test can be increased up to 4 meters if the maximum lateral deflection of the specimen did not exceed 100 mm.

In other words, the size and other characteristics of the test sample can be varied within the limits of the field of direct application without affecting the characteristics of fire resistance.

In case of sample variations that fall outside the direct field of application, the manufacturer has to prepare the technical instruction, to which the test institute will have to give positive opinion. The positive opinion of the laboratory is the only instrument allowing to make changes to the test specimen.

Evaluation reports prepared by professionals are not valid under the experimental method and are not applicable. Through the technical instruction the manufacturer could guarantee to the designer the safe use of a system or a product even when it is outside the direct application field.



Results of calculations: the analytical method

Analytical calculations are permitted according to EN 1996-1-2: "Design of masonry structures - Part 1-2: General rules - Structural fireproof design."

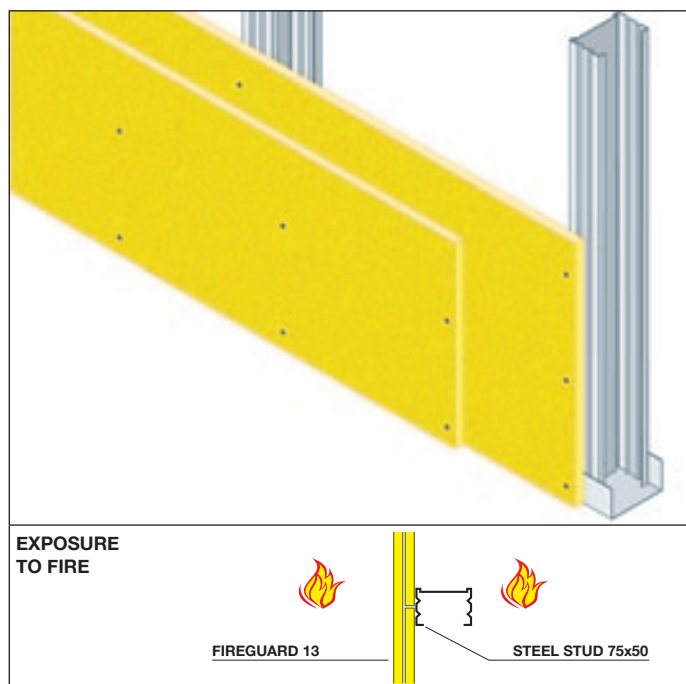
Some countries, regarding the definition of national annexes, consider Appendices A, C, D, F with only informational value and Appendix B has been deemed invalid. Therefore the tables contained in "Walls" Eurocode are not applicable.

The application of analytical methods of calculation are currently very difficult because the values of "thermal expansion" and the "specific heat", for use in the procedures provided by the standard, can only be determined experimentally by the EN 1364-1 for non-loadbearing masonry walls and EN 1365-1 for loadbearing walls and are not readily available.

For sure is not possible to apply arbitrarily made analytical calculations and mathematical models on light walls with metal frames and cladding.



FIRE BARRIERS



SYSTEM SPECIFICATIONS

Construction of a vertical barrier with fire resistance EI 60 using two FIREGUARD® 13 boards in thickness 12,7 mm, in maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 260329-3145 FR.

REACTION TO FIRE: A1

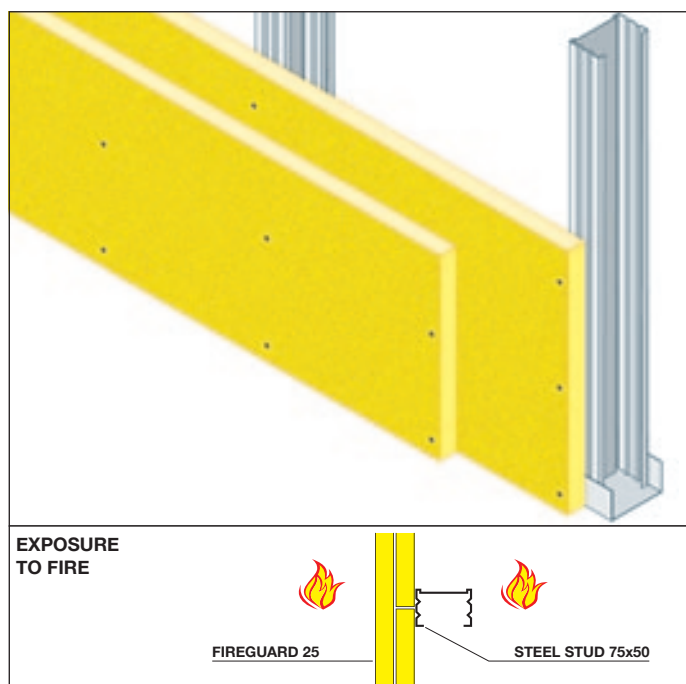
FIRE RESISTANCE: EI 60

- **Supporting structure:** vertical steel studs "C" 75x50x0,6 mm at 600 mm centres
- **Fire protection:** FIREGUARD® 13 boards, thickness 2x12,7 mm
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m
- **Extended applications based on technical instruction No. 313970 approved by Istituto Giordano**
maximum height: 12 m for exposure to fire from side with fire protection boards, only. (For detailed dimensions please check with our technical department)

Classification report: I.G. 260329-3145 FR
Fire Testing Norm: EN 1364-1

The boards are installed vertically with staggered joints using self-tapping phosphated screws 3,5 mm in diameter and 25 mm length at 600 mm centres for the inner layer, and 35 mm length at 250 mm centres for the outer. They are such fastened to vertical steel studs "C" 75x50x0,6 mm which are positioned at 600 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling. For further details see the "Installation Manual".

FIRE BARRIERS



SYSTEM SPECIFICATIONS

Construction of a vertical barrier with fire resistance EI 120 using two FIREGUARD® 25 boards in thickness 25,4 mm, in maximum size 610x2200 mm, consisting of calcium silicate and sulfate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 260330-3146 FR.

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120

- **Supporting structure:** vertical steel studs "C" 75x50x0,6 mm at 550 mm centres
- **Fire protection:** FIREGUARD® 25 boards, thickness 2x25,4 mm
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m
- **Extended applications based on technical instruction No. 313971 approved by Istituto Giordano**
maximum height: 12 m for exposure to fire from side with fire protection boards, only. (For detailed dimensions please check with our technical department)

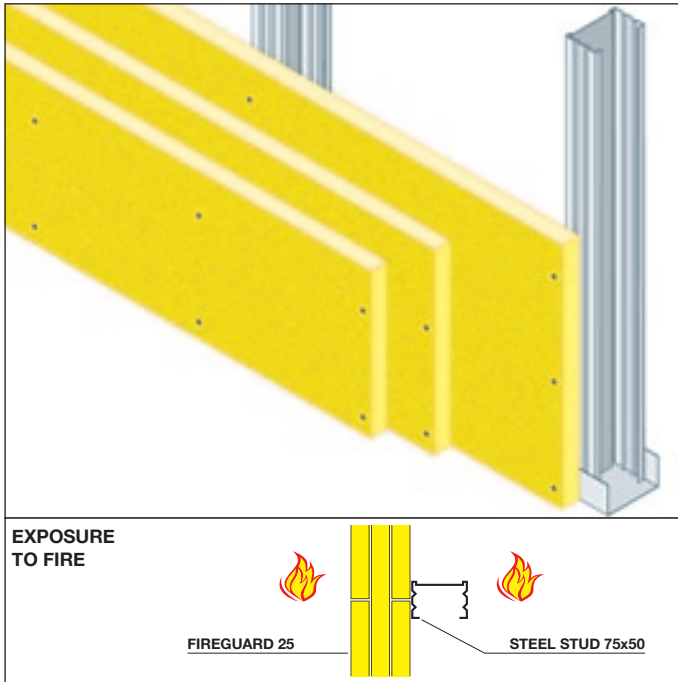
Classification report: I.G. 260330-3146 FR
Fire Testing Norm: EN 1364-1

The boards are installed horizontally with staggered joints using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 600 mm centres for the inner layer, and 70 mm length at 250 mm centres for the outer.

They are such fastened to vertical steel studs "C" 75x50x0,6 mm which are positioned at 550 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling. For further details see the "Installation Manual".



FIRE BARRIERS



Construction of a vertical barrier with fire resistance EI 180 using three FIREGUARD® 25 boards in thickness 25,4 mm, in maximum size 610x2200 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 260331-3147 FR.

The boards are installed horizontally with staggered joints using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 180

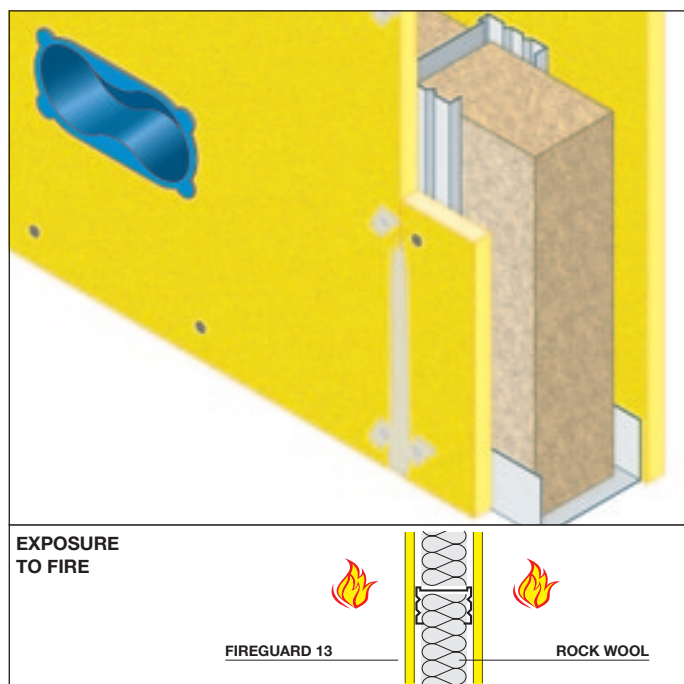
- **Supporting structure:** vertical steel studs "C" 75x50x0,6 mm at 550 mm centres
- **Fire protection:** FIREGUARD® 25 boards, thickness 3x25,4 mm
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:** maximum height: 4 m
- **Extended applications based on technical instruction No. 313972 approved by Istituto Giordano** maximum height: 12 m for exposure to fire from side with fire protection boards, only. (For detailed dimensions please check with our technical department)

Classification report: I.G. 260331-3147 FR
Fire Testing Norm: EN 1364-1

600 mm centres for the inner layer, and 70 mm length at 600 mm centres for the intermediate and 90 mm length at 300 mm centres for the outer. They are such fastened to vertical steel studs "C" 75x50x0,6 mm which are positioned at 550 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling. For further details see the "Installation Manual".



NON-LOAD BEARING WALLS



REACTION TO FIRE : A1 FIRE RESISTANCE: EI 90

- **Supporting structure:** vertical steel studs "C" 75x50x0,6 mm at 500 mm centres
- **Insulation:** rock wool 60 mm, density 60 kg/m³
- **Fire protection:** FIREGUARD® 13 boards, thickness 1x12,7 mm on each side
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads
- **Extended applications:**
maximum height: 4 m
penetration by electrical installations: permissible
- **Extended applications:** please check with our technical department

Classification report: I.G. 249552-3091 FR
Fire Testing Norm: EN 1364-1

SYSTEM SPECIFICATIONS

Construction of a partition with fire resistance EI 90 using on each side one FIREGUARD® 13 board in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 249552-3091 FR.

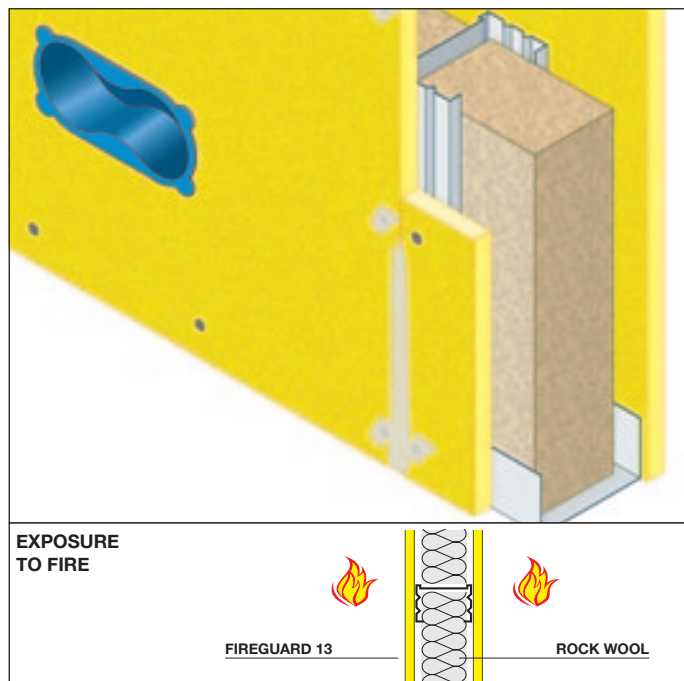
The boards are installed horizontally and fastened by self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 200 mm

centres to vertical steel studs "C" 75x50x0,6 mm which are positioned at 500 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling.

In between a mat of rock wool 60 mm thick and 60 kg/m³ in density, is inserted. FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

NON-LOAD BEARING WALLS



REACTION TO FIRE : A1 FIRE RESISTANCE: EI 120

- **Supporting structure:** vertical steel studs "C" 75x50x0,6 mm at 500 mm centres
- **Insulation:** rock wool 60 mm, density 80 kg/m³
- **Fire protection:** FIREGUARD® 13 boards, thickness 1x12,7 mm on each side
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads
- **Extended applications:**
maximum height: 4 m
penetration by electrical installations: permissible
- **Extended applications: technical instructions No. 288888 approved by Istituto Giordano**
maximum height: 11,3 m – EI 90 (For detailed dimensions please check with our technical department)

Classification report: I.G. 253623-3112 FR
Fire Testing Norm: EN 1364-1

SYSTEM SPECIFICATIONS

Construction of a partition with fire resistance EI 120 using on each side one FIREGUARD® 13 board in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 253623-3112 FR.

The boards are installed horizontally and fastened by self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 200 mm

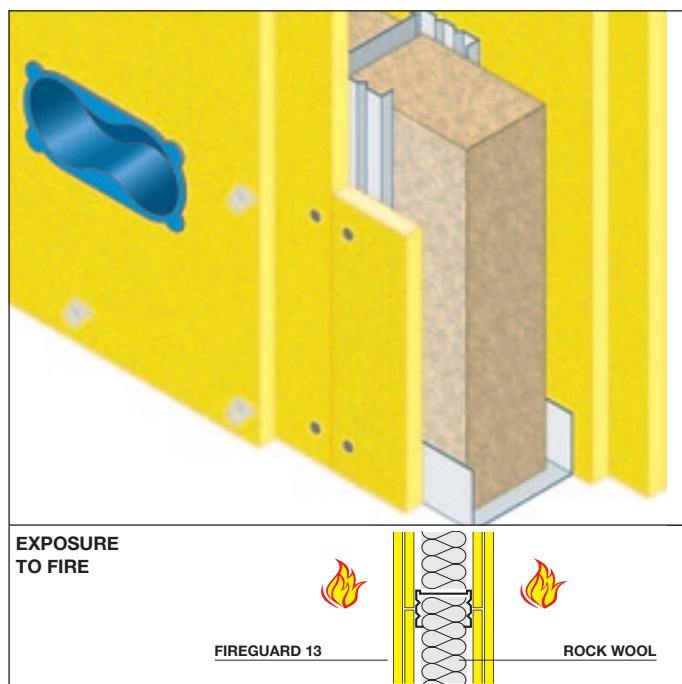
centres to vertical steel studs "C" 75x50x0,6 mm which are positioned at 500 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling.

In between a mat of rock wool 60 mm thick and 80 kg/m³ in density, is inserted. FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".



NON-LOAD BEARING WALLS



SYSTEM SPECIFICATIONS

Construction of a partition with fire resistance EI 180 using on each side two FIREGUARD® 13 board in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 249553-3092 FR.

The boards are installed horizontally and fastened by self-tapping phosphated screws 3,5 mm in diameter and 25 mm length at 600 mm

REACTION TO FIRE : A1

FIRE RESISTANCE: EI 180

- **Supporting structure:** vertical steel studs "C" 75x50x0,6 mm at 500 mm centres
- **Insulation:** rock wool 60 mm, density 60 kg/m³
- **Fire protection:** FIREGUARD® 13 boards, thickness 2x12,7 mm on each side
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads
- **Extended applications:**
maximum height: 4 m
penetration by electrical installations: permissible
- **Extended applications:** please check with our technical department

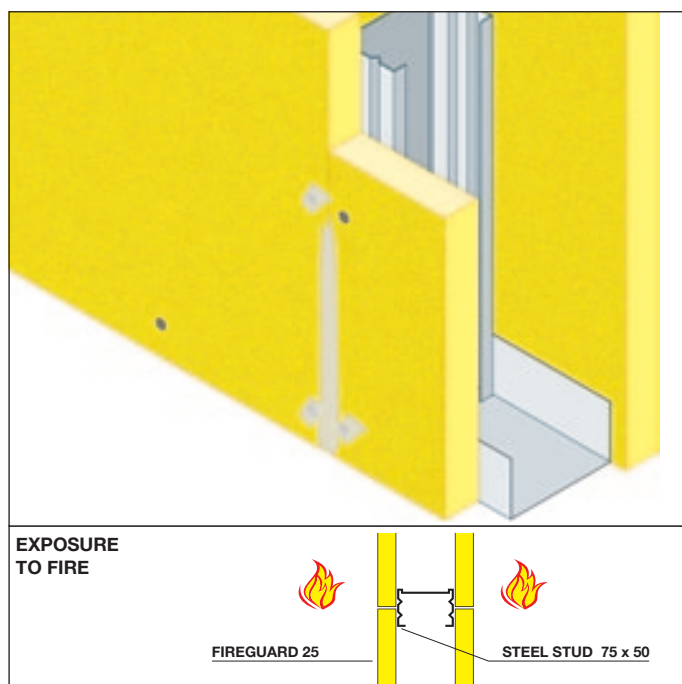
Classification report: I.G. 249553-3092 FR
Fire Testing Norm: EN 1364-1

centres for the inner layer, and 35 mm length at 200 mm centres for the outer. They are such fastened to vertical steel studs "C" 75x50x0,6 mm which are positioned at 500 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling.

In between a mat of rock wool 60 mm thick and 60 kg/m³ in density, is inserted. FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

NON-LOAD BEARING WALLS



SYSTEM SPECIFICATIONS

Construction of a partition with fire resistance EI 180 using on each side one FIREGUARD® 25 board in thickness 25,4 mm, maximum size 610x2200 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 264458-3161 FR.

The boards are installed horizontally and fastened by self-tapping

REACTION TO FIRE : A1

FIRE RESISTANCE: EI 180

- **Supporting structure:** vertical steel studs "C" 75x50x0,6 mm at 550 mm centres
- **Insulation:** not provided
- **Fire protection:** FIREGUARD® 25 boards, thickness 1x25,4 mm on each side
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads
- **Applications:** maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications: technical instructions No. 288889 approved by Istituto Giordano**
maximum height: 12,6 m – EI 120 (For detailed dimensions please check with our technical department)

Classification report: I.G. 264458-3161 FR
Fire Testing Norm: EN 1364-1

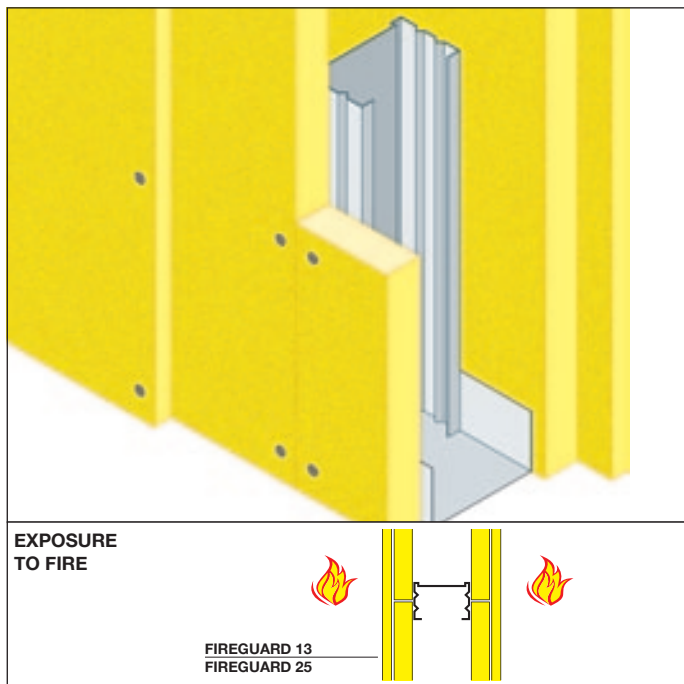
phosphated screws 3,5 mm in diameter and 35 mm length at 250 mm centres to vertical steel studs "C" 75x50x0,6 mm which are positioned at 550 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".



NON-LOAD BEARING WALLS


REACTION TO FIRE : A1
FIRE RESISTANCE: EI 240

- **Supporting structure:** vertical steel studs "C" 75x50x0,6 mm at 550 mm centres
- **Insulation:** not provided
- **Fire protection:** FIREGUARD® 25 and FIREGUARD® 13 boards in thickness 1 x 25,4 mm + 1 x 12,7 mm on each side
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications: technical instructions No. 303834 approved by Istituto Giordano**
maximum height: 12,7 m – EI 180 (For detailed dimensions please check with our technical department)

Classification report: I.G. 286901-3343 FR
Fire Testing Norm: EN 1364-1

SYSTEM SPECIFICATIONS

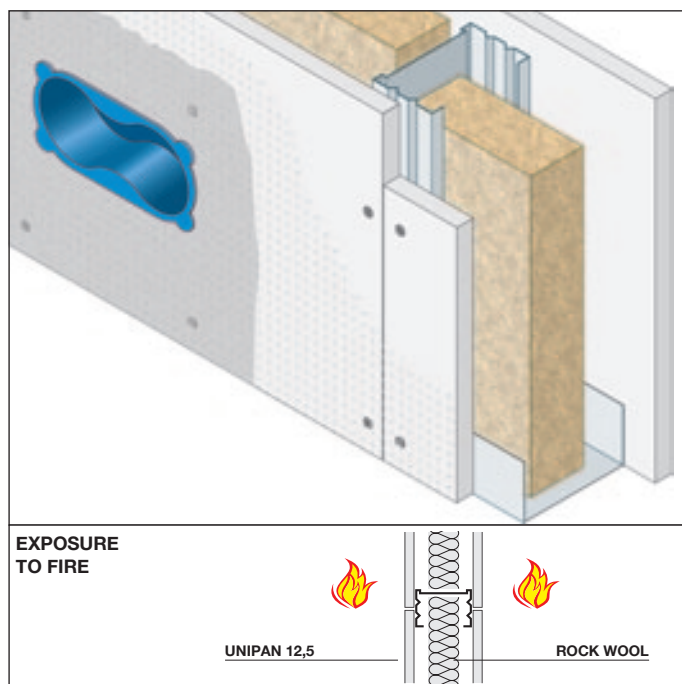
Construction of a partition with fire resistance EI 240 using on each side one FIREGUARD® 25 board in thickness 25,4 mm, maximum size 610 x 2200 mm and one FIREGUARD® 13 board in thickness 12,7 mm, maximum size 1220 x 2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report: I.G. 286901-3343 FR.

The boards are installed horizontally with staggered joints for the outer layer and fastened by self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 500 mm centres for the inner layer, and 55 mm length at 250 mm centres for the outer. They are such fastened to vertical steel studs "C" 75x50x0,6 mm which are positioned at 550 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling.

For further details see the "Installation Manual".



EXTERNAL WALLS



SYSTEM SPECIFICATIONS

Construction of a partition suitable for outdoor and wet environment with fire resistance EI 60 using on each side one UNIPAN® board in thickness 12,5 mm, maximum size 1200x2000 mm, obtained from a mixture of Portland cement and aggregates, with the two faces, front and back, made by glass fiber mesh with a polymeric coating, the longitudinal edges thinned and strengthened thanks to the EdgeTech® technology, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 237597-3031 FR. The boards are installed horizontally and fastened

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 60

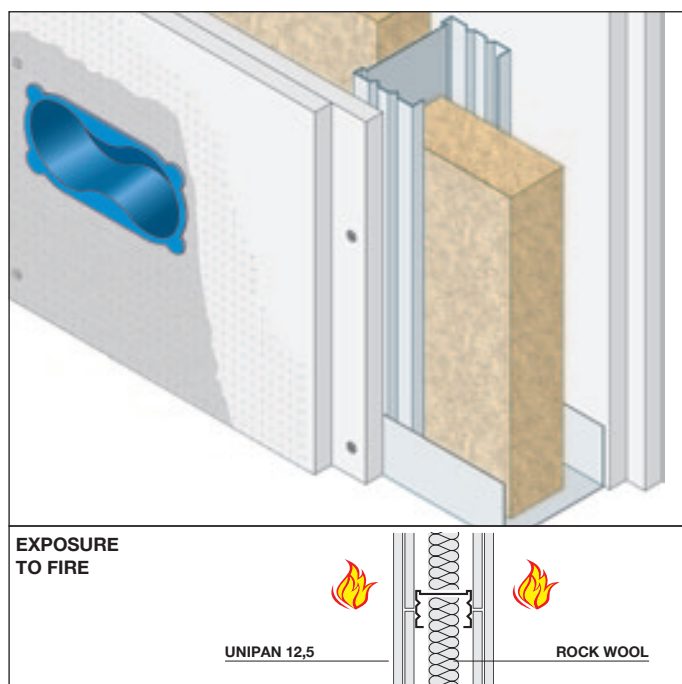
- **Supporting structure:** vertical steel studs "C" 75x50x0,6 mm at 400 mm centres
- **Insulation:** rock wool 40 mm, density 40 kg/m³
- **Fire protection:** UNIPAN® boards in thickness 1 x 12,5 mm on each side
- **Surface finish:** using UNIJOINT cement based compound with mesh as a reinforced finish over boards
- **Applications:**
maximum height: 4 m
penetration by electrical installations: permissible
- **Extended applications:** please check with our technical department

Classification report: I.G. 237597-3031 FR
Fire Testing Norm: EN 1364-1

by UNIVIS self-tapping phosphated screws 3,2 mm in diameter and 32 mm length at 200 mm centres to vertical steel studs "C" 75x50x0,6 mm which are positioned at 400 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling. In between a mat of rock wool 40 mm thick and 40 kg/m³ in density, is inserted. UNIJOINT cement based compound is applied with UNIROLL fibreglass mesh as a reinforced finish to cover the boards.

For further details see the "Installation Manual".

EXTERNAL WALLS



SYSTEM SPECIFICATIONS

Construction of a partition suitable for outdoor and wet environment with fire resistance EI 120 using on each side two UNIPAN® board in thickness 12,5 mm, maximum size 1200x2000 mm, obtained from a mixture of Portland cement and aggregates, with the two faces, front and back, made by glass fiber mesh with a polymeric coating, the longitudinal edges thinned and strengthened thanks to the EdgeTech® technology, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 237598-3032 FR. The boards are installed horizontally and fastened by UNIVIS self-tapping

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120

- **Supporting structure:** vertical steel studs "C" 75x50x0,6 mm at 400 mm centres
- **Insulation:** rock wool 40 mm, density 40 kg/m³
- **Fire protection:** UNIPAN® boards in thickness 2 x 12,5 mm on each side
- **Surface finish:** using UNIJOINT cement based compound with mesh as a reinforced finish over boards
- **Applications:**
maximum height: 4 m
penetration by electrical installations: permissible
- **Extended applications:** please check with our technical department

Classification report: I.G. 237598-3032 FR
Fire Testing Norm: EN 1364-1

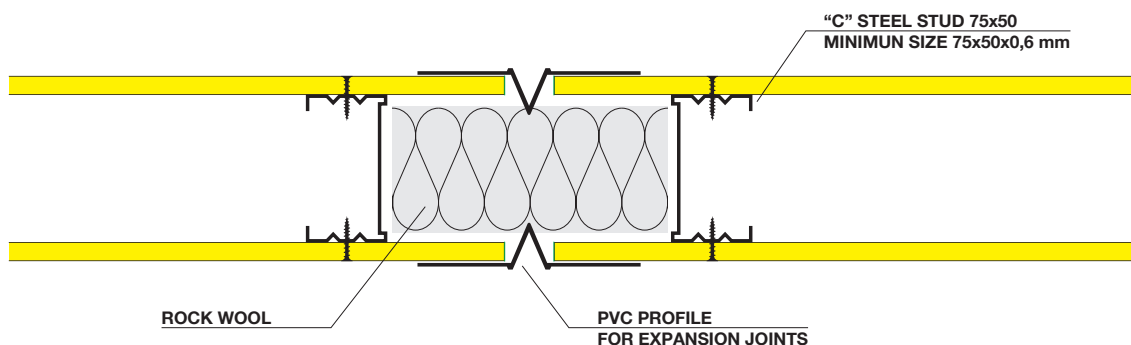
phosphated screws 3,2 mm in diameter and 32 mm length at 600 mm centres for the inner layer, and 41 mm length at 200 mm centres for the outer. They are such fastened to vertical steel studs "C" 75x50x0,6 mm which are positioned at 400 mm centres and inserted in steel angles "U" 75x40x0,6 mm mounted on the floor and ceiling. In between a mat of rock wool 40 mm thick and 40 kg/m³ in density, is inserted. UNIJOINT cement based compound is applied with UNIROLL fibreglass mesh as a reinforced finish to cover the boards. For further details see the "Installation Manual".



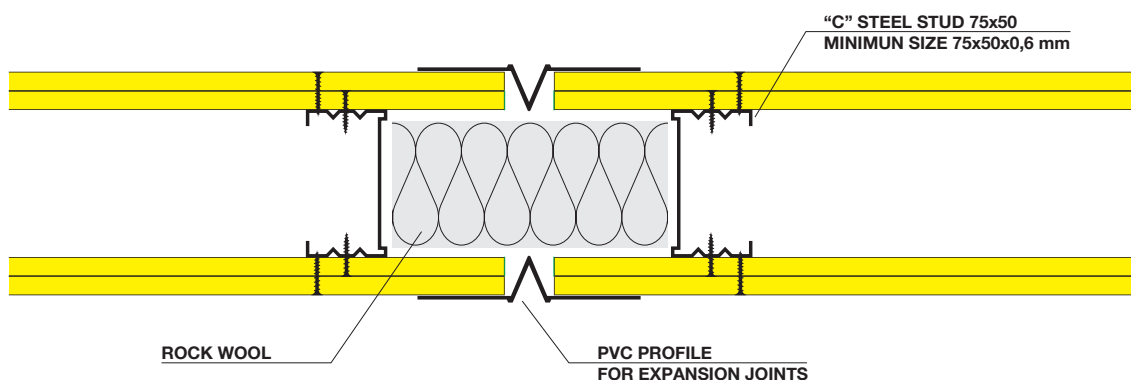
JOINTS DETAILS

GIUNTI A PARETE

SINGLE
BOARD WALLS
up to EI 120

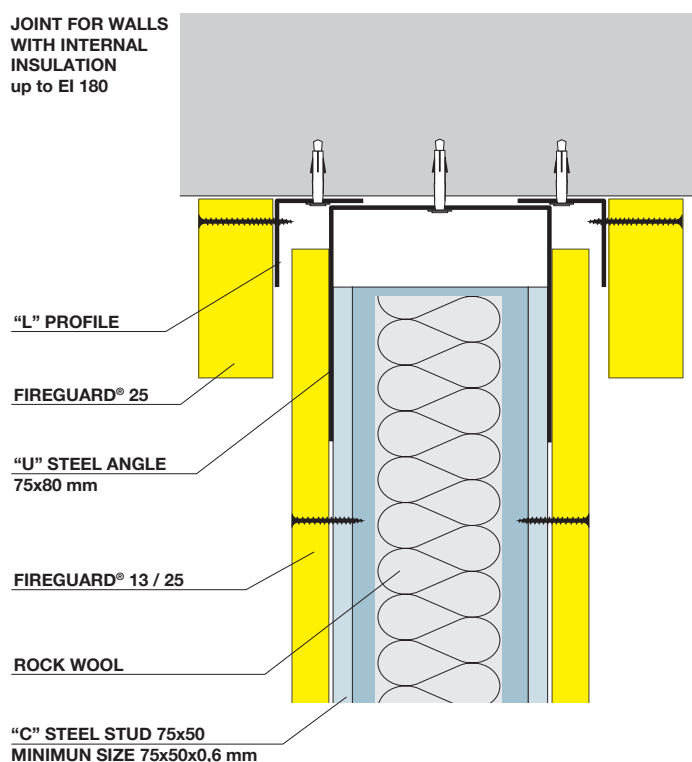


DOUBLE
BOARD WALL
up to EI 240

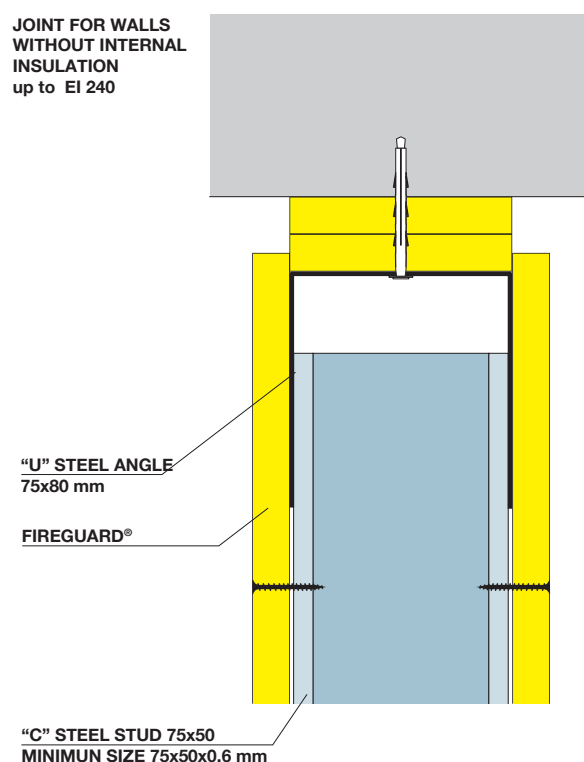


CEILING JOINTS

JOINT FOR WALLS
WITH INTERNAL
INSULATION
up to EI 180

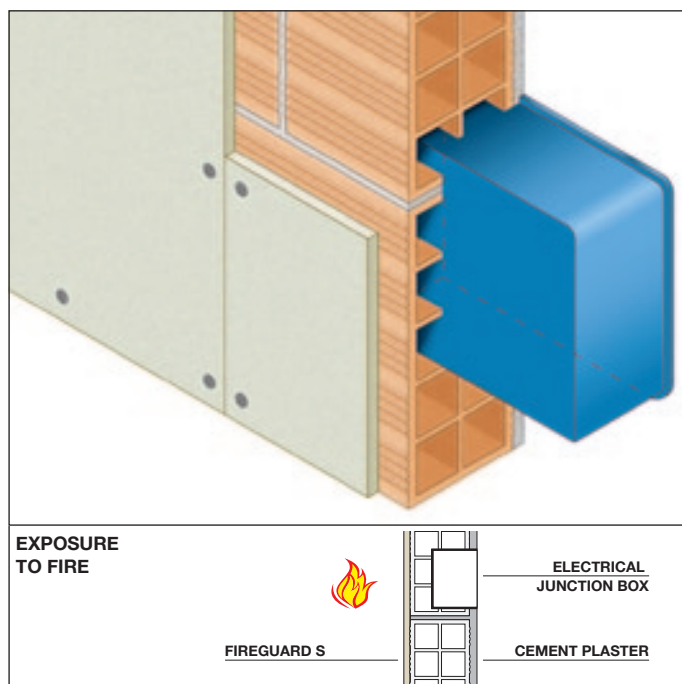


JOINT FOR WALLS
WITHOUT INTERNAL
INSULATION
up to EI 240





NON-LOAD BEARING WALLS PROTECTION


REACTION TO FIRE: A1
FIRE RESISTANCE: EI 120

- **Base structure:** brick wall in thickness 80 mm with plaster on non-exposed side
- **Fire protection:** FIREGUARD® S boards in thickness 1 x 8 mm to be anchored
- **Fastening:** metal expansion anchor bolts 9 mm in diameter at 550 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:** maximum height: 4 m
penetration by electrical installations: electrical junction box 200x100 mm on the not exposed side
- **Extended applications: technical instructions No. 302151 approved by Istituto Giordano**
maximum height: 8 m
applicable to various kinds of slabs (for detailed dimensions and types of slabs please check with our technical department)

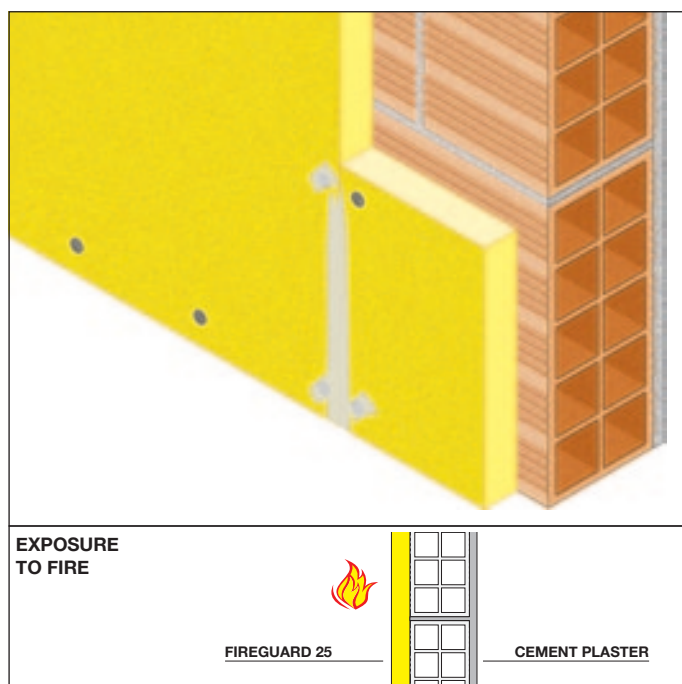
Classification report: I.G. 275726-3239 FR
Fire Testing Norm: EN 1364-1

SYSTEM SPECIFICATIONS

Construction of a cladding to brick walls 80 mm in thickness with plaster 10 mm in thickness on the side not exposed to fire, for fire resistance EI 120 using FIREGUARD® S boards in thickness 8 mm, maximum size 1220x2440 mm, consisting of a calcium silicate cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 275726-3239 FR.

The boards are installed vertically using metal expansion anchor bolts 9 mm in diameter and 40 mm length at 550 mm centres.
For further details see the "Installation Manual".

NON-LOAD BEARING WALLS PROTECTION


REACTION TO FIRE: A1
FIRE RESISTANCE: EI 180

- **Base structure:** brick wall in thickness 80 mm with plaster on non-exposed side
- **Fire protection:** FIREGUARD® 25 boards, thk 1 x 25,4 mm to be anchored
- **Fastening:** metal expansion anchor bolts 9 mm in diameter at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and anchor bolt heads
- **Applications:** maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications: technical instructions No. 302148 approved by Istituto Giordano**
maximum height: 8 m
applicable to various kinds of slabs (for detailed dimensions and types of slabs please check with our technical department)

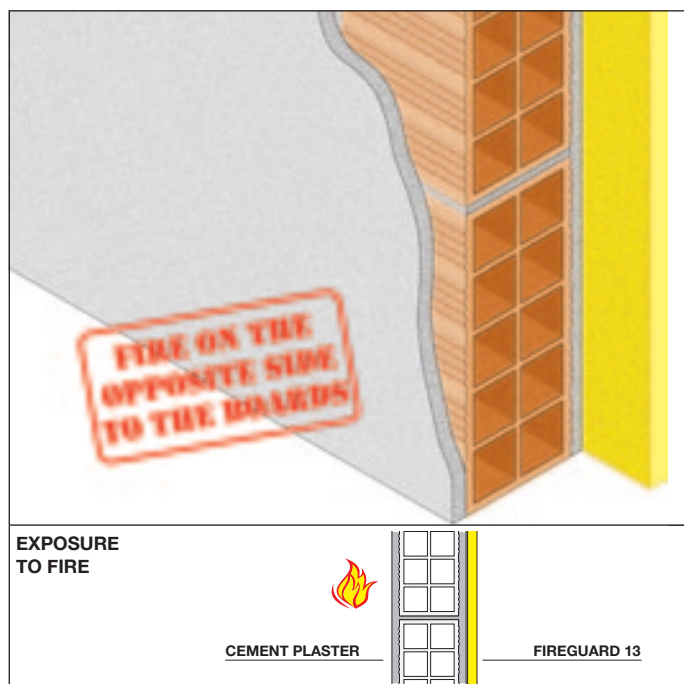
Classification report: I.G. 255766-3122 FR
Fire Testing Norm: EN 1364-1

Construction of a cladding to brick walls 80 mm in thickness with plaster 10 mm in thickness on the side not exposed to fire, for fire resistance EI 180 using FIREGUARD® 25 boards in thickness 25,4 mm, maximum size 610x2200 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 255766-3122 FR.

The boards are installed vertically using metal expansion anchor bolts 9 mm in diameter and 65 mm length at 500 mm centres.
FIREGUARD COMPOUND is applied as a finish to cover joints and anchor bolt heads.
For further details see the "Installation Manual".



NON-LOAD BEARING WALLS PROTECTION



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120

- **Base structure:** brick wall in thickness 80 mm with plaster on both sides
- **Fire protection:** FIREGUARD® 13 boards, thickness 1 x 12,7 mm to be anchored
- **Fastening:** metal expansion anchor bolts 9 mm in diameter at 600 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications: technical instructions approved by Istituto Giordano No. 302149.** maximum height: 8 m
applicable to various kinds of slabs (for detailed dimensions and types of slabs please check with our technical department)

Classification report: I.G. 255498-3121 FR
Fire Testing Norm: EN 1364-1

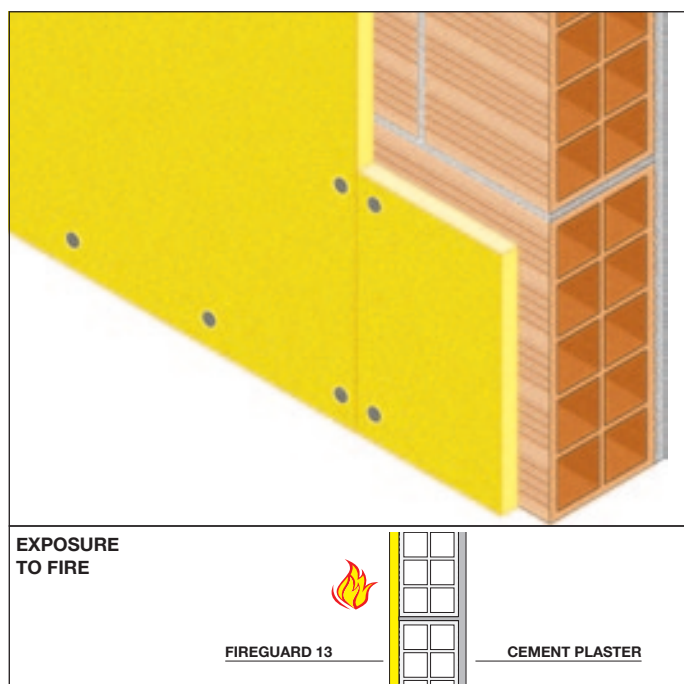
SYSTEM SPECIFICATIONS

Construction of a cladding to brick walls 80 mm in thickness with plaster 10 mm in thickness on the both side, for fire resistance EI 120 using FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 255498-3121 FR.

The boards are installed vertically on the side not exposed to fire using metal expansion anchor bolts 9 mm in diameter and 40 mm length at 600 mm centres.

For further details see the "Installation Manual".

NON-LOAD BEARING WALLS PROTECTION



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120

- **Base structure:** brick wall in thickness 80 mm with plaster on non-exposed side
- **Fire protection:** FIREGUARD® 13 boards, thickness 1 x 12,7 mm to be anchored
- **Fastening:** metal expansion anchor bolts 9 mm in diameter at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications: technical instructions approved by Istituto Giordano No. 302150.** maximum height: 8 m
applicable to various kinds of slabs (for detailed dimensions and types of slabs please check with our technical department)

Classification report: I.G. 282210-3303 FR
Fire Testing Norm: EN 1364-1

SYSTEM SPECIFICATIONS

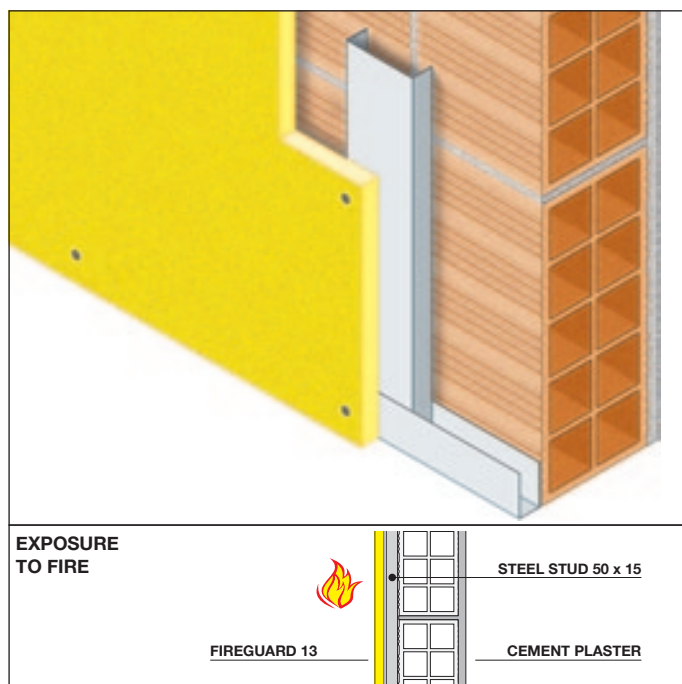
Construction of a cladding to brick walls 80 mm in thickness with plaster 10 mm in thickness on the side not exposed to fire, for fire resistance EI 120 using FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 282210-3303 FR.

The boards are installed vertically using metal expansion anchor bolts 9 mm in diameter and 40 mm length at 500 mm centres.

For further details see the "Installation Manual".



UPGRADING OF NON-LOADBEARING WALLS



SYSTEM SPECIFICATIONS

Construction of a cladding to hollow slab walls 80 mm in thickness with plaster 10 mm in thickness on the side not exposed to fire, for fire resistance EI 120 using FIREGUARD® 13 boards in thk 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 287016-3344 FR.

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120

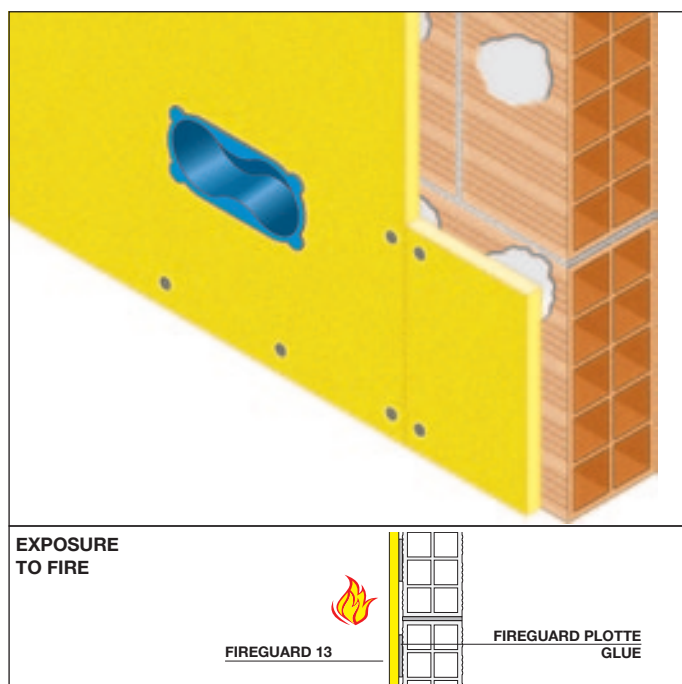
- **Base structure:** hollow slab wall in thickness 80 mm with plaster on non-exposed side
- **Fire protection:** FIREGUARD® 13 boards, in thickness 1x12,7 mm fastened on vertical steel studs "C" 50x15 mm
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications: technical instructions No. 302152 approved by Istituto Giordano.**
maximum height: 8 m
applicable to various kinds of slabs (for detailed dimensions and types of slabs please check with our technical department)

Classification report: I.G. 287016-3344 FR
Fire Testing Norm: EN 1364-1

The boards are installed vertically and fastened by self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 250 mm centres to vertical steel studs "C" 50x15x0,6 mm which are positioned at 600 mm centres, attached to adjustable brackets fixed to the wall with anchors at 1000 mm centres and inserted in steel angles "U" 30x15x0,6 mm mounted on the floor and ceiling.

For further details see the "Installation Manual".

UPGRADING OF NON-PLASTERED WALLS



SYSTEM SPECIFICATIONS

Construction of a cladding to hollow slab walls 80 mm in thickness without plaster, for fire resistance EI 120 using FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 307794-3560 FR.

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120

- **Base structure:** hollow slab wall in thickness 80 mm
- **Fire protection:** FIREGUARD® 13 boards, thickness 1x12,7 mm to be anchored and glued
- **Fastening:** metal expansion anchor bolts 4,5 mm in diameter, 80 mm length, at 600 mm centres and FIREGUARD PLOTTE glue
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Use of unprotected electrical boxes:** allowed
- **Applications:**
maximum height: 4 m
- **Extended applications: technical instructions No. 316581 approved by Istituto Giordano**
Maximum height: 8 m (for detailed dimensions please check with our technical department)

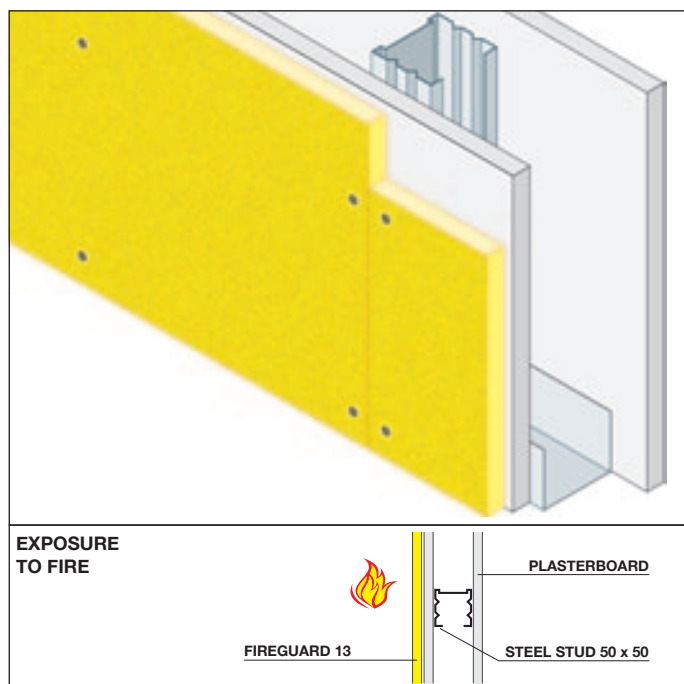
Classification report: I.G. 307794-3560 FR
Fire Testing Norm: EN 1364-1

The boards are installed vertically using metal expansion anchor bolts 4,5 mm in diameter and 80 mm length at 600 mm centres after interposition of adhesive pads of FIREGUARD PLOTTE glue.

For further details see the "Installation Manual".



PLASTERBOARD WALLS PROTECTION



SYSTEM SPECIFICATIONS

Construction of upgrading of plasterboard walls, for fire resistance EI 90. The existing plasterboard wall is made of vertical steel studs "C" 50x50x0,6 mm which are positioned at 600 mm centres and inserted in steel angles "U" 50x40x0,6 mm mounted on the floor and ceiling, coated with a standard plasterboard sheet with a thickness of 12,5 mm each side. The lining of the wall on the side exposed to fire will be made of one FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2400 mm, consisting of calcium silicate and sulphate, asbestos-

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 90

- **Base structure:** drywall made of vertical steel studs "C" 50x50x0,6 mm and a standard plasterboard sheet in thickness 12,5 mm each side
- **Fire protection:** FIREGUARD® 13 boards, thickness 1 x 12,7 mm
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications: technical instructions No. 288890 approved by Istituto Giordano**
maximum height: 11,3 m (for detailed dimensions please check with our technical department)

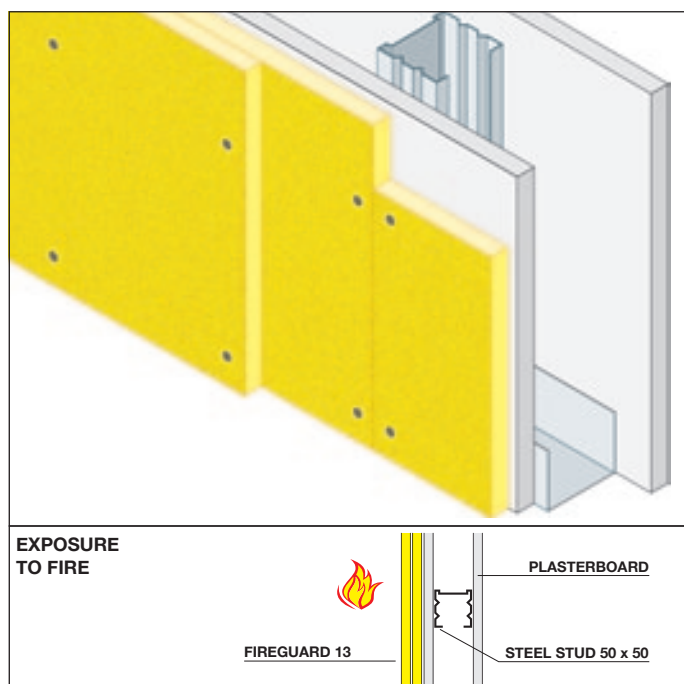
Classification report: I.G. 267600-3186 FR
Fire Testing Norm: EN 1364-1

free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 267600-3186 FR.

The boards are installed horizontally on the side exposed to fire and fastened by self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 250 mm centres to vertical steel studs.

For further details see the "Installation Manual".

PLASTERBOARD WALLS PROTECTION



SYSTEM SPECIFICATIONS

Construction of upgrading of plasterboard walls, for fire resistance EI 120. The existing plasterboard wall is made of vertical steel studs "C" 50x50x0,6 mm which are positioned at 600 mm centres and inserted in steel angles "U" 50x40x0,6 mm mounted on the floor and ceiling, coated with a standard plasterboard sheet with a thickness of 12,5 mm each side. The lining of the wall on the side exposed to fire will be made of two FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2400 mm, consisting of calcium silicate and sulphate, asbestos-

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120

- **Base structure:** drywall made of vertical steel studs "C" 50x50x0,6 mm and a standard plasterboard sheet in thickness 12,5 mm each side
- **Fire protection:** FIREGUARD® 13 boards, thickness 2 x 12,7 mm
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications: technical instructions no. 288891 approved by Istituto Giordano**
maximum height: 12,6 m (for detailed dimensions please check with our technical department)

Classification report: I.G. 268751-3193 FR
Fire Testing Norm: EN 1364-1

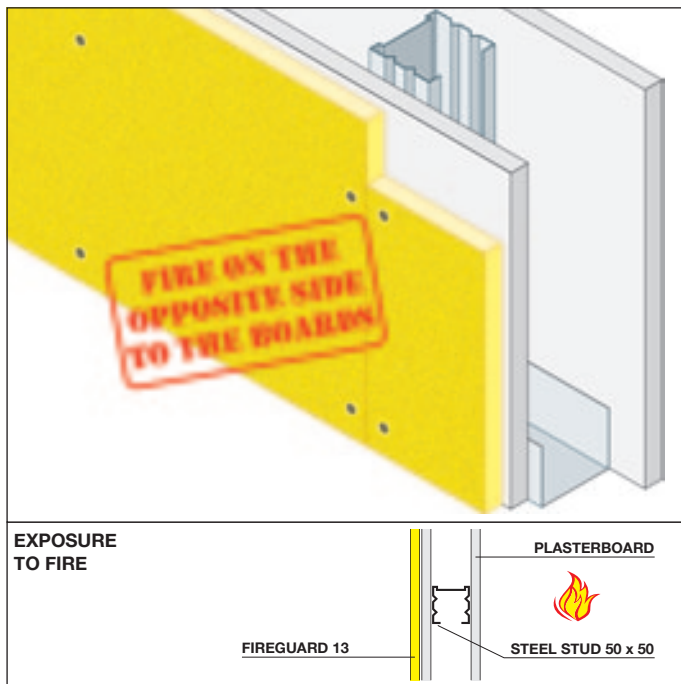
free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 268751-3193 FR.

The boards are installed horizontally on the side exposed to fire and fastened by self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 600 mm centres for the inner layer, and 45 mm length at 250 mm centres for the outer to vertical steel studs.

For further details see the "Installation Manual".



PLASTERBOARD WALLS PROTECTION



SYSTEM SPECIFICATIONS

Construction of upgrading of plasterboard walls, for fire resistance EI 90. The existing plasterboard wall is made of vertical steel studs "C" 50x50x0,6 mm which are positioned at 600 mm centres and inserted in steel angles "U" 50x40x0,6 mm mounted on the floor and ceiling, coated with a standard plasterboard sheet with a thickness of 12,5 mm each side. The lining of the wall on the side not exposed to fire will be made of one FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2400 mm, consisting of calcium silicate and sulphate, asbestos-

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 90

- **Base structure:** drywall made of vertical steel studs "C" 50x50x0,6 mm and a standard plasterboard sheet in thickness 12,5 mm each side
- **Fire protection:** FIREGUARD® 13 boards, thickness 1 x 12,7 mm
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m

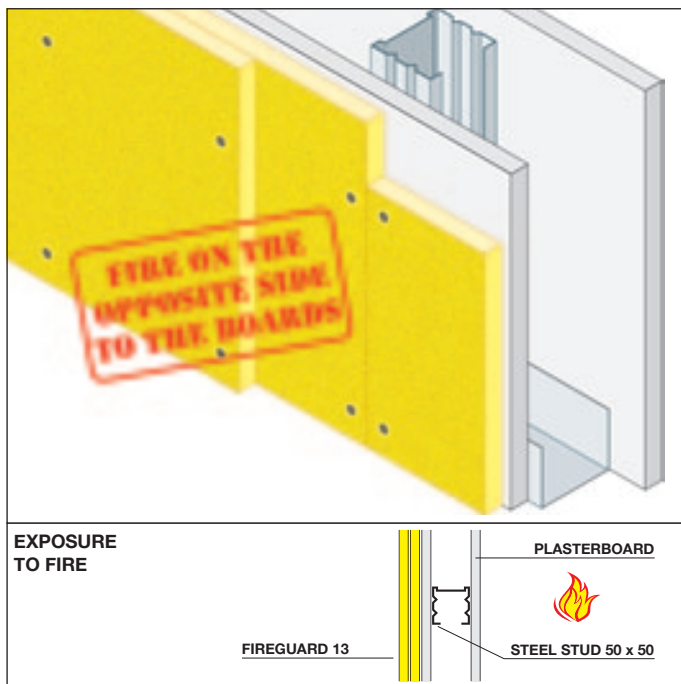
Classification report: I.G. 304551-3519 FR
Fire Testing Norm: EN 1364-1

free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 304551-3519 FR.

The boards are installed horizontally on the side not exposed to fire and fastened by self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 250 mm centres to vertical steel studs.

For further details see the "Installation Manual".

PLASTERBOARD WALLS PROTECTION



SYSTEM SPECIFICATIONS

Construction of upgrading of plasterboard walls, for fire resistance EI 120. The existing plasterboard wall is made of vertical steel studs "C" 50x50x0,6 mm which are positioned at 600 mm centres and inserted in steel angles "U" 50x40x0,6 mm mounted on the floor and ceiling, coated with a standard plasterboard sheet with a thickness of 12,5 mm each side. The lining of the wall on the side not exposed to fire will be made of two FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2400 mm, consisting of calcium silicate and sulphate, asbestos-

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120

- **Base structure:** drywall made of vertical steel studs "C" 50x50x0,6 mm and a standard plasterboard sheet in thickness 12,5 mm each side
- **Fire protection:** FIREGUARD® 13 boards, thickness 2 x 12,7 mm
- **Surface finish:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m

Classification report: I.G. 305104-3543 FR
Fire Testing Norm: EN 1364-1

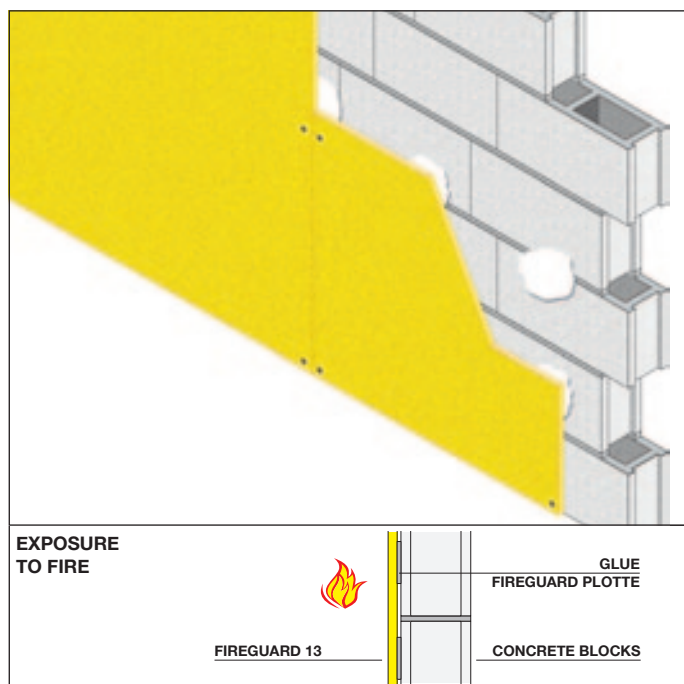
free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 305104-3543 FR.

The boards are installed horizontally on the side not exposed to fire and fastened by self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 600 mm centres for the inner layer, and 45 mm length at 250 mm centres for the outer to vertical steel studs.

For further details see the "Installation Manual".



UPGRADING OF CONCRETE BLOCKS WALLS



REACTION TO FIRE: A1 FIRE RESISTANCE: EI 120

- **Base structure:** lightweight concrete block wall in thk 12 cm without plaster on both sides
- **Fire protection:** FIREGUARD®13 boards in thk 1x12,7 mm to be anchored and glued
- **Fastening:** metal expansion anchor bolts 9 mm in diameter at 600 mm centres and FIREGUARD PLOTTE glue
- **Surface finishing:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:** maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications: technical instructions No. 316581 approved by Istituto Giordano.** maximum height: 8 m applicable to various kinds of slabs (for detailed dimensions and types of slabs please check with our technical department)
For the condition with fire on the opposite side, please check with our technical department

Classification report: I.G. 307794-3560 FR
Fire Testing Norm: EN 1364-1

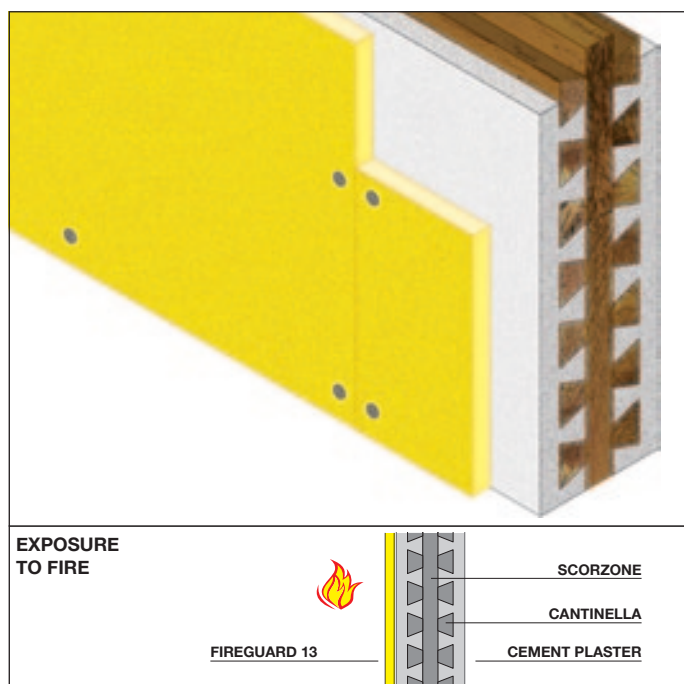
SYSTEM SPECIFICATIONS

Construction of a cladding to lightweight concrete block walls 12 cm in thickness for fire resistance EI 120 using FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 307794-3560 FR.

The boards are installed vertically on the side exposed/not exposed to fire using metal expansion anchor bolts 9 mm in diameter and 40 mm length at 600 mm centres after interposition of adhesive pads of FIREGUARD PLOTTE glue.

For further details see the "Installation Manual".

UPGRADING OF SCORZONI AND CANTINELLE WALLS



REACTION TO FIRE: A1 FIRE RESISTANCE: EI 180

- **Base structure:** scorzoni and cantinelle wall in thk 90 mm
- **Fire protection:** FIREGUARD® 13 boards in thk 1x12,7 mm
- **Fastening:** self-tapping phosphated screws 3,5 mm in diameter at 250 mm centres
- **Surface finishing:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications:** please check with our technical department

Classification report: I.G. 288149-3351 FR
Fire Testing Norm: EN 1364-1

SYSTEM SPECIFICATIONS

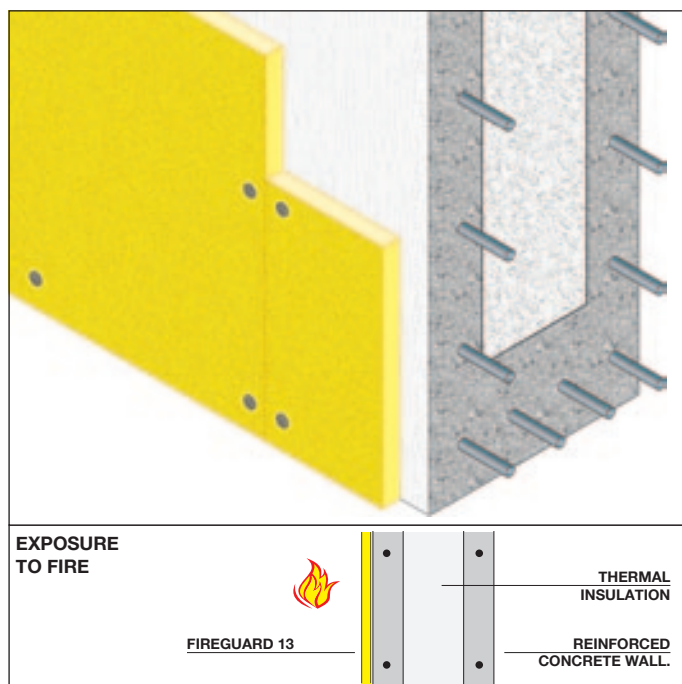
Construction of a cladding to scorzoni and cantinelle walls 90 mm in thickness for fire resistance EI 180 using FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 288149-3351 FR.

The boards are installed vertically on the side exposed to fire and fastened by self-tapping phosphated screws 3,5 mm in diameter and 55 mm length at 250 mm centres.

For further details see the "Installation Manual".



UPGRADING OF REINFORCED CONCRETE AND POLYSTYRENE WALLS



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120

- **Base structure:** reinforced concrete walls with thermal insulation in thickness 40 + 80 + 40 mm
- **Fire protection:** FIREGUARD® 13 boards in thk 1x12,7 mm to be anchored
- **Fastening:** metal expansion anchor bolts 6 mm in diameter at 500 mm centres
- **Surface finishing:** using FIREGUARD® COMPOUND as a finish; not required for fire protection purposes
- **Applications:**
maximum height: 4 m
penetration by electrical installations: permissible only with specific certification
- **Extended applications:** please check with our technical department

Classification report: I.G. 296345-3436 FR
Fire Testing Norm: EN 1364-1

SYSTEM SPECIFICATIONS

Construction of a cladding to reinforced concrete walls with thermal insulation 40+80+40 mm in thickness for fire resistance EI 120 using FIREGUARD® 13 boards in thk 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 296345-3436 FR.

The boards are installed vertically on the side exposed to fire using metal expansion anchor bolts 6 mm in diameter and 40 mm length at 500 mm centres.

For further details see the "Installation Manual".



CEILINGS





FIREPROOF COMPARTMENT

A fireproof compartment is defined as a part of the building delimited by horizontal and vertical construction elements having determined fire resistance, in practice it is a box that has a certain fire resistance.

A fire compartment is defined as “a part of the building, organized to meet the needs of safety in case of fire and bounded by building elements that ensure, under the action of the fire and for a given period of time, the ability of subdivision, understood as “the ability of a building element to keep under the action of the fire, in addition to its stability, a sufficient thermal insulation and a sufficient seal to combustion hot gases, as well as other required performances.”

Therefore, a compartment is a part of the building in which it is expected that the entire duration of a fire, until the exhaustion of the combustible material or until the arrival of the fire brigade, remains confined inside it, without causing any risk of spreading to other areas or adjacent compartments. A compartment must be completely isolated from the others and does not have parts that do not withstand the entire fire. The communication between the compartments should be obtained by fire doors, having necessarily the same class of fire resistance of the separation elements.

We distinguish therefore a:

- horizontal type partition, made by horizontal closing and partition elements, load-bearing and non-load bearing (floors and ceilings)
- vertical type partition, made by vertical closing and partition elements, load-bearing and non-bearing (inner and outer walls).

The horizontal partitioning has the purpose of limiting the spread of fire toward the upper/lower floors and is made with fire-resistant floors.

The vertical partitioning has the purpose of limiting the spread of fire to other areas of the same floor of the building and is made with fire resistant partitions which extend from floor to floor slab.

These partitions must not have discontinuities that allow the passage of flame, heat and smoke; including all the gates for the passage of pipes, electrical cables and networks plant that must be treated with suitable intumescent products acts to ensure the sealing of the compartment.

A compartment must be durable for the duration of the theoretical fire in order to maintain its mechanical stability (in the case of load-bearing elements) defined by the “R feature”, its resistance to hot gases and flames “E feature” and thermal insulation, in order to prevent the propagation by conduction or radiation “I feature”.

The extension of the compartment depends on various factors, the main ones are:

- fire load;
- building type;
- manufacturing process;
- presence of fire extinguishing systems;
- easy access for Fire Department

They are defined by specific rules or individual territorial issues.

The Annex “A” of the Ministerial Decree of 16 February 2007 identifies **two types of horizontal elements with the function of compartment**:

- loadbearing, or slabs where it is expected the fulfillment of one of the following requirements: REI, REI-M, REW
- Non-loadbearing elements such as false ceiling which must fulfill of the requirement EI

Cover slabs, roofs, beams, balconies, stair are also defined as **elements with no compartment function** for which there is the satisfaction of the R requirement.

Interventions aimed to the realization of horizontal partitioning construction elements are the following:

- building of fireproof floors
- building of fireproof partition
- fireproof upgrading of existing floors through adherence plating or false ceiling.



FLOORS

The floors are by definition the main elements with horizontal load-bearing function of the fire compartment. The methods for the determination of the fire resistance class, are based on:

- test results: experimental method
- calculations results: the analytical method

Results of tests: experimental method

The fire resistance of a floor can be assessed experimentally in accordance with EN 1365-2: "Fire resistance tests for load-bearing elements - Floors and roofs." This standard specifies a method for determining the fire resistance of floors and roofs with exposure of fire coming from underneath. This test method does not provide a test with fire exposure from above because for this type of artifacts the fire condition from the bottom is the most critical and is therefore conservative against exposure with fire from above.

Each floor, unlike the ceilings, has tested with fire only from below but the condition of subdivision is bidirectional.

The classification in this case is determined in terms of "R", "RE", "REI".

With regard to the direct field of application the EN 1365-2 norm specifies the following (paragraph 13):

"The test results are directly applicable to similar not tested floors or roofs, provided it meets the following requirements: the maximum moments and shear forces, calculated on the basis of the same criteria of the test load, must not be greater than those tested. "

In the case of modifications not covered by the field of direct application the manufacturer shall prepare a technical instructions, which should be approved by the laboratory that performed the test, where it is defined the extended application field. If using protective coatings such as bards, plasters, etc., the experimental method is not applicable or applicable with high limitation, because are not allowed extrapolations of the test result for loads and situations of different constraint than those tested. Even variations of the thickness of protective coatings are not allowed, for which the norm refers to a more appropriate evaluation with the analytical method.

Results of calculations: the analytical method

The different calculation methods for determining the fire resistance of load-bearing components, separating or not separating are defined through the Structural Eurocodes below:

- EN 1991-1-2: "Action on structures - Part 1-2: General actions - Actions on structures exposed to fire"
- EN 1992-1-2: "Design of concrete structures - Part 1-2: General rules - Structural fireproof design"
- EN 1993-1-2: "Design of steel structures - Part 1-2: General rules - Structural fireproof design"
- EN 1994-1-2: "Design of composite steel concrete structures - Part 1-2: General rules - Structural fireproof design"
- EN 1995-1-2: "Design of timber structures - Part 1-2: General rules - Structural fireproof design"
- EN 1996-1-2: "Design of masonry structures - Part 1-2: General rules - Structural fireproof design"
- EN 1999-1-2: "Design of aluminum structures - Part 1-2: General rules - Structural fireproof design"

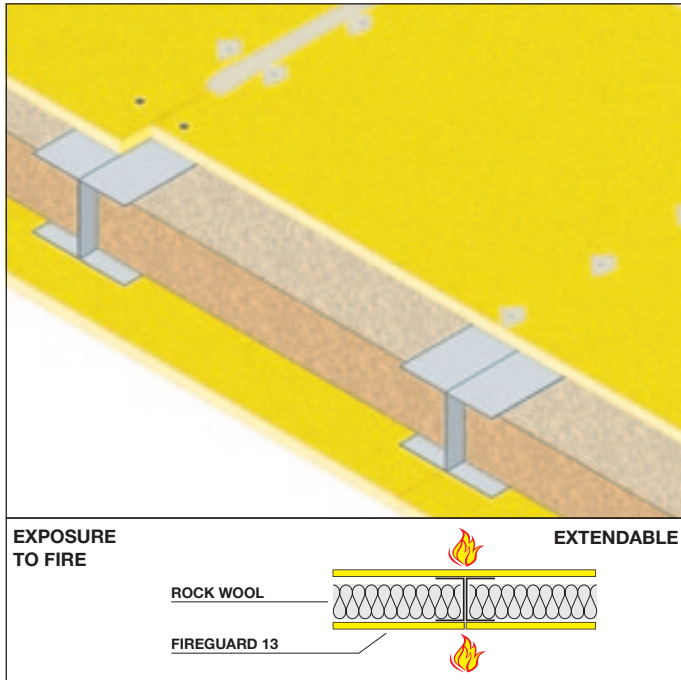
The calculation methods mentioned above may require the determination, under varying temperature, of the thermo-physical parameters of the protection systems that may be present on the loadbearing components. In these cases the values assumed by these parameters must be determined exclusively through the tests listed below.

- EN 13381-1 - Horizontal protective membranes
- EN 13381-2 - Vertical protective membranes
- EN 13381-3 - Protection applied to concrete elements
- EN 13381-4 - Protection applied to steel elements
- EN 13381-5 - Protection applied to concrete/profiled steel sheet composite elements
- EN 13381-6 - Protection applied to timber elements
- EN 13381-7 - Protective reagents applied to steel elements

The result of tests conducted according to the standard EN 13381 is not a true and proper classification of the element, but rather a procedure (assessment) for the determination of the thicknesses required according to the type of construction element to be protected.



SELF SUPPORTING



SYSTEM SPECIFICATIONS

Construction of a membrane ceiling with fire resistance REI 120 using on each side one FIREGUARD® 13 board in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to its reaction to fire and conforming to classification report I.G. 253656-3113 FR.

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 120

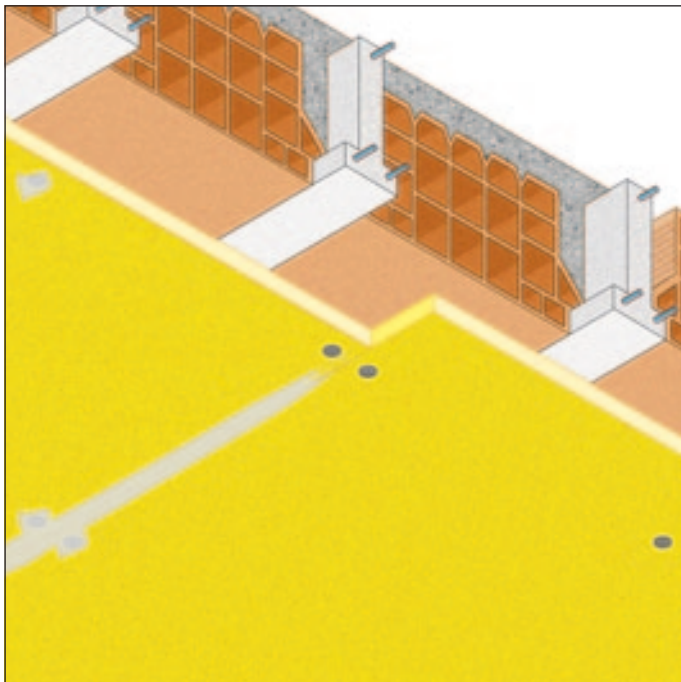
- **Supporting structure:** steel angles "C" 75x50x1 mm, mounted back-to-back at 400 mm centres
- **Insulation:** rock wool 60 mm, density 80 kg/m³
- **Fire protection:** FIREGUARD® 13 boards in thk 1 x 12,7 mm on each side
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads
- **Applications:**
tested width of ceiling 4,2 m; Mmax = 2,11 kNm, Tmax = 2,01 kN
- **Extended applications based on technical instruction No. 304671 approved by Istituto Giordano.** widths of ceiling up to 7 m are possible (for detailed dimensions please check with our technical department)

Classification report: I.G. 253656-3113 FR
Fire Testing Norm: EN 1365-2

The boards are fastened by self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 200 mm centres to steel angles "C" 75x50x1 mm which are positioned back-to-back at 400 mm centres and inserted in steel angles "U" 75x50x1 mm. In between a mat of rock wool 60 mm thick and 80 kg/m³ in density, is inserted.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

**DIRECT FIXING TO SLAB AND MASONRY DECK****REACTION TO FIRE: A1**
FIRE RESISTANCE: REI 180

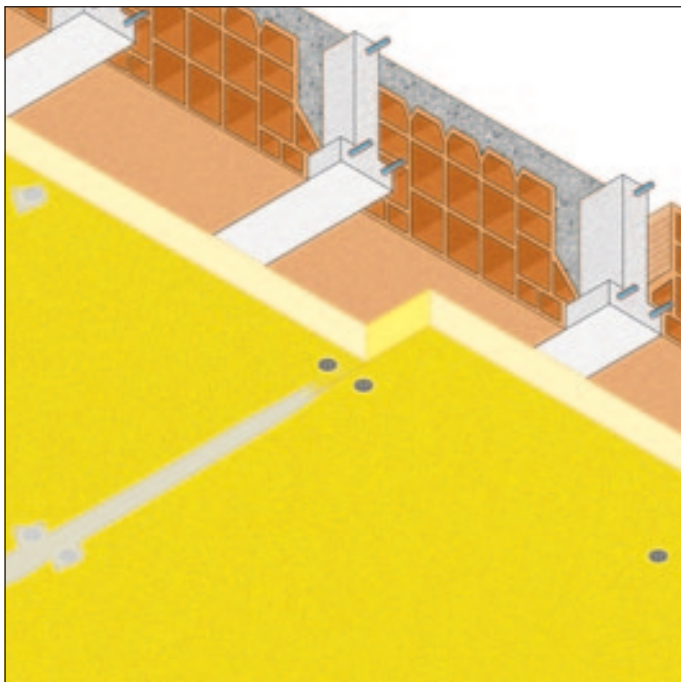
- **Floor type:** slab and masonry thickness 16+4 cm
- **Fire protection:** FIREGUARD® 13 boards in thickness 1 x 12,7 mm
- **Fastening:** with metal expansion anchor bolts 9 mm in diameter at 500 mm centres
- **Surface finish:** FIREGUARD COMPOUND as a finish over joints and anchor bolt heads

Assessment report for the protection Applus 11-2267-877-M1 application SLC01
Fire Testing Norm: EN 13381-3
Classification norm: EN 1992-1-2

Direct fixing to slab and masonry deck in minimum thickness 20 cm for fire resistance REI 180 using FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2267-877 M1 according to norm EN 13381-3.

The boards are fastened by metal expansion anchor bolts 9 mm in diameter and 40 mm in length at 500 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and anchor bolt heads.

For further details see the "Installation Manual".

DIRECT FIXING TO SLAB AND MASONRY DECK**REACTION TO FIRE: A1**
FIRE RESISTANCE: REI 240

- **Floor type:** slab and masonry in thickness 16+4 cm
- **Fire protection:** FIREGUARD® 25 boards in thickness 1 x 25,4 mm
- **Fastening:** with metal expansion anchor bolts 9 mm in diameter at 500 mm centres
- **Surface finish:** FIREGUARD COMPOUND as a finish over joints and anchor bolt heads

Assessment report for the protection Applus 11-2267-877-M1 application SLC02
Fire Testing Norm: EN 13381-3
Classification norm: EN 1992-1-2

SYSTEM SPECIFICATIONS

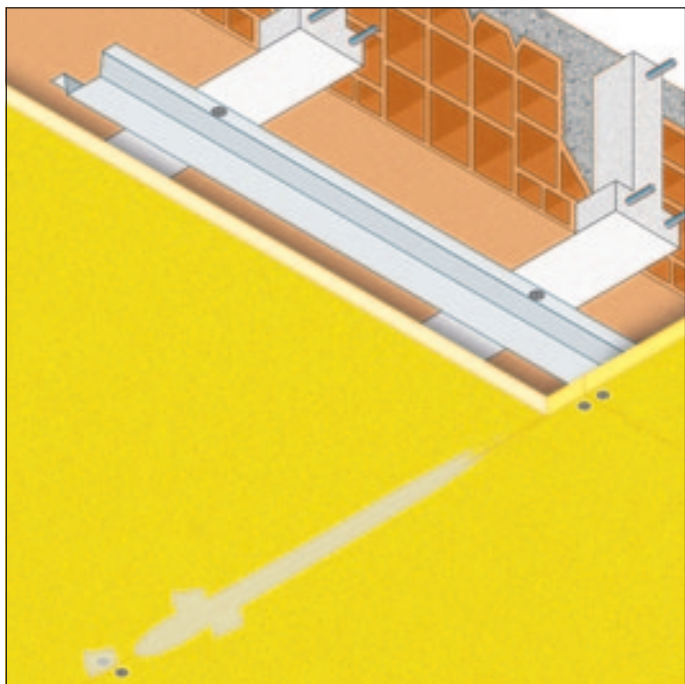
Direct fixing to slab and masonry deck in minimum thickness 20 cm for fire resistance REI 240 using FIREGUARD® 25 boards in thickness 25,4 mm, maximum size 600x2200 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2267-877 M1 according to norm EN 13381-3.

The boards are fastened by metal expansion anchor bolts 9 mm in diameter and 55 mm in length at 500 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and anchor bolt heads.

For further details see the "Installation Manual".



DIRECT FIXING TO SLAB AND MASONRY DECK



REACTION TO FIRE: A1

FIRE RESISTANCE: REI 180

- **Floor type:** slab and masonry in thickness 16+4 cm
- **Fire protection:** FIREGUARD® 13 boards in thk 1 x 12,7 mm
- **Support structure** steel angles "Omega" 50x15 mm at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads

Assessment report for the protection Applus 11-2267-877-M1 application SLC05

Fire Testing Norm: EN 13381-3

Classification norm: EN 1992-1-2

SYSTEM SPECIFICATIONS

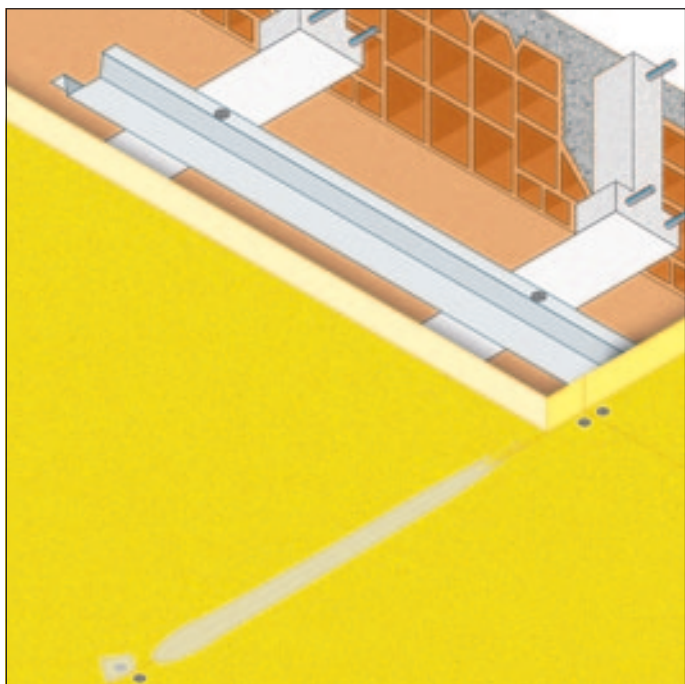
Direct fixing to slab and masonry deck in minimum thickness 20 cm for fire resistance REI 180 using FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2267-877 M1 according to norm EN 13381-3.

The boards are fastened by means of self-tapping phosphated screws 3,5 mm in diameter and 25 mm in length at 250 mm centres to a metal support structure of galvanized steel angles "Omega" 50x15x0,6 mm mounted at 500 mm intervals by metal expansion anchor bolts at 500 mm centres.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

DIRECT FIXING TO SLAB AND MASONRY DECK



REACTION TO FIRE: A1

FIRE RESISTANCE: REI 240

- **Floor type:** slab and masonry in thickness 16+4 cm
- **Fire protection:** FIREGUARD® 25 boards in thk 1 x 25,4 mm
- **Support structure:** steel angles "Omega" 50x15 mm at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and screw heads

Assessment report for the protection Applus 11-2267-877-M1 application SLC06

Fire Testing Norm: EN 13381-3

Classification norm: EN 1992-1-2

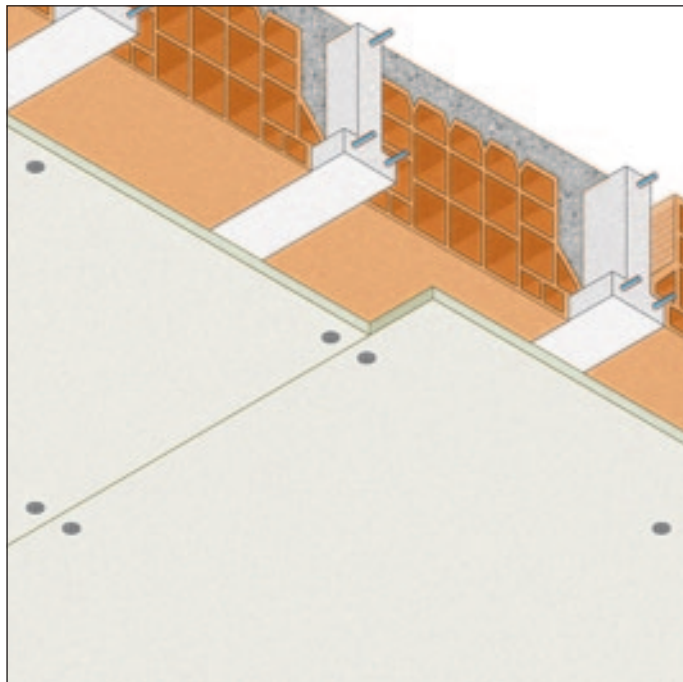
SYSTEM SPECIFICATIONS

Direct fixing to slab and masonry deck in minimum thickness 20 cm for fire resistance REI 240 using FIREGUARD® 25 boards in thickness 25,4 mm, maximum size 600x2200 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2267-877 M1 according to norm EN 13381-3.

The boards are fastened by means of self-tapping phosphated screws 3,5 mm in diameter and 35 mm in length at 250 mm centres to a metal support structure of galvanized steel angles "Omega" 50x15x0,6 mm mounted at 500 mm intervals by metal expansion anchor bolts at 500 mm centres.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

**DIRECT FIXING TO SLAB AND MASONRY DECK****SYSTEM SPECIFICATIONS**

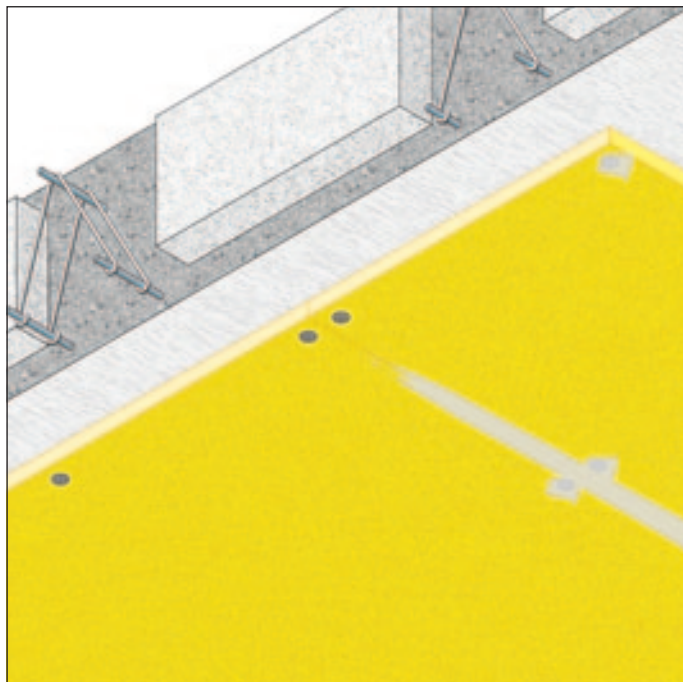
Construction of a cladding to hollow slab concrete floors in minimum thickness 20 cm for fire resistance REI 120 using FIREGUARD® S boards in thickness 8 mm, maximum size 1220x2440 mm, consisting of a silicates cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 325714-3725 FR according to norm EN 1365-2.

REACTION TO FIRE: A1**FIRE RESISTANCE: REI 120**

- **Floor type:** hollow slab concrete floor in thickness 16+4 cm
- **Fire protection:** FIREGUARD S 8 boards in thickness 1 x 8 mm
- **Fastening:** with metal expansion anchor bolts 9 mm in diameter at 500 mm centres
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and anchor bolt heads, not required for fire protection purposes

Classification report: I.G. 325714-3725 FR
Fire Testing Norm: EN 1365-2

The boards are fastened by metal expansion anchor bolts 9 mm in diameter and 40 mm in length at 500 mm centres.
For further details see the "Installation Manual".

DIRECT FIXING TO "PREDALLES" DECK**SYSTEM SPECIFICATIONS**

Construction of a cladding to "Predalles" type deck in minimum thickness 20 cm for fire resistance REI 180 using FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulfate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2267-877 M1 according to norm EN 13381-3.

REACTION TO FIRE: A1**FIRE RESISTANCE: REI 180**

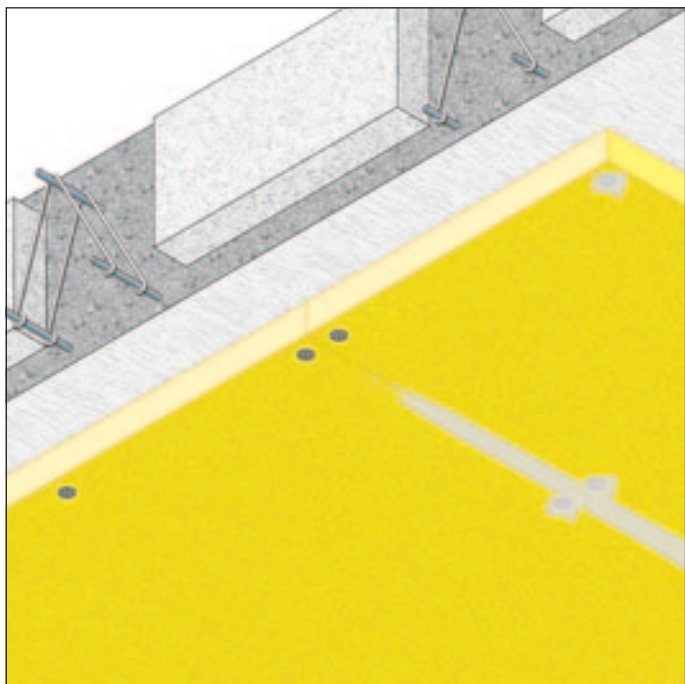
- **Floor type:** "Predalles" deck in thickness 16+4 cm
- **Fire protection:** FIREGUARD® 13 boards in thk 1 x 12,7 mm
- **Fastening:** with metal expansion anchor bolts 9 mm in diameter at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and anchor bolt heads

Assessment report for the protection Applus 11-2267-877-M1 application SPR03
Fire Testing Norm: EN 13381-3
Classification norm: EN 1992-1-2

The boards are fastened by metal expansion anchor bolts 9 mm in diameter and 40 mm in length at 500 mm centres.
FIREGUARD COMPOUND is applied as a finish to cover joints and anchor bolt heads.
For further details see the "Installation Manual".



DIRECT FIXING TO “PREDALLES” DECK



SYSTEM SPECIFICATIONS

Construction of a cladding to “Predalles” type deck in minimum thickness 20 cm for fire resistance REI 240 using FIREGUARD® 25 boards in thickness 25,4 mm, maximum size 600x2200 mm, consisting of calcium silicate and sulfate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2267-877 M1 according to norm EN 13381-3.

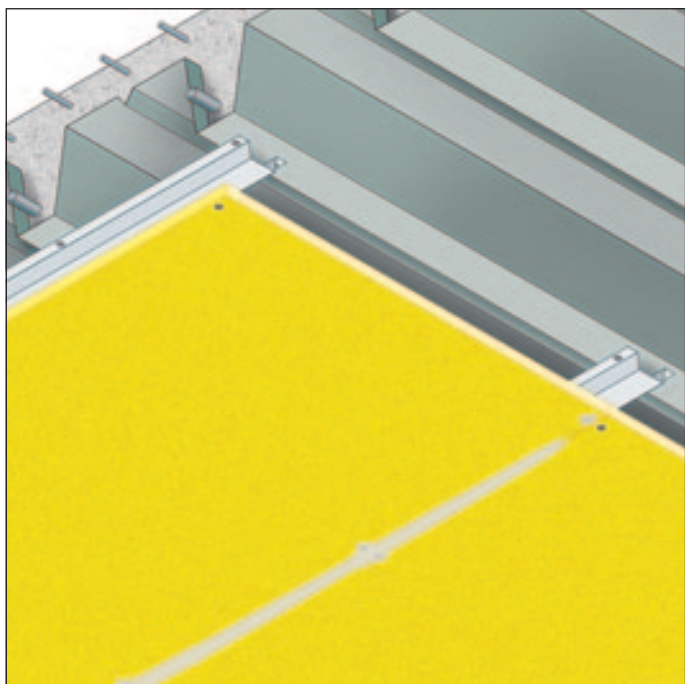
REACTION TO FIRE: A1 FIRE RESISTANCE: REI 240

- **Floor type:** “Predalles” deck in thickness 16+4 cm
- **Fire protection:** FIREGUARD® 25 boards in thk 1 x 25,4 mm
- **Fastening:** with metal expansion anchor bolts 9 mm in diameter at 500 mm centres
- **Surface finish:** using FIREGUARD COMPOUND as a finish over joints and anchor bolt heads

Assessment report for the protection Applus 11-2267-877-M1 application SPR04
Fire Testing Norm: EN 13381-3

The boards are fastened by metal expansion anchor bolts 9 mm in diameter and 55 mm in length at 500 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and anchor bolt heads. For further details see the “Installation Manual”.

CORRUGATED SHEET DECK



SYSTEM SPECIFICATIONS

Construction of a cladding to corrugated sheet deck with metal sheet in thickness 1 mm and reinforced concrete in thickness 90 mm, for fire resistance REI 120 using FIREGUARD® 13 boards in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report Applus 11-2720-1040.

REACTION TO FIRE: A1 FIRE RESISTANCE: REI 120

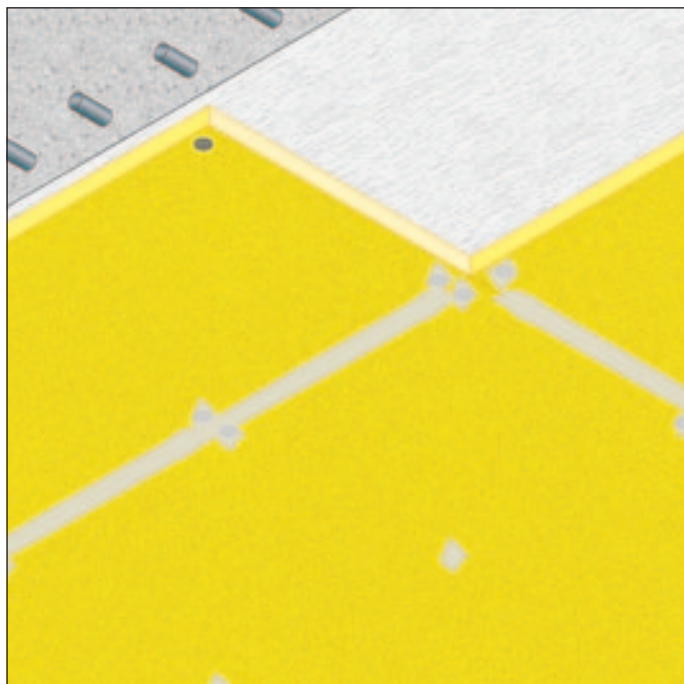
- **Floor type:** corrugated sheet in thickness 1 mm and reinforced concrete in thickness 90 mm
- **Fire protection:** FIREGUARD® 13 boards in thickness 1x12,7 mm
- **Support structure:** steel angles “Omega” 50x15 mm at 400 mm centres
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw heads

Assessment report for the protection: Applus 11-2720-1040
Fire Testing Norm: EN 13381-5
Classification norm: EN 1994-1-2

The boards are fastened by means of self-tapping phosphated screws 3,5 mm in diameter and 25 mm in length at 250 mm centres to a metal support structure of galvanized steel angles “Omega” 50x15x0,6 mm mounted at 400 mm intervals by metal expansion anchor bolts 6 mm in diameter at 600 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads. For further details see the “Installation Manual”.



DIRECT FIXING TO REINFORCED CONCRETE SLAB



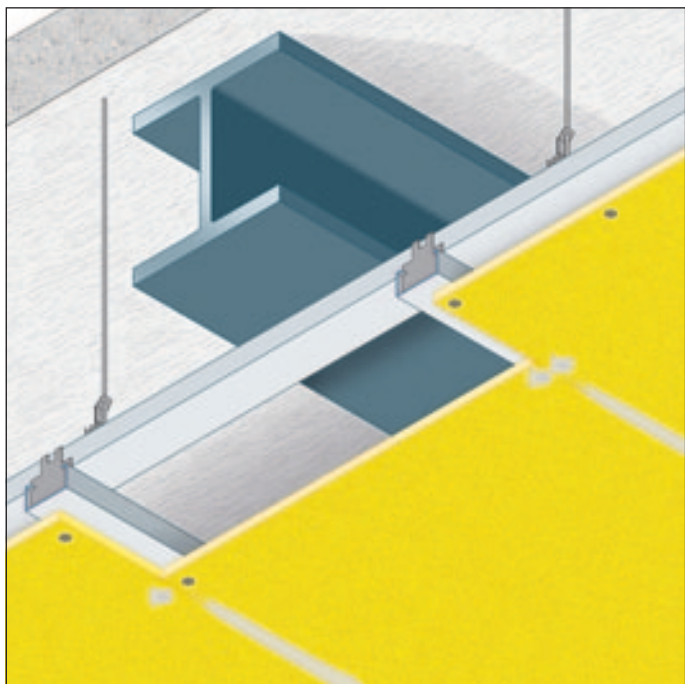
REACTION TO FIRE: A1

FIRE RESISTANCE: **REI 30-240**

SEE THE SECTION ON
THE PROTECTION OF REINFORCED
CONCRETE STRUCTURES (p. 46).



SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of ceiling on metal uncooperative floor for fire resistance REI 120, located 200 mm from the intrados of the beams, using FIREGUARD® 13 board in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 300967/3491 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm in diameter and 25 mm length at 250 mm centres.

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 120

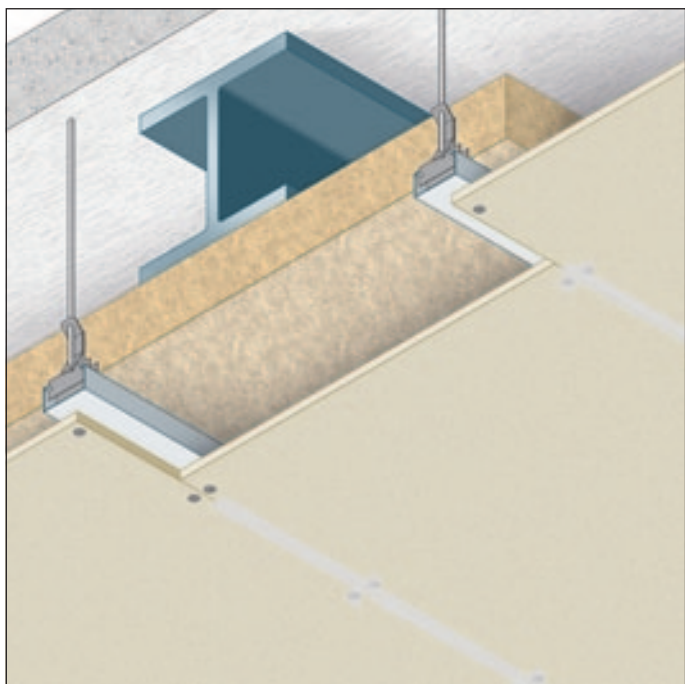
- **Floor type:** reinforced concrete slab in thickness 100 mm and metal beams
- **Distance from deck:** 200 mm from the intrados of the beams
- **Support structure:** steel angles "C" 50x27x0,6 mm for both the primary framework that for the secondary frame
- **Hangers:** at 900 mm intervals
- **Fire protection:** FIREGUARD® 13 boards in thk 1 x 12,7 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw heads
- **Applications:** presence of inspection door: allowed
- **Extended applications based on technical instruction No. 304672 approved by Istituto Giordano.**
With inclination up to 25°

Classification report: I.G. 300967/3491 FR
Fire Testing Norm: 1365-2

They are such fastened to a metal structure composed of a secondary frame formed by galvanized steel angles "C" 50x27x0,6 mm which are positioned at 500 mm intervals, and a main metal frame constituted by the same steel angles "C" which are positioned at 900 mm intervals, fixed to the secondary frame by means of orthogonal hooks and connected to the floor at 900 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of ceiling on metal uncooperative floor for fire resistance REI 180, located 10 mm from the intrados of the beams, using NAPER S 12 board in thickness 12 mm, maximum size 1220x2440 mm, consisting of a silicates cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 300909/3489 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 250 mm centres to a metal structure

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 180

- **Floor type:** reinforced concrete slab in thickness 100 mm and metal beams.
- **Distance from deck:** 10 mm from the intrados of the beams.
- **Insulation:** rock wool 40 mm, density 60 kg/m³.
- **Support structure:** steel angles "C" 50x27x0,6 mm at 400 mm centres.
- **Hangers:** at 900 mm intervals.
- **Fire protection:** NAPER S 12 boards in thickness 1 x 12 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw heads.
- **Applications:** presence of inspection door: allowed.
- **Extended applications based on technical instruction No. 304673 approved by Istituto Giordano.**
With inclination up to 25°

Classification report: I.G. 300909/3489 FR
Fire Testing Norm: 1365-2

composed by galvanized steel angles "C" 50x27x0,6 mm which are positioned at 488 mm intervals and connected to the floor at 900 mm centres.

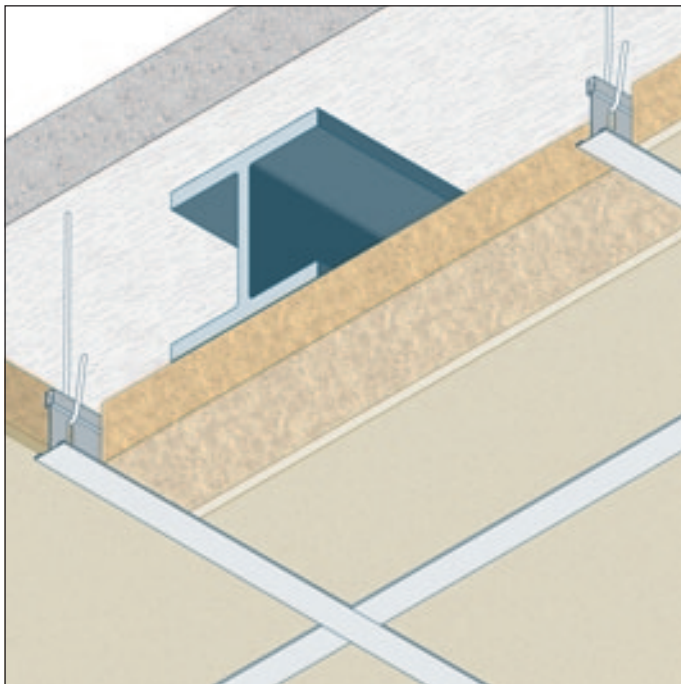
In between a mat of mineral wool 40 mm thick and 60 kg/m³ in density, is inserted.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".



MODULAR SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of modular ceiling on floor made by reinforced concrete slab in thickness 100 mm and metal beams, for fire resistance REI 180, using NAPER S 8 board in thickness 8 mm, maximum size 595x595 mm, consisting of a silicates cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 315439-3637 FR.

The panels are laid on a metal structure made by galvanized steel "T" main profiles, dimensions 24x38x0, 4 mm placed at 600 mm intervals and

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 180

- **Floor type:** reinforced concrete slab in thickness 100 mm and metal beams
- **Distance from floor:** 10 mm from the intrados of the beams
- **Insulation:** mineral wool 40 mm, density 60 kg/m³
- **Support structure:** galvanized steel "T" profile 24x38x0,4 mm at 600 mm intervals
- **Hangers:** at 600 mm intervals
- **Fire protection:** NAPER S 8 boards dimensions 595x595 mm, in thickness 1 x 8 mm
- **Surface finishing:** non provided
- **Applications:** presence of ceiling light protection: allowed
- **Extended applications based on technical instruction No. 319060 approved by Istituto Giordano**
With inclination up to 25°

Classification report: I.G. 315439-3637 FR
and technical instruction
Fire Testing Norm: EN 1365-2

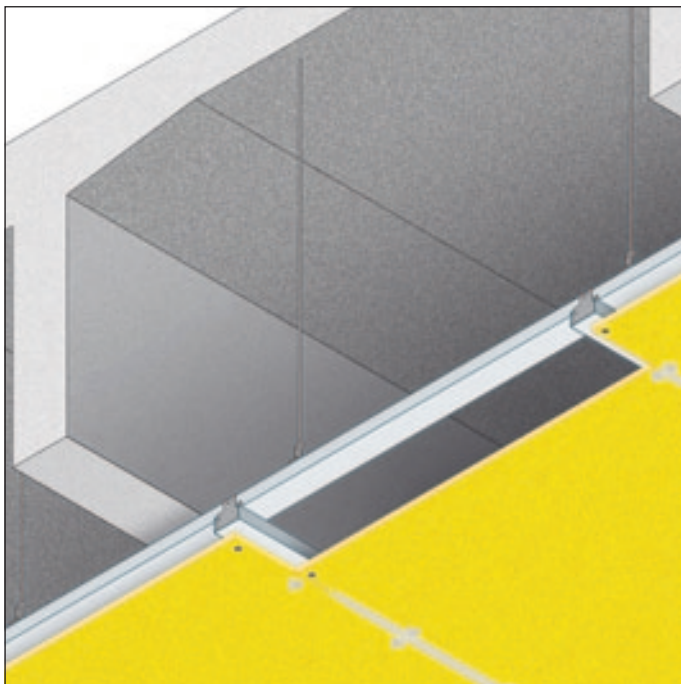
galvanized steel "T" secondary profiles with dimensions 24x38x0, 4 mm placed at 600 mm intervals.

The metal structure is connected to the floor with hangers made by 4 mm diameter steel bar placed at 600 mm centres.

In between a mat of mineral wool 40 mm thick and 60 kg/m³ in density, is inserted.

For further details see the "Installation Manual".

SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of ceiling on reinforced concrete or prestressed reinforced concrete tiles for fire resistance REI 120, located 200 mm from the intrados of the beams, using FIREGUARD® 13 board in thk 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 300967/3491 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm in

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 120

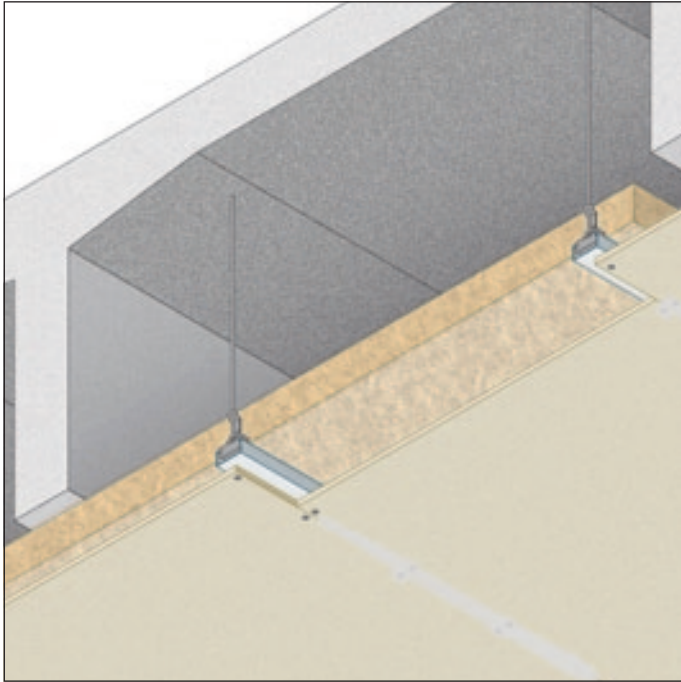
- **Floor type:** reinforced concrete or prestressed reinforced concrete tiles with slab in thickness 100 mm
- **Distance from deck:** 200 mm from the intrados of the beams
- **Support structure:** steel angles "C" 50x27x0, 6 mm for both the primary framework that for the secondary frame
- **Hangers:** at 900 mm intervals
- **Fire protection:** FIREGUARD® 13 boards, thk 1 x1 2,7 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw
- **Applications:** presence of inspection door: allowed
- **Extended applications based on technical instruction No. 304672 approved by Istituto Giordano.**
With inclination up to 25°

Classification report: I.G. 300967/3491 FR
and technical instruction
Fire Testing Norm: EN 1365-2

diameter and 25 mm length at 250 mm centres. They are such fastened to a metal structure composed of a secondary frame formed by galvanized steel angles "C" 50x27x0, 6 mm which are positioned at 500 mm intervals, and a main metal frame constituted by the same steel angles "C" which are positioned at 900 mm intervals, fixed to the secondary frame by means of orthogonal hooks and connected to the floor at 900 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads. For further details see the "Installation Manual".



SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of ceiling on reinforced concrete or prestressed reinforced concrete tiles for fire resistance REI 180, located 10 mm from the intrados of the beams, using NAPER S 12 board in thickness 12 mm, maximum size 1220x2440 mm, consisting of a silicates cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 300909/3489 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 250 mm centres to a metal structure

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 180

- **Floor type:** reinforced concrete or prestressed reinforced concrete tiles with slab in thickness 100 mm
- **Distance from floor:** 10 mm from the intrados of the beams
- **Insulation:** mineral wool 40 mm, density 60 kg/m³
- **Support structure:** steel angles "C" 50x27x0,6 mm at 400 mm intervals
- **Hangers:** at 900 mm intervals
- **Fire protection:** NAPER S 12 boards in thickness 1 x 12 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw
- **Applications:** presence of inspection door: allowed
- **Extended applications based on technical instruction No. 304673 approved by Istituto Giordano**
With inclination up to 25°

Classification report: I.G. 300909/3489 FR
and technical instruction
Fire Testing Norm: EN 1365-2

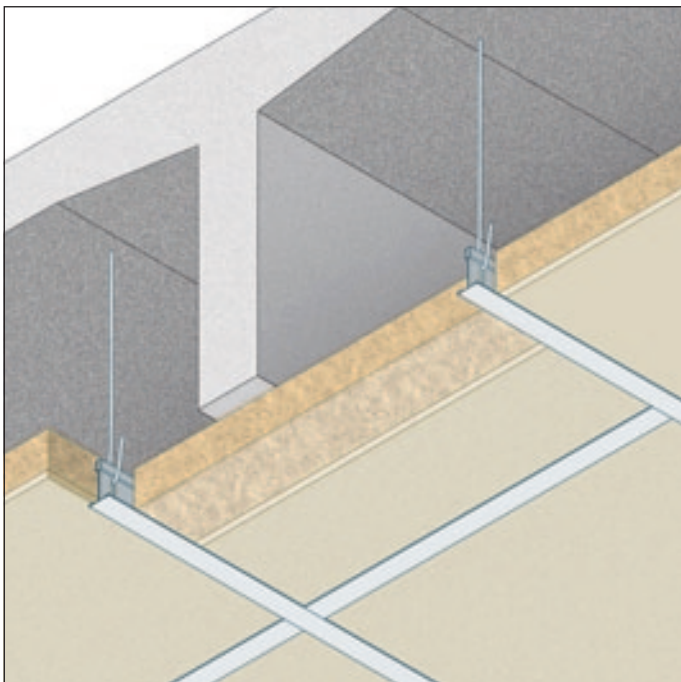
composed by galvanized steel angles "C" 50x27x0, 6 mm which are positioned at 400 mm intervals and connected to the floor at 900 mm centres.

In between a mat of mineral wool 40 mm thick and 60 kg/m³ in density, is inserted.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

MODULAR SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of modular ceiling on reinforced concrete or prestressed reinforced concrete tiles in thickness 100 mm, for fire resistance REI 180, using NAPER S 8 board in thickness 8 mm, maximum size 595x595 mm, consisting of a silicates cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 315439-3637 FR.

The panels are laid on a metal structure made by galvanized steel "T" main profiles, dimensions 24x38x0,4 mm placed at 600 mm intervals and

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 180

- **Floor type:** reinforced concrete or prestressed reinforced concrete tiles with slab in thickness 100 mm
- **Distance from floor:** 10 mm from the intrados of the beams
- **Insulation:** mineral wool 40 mm, density 60 kg/m³
- **Support structure:** galvanized steel "T" profile 24x38x0,4 mm at 600 mm intervals
- **Hangers:** at 600 mm intervals
- **Fire protection:** NAPER S 8 boards dimensions 595x595 mm, in thickness 1 x 8 mm
- **Surface finishing:** non provided
- **Applications:** presence of ceiling light protection: allowed
- **Extended applications based on technical instruction No. 319060 approved by Istituto Giordano**
With inclination up to 25°

Classification report: I.G. 315439-3637 FR
and technical instruction
Fire Testing Norm: EN 1365-2

galvanized steel "T" secondary profiles with dimensions 24x38x0, 4 mm placed at 600 mm intervals.

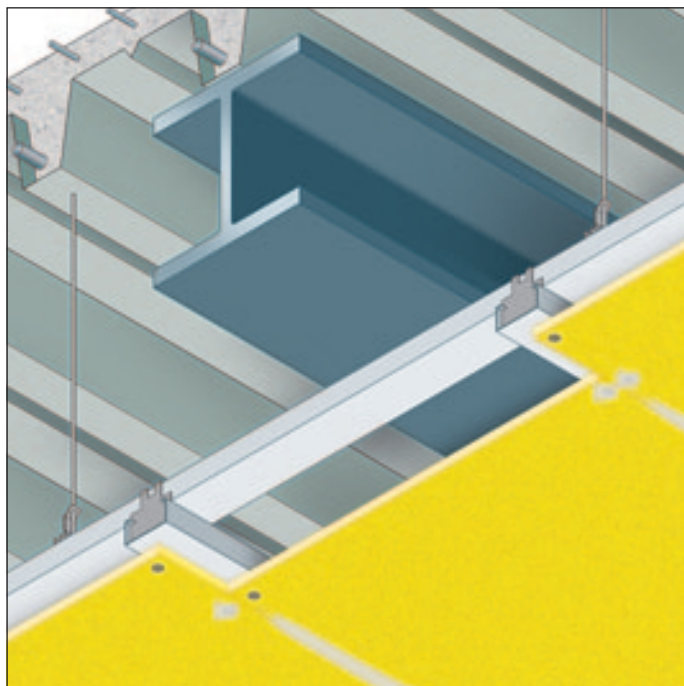
The metal structure is connected to the floor with hangers made by 4 mm diameter steel bar placed at 600 mm centres.

In between a mat of mineral wool 40 mm thick and 60 kg/m³ in density, is inserted.

For further details see the "Installation Manual".



SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of ceiling on floor made by reinforced concrete slab, corrugated metal sheet and metal beams, for fire resistance REI 120, located 200 mm from the intrados of the beams, using FIREGUARD® 13 board in thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 300967/3491 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 120

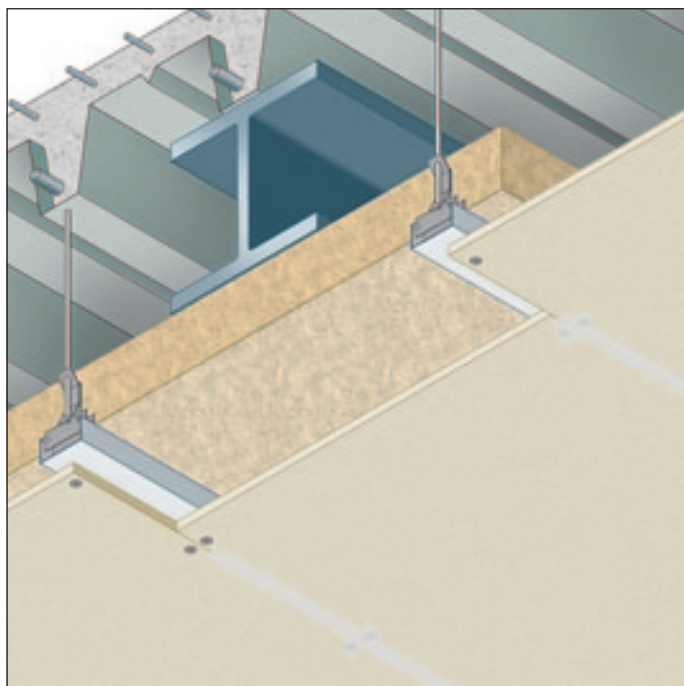
- **Floor type:** reinforced concrete slab in thickness 100 mm, corrugated metal sheet and metal beams
- **Distance from floor:** 200 mm from the intrados of the beams
- **Support structure:** steel angles "C" 50x27x0,6 mm for both the primary framework that for the secondary frame
- **Hangers:** at 900 mm intervals
- **Fire protection:** FIREGUARD® 13 boards in thk 1 x 12,7 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw
- **Applications:** presence of inspection door: allowed
- **Extended applications based on technical instruction No. 304672 approved by Istituto Giordano**
With inclination up to 25 °

Classification report: I.G. 300967/3491 FR
and technical instruction
Fire Testing Norm: EN 1365-2

diameter and 25 mm length at 250 mm centres. They are such fastened to a metal structure composed of a secondary frame formed by galvanized steel angles "C" 50x27x0,6 mm which are positioned at 500 mm intervals, and a main metal frame constituted by the same steel angles "C" which are positioned at 900 mm intervals, fixed to the secondary frame by means of orthogonal hooks and connected to the floor at 900 mm centres.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads. For further details see the "Installation Manual".

SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of ceiling on floor made by reinforced concrete slab, corrugated metal sheet and metal beams, for fire resistance REI 180, located 10 mm from the intrados of the beams, using NAPER S 12 board in thickness 12 mm, maximum size 1220x2440 mm, consisting of a silicates cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 300909/3489 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 180

- **Floor type:** reinforced concrete slab in thickness 100 mm, corrugated metal sheet and metal beams
- **Distance from floor:** 10 mm from the intrados of the beams
- **Insulation:** mineral wool 40 mm, density 60 kg/m³
- **Support structure:** steel angles "C" 50x27x0,6 mm at 400 mm intervals
- **Hangers:** at 900 mm intervals
- **Fire protection:** NAPER S 12 boards in thickness 1x12 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw
- **Applications:** presence of inspection door: allowed
- **Extended applications based on technical instruction NO. 304673 approved by Istituto Giordano**
With inclination up to 25 °

Classification report: I.G. 300909/3489 FR
and technical instruction
Fire Testing Norm: EN 1365-2

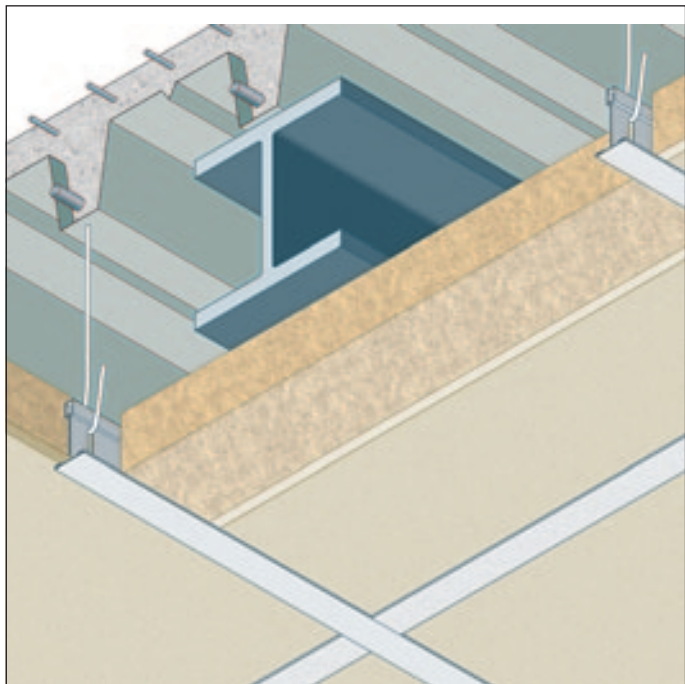
in diameter and 35 mm length at 250 mm centres to a metal structure composed by galvanized steel angles "C" 50x27x0,6 mm which are positioned at 400 mm intervals and connected to the floor at 900 mm centres.

In between a mat of mineral wool 40 mm thick and 60 kg/m³ in density, is inserted.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads. For further details see the "Installation Manual".



MODULAR SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of modular ceiling on floor made by reinforced concrete slab in thickness 100 mm, corrugated metal sheet or and metal beams, for fire resistance REI 180, using NAPER S 8 board in thickness 8 mm, maximum size 595x595 mm, consisting of a silicates cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 315439-3637 FR. The panels are laid on a metal structure made by galvanized steel "T"

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 180

- **Floor type:** reinforced concrete slab in thickness 100 mm, corrugated metal sheet and metal beams
- **Distance from floor:** 10 mm from the intrados of the beams
- **Insulation:** mineral wool 40 mm, density 60 kg/m³
- **Support structure:** galvanized steel "T" profile 24x38x0,4 mm at 600 mm intervals
- **Hangers:** at 600 mm intervals
- **Fire protection:** NAPER S 8 boards dimensions 595x595 mm, in thickness 1 x 8 mm
- **Surface finishing:** non provided
- **Applications:** presence of ceiling light protection: allowed
- **Extended applications based on technical instruction No. 319060 approved by Istituto Giordano**
With inclination up to 25°

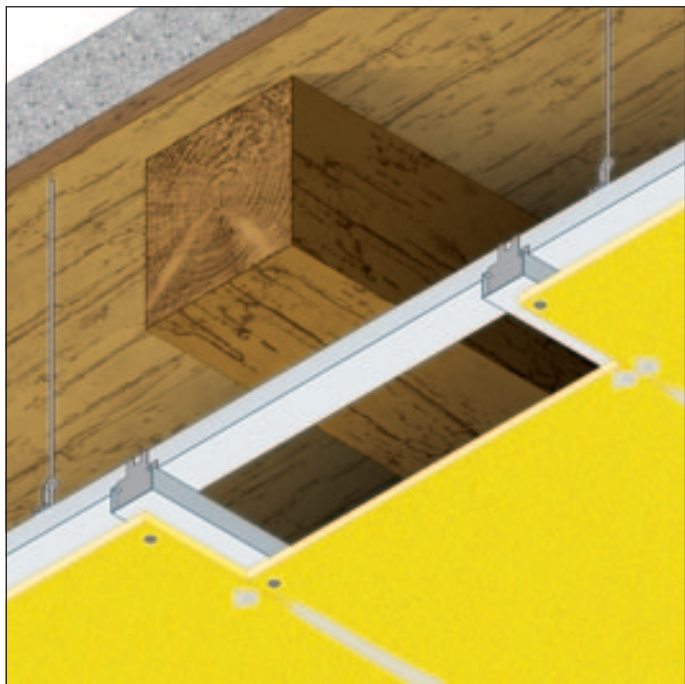
Classification report: I.G. 315439-3637 FR
and technical instruction
Fire Testing Norm: EN 1365-2

main profiles, dimensions 24x38x0,4 mm placed at 600 mm intervals and galvanized steel "T" secondary profiles with dimensions 24x38x0,4 mm placed at 600 mm intervals.

The metal structure is connected to the floor with hangers made by 4 mm diameter steel bar placed at 600 mm centres. In between a mat of mineral wool 40 mm thick and 60 kg/m³ in density, is inserted.

For further details see the "Installation Manual".

SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of ceiling on floor made by reinforced concrete slab, plank and wood beams, for fire resistance REI 60, located 200 mm from the intrados of the beams, using FIREGUARD® 13 board in thk 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 300967/3491 FR. The boards are installed using self-tapping phosphated screws 3,5 mm in

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 60

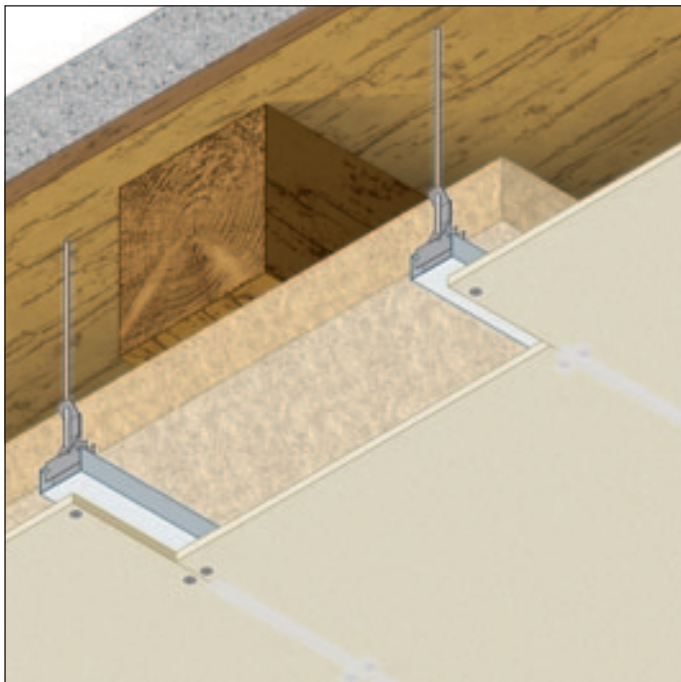
- **Floor type:** reinforced concrete slab in thickness 100 mm, plank and wood beams
- **Distance from floor:** 200 mm from the intrados of the beams
- **Support structure:** steel angles "C" 50x27x0,6 mm for both the primary framework that for the secondary frame
- **Hangers:** at 900 mm intervals
- **Fire protection:** FIREGUARD® 13 boards in thk 1 x 12,7 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw
- **Applications:** presence of inspection door: allowed
- **Extended applications based on technical instruction No. 304672 approved by Istituto Giordano**
With inclination up to 25°

Classification report: I.G. 300967-3491 FR
and technical instruction
Fire Testing Norm: EN 1365-2

diameter and 25 mm length at 250 mm centres. They are such fastened to a metal structure composed of a secondary frame formed by galvanized steel angles "C" 50x27x0,6 mm which are positioned at 500 mm intervals, and a main metal frame constituted by the same steel angles "C" which are positioned at 900 mm intervals, fixed to the secondary frame by means of orthogonal hooks and connected to the floor at 900 mm centres. FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads. For further details see the "Installation Manual".



SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of ceiling on floor made by reinforced concrete slab, plank and wood beams, for fire resistance REI 120, located 10 mm from the intrados of the beams, using NAPER S 12 board in thk 12 mm, maximum size 1220x2440 mm, consisting of a silicates cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 300909/3489 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 250 mm centres to a metal structure

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 120

- **Floor type:** reinforced concrete slab in thickness 100 mm, plank and wood beams
- **Distance from floor:** 10 mm from the intrados of the beams
- **Insulation:** mineral wool 40 mm, density 60 kg/m³
- **Support structure:** steel angles "C" 50x27x0,6 mm at 400 mm centres
- **Hangers:** at 900 mm intervals
- **Fire protection:** NAPER S 12 boards in thickness 1 x 12 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw
- **Applications:** presence of inspection door: allowed
- **Extended applications based on technical instruction No. 304673 approved by Istituto Giordano**
With inclination up to 25 °

Classification report: I.G. 300909-3489 FR
and technical instruction
Fire Testing Norm: EN 1365

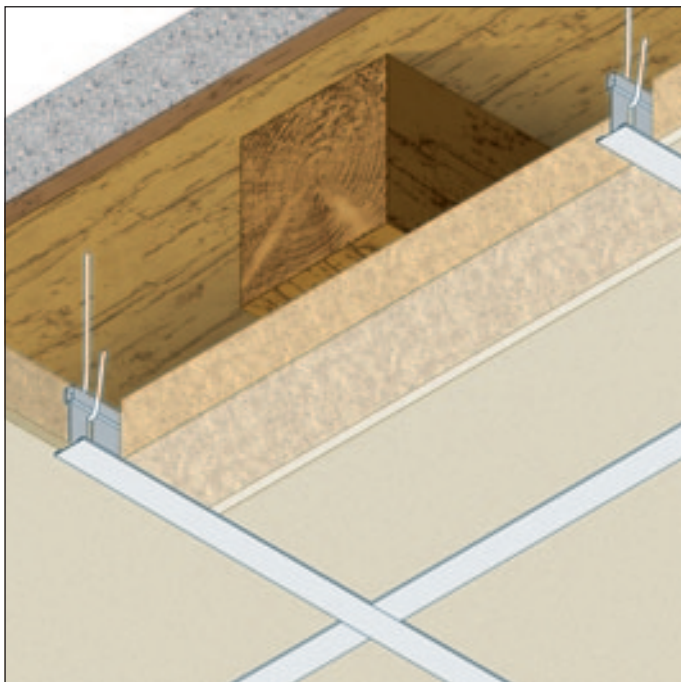
composed by galvanized steel angles "C" 50x27x0, 6 mm which are positioned at 400 mm intervals and connected to the floor at 900 mm centres.

In between a mat of mineral wool 40 mm thick and 60 kg/m³ in density, is inserted.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

MODULAR SUSPENDED CEILING



SYSTEM SPECIFICATIONS

Construction of modular ceiling on floor made by reinforced concrete slab in thickness 100 mm, plank and wood beams, for fire resistance REI 120, using NAPER S 8 board in thickness 8 mm, maximum size 595x595 mm, consisting of a silicates cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 315439-3637 FR.

The panels are laid on a metal structure made by galvanized steel "T"

REACTION TO FIRE: A1

FIRE RESISTANCE: REI 120

- **Floor type:** reinforced concrete slab in thickness 100 mm, plank and wood beams
- **Distance from floor:** 10 mm from the intrados of the beams
- **Insulation:** mineral wool 40 mm, density 60 kg/m³
- **Support structure:** galvanized steel "T" profile 24x38x0,4 mm at 600 mm intervals
- **Hangers:** at 600 mm intervals
- **Fire protection:** NAPER S 8 boards dimensions 595x595 mm, in thickness 1 x 8 mm
- **Surface finishing:** non provided
- **Applications:** presence of ceiling light protection: allowed
- **Extended applications based on technical instruction No. 319060 approved by Istituto Giordano**
With inclination up to 25 °

Classification report: I.G. 315439-3637 FR
and technical instruction
Fire Testing Norm: EN 1365-2

main profiles, dimensions 24x38x0,4 mm placed at 600 mm intervals and galvanized steel "T" secondary profiles with dimensions 24x38x0,4 mm placed at 600 mm intervals.

The metal structure is connected to the floor with hangers made by 4 mm diameter steel bar placed at 600 mm centres. In between a mat of mineral wool 40 mm thick and 60 kg/m³ in density, is inserted.

For further details see the "Installation Manual".





MEMBRANE CEILINGS

For membrane ceiling we intend a false ceiling with intrinsic resistance to fire, or with the proper function of subdivision. This type of false ceiling is tested alone, without the presence and collaboration of a floor; in fact, during the tests, the criterion of thermal insulation "I" and the criterion of flames and smoke seal "E" is measured directly on the extrados of the false ceiling and not on the extrados of the floor, which in this type of test is not present.

Such ceilings have therefore their own intrinsic fire resistance, whatever the support which they are applied; in practice they can be applied to any type of structure or floor, ensuring a horizontal partitioning "EI".

The applications of the membrane ceiling are of three types:

- upgrading the fire resistance of concrete slabs or structures with reduced or difficult to evaluate fire resistance.
- creation of a horizontal partitioning without having to use to a traditional slab.
- realization of a ceiling compartment in the area between the extrados of the false ceiling and the intrados of the deck, ie when the space is occupied by crossing plant with possible sources of ignition or when the ceiling is passing over a partitioning wall.

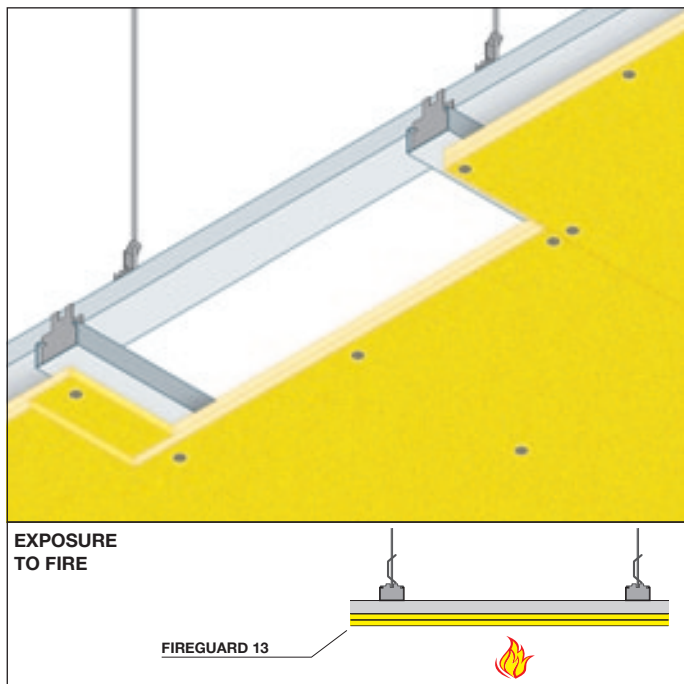
The fire resistance class is determined on the basis of experimental tests conform to standard test EN 1364-2 – "Fire resistance tests for non-loadbearing elements and countertops". This standard specifies a method for determination of the fire resistance of ceilings that possess themselves a fire resistance regardless of each construction element above. The test method described in the standard provides that the ceiling is **exposed to fire from below or from above** to simulate the fire in the cavity above the ceiling: a→b or a←b classification.

The standard EN1364-2 defines the field of direct application in the following way:

- **Suspended ceilings with fire from below**, classification a←b
Dimensions: "The test results obtained on a false ceiling with 4x3 m size or bigger can be applied to ceilings of any size provided that the distance between the suspension devices is not greater than the one tested."
- **Suspended ceilings with fire from above**, classifying a→b
Dimensions: "The test results obtained on a false ceiling with 4x3 m size or bigger can be applied to ceilings of any size provided that the distribution of support is not reduced. The length of the support grid elements and the load on the supports should not be increased.
Suspension devices: "test results are applicable to suspended ceilings with steel suspension devices **with length equal to or less than that under test**".



MEMBRANE CEILING



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 60 (a←b)

- **Deck type:** any
- **Distance from deck:** any
- **Support structure:** steel angles "C" 50x27x0,6 mm for both the primary framework that for the secondary frame
- **Hangers:** at 650 mm intervals
- **Fire protection:** FIREGUARD® 13 boards, thickness 2 x 12,7 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes
- **Applications:** presence of inspection door: allowed

Classification report: I.G. 286860-3341 FR
Fire Testing Norm: EN 1364-2

SYSTEM SPECIFICATIONS

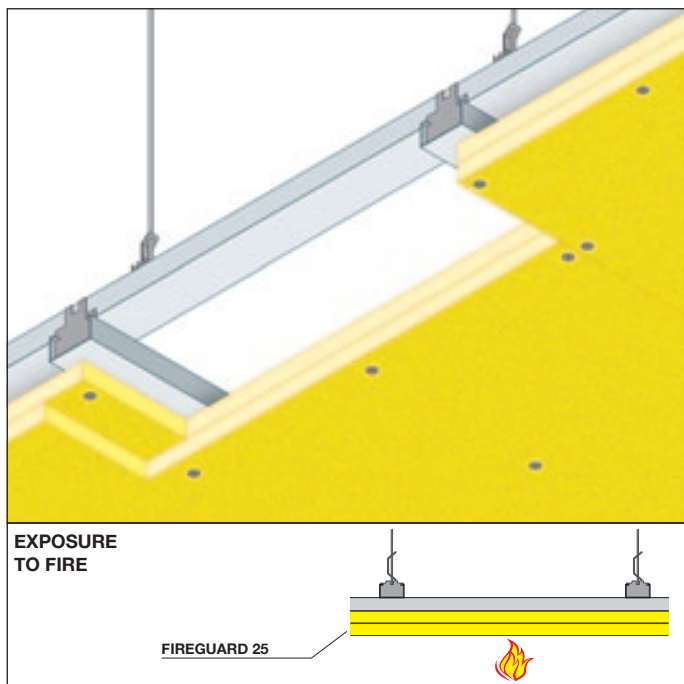
Construction of membrane ceiling for fire resistance EI 60 (a←b), using two FIREGUARD® 13 board, thickness 12,7 mm, maximum size 1220x2000 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 286860-3341 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm in diameter and 25 mm length at 600 mm centres for the upper layer

and 35 mm length at 250 mm centres for the lower. They are such fastened to a metal structure composed of a secondary frame formed by galvanized steel angles "C" 50x27x0,6 mm which are positioned at 400 mm intervals, and a main metal frame constituted by the same steel angles "C" which are positioned at 900 mm intervals, fixed to the secondary frame by means of orthogonal hooks and connected to the floor at 650 mm centres.

For further details see the "Installation Manual".

MEMBRANE CEILING



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120 (a←b)

- **Deck type:** any
- **Distance from deck:** any
- **Support structure:** steel angles "C" 50x27x0,6 mm for both the primary framework that for the secondary frame
- **Hangers:** at 600 mm intervals
- **Fire protection:** FIREGUARD® 25 boards, thickness 2 x 25,4 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish; not required for fire protection purposes

Classification report: I.G. 276492-3246 FR
Fire Testing Norm: EN 1364-2

SYSTEM SPECIFICATIONS

Construction of membrane ceiling for fire resistance EI 120 (a←b), using two FIREGUARD® 25 board, thickness 25,4 mm, maximum size 610x2200 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 276492-3246 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 600 mm centres for the upper layer and 75

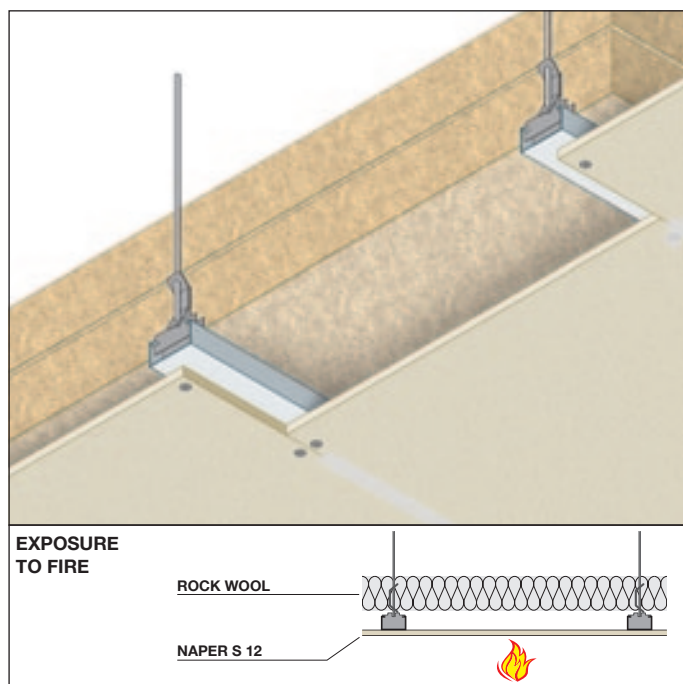
mm length at 250 mm centres for the lower.

They are such fastened to a metal structure composed of a secondary frame formed by galvanized steel angles "C" 50x27x0,6 mm which are positioned at 440 mm intervals, and a main metal frame constituted by the same steel angles "C" which are positioned at 700 mm intervals, fixed to the secondary frame by means of orthogonal hooks and connected to the floor at 600 mm centres.

For further details see the "Installation Manual".



MEMBRANE CEILING



SYSTEM SPECIFICATIONS

Construction of membrane ceiling, for fire resistance EI 120 (a-b), using NAPER S 12 board in thickness 12 mm, maximum size 1220x2440 mm, consisting of a calcium silicate cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 290266-3371 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 250 mm centres to a metal structure composed by galvanized steel angles "C" 50x27x0,6 mm which are

REACTION TO FIRE: A1**FIRE RESISTANCE: EI 120 (a-b)**

- **Deck type:** any
- **Distance from deck:** any
- **Insulation:** rock wool 40 + 40 mm, density 80 kg/m³
- **Support structure:** steel angles "C" 50x27x0,6 mm at 400 mm intervals
- **Hangers:** at 900 mm intervals
- **Fire protection:** NAPER S 12 boards in thickness 1x12 mm
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw
- **Applications:** presence of inspection door: allowed

Classification report: I.G. 290266-3371 FR
Fire Testing Norm: EN 1364-2

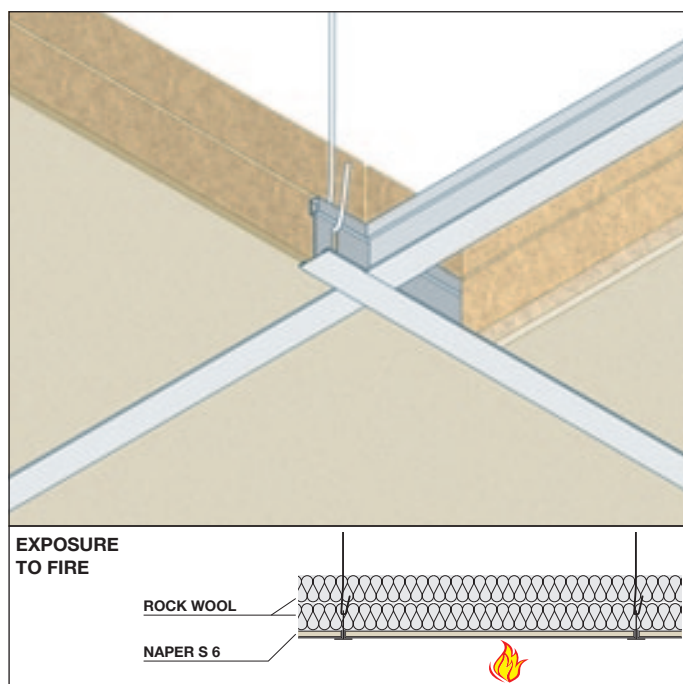
positioned at 400 mm intervals and connected to the floor at 900 mm centres.

In between a mat of rock wool 40 + 40 mm thick and 80 kg/m³ in density, is inserted.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

For further details see the "Installation Manual".

MODULAR MEMBRANE CEILING



SYSTEM SPECIFICATIONS

Construction of modular membrane ceiling, for fire resistance EI 60 (a-b), using NAPER S 6 board in thickness 6 mm, maximum size 595x595 mm, consisting of a calcium silicate cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 311927-3604 FR.

The panels are laid on a metal structure made by galvanized steel "T" main profiles, dimensions 24x38x0,4 mm placed at 600 mm intervals and galvanized steel "T" secondary profiles with dimensions 24x38x0,4 mm

REACTION TO FIRE: A1**FIRE RESISTANCE: EI 60 (a-b)**

- **Deck type:** any
- **Distance from deck:** any
- **Insulation:** rock wool 40 + 40 mm, density 60 kg/m³
- **Support structure:** galvanized steel "T" profile 24x38x0,4 mm at 600 mm intervals
- **Hangers:** at 600 mm intervals
- **Fire protection:** NAPER S 6 boards dimensions 595x595 mm, in thickness 1 x 6 mm
- **Surface finishing:** non provided

Classification report: I.G. 311927-3604 FR
Fire Testing Norm: EN 1364-2

placed at 600 mm intervals.

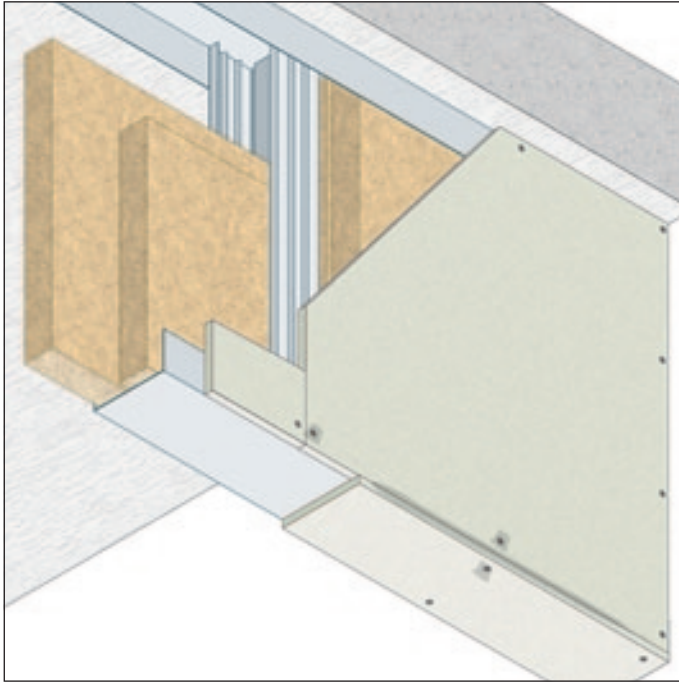
The metal structure is connected to the floor with hangers made by 4 mm diameter steel bar placed at 600 mm centres.

In between a mat of rock wool 40 + 40 mm thick and 60 kg/m³ in density, is inserted.

For further details see the "Installation Manual".



VERTICAL MEMBRANE VEIL



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 60 (a←b)

- **Deck type:** any
- **Distance from deck:** any
- **Support structure:** vertical steel studs "C" 75x50x0,6 mm at 488 mm centres
- **Fire protection:** FIREGUARD® S 8 boards in thickness 1 x 8 mm
- **Insulation:** rock wool 2 x 30 mm, density 60 kg/m³
- **Fastening:** self-tapping phosphated screws 3,5 mm in diameter, 25 mm in length
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw

Classification report: I.G. 310251-3594 FR
Fire Testing Norm: EN 1364-2

SYSTEM SPECIFICATIONS

Construction of vertical membrane veil with fire resistance EI 60 (a←b), using one using FIREGUARD® S boards in thickness 8 mm, maximum size 1220x2440 mm, consisting of a calcium silicate cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 310251-3594 FR. The boards are installed horizontally and fastened by self-tapping phosphated screws 3,5 mm in diameter and 25 mm length at 200 mm centres to vertical steel studs "C" 75x50x0,6 mm which are positioned

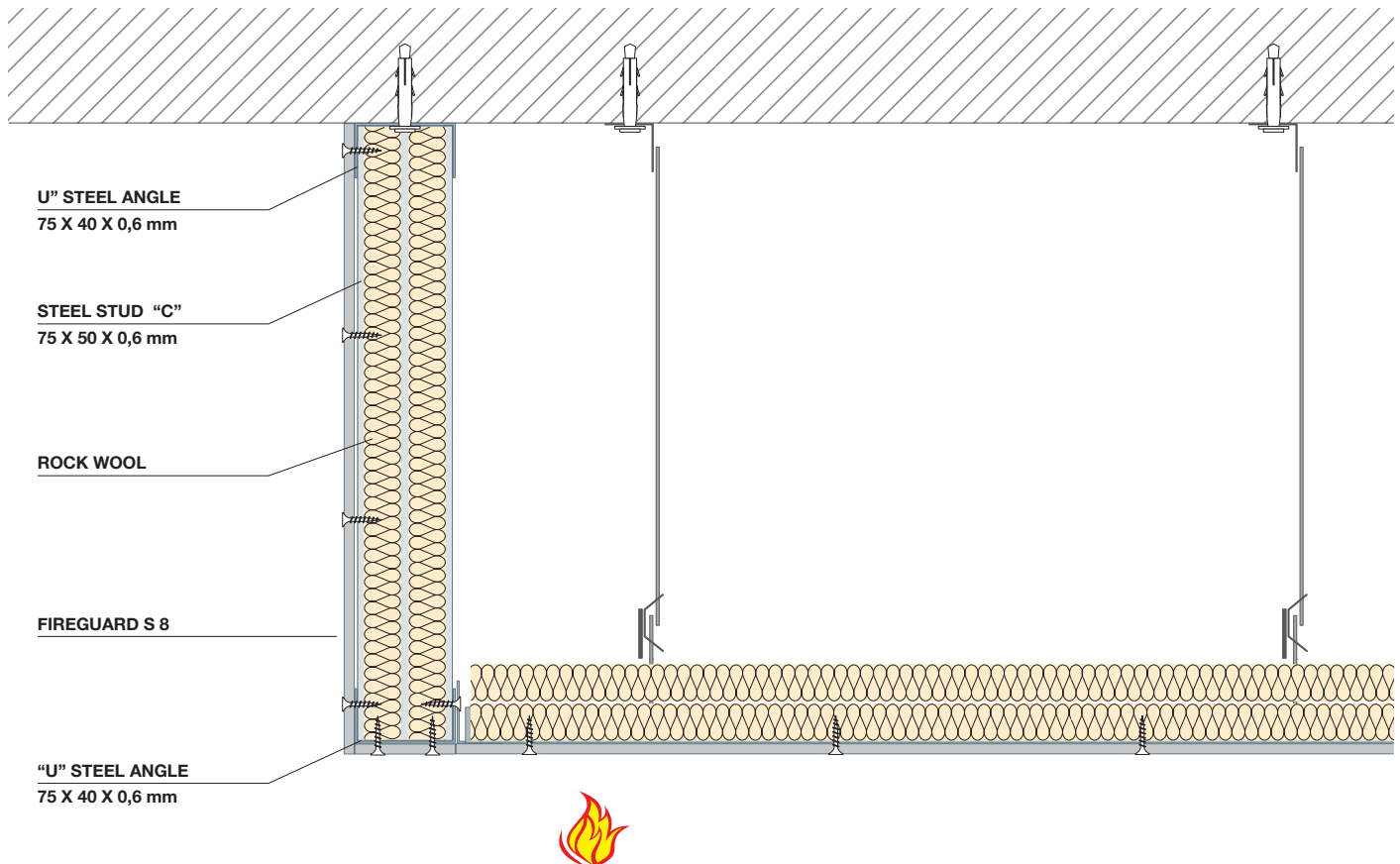
at 488 mm intervals and inserted in steel angles "U" 75x40x0,6 mm mounted underneath the deck and at the bottom of the veil.

In between a mat of rock wool 30 + 30 mm thick and 60 kg/m³ in density, is inserted.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

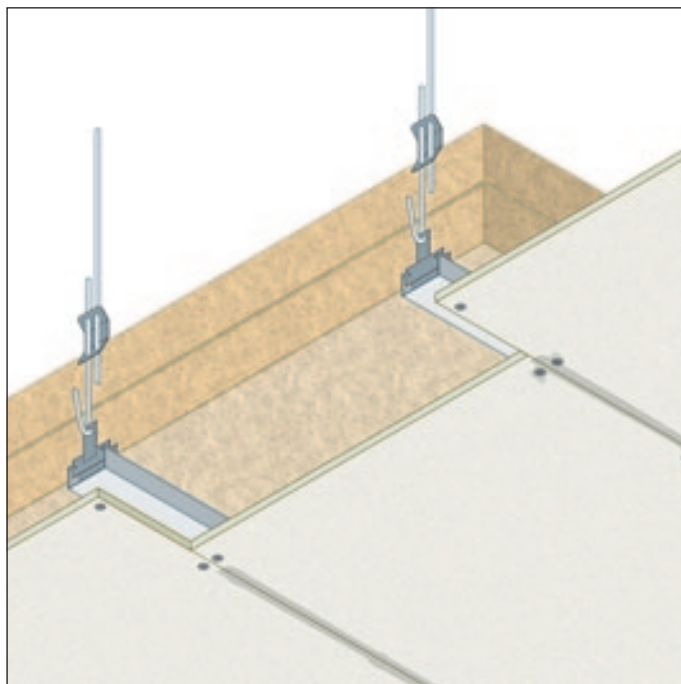
For further details see the "Installation Manual".

VEIL DETAILS





DIAGONAL MEMBRANE CEILING



SYSTEM SPECIFICATIONS

Construction of angled membrane ceiling, for fire resistance EI 60 (a+b), using FIREGUARD® S board in thickness 8 mm, maximum size 1220x2440 mm, consisting of a calcium silicate cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 310251-3594 FR.

The boards are installed using self-tapping phosphated screws 3,5 mm in diameter and 25 mm length at 200 mm centres to a metal structure composed by galvanized steel angles "C" 50x27x0,6 mm which are

REACTION TO FIRE: A1

FIRE RESISTANCE: EI 60 (a+b)

- **Deck type:** any
- **Distance from deck:** any
- **Insulation:** rock wool 2 x 30 mm, density 60 kg/m³
- **Support structure:** steel angles "C" 50x27x0,6 mm at 488 mm intervals
- **Hangers:** at 900 mm intervals
- **Fire protection:** FIREGUARD® S boards in thickness 1 x 8 mm
- **Fastening:** self-tapping phosphated screws 3,5 mm in diameter, 25 mm in length
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over joints and screw
- **Extended applications:** : tilt up to 45°

Classification report: I.G. 310251-3594 FR
Fire Testing Norm: EN 1364-2

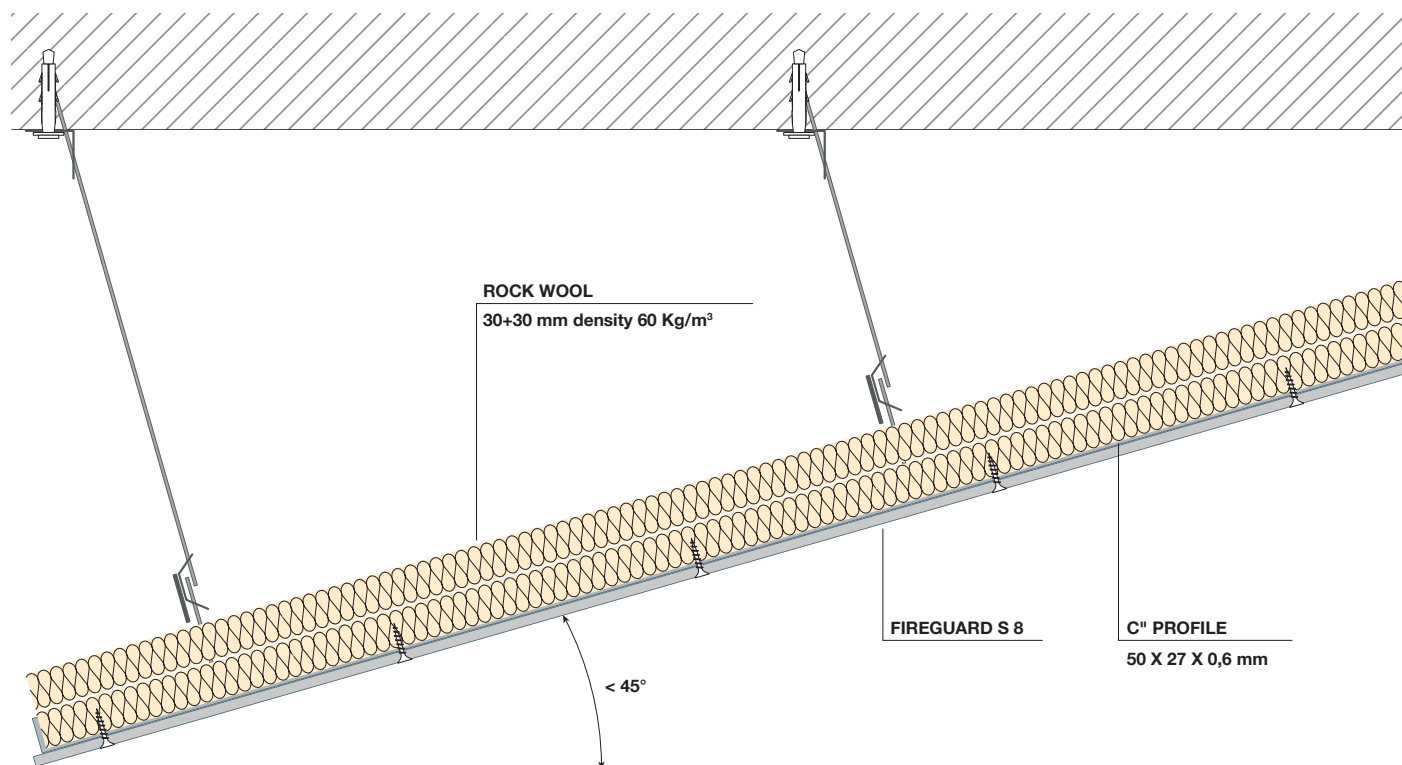
positioned at 488 mm intervals and connected to the deck at 900 mm centres.

In between a mat of rock wool 30 + 30 mm thick and 60 kg/m³ in density, is inserted.

FIREGUARD COMPOUND is applied as a finish to cover joints and screw heads.

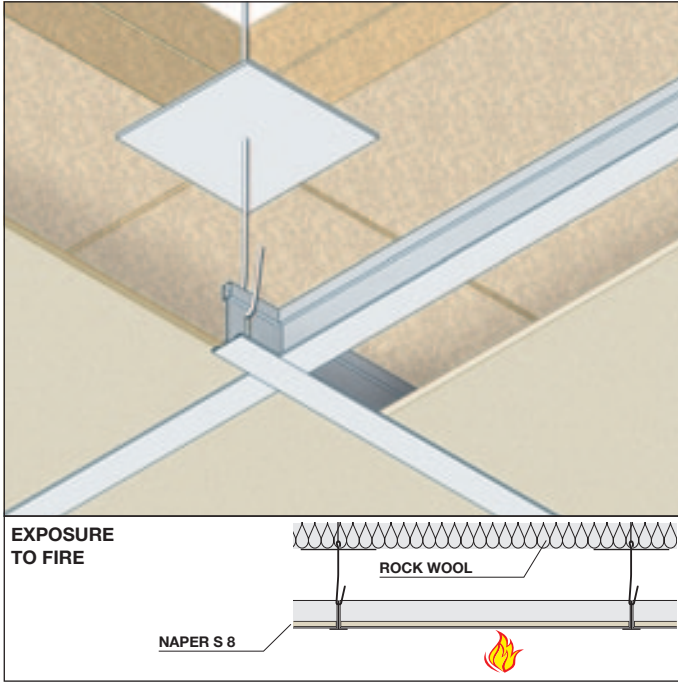
For further details see the "Installation Manual".

DIAGONAL CEILING DETAILS





MODULAR MEMBRANE CEILING



REACTION TO FIRE: A1
FIRE RESISTANCE: EI 120 (a←b)

- **Deck type:** any
- **Distance from deck:** any
- **Insulation:** rock wool 40 + 40 mm, density 80 kg/m³
- **Support structure:** galvanized steel "T" profile 24x38x0,4 mm at 600 mm intervals
- **Hangers:** at 600 mm intervals
- **Fire protection:** NAPER S 8 boards dimensions 595x595 mm, in thickness 1 x 8 mm
- **Surface finishing:** non provided

Classification report: I.G. 294768-3409 FR
Fire Testing Norm: EN 1364-2

SYSTEM SPECIFICATIONS

Construction of membrane ceiling, for fire resistance EI 120 (a←b), using NAPER S 8 board in thickness 8 mm, maximum size 595x595 mm, consisting of a calcium silicate cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 294768-3409 FR.

The panels are laid on a metal structure made by galvanized steel "T" main profiles, dimensions 24x38x0,4 mm placed at 600 mm intervals and galvanized steel "T" secondary profiles with dimensions 24x38x0,4 mm

placed at 600 mm intervals.

The metal structure is connected to the deck with hangers made by 4 mm diameter steel bar with steel plate in size 100x100 mm with a support function to the rock wool.

In between a mat of rock wool 40+40 mm thick and 80 kg/m³ in density, is inserted.

For further details see the "Installation Manual".



PROTEZIONI ANTINCENDIO PER IMPIANTI FOTOVOLTAICI

La guida per l'installazione di impianti fotovoltaici, pubblicata dal Dipartimento dei Vigili del Fuoco, del Soccorso Pubblico e della Difesa Civile, con prot. 1324 del 7 Febbraio 2012, ha sancito come l'installazione di un impianto fotovoltaico possa comportare un aggravio del preesistente livello di rischio di incendio.

L'aggravio potrebbe concretizzarsi, per il fabbricato servito, in termini di:

- interferenza con il sistema di ventilazione dei prodotti della combustione (ostruzione parziale/totale di traslucidi, impedimenti apertura evacuatori);
- ostacolo alle operazioni di raffreddamento/estinzione di tetti combustibili;
- rischio di propagazione delle fiamme all'esterno o verso l'interno del fabbricato (presenza di condutture sulla copertura di un fabbricato suddiviso in più compartimenti - modifica della velocità di propagazione di un incendio in un fabbricato mono compartimento).

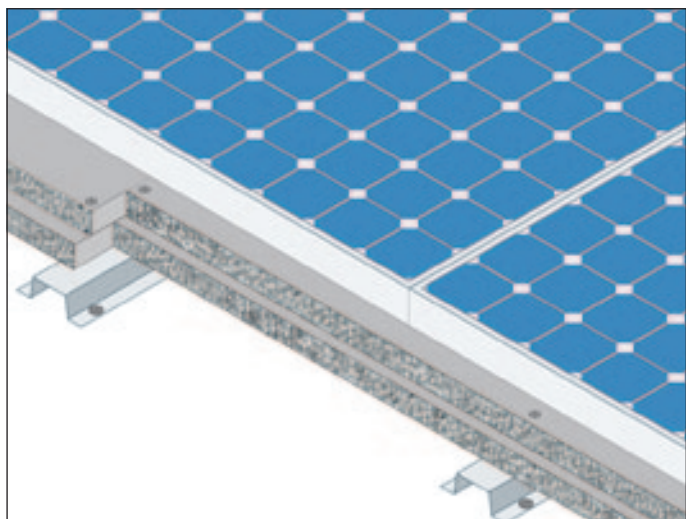
L'installazione di un impianto fotovoltaico a servizio di un'attività soggetta ai controlli di prevenzione incendi richiede gli adempimenti previsti dal comma 6 dell'art. 4 del D.P.R. n.151 del 1 agosto 2011.

A tal fine l'installazione dovrà essere eseguita in modo da evitare la propagazione di un incendio dal generatore fotovoltaico al fabbricato nel quale è incorporato.

Tale condizione si ritiene rispettata qualora l'impianto fotovoltaico, incorporato in un'opera di costruzione, venga installato su strutture ed elementi di copertura e/o di facciata incombustibili (Classe 0 secondo il DM 26/06/1984 oppure Classe A1 secondo il DM 10/03/2005).

Risulta, altresì, equivalente l'interposizione tra i moduli fotovoltaici e il piano di appoggio, di uno strato di materiale di resistenza al fuoco almeno EI 30 ed incombustibile (Classe 0 secondo il DM 26/06/1984 oppure classe A1 secondo il DM 10/03/2005).

SUPPORTO IMPIANTI FOTOVOLTAICI



EXPOSURE
TO FIRE

UNIPAN 16 mm

PROFILO OMEGA

REACTION TO FIRE: A1
FIRE RESISTANCE: EI 30

- **Rivestimento protettivo:** lastre UNIPAN® spessore 2x16 mm
- **Fissaggio:** viti auto perforanti diametro 4,2 mm, con lunghezza 32 mm
- **Orditura:** non necessaria ai fini antincendio
- **Finitura:** non prevista

Certificato: I.G. 294732-3407 FR
Norma di prova: EN 1364-1

SYSTEM SPECIFICATIONS

Fornitura e posa in opera di supporto per impianti fotovoltaici con resistenza al fuoco EI 30, realizzato con due lastre UNIPAN® spessore 16 mm, costituite da un impasto di cemento Portland e inerti, con le due facce, fronte e retro, in rete di fibra di vetro con rivestimento polimerico, i bordi longitudinali assottigliati e irrobustiti grazie alla tecnologia EDGETECH®, omologate in classe A1 (incombustibile) di reazione al fuoco, in conformità al certificato I.G. 294732-3407 FR.

Le lastre saranno posate a giunti sfalsati tra il pannello fotovoltaico e una struttura metallica composta da profili a "omega" in acciaio zincato a passo 460 mm.

Le lastre saranno avvitate al profilo metallico con viti auto perforanti fosfatate UNIVIS diametro 3,2 mm, lunghezza 32 mm con passo 250 mm. Per le modalità di applicazione si veda apposito "manuale di posa".



VENTILATION AND SMOKE EXTRACTION DUCTS





INTRODUCTION

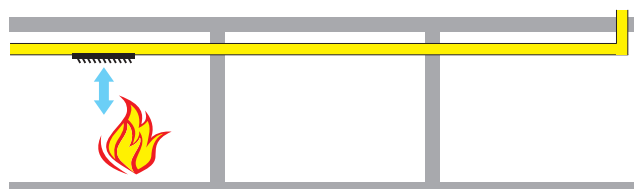
In all ventilation and smoke extraction systems the major danger basically results from the potential propagation of smoke and flames from one compartment to another.

Ductwork has turned out to be a primary path by which fire may propagate as the smoke or flames created by the fire may either penetrate through the duct walls, or expand from one to another compartment along the duct system or through gaps which may exist between the ductwork and partitions.

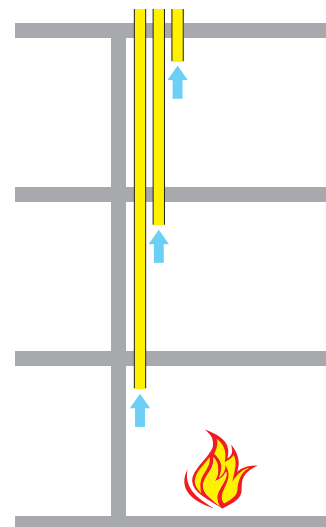
In such case, unless the appropriate measures have been taken to prevent the above stated problems, an entire building could be invaded by the smoke and flames originating from a localized fire even far away.

The fundamental methods to protect ductwork against fire and to avoid its propagation to the outside are:

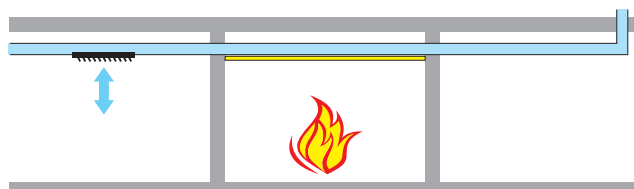
- BUILDING THE DUCT, OR CLADDING TO IT, BY USING FIRE RESISTANT MATERIALS



fire resistant duct, or duct clad to with fire resistant material, passing through compartments

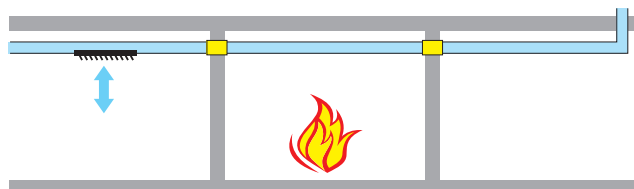


- INSTALLING HORIZONTAL BARRIERS TO FIRE



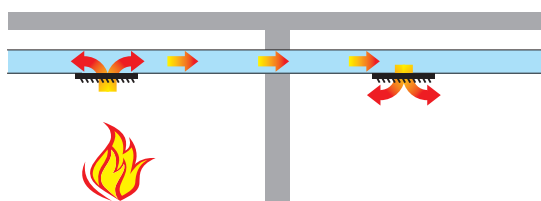
fire resistant ceiling protecting the duct, proven for internal or external fire exposure.

- INSTALLING FIRE DAMPERS

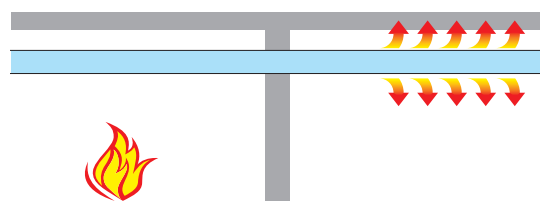


by means of fire dampers which will automatically seal the relevant compartment.

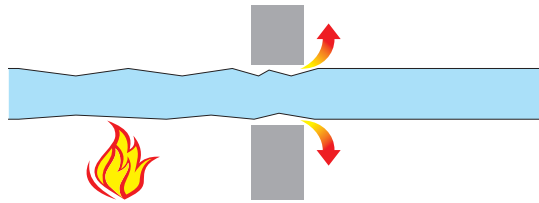
Air ducts passing through various zones of a building may represent a preferred path for fire propagation from one compartment to another.



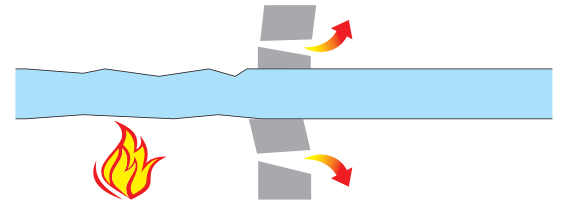
Air ducts passing through various zones of a building may represent a preferred path for fire propagation from one compartment to another.



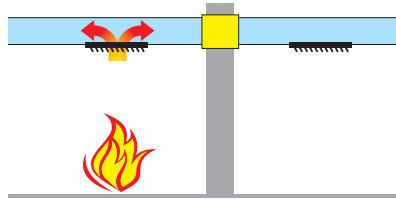
The walls of a steel duct may heat up rapidly and transmit the fire to adjacent compartments by conduction and radiation.



The heat may also deform the duct, thus permitting the hot gases to escape and enter the adjacent compartments.

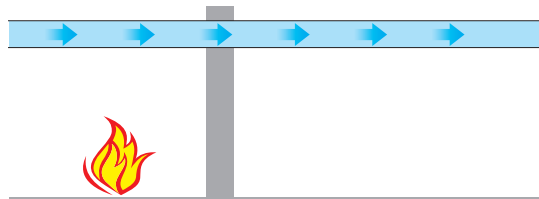


The duct may as well fail within in compartment in which the fire started, and thereby cause the partitions between compartments to crack.

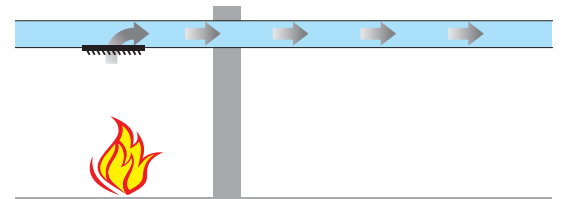


In case of steel ductwork the use of fire dampers will maintain the compartmentisation, yet it impedes the proper functioning of the duct system during the fire.

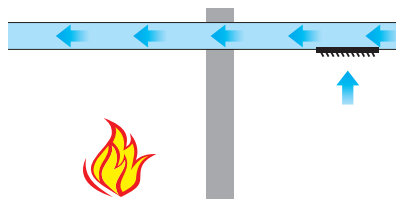
There are situations in which the duct systems has to function even during the fire, such as:



In case the ducts pass through a zone with fire towards more distant parts of the building, e.g., parking garages.



In case of ducts for smoke extraction



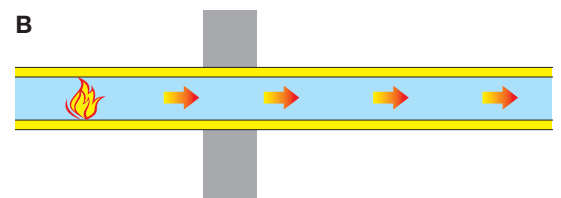
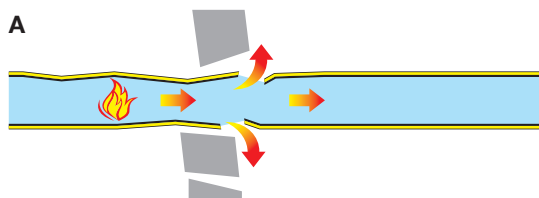
In case the ducts pass through a zone with fire arriving in an area in which positive pressure has to be kept to prevent smoke from entering it, e.g., escape routes, staircases. Needless to mention that in case of gas heating the ductwork for ventilation must always be resist fire resistant if direct ventilation is not possible.

Fire resistant ducts may be carried out in two ways:

- cladding the protection to existing steel ductwork
- building the duct entirely from fire resistant boards.

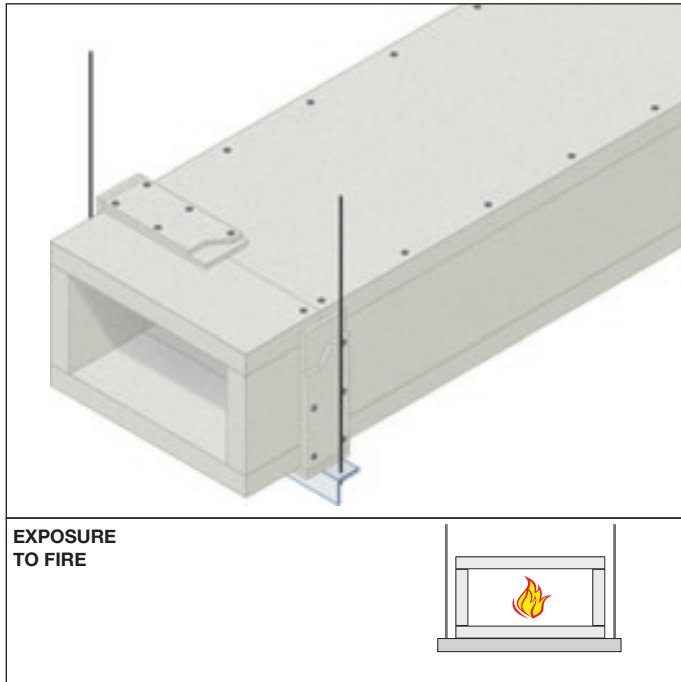
These solutions are considered adequate protections in case of **external** exposure of the duct to fire; **metal ductwork in the event of fire within the duct, however, may be subject to yielding effects** caused by the temperature rise of the metal, (A), and thereby no longer provide the extraction of smoke from the compartment in which the fire started.

This problem does not arise if the duct is built entirely from boards (B).





HORIZONTAL VENTILATION DUCTS – INTERNAL EXPOSURE TO FIRE



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120 ($h_o \rightarrow i$)

- **Exposure to fire:** internal
- **Supporting structure:** steel angle “L” 50x50x5 mm and threaded steel hanger rod 16 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Applications:** 4 sided self-supporting duct, Maximum duct size: 1250 mm (width) x 1000 mm (height). Maximum stress of the support system: elastic stress limit for vertical components (hangers) for $t \leq 60$ min : 9 N/mm²; for 60 min < $t \leq 120$ min: 6 N/mm². Maximum support center distance: 1200 mm, to coincide with joints.

Classification report: PK3-01-11-002-A-0
Fire Testing Norm: EN 1366-1

SYSTEM SPECIFICATIONS

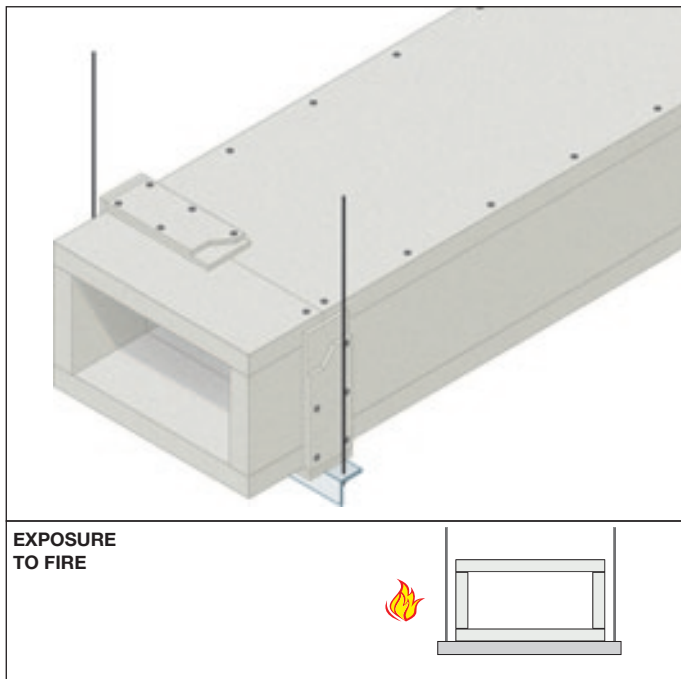
Horizontal ventilation ducts with fire resistance EI 120 ($h_o \rightarrow i$) to be constructed using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm.

These boards are composed of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report PK3-01-11-002-A-0. The boards are glued to each other using FIREGUARD GLUE and screwed to each other at 200 mm centres by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

Joints of the board are to be covered with FIREGUARD® S strips in thickness 2x9 mm and 100 mm in width, fastened using self-tapping phosphated screws 4,5 mm in diameter, 40 mm in length, at 100 mm centres, and glued with FIREGUARD GLUE.

The duct is placed on an “L” steel angle size 50x50x5 mm, positioned coinciding with the board joints at 1200 mm distance, and mounted to the ceiling using threaded steel hanger rods 16 mm in thickness. For further details see the “Installation Manual”.

HORIZONTAL VENTILATION DUCTS – EXTERNAL EXPOSURE TO FIRE 500 Pa



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120 ($h_o \rightarrow i$)

- **Exposure to fire:** external
- **Supporting structure:** steel angle “L” 50x50x5 mm and threaded steel hanger rod 16 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Applications:** 4 sided self-supporting duct, Maximum duct size: 1250 mm (width) x 1000 mm (height). Maximum stress of the support system: elastic stress limit for vertical components (hangers) for $t \leq 60$ min.: 9 N/mm²; for 60 min < $t \leq 120$ min : 6 N/mm². Maximum support center distance: 1200 mm, to coincide with joints.

Classification report: PK3-01-11-002-A-0
Fire Testing Norm: EN 1366-1

SYSTEM SPECIFICATIONS

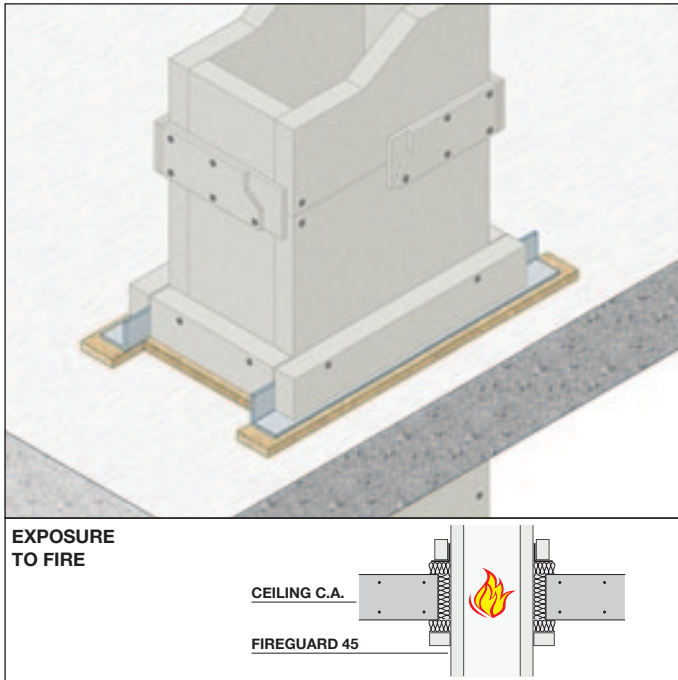
Horizontal ventilation ducts with fire resistance EI 120 ($h_o \rightarrow i$) to be constructed using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm. These boards are composed of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report PK3-01-11-002-A-0 tested for 500 Pa pressure. The boards are glued to each other using FIREGUARD GLUE and screwed to each other at 200 mm centres by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

Joints of the board are to be covered with FIREGUARD® S strips in thickness 2x9 mm and 100 mm in width, fastened using self-tapping phosphated screws 4,5 mm in diameter, 40 mm in length, at 100 mm centres, and glued with FIREGUARD GLUE.

The duct is placed on an “L” steel angle size 50x50x5 mm, positioned coinciding with the board joints at 1200 mm distance, and mounted to the ceiling using threaded steel hanger rods 16 mm in thickness. For further details see the “Installation Manual”.



VERTICAL VENTILATION DUCTS – INTERNAL EXPOSURE TO FIRE



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120 ($v_e i \rightarrow o$)

- **Exposure to fire:** internal
- **Supporting structure:** steel angle “L” 60x60x6 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Applications:** 4 sided self-supporting duct
Maximum duct size: 1250 mm (width) x 1000 mm (height).
Maximum support center distance: 5 m.
The ratio between the support center distance and the shorter size of the duct must not exceed 8:1.

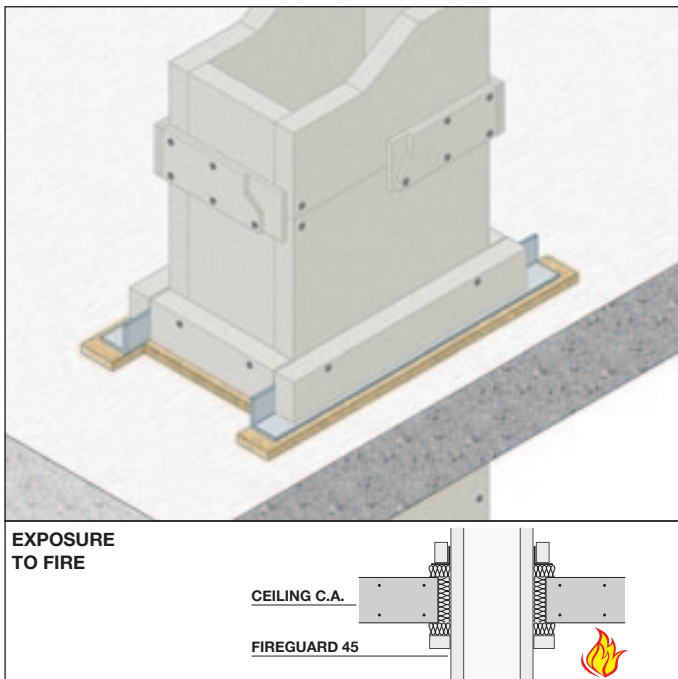
Classification report: PK3-01-11-002-A-0
Fire Testing Norm: EN 1366-1

SYSTEM SPECIFICATIONS

Vertical ventilation ducts with fire resistance EI 120 ($v_e i \rightarrow o$) to be constructed using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm. These boards are composed of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report PK3-01-11-002-A-0. The boards are glued to each other using FIREGUARD GLUE and screwed to each other at 200 mm centres by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

Joints of the board are to be covered with FIREGUARD® S strips in thickness 2x9 mm and 100 mm in width, fastened using self-tapping phosphated screws 4,5 mm in diameter, 40 mm in length, at 100 mm centres, and glued with FIREGUARD GLUE. The duct is fastened to the ceiling using an “L” steel angle size 60x60x6 mm, positioned along the longer sides of the duct, with a strip of rock wool in 30 mm thickness inserted between the ceiling and the “L” steel angle. For further details see the “Installation Manual”.

VERTICAL VENTILATION DUCTS – EXTERNAL EXPOSURE TO FIRE 500 Pa



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120 ($v_e o \rightarrow i$)

- **Exposure to fire:** external
- **Supporting structure:** steel angle “L” 60x60x6 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Applications:** 4 sided self-supporting duct
Maximum duct size: 1250 mm (width) x 1000 mm (height).
Maximum support center distance: 5 m.
The ratio between the support center distance and the shorter size of the duct must not exceed 8:1.

Classification report: PK3-01-11-002-A-0
Fire Testing Norm: EN 1366-1

SYSTEM SPECIFICATIONS

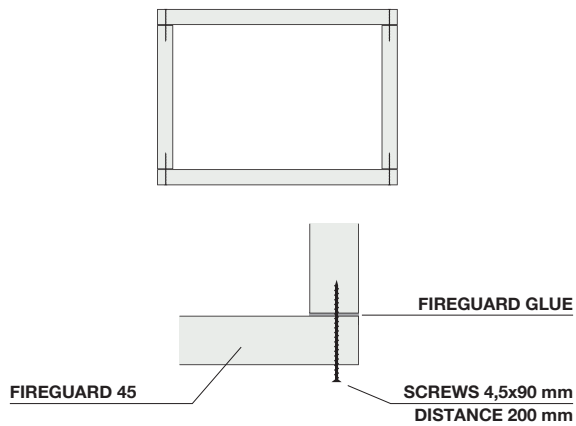
Vertical ventilation ducts with fire resistance EI 120 ($v_e o \rightarrow i$) to be constructed using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm. These boards are composed of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report PK3-01-11-002-A-0 tested at 500 Pa pressure. The boards are glued to each other using FIREGUARD GLUE and screwed to each other at 200 mm centres by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

Joints of the board are to be covered with FIREGUARD® S strips in thickness 2x9 mm and 100 mm in width, fastened using self-tapping phosphated screws 4,5 mm in diameter, 40 mm in length, at 100 mm centres, and glued with FIREGUARD GLUE. The duct is fastened to the ceiling using an “L” steel angle size 60x60x6 mm, positioned along the longer sides of the duct, with a strip of rock wool in 30 mm thickness inserted between the ceiling and the “L” steel angle. For further details see the “Installation Manual”.

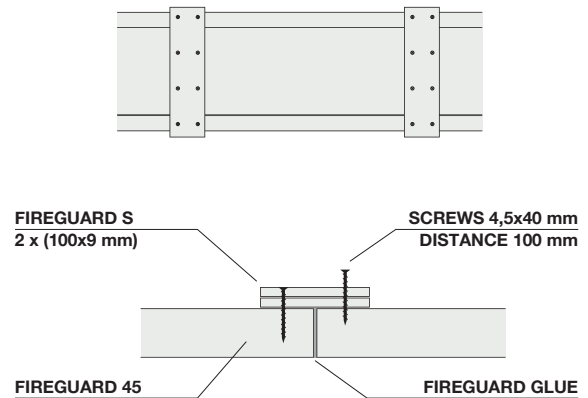


CONSTRUCTION DETAILS

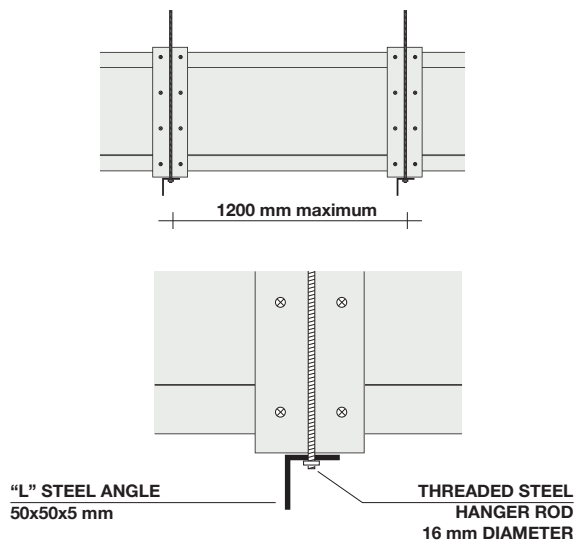
DUCT



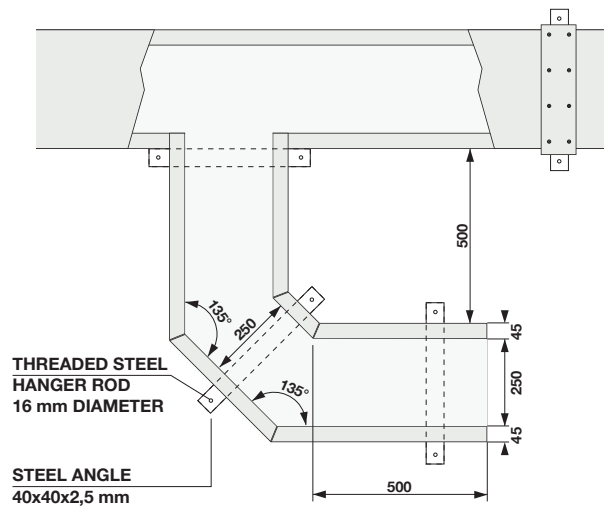
DUCT JOINT



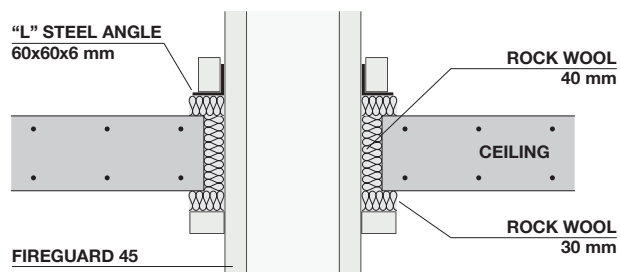
DUCT SUPPORT



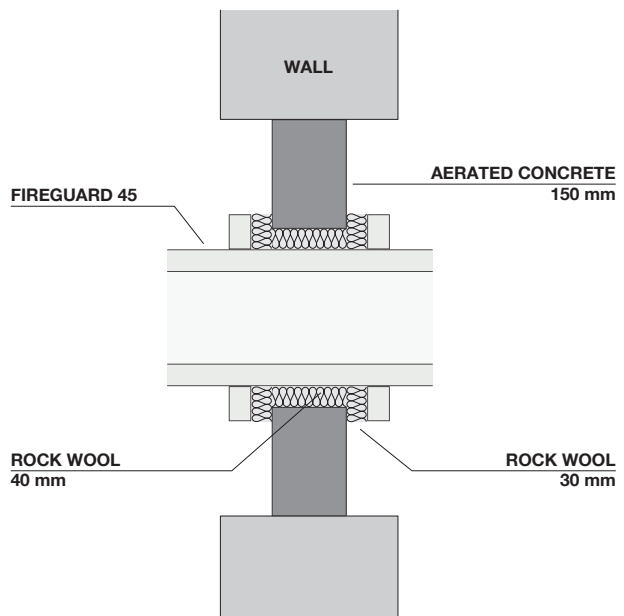
"T" CONNECTION AND CURVED DUCT



VERTICAL PENETRATION

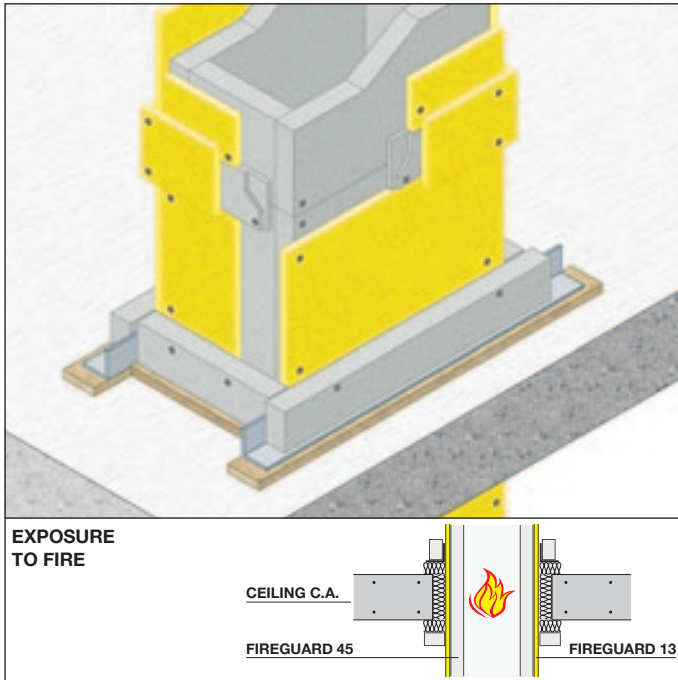


HORIZONTAL PENETRATION





VERTICAL VENTILATION DUCTS – INTERNAL EXPOSURE TO FIRE



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 180 ($v_e i \rightarrow o$)

- **Exposure to fire:** internal
- **Supporting structure:** steel angle “L” 60x60x6 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1x45 mm and boards type FIREGUARD® 13 in thk 1x 2,7 mm
- **Applications:** 4 sided self-supporting duct, maximum duct size: 1250 mm (width) x 1000 mm (height). Maximum support center distance: 5 m. The ratio between the support center distance and the shorter size of the duct must not exceed 8:1

Classification report: Applus 12/4798-1545
Fire Testing Norm: EN 1366-1

SYSTEM SPECIFICATIONS

Vertical ventilation ducts with fire resistance EI 180 ($v_e i \rightarrow o$) to be constructed using FIREGUARD® 45 boards in thickness 45 mm and FIREGUARD® 13 boards in thickness 12,7 mm maximum size 1200x2000 mm. These boards are composed of calciumsilicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report Applus 12/4798-1545.

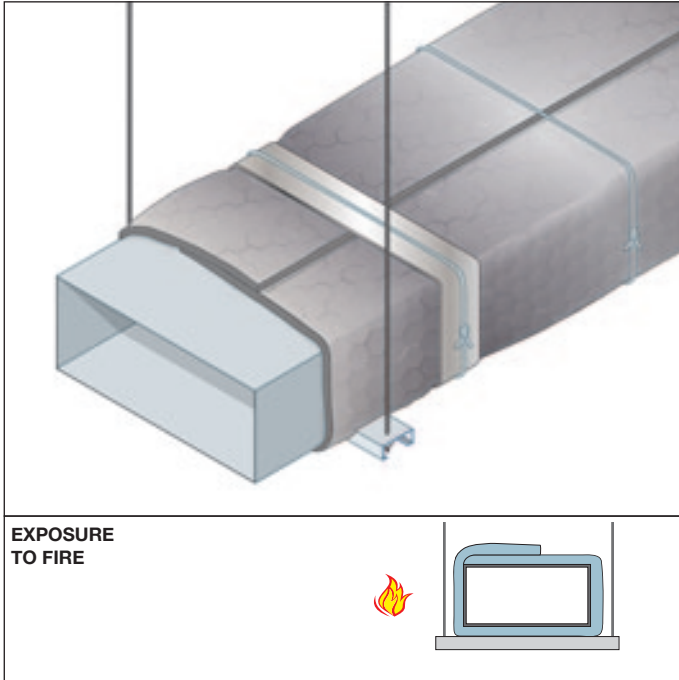
The boards are glued to each other using FIREGUARD GLUE and screwed to each other at 200 mm centres by self-tapping phosphated screws 4,5 mm

in diameter, 90 mm in length. Joints of the board are to be covered with FIREGUARD® S strips in thickness 2x9 mm and 100 mm in width, fastened using self-tapping phosphated screws 4,5 mm in diameter, 40 mm in length, at 100 mm centres, and glued with FIREGUARD GLUE.

The duct is fastened to the ceiling using an “L” steel angle size 60x60x6 mm, positioned along the longer sides of the duct, with a strip of mineral wool in 30 mm thickness inserted between the ceiling and the “L” steel angle. For further details see the “Installation Manual”.



HORIZONTAL VENTILATION DUCTS – EXTERNAL EXPOSURE TO FIRE



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120 ($h_o \rightarrow i$)

- **Exposure to fire:** external
- **Supporting structure:** steel “C”-channel 20x40x20 mm, thickness 4 mm, and threaded steel hanger rods 10 mm in diameter
- **Fire protection:** OISTER 30 fire protection mat
- **Applications:**
Maximum duct size: 1250 mm (width) x 1000 mm (height).
Elastic stress limit for all vertical support components (hangers) for $t \leq 60$ min : 9 N/mm²; for $60 \text{ min} < t \leq 120$ min : 6 N/mm².
Maximum support center distance: 1350 mm, to coincide with joints.
Applicable for ducts with tightness greater or equal class A (according to EN 1507)

Classification report: Applus 10/101765-2074 M1
Fire Testing Norm: EN 1366-1

SYSTEM SPECIFICATIONS

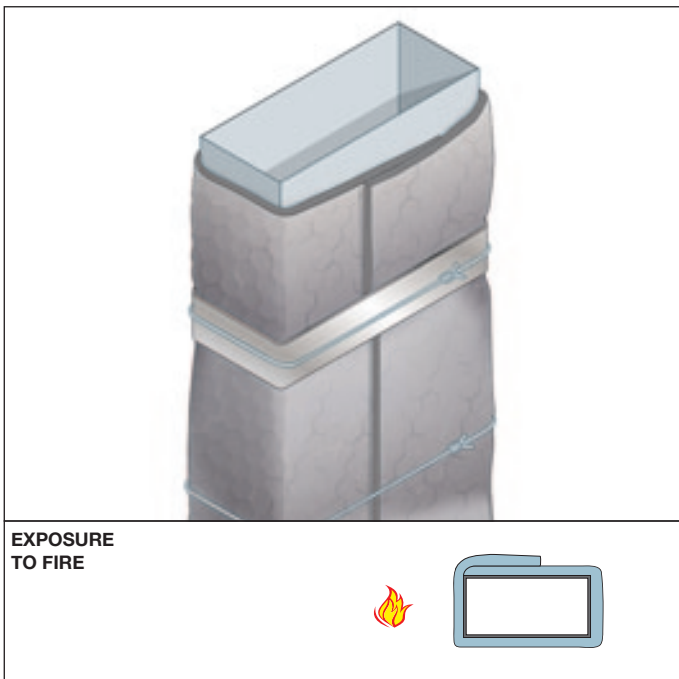
Cladding to horizontal ventilation ducts for fire resistance EI 120 ($h_o \rightarrow i$) using OISTER 30 fire protection mats. These mats consist of a mat of mineral wool, stitched to a metal mesh, covered by an aluminum foil on the outer surface and coated on the inner with ablative material protected by glass fabric.

The mat is applied as a single layer 30 mm thick in compliance with classification report Applus 10/101765-2074 M1.

The OISTER 30 mats are applied by wrapping them around the ventilation duct such that their longitudinal edges overlap by approximately 200 mm, whereas their transversal edges have to join accurately. The mats are then fastened with steel wire in thickness 10/10 every 300 mm in distance. Aluminized adhesive tape is wrapped over the entire transversal joints and then fastened with the above steel wire.

For further details see the “Installation Manual”.

VERTICAL VENTILATION DUCTS – EXTERNAL EXPOSURE TO FIRE



REACTION TO FIRE: A1

FIRE RESISTANCE: EI 120 ($V_e \rightarrow i$)

- **Exposure to fire:** external
- **Fire protection:** OISTER 30 fire protection mat
- **Applications:**
Maximum duct size: 1250 mm (width) x 1000 mm (height).
Maximum support center distance: 5 m.
The ratio between the support center distance and the shorter size of the duct must not exceed 8:1.
Applicable for ducts with tightness greater or equal class A (according to EN 1507)

Classification report: Applus 11/2839-992
Fire Testing Norm: EN 1366-1

SYSTEM SPECIFICATIONS

Cladding to vertical ventilation ducts for fire resistance EI 120 ($V_e \rightarrow i$) using OISTER 30 fire protection mats. These mats consist of a mat of mineral wool, stitched to a metal mesh, covered by an aluminum foil on the outer surface and coated on the inner with ablative material protected by glass fabric.

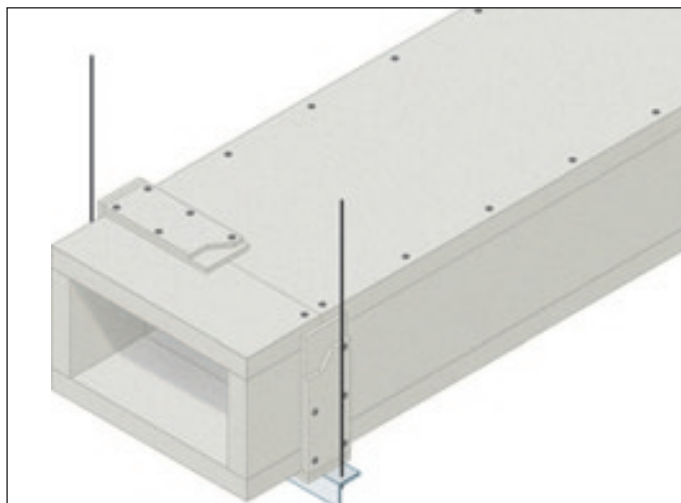
The mat is applied as a single layer 30 mm thick in compliance with classification report Applus 10/101765-2074 M1.

The OISTER 30 mats are applied by wrapping them around the ventilation duct such that their longitudinal edges overlap by approximately 200 mm, whereas their transversal edges have to join accurately. The mats are then fastened with steel wire in thickness 10/10 every 300 mm in distance. Aluminized adhesive tape is wrapped over the entire transversal joints and then fastened with the above steel wire.

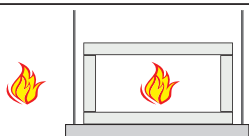
For further details see the “Installation Manual”.



HORIZONTAL SMOKE EXTRACTION DUCTS



EXPOSURE TO FIRE



SYSTEM SPECIFICATIONS

Horizontal smoke extraction ducts with fire resistance EI 120 ($h_o \leftrightarrow i$) 500 multi to be constructed using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm.

These boards are composed of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report Applus 12/4798-1532. The boards are glued to each other using FIREGUARD GLUE and screwed to each other at 200 mm centres by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

REACTION TO FIRE: A1

RES. AL FUOCO: EI 120 ($h_o \leftrightarrow i$) 500 multi

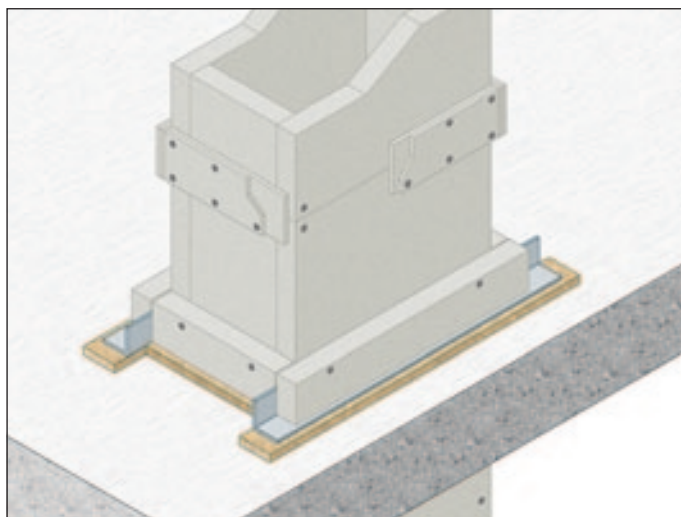
- **Exposure to fire:** internal/external
- **Supporting structure:** steel angle "L" 50x50x5 mm and threaded steel hanger rod 16 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Applications:** 4 sided self-supporting duct
Maximum duct size : 1250 mm (width) x 1000 mm (height).
Maximum stress of the support system: elastic stress limit for vertical components (hangers) for $t \leq 60$ min : 9 N/mm²; for 60 min < $t \leq 120$ min: 6 N/mm².
Maximum support center distance: 1200 mm, to coincide with joints.
Service pressure: -500/+500 Pa

Classification report: Applus 12/4798-1532
Fire Testing Norm: EN 1366-8

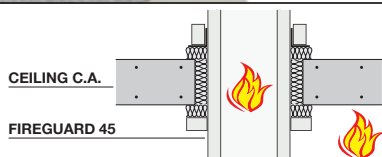
Joints of the board are to be covered with FIREGUARD® S strips in thickness 2x9 mm and 100 mm in width, fastened using self-tapping phosphated screws 4,5 mm in diameter, 40 mm in length, at 100 mm centres, and glued with FIREGUARD GLUE.

The duct is placed on an "L" steel angle size 50x50x5 mm, positioned coinciding with the board joints at 1200 mm distance, and mounted to the ceiling using threaded steel hanger rods 16 mm in thickness. For further details see the "Installation Manual".

VERTICAL SMOKE EXTRACTION DUCTS



EXPOSURE TO FIRE



SYSTEM SPECIFICATIONS

Vertical smoke extraction ducts with fire resistance EI 120 ($V_e \leftrightarrow i$) 500 multi to be constructed using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm.

These boards are composed of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report PK3-01-11-002-A-0. The boards are glued to each other using FIREGUARD GLUE and screwed to each other at 200 mm centres by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

REACTION TO FIRE: A1

RES. AL FUOCO: EI 120 ($V_e \leftrightarrow i$) 500 multi

- **Exposure to fire:** internal/external
- **Supporting structure:** steel angle "L" 60x60x6 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Applications:** 4 sided self-supporting duct
Maximum duct size: 1250 mm (width) x 1000 mm (height).
Maximum support center distance: 5 m.
The ratio between the support center distance and the shorter size of the duct must not exceed 8:1.
Service pressure: -500/+500 Pa

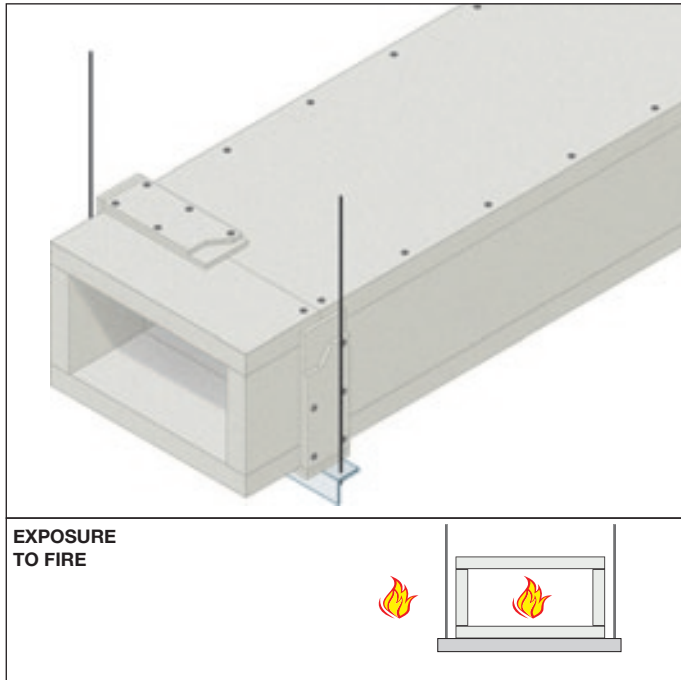
Classification report: Applus 12/4798-1532
Fire Testing Norm: EN 1366-8

Joints of the board are to be covered with FIREGUARD® S strips in thickness 2x9 mm and 100 mm in width, fastened using self-tapping phosphated screws 4,5 mm in diameter, 40 mm in length, at 100 mm centres, and glued with FIREGUARD GLUE. The duct is fastened to the ceiling using an "L" steel angle size 60x60x6 mm, positioned along the longer sides of the duct, with a strip of rock wool in 30 mm thickness inserted between the ceiling and the "L" steel angle.

For further details see the "Installation Manual".



HORIZONTAL SMOKE EXTRACTION DUCTS



REACTION TO FIRE: A1

RES. AL FUOCO: EI 90 ($h_o \leftrightarrow i$) 1500 multi

- **Exposure to fire:** internal/external
- **Supporting structure:** steel angle "L" 50x50x5 mm and threaded steel hanger rod 16 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Applications:** 4 sided self-supporting duct.
Maximum duct size: 1250 mm (width) x 1000 mm (height).
Maximum stress of the support system: elastic stress limit for vertical components (hangers) for $t \leq 60$ min : 9 N/mm²; for $60 \text{ min} < t \leq 120 \text{ min}$: 6 N/mm².
Maximum support center distance: 1200 mm, to coincide with joints.
Service pressure: -1500/+500 Pa

Classification report: PK4-01-12-001-A-0
Fire Testing Norm: EN 1366-8

SYSTEM SPECIFICATIONS

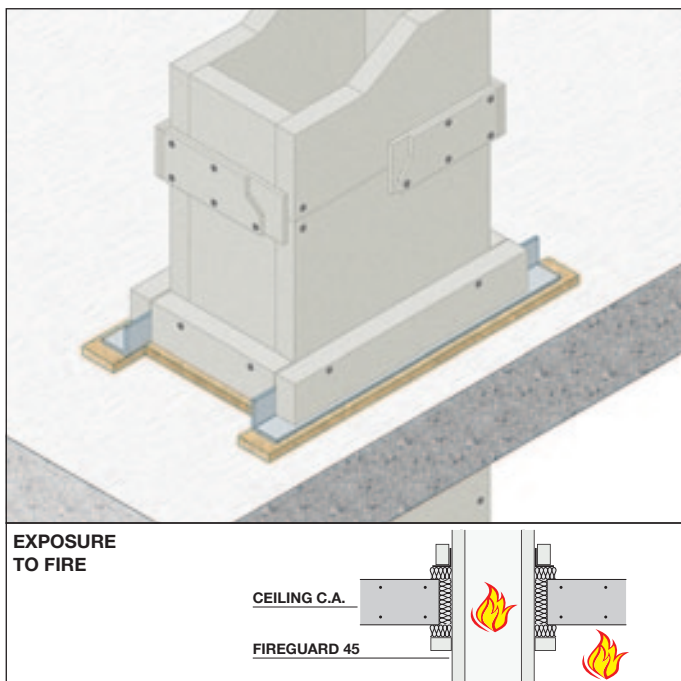
Horizontal smoke extraction ducts with fire resistance EI 90 ($h_o \leftrightarrow i$) 1500 multi to be constructed using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm.

These boards are composed of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report PK4-01-12-001-A-0. The boards are glued to each other using FIREGUARD GLUE and screwed to each other at 200 mm centres by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

Joints of the board are to be covered with FIREGUARD® S strips in thickness 2x9 mm and 100 mm in width, fastened using self-tapping phosphated screws 4,5 mm in diameter, 40 mm in length, at 100 mm centres, and glued with FIREGUARD GLUE. The duct is placed on an "L" steel angle size 50x50x5 mm, positioned coinciding with the board joints at 1200 mm distance, and mounted to the ceiling using threaded steel hanger rods 16 mm in thickness.

For further details see the "Installation Manual".

VERTICAL SMOKE EXTRACTION DUCTS



REACTION TO FIRE: A1

RES. AL FUOCO: EI 90 ($v_o \leftrightarrow i$) 1500 multi

- **Exposure to fire:** internal/external
- **Supporting structure:** steel angle "L" 60x60x6 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Applications:** 4 sided self-supporting duct
Maximum duct size : 1250 mm (width) x 1000 mm (height).
Maximum support center distance: 5 m.
The ratio between the support center distance and the shorter size of the duct must not exceed 8:1.
Service pressure: -1500/+500 Pa

Classification report: PK4-01-12-001-A-0
Fire Testing Norm: EN 1366-8

SYSTEM SPECIFICATIONS

Vertical smoke extraction ducts with fire resistance EI 90 ($v_o \leftrightarrow i$) 1500 multi to be constructed using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm.

These boards are composed of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report PK4-01-12-001-A-0. The boards are glued to each other using FIREGUARD GLUE and screwed to each other at 200 mm centres by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

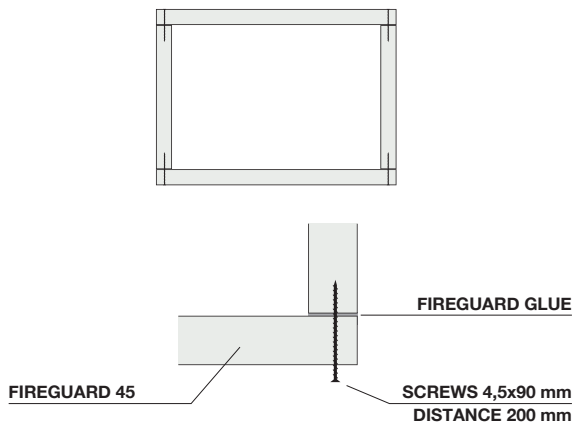
Joints of the board are to be covered with FIREGUARD® S strips in thickness 2x9 mm and 100 mm in width, fastened using self-tapping phosphated screws 4,5 mm in diameter, 40 mm in length, at 100 mm centres, and glued with FIREGUARD GLUE. The duct is fastened to the ceiling using an "L" steel angle size 60x60x6 mm, positioned along the longer sides of the duct, with a strip of rock wool in 30 mm thickness inserted between the ceiling and the "L" steel angle.

For further details see the "Installation Manual".

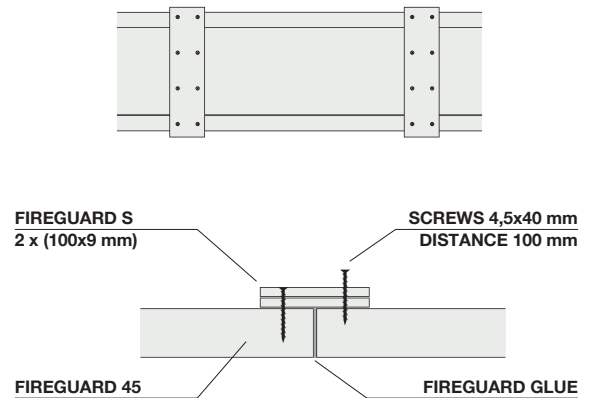


CONSTRUCTION DETAILS

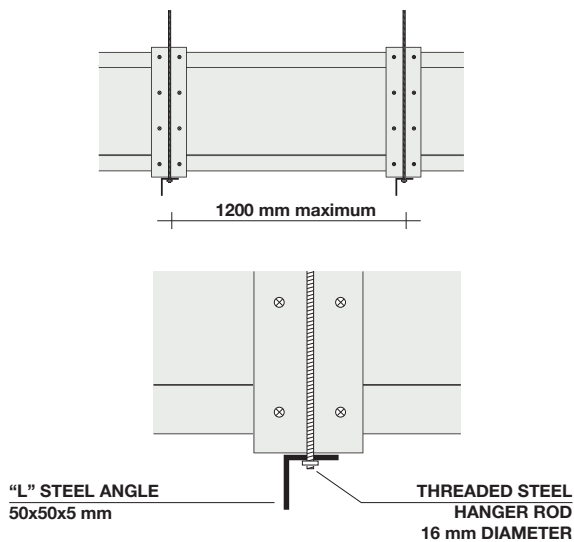
DUCT



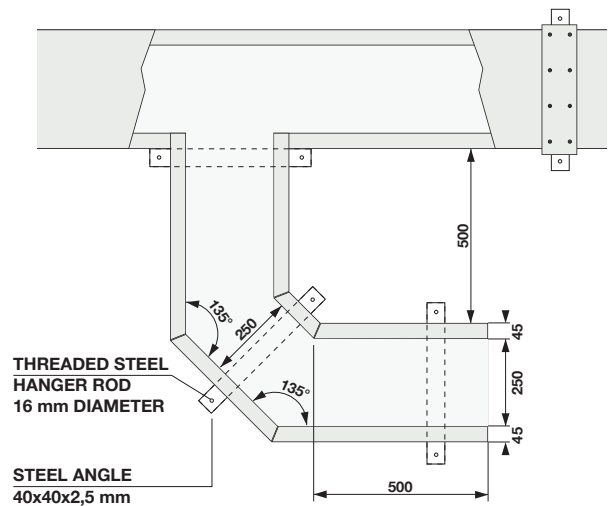
DUCT JOINT



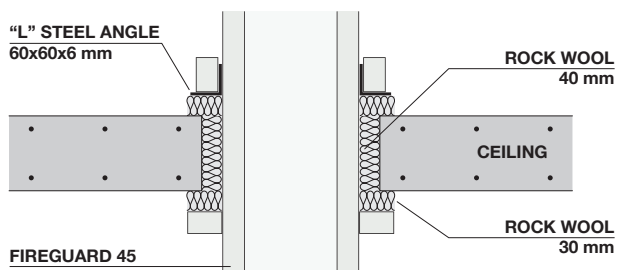
DUCT SUPPORT



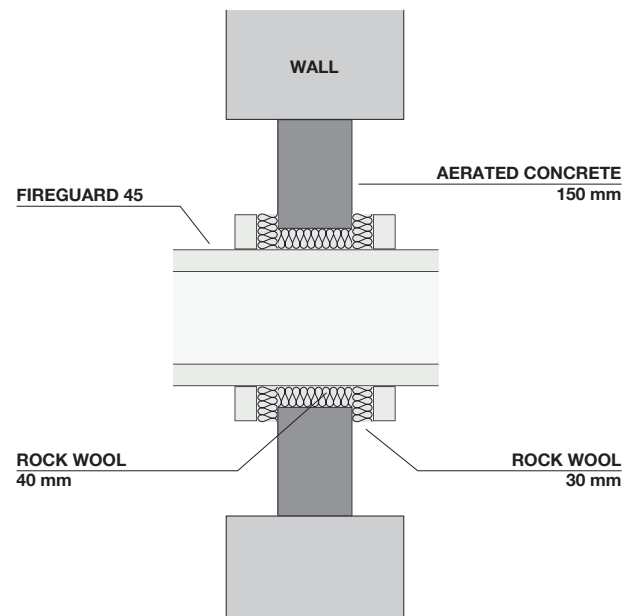
"T" CONNECTION AND CURVED DUCT



VERTICAL PENETRATION



HORIZONTAL PENETRATION





SERVICE DUCT





The requirement of subdivision could not be separated from the protection of technological systems such as ducts that carry electric cables and networks present in the compartmentalized areas.

The appropriate design solution of these problems could avoid some important risk factors during the fire, such as:

- loss of functionality of the system (especially for electrical systems, alarm systems, for the solenoid valves of the extinguishing systems, etc.).
- spread of fire through ducts.
- trigger factors related to short-circuit (for electrical installation).

Many plants and electrical equipment must remain operational even in the event of fire: this is true for many industrial facilities, alarm systems, emergency telephone lines, elevators, auxiliary supply of electrical power and emergency lights in buildings: the operation must remain efficient in terms of security.

SERVICE DUCTS AND SHAFTS - EN 1366-5 NORM

The reference standard for measuring the service ducts and shafts capacity to resist to the spread of fire is the UNI EN 1366 Part 5: "Fire resistance tests for supply services plants - service ducts and shafts".

This standard specifies a method for determination of the fire resistance of horizontal service ducts and vertical service shafts that pass through walls or floors and that contain pipes and cables. The norm examines the behavior of the ducts and shafts exposed to fire from the outside and from the inside. The specimens tested must incorporate joints and openings and should be suspended as they would be in practice; also they are subjected to a standard load representing a typical service load.

NOTES ON THE TESTING MODE

The norm requires for the construction of a complete duct of at least 6 m in length horizontally and at least 4 meters vertically, with sections of 1000x500 mm (conduit A) and 200x200 mm (conduit B).

More than half of the duct must be inside the testing oven and must be equipped with an access opening, positioned in the middle of the part exposed to fire from the outside, with dimensions representative of that used in practice.

The ducts shall be subjected to horizontal load when supporting service facilities; in this case the load should be representative of that used in practice.

In the case of ducts that are realized with a double layer, the test setup requires the presence of at least one joint both inside and outside of the oven and requires for the presence of a joint in the outer layer of the coating, both inside and outside of the oven. The distance between the joints and suspension devices must not be less than that used in practice.

The support structure of the duct must be a wall, a partition wall or a floor with a fire resistance higher than required, if the nature or the type of supporting construction is not known, it is necessary to use a normalized support construction as indicated in the tables of the standard. If the type of construction used in service is not among those listed in the tables of the standard, the sample must be tested with the support construction for which it is intended.

The ducts ends positioned within the furnace must be sealed with the same material constituting the ducts. During the test several measurements will be performed in order to determine the time of "fault", which is the point from which the duct is no longer able to perform its function and reaches the ultimate strength, the point which marks the end of the test itself. The performance criteria considered by the standard are the following:

- Seal: for this criterion will be observed the formation of cracks or openings, inflammation of the cotton swab, the lack of seal at the crossing point of the wall/floor, etc.. As soon as one of these parameters is no longer satisfied, the criterion of sealing shall be considered not satisfied.
- Insulation: the criterion of thermal insulation requires that the temperature on the unexposed surface of the specimen outside of the furnace is maintained below
 - 140°C + T^a for the mean value read by the thermocouples.
 - 180°C + T^a for the value read from any thermocouple.
- Other comments: curvature, smoke from the unexposed face, endurance time of the supports or suspension systems, collapse of the duct walls and so on.



The test report must include:

- an explanation that the test was carried out in accordance with EN 1366-5;
- the fixation, support and installation method, according to the test sample type;
- the description of the method and materials used to seal the space between the duct and the opening formed in the wall to accommodate the duct;
- the details of the support construction
- the load of twisted steel wires used to apply the load on the specimens,
- the observations made during the test.

The classification report is prepared by the laboratory in accordance with EN 13501-2 which certifies on the basis of one or more test reports the class of the product or building element.

Within the classification report must be described in the “Field of direct application of test results”, understood as “the intended scope of the specific test method, use limitations and possible modifications to the sample that has stood the test, that do not require further evaluation, calculation or approvals for the assignment of the result achieved. “

With regard to the field of direct application the UNI EN 1366-5 reads as follows:

- par. 13.1 - “A test result obtained for a fire resistant duct or shaft, passing through a masonry wall or floor, a concrete wall or floor, or a partition wall (without cavity) is applicable to the same type of wall or floor with thickness and density equal to or greater than those of the wall or floor used for the test.
- par. 13.2 - The results for ducts or shafts tested with dimensions 200x200 and 1000x500 mm applies to all dimensions of the cross section between the minimum and the maximum reported in the following table.

	Width	Height or depth
Minimum	200 mm	200 mm
Maximum	1250 mm	1000 mm

The results for the tested ducts or shafts only with the size of 1000x500 mm are applicable to all sizes between the minimum and the maximum reported in the following table:

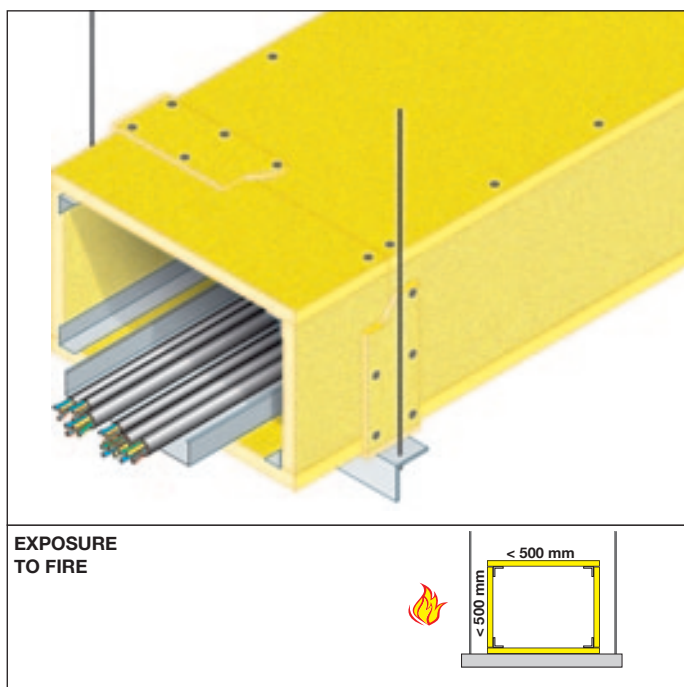
	Width	Height or depth
Minimum	1000 mm	500 mm
Maximum	1250 mm	1000 mm

The results for the tested ducts or shafts with another dimension are applicable only to that dimension.

- par. 13.3 - The results of tests in accordance with this standard can be used for shafts that include all the usual services. For the service ducts, this applies only up to the maximum mass of twisted wires used during the test.



SERVICE DUCT - EXTERNAL FIRE



REACTION TO FIRE : A1
FIRE RESISTANCE: EI 120 (h_o o→i)

Maximum size 500 x 500 mm

- **Exposure to fire:** external
- **Supporting structure:** steel angle "L" 60x60x4 mm and threaded steel hanger rod 14 mm
- **Fire protection:** boards type FIREGUARD® 25 in thickness 1 x 25,4 mm
- **Applications:** applicable to ducts passing through walls with a thickness greater than or equal to 25 cm and a density greater than or equal to 900 Kg/m³
 Maximum size (width x height): 500 x 500 mm
 Applicable up to a maximum load of 20 kg/m
 Maximum support centre distance: 1100 mm.

Classification report: I.G. 290044-3368 FR
Fire Testing Norm: EN 1366-5

SYSTEM SPECIFICATIONS

Construction of protection of horizontal service ducts with fire resistance EI 120 (h_o o→i) using FIREGUARD® 25 boards in thickness 25,4 mm, maximum size 2200x610 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report I.G. 290044-3368 FR.

The boards are glued to each other using FIREGUARD GLUE and fixed using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 250 mm centres to a metal structure composed by galvanized steel "L" profiles 30x30x0,6 mm placed along all corners between the walls

of the service duct. Joints of the board are to be covered, on all 4 sides, with a FIREGUARD® S strip in thickness 1x8 mm and 100 mm in width, fastened using self-tapping phosphated screws 3,5 mm in diameter, 35 mm in length, at 250 mm centres, and glued with FIREGUARD GLUE.

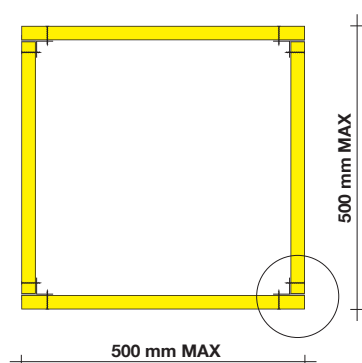
The duct is placed on an "L" steel angle size 60x60x4 mm, positioned at 1100 mm distance, and connected to the ceiling using threaded steel hanger rods 14 mm in thickness.

It is possible to upgrade the duct with upper, lower or lateral inspection panel, a maximum width of 600 mm.

For further details see the "Installation Manual".

CONSTRUCTION DETAILS - 500 x 500 mm

CROSS SECTION



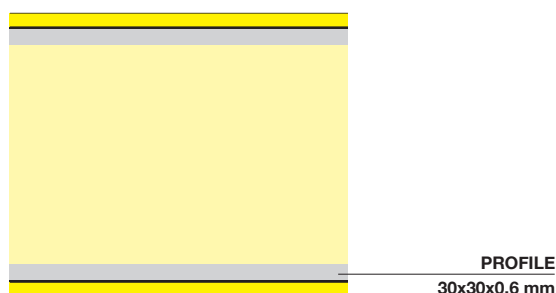
PROFILE
 30x30x0,6 mm

FIREGUARD GLUE

FIREGUARD 25

SCREW 3,5x35 mm
 250 mm CENTRES

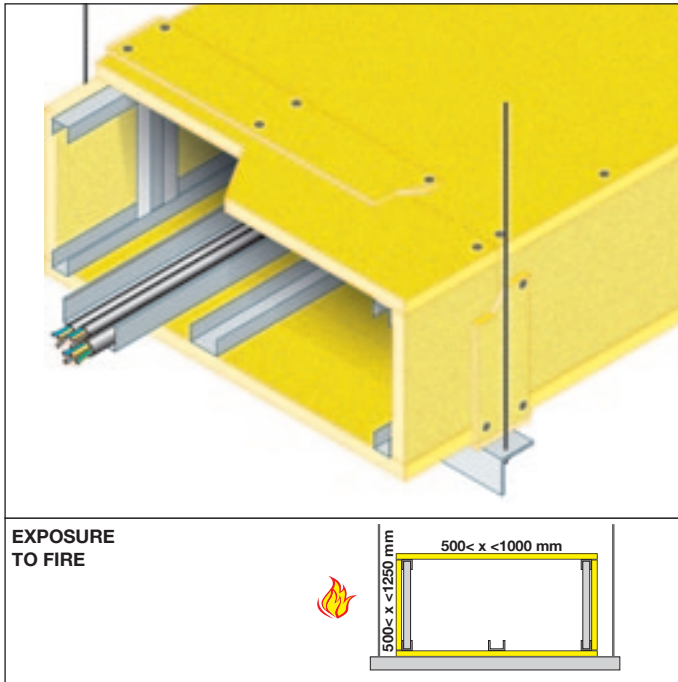
LONGITUDINAL SECTION



PROFILE
 30x30x0,6 mm



SERVICE DUCT - EXTERNAL FIRE



REACTION TO FIRE : A1

FIRE RESISTANCE: EI 120 (h_o o→i)

Maximum size 1250 x 1000 mm

- **Exposure to fire:** external
- **Supporting structure:** steel angle "L" 60x60x4 mm and threaded steel hanger rod 14 mm
- **Fire protection:** boards type FIREGUARD® 25 in thickness 1 x 25,4 mm
- **Applications:** applicable to ducts passing through walls with a thickness greater than or equal to 25 cm and a density greater than or equal to 900 Kg/m³
Maximum size (width x height): 1250 x 1000 mm
Applicable up to a maximum load of 20 kg/m
Maximum support centre distance: 1100 mm.

Classification report: I.G. 290044-3368 FR
Fire Testing Norm: EN 1366-5

SYSTEM SPECIFICATIONS

Construction of protection of horizontal service ducts with fire resistance EI 120 (h_o o→i) using FIREGUARD® 25 boards in thickness 25,4 mm, maximum size 2200x610 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report I.G. 290044-3368 FR.

The boards are glued to each other using FIREGUARD GLUE and fixed using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length at 250 mm centres to a metal structure composed by steel angles "U" 30x27x0,6 mm placed superiorly and inferiorly along the vertical walls of the duct and "C" profiles 50x27x0,6 mm which are positioned at 550 mm centres along the vertical walls of the duct and along the midline

of the lower longitudinal inner wall of the duct. Joints of the board are to be covered, on all 4 sides, with a FIREGUARD® S strip in thickness 1x8 mm and 100 mm in width, fastened using self-tapping phosphated screws 3,5 mm in diameter, 35 mm in length, at 250 mm centres, and glued with FIREGUARD GLUE.

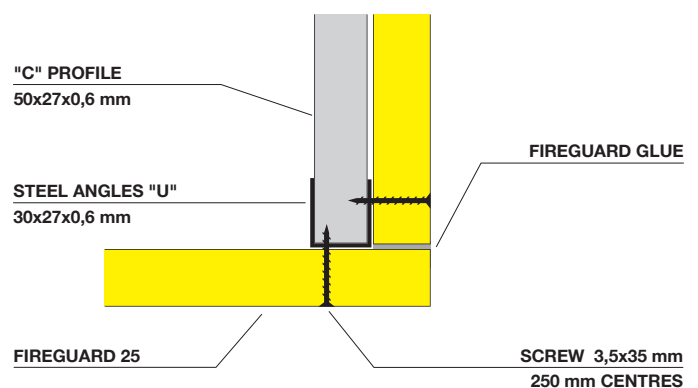
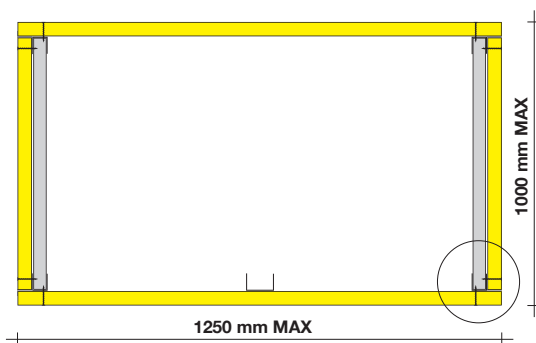
The duct is placed on an "L" steel angle size 60x60x4 mm, positioned at 1100 mm distance, and connected to the ceiling using threaded steel hanger rods 14 mm in thickness.

It is possible to upgrade the duct with upper, lower or lateral inspection panel, a maximum width of 600 mm.

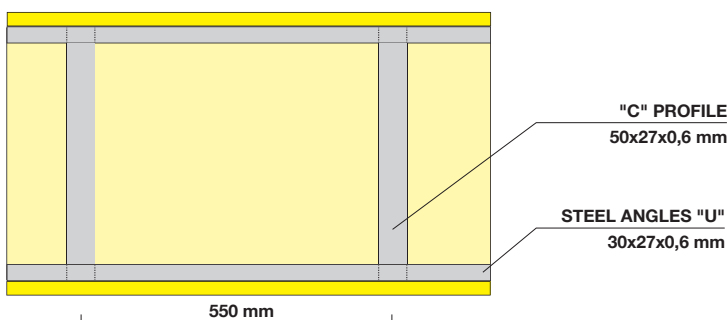
For further details see the "Installation Manual".

CONSTRUCTION DETAILS - 1250 x 1000 mm

CROSS SECTION



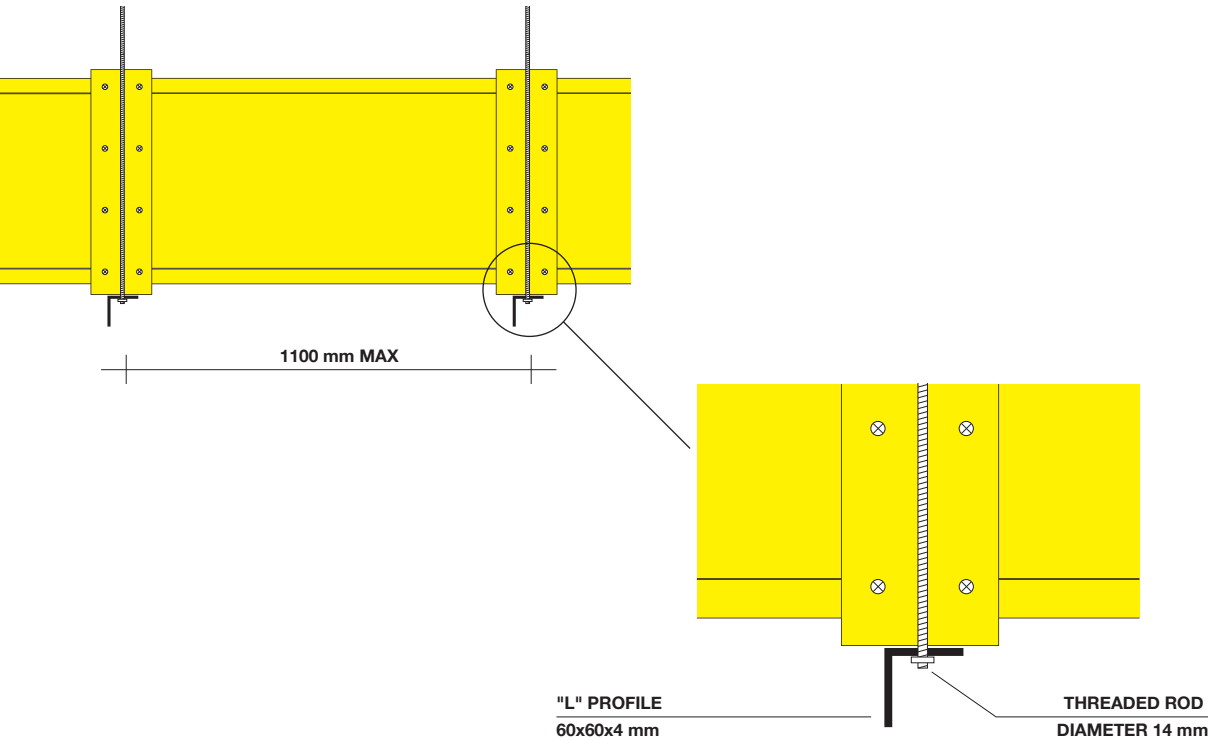
LONGITUDINAL SECTION



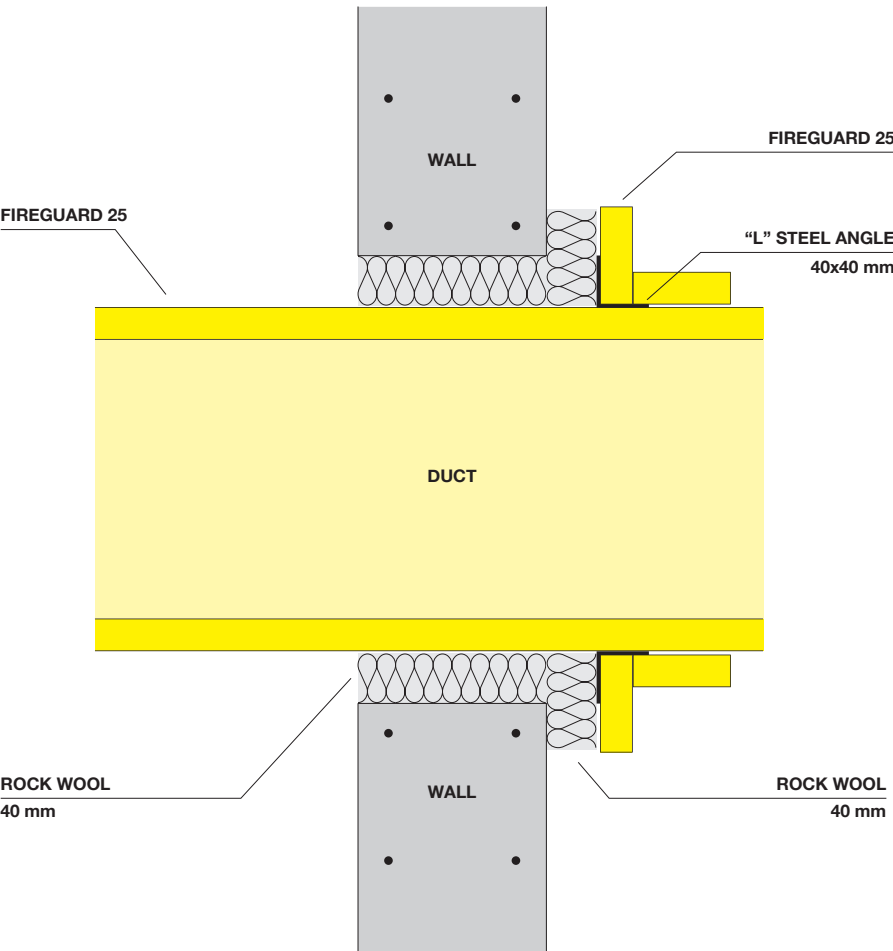


CONSTRUCTION DETAILS

DUCT SUPPORT

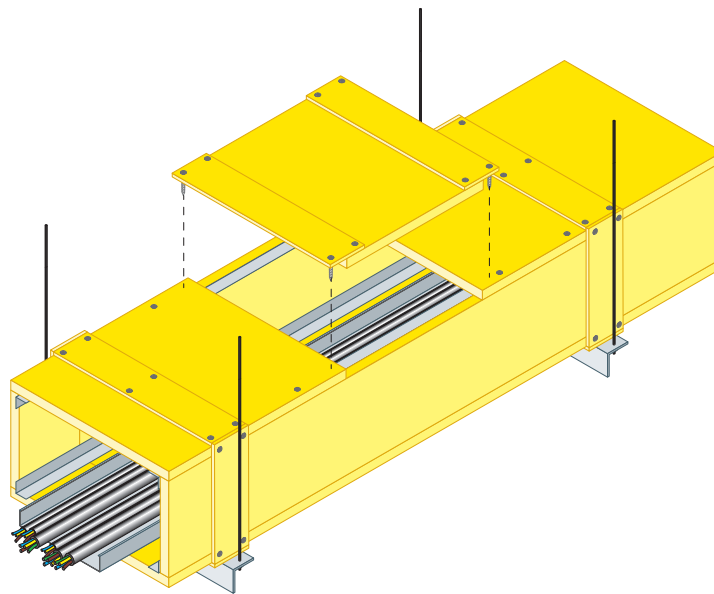


HORIZONTAL CROSSING

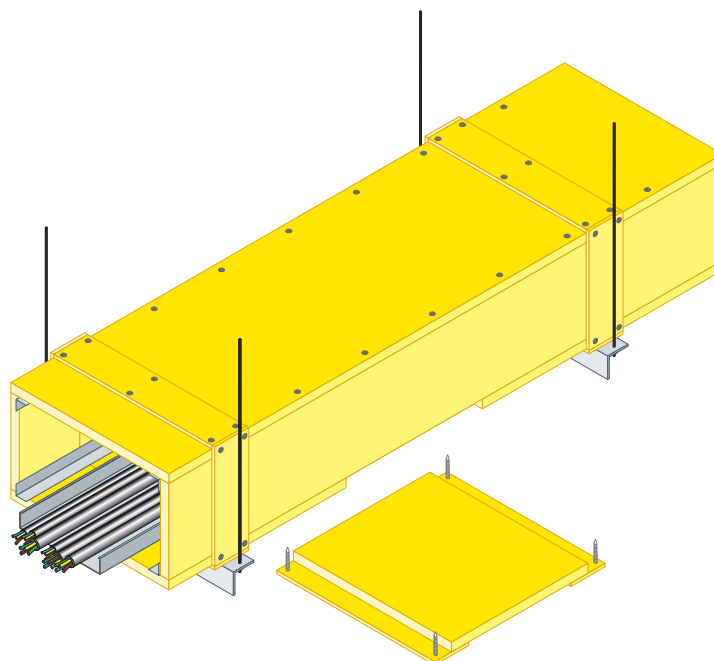




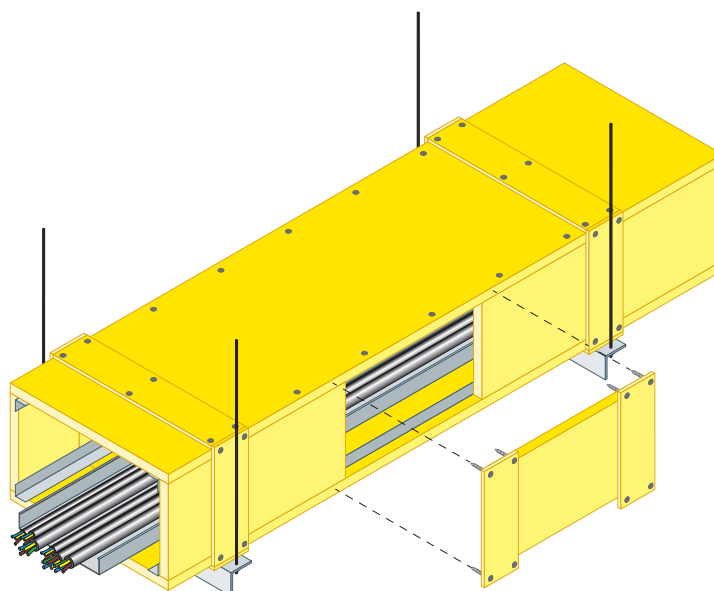
INSPECTION PANEL



UPPER INSPECTION PANEL



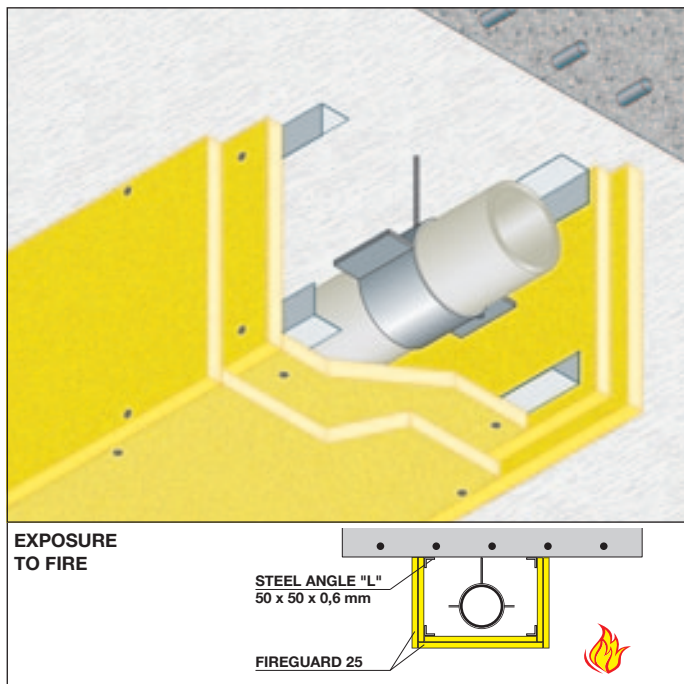
LOWER INSPECTION PANEL



LATERAL INSPECTION PANEL



3 SIDES SERVICE DUCT



REACTION TO FIRE : A1 FIRE RESISTANCE: EI 120

Maximum internal size: 550 mm width

- **Exposure to fire:** external
- **Base structure:** deck
- **Metal structure:** steel angle "L" 50x50x0,6 mm
- **Fire protection:** boards type FIREGUARD® 25 in thickness 2 x 25,4 mm
- **Fastening:** metal expansion anchor bolts 6 mm in diameter and self-tapping phosphated screws with appropriate length
- **Applications:** maximum internal size 550 mm width
- **Extended applications:** 2 sides protection
1 side protection

Classification report: I.G. 308030-3563 FR
Fire Testing Norm: EN 1364-2

SYSTEM SPECIFICATIONS

Construction of protection of horizontal systems, maximum width 550 mm, with fire resistance EI 120 using two FIREGUARD® 25 boards in thickness 25,4 mm, maximum size 2200x610 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report I.G. 308030-3563 FR.

The boards are installed with staggered joints, using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length for the inner

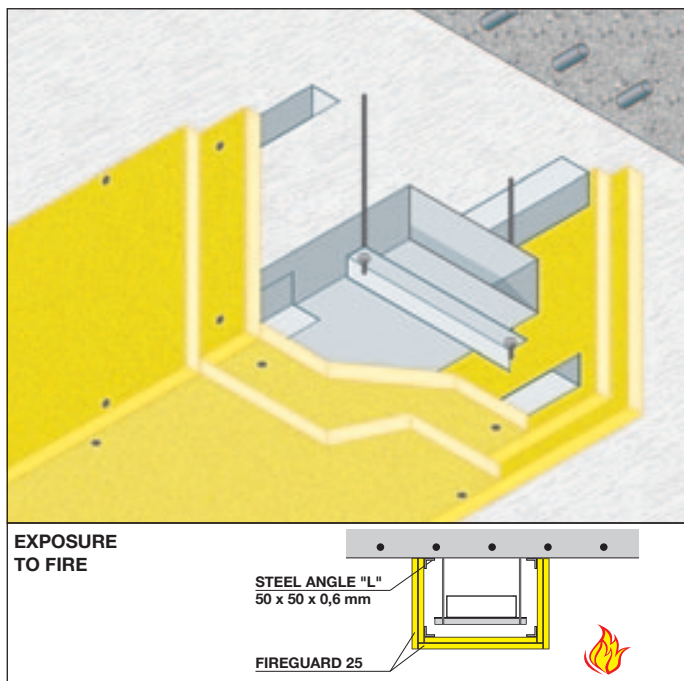
layer and 55 mm length for the outer, at 250 mm centres.

They are such fastened to a metal structure composed by galvanized steel angles "L" 50x50x0,6 mm placed along the internal longitudinal corners of the protection.

These profiles are fixed to the deck using metal expansion anchor bolts 6 mm in diameter at 500 mm centres.

For further details see the "Installation Manual".

3 SIDES METAL DUCT PROTECTION



REACTION TO FIRE : A1 FIRE RESISTANCE: EI 120

Maximum internal size: 550 mm width

- **Exposure to fire:** external
- **Base structure:** deck
- **Metal structure:** steel angle "L" 50x50x0,6 mm
- **Fire protection:** boards type FIREGUARD® 25 in thickness 2 x 25,4 mm
- **Fastening:** metal expansion anchor bolts 6 mm in diameter and self-tapping phosphated screws with appropriate length
- **Applications:** maximum internal size 550 mm width

Classification report: I.G. 308030-3563 FR
Fire Testing Norm: EN 1364-2

SYSTEM SPECIFICATIONS

Construction of protection of horizontal ventilation ducts, maximum width 550 mm, with fire resistance EI 120 using two FIREGUARD® 25 boards in thickness 25,4 mm, maximum size 2200x610 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report I.G. 308030-3563 FR.

layer and 55 mm length for the outer, at 250 mm centres.

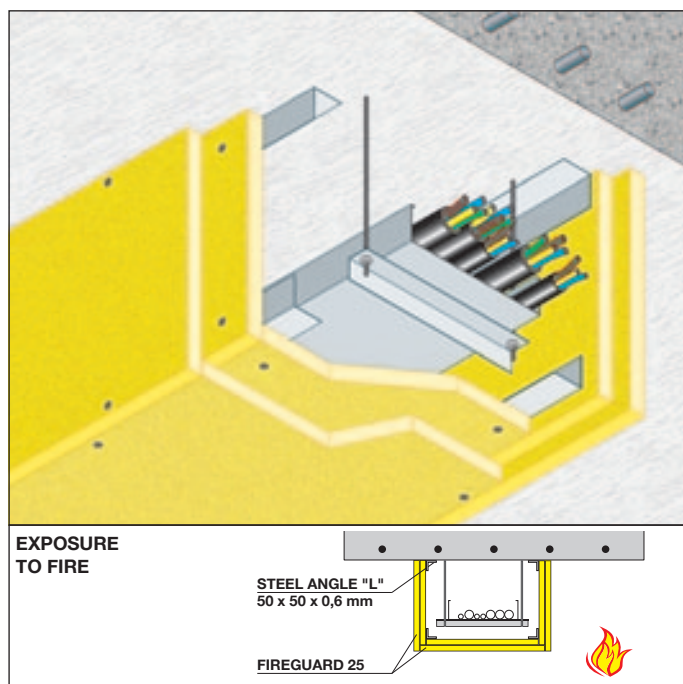
They are such fastened to a metal structure composed by galvanized steel angles "L" 50x50x0,6 mm placed along the internal longitudinal corners of the protection.

These profiles are fixed to the deck using metal expansion anchor bolts 6 mm in diameter at 500 mm centres.

For further details see the "Installation Manual".



3 SIDES CABLE DUCT PROTECTION



REACTION TO FIRE : A1
FIRE RESISTANCE: EI 120

Maximum internal size: 550 mm width

- **Exposure to fire:** external
- **Base structure:** deck
- **Metal structure:** steel angle "L" 50x50x0,6 mm
- **Fire protection:** boards type FIREGUARD® 25 in thickness 2 x 25,4 mm
- **Fastening:** metal expansion anchor bolts 6 mm in diameter and self-tapping phosphated screws with appropriate length
- **Applications:** maximum internal size 550 mm width

Classification report: I.G. 308030-3563 FR
Fire Testing Norm: EN 1364-2

SYSTEM SPECIFICATIONS

Construction of protection of horizontal service ducts, maximum width 550 mm, with fire resistance EI 120 using two FIREGUARD® 25 boards in thickness 25,4 mm, maximum size 2200x610 mm, consisting of calcium silicate and sulphate, asbestos-free, produced by lamination under controlled drying conditions, rated as class A1 (non-combustible) as to their reaction to fire and conforming to assessment report I.G. 308030-3563 FR. The boards are installed with staggered joints, using self-tapping phosphated screws 3,5 mm in diameter and 35 mm length for the inner

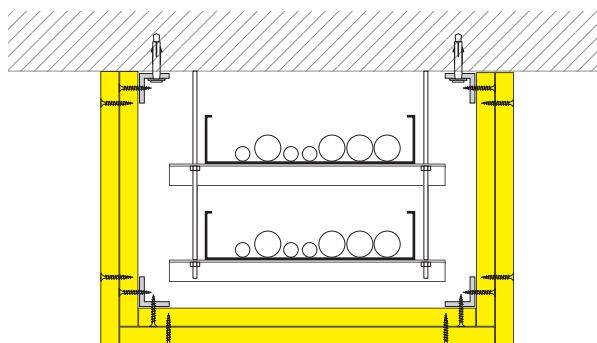
layer and 55 mm length for the outer, at 250 mm centres.

They are such fastened to a metal structure composed by galvanized steel angles "L" 50x50x0,6 mm placed along the internal longitudinal corners of the protection.

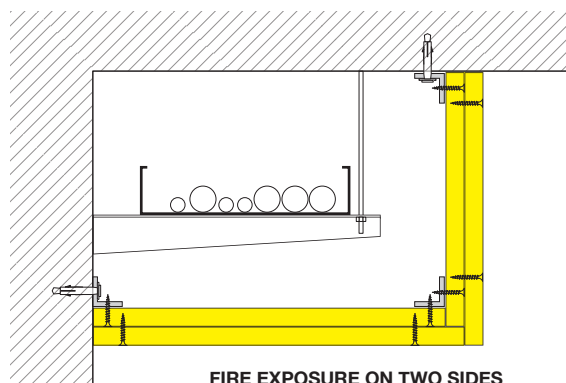
These profiles are fixed to the deck using metal expansion anchor bolts 6 mm in diameter at 500 mm centres.

For further details see the "Installation Manual".

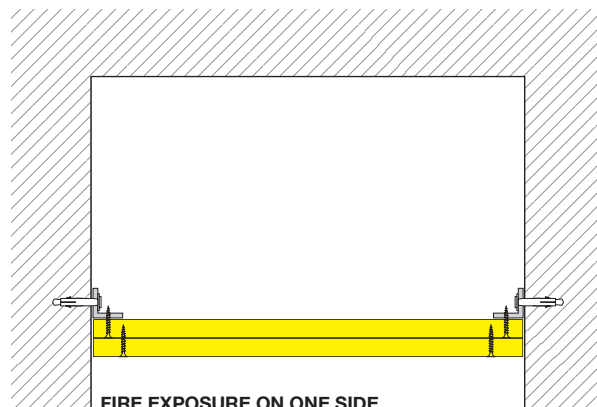
SPECIAL CASES



FIRE EXPOSURE ON THREE SIDES



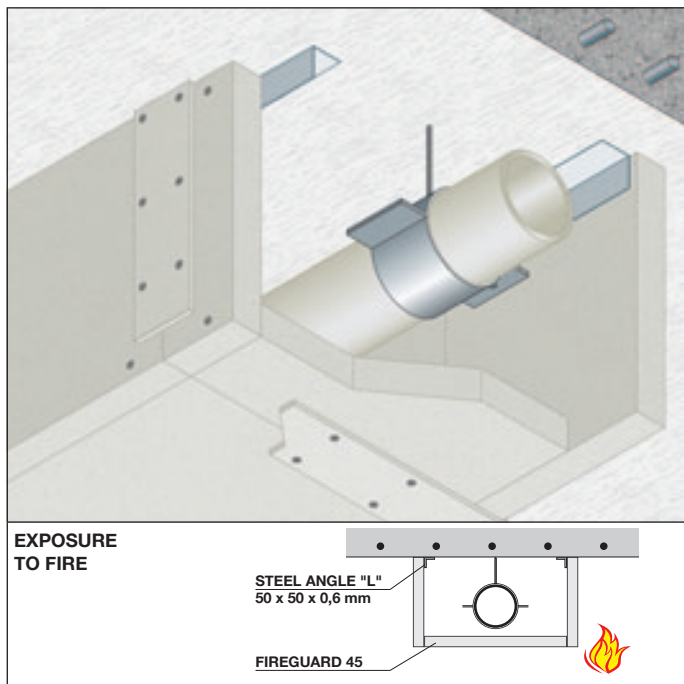
FIRE EXPOSURE ON TWO SIDES



FIRE EXPOSURE ON ONE SIDE



3 SIDES SERVICE DUCT



SYSTEM SPECIFICATIONS

Construction of protection of horizontal systems, maximum width 1000 mm, with fire resistance EI 120 using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm, consisting of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report I.G. 307804-3561 FR.

The boards are glued to each other using FIREGUARD GLUE and screwed to each other by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

REACTION TO FIRE : A1 FIRE RESISTANCE: EI 120

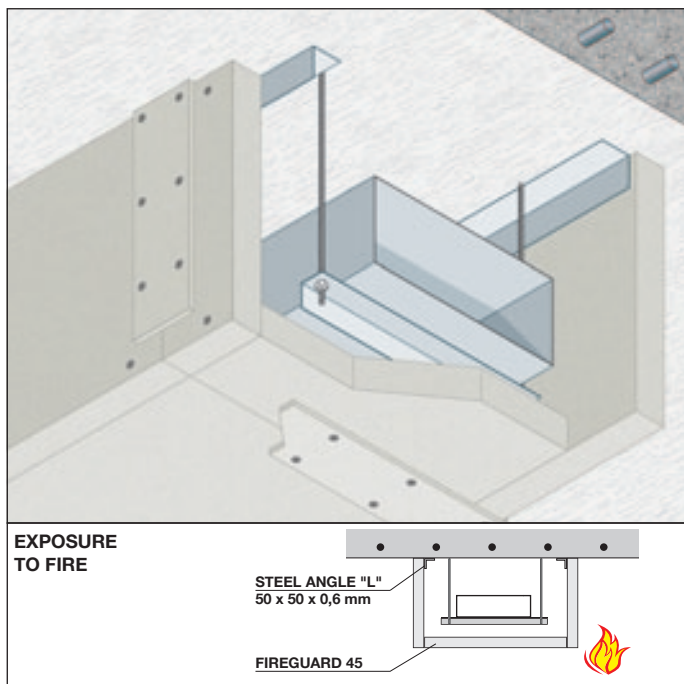
Maximum internal size: 1000 mm width

- **Exposure to fire:** external
- **Base structure:** deck
- **Metal structure:** steel angle "L" 50x50x0,6 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Fastening:** metal expansion anchor bolts 6 mm in diameter and self-tapping phosphated screws 5 mm in diameter, 90 mm in length
- **Applications:** maximum internal size 1000 mm width
- **Extended applications:** 2 sides protection
1 side protection

Classification report: I.G. 307804-3561 FR
Fire Testing Norm: EN 1364-2

Joints of the board are to be covered with FIREGUARD® S strips 8 mm in thickness and 100 mm in width, fastened using self-tapping phosphated screws 3,5 mm in diameter, 35 mm in length and glued with FIREGUARD GLUE. The protection is fixed to the deck by means of a metal structure composed by galvanized steel angles "L" 50x50x0,6 mm placed along the upper internal longitudinal corners. These profiles are fixed to the deck using metal expansion anchor bolts 6 mm in diameter at 500 mm centres. For further details see the "Installation Manual".

3 SIDES METAL DUCT PROTECTION



SYSTEM SPECIFICATIONS

Construction of protection of horizontal ventilation ducts, maximum width 1000 mm, with fire resistance EI 120 using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm, consisting of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report I.G. 307804-3561 FR.

The boards are glued to each other using FIREGUARD GLUE and screwed to each other by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

REACTION TO FIRE : A1 FIRE RESISTANCE: EI 120

Maximum internal size: 1000 mm width

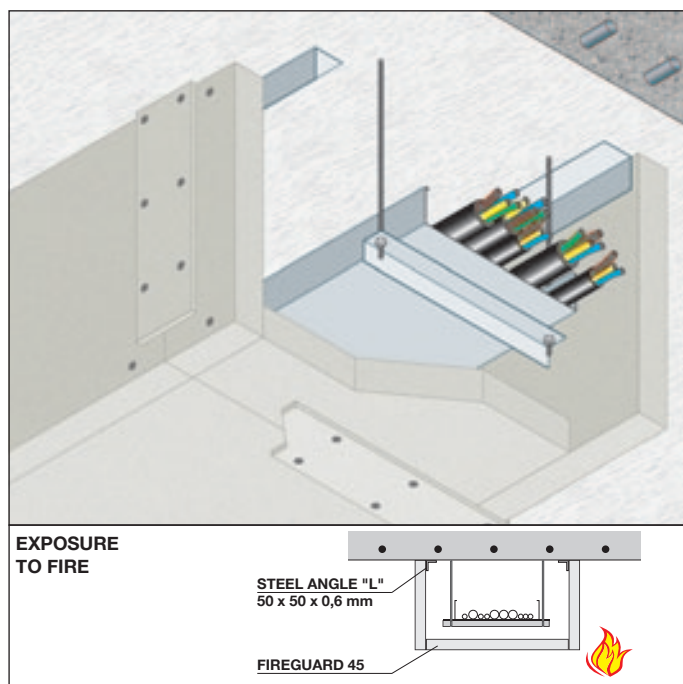
- **Exposure to fire:** external
- **Base structure:** deck
- **Metal structure:** steel angle "L" 50x50x0,6 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Fastening:** metal expansion anchor bolts 6 mm in diameter and self-tapping phosphated screws 5 mm in diameter, 90 mm in length
- **Applications:** maximum internal size 1000 mm width
- **Extended applications:** 2 sides protection
1 side protection

Classification report: I.G. 307804-3561 FR
Fire Testing Norm: EN 1364-2

Joints of the board are to be covered with FIREGUARD® S strips 8 mm in thickness and 100 mm in width, fastened using self-tapping phosphated screws 3,5 mm in diameter, 35 mm in length and glued with FIREGUARD GLUE. The protection is fixed to the deck by means of a metal structure composed by galvanized steel angles "L" 50x50x0,6 mm placed along the upper internal longitudinal corners. These profiles are fixed to the deck using metal expansion anchor bolts 6 mm in diameter at 500 mm centres. For further details see the "Installation Manual".



3 SIDES CABLE DUCT PROTECTION



SYSTEM SPECIFICATIONS

Construction of protection of horizontal service ducts, maximum width 1000 mm, with fire resistance EI 120 using FIREGUARD® 45 boards in thickness 45 mm and maximum size 1200x2000 mm, consisting of calcium silicate and asbestos-free; rated in class A1 (non-combustible) for reaction to fire according to classification report I.G. 307804-3561 FR.

The boards are glued to each other using FIREGUARD GLUE and screwed to each other by self-tapping phosphated screws 4,5 mm in diameter, 90 mm in length.

REACTION TO FIRE : A1

FIRE RESISTANCE: EI 120

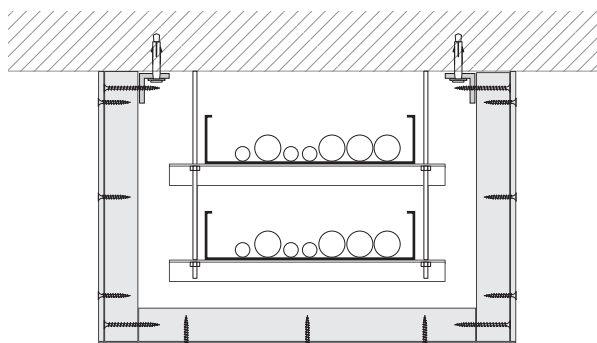
Maximum internal size: 1000 mm width

- **Exposure to fire:** external
- **Base structure:** deck
- **Metal structure:** steel angle "L" 50x50x0,6 mm
- **Fire protection:** boards type FIREGUARD® 45 in thickness 1 x 45 mm
- **Fastening:** metal expansion anchor bolts 6 mm in diameter and self-tapping phosphated screws 5 mm in diameter, 90 mm in length
- **Applications:** maximum internal size 1000 mm width
- **Extended applications:** 2 sides protection
1 side protection

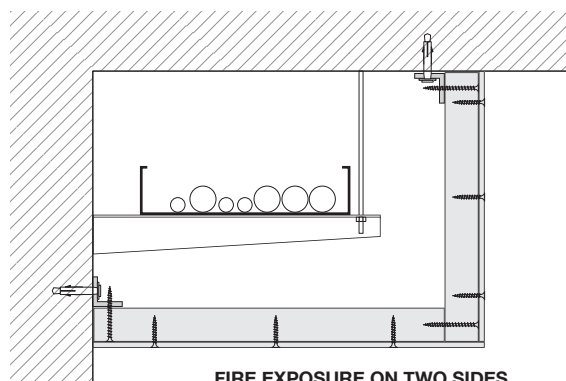
Classification report: I.G. 307804-3561 FR
Fire Testing Norm: EN 1364-2

Joints of the board are to be covered with FIREGUARD® S strips 8 mm in thickness and 100 mm in width, fastened using self-tapping phosphated screws 3,5 mm in diameter, 35 mm in length and glued with FIREGUARD GLUE. The protection is fixed to the deck by means of a metal structure composed by galvanized steel angles "L" 50x50x0,6 mm placed along the upper internal longitudinal corners. These profiles are fixed to the deck using metal expansion anchor bolts 6 mm in diameter at 500 mm centres. For further details see the "Installation Manual".

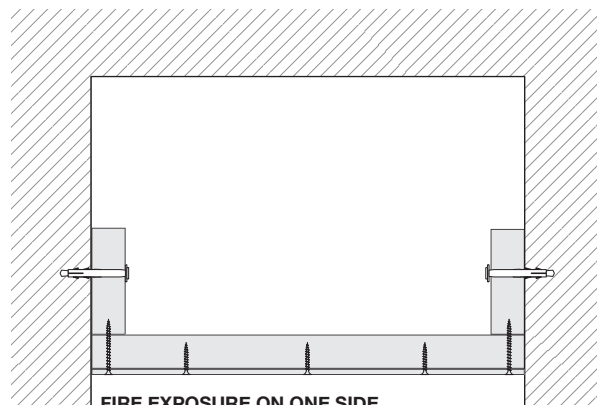
SPECIAL CASES



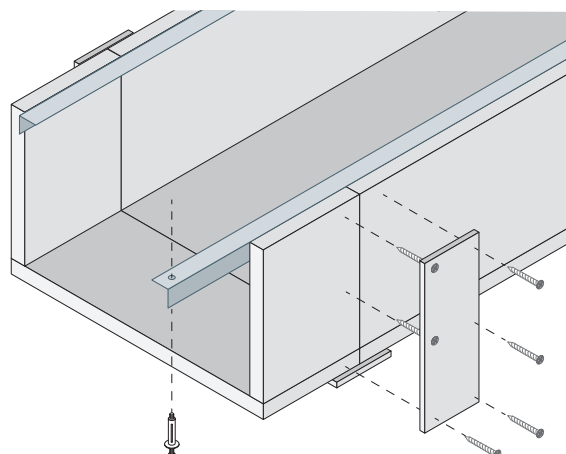
FIRE EXPOSURE ON THREE SIDES



FIRE EXPOSURE ON TWO SIDES



FIRE EXPOSURE ON ONE SIDE





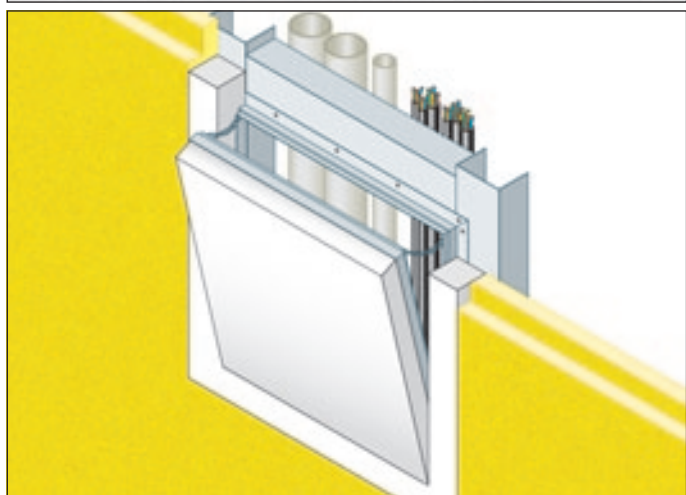
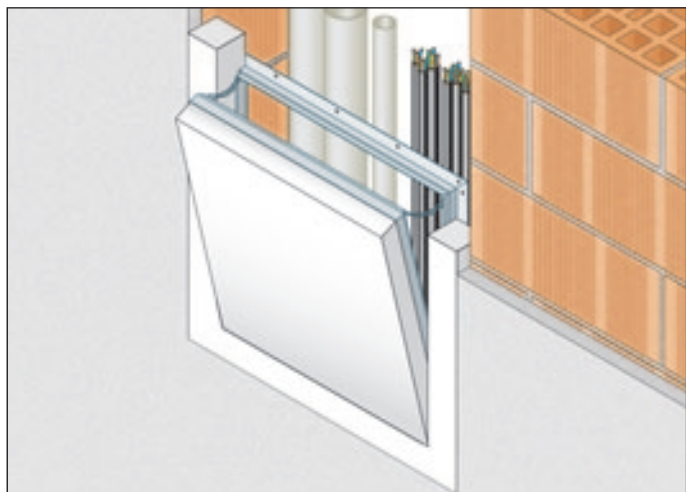
INSPECTION HATCH AND LIGHTING PROTECTION





INSPECTION HATCH FOR PARTITIONS/SHAFTS

HATCH "GB"



FIRE RESISTANCE: EI 120

- **Base structure:** partition made with calcium silicate boards
- **Product to use:** INSPECTION HATCH FOR PARTITIONS/SHAFTS "GB"
Available dimensions: 200x200 mm,
300x300 mm,
400x400 mm,
450x450 mm,
500x500 mm,
600x600 mm,
1000x1500 mm
- **Fastening:** phosphated self-tapping screws
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over frame and hatch

Classification report: MPA 2008-B-2789
PK2-08-12-020-C-O
Fire Testing Norm: EN 1634-1

SYSTEM SPECIFICATIONS

Installation of INSPECTION HATCH FOR PARTITIONS/SHAFTS "GB" with fire resistance EI 120 certified on partition made with calcium silicate boards, consisting of two frames made by aluminum profiles solidly welded to one another by means of a special procedure, a fireproof plasterboard frame with 55 mm outer width and 25 mm inner and fireproof plasterboard 50 mm in thickness and conforming to classification report MPA 2008-B-2789 and PK2-08-12-020-C-O.

The INSPECTION HATCH FOR PARTITIONS/SHAFTS "GB" will be installed by drilling a hole in the partition with the same size of the door + 110 mm

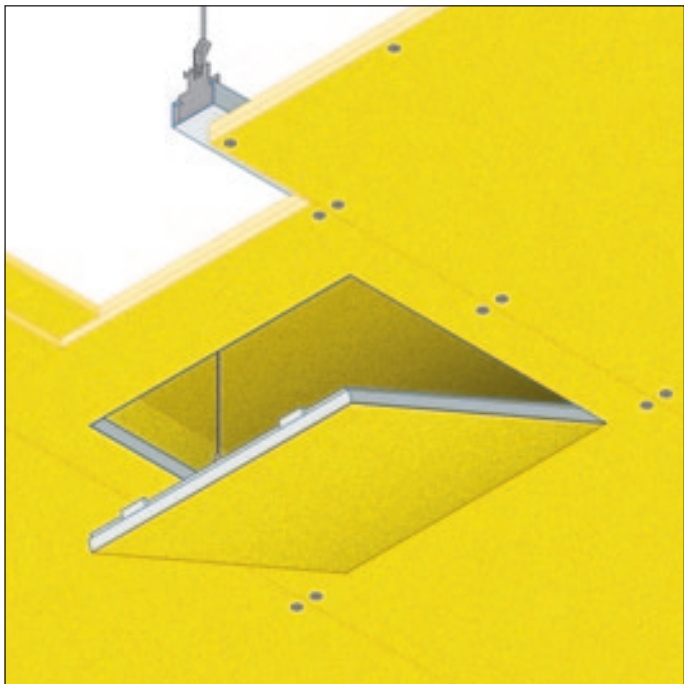
and install "C" profiles 75x50 mm around the opening. Remove the hatch from the outside frame and insert the latter from the front through the hole, press the frame on the "C" profile 75x50 mm and fasten it with self-tapping screws through the holes. Fill with FIREGUARD COMPOUND the outline of the frame, screws included. Fill the fireproof inspection hatch also around the aluminum profiles, screws included.

At the end of the filling process clean the outer frame and aluminum profiles of any residues, hook the safety chain and close the hatch. For further details see the "Installation Manual".



MEMBRANE CEILINGS INSPECTION HATCH

"GB-EI 60"



FIRE RESISTANCE: EI 60

- **Base structure:** EI 60 membrane ceiling
- **Product to use:** INSPECTION HATCH FOR MEMBRANE CEILING "GB-EI 60"
- **Fastening:** phosphated self-tapping screws
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over frame

Classification report: I.G. 286860-3341 FR
Fire Testing Norm: EN 1364-2

SYSTEM SPECIFICATIONS

Installation of INSPECTION HATCH FOR MEMBRANE CEILING "GB-EI 60", available dimensions 200x200 mm, 300x300 mm, 400x400 mm, 500x500 mm, 600x600 mm with fire resistance EI 60 certified on diaphragm ceiling, consisting of two frames made by aluminum profiles solidly welded to one another by means of a special procedure with the addition of a FIREGUARD® 13 board, in thickness 12,7 mm and conforming to classification report I.G. 286860-3341 FR.

The INSPECTION HATCH FOR MEMBRANE CEILING "GB-EI 60", will be installed by drilling a hole in the ceiling of the same size of the frame + 5 mm and mounting "C" profiles 27x50x0,6 mm around the opening .

Coat the vertical internal sides of the opening with a double layer of

FIREGUARD® 13 boards in thickness 12,7 mm with a height of 50 mm, screwing the boards to the "C" profiles 50x27x0,6 mm.

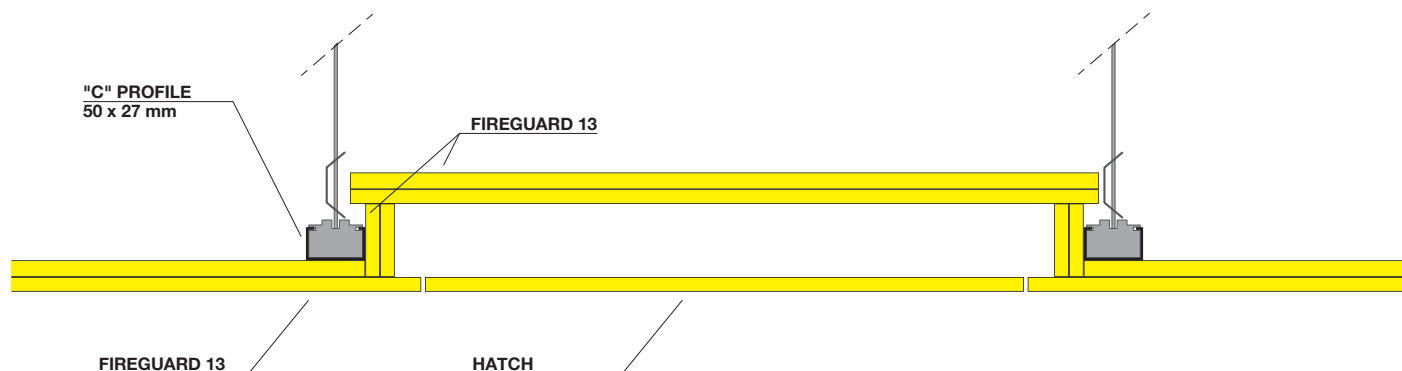
Place on the opening, into the intrados of the ceiling, by simply placing it, a roof made of a double layer of FIREGUARD® 13 boards.

Take the inspection hatch and insert it through the opening hole drilled in the ceiling and attach the outer frame with phosphated self-tapping screws.

Fill the contour of the frame to the ceiling using FIREGUARD COMPOUND, screws included. At the end of the filling process clean the outer frame of any residues, attach the safety cable and close the hatch.

For further details see the "Installation Manual".

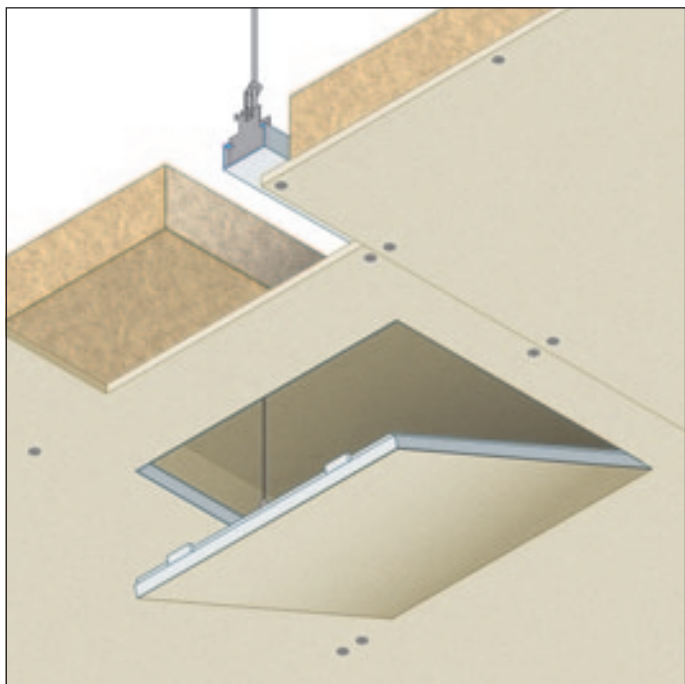
INSPECTION HATCH DETAILS





MEMBRANE CEILINGS INSPECTION HATCH

"GB-EI 120"



FIRE RESISTANCE: EI 120

- **Base structure:** EI 120 membrane ceiling
- **Product to use:** INSPECTION HATCH FOR MEMBRANE CEILING "GB-EI 120"
- **Fastening:** phosphated self-tapping screws
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over frame

Classification report: I.G. 290266-3371 FR
Fire Testing Norm: EN 1364-2

SYSTEM SPECIFICATIONS

Installation of INSPECTION HATCH FOR MEMBRANE CEILING "GB-EI 120", available dimensions 200x200 mm, 300x300 mm, 400x400 mm, 500x500 mm, 600x600 mm with fire resistance EI 120 certified on diaphragm ceiling, consisting of two frames made by aluminum profiles solidly welded to one another by means of a special procedure with the addition of a NAPER S 12 board, in thickness 12 mm and conforming to classification report I.G. 290266-3371 FR. The INSPECTION HATCH FOR MEMBRANE CEILING "GB-EI 120" will be installed by drilling a hole in the ceiling of the same size of the frame + 5 mm and mounting "C" profiles 27x50x0,6 mm around the opening. Coat the vertical internal sides of the opening with a layer of NAPER S 12

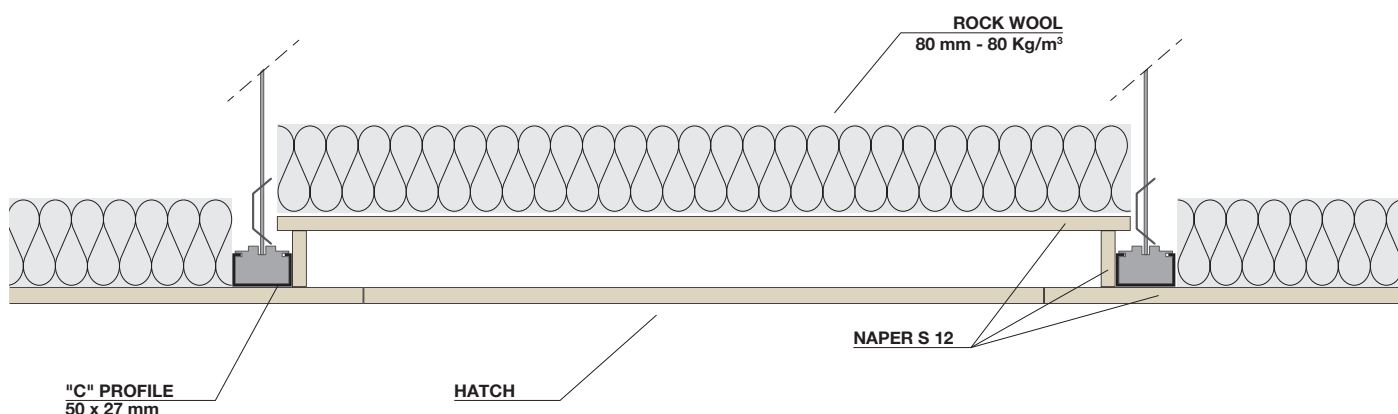
boards in thickness 12 mm with a height of 50 mm, screwing the boards to the "C" profiles 50x27x0,6 mm.

Place on the opening, into the intrados of the ceiling, by simply placing it, a roof made of a single layer of NAPER S 12 boards and rock wool 80 mm thick and 80 kg/m³ in density.

Take the inspection hatch and insert it through the opening hole drilled in the ceiling and attach the outer frame with phosphated self-tapping screws. Fill using FIREGUARD COMPOUND the contour of the frame to the ceiling, screws included. At the end of the filling process clean the outer frame of any residues, attach the safety cable and close the hatch.

For further details see the "Installation Manual".

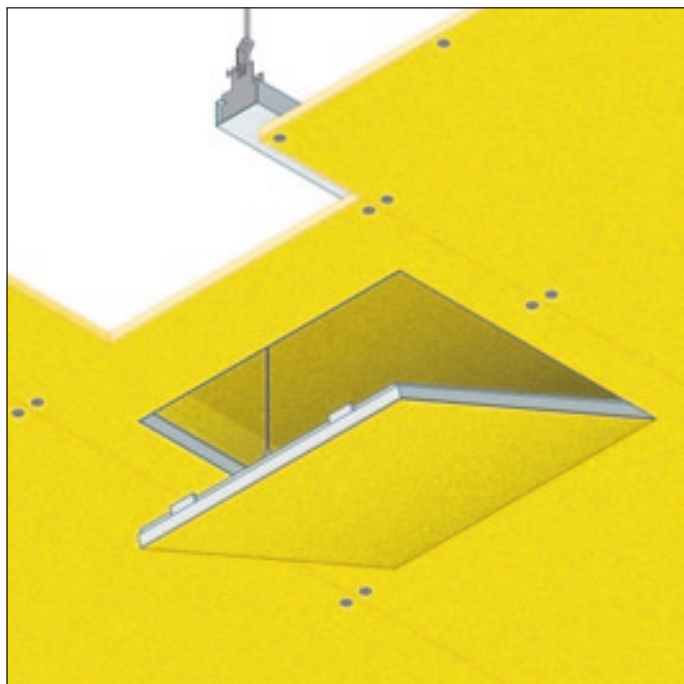
INSPECTION HATCH DETAILS





SUSPENDED CEILINGS INSPECTION HATCH

"GB-REI 120"



FIRE RESISTANCE: REI 120

- **Base structure:** suspended ceiling
- **Product to use:** INSPECTION HATCH FOR CEILING "GB-REI 120"
- **Fastening:** phosphated self-tapping screws
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over frame

NOTE: the solution is certified according to the type of floor to be protected. Please refer to the technical instruction.

Classification report: I.G. 300967/3491 FR
Fire Testing Norm: EN 1365-2

SYSTEM SPECIFICATIONS

Installation of INSPECTION HATCH FOR CEILING "GB-REI 120", available dimensions 200x200 mm, 300x300 mm, 400x400 mm, 500x500 mm, 600x600 mm with fire resistance REI 120 certified on false ceiling, consisting of two frames made by aluminum profiles solidly welded to one another by means of a special procedure with the addition of a FIREGUARD® 13 board, in thickness 12,7 mm and conforming to classification report I.G. 300967/3491 FR.

The INSPECTION HATCH FOR CEILING "GB-REI 120" will be installed by drilling a hole in the ceiling of the same size of the frame + 5 mm and mounting "C" profiles 27x50x0,6 mm around the opening. Coat the vertical internal sides of the opening with a layer of FIREGUARD® 13 boards in

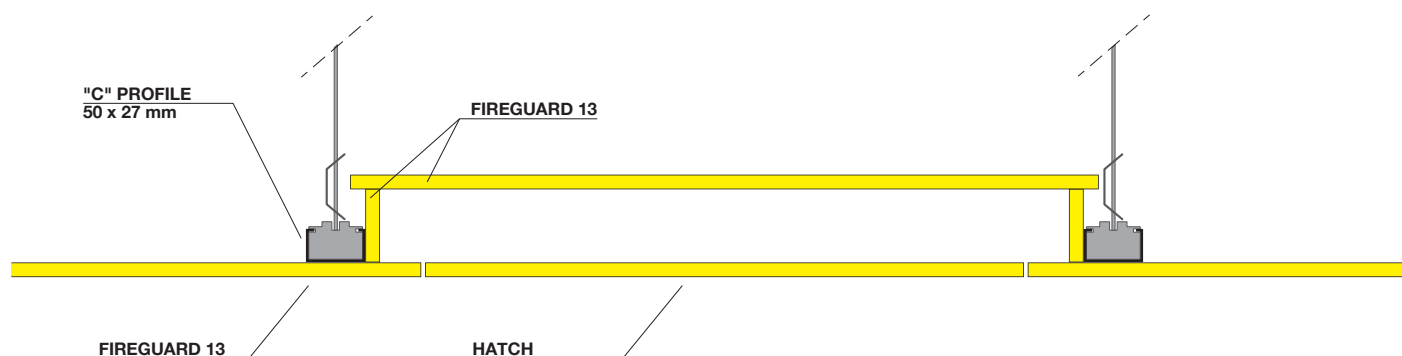
thickness 12.7 mm with a height of 50 mm, screwing the boards to the "C" profiles 50x27x0,6 mm.

Place on the opening, into the intrados of the ceiling, by simply placing it, a roof made of a single layer of FIREGUARD® 13 boards.

Take the inspection hatch and insert it through the opening hole drilled in the ceiling and attach the outer frame with phosphated self-tapping screws. Fill the contour of the frame to the ceiling using FIREGUARD COMPOUND, screws included. At the end of the filling process clean the outer frame of any residues, attach the safety cable and close the hatch.

For further details see the "Installation Manual".

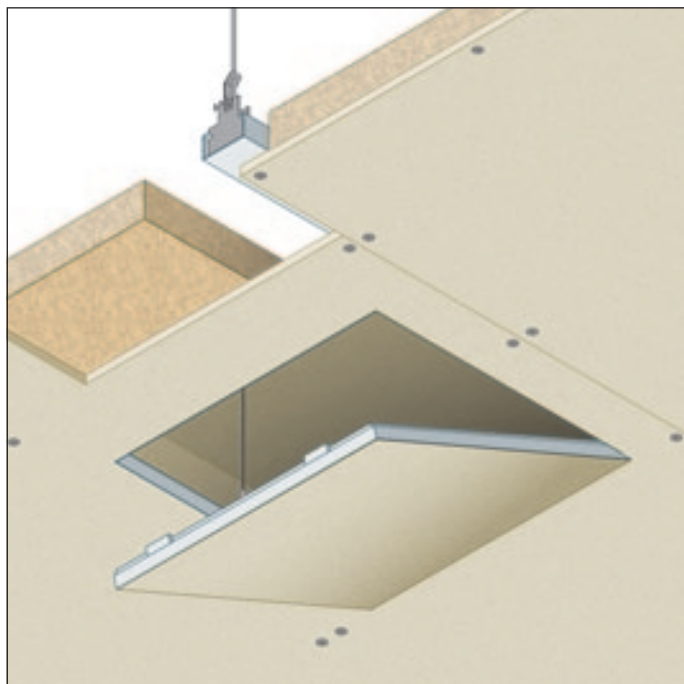
INSPECTION HATCH DETAILS





SUSPENDED CEILINGS INSPECTION HATCH

"GB-REI 180"



FIRE RESISTANCE: REI 180

- **Base structure:** suspended ceiling
- **Product to use:** INSPECTION HATCH FOR CEILING "GB-REI 180"
- **Fastening:** phosphated self-tapping screws
- **Surface finishing:** using FIREGUARD COMPOUND as a finish over frame

NOTE: the solution is certified according to the type of floor to be protected. Please refer to the technical instruction.

Classification report: I.G. 300909/3489 FR
Fire Testing Norm: EN 1365-2

SYSTEM SPECIFICATIONS

Installation of INSPECTION HATCH FOR CEILING "GB-REI 180", available dimensions 200x200 mm, 300x300 mm, 400x400 mm, 500x500 mm, 600x600 mm with fire resistance REI 180 certified on false ceiling, consisting of two frames made by aluminum profiles solidly welded to one another by means of a special procedure with the addition of a NAPER S 12 board, in thickness 12 mm and conforming to classification report I.G. 300909/3489 FR.

The INSPECTION HATCH FOR CEILING "GB-REI 180" will be installed by drilling a hole in the ceiling of the same size of the frame + 5 mm and mounting "C" profiles 27x50x0,6 mm around the opening .

Coat the vertical internal sides of the opening with a layer of NAPER S 12

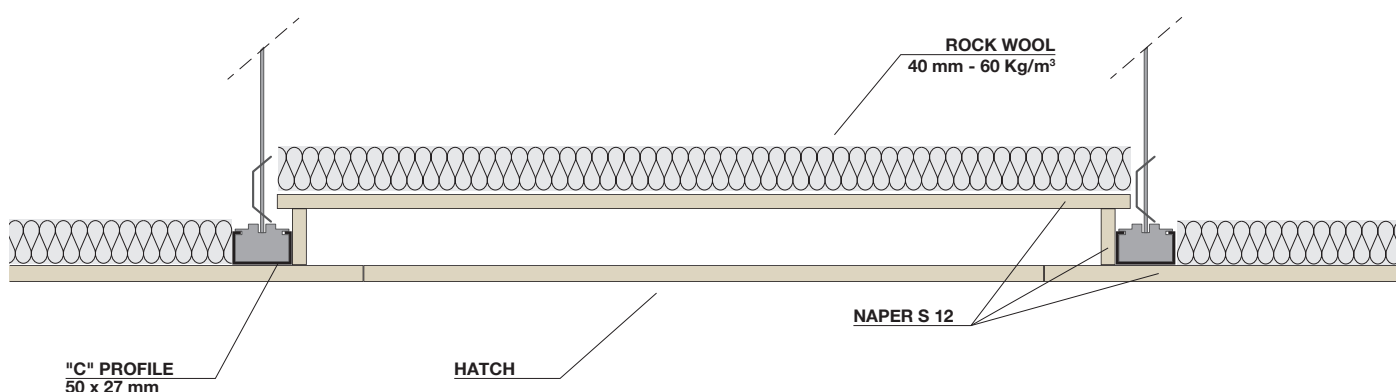
boards in thickness 12 mm with a height of 50 mm, screwing the boards to the "C" profiles 50x27x0,6 mm.

Place on the opening, into the intrados of the ceiling, by simply placing it, a roof made of a single layer of NAPER S 12 boards and rock wool 40 mm thick and 60 kg/m³ in density.

Take the inspection hatch and insert it through the opening hole drilled in the ceiling and attach the outer frame with phosphated self-tapping screws. Fill using FIREGUARD COMPOUND the contour of the frame to the ceiling, screws included. At the end of the filling process clean the outer frame of any residues, attach the safety cable and close the hatch.

For further details see the "Installation Manual".

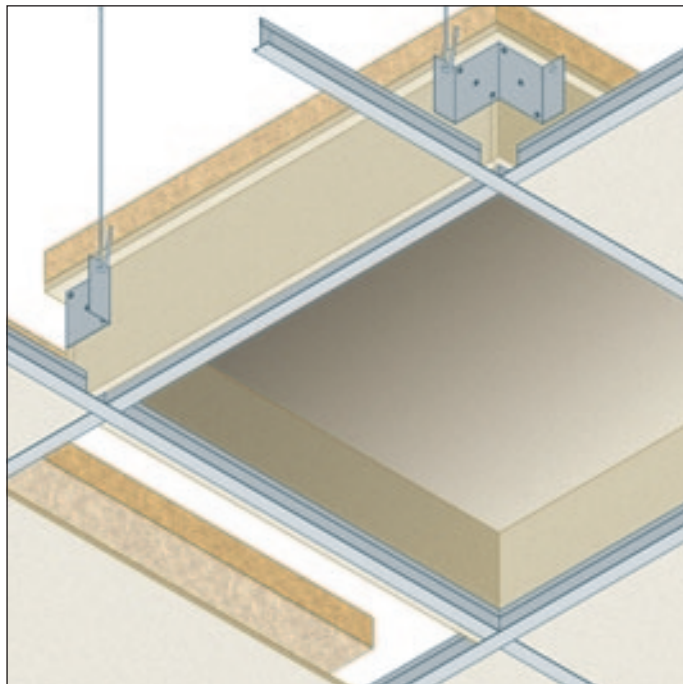
INSPECTION HATCH DETAILS





CEILING LIGHTS PROTECTION

"GB-LIGHT-S"



SYSTEM SPECIFICATIONS

Installation of CEILING LIGHTS PROTECTION "GB-LIGHT-S" with fire resistance REI 120/180 certified on a false ceiling, consisting of a pre-assembled cover made by NAPER S 8 boards, in thickness 8 mm, consisting of a silicates cementitious matrix, asbestos-free, rated as class A1 (non-combustible) as to their reaction to fire and conforming to classification report I.G. 315439-3637 FR.

FIRE RESISTANCE: REI 180

• Floor type:

- reinforced concrete slab in thickness 100 mm and metal beams
- reinforced concrete or prestressed reinforced concrete tiles with slab in thickness 100 mm
- reinforced concrete slab in thickness 100 mm, corrugated metal sheet and metal beams
- hollow slab concrete floor in thickness 160 mm
- reinforced concrete slab in thickness 100 mm, plank and wood beams – REI 120

• Insulation: rock wool 40 mm, density 60 kg/m³

• Hangers: on the four corners

• Fire protection: NAPER S 8 boards in thickness 1 x 8 mm

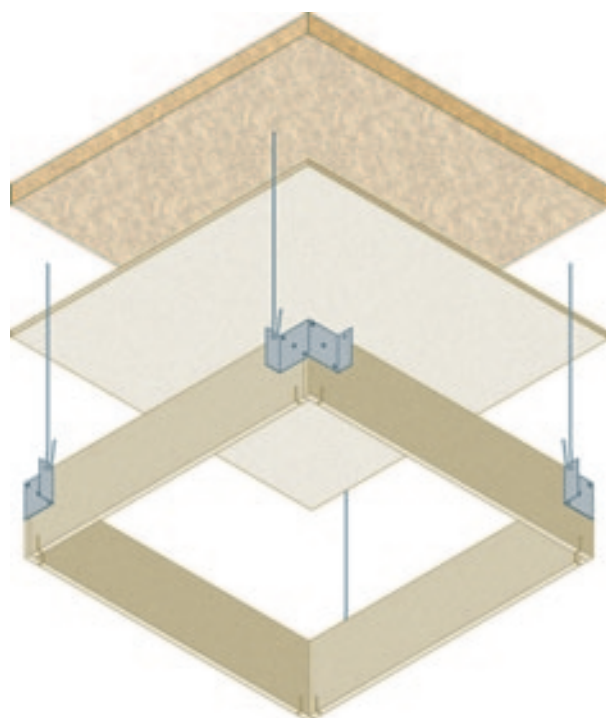
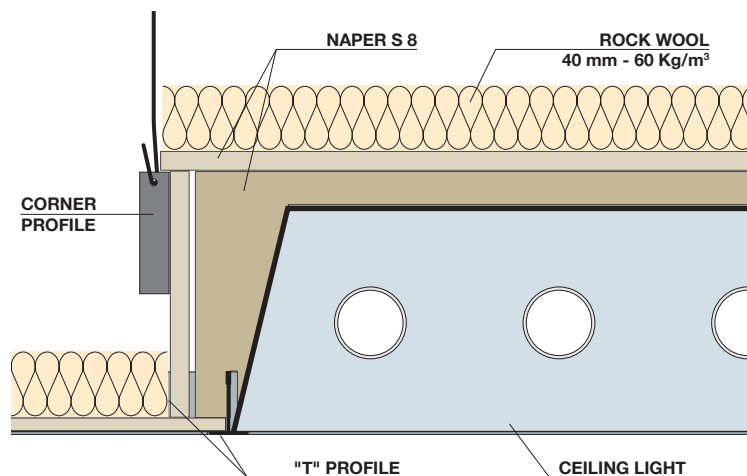
• Surface finishing: not provided

Classification report: I.G. 315439-3637 FR
Fire Testing Norm: EN 1365-2

The CEILING LIGHTS PROTECTION "GB-LIGHT-S" will be placed over the opening of the false ceiling, as close as possible to it and will be anchored to the floor by means of special mounting brackets and 4 mm diameter steel bar hangers on the four corners.

Above the ceiling light protection a mat of rock wool, 40 mm thick and 60 Kg/m³ in density will be laid.

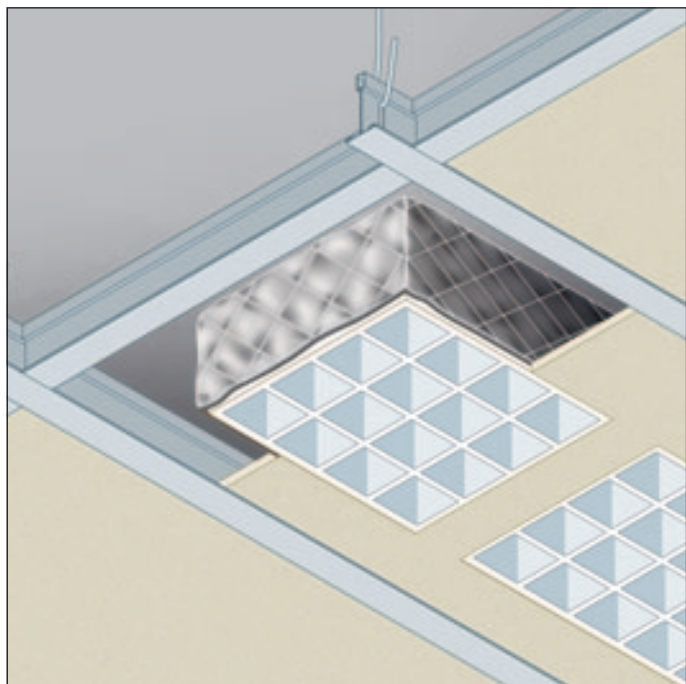
For further details see the "Installation Manual".





CEILING LIGHTS PROTECTION

"GB-LIGHT"



FIRE RESISTANCE: REI 120

- **Base structure:** hollow slab concrete floor 240 mm in thickness protected by a mineral fiber ceiling
- **Product to use:** CEILING LIGHTS PROTECTION "GB-LIGHT"
- **Fastening:** positioning over the opening of the false ceiling
- **Surface finishing:** not provided
- **Application:**
On a hollow slab concrete floor 240 mm in thickness
Mmax = 42,5 kNm, Tmax = 21,38 kN
False ceiling panels size: 600x600 mm
Maximum size false ceiling opening: 1200x600 mm
Minimum height of interspace floor-ceiling: 300 mm

Classification report: I.G. 264416-3160 FR
Fire Testing Norm: EN 1365-2

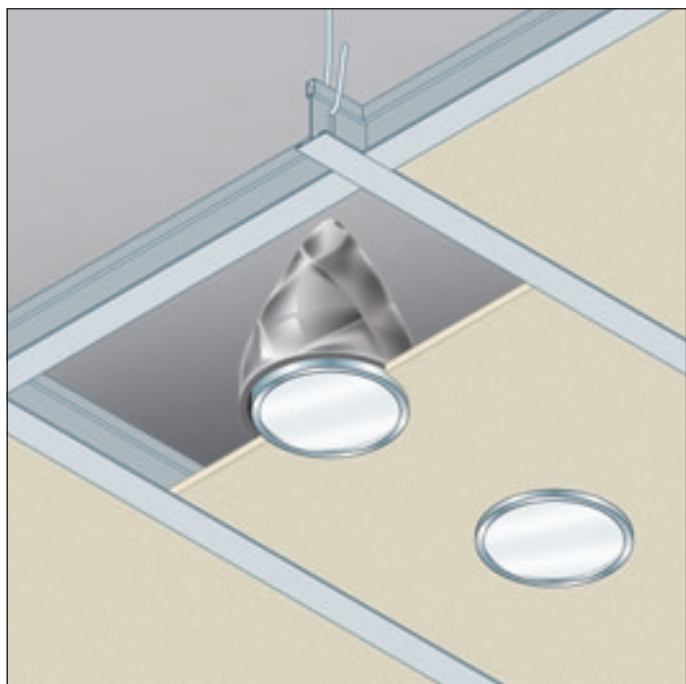
SYSTEM SPECIFICATIONS

Installation of CEILING LIGHTS PROTECTION "GB-LIGHT" with fire resistance REI 120 certified on a hollow slab concrete floor 240 mm in thickness protected by mineral fiber false ceiling, consisting of a preassembled incombustible fabric mat treated with a suitable flame retardant product, and conforming to classification report I.G. 264416-3160 FR.

The CEILING LIGHTS PROTECTION "GB-LIGHT" will be placed over the opening on the false ceiling, keeping it as close as possible to the opening. For further details see the "Installation Manual".

SPOTLIGHTS PROTECTION

"GB-LIGHT"



FIRE RESISTANCE: REI 120

- **Base structure:** hollow slab concrete floor 240 mm in thickness protected by a mineral fiber ceiling
- **Product to use:** SPOTLIGHTS PROTECTION "GB-LIGHT"
- **Fastening:** positioning over the opening of the false ceiling
- **Surface finishing:** not provided
- **Application:**
On a hollow slab concrete floor 240 mm in thickness
Mmax = 42,5 kNm, Tmax = 21,38 kN
False ceiling panels size: 600x600 mm
Maximum size false ceiling opening: 1200x600 mm
Minimum height of interspace floor-ceiling: 300 mm

Classification report: I.G. 264416 -3160 FR
Fire Testing Norm: EN 1365-2

SYSTEM SPECIFICATIONS

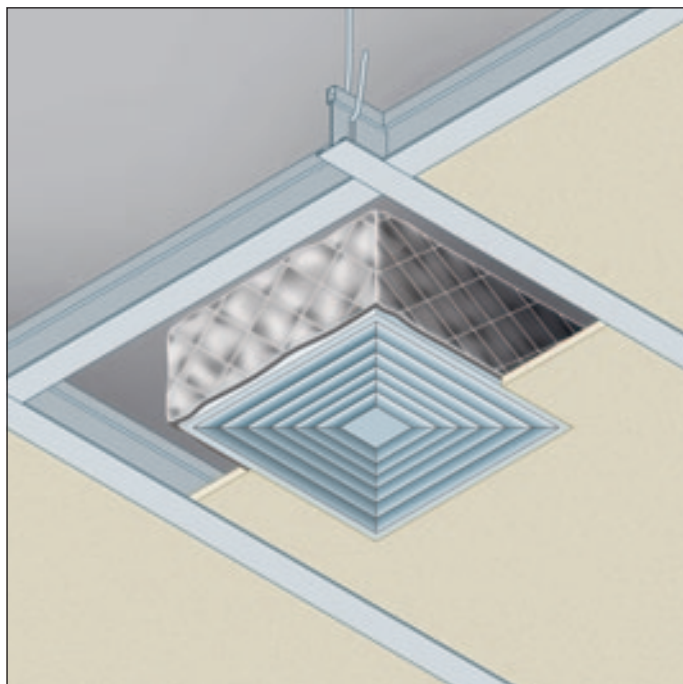
Installation of SPOTLIGHTS PROTECTION "GB-LIGHT" with fire resistance REI 120 certified on a hollow slab concrete floor 240 mm in thickness protected by mineral fiber false ceiling, consisting of a preassembled incombustible fabric mat treated with a suitable flame retardant product, and conforming to classification report I.G. 264416-3160 FR.

The SPOTLIGHTS PROTECTION "GB-LIGHT" will be placed over the opening on the false ceiling, keeping it as close as possible to the opening. For further details see the "Installation Manual".



AIR DIFFUSER PROTECTION

“GB-AIR”



SYSTEM SPECIFICATIONS

Installation of AIR DIFFUSER PROTECTION “GB-AIR” with fire resistance REI 120 certified on a hollow slab concrete floor 240 mm in thickness protected by mineral fiber false ceiling, consisting of a mineral wool mat contained between two layers of glass cloth, with the outside aluminized and the inner mat treated with a special intumescent paint and endowed with a special collar in order to be applied on the air diffuser hose, conforming to classification report I.G. 264416-3160 FR. It is necessary to place the AIR DIFFUSER PROTECTION “GB - AIR”

FIRE RESISTANCE: REI 120

- **Base structure:** hollow slab concrete floor 240 mm in thickness protected by a mineral fiber ceiling
- **Product to use:** AIR DIFFUSER PROTECTION “GB-AIR”
- **Dimensions:** 600x600 mm
- **Hose diameter:** maximum 315 mm
- **Fastening:** positioning over the opening of the false ceiling
- **Surface finishing:** not provided
- **Application:**

On a hollow slab concrete floor 240 mm in thickness
Mmax = 42.5 kNm, Tmax = 21.38 kN
False ceiling panels size: 600x600 mm
Maximum size false ceiling opening: 1200x600 mm
Minimum height of interspace floor-ceiling: 300 mm

Classification report: I.G. 264416-3160 FR
Fire Testing Norm: EN 1365-2

over the diffuser, practicing an etching cross on the mouth of the diffuser and inserting the neck of the diffuser 's mouth through the cut made in the mat.

Cut the of surplus mat, insert the hose on the diffuser 's neck, apply the collar around the hose and place ie taking care to keep it above the metal edge of the neck of the diffuser with the tabs facing downward. Finally you need to fix the collar and conduct with a metal hose clamp.

For further details see the “Installation Manual”.

Dimensions

Dimensions 600 x 600 x 150 mm	for pipes Ø 160 mm, for pipes Ø 200 mm, for pipes Ø 250 mm, for pipes Ø 315 mm,
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Protection of combustible pipes and multi-layer composite pipes. Non combustible pipes with or without insulation. Electric cables, bundles of electrical cables and cable trays. Protection of openings with multiple crossings, protection of crossings on ceilings and veils. Protection of fire dampers, ceiling lights and spotlights. Gates closing. For complete documentation see the specific catalog.

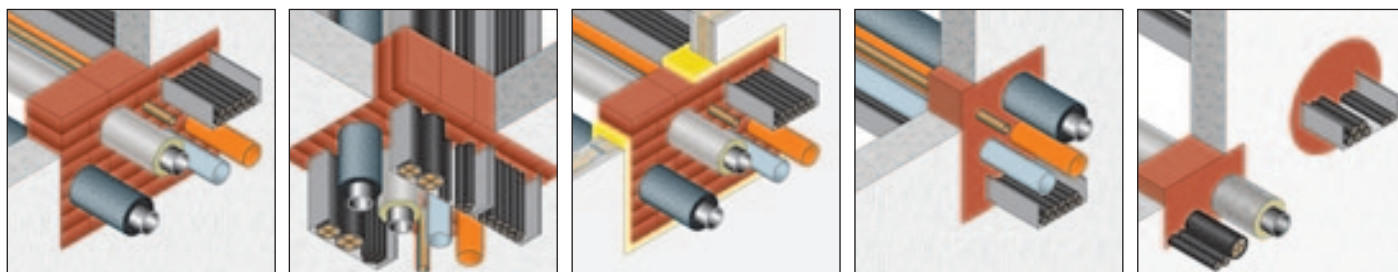
PROTECTION OF CROSSINGS ON MASONRY WALLS, PLASTERBOARD WALLS AND CEILINGS

EI 120-240



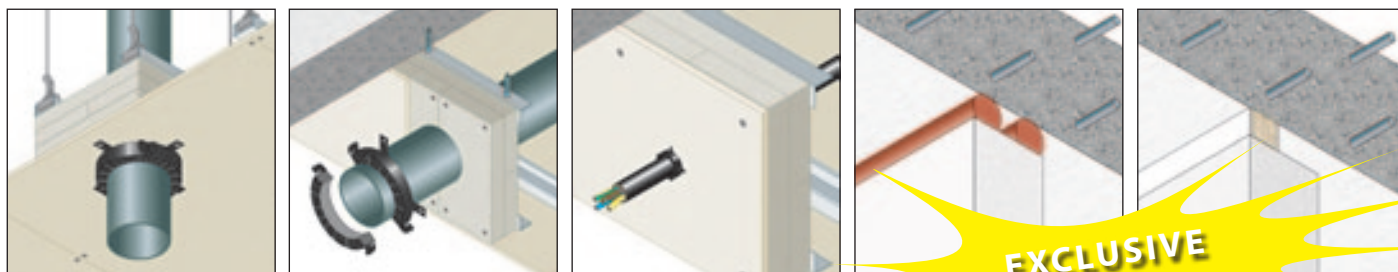
PROTECTION OF MULTIPLE CROSSINGS ON MASONRY WALLS, PLASTER WALLS AND CEILINGS

EI 30-120



PROTECTION OF CROSSINGS ON CEILINGS AND VEILS

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