A.T ITC n. 650/22 del 12.05.2022

certificate validity: five years

This certificate of technical suitability copertec/coperplax relates to the fall protection system mesh Copertec and the plastic coated variant Coperplax, issued by the NATIONAL RESEARCH COUNCIL - INSTITUTE FOR CONSTRUCTION TECHNOLOGY (ITC-CNR), contains:

- Technical description of the product and manufacturing and control systems
- Installation of meshes
- Testing for technical suitability according to EN 15057

TECHNICAL AGREEMENT
COPERTECSYSTEM

PERMANENT FALL PROTECTION SYSTEM FOR INDUSTRIAL ROOFS

CAVATORTA

OUR VALUES. YOUR CONFIDENCE.

SYSTEM PARTS AND SPECIFIC INSTALLATION

Permanent fall protection system to protect non-walkable skylights, to be applied internally on the load-bearing roof frame or externally on double-sheet sandwich panels or on corrugated/ wavy metal sheets. It is designed to protect against the risk of falling during the maintenance of roofs of buildings for industrial/agricultural use, and envisages the use of the **Copertec** fall protection net (or its alternative **Coperplax**) to be fitted in combination with specific accessories. It is necessary to follow the installation instructions described in this Technical Agreement, a document issued by the
National Research Council - Institute for Construction Technology (ITC-CNR).

protezione anticaduta permanente per lucernari in materiale plastico
CNR ITC
A.T. ITC n. 650/22

COPERTEC

Electro-welded mesh with triple selvedge. The horizontal and vertical wires, both linear, are made of galvanised steel before welding.
Copertec mesh is supplied in 25 m rolls, packed on pallets of 9 rolls each, wrapped in recyclable polyethylene film.

Example of skylight application on the roof structure.

COPERPLAX

Electro-welded mesh with triple selvedge. The horizontal and vertical wires, both linear, are made of galvanised steel. Plastic coating is carried out by means of the unique Galvaplax sintering process developed by Cavatorta. Under normal conditions of use, performance is guaranteed for more than 10 years. Coperplax mesh is supplied in 25 m rolls, packed on pallets of 9 rolls each, wrapped in recyclable polyethylene film.

GALVAPLAX PROCESS

Galvaplax Process is a plasticization process, developed by Cavatorta, which gives Coperplax mesh extreme strength and durability, carried out through the combination of different protective elements: galvanisation, primer and PVC.
The hot-dip galvanised steel base wire is dipped in a bath of special primer, which is essential for a perfect anchorage of the PVC to the metal. This is followed by plasticization using a fluidised bed melting process, which guarantees a clean and homogenous coverage over the entire surface of the mesh.

Example of outdoor application on corrugated metal sheet.

SYSTEM PARTS AND SPECIFIC INSTALLATION

INDOOR INSTALLATION

The system is positioned underneath the non-walkable plastic skylights to be protected and is anchored directly onto the load-bearing structure of the roof following one of the Installation layouts B or C. For the anchoring of the net (Copertec or Coperplax) 3 options of different profiles and 3 options of screws are given to choose from, depending on the type of structure to be anchored.

TYPOLOGY OF STRUCTURES ON WHICH TO ANCHOR

- Solid wood, glulam and similar beams; however load-bearing in nature
- Reinforced concrete or structural concrete beams, pre-stressed reinforced concrete roofing tiles, hollow-core concrete structures with at least 50 mm of bearing slab
- Steel beams (IPE-HEA) tubular with a minimum thickness of 3.00 mm - Purlins

ANCHORING ELEMENTS

Load-bearing beam in structural timber 50x40 mm

L-profile in steel 2 mm thick S235JHR ZN hot laminated - 30x30 mm

Steel plate S235JHR sp. 3 mm ZN hot laminated 30 mm

FASTENING ELEMENTS

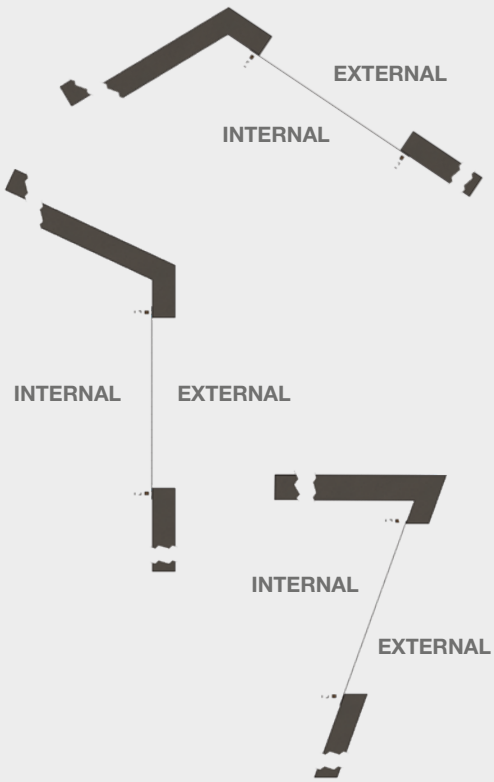
For reinforced concrete or structural concrete beams; pre-stressed reinforced concrete roofing tiles, clay-cement mix structures with composite slab of at least 5.00 cm;

For load-bearing solid wood beams, plywood beams and similar wood-based materials;

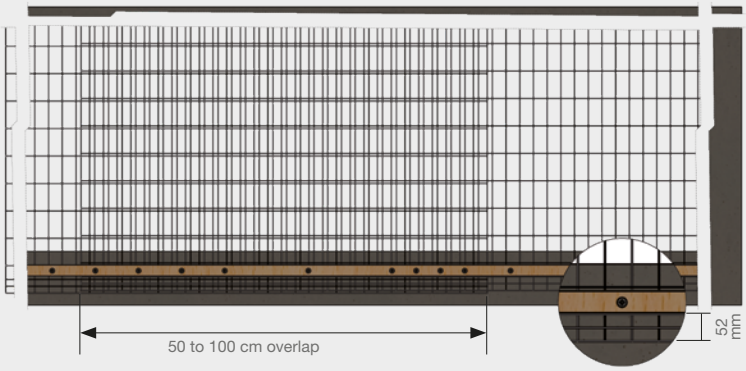
For tubular steel (IPE- HEA) beams with minimum thickness 3.00 mm; purlins.

HORIZONTAL APPLICATION

INCLINED APPLICATION



OVERLAPPING



OUTDOOR INSTALLATION

In the case of roofs clad with double-sheet sandwich panels or corrugated/wavy metal sheets of suitable thickness and adequately anchored to the structure underneath, the system can be anchored directly onto them, above the plastic skylights that cannot be walked on to be protected, following one of the installation layouts D and E. In this case, since the net is exposed to atmospheric agents, it is necessary to use the net in its plastic-coated version (Coperplax), anchoring it with appropriate accessories (stainless steel plate with relative EPDM gasket, 3 rivets per plate).

TYPOLOGY OF STRUCTURES ON WHICH TO ANCHOR

- Corrugated or ribbed metal sheets in steel (min. thickness 5/10) or aluminium (min. thickness 7/10) - Double-sheet sandwich panels in steel (min. thickness 4/10) or aluminium (min. thickness 6/10)

ANCHORING ELEMENTS

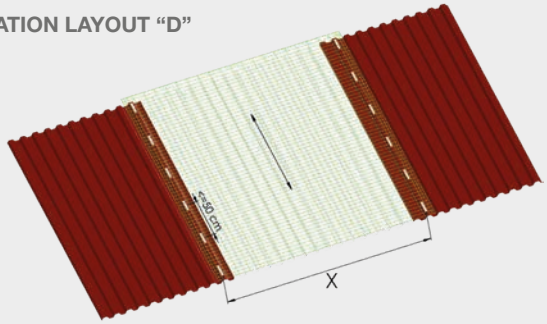
Stainless Steel Plate

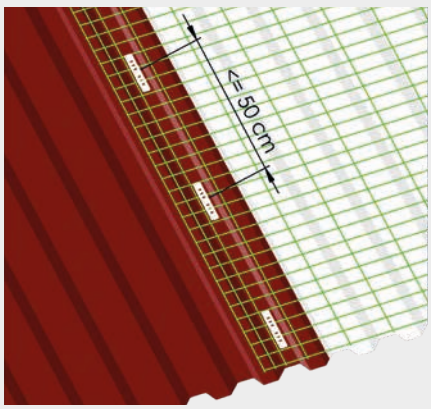
EPDM gasket

no. 3 rivets per plate

CORRUGATED / WAVY METAL SHEETS PARALLEL TO ROLL LENGHT

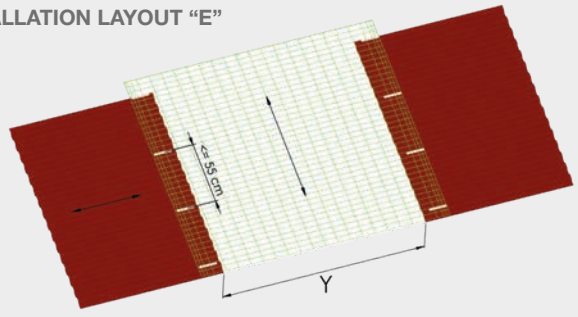
INSTALLATION LAYOUT “D”

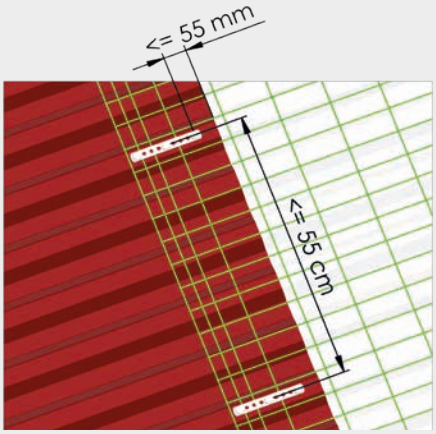




CORRUGATED / WAVY METAL SHEETS PERPENDICULAR TO ROLL LENGHT

INSTALLATION LAYOUT “E”



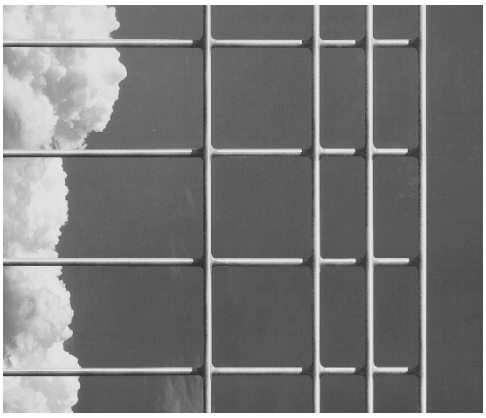


TECHNICAL AGREEMENT

Agrément Technique/Technical Application Document

No. 650/22

Date of issue:	**12.05.2022**
Date of expiry:	**11.05.2027**
Certification Body:	**ITC-CNR**
Product Category:	**Anti-falling safety mesh for use in zenith skylights**



Trade name:	**Rete COPERTEC - Rete COPERPLAX**
Beneficiary of the certificate:	**METALLURGICA ABRUZZESE S.p.A. (Gruppo Cavatorta)** **Via Repubblica, 58 - 43100 PARMA - IT**
Manufacturer:	**METALLURGICA ABRUZZESE S.p.A. (Gruppo Cavatorta)**
Plants:	**Contrada Marina – 64023 Mosciano S. Angelo – TE - IT** **via Baganza 6 - 43030 Calestano (PR) presso Trafileria e Zincheria Cavatorta S.p.A.** **via Fondovalle 2 – 43040 – Ghiare di Berceto (PR) - IT**

TECHNICAL DESCRIPTION

1 Intended use

The safety mesh named "Copertec" and its PVC-coated variant named "Coperplax" are used in agricultural/industrial buildings as a permanent anti-falling safety system under plastic zenith skylights when such plastic materials are not able to withstand concentrated loads, without prejudice to the provisions of NTC 2018 – Non-accessible roofs. The anti-falling safety system, only in its PVC-coated variant, can also be used to directly protect from the outside non-accessible translucent roofing sheets, such as flat or corrugated skylights in plastic material, mounted on double sheet sandwich panels or on corrugated or ribbed metal sheets (in steel or aluminium).

2 Description

The anti-falling system comprises the following:

- electro-welded wire mesh with differentiated mesh and triple selvedge at the longitudinal ends ("Copertec");
- alternatively, sintered plastic-coated wire mesh with differentiated mesh and triple selvedge at the longitudinal ends ("Coperplax)";
- accessories: fastening devices.

3 Raw materials and semi-finished materials

3.1 Steel wire

Low-carbon steel wire obtained by drawing of a Ø 5.50 mm wire rod, hot-dip galvanized by the Beneficiary.

- Tensile strength: ≥ 450 N/ mm^2
- Minimum zinc coating: 40 g/m^2
- Minimum zinc coating thickness: approx.10 µm.
- Zinc coating colour: silver.

3.2 Zinc

Pure zinc ingots 99,995 % (UNI EN 1179).

3.3 PVC

PVC in powder form:

- Specific gravity: 1.274 g/cm^3 ± 3%
- Humidity content: 0.09 g/cm^3 ± 3%
- Melt flow index: PO5: 30''.

4. Semi-finished products and finished products

4.1 Electro-welded wire mesh "Copertec"

This wire mesh with differentiated meshes consists of Ø 2.0 mm steel wires which are hot-dip galvanized (UNI EN 10244-2) prior to electro-welding. For geometric and dimensional characteristics (and relevant tolerances) see Table 1; for materials' properties see Table 2.
The "Copertec" mesh is sold in 25 m rolls, packed on pallets of 9 rolls each, wrapped in a recyclable polyethylene film. The Beneficiary declares the product's characteristics listed in the table below.

Nominal height (m)	Nominal length (m)	Approximate weight of the roll (kg)	Weight per surface unit (kg/m²)	Weight per pallet (kg)	Composition of the mesh		ø wire (mm)
					(No.)	(mm)	
1.020 (± 5.00 mm)	25,00 (-0/+0,5)	21.5	0.84	193.5	4	25.4 (±3)	2.0 (±0.04)
					2	50.8 (±4)	
					8	101.6 (±5)	
1.220 (± 5.00 mm)		25.5		229.5	4	25.4 (±3)	
					2	50.8 (±4)	
					10	101.6 (±5)	
1.520 (± 5.00 mm)		31	0.82	279.0	4	25.4 (±3)	
					2	50.8 (±4)	
					13	101.6 (±5)	
1.830 (± 5.00 mm)		37	0.81	333.0	4	25.4 (±3)	
					2	50.8 (±4)	
					16	101.6 (±5)	
2,030 (± 5.00 mm)		40	0.79	360.0	4	25.4 (±3)	
					2	50.8 (±4)	
					18	101.6 (±5)	
2.23 (± 5.00 mm)		46	0.82	414.0	4	25.4 (±3)	
					2	50.8 (±4)	
					20	101.6 (±5)	
2.53 (± 5.00 mm)		52	0.82	468.0	4	25.4 (±3)	
					2	50.8 (±4)	
					23	101.6 (±5)	
Distance between vertical wires (mm)		50.8 (±4)					

Table 1: Geometric and dimensional characteristics of the Copertec mesh

Property	Value	Unit of measurement	Standard reference
Maximum breaking load per vertical wire	≥ 450*	N/mm²	-
Maximum breaking load per horizontal wire			
Strength of welding points	≥ 75%**	-	UNI EN 10223-4
Zinc adhesion	1 (excellent)		UNI EN 10244-2
Zinc coating thickness	~ 10	µm	-
(*) values relate to the wire prior to the production of the wire mesh			
(**) 75% of the maximum breaking load of the wire			

Table 2: Materials' properties of the Copertec mesh

4.2 Electro-welded and PVC-coated wire mesh "Coperplax"

This wire mesh with differentiated mesh consists of Ø 2.0 mm steel wires which are hot-dip galvanized (UNI EN 10244-2) before they are electro-welded and plastic-coated through an exclusive sintering process (UNI EN 10245-2). For geometric and dimensional characteristics (and relevant tolerances) see Table 3; for materials' properties see Table 4. "Coperplax" is sold in 25 m rolls, packed on pallets of 9 rolls each, wrapped in a recyclable polyethylene film. The Beneficiary declares the product's characteristics listed in the table below.

Nominal height (m)	Nominal length (m)	Approximate weight of the roll (kg)	Weight of the mesh per m² (kg/m²)	Composition of the mesh		Diameter of galvanized wire Ø (mm)	Diameter of PVC-coated wire Ø (mm)
				(No.)	(mm)		
1.02 (± 5.00 mm)	25.00 (-0/+0.5)	23,5	0.92	4	25.4 (±3)	2.00 (± 0.04)	2.40 (± 0.15)
				2	50.8 (±4)		
				8	101.6 (±5)		
1.22 (± 5.00 mm)		28		4	25.4 (±3)		
				2	50.8 (±4)		
				10	101.6 (±5)		
1.52 (± 5.00 mm)		34	0.89	4	25.4 (±3)		
				2	50.8 (±4)		
				13	101.6 (±5)		
1.83 (± 5.00 mm)		40	0.87	4	25.4 (±3)		
				2	50.8 (±4)		
				16	101.6 (±5)		
2.03 (± 10.00 mm)		44		4	25.4 (±3)		
				2	50.8 (±4)		
				18	101.6 (±5)		
Distance between vertical wires (mm):			50.8 (± 4)				

Table 3: Geometric and dimensional characteristics of the Coperplax mesh

Property	Value	Unit of measurement	Standard reference
Maximum breaking load per vertical wire	≥ 450*	N/mm²	-
Maximum breaking load per horizontal wire			
Strength of welding points	≥ 75%**	-	UNI EN 10223-4
Zinc adhesion	1(excellent)		UNI EN 10244-2
Zinc coating thickness	~ 10	µm	-
PVC coating thickness	~ 20	µm	UNI EN 10218-2
PVC-coating process	Sintering		UNI EN 10245-2
(*) values relate to the wire prior to the production of the wire mesh			
(**) 75% of the maximum breaking load of the wire			

Table 4: Materials' properties of the Coperplax mesh

4.3 Fastening devices

The system may be fastened to the following roofing systems:

- clay-cement mix structures with composite/concrete slab, reinforced concrete/concrete structures (minimum class Rck 30 N/mm²), steel or wood structures;
- double sheet sandwich panels properly fastened to the underlying structure;
- corrugated or ribbed metal sheets (in steel or aluminium) of appropriate thickness, properly fastened to the underlying structure;

Wire meshes are fastened with the fastening accessories described in the following sections.

The Beneficiary undertakes to provide his customers with the purchased wire meshes, together with the technical sheets of the fastening devices complying with those provided for under this Certificate, i.e. having the same morphological and performance features.

4.3.1 Fixing to wood structures

The wire mesh may be fixed directly to a wood structure or decking respecting the spacing between fasteners indicated for the different spans of the openings concerned (Table 8), by means of:

- non-galvanized bright wire iron staples Ø mm 3.0; length mm 35 (17x35);
- hot-dip galvanized bright wire iron staples Ø mm 3.0; length mm 30 (17x30).

4.3.2 Fastenings for use in concrete, steel and wood structures

The wire mesh may be fixed to the upper part, the side surfaces and lower part of concrete, steel and wood structures (the latter as an alternative to those provided for in the previous section) by means of one of the following accessories:

– wood lath with minimum section 40 x 50 mm;
– L-profile with minimum section 30 x 30 mm, thickness 2 mm;
– steel plate with minimum section 30 x 3 mm;
– screws and anchors (see tables and installation schemes A, B and C below).

4.3.3 Fixing to double sheet sandwich panels or corrugated or ribbed metal sheets

To protect the flat or corrugated non-accessible translucent skylights in plastic material, the Coperplax variant can be fixed directly on double sheet sandwich panels or on corrugated or ribbed metal sheets with the following minimum thicknesses:

SUBSTRATE	MATERIAL	MINIMUM THICKNESS
Corrugated or ribbed metal sheets	Steel	5/10
	Aluminium	7/10
Double sheet sandwich panels	Steel	4/10
	Aluminium	6/10

Table 5: minimum thicknesses of sheets and panels

The following accessories shall be used for fastening the wire mesh (see installation schemes D and E in Section 6.3):

– Stainless steel plates in Aisi 304 (or Aisi 316) 142x19x2.5 mm;
– EPDM sealing washers 142x19x4.0 mm;
– Multifunctional blind rivets diam. 7.7x27.7mm.

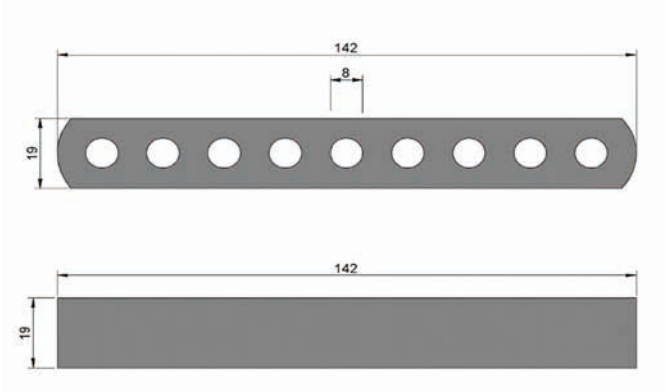


Figure 1 – Stainless steel plate and EPDM sealing washer

Figure 2 – Rivet 7.7x27.7 mm

5 Manufacturing

The wire mesh is manufactured through a series of different processes that include the following phases: drawing, galvanization and electro-welding, PVC-coating (the latter only for Coperplax).

5.1 Manufacturing controls

The following controls are in place at the plant:

5.1.1 – On raw materials

WIRE ROD

Each supply is accompanied by analysis reports of the characteristics below drawn up by the suppliers:

Characteristic	Method	Batch size
Elementary analysis	In-house method	Casting size
Tensile strength	UNI EN ISO 6892-1	Casting size

The following controls are carried out on supply batches at the Beneficiary's internal laboratory:

Characteristic	Method	Frequency	Batch size
Elementary analysis	Documentary verification	Each batch	Variable
Tensile strength			

ZINC

Each supply is accompanied by analysis reports of the characteristics below drawn up by the suppliers:

Characteristic	Method	Dimensione lotto
Elementary analysis	UNI-EN 1179	Variable

The following controls are carried out on supply batches at the Beneficiary's internal laboratory:

Characteristic	Method	Frequency	Batch size
Elementary analysis	Documentary verification	Variabile	Variable

PVC

Each supply is accompanied by analysis reports of the characteristics below drawn up by the suppliers:

Characteristic	Method	Batch size
Colour/Opacity	In-house method	Approx. 28 ton
Gelling	In-house method	Approx. 28 ton
Thermal stability	In-house method	Approx. 28 ton
Particle size	ASTM 921.63	Approx. 28 ton
Melt flow index	In-house method	Approx. 28 ton

The following controls are carried out on supply batches at the Beneficiary's internal laboratory:

Characteristic	Method	Frequency	Batch size
Specific gravity	ASTM D792	Each batch supplied	28 ton
Hardness	ASTM D2240, DIN 53505	Each batch supplied	28 ton

5.1.2 - During production

The Beneficiary carries out the following controls at all stages of production.

DRAWING

Characteristic	Method	Frequency	Batch size
Wire diameter	UNI EN 10218-2	Each batch	Variable

GALVANIZATION

Characteristic	Method	Frequency	Batch size
Wire diameter	UNI EN 10218-2	1/shift	Variable
Tensile strength	UNI EN ISO 6892-1		
Zinc coating	UNI EN 10244-2		

ELECTRO-WELDING

Characteristic	Method	Frequency	Batch size
Wire diameter	UNI EN 10218-2	1/shift	Variable
Failure to weld	Visual control	Continuously	

PVC-COATING

Characteristic	Method	Frequency	Batch size
Diameter of the PVC-coated wire	UNI EN 10218-2	1/shift	Variable
Unsuccessful PVC-coating	Visual control	Continuously	

5.1.3 – On the finished product

Characteristic	Method	Frequency	Batch size
Mesh welding strength	UNI EN 10223-4	1/shift	Variable

6 Installation

6.1 General

The system can be installed on openings involving risks of falling from above.
Workers must be properly protected at all times and the working areas must be well delimited and secured. To this scope, all safety rules in force regarding access to the roofs and ordinary pedestrian traffic on them must be respected, and personal and collective protection equipment must be used at all times as well.
This implies, among other things, the following.
Access to the roof
Ladders, rolling scaffolding, suspended scaffolds can be used in compliance with the specific use requirements whenever ordinary scaffolding is not already in use.
Ordinary pedestrian traffic
Walking directly on the roof must be avoided: either wooden boards or builder's ladders must always be used to this scope; in case of strong wind or rain, work shall be interrupted; stacking up packages of material or heavy tools directly on the roof must be avoided.
Collective protective equipment
Regular parapets shall protect eaves, trapdoors, etc.; permanent anchor points for personal protective equipment such as ropes and body harnesses shall be identified or arranged; temporary anti-falling safety meshes shall be mounted under the openings.
Personal protective equipment
The staff involved in the works shall be equipped with safety belts and harnesses, safety ropes, helmets, gloves, protective goggles, etc. All operators shall be trained in the use of such equipment.
The above equipment list is provided by the Beneficiary by way of example and shall not be considered as exhaustive.

6.2 General conditions for fastening the wire mesh "under the skylight" (installation schemes A, B and C)

For all fastening methods, the following technical provisions shall be taken into account.

The wire mesh shall protrude at least 52 mm from the fastening edge, so that the three longitudinal wires extend outside the adopted fastening system (Figure 3).

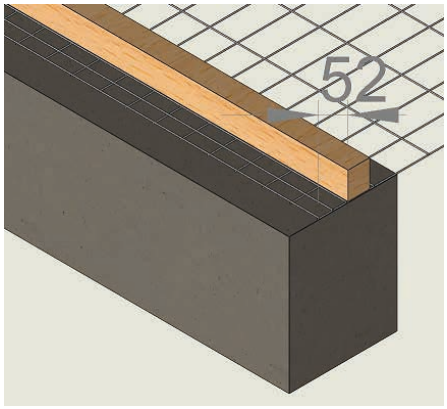


Figure 3

For all installation schemes it is necessary to make sure that the wire mesh is not held in tension with the structure and that a chord line of ~ 2.00 cm is created.

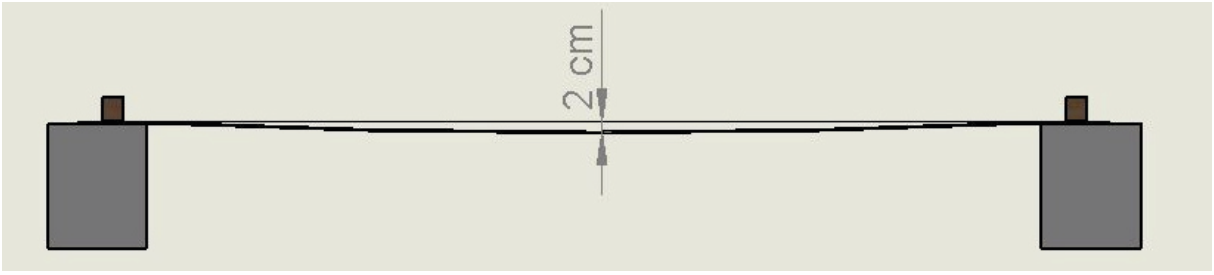


Figure 4

At the joint between two rolls, an overlap of at least 50 cm must be envisaged for wire meshes 102 cm to 203 cm in height while for wire meshes 223 cm to 253 cm in height the overlap must be at least 100 cm. In the overlap area, the spacing between fasteners must be doubled on each side.

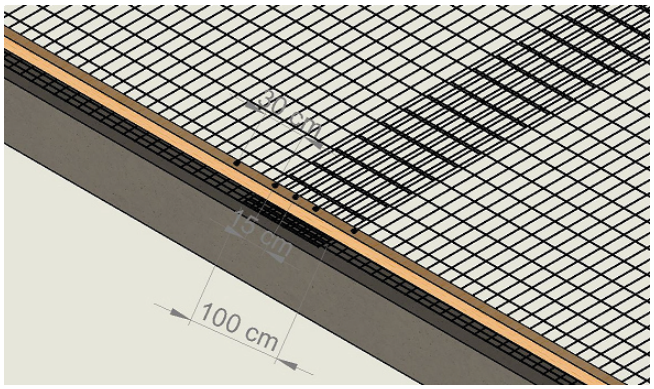


Figure 5

At the start and the end of the overlap, make sure that the first fixing is not farther than 15 cm from the start of the overlap.

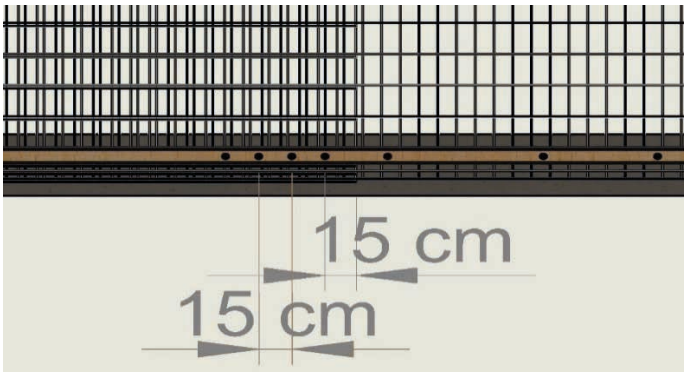


Figure 6

The wire mesh fastenings shall be doubled at the terminal ends of the skylight and three supplementary fastenings shall be added on each side (Figure 7). Alternatively, one fastening shall be added at the end of the wire mesh (Figure 8). In both cases, at least three meshes shall be left beyond the fastening edge.

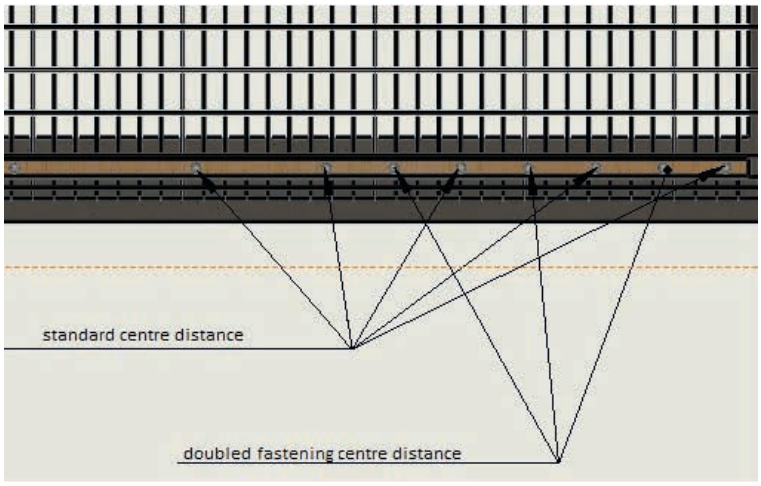


Figure 7

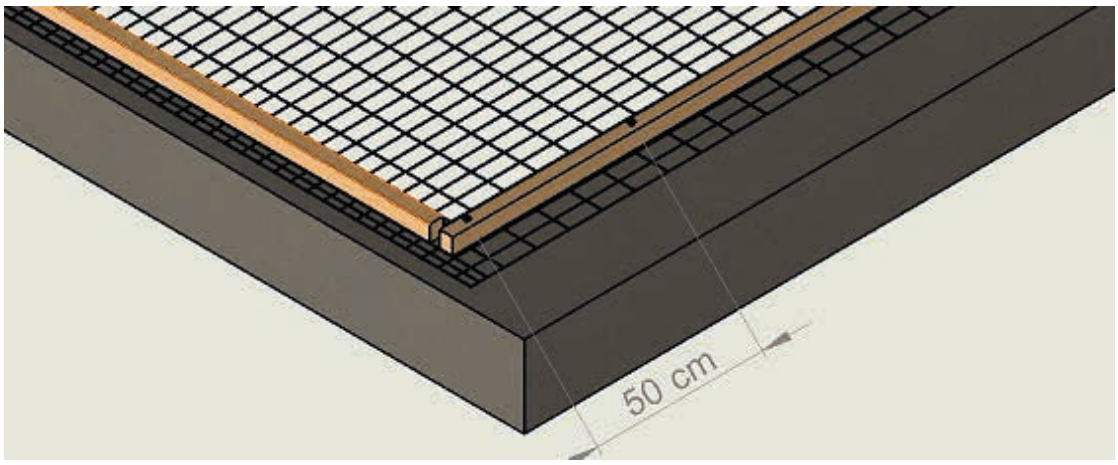


Figure 8

For each of the installation schemes indicated here below (A - B - C), three generic structure typologies are taken into account:

1. load-bearing solid wood beams, plywood beams and similar wood-based materials;
2. reinforced concrete or structural concrete beams; pre-stressed reinforced concrete roofing tiles, clay-cement mix structures with composite slab of at least 5.00 cm;
3. tubular steel (IPE- HEA) beams with minimum thickness 3.00 mm; purlins.

Three fastening options are given for each structure typology:

1. commercial fir wood lath 40 x 50 mm with anchoring base on the 40 mm side and constraint axis on the 50 mm side (detail A Figure 9);
2. hot-dip galvanized steel L profile (S235JRH), measuring 30 x 30 x 2 mm with fold side oriented towards the opening;
3. hot-dip galvanized steel flat profile (S235JRH), measuring 30 x 3 mm.

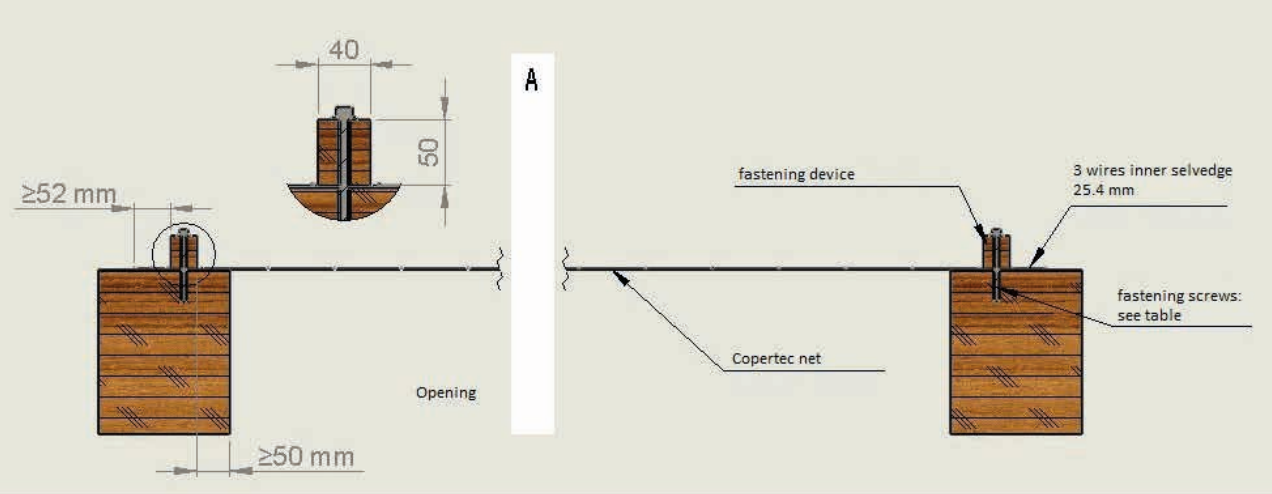


Fig. 9

The following schemes and tables indicate and detail the installation procedures and the methods adopted to fasten the wire mesh to the structure, so to create a permanent anti-falling safety system for use under the skylights.

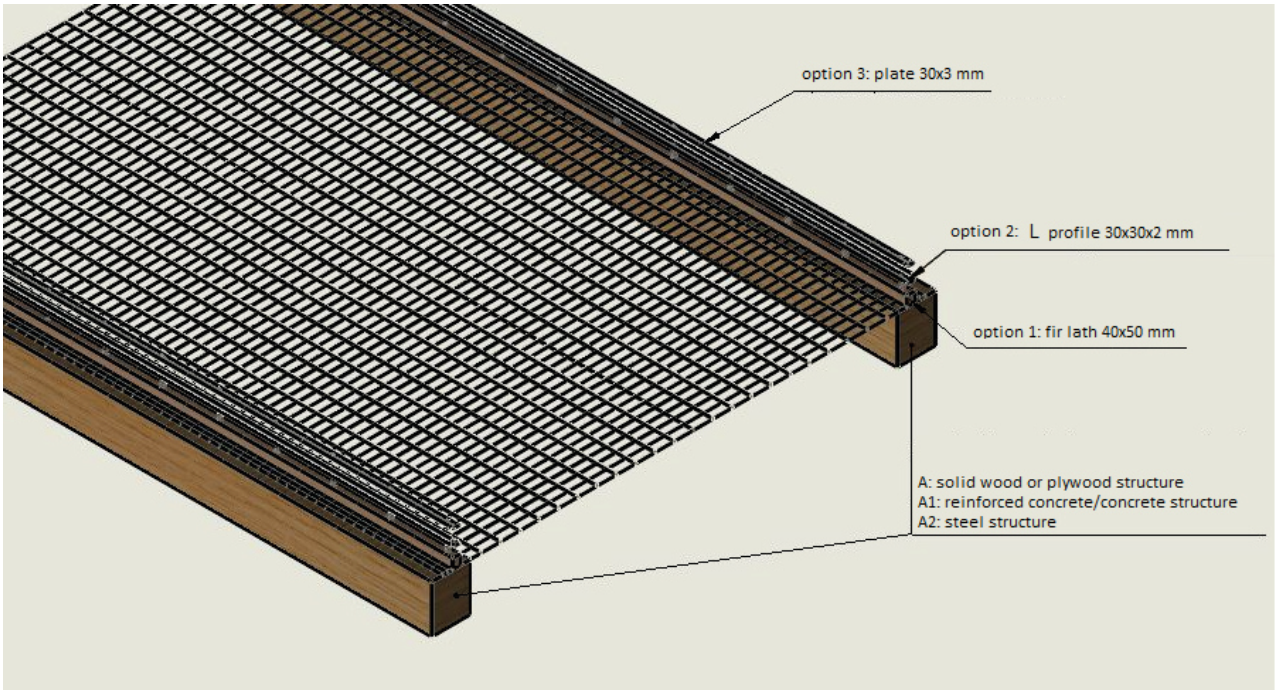


Figure 10: installation schemes A, A1, A2

Scheme	Substrate	Fastening device	Anchoring depth/ distance from the edge (mm)	Description of the screw
A	Wood	Wood lath 40 x 50 mm	**35/40**	Self-tapping screw HBS PLATE EVO for wood-to-wood fixing (HBSPEVO6*); steel nails Ø 3.5/4.00 mm
		L profile 30 x 30 x 2 mm; or, alternatively: flat profile 30 x 3 mm	**35/40**	Self-tapping screw SBS for wood-to-steel fixing (SBS63*); steel nails Ø 3.5/4.00 mm
A1	Reinforced concrete/con crete	Wood lath 40 x 50 mm	**35/50**	Hexagonal head threaded anchor screw (SKR75*), steel nail anchor Ø 8 mm
		L profile 30 x 30 x 2 mm or, alternatively: flat profile 30 x 3 mm	**35/50**	
A2	Steel	Wood lath 40 x 50 mm	**35/40**	Vite auto forante SBS per fissaggio acciaio-legno (SBS63*)
		L profile 30 x 30 x 2 mm; alternatively: flat profile 30 x 3 mm	**35/35**	Self-tapping screw SBS for wood-to-steel fixing (SBS63*)

Table 6: installation schemes A, A1, A2 (* = variable length of the screw)

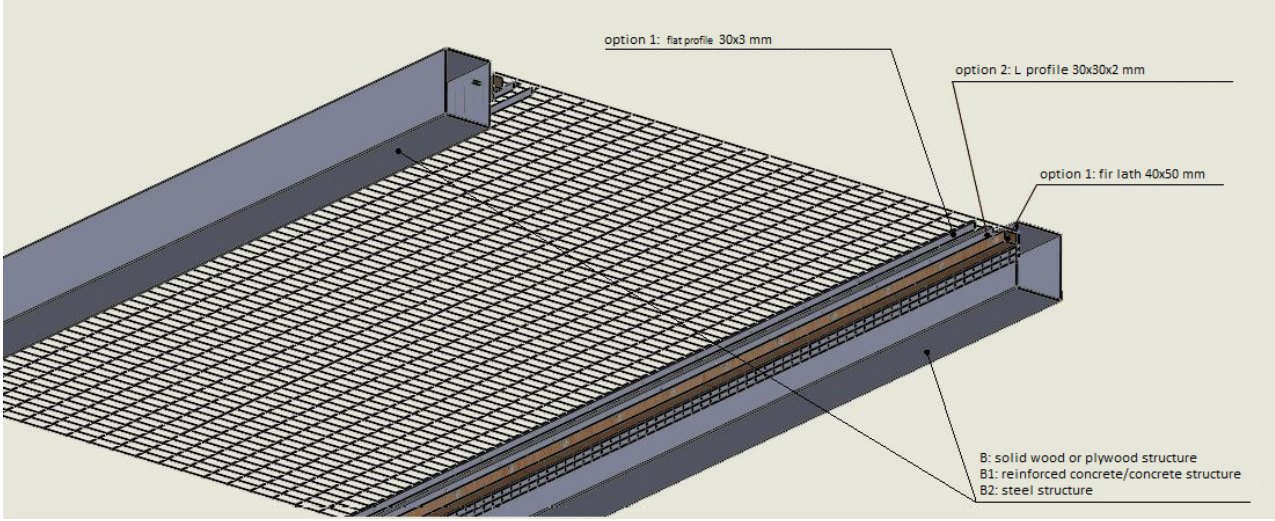


Figure 11: installation schemes B, B1, B2

Scheme	Substrate	Fastening device	Anchoring depth/ distance from the edge (mm)	Description of the screw
B	Wood	Wood lath 40 x 50 mm	**40/40**	Self-tapping screw HBS PLATE EVO for wood-to-wood fixing (HBSPEVO6*)
		L profile 30 x 30 x 2 mm; or, alternatively: flat profile 30 x 3 mm	**40/40**	Self-tapping screw SBS for wood-to-steel fixing (SBS63*)
B1	Reinforced concrete/concrete	Wood lath 40 x 50 mm	**45/50**	Hexagonal head threaded anchor screw (SKR75*)
		L profile 30 x 30 x 2 mm; or, alternatively: flat profile 30 x 3 mm	**45/50**	
B2	Steel	Wood lath 40 x 50 mm	**35/40**	Self-tapping screw SBS for wood-to-steel fixing (SBS63*)
		L profile 30 x 30 x 2 mm; or, alternatively: flat profile 30 x 3 mm	**35/35**	Self-tapping screw SBS for wood-to-steel fixing (SBS63*)

Table 7: installation scheme B

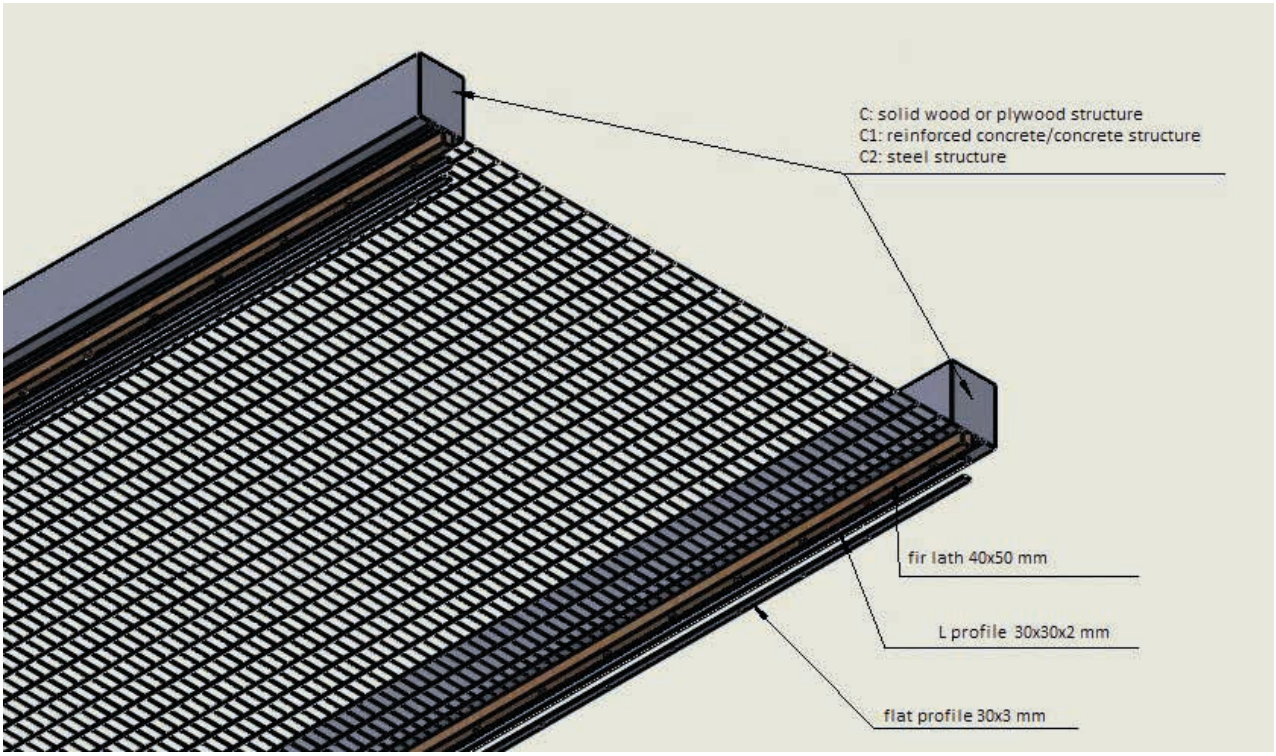


Figure 12: installation schemes C, C1, C2

Scheme	Substrate	Fastening device	Anchoring depth/ distance from the edge (mm)	Description of the screw
C	Wood	Wood lath 40 x 50 mm	**50/40**	Self-tapping screw HBS PLATE EVO for wood-to-wood fixing (HBSPEVO6*)
		L profile 30 x 30 x 2 mm; or, alternatively: flat profile 30 x 3 mm	**50/40**	Self-tapping screw SBS for wood-to-steel fixing (SBS63*)
C1	Reinforced concrete/concrete	Wood lath 40 x 50 mm	**40/50**	Hexagonal head threaded anchor screw (SKR75*)
		L profile 30 x 30 x 2 mm; or, alternatively: flat profile 30 x 3 mm	**40/50**	
C2	Steel	Wood lath 40 x 50 mm	**35/40**	Self-tapping screw SBS for wood-to-steel fixing (SBS63*)
		L profile 30 x 30 x 2 mm; or, alternatively: flat profile 30 x 3 mm	**35/35**	Self-tapping screw SBS for steel-to-steel fixing (SBS63*)

Table 8: installation scheme C

The spacing values given in Table 8 apply to all fastening devices. The size of the wire mesh to be used is related to the clear span of the opening to be protected. The spacing between fasteners varies as a function of the size of the opening (Figure 13).

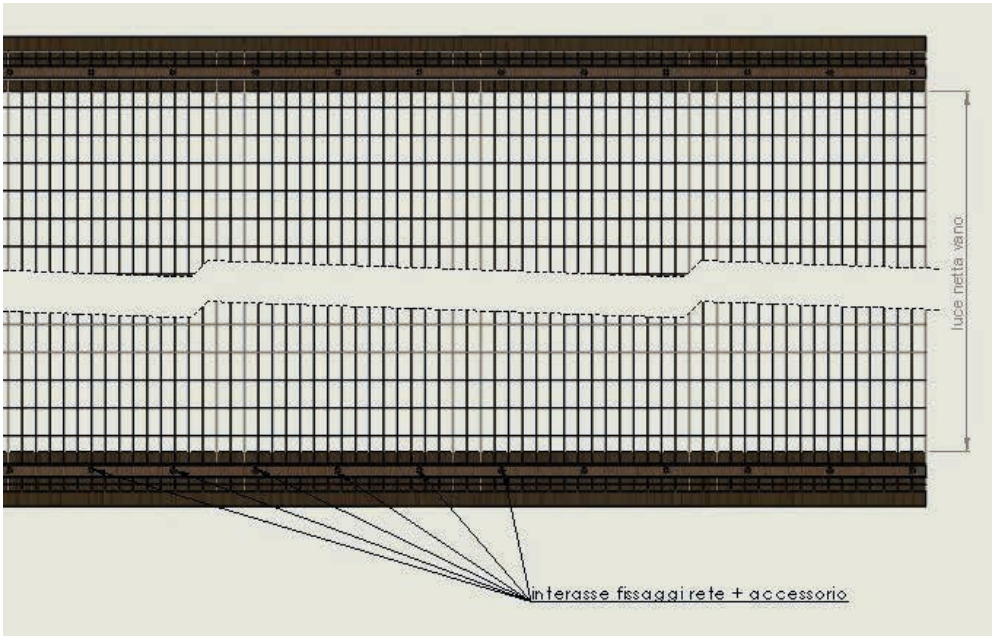


Figure 13: generic fastening scheme

Height of the safety mesh Copertec / Coperplax (cm)	Clear span of the opening (< >) (cm)	Fastening scheme	Spacing between fasteners (cm)
102	0 - 77	**A - C**	100
	0 - 84	**B**	
122	73 - 97	**A - C**	90
	82 - 104	**B**	
152	93 - 127	**A - C**	70
	102 - 134	**B**	
183	123 - 158	**A - C**	60
	132 - 165	**B**	
203	153 - 178	**A - C**	50
	163 - 185	**B**	
223 (*)	173 - 198	**A - C**	40
	183 - 205	**B**	
253 (*)	193 - 228	**A - C**	30
	203 - 235	**B**	
(*): values related to the Copertec mesh			

Table 9: Summary of the fastening specifications

The PVC-coated COPERPLAX safety mesh is recommended for outdoor use involving direct exposure to the environment, as well as in indoor environments for which severe metal corrosion conditions are expected.

The anti-falling safety system for use under skylights may be installed in all the structures mentioned in schemes A, B and C, with their relevant fastening systems.
The system can be installed on flat and sloping roofs, whatever the slope percentage of the roofing.
This system cannot be used as a parapet and is not suitable for ordinary pedestrian traffic.
The installation system used should preferably not contribute to the stability of the structures of skylights, panelling systems, etc.
If the installation systems mentioned in this Certificate make no express reference to the verification of the performance of the system with regard to soft body impact resistance, it is possible to refer to the relevant rules in force.

6.3 General conditions for fastening the wire mesh to double sheet sandwich panels or to corrugated or ribbed metal sheets in steel or aluminium (installation schemes D and E)

For the installation schemes shown below (D - E), the technical provisions indicated below should be taken into account:
- for uses involving direct exposure to the outside environment of the anti-falling safety mesh (*Installation schemes D and E*), only the COPERPLAX PVC-coated variant of the net (and not the non-PVC-coated COPERTEC variant) can be used;
- arrange the wire mesh so that the transverse wires (height of the roll) are at the lower part of the mesh (i.e., in contact with the panel/sheet) and the longitudinal wires (i.e., those oriented towards the unwinding direction of the roll) are at the upper part of the mesh;
- ensure that the mesh is not held in tension with the structure and that a chord line of ~2.00 cm is created;
- provide an overlap of at least 50 cm at the joint between two rolls;
- in the overlap area, the spacing between fasteners on each side shall be doubled; if that is not feasible, the overlap between the rolls shall be increased to at least 100 cm;
- at the start and the end of the overlap, check that the first fastener is no more than 15 cm away from the start of the overlap (Fig. 4);
- at the end parts of the skylight, the first plate shall be preferably beyond or at most in line with the opening to be protected. It should also be ensured that at least 2 meshes are left beyond the edge of the last fastener.

Four substrate categories are allowed for each installation scheme (D - E) shown below:

SUBSTRATE	MATERIAL
Corrugated or ribbed metal sheets	Steel
	Aluminium
Double sheet sandwich panels	Steel
	Aluminium

Table 10: substrate categories for Coperplax meshes

For both installation schemes (D- E), the following accessories shall be used for fastening the wire mesh:
– Stainless steel plates in Aisi 304 (or Aisi 316) 142x19x2.5 mm;
– EPDM sealing washers 142x19x4.0 mm;
– Multifunctional blind rivets diam. 7.7x27.7mm

6.3.1 *Installation scheme D*: ribs parallel to the unwinding direction of the roll

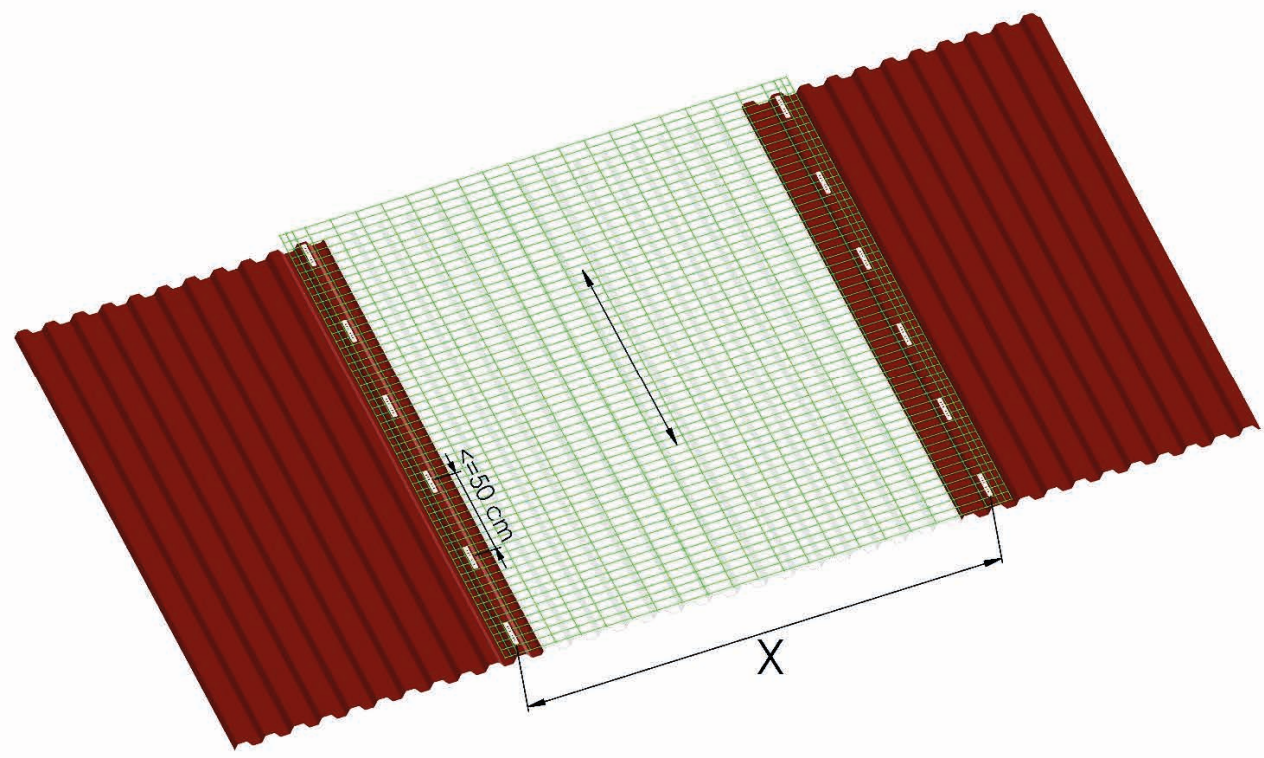


Figure 14: Installation scheme D.

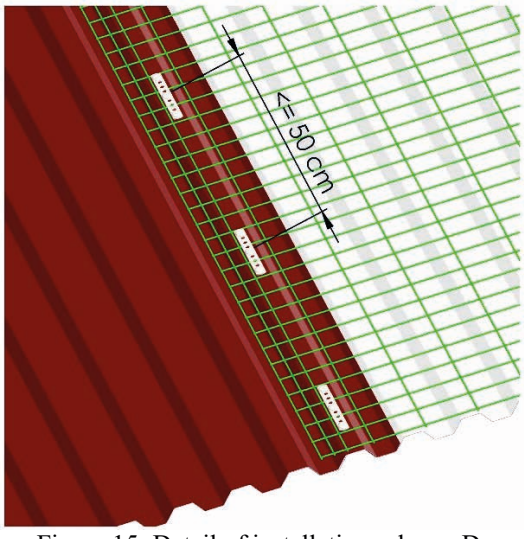


Figure 15: Detail of installation scheme D.

When installing Coperplax meshes according to scheme D, the following guidelines shall be observed (Figures 14, 15 and 16):
- place the mesh and the plates with the corresponding sealing washer directly in contact with the "top parts" of the profile of the double sheet sandwich panels or of the ribbed or corrugated sheets;
- provide for fixing the mesh along the second rib of the panels adjacent to the opening to be protected, avoiding fixing on incomplete ribs or on ribs on which the non-accessible sheets to be protected are already overlaid;

- place the EPDM sealing washer under each stainless steel plate;

- place the stainless steel plates with the sealing washer at a center-plate-to-center-plate spacing ≤ 50 cm (Figures 14 and 15 and Table 11);
- position the stainless steel plates by including at least two transverse wires perpendicular to the unwinding direction of the roll between the two outer rivets of each plate (Figure16);
- drill three ø8 mm pre-drilled holes at the outer and center holes of the stainless steel plate using the plate itself with the EPDM sealing washer as a template;
- apply three rivets to each stainless steel plate with the special riveting machine.

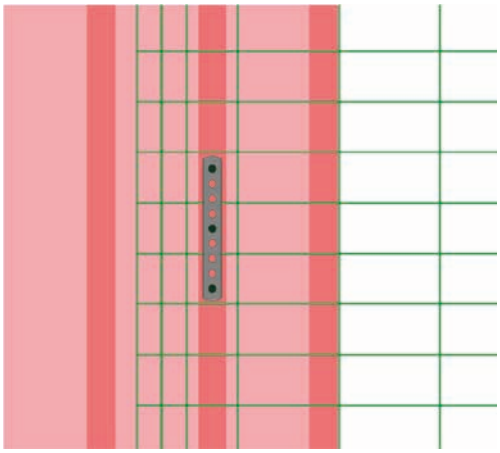


Figure 16 – Detail of the mesh fastened according to installation scheme D
(Scheme used to set up the specimens for tests 1,2,3,5.)

INSTALLATION SCHEME - "D"-		
Height of Coperplax mesh (cm)	**Clear span X between fastening ribs (Figure 14) (< >) (cm)**	**Maximum spacing between stainless steel plates (cm)**
102	≤ 88	≤ 50
122	89 - 107	≤ 50
152	108 - 139	≤ 50
183	140 - 169	≤ 50
203	170 - 190	≤ 50

Table 11: Spans and spacing of fastenings according to installation scheme D

6.3.2 Installation scheme E: ribs perpendicular to the unwinding direction of the roll

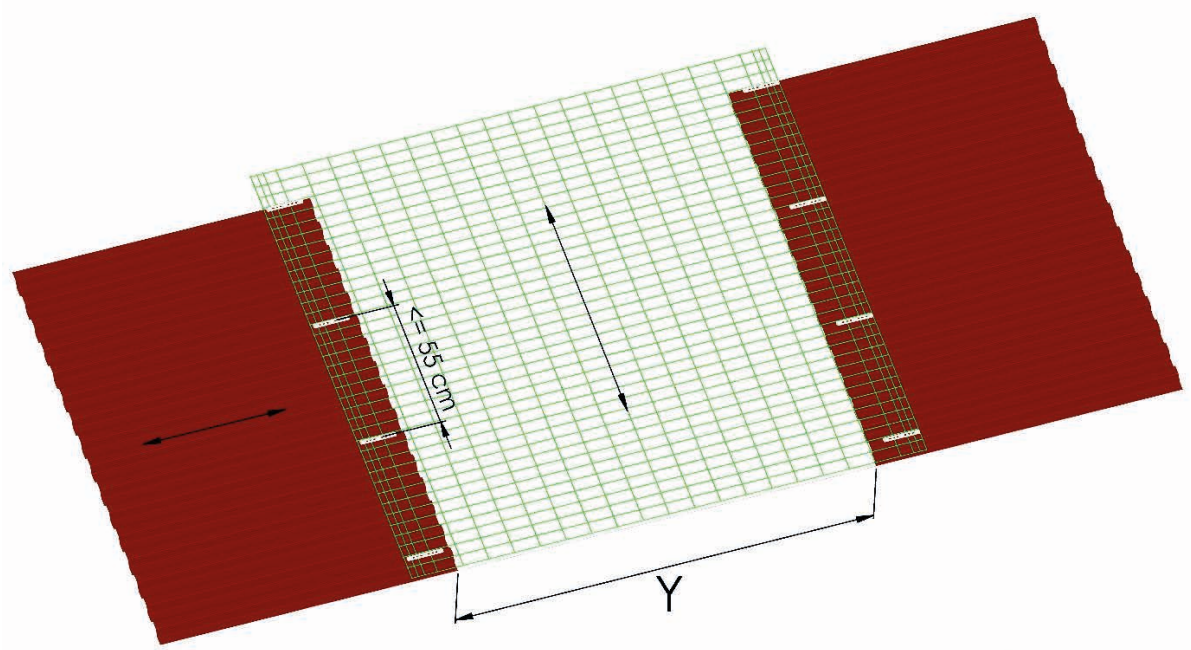


Figure 17: Installation scheme E. "Y" is the clear span of the opening to be protected excluding any non-accessible sheets overlaps

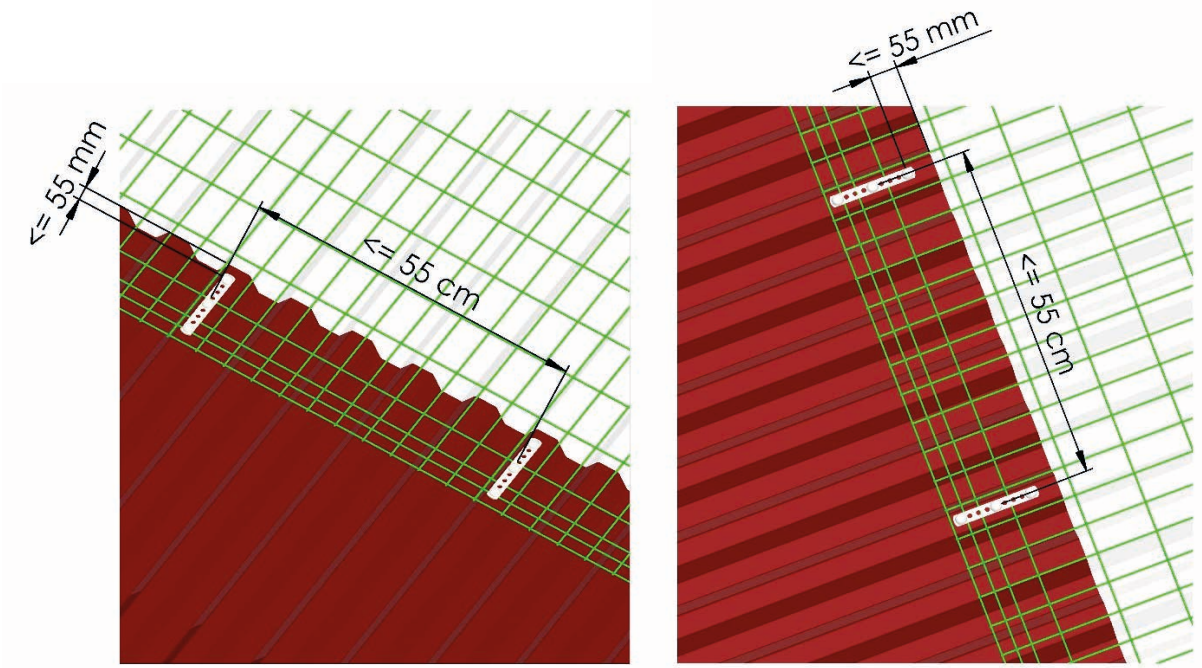


Figure 18: Installation scheme E

When installing Coperplax meshes according to scheme E, the following guidelines shall be observed (Figures 17, 18 and 19):
- place the mesh and the plates with the corresponding sealing washer directly in contact with the "top parts" of the profile of the double sheet sandwich panels or of the ribbed or corrugated sheets;
- spacing between stainless steel plates with sealing washer ≤ 55 cm (Figure 18);
- the stainless steel plates shall be positioned so that the distance from the axis of the first rivet to the edge of the sheet/sandwich panel towards the opening to be protected is at least 55 mm (Figure18);

- with stainless steel plates, include at least three longitudinal wires (parallel to the to the unwinding direction of the roll) between the two outer rivets of each plate (Figure 19);
- drill three ø8 mm pre-drilled holes at the outer and center holes of the stainless steel plate using the plate itself already fitted with the EPDM sealing washer as a template;
- apply three rivets to each stainless steel plate with the special riveting machine.

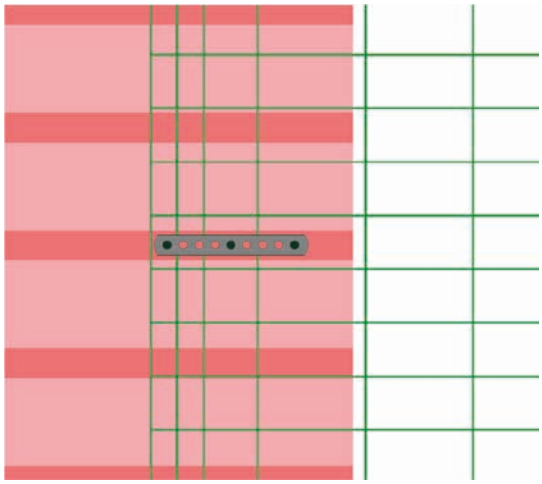


Figure 19 – Detail of the mesh fastened according to installation scheme E
(Scheme used to set up the specimens for test 4)

INSTALLATION SCHEME - "E"-		
Height of Coperplax mesh (cm)	**Clear span Y of the opening (Figure 17) (< >) (cm)**	**Maximum spacing between stainless steel plates (cm)**
102	≤ 63	≤ 55
122	64 - 83	≤ 55
152	84 - 114	≤ 55
183	115 - 144	≤ 55
203	145 - 165	≤ 55

Table 12: Spans and spacing of fastenings according to installation scheme E

The system can be installed on flat and sloping roofs, whatever the slope percentage of the roofing. It is not possible to install the stainless steel plates with rivets on the ribs overlaid with the non-accessible sheets to be protected; the installed mesh shall be directly in contact with the steel.
Prior to installing the system on double sheet sandwich panels and on ribbed or corrugated steel sheets (Installation scheme D and E) the Designer shall make a thorough evaluation in order to:
- ensure that the mesh is anchored to new sheets/panels, or on existing sheets/panels provided that they are in in good condition (not deteriorated, not rusted, etc.);
- verify that the sheet thicknesses are in line with the minimum thicknesses stated in this Certificate;

- verify that the sandwich panels (or metal sheets) are adequately anchored to the underlying structure and require, if necessary, to increase the fixing rate on them in the vicinity of the opening to be protected;
- schemes A, B and C are preferred in marine areas, avoiding in any case direct exposure of the anti-falling safety system to weathering agents.

In application cases not referred to in this Certificate, it is possible to refer to the relevant rules in force concerning the verification of the performance of the system with regard to soft body impact resistance.

7 Manufacturing plant and organization of installation

The proposed system is manufactured in the following plants:

- Metallurgica Abruzzese S.p.A. (Gruppo Cavatorta) - Contrada Marina - 64023 Mosciano S. Angelo (TE) - ITALY.
- Trafileria e Zincheria Cavatorta S.p.A., via Baganza, 6 – 43030 – Calestano (PR) - ITALY.
- Metallurgica Abruzzese S.p.A. (Gruppo Cavatorta) – via Fondovalle 2 – 43040 – Ghiare di Berceto (PR) - ITALY

The commercial range of the meshes “Copertec” and “Coperplax” consists only of the products under this Certificate. Installation is carried out by qualified external companies.

8 References

The company has declared that, among the works carried out, the following premises have been inspected**:**

- Warehouse of Bartolini (express shipping company) – Località interporto – Fontevivo (PR) – IT - year 2002, 2900 m^2;
- Industrial laboratory of the company Maghei – Sacca di Colorno (PR) – IT - year 1998, 600 m^2;
- OMAG laboratory – Gramignazzo di Sissa (PR) – IT - year 1997, 4500 m^2 (mesh not used under the skylight);
- Warehouse of the company TECNOIMPORT sas – via dei Gonzaga, 60 - Reggio Emilia – IT – year 2009 – 275 m^2;
- Factory of the company P.C.L. S.p.A. – Limbiate (MI) – IT – years 2005/2006/2007 – 7.900 m^2;
- Factory of the company FAG ARTIGRAFICHE S.p.A. – via Torino, 347 – Dogliani (CN) – IT – year 2009 – 1380 m^2;
- Warehouse of the company DADA S.p.A. – s.p. 31 – Mesero (MI) – IT – year 2008 – 600 m^2;
- Offices of Estate Agents SIT IMMOBILIARE S.p.A. – viale Volta, 2/4 – Cusago (MI) – IT – years 2007/2008 – 700 m^2;
- Factory of the company BREMBANA COSTR. IND. srl – via Villino, 1 – Valbrembo (BG) – IT – year 2008 – 1000 m^2;
- Warehouses of the Logistics Centre MAGNA PARK Monticelli – Monticelli D’Ongina (PC) – IT – years 2006/2007 – 2800 m^2;
- Warehouse of TNT MILANO MEGA (express shipping company) – Peschiera Borromeo (MI) – IT – years 2008/2009 – 2000 m^2;
- Warehouse of IMPRESA VITALI srl – Roncello (MI) – IT – year 2009 – 1250 m^2.
- Stabilimento di PRISMA ITALIA S.r.l. – via dell’Industria, 4 – San Polo di Piave (TV) – IT – year 2014 – 4500 m^2;

- Steel mill ACCIAIERIE VENETE S.p.a. – Riviera Francia, 9 – Padova (PD) – IT – year 2015 – 1900 m^2;
- Steel mill ACCIAIERIE DI VERONA S.p.a. – Lungadige Galtarossa – Verona (VR) – IT – year 2017 – 1500 m^2;
- Factory of HS MARINE SRL – via delle Querce 1/3 – Viadana (MN) – IT – year 2018 – 1400 m^2;
- Factory of ELECTROLUX ITALIA S.p.a. – via Foresto Est, 16 – Santa Lucia di Piave (TV) – IT – year 2019 – 3650 m^2;
- Factory of GIMAR S.r.l. – strada Alessandria, 26 – Occimiano (AL) – IT – year 2019 – 1715 m^2;
- Factory of TERMOTECNICA VENETA Srl – via Podgora, 2 – Vittorio Veneto (TV) – IT – year 2021 – 3800 m^2;
- Factory of CARLO NOBILI S.p.a. – via Novara, 29 – Suno (NO) – IT – year 2021 – 4950 m^2;
- BAINVEST SRL – via Lisbona, 1 – Fontevivo (PR) – IT – year 2021 – 1445 m^2;
- Factory of GOLD ART S.p.a. – via Giardini Nord, 231-233 – Pavullo nel Frignano (MO) – IT – year 2021 – 2235 m^2;
- SMEG S.p.a. – via Leonardo da Vinci, 4 – Guastalla (RE) – ITALY – IT 2021 – 2600 m^2.

9 Tests

When verifying the suitability of the proposed system, in the absence of reference guides, the experimental test program was drafted by first checking the available regulatory provisions. Some of them, already in force at the Company for FPC purposes, were applied for the characterization of the mesh's constituent materials, especially the galvanized steel wire.
In the absence of specific standards for system tests on anti-falling safety meshes under skylights, the standard references laid down for other roofing elements were adopted. In agreement with the Company, the system tests for the verification of fitness for use were carried out in accordance with the test methods referred to in the following standards:

- UNI EN 15057: "Fibre-cement profiled sheets"– Impact resistance test method*"*
- EN 1873: " Prefabricated accessories for roofing - Individual rooflights of plastics - Product specification and test methods*"*
- EN 14963 "Roof coverings - Continuous rooflights of plastics with or without upstands - Classification, requirements and test methods*"*.

Furthermore, with regard to the verification of the resistance to evenly distributed loads, reference is made to the Regional Decree of the Veneto Region DGR No. 2774 of 22 September 2009, with reference to Annex "A".
Test results are included in Evaluation Report RV ITC No. 916, RV ITC 01/13, RV ITC 01/14 and ITC 6729/RT/22. Results fall within the limits declared by the Company.

9.1 Identification

9.1.1 Galvanized steel wire

Characteristic	Method	Average value measured
Diameter (mm)	UNI EN 10218-2	2.0
Zinc coating (g/m^2)	UNI EN 10244-2	40
Tensile strength (N/mm^2)	UNI EN ISO 6892-1	481.4

Table 13: characteristics of the galvanized steel wire

9.1.2 Wire mesh samples

Characteristic	Method	Average value measured
Weld shear strength (N/mm^2)	UNI EN 10223-4	479.8

Table 14: weld shear strength

9.1.3 Dimensional controls

Height of the wire mesh (cm)	Nominal length of the roll (m)	Measured length (m)
102	25 (-0. +0.50)	25.10
122		25.15
152		25.08
203		25.12
223		25.07
253		25.13

Table15: length of the roll

Nominal height of the wire mesh (cm)	Measured height (mm)
102 (± 5 mm)	101.7
122 (± 5 mm)	122.0
152 (± 5 mm)	152.7
203 (± 10 mm)	203.0
223 (± 10 mm)	223.5
253 (± 10 mm)	253.6

Table16: height of the wire mesh

Nominal height of the mesh (mm)	Measured average height value of the mesh (mm)
25.4 (± 3)	25.3
50.8 (± 4)	50.4
101.6 (± 5)	101.2

Table 17: height of the mesh (h=102)

Nominal width of the mesh (mm)	Measured average width value of the mesh (mm)
50.8 (± 4)	50,4

Tab.18: width of the mesh (h=102)

9.2 Fitness for use

Fitness for use was assessed in accordance with the test method laid down in the mentioned standards UNI EN 15057:2006, EN 1873:2006, EN 14963:2007. Special attention was paid to safety in use, namely the impact resistance using a 50 kg soft body with vertical drop height of 120 cm generating an impact energy of 600 J (simulating the impact of a worker falling on the installed skylight). Tests were performed using the largest mesh, i.e. the most critical one, by replicating the situations envisaged in schemes A, B, C, D and E described above. Furthermore, the installation under wooden laths was tested both in normal fastening conditions (tight fastening) and weak fastening conditions (loose fastening) to simulate a case of bad installation or looseness caused by wear over time.
Tests were carried out at ITC-CNR (RV ITC No. 916, RV ITC 01/13), at the Laboratories of Trafileria e Zincheria Cavatorta S.p.A. (RV ITC 01/14), at the Official Testing Laboratory of “Materials and Structures” of the University of Parma (RT ITC 6729/RT/22), on test setups replicating the installation conditions excluding the contribution of the fastening devices of the skylight.

9.2.1 Tests on wire meshes "under the skylight" (installation schemes A, B and C)

9.2.1.1 System tests on wire meshes fastened under the wooden laths carried out at the laboratories of ITC-CNR

The tests performed to assess the impact resistance using a 50 kg soft body with vertical drop height of 120 cm are summarized below. The falling body generates an impact energy of 600 J on wire meshes installed under the wooden laths to simulate some of the most significant installation conditions that can be extended also to the cases that have not been considered.

Wire meshes fastened under the wooden laths with tightened screws				
Wire mesh width (cm)	Skylight opening (cm)	Fastening points per side (No.)	Spacing between fasteners (cm)	Post-impact depression depth in the wire mesh (cm)
102	70	4	100	34
122	90	4	100	40
152	120	4	100	42
203	171	7	50	40

Table 19: wire meshes fastened under the wooden laths with tightened screws

Wire meshes fastened under the wooden laths with loosened screws				
Wire mesh width (cm)	Skylight opening (cm)	Fastening points per side (No.)	Spacing between fasteners (cm)	Post-impact depression depth in the wire mesh (cm)
102	70	4	100	46
122	90	4	100	54
152	120	4	100	59
203	171	7	50	56

Table 20: wire meshes fastened under the wooden laths with loosened screws

Wire meshes fastened under the wooden laths with loosened screws				
Wire mesh width (cm)	Skylight opening (cm)	Fastening points per side (No.)	Distance between fasteners at wire meshes overlap (cm)	Post-impact depression depth in the wire mesh (cm)
102	70	4	30	25
122	90	4	30	32
152	120	4	30	37
203	171	4	30	43

Table 21: wire meshes joined by 50 cm overlap fastened under the wooden laths with loosened screws

Wire meshes fastened under the wooden laths with loosened screws (impact on the fastening line)				
Wire mesh width (cm)	Skylight opening (cm)	Fastening points per side (No.)	Spacing between fasteners (cm)	Post-impact depression depth in the wire mesh (cm)
102	70	5	100	45

Table 22: wire meshes fastened under the wooden laths with loosened screws (impact on the fastening line)

Wire meshes fastened under the wooden laths with loosened screws (impact at the head of the fastening line)				
Wire mesh width (cm)	Skylight opening (cm)	Fastening points per side (No.)	Spacing between fasteners (cm)	Post-impact depression depth in the wire mesh (cm)
203	171	8	50	43

Table 23: wire meshes fastened under the wooden laths with loosened screws (impact at the head of the fastening line)

9.2.1.2 System tests on wire meshes fastened under the wooden laths and under the L profile carried out at the laboratories of ITC-CNR

The following impact resistance tests with a 50 kg soft body with vertical drop height of 120 cm generating an impact energy of 600 J were performed to assess whether the system is suitable for installation in steel structures and with metal profiles. Tests were performed on a 253 cm high mesh in accordance with the mentioned installation schemes A, B and C, option 1-2.
The specifications shown in the tables of the different schemes were adopted to make the fixings. The number of lateral fastening points during the test remained unchanged close to the heads, and the mesh was not fastened along the heads, so to simulate a detrimental situation, on lateral fastenings and on the mesh at the moment of the impact.

Wire meshes fastened over the structure according to installation scheme "A"			
Type of structure	Fastening system (mm)	Fastening points per side (No.)	Post-impact depression depth in the wire mesh (cm)
Solid wood beam	Fir wood lath 40 x 50	8	27
"	L profile 30 x 30 x 2	8	34
Tubular steel beam	Fir wood lath 40 x 50	8	46
"	L profile 30 x 30 x 2	8	37
Concrete beam	Fir wood lath 40 x 50	8	34
"	L profile 30 x 30 x 2	8	36

Table 24: wire meshes fastened over the structure according to installation scheme “A”

Wire meshes laterally fastened to the structure according to installation scheme "B"			
Type of structure	Fastening system (mm)	Fastening points per side (No.)	Post-impact depression depth in the wire mesh (cm)
Solid wood beam	Fir wood lath 40 x 50	8	30
"	L profile 30 x 30 x 2	8	24
Tubular steel beam	Fir wood lath 40 x 50	8	34
"	L profile 30 x 30 x 2	8	41
Concrete beam	Fir wood lath 40 x 50	8	34
"	L profile 30 x 30 x 2	8	44

Table 25: wire meshes laterally fastened to the structure according to installation scheme "B"

Wire meshes fastened under the structure according to installation scheme "C"			
Type of structure	Fastening system (mm)	Fastening points per side (No.)	Post-impact depression depth in the wire mesh (cm)
Solid wood beam	Fir wood lath 40 x 50	8	44
"	L profile 30 x 30 x 2	8	40
Tubular steel beam	Fir wood lath 40 x 50	8	42
"	L profile 30 x 30 x 2	8	34
Concrete beam	Fir wood lath 40 x 50	8	44
"	L profile 30 x 30 x 2	8	38

Table 26: wire meshes fastened under the structure according to installation scheme "C"

All wire mesh samples passed the test and, even though the wires of the mesh broke in different ways, principally in the areas of the fastening points adjacent to the impact area, they were capable of retaining the bag after the impact. The most severe test conditions were obtained with the configuration with not fully tightened screws simulating a case of bad installation or possible looseness of the fastenings caused by wear over time.

9.2.1.3 *Evenly distributed load tests carried out at the Laboratories of Trafileria e Zincheria Cavatorta S.p.A.*

The following evenly distributed load tests were carried out at the Beneficiary's plant, in the presence of a technical supervisor from ITC. Tests were performed on some experimental set-ups that were considered the most critical ones, to assess the compliance of the mesh with the performance requirement laid down in Regional Decree of the Veneto Region DGR No. 2774 of 22 September 2009, Annex "A". The Decree states: "The permanent meshes mounted under the inaccessible parts of the roof (e.g. skylights, domes, etc.) shall withstand a load of at least 1.50 kN/m².”
All samples passed the test showing no failure and stably supporting the approx.155 kg/m² evenly distributed loads; the deflections at the centre line of the samples under load are shown in the table below.

Experimental set-up	Height of the mesh (mm)	Opening between the lateral surfaces of the supports (mm)	Fastenings per support (n)	Spacing between fasteners (mm)	Total applied load (kg)	Load (kN/m²)	Deflection (mm)
A	2030	1730	5	500	600	**1,55**	130
B							100
C							140
C2	2530	2280	8	300	775		205

Table 27 – deflections at the centre line of the samples under load

The failure resistance value of some samples was determined although not expressly stated in the standard reference used. In particular, the samples of set-up "C" and "C2", after reaching the 1.55 kN/m² threshold and successfully passing the test, were further loaded for the determination of the breaking load; the table of results is shown below.
The results of the evenly distributed load tests can be extended to all the other heights of smaller meshes that have not been tested, including those relating to the "Coperplax" meshes.

Experimental set-up	Height of the mesh (mm)	Clear span between supports (mm)	Fastenings per support (n)	Spacing between fasteners (mm)	Total applied load (kg)	Remarks	Reference
C	2030	1730	5	500	**1125**	The sample withstand the load up to **2.96 kN/m²** then collapses due to the breaking of the wires of one side of the mesh at the fastening points.	**≥ 1.50 kN/m²**
C2	2530	2280	8	300	**1500**	The sample bears the **3.00 kN/m²** load.	

Table 28 – breaking load values of the tested samples

9.2.2 Strength tests for Coperplax mesh fastened on sandwich panels and on "bare" steel or aluminum sheets carried out at the Laboratories of the University of Parma (installation schemes D and E)

A series of tests regarded as the most representative were performed to test Installation Schemes D and E.
Two types of roofing membranes were reproduced based on the panels/sheets to which the anti-falling safety mesh, fitted with its accessories, was fastened during the tests, as better defined in Figure 20 and Table 29:

- Roofing portion consisting of sandwich panels;
- Roofing portion consisting of metal sheets.

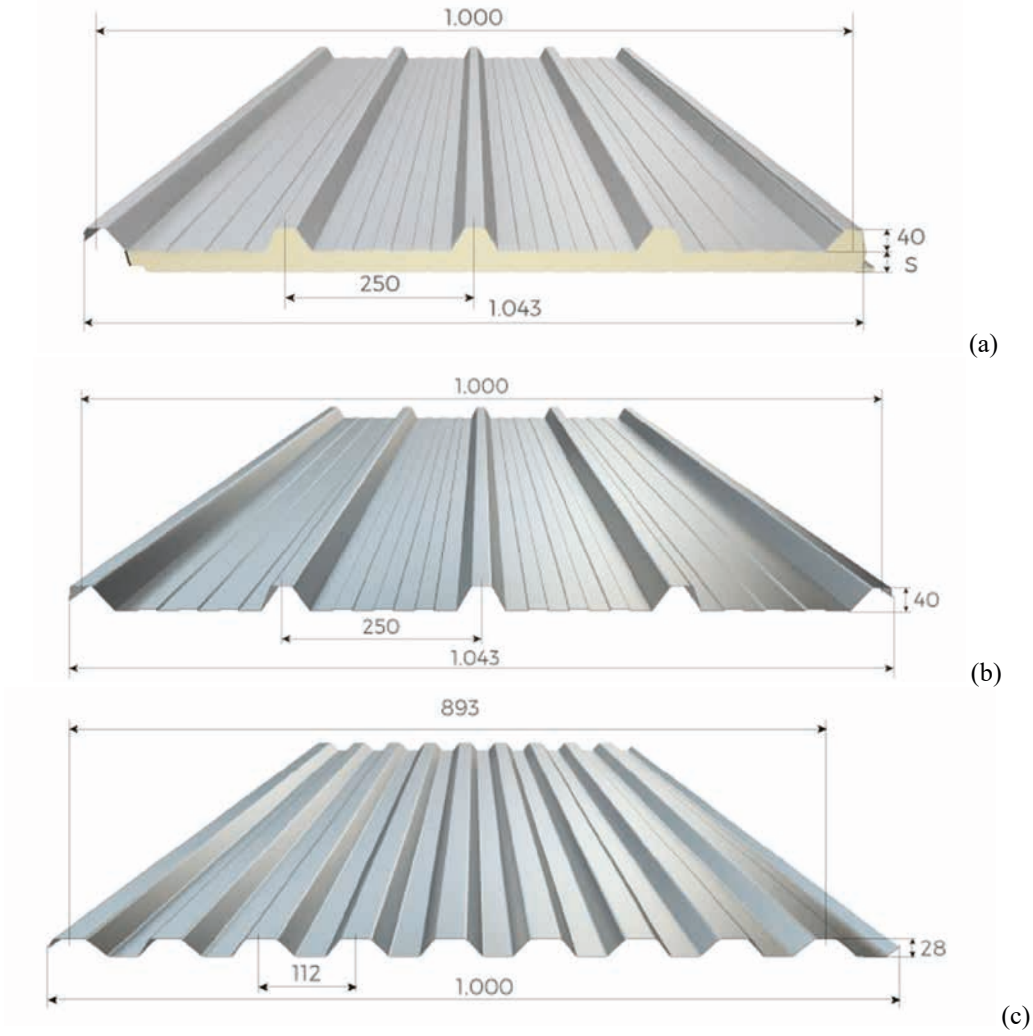


Figure 20 – (a) Sandwich panel; (b) Steel ribbed sheet; (c) Aluminium ribbed sheet

These panels/sheets were fastened on fir laths firmly anchored to the underlying support structure to simulate actual installation conditions. Coperplax H.203 cm mesh was used in all the tests conducted because it is the widest of all, and therefore, it represents the most critical scenario, pitch and type of fixings being equal. Therefore, the test results may be extended also to the meshes that have not been tested.

Element	Material	Sheet thickness (mm)	Test identification number
Sandwich panel thickness = 30 mm	Steel	4/10+4/10	1
Ribbed sheet with rib height=40 mm	Steel	5/10	2
Ribbed sheet with rib height=28 mm	Aluminium	7/10	3-4-5

Table 29 – Characteristics of roofing panels and sheets used in the tests (Figure 20)

For tests 1, 2, 3 and 5, the Coperplax H.203 cm mesh is fastened to the panels/sheets at the ribs in accordance with *Installation Scheme D* (§ 6.3.1) using the appropriate stainless steel plates with

corresponding gasket placed at a spacing of 50 cm and fixed to the sheet with 3 rivets per plate. The roofing panels are arranged in a way that the two virtual axes in which the plates are positioned, have a spacing of about 188 cm (maximum attainable height corresponding to the worst-case scenario). The mesh is fastened in a way that it is not held in tension with the structure.

For test 4, the Coperplax H.203 cm mesh is fastened to the sheet in accordance with *Installation Scheme E* (§ 6.3.2) using the appropriate stainless steel plates (with corresponding gasket and 3 rivets) at a spacing of 55 cm.
The roofing sheets plates on the two sides of the opening to be protected are arranged in a way to create a clear span of about 165 cm (maximum attainable height corresponding to the worst-case scenario). The first row of rivets is placed at least 55 mm away from the edge of the sheet close to the opening to be protected.
The mesh is fastened in a way that it is not held in tension with the structure.

9.2.2.1 Soft body impact tests (Installation schemes D and E)

Summarized below are the results of impact tests from a 50 kg soft body with vertical drop height of 120 cm from the test specimen in order to hit its center, and capable of generating an impact energy of 600 J.
The specimens under tests are composed both of meshes fastened onto double sheet ribbed sandwich panels and of meshes fastened onto steel or aluminium ribbed sheets, in order to simulate the real and most critical installation conditions.
The following soft-body impact resistance tests were carried out at the Laboratory of the University of Parma, according to specifications and methodologies agreed with the Technical Representative of ITC-CNR.

	Installation schemes "D" and "E" Meshes fastened onto sandwich panels Meshes fastened onto steel or aluminium ribbed sheets			
Test identification number	Substrate	Installation scheme	Number of stainless steel plates per side	Post-impact depression depth in the wire mesh (cm)
1	Sandwich panels (steel)	D	4	34
2	Ribbed sheet (steel)	D	4	32
3	Ribbed sheet (aluminium)	D	4	32
4	Ribbed sheet (aluminium)	E	4	39

Table 30: Meshes fastened to the side of the structure in accordance with installation scheme "D" and "E" (Tests ID.1,2,3 and 4)

All samples passed the test, as the tested wire meshes were capable of retaining the bag after the impact.
A number of damage mechanisms were also observed that only locally affected the mesh at some of the fastening points, specifically:
- some wires of the tested meshes broke at the stainless steel plates closest to the point of impact of the bag;
- some wires of the tested mesh are particularly warped because they came in contact with the heads of the fasteners connecting the panels to the laths below;
- only in one location close to one of the stainless steel plates used in *Test 4*, breakage of the wires perpendicular to the span of the opening protected by the mesh which resulted in the localized pull-out of the mesh from the fastening point. Even so, the tightness of the system was not compromised and the bag was retained.

9.2.2.2 Evenly distributed load test (Installation scheme D)

The following evenly distributed load test was carried out at the Laboratory of the University of Parma, according to specifications and methodologies agreed with the Technical Representative of ITC-CNR, to assess the compliance of the mesh with the performance requirement laid down in Regional Decree of the Veneto Region DGR No. 2774 of 22 September 2009, Annex "A". The Decree states: "The permanent meshes mounted under the non-accessible parts of the roof (e.g. skylights, domes, etc.) shall withstand a load of at least 1.50 kN/m².”

The sample passed the test showing no failure and stably supporting the evenly distributed loads exceeding 150 kg/m² amounting to approximately 212 kg/m².

The table below shows the data of the test conducted.

Test identification number	Installation scheme	Height of the mesh (mm)	Clear span between fastening plates (mm)	Number of stainless steel plates per side	Stainless steel plates spacing (mm)	Total mass applied (kg)	Load (kN/m²)	Deflection (mm)
5	**D**	2030	1878	4	550	400	**2,12>1,5**	168

Table 31: Meshes fastened to the side of the structure in accordance with installation scheme "D" (Test ID.5)

Some remarks made during and after the test are listed below:

- No signs of detachment of the stainless steel plates and rivets;
- No evidence of broken wires in the mesh;
- Clear rotations of the outer part of the ribbed sheet facing the opening protected by the mesh are observed under load conditions.

9.3 Durability

In order to assess the performance decay due to the extended exposure of the wire mesh to service conditions, samples of wire and portions of the wire mesh were taken and subjected to accelerated artificial ageing in salt spray fog for 1000 hours in accordance with standard UNI ISO 9227.

The tests performed for the assessment of the performance decay of aged samples and relevant results are shown below.

9.3.1 Tests on samples of artificially aged wire mesh carried out at the laboratories of ITC-CNR

Samples of aged galvanized steel wire	
Exposure time in salt spray fog (h)	Mass loss (%)
240	- 1.04
500	- 5.94
1000	- 15.95

Table 32: Mass loss

Samples of aged galvanized steel wire	
Exposure time in salt spray fog (h)	Strength loss of welding points (%)
240	- 5.00
500	- 7.00
1000	- 17.00

Table 33: strength loss of welding points

The decrease of the mass of the aged wire may correspond to an almost equivalent decrease of mechanical tensile strength.
However, as proved by the test results listed below, obtained from samples of aged wire meshes, the oxidation phenomenon with rust formation did not cause the wire mesh to weaken to the point of letting the bag pass through the wire mesh itself.

9.3.2 System tests on samples of artificially aged wire mesh fastened under the wooden laths carried out at the laboratories of ITC-CNR

During the ageing process, at predetermined intervals, some meters of "Copertec" mesh were removed in order to prepare the impact resistance tests with a 50 kg soft body with vertical drop height of 120 cm generating an impact energy of 600 J on wire meshes fastened under the wooden laths to simulate real installation conditions.

Copertec meshes aged in salt spray fog and fastened under the wooden laths with loosened screws					
Exposure time in salt spray fog	Wire mesh width (cm)	Skylight opening (cm)	Fastening points per side (No.)	Spacing between fasteners (cm)	Post-impact depression depth in the wire mesh (cm)
240	102	70	4	100	47
500	102	70	4	100	47
1000	102	70	4	100	63

Tabella 34: Copertec meshes aged in salt spray fog and fastened under the wooden laths with loosened screws

All artificially aged Copertec mesh samples passed the test and were capable of retaining the bag after the impact even though the wires of the mesh broke in different ways in the areas of the fastening points.
Although the artificially aged samples of the Copertec mesh passed the impact test, this variant should be considered at the safety limit because, after 1000 hours in salt spray fog, the sample showed a considerable number of unsoldered points due to severe oxidation conditions. The use of the Coperplax mesh is therefore recommended under severe indoor environmental conditions (chemical industries, etc.) and close to heavily polluted or marine areas.

CONSIGLIO NAZIONALE DELLE RICERCHE
Istituto per le Tecnologie della Costruzione

THE DIRECTOR

Having regard to:

- the Decree Law No. 127 of 04/01/2013 concerning the "Reorganization of the National Research Council of Italy";
- the Decree Law No. 213 of 31/12/2009 concerning the "Reorganization of Research Bodies in implementation of Article 1 of Law No. 165 of 27/09/2007";
- the Decree Law No. 218 of 25/11/2016 "Streamlining of the activities of public research bodies pursuant to Article 13 of Law No. 124 of 07/08/2015;
- the Deliberation of the President of the National Research Council of Italy No. 53 of 12/09/2007 concerning "Construction Technologies Institute (ITC) established in San Giuliano Milanese (MI): confirmation and replacement of its By-Law";
- the application submitted by Metallurgica Abruzzese S.p.A. (Gruppo Cavatorta) for the issuing of the renewal of Certificate No. 650/19 for the product "Copertec" and its variant "Coperplax" under this document;
- the documentation submitted to illustrate products, manufacturing systems, results of the executed tests and reports of the surveys carried out at the plant and at the construction sites;

declares that

the wire mesh named "**Copertec**" and its variant "**Coperplax**" manufactured by
Metallurgica Abruzzese S.p.A. (Gruppo Cavatorta)
in the plants located in:

- Contrada Marina – Mosciano S. Angelo (TE) - Italy,
- Via Baganza, 6 - 43030 - Calestano (PR) - Italy, at Trafileria e Zincheria Cavatorta S.p.A. (Gruppo Cavatorta)
- Via Fondovalle 2 – 43040 – Ghiare di Berceto (PR) - Italy

is fit for use in agricultural/industrial buildings as a permanent anti-falling safety system under plastic zenith skylights when such plastic materials are not able to withstand concentrated loads and do not meet the requirements set forth in the Technical Standards for Constructions implemented by Decree of the Italian Ministry of Infrastructures and Transport of 17/01/2018 on non-accessible roofs.

whose characteristics are as defined above and under the following conditions:

MANUFACTURING AND ACCEPTANCE CONDITIONS

- The beneficiary is obliged to perform acceptance controls on raw materials both during the manufacturing phase and on the finished product, as specified in § 5.1 of the Technical Description and to enter results into appropriate record books.
- The manufacturer's Factory Production Control is essential in order to ensure the ongoing quality characteristics of the finished product over time as mentioned above, as a basis for the largest part of the fitness for use assessment.
- Such control shall be extended also to those elements making part of the proposed systems that are not directly produced by the beneficiary of the Certificate.
- The beneficiary shall be subject to continuous periodic inspections aimed at the verification of the continuity of manufacturing, according to the frequencies and conditions established by ITC-CNR.

INSTALLATION CONDITIONS

- The fitness for use declared in the present Technical Approval is specifically and exclusively related to the installation conditions described in detail in § 6 of the Technical Description.
- Installation operations have as strong an influence on the final result as constancy of quality. The on-site assembly is carried out in accordance with the indications contained in the present Technical Approval and in the technical manual published by the beneficiary and is done by qualified installation companies, that shall receive, either in advance or on demand, technical assistance from the beneficiary.
- Both design and assembly of the anti-falling safety mesh shall be coordinated by the project manager and the construction manager.
- Rolls shall be handled in a way that no damage is done to them, according to the handling instructions that will be specially prepared by the beneficiary.

CONDITIONS FOR USAGE

- The results obtained from the tests conducted to evaluate the durability of the system installed after ageing of the wire mesh, indicate that the system, if used in aggressive environmental conditions, shall be periodically checked out and receive regular maintenance in order to ensure that its mechanical properties are maintained. In any case, a periodic visual control is recommended to verify that the system is well preserved over the years.

CONDITIONS FOR MARKING AND STORAGE

- On-site storage shall be done in strict compliance with the instructions provided to this end by the beneficiary of the Certificate.
- All packaging materials used to pack up the product shall bear reference to the present Technical Approval in the following form:

A.T. ITC-CNR No. 650/22 of 12.05.2022
Validity of the Certificate: five years
Intended use: Copertec, permanent anti-falling safety system under plastic zenith skylights or, only for the PVC-coated variant Coperplax, direct protection from the outside of non-accessible translucent roofing sheets, such as flat or corrugated skylights in plastic material, mounted on double sheet sandwich panels or on corrugated or ribbed metal sheets (in steel or aluminium).

VALIDITY CONDITIONS

- This Technical Application Document does not bind ITC CNR, nor does it involve any legal liability, whether civil or penal, on its part in relation to events or consequences deriving from the total or partial application of materials, structures, mechanisms or systems covered by the certificate.
- This Certificate is valid for five years, i.e. until 11.05.2027, in any case not beyond the end of the transitional period for the mandatory entry into force of a European Technical Specification laid down in Regulation (EC) 305/2011 that makes it mandatory to affix the CE Marking.
- The lists of valid Certificates are periodically made available and updated by ITC on its website: www.itc.cnr.it.

This document is made up of 30 pages.

S. Giuliano Milanese,

The Italian version of this Technical Application Document issued on 12.05.2022 is signed in original.

DIRECTOR OF ITC-CNR
Prof. Antonio Occhiuzzi

Antonio Occhiuzzi
01.08.2022 11:16:52
GMT+00:00

FASTENING ELEMENTS DATA SHEETS

The tests were carried out using the fastening systems shown on the following pages; however, alternative fastening systems may be used provided they have equivalent or superior technical characteristics.

CONCRETE SCREW WITH EXAGONAL HEAD

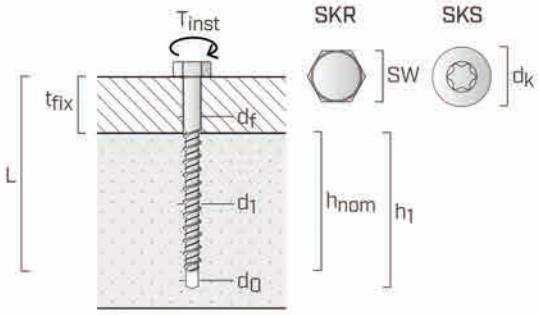
CHARACTERISTICS

FOCUS	screw for concrete
HEAD	hexagonal and countersunk

MATERIAL

Galvanized carbon steel.

SKR - SKS GEOMETRY



d_1	external diameter of anchor
L	anchor length
t_{fix}	maximum fastening thickness
h_1	minimum hole depth
h_{nom}	nominal anchoring depth
d_0	hole diameter in the concrete support
d_f	maximum hole diameter in the element to be fastened
SW	wrench size SKR
d_k	SKS head diameter
T_{inst}	tightening torque

CODES AND DIMENSIONS SKR - SKS

SKR hexagonal head

CODE	d_1 [mm]	L [mm]	t_{fix} [mm]	$h_{1,min}$ [mm]	h_{nom} [mm]	d_0 [mm]	$d_{f\ timber}$ [mm]	$d_{f\ steel}$ [mm]	SW [mm]	T_{inst} [Nm]	pcs
SKR7560	7,5	60	10	60	50	6	8	8-10	13	15	50
SKR7580		80	30	60	50	6	8	8-10	13	15	50
SKR75100		100	20	90	80	6	8	8-10	13	15	50
SKR1080	10	80	30	65	50	8	10	10-12	16	25	50
SKR10100		100	20	95	80	8	10	10-12	16	25	25
SKR10120		120	40	95	80	8	10	10-12	16	25	25
SKR10140		140	60	95	80	8	10	10-12	16	25	25
SKR10160		160	80	95	80	8	10	10-12	16	25	25
SKR12100	12	100	20	100	80	10	12	12-14	18	50	25
SKR12120		120	40	100	80	10	12	12-14	18	50	25
SKR12140		140	60	100	80	10	12	12-14	18	50	25
SKR12160		160	80	100	80	10	12	12-14	18	50	25
SKR12200		200	120	100	80	10	12	12-14	18	50	25
SKR12240		240	160	100	80	10	12	12-14	18	50	25
SKR12280		280	200	100	80	10	12	12-14	18	50	25
SKR12320		320	240	100	80	10	12	12-14	18	50	25
SKR12400		400	320	100	80	10	12	12-14	18	50	25

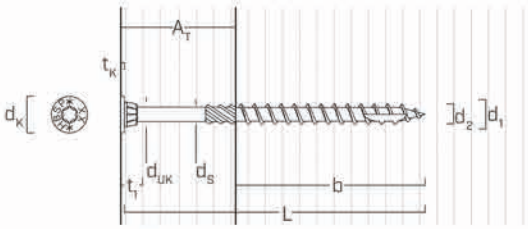
PAN HEAD WOOD SCREW

CHARACTERISTICS

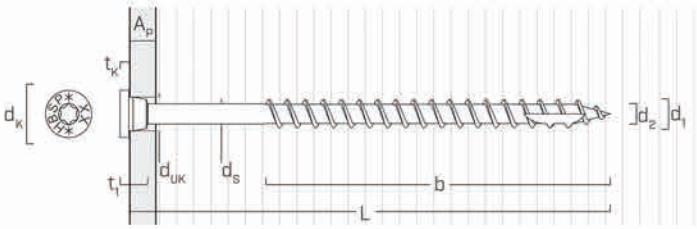
HEAD	shoulder for plate

MATERIAL
Carbon steel.

GEOMETRY AND MECHANICAL CHARACTERISTICS



HBS P EVO - 5,0 | 6,0 mm



HBS P EVO - 8,0 | 10,0 mm

Nominal diameter	d_1	[mm]	5	6	8	10
Head diameter	d_K	[mm]	9,65	12,00	14,50	18,25
Tip diameter	d_2	[mm]	3,40	3,95	5,40	6,40
Shank diameter	d_S	[mm]	3,65	4,30	5,80	7,00
Head thickness	t_1	[mm]	5,50	6,50	8,00	10,00
Washer thickness	t_K	[mm]	1,00	1,50	3,40	4,35
Underhead diameter	d_{UK}	[mm]	6,0	8,0	10,00	12,00
Pre-drilling hole diameter(1)	d_V	[mm]	3,0	4,0	5,0	6,0
Characteristic yield moment	$M_{y,k}$	[Nm]	5,4	9,5	20,1	35,8
Characteristic withdrawal-resistance parameter(2)	$f_{ax,k}$	[N/mm²]	11,7	11,7	11,7	11,7
Associated density	ρ_a	[kg/m³]	350	350	350	350
Characteristic head-pull-through parameter(2)	$f_{head,k}$	[N/mm²]	10,5	10,5	10,5	10,5
Associated density	ρ_a	[kg/m³]	350	350	350	350
Characteristic tensile strength	$f_{tens,k}$	[kN]	7,9	11,3	20,1	31,4

(1) Pre-drilling valid for softwood.
(2) Valid for softwood - maximum density 440 kg/m³.
For applications with different materials or with high density please see ETA-11/0030.

CODES AND DIMENSIONS

d_1 [mm] *[in]*	CODE	L [mm]	L *[in]*	b [mm]	A_T [mm]	A_P [mm]	pcs
5 *0.20* TX 25	HBSPEVO550	50	*1 15/16*	30	20	1.0 ÷ 10.0	200
	HBSPEVO560	60	*2 3/8*	35	25	1.0 ÷ 10.0	200
	HBSPEVO570	70	*2 3/4*	40	30	1.0 ÷ 10.0	100
	HBSPEVO580	80	*3 1/8*	50	30	1.0 ÷ 10.0	100
6 *0.24* TX 30	HBSPEVO680	80	*3 1/8*	50	30	1.0 ÷ 10.0	100
	HBSPEVO690	90	*3 1/2*	55	35	1.0 ÷ 10.0	100
8 *0.32* TX 40	HBSPEVO840	40	*1 9/16*	32	-	1.0 ÷ 15.0	100
	HBSPEVO860	60	*2 3/8*	52	-	1.0 ÷ 15.0	100
	HBSPEVO880	80	*3 1/8*	55	-	1.0 ÷ 15.0	100
	HBSPEVO8100	100	*4*	75	-	1.0 ÷ 15.0	100

d_1 [mm] *[in]*	CODE	L [mm]	L *[in]*	b [mm]	A_P [mm]	pcs
8 *0.32* TX 40	HBSPEVO8120	120	*4 3/4*	95	1.0 ÷ 15.0	100
	HBSPEVO8140	140	*5 1/2*	110	1.0 ÷ 20.0	100
	HBSPEVO8160	160	*6 1/4*	130	1.0 ÷ 20.0	100
10 *0.40* TX 40	HBSPEVO1060	60	*2 3/8*	52	1.0 ÷ 15.0	50
	HBSPEVO1080	80	*3 1/8*	60	1.0 ÷ 15.0	50
	HBSPEVO10100	100	*4*	75	1.0 ÷ 15.0	50
	HBSPEVO10120	120	*4 3/4*	95	1.0 ÷ 15.0	50
	HBSPEVO10140	140	*5 1/2*	110	1.0 ÷ 20.0	50
	HBSPEVO10160	160	*6 1/4*	130	1.0 ÷ 20.0	50
	HBSPEVO10180	180	*7 1/8*	150	1.0 ÷ 20.0	50

NOT SUPPLIED FASTENING ELEMENTS DATA SHEETS (INSTALLATION LAYOUTS A, B, C)

SELF-DRILLING SCREW FOR STEEL

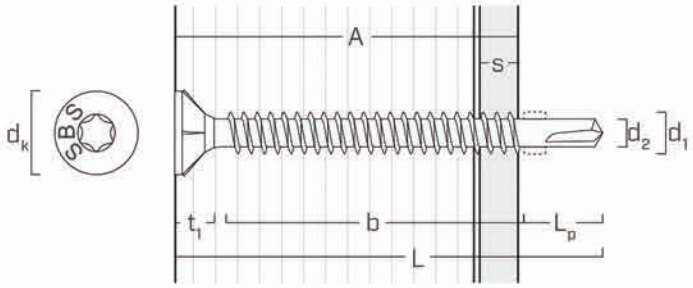
CHARACTERISTICS

FOCUS	self-perforating tip with protective fins
HEAD	countersunk with under-head ribs

MATERIAL

Galvanized carbon steel.

GEOMETRY



SBS

			SBS				SPP
Nominal diameter	**d_1**	**[mm]**	**4,2**	**4,8**	**5,5**	**6,3**	**6,3**
Head diameter	d_K	[mm]	8,00	9,25	10,50	12,00	12,50
Tip diameter	d_2	[mm]	3,30	3,50	4,15	4,85	4,85
Head thickness	t_1	[mm]	3,50	4,20	4,80	5,30	5,30
Tip length	L_p	[mm]	10,0	10,5	11,5	15,0	20,0

CODES AND DIMENSIONS

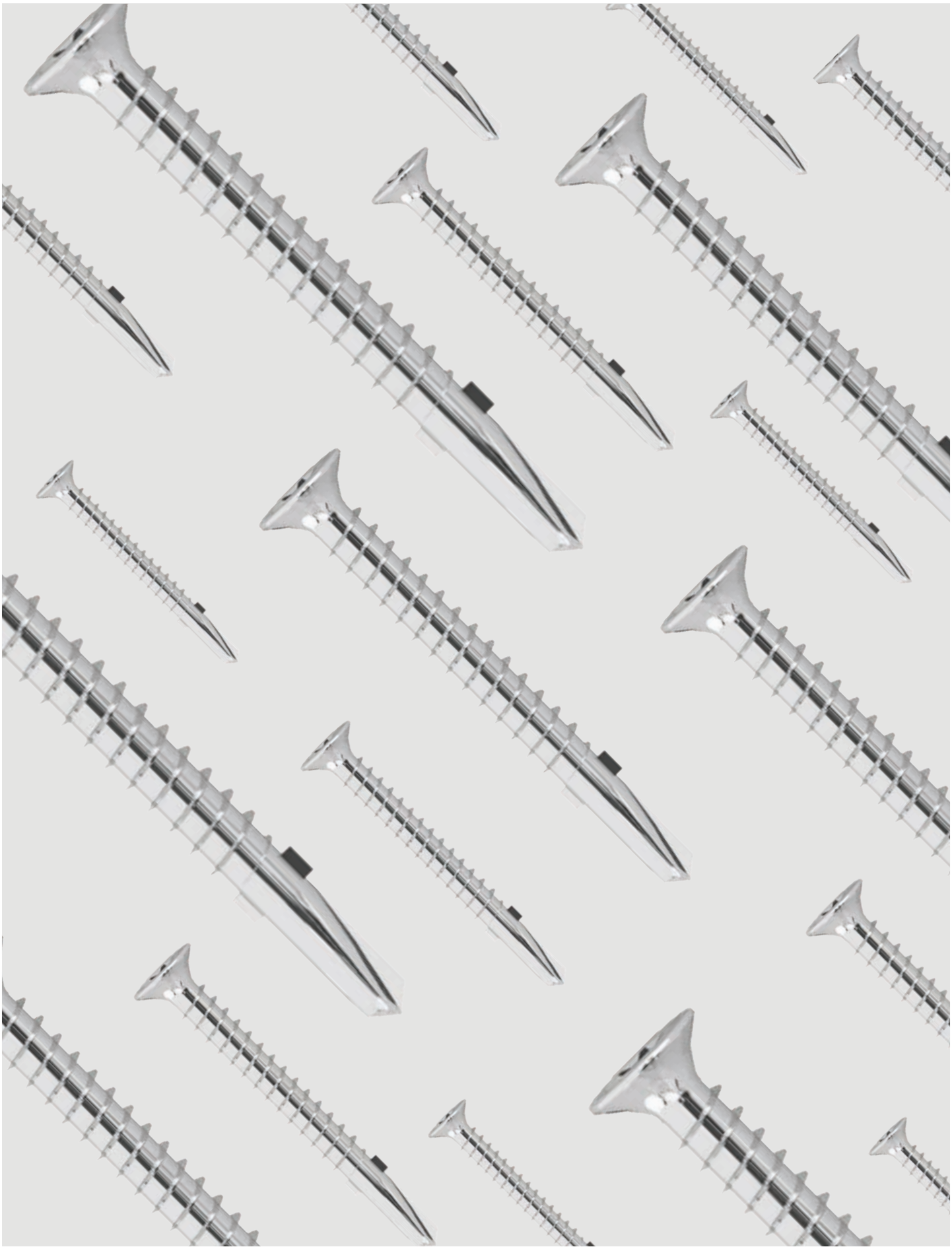
SBS

d_1 [mm]	CODE	L [mm]	b [mm]	A [mm]	s_1 [mm]	s_2 [mm]	pcs
4,2 TX 20	SBS4232	32	19	17	1÷3	2÷4	500
	SBS4238	38	25	23	1÷3	2÷4	500
4,8 TX 25	SBS4838	38	23	21	2÷4	3÷5	200
	SBS4845	45	30	28	2÷4	3÷5	200
5,5 TX 30	SBS5545	45	29	26	3÷5	4÷6	200
	SBS5550	50	34	31	3÷5	4÷6	200
6,3 TX 30	SBS6360	60	40	36	4÷6	6÷8	100
	SBS6370	70	50	46	4÷6	6÷8	100
	SBS6385	85	65	61	4÷6	6÷8	100
	SBS63100	100	80	76	4÷6	6÷8	100

SPP

d_1 [mm]	CODE	L [mm]	b [mm]	A [mm]	s_1 [mm]	s_2 [mm]	pcs
6,3 TX 30	SPP63125	125	60	96	6÷8	8÷10	100
	SPP63145	145	60	116	6÷8	8÷10	100
	SPP63165	165	60	136	6÷8	8÷10	100
	SPP63180	180	60	151	6÷8	8÷10	100
	SPP63200	200	60	171	6÷8	8÷10	100
	SPP63220	220	60	191	6÷8	8÷10	100
	SPP63240	240	60	211	6÷8	8÷10	100

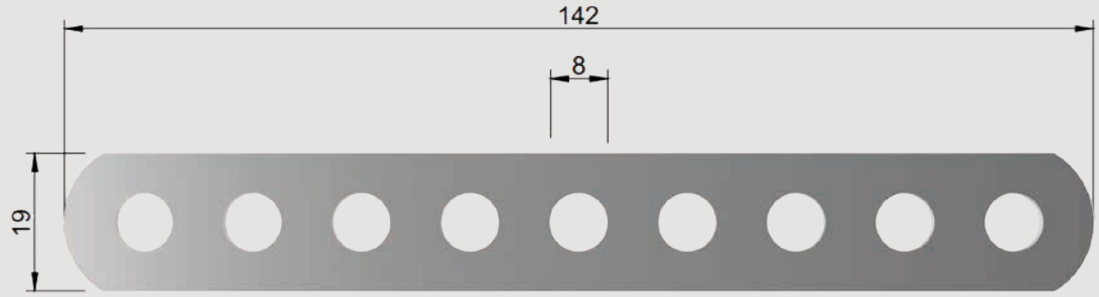
s_1 thickness, steel plate S235/St37
s_2 thickness, aluminium plate



SUPPLIED FASTENING ELEMENTS SHEETS (INSTALLATION LAYOUTS D, E)

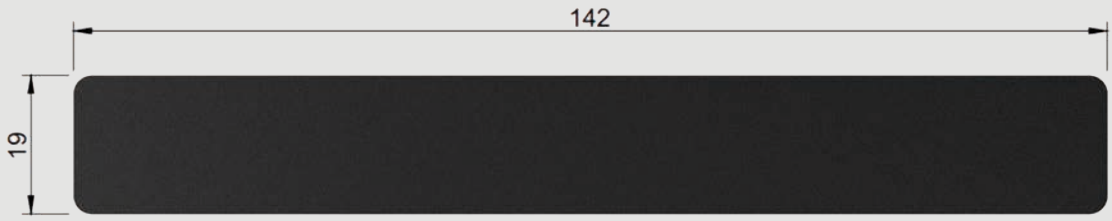
INOX PLATE (AISI 304)

Length	142 mm
Width	19 mm
Thickness	2.5 mm
Material	Inox Aisi 304
Weight	0,052 kg

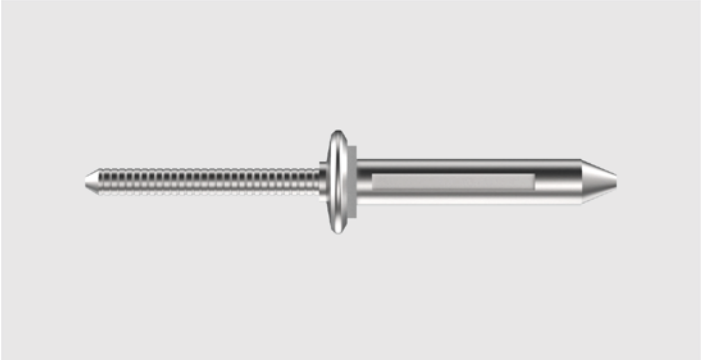


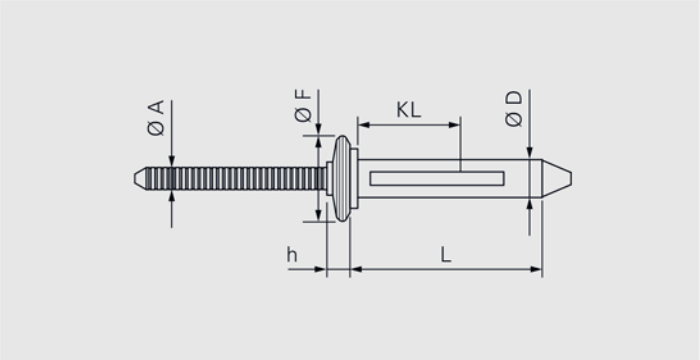
EPDM GASKET

Length	142 mm
Width	19 mm
Thickness	4.0 mm
Material	EPDM
Shore	30 ÷ 50



BLIND RIVET 7,7x28 mm





Application
Fastening of metal profiles onto profile sheets
Fastening of overlaps of profile sheets
Fastening of metal profiles onto metal decks and liner trays
Fastening of metal profiles onto sandwich panels

Component 1 (t_I)		Component 2 (t_{II})		$\Sigma_{max}\, t_I + t_{II}$
Steel	≥0.40	Steel	≥0.40	–
Aluminium	≥0.50	Aluminium	≥0.50	–
Aluminium	≥0.50	Steel	≥0.50	–

Fastener material

Aluminium 5056 (EN573)

Sealing washer: EPDM

Approvals

CE

ETA-13/0255

Features and Benefits

- Multifunctional blind rivet for a variety of applications
- High clamping range with clamping force independent of the clamping thickness
- High quality EPDM sealing washer for long-term weather sealing
- Non-detachable and vibration-resistant connection given by the locking ribs
- Save setting given by the three load bearing legs

Rivets in aluminium onto steel and aluminium

Product code	PU	Ø	L	CL_{met}	Pre-drill Ø	Ø A	Ø F	h	
RV6604/6/3W-BULB-TITE	1000	5.20	17.50	1.30–4.80	5.30–5.50	2.90	11.60	3.40	1570655
RV6604/6/4W-BULB-TITE	1000	5.20	19.10	1.60–6.40	5.30–5.50	2.90	11.60	3.40	1570656
RV6604/6/6W-BULB-TITE	1000	5.20	22.20	4.70–9.50	5.30–5.50	2.90	11.60	3.40	1570658
RV6604/6/8W-BULB-TITE	1000	5.20	25.40	7.90–12.70	5.30–5.50	2.90	11.60	3.40	1570659
RV6604/6/10W-BULB-TITE	1000	5.20	28.60	11.10–15.90	5.30–5.50	2.90	11.60	3.40	1570629
RV6604/6/12W-BULB-TITE	1000	5.20	31.80	14.30–19.10	5.30–5.50	2.90	11.60	3.40	1570652
RV6603/9/6W-BULB-TITE	1000	7.70	28.00	0.80–9.50	7.80–8.20	4.50	15.90	4.80	1570647
RV6605/9/6W-BULB-TITE	1000	7.70	28.00	1.10–9.50	7.80–8.20	4.50	19.40	5.30	1570660
RV6603/9/10W-BULB-TITE	1000	7.70	34.00	6.40–15.90	7.80–8.20	4.50	15.90	4.80	1570649

Documentation

Approval document (ETA) I Declaration of performance (DoP)

All measures in mm

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