swissporton

APPLICATION GUIDE

Side interlocking plain roof tiles

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The informations provided in this documents, are textual guidelines, the datas in the form of technical drawnings correspond to the current technical knowledge at the time of publication and based to the experience of CREATON South-East Europe Kft.. This application guide contains only a part of the product informations. The described applications, examples, do not take into account the special features that may arise in individual cases.

All datas and the suitability of the material for the intended use must always be checked on the construction site! CREATON South-East Europe Kft. disclaims all warranties related the provided informations. This includes typographical errors and the subsequent changes to the specifications.

More informations: **swissporTON.hu**

PART I.
General rules and informations

More informations: **swissporTON.hu**

I. Standards and regulations

General design and construction rules and regulations for the swissporTON side interlocking clay tiles. Compliance with regulations and rules is important because warranty claims can only be enforced if the regulations are complied and the original accessories are installed.

EN 1304 Clay roofing tiles and fittings. Product definitions and specifications

ÉMSZ* Cserépfedések tervezési és kivitelezési szabályai.

ÉMSZ* Bádogos munkák tervezési és kivitelezési szabályai.

ÉMSZ* Alátéthéjazatok tervezési és kivitelezési szabályai.

ZVDH Zentralverband des Deutschen Dachdeckerhandwerks.

**Épületszigetelők, Tetőfedők és Bádogosok Magyarországi Szövetsége (Hungarian Association of Building Insulators, Roofers and Tinsmiths)*

The most importants are:

- DIN 4108 Thermal insulation in buildings
- DIN 4109 Sound insulation in buildings
- DIN 18516 Cladding for external walls, ventilated at rear
- DIN 68800 Wood preservation
- VOB/C DIN 18338 General technical specifications in construction contracts (ATV) - Roofing work
- VOB/C DIN 18351 General technical specifications in construction contracts (ATV) - Work on back-ventilated curtain walling

II. From clay to tile

1. Main properties of clay:

The clay were formed by the wheathering of feldspar-rich magmatic rocks. It is a multi-component colloidal system, so:

- the particle sizes of the components are very small, less then 2mμ,
- does not crystallize,
- the proportion of each component varies depending on the place and circumstances of origin.

2. Components of clay mineral:

- clay minerals formed during rock erosion: kaolinites, illites, montmorillonites, (aluminosilicates)
- fragmented but not transformed weathering residue corresponding to the original rocks (mica, quartz)
- other minerals formed during rock deposition (gypsum, dolomite)
- impurities (organic matter, iron oxide)

Of the individual components, clay minerals are the predominant, usually more than 85%.

3. The clay tile:

Clay as a building material has had a very special relationship with humanity from the very beginning.

Tile, as the first building material shaped by human hands, dates back nearly 10,000 years. From quality clay, people created their first information-bearing objects that have survived to this day in the form of cuneiform pots.

Thanks to its excellent building physical and natural properties, it has been and still is one of the most popular building materials: its unique synthesis provides optimal protection against moisture and frost, while being diffusible and fireproof, UV-resistant and extremely durable. All of these are extras so that tile, as a popular building material, still retains its place today, precisely in terms of durability and is therefore so indispensable for swissporTON.

It is millions of years old and still relevant today

The unique raw material has always proved its worth since time immemorial. Using state-of-the-art technologies, swissporTON 's clay specialists have been working for decades to shape clay into a special brand product that plays a key role throughout Europe.

III. Side interlocking plain tile:

1. Color and coating:

„Natural" original surface:

Natural ceramic roof tiles do not have any coating, their color is determined by the clay used for production and the production technology. Each roof tile can be considered unique and with this variety it impresses the viewer that with slight fluctuations it first boasts a natural hue and then forms the desired natural "tarnish". It is made from living, moisture-regulating, natural clay, without the addition of chemical additives, in the spirit of swissporTON 's ecological responsibility. In the case of natural tiles, it should be taken into account that there may be a difference in the color of tiles made of clay mined in the same mine but at a different place or time.

Engobe:

The main components of the clay are the silicate minerals and metal oxides. The engobe is a natural coloring material called clay sludge, which containing clay minerals and the main components are the same minerals and oxides like clay tiles have, so the two materials have the same properties. This procedure has been used by potters for thousands of years to make their pots more beautiful, colorful, finer looking, and last but not least, more durable. The surface treatment and engobing of the tiles is carried out in a similar way today, although we have already called on the help of science to determine exactly what engobic composition we need to achieve the desired effect. Therefore, it is possible that, after leaving the drying oven, the shaped and dried raw clay tiles may receive the engob, which is absorbed into the material through the surface poles of the tile. With the firing process, the engob

becomes chemically one with the tile, this relationship can be perfect and inseparable if the two materials are not unknown to each other, so they have the same chemical composition with the same properties. Thus, in this case, this means that the engob is not a coating that does form a separate layer of paint on the surface of the tile, but it is part of the ceramic tile. This creates a highly resistant surface.

The engobing creates the opportunity to enrich the various tiles in a very special way and at the same time do something for surface durability and lasting color retention. Natural earth paint from clay deposits specially selected for this purpose is applied to the unburned tiles and fused with it at a temperature above 1000ºC using a non-contact firing process. This demanding process gives swissporTON ceramic tiles a particularly aesthetic appearance and a wide range of colors.

2. Manufacturing Technology

Raw material mining

The first and most important step in tile production is to provide the right raw material. Based on preliminary raw material research, swissporTON found this near the town of Lenti in the western half of the country.

The raw material is extracted by opencast mining, during which the top soil layer (up to a depth of about 25 - 40 cm) is removed, followed by a barren layer unsuitable for product production (up to a further depth of about 40 - 120 cm). Both layer will be deposited separately in the area of the mining plot. After the removal of the top layers, the extraction of the utility material (clay suitable for tile production) can start. The pre-depot is built by mixing different amounts of materials from different parts of the mine. Upon completion of the mining process, recultivation is carried out using the previously extracted soil layers, and the mine is returned to the nature.

Extraction, depot built-up

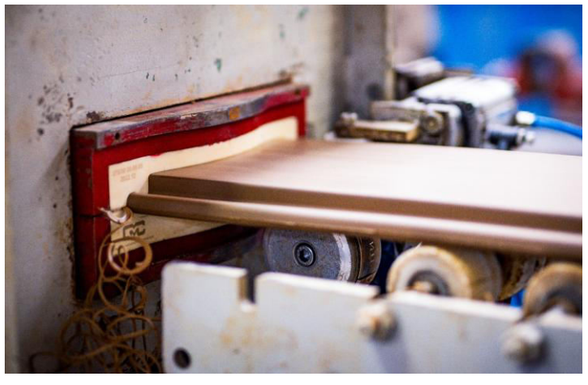
As a first step, a pre-depot will be built on the mine site. The desired goal, to produce the best possible (homogenized) clay mixture, can be achieved by taking into account the preliminary test data of each layer. In the second phase of the extraction, a service depot (Halde) is built from the pre-depot material next to the preparation plant (thus the feedstock is further mixed and homogenized). These processes are repeated according to the raw material requirements of the manufacturing plants

Clay preparation

The depot described above will be dismantled by a front loader by dismantling in a vertical plane. The raw material thus obtained is stored in the box feeder of the preparation plant. From here it is passed on a conveyor belt to a pan mill, in which it is further mixed, and the appropriate plasticity is set by the controlled addition of water. In the next operation, the raw material is ground between 2 rows of rollers. For the first time, crushing of larger particles is ensured with cylinder distances of 1.2 and then 0.8 mm. The clay thus processed is conveyed by means of a conveyor belt to a round store where it is stored for approximately 2 weeks. In this way, the clay can be properly rested and homogenized before use. In addition to frequent sampling, the raw material used is subjected to laboratory tests, where it is examined for its color, shrinkage, water uptake and sedimentation. The latter operation is intended to determine the particle size distribution of the clay. With the help of a bucket-row excavator, we can extract the amount of raw material needed for production from the round storage. It is transported and distributed between the two factories on underground belts.

Forming the tile

The properly prepared and then rested raw material enters the plant with the help of a belt, where we manufacture the drawn-type products (plain and Plain tiles) and their accessories which has a cross-section constant along their longitudinal axis.



The raw material is transferred to a roller crusher, from which it is transferred to a double-shaft mixer by a collecting plate. Here we compact first with mixing paddles and then with an auger axle to achieve the most compressed material possible. From this it is then shredded into a vacuum chamber with a slicing knife. Vacuuming the chamber is necessary, because any air bubbles that may remain inside of the clay has to be removed from the it with absolute certainty. From here, the auger transports the raw material to the ceramic opening. Exiting through the ceramic opening, we get an endless flow of clay, which is cut to the right size and shape on the cutting table set for the given product, so we get the raw shape of the tile.

The raw tiles are placed on stainless trays. 19-20% moisture can be measured in the raw material. The stacking equipment stacks the trays on the drying trolley, which, regardless of the product, has 1,800 semi-finished products.

Drying

Moving on rails, the cars enter a counter-current (the direction of air movement is opposite to the direction of product movement) tunnel dryer, where the tiles begin to dry. In the first step, they are placed in a medium with a relative humidity of 40°C, close to 100%, so that the drying starts gently. By continuously increasing the temperature and decreasing the humidity, we reach 90°C and 0% relative humidity in 1 day. At that time, there is an additional 2-3% moisture in the tile, which will only be lost during the firing process. There are 66,000 products in the dryer at the same time.

Engobing process

The final color of the tile is determined by the so-called engobe applied after drying. Its composition is made up of metal oxides varying in color and other natural materials. The aqueous mixture of these is applied evenly to the surface of the tile with the help of different spray equipment. The most important physical parameter of engobe paint is its coefficient of thermal expansion, which must be the same as that of its tile. The existence of this is constantly checked during production. In this way, we can guarantee that the engob and the tile will not live "separate lives" even after years.

Firing

After engobing, the tiles are placed in so-called "H-Cassettes" of their type, with millimeter-accurate Fanuc robots. The individual types of tiles (base, verge, ridge etc.) are supported in this case at several points, thus guaranteeing a perfect, deformation-free finished product. The accuracy of the combustion curve is guaranteed by PLC-controlled, automatic combustion zones. This guarantees that high-quality ceramic roof tiles can leave our factory any day of the year.

Finished goods classification and packaging

After firing in the tunnel kiln, each finished product is visually inspected and acoustically tested with the help of a hammer. The latter is needed to filter out hairline cracks that are not visible to the naked eye. After that, small bundles are formed from the product, then they are arranged on EUR pallets, strapped to each other and to the pallet. The resulting unit stack is stored in the warehouse area with six forklifts capable of moving three pallets at a time, from where it is transported to the customer by trucks.

IV. The roof:

The roof not only determines the aesthetic of our house, but also has many other functions, it has to perform many different tasks. It should provide the fullest possible protection against the various weather effects. It is exposed to high loads due to constantly changing weather conditions. A good roof should therefore be frost, storm, and rain resistant. The swissporTON 's roof system offers a timeless and aesthetic solution for every need.

1. Layers of the general roof structure:

- Rafter
- Underlayment
- Counter-batten
- Roof batten
- Side interlocking plain tile

2. Rafter:

The roofing plane and the slope of the roof structure is determined by the rafters. In addition to their own weight, the rafters and the supporting elements carry the weight of the roof and other elements of the roof, as well as the wind and snow load. The cross-section and distribution of the rafters in the roof structure must be designed for these loads.

3. Underlayment:

When higher than normal requirements are expected, additional protection must be provided during design and construction. The underlayment will be installed under the roof covering as an additional measure to increase the watertightness of the roof structure.

Functions of the underlayment:

- Protects against powder snow
- Protects against rainfall even with higher wind pressure
- Lead out the condensation water
- Helps to remove vapors from the thermal insulation
- Lead out the moisture from the melting of the accumulated snow
- Temporarily takes over the role of the tiles when the cover is damaged, until the roofing is repaired.

Underlayment groups and their characteristics:

Main group	Variations	Overlaps	Materials	Position	Support
1./ underlay insulation	**waterproof underlayment**	welded or glued joints and overlaps	bituminous or plastic sheets	above the counter-batten	complete formwork (decking or walkable thermal insulation)
	watertight underlayment			under the counter-batten	
2./ supported underlays	**windproof underlayment**	welded or glued joints and overlaps or sealed groove	insulating sheets, membranes or plates		
	free overlapping underlayment	without glued or sealed joints, boards with groove splicing or with overlaps			
3./ unsupported underlayment	**free laid underlayment**	without glued or sealed joints, boards with groove splicing or with overlaps	membranes, sheets		none

Standpoints for selecting the underlayment:

- The **standard roof pitch** of the roof tile model used
- **Designed pitch of the roof** (if there are several different pitch in one roof surface, then the lowest one must always be taken into account and the corresponding underlayment applied on the complete roof plane)
- When there is a **living space in the attic**, it is always necessary to install an underlayment.
- **Roof shape, complexity of roof structure**: Rafter length longer than average (more than 10 m), complex roof profile, snow-trap roof sections, etc.
- **Special weather conditions**: In areas with above-average rainfall, snow, and wind conditions, as well as in areas above 600 m above sea level, the cover is subject to increased requirement.
- **Other conditions**: Local building regulations, historical protection, or a higher level of requirements due to the special usage of the interiors

Several aspects need to be considered when determining the appropriate underlay for a given roof structure. These aspects called as "stress factors" during selection. All stress factors must be taken into account! For each type of tile, the underlayment specified in the table are the lightest additional measures required, for which a higher rated underlay can always be selected.

Choosing the underlayment for side interlocking plain tiles:

The planned roof pitch "α"	-	One additional requirement	Two additional requirement	Tree additional requirement
$\alpha \geq \alpha_k$		**free laid underlayment**	**free laid underlayment**	**free laid underlayment**
$\alpha < \alpha_k$ $\alpha \geq \alpha_k - 6°$	**free laid underlayment**	**free laid underlayment**	**free overlapping underlayment**	**windproof underlayment**
$\alpha < \alpha_k - 6°$ $\alpha \geq \alpha_k - 10°$	**watertight underlayment**	**watertight underlayment**	**watertight underlayment**	**watertight underlayment**
$\alpha < \alpha_k - 10°$	**watertight underlayment**	**waterproof underlayment**	**waterproof underlayment**	**waterproof underlayment**
$\alpha < 10°$	**Side interlocking plain roof tile cover can't be made!**			

*α_k *(standard roof pitch): is the angle where the specific roof tile model met the watertightness requirement without any additional measure.*

When using the table, the following must be taken into account:

Among the criteria determining the selection, the standard roof pitch of the tile model and the utilization of the attic space are of the greatest importance. The other factors are given equal weight but somewhat lighter weight, so this is shown in the selection table not item by item but as the number of requirement factors.

Grouping the swissporTON roof tiles by roof pitch:

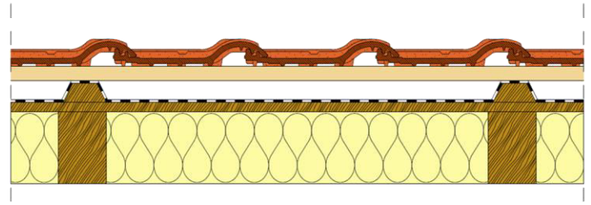
Model	DIN*	swissporTON **	Free laid underlayment	Windproof underlayment	Watertight underlayment	Waterproof underlayment
			"ECO"	"BASIC"	"PRO"	"ULTRA"
"PROFIL"	35°	30°	≥ 24°	≥ 22°	≥ 18°	≥ 10°
"RÓNA" segment cut	35°	30°	≥ 24°	≥ 22°	≥ 18°	≥ 10°
"RÓNA" straight cut	35°	30°	≥ 24°	≥ 22°	≥ 18°	≥ 10°
"KERKA" segment cut	35°	30°	≥ 24°	≥ 22°	≥ 18°	≥ 10°
"KERKA" straight cut	35°	30°	≥ 24°	≥ 22°	≥ 18°	≥ 10°
"MAGNUM"	22°		≥ 16°	≥ 14°	≥ 12°	≥ 10°
"BALANCE"	22°		≥ 16°	≥ 14°	≥ 12°	≥ 10°
"TITANIA"	22°		≥ 16°	≥ 14°	≥ 12°	≥ 10°
"FUTURA"	22°	18°	≥ 14°	≥ 12°	≥ 10°	≥ 7°
"PREMION"	22°	18°	≥ 14°	≥ 12°	≥ 10°	≥ 7°
"MZ3"	22°		≥ 16°	≥ 14°	≥ 12°	≥ 10°
"HARMONIE"	22°		≥ 16°	≥ 14°	≥ 12°	≥ 10°
"CANTUS"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"OPTIMA"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"SIMPLA"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"DOMINO"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"MIKADO"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"RAPIDO"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"RATIO"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"RUSTICO"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"SINFONIE"	22°	18°	≥ 14°	≥ 12°	≥ 10°	≥ 7°
"MELODIE"	22°		≥ 16°	≥ 14°	≥ 12°	≥ 10°
Plain tiles	30°	30°	≥ 24°	≥ 22°	≥ 18°	≥ 10°

DIN*: Standard roof pitch defined by DIN (the lowest roof pitch where the roof tile cover considered rainproof on its own)*

swissporTON*: Standard roof pitch defined by the experience of swissporTON (the lowest roof pitch where the roof tile cover considered rainproof on its own)*

3.1. Supported underlays

3.1.1. Waterproof underlayment:

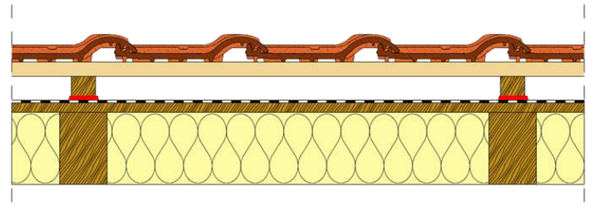


The waterproof underlayment is supported with a rigid formwork. The underlay covers the counter-battens, so the holes caused their nail fastenings are elevated from the level of the possible waterflow. Waterproof underlayment can only be made with qualified bituminous, plastic or synthetic rubber insulation plates. Overlaps and all breakthroughs on the roof shall be designed to be waterproof as well. An air layer below (double-ventilated roof) can only be made with roofs where there are no ridge ventilations, valleys and hips and also with roof structure where the breakthroughs are not exceeding the width of the rafter distances.

swissporTON "ULTRA, waterproof underlayment

Property	Test method	Datas			
Length	**EN 1848-2**	25 m			
Width	**EN 1848-2**	1,5 m			
Weight	**EN 1849-2**	360 g/m^2			
Fire resistance	**EN 13501-1**	E-d2			
Surface area		37,5 m^2			
Vapor permeability (sd)	**EN ISO 12572**	0,2 m			
Tensile strength	**EN 12311-1**	longitudinal:	420 N / 50 mm	cross direction:	490 N / 50 mm
Expansion	**EN 12311-1**	longitudinal:	50%	cross direction:	65%
Tearing resistance	**EN 12310-1**	longitudinal:	310 N	cross direction:	280 N
UV resistance		16 week			
Water proofness	**EN 1928**	W1			
Cold bending	**EN 1109**	-30 °C			

3.1.2. Watertight (rainproof) underlayment:

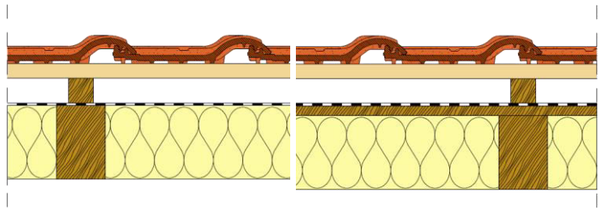


The watertight underlayment is supported with a rigid formwork., laid under the counter-battens and perforated by the fastenings of the counter-battens. These perforations has to be sealed under the counter battens. Watertight underlayment may only be made with certified bituminous, plastic or synthetic rubber insulation plates, or with a sheet or foil specially developed for this purpose and certified for this grade. Overlaps and all breakthroughs on the roof must be watertight.

swissporTON "PRO", watertight underlayment

Property	Test method	Datas			
Length	**EN 1848-2**	50 m			
Width	**EN 1848-2**	1,5 m			
Weight	**EN 1849-2**	210 g/m^2			
Fire resistance	**EN 13501-1**	E-d2			
Surface area		75,0 m^2			
Vapor permeability (sd)	**EN ISO 12572**	0,03 m			
Tensile strength	**EN 12311-1**	longitudinal:	490 N / 50 mm	cross direction:	460 N / 50 mm
Expansion	**EN 12311-1**	longitudinal:	45%	cross direction:	70%
Tearing resistance	**EN 12310-1**	longitudinal:	500 N	cross direction:	450 N
UV resistance		16 week			
Water proofness	**EN 1928**	W1			
Cold bending	**EN 1109**	-40 °C			

3.1.3. Windproof underlayment



The windproof underlayment is supported with a rigid formwork (eg. decking or walkable thermal insulation) and all of the joints and connections are welded, sealed or glued. The underlayment is laid under the counter-battens and perforated by the fastening of the counter-battens. It can be made with certified insulation plates, or with a sheet or foil developed for this purpose and certified for this grade. The overlaps and every breakthrough on the roof must be designed to be watertight!

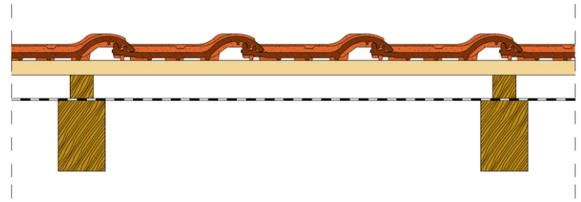
3.1.4. Free overlapping underlayment:

Overlapping sheets, foils, and / or grooved boards which are laid on a full surface, rigid formwork. The underlayment laid below the counter-battens, and perforated by the fastening of the counter-batttens.

swissporTON „BASIC", windproof underlayment**:**

Property	Test method	Datas			
Length	**EN 1848-2**	50 m			
Width	**EN 1848-2**	1,5 m			
Weight	**EN 1849-2**	150 g/m^2			
Fire resistance	**EN 13501-1**	E-d2			
Surface area		75,0 m^2			
Vapor permeability (sd)	**EN ISO 12572**	0,02 m			
Tensile strength	**EN 12311-1**	longitudinal:	310 N / 50 mm	cross direction:	240 N / 50 mm
Expansion	**EN 12311-1**	longitudinal:	70%	cross direction:	80%
Tearing resistance	**EN 12310-1**	longitudinal:	180 N	cross direction:	210 N
UV resistance		12 week			
Water proofness	**EN 1928**	W1			
Cold bending	**EN 1109**	-20 °C			

3.2. Free laid underlayment:



Made without any support, laid above the rafter with loose overlaps or made with unsealed grooved boards. The underlayment laid below the counter-battens, and perforated by the fastening of the counter-batttens. In the case of a thermally insulated structure, a free laid underlayment can only be made as a double-ventilated roof. The required thickness of the air layer formed above the thermal insulation must be ensured regardless of the degree of overhang! Free-laid underlayment must not be used below a roof pitch of 20°!

swissporTON „ECO", free laid underlayment:

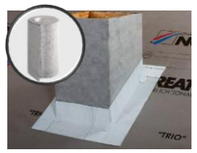
Property	Test method	Datas			
Length	**EN 1848-2**	50 m			
Width	**EN 1848-2**	1,5 m			
Weight	**EN 1849-2**	120 g/m^2			
Fire resistance	**EN 13501-1**	E-d2			
Surface area		75,0 m^2			
Vapor permeability (sd)	**EN ISO 12572**	0,02 m			
Tensile strength	**EN 12311-1**	longitudinal:	260 N / 50 mm	cross direction:	180 N / 50 mm
Expansion	**EN 12311-1**	longitudinal:	50%	cross direction:	80%
Tearing resistance	**EN 12310-1**	longitudinal:	120 N	cross direction:	140 N
UV resistance		12 week			
Water proofness	**EN 1928**	W1			
Cold bending	**EN 1109**	-20 °C			

Underlay accessories:

"SKL" adhesive

For foil seams and for other connections

- cc. 19 lm adhesion



"UAB" connection tape

For sealing connections (e.g. wall edges).

- 25 cm width
- 5 m / roll

"NKS" seam adhesive tape

To seal longitudinal and transverse seams.

- 50 mm width
- 25 m / roll

"QSM" welding liquid & bottle

For welding the longitudinal and transverse joints of ULTRA

- 1 000 ml / canister
- 1 liter per cc. 200 m^2 roof surface

"NDS" nail sealing tape

To seal nail holes below the counter battens.

- Butyl raw material
- 50 mm width
- 10 m / roll

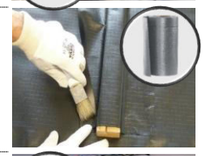
Hot air gun

For welding the longitudinal and transverse joints of ULTRA.

"NDB" nail sealing tape

To seal nail holes below the counter battens.

- PE raw material
- 60 mm width
- 30 m / roll



"KKS" counter-batten tape

To cover the counter batten for welded waterproof underlays

- 30 cm width
- 20 m / roll

"NDM" nail sealing mastic

To seal nail holes below the counter battens.

- 1 000 ml / tube
- cc. 50 lm counter-battens

"ULTRA" external corner

For waterproof wall corner joint.

Accessory	„ECO"	„BASIC"	„PRO"	„ULTRA"
"SKL" adhesive	✓	✓	✓	✓
"NKS" seam adhesive tape	✓	✓	✘	✘
"NDS" nail sealing tape	✓	✓	✓	✓
"NDB" nail sealing tape	✓	✓	✓	✘
"NDM" nail sealing mastic	✓	✓	✓	✘
"UAB" connection tape	✓	✓	✓	✘
"QSM" welding liquid & bottle	✘	✘	✘	✓
Hot air gun	✘	✘	✘	✓
"KKS" counter-batten tape	✘	✘	✘	✓
"ULTRA" external corner	✘	✘	✘	✓

4. Counter-batten:

The counter-battens must have a nominal thickness of at least 30 mm. Depending on the roof pitch, the length of the rafters and the location of the building, the size (height) of the counter-batten may should be increased. The tile covers belong to the group of the watertight coverings, so small amounts of moisture are allowed to enter below them. However, this moisture must be able to escape from the attic or the roof structure, so ventilation must be provided in all such cases!

Role of the air-gap:

One of the functions of the air-gap is to vent-out the moisture that has entered through the gaps in the roofing and the moisture that condenses on the bottom surface of the roof tiles, but this air layer also allows the moisture that drips from the tiles to escape from the roof. Another function of the air layer is to cool the back of the tile covering. Reducing the surface temperature of the roofing significantly relieves the thermal insulation and reduces its summer heat load. In the case of a single ventilated roof, the function of both air layers is performed by the outer air layer. In order to safely drain the steam built into the layers of the structure and escaping from the interior, the underlayment must have a vapor permeability (Sd < 0.3 m). In winter conditions, the cold air flowing in the air layer delays the melting of the snow, thus reducing the formation of ice rinks and the possibility of the gutter freezing. The counter-batten must comply at least with the requirement of the S 10 class according to the DIN 4074-1 (Strength grading of wood - Part 1: Coniferous sawn timber) standard.

Recommended counter-batten heights:

Rafter length	Roof pitch:				
	10° - 15°	15° - 20°	20° - 25°	25° - 30°	30° felett
up to 10 m	7,5 cm	5 cm	5 cm	5 cm	5 cm
10-15 m	10 cm	7,5 cm	5 cm	5 cm	5 cm
15-20 m	10 cm	10 cm	7,5 cm	5 cm	5 cm

Based on the Hungarian experience, in all cases the min. 5 cm counter-batten height is recommended!

In order to allocate the roof battens, we need to know the actual covering length. The length increase caused by the counter batten can be determined using the table below:

Height of the counter-batten	The increment of the counter-batten length (mm) if the roof pitch is:									
	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°
30 mm	8,0	10,9	14,0	17,3	21,0	25,2	30,0	35,8	42,9	52,0
50 mm	13,4	18,2	23,3	28,9	35,0	41,9	50,0	59,6	71,4	86,7
65 mm	17,4	23,7	30,3	37,5	45,5	54,5	65,0	77,5	92,9	112,7
100 mm	26,8	36,4	46,6	57,7	70,0	83,9	100,0	119,2	142,9	173,3

5. Roof batten:

The supporting structure of the roof tile is the batten. The design and the quality of the roof battens greatly influence the plane of the roof and, consequently, the appearance of the roof covering, so it is especially important to pay attention to the flatness of all of the roof surfaces.

The roof battens must be fastened to the counter batten! Their distance from each other depends on the selected roofing material and the type of covering.

The recommended cross-sectional dimensions of the batten, depending on the rafter distance (distance between the counter-battens), can be found in the attached table. The cross section of the roof battens must comply with the static requirements! Increased load due to self-weight, wind and snow, and local roofing habits may require larger batten dimensions.

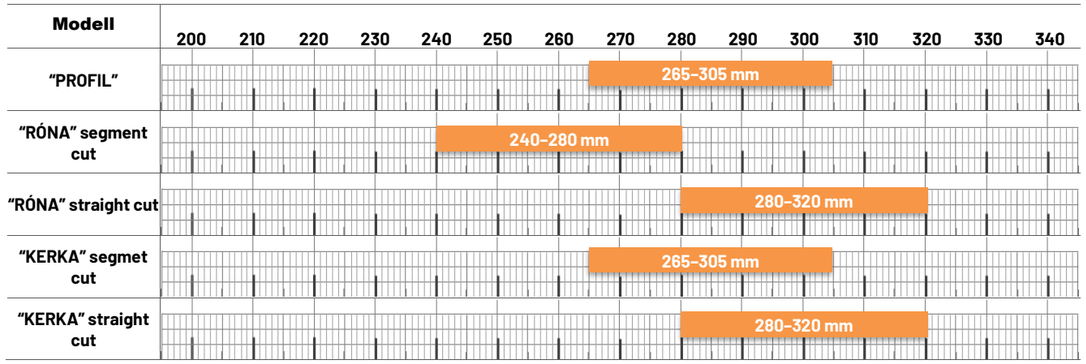
The counter-batten must comply at least with the requirement of the S 10 class according to the DIN 4074-1 (Strength grading of wood - Part 1: Coniferous sawn timber) standard.

Recommended sizes of roof battens:

Rafter distance*	Batten dimensions
up to 70 cm	30 x 50 mm
70 – 80 cm	30 x 50 mm
80 – 90 cm	30 x 50 mm
90 - 100 cm	40 x 60 mm

** Distance between adjacent rafters (not the axis distance). The location of the counter-battens must also be taken into account!*

Batten distances [mm] overview



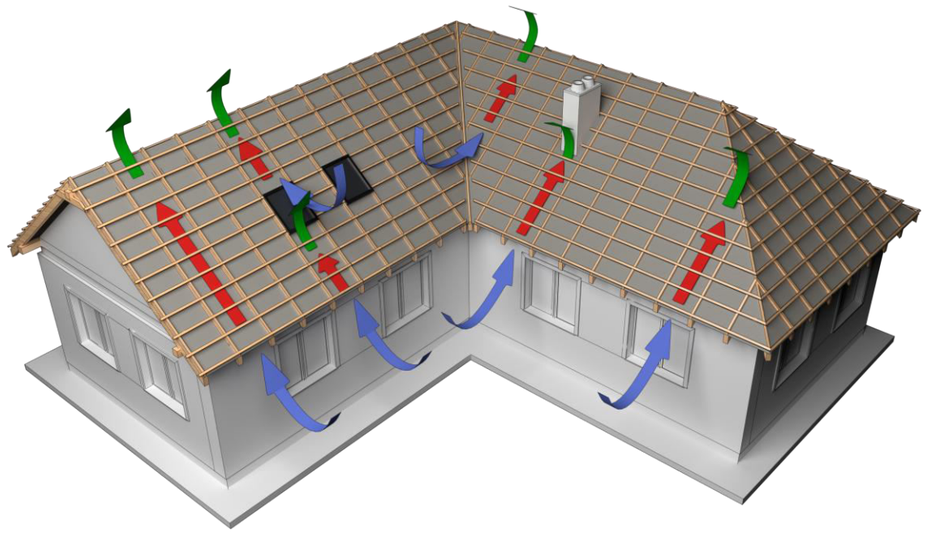
Note.: The batten distance is defined by the pitch of the roof surface (and thus the overlapping of the tiles)!

More informations: **swissporTON.hu**

V. Ventillation:

1. Main principles:

The air layer under the tile covering must be ventilated according to the building's physical aspects! Ventilation occurs when an upward flow begins in an air layer or air space of appropriate cross-section (due to a difference in temperature or pressure). In a ventilated roof structure, the air movement depends on the roof pitch, the cross section of the air layer, the size and design of the air space, the free air permeability of the ventilation and ventilation openings and their placement on the roof. The greater the roof pitch and, consequently, the height difference between the in-ventilation and out-ventilation openings, the greater the driving force and thus the flow rate and the amount of air flushing the air layer / air space.



2. The size of the in and out-ventilation air gap:

There are no national regulations for the appropriate cross-section of the above-mentioned air layer and the size of the in-ventilation and out-ventilation openings, therefore we use the requirements of the proven DIN 4108-3 standard. According to the requirements of the standard, for roofs with a pitch angle of more than 10 °, the detailed vapor diffusion calculation can be dispensed with if the following minimum requirements are met:

- The free ventilation cross-section at the eaves must be at least 0.2% of the ventilated roof area, but at least 200 cm^2 / eaves meter!
- The minimum free ventilation cross-section to be formed on the general parts of the roof must be at least 200 cm^2 / meter!
- The free cross-section of the ventilation openings along the ridges and the hips must be at least 0.05% of the associated roof area!

- The following chart shows the necessary combined vapor diffusion equivalent air layer thickness (sd) of the building layers below the ventilation cross-section, depending on the length of the rafter:

Rafter length*	Required vapor diffusion equivalent air layer thickness (Sd)
0-10 m	≥ 2 m
10 – 15 m	≥ 5 m
>15 m	≥ 10 m

Along the eaves and ridges, the narrowing effect of the installed ventilation meshes, ventilation strips and other profiles has to be considered. The size of the required ventilation openings must be increased accordingly!

In the case of warm, humid spaces, individual sizing is required!

The vapor diffusion calculation can be performed according to DIN 4108-5.

The calculation is not necessary, if the following conditions are met:

In the case of ventilated and insulated roofs, if

- the above minimum ventilation cross-sections are provided,
- thickness of the diffusion-equivalent air layer of the structure under the ventilation air gap: Sdi> 2m

In the case of thermal-insulated roofs without ventilation, if ventilation of the roof covering is ensured (eg small roofing elements)

- Sde ≤ 0,1 m and Sdi ≥ 10 m, or
- Sde ≤ 0,3 m and Sdi ≥ 20 m, or
- Sde ≥ 0,3 m and Sdi ≥ 6*Sde

In the case of thermal-insulated roofs without ventilation, if ventilation of the roof covering is not ensured (eg large roofing elements)

- Sdi ≥ 100,0 m

swissporTON ventilation system elements

Ventilation element	Ventilation cross-section	Application field
Aluminium ventilation mesh	540 cm²/lm for 10 cm width	eave, shed roof ridge
Ventilation batten with comb	200 cm²/m	eave
Ventilation tile	See in the charts later	ridge, hip, valley, eave
Ventilation base tile	See in the charts later	ridge, hip, valley, eave
Aluminium ridge and hip roll	150 cm²/lm for 220 mm width	ridge, hip
Ridge and hip roll, PP	100 cm²/lm for 220 mm widthl	ridge, hip

In the event of the combined appearance of several weather factors (eg strong winds and long rain), the entry of powder snow and rainfall into the roof structure, cannot be avoided.

VI. Snow guard:

1. Concept, purpose, and task of snow guards:

The purpose of using snow guards is to prevent the snow mass from slipping on the roof surface and falling off the roof surface. According to § 60 (2) of the OTÉK in Hungary, all roofs between 25° and 75° must be covered with snow if the eave edge bordered with the area of traffic. Based on experience, it may also be necessary to create a snow guard at a roof pitch less than 25°, and the purpose of the snow guard is not only to avoid personal injury, but also to protect the connecting building structures. For this purpose, linear and / or point-like snow stopper which built into the roof surface can be used.

The two systems (linear and surface) can be used together for greater efficiency. When designing and constructing complex roof forms, the formation of snow traps between the roof profiles must be avoided, and care must be taken to prevent the formation of snow barriers between some roof profiles.

2. Surface snow guard

The point-like snow stop noses should be evenly distributed over the entire surface to prevent the snow on the roof from slipping. The base value of the snow load (which can be used to determine the required quantity of the snow stop noses) can be calculated by the *"EN 1991-1-3 Actions on structures, Part 1-3: General actions, Snow loads"* standard. During the calculation, the National Annex of the specific country has to be taken into account.

$$s_d = \gamma_s * \mu * C_e * C_t * s_k$$

- "γ_s": safety coeffficient (equals to 1,5)
- "μ": snow load shape coefficient, the value is at least 0,8 but for complex roofs it is equal to 1,6
- "C_e": Exposure coefficient (equal to 1)
- "C_t": Thermal coefficient (for safety, equal to 1)
- "s_k": Characteristic value of snow on the ground at the relevant site (can be found in the National Anex)

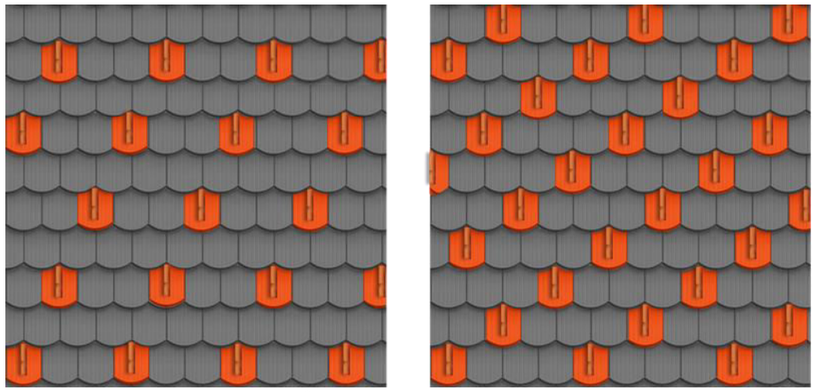
The amount of snow noses can be determined from the following tables.

Base value of the snow load (kN/m²)

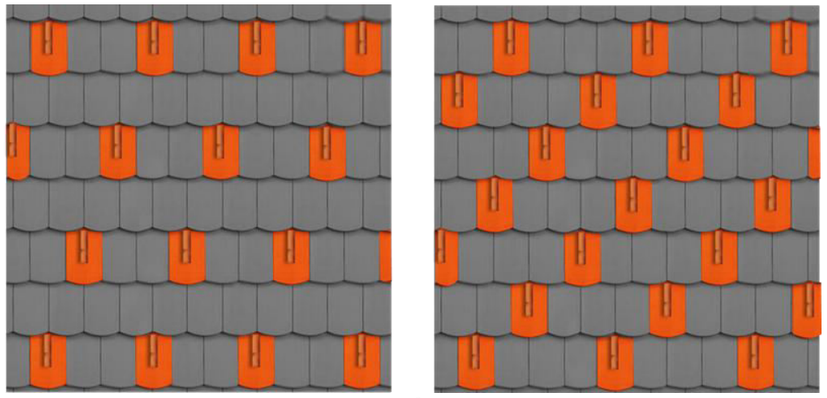
α*	1,00	2,00	3,00	4,00	5,00	6,00	7,00	8,00	9,00	10,00	12,00
20°	3,0	3,0	3,0	3,0	3,0	3,1	3,4	4,0	4,2	4,6	5,6
25°	3,0	3,0	3,0	3,0	3,2	3,3	3,8	4,2	4,8	5,3	6,3
30°	3,0	3,0	3,0	3,0	3,4	3,9	4,6	5,1	5,6	5,9	6,6
35°	3,0	3,0	3,1	3,1	3,5	4,	4,7	5,3	5,6	6,3	7,5
40°	3,1	3,1	3,2	3,2	3,6	4,1	5,1	5,4	6,0	6,4	8,2
45°	3,2	3,2	3,3	3,4	3,8	4,4	5,3	5,9	6,3	6,6	8,4
50°	4,0	4,0	4,4	4,8	5,2	5,7	6,3	6,8	7,1	7,4	8,6
55°	4,1	4,1	4,5	5,0	5,3	5,8	6,5	7,0	7,2	7,6	8,7
60°	4,6	4,6	5,1	5,3	5,7	6,2	6,5	7,2	7,7	8,2	8,9

α: roof pitch*

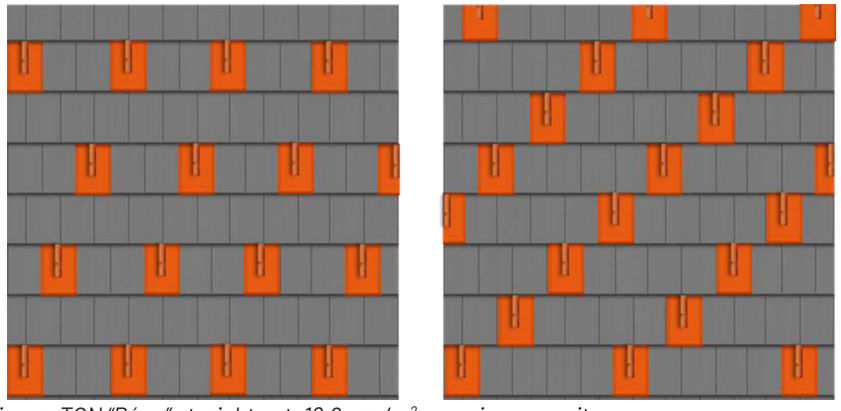
Placement of the snow stop noses for different tile models in quantities of 3,0 pcs/m² and 4,0 pcs/m²



swissporTON "PROFIL", 19,6 pcs/m² covering capacity



swissporTON "Róna" segment cut, 21,5 pcs/m² covering capacity



swissporTON "Róna" straight cut, 18,6 pcs/m² covering capacity

1. Linear snow guard

The purpose of using linear snow guard is to prevent the snow mass from slipping on the roof surface and to tear off the gutter. In the swissporTON product range, there are two kind of linear snow guard system:

Aluminium snow guard system

- Available in snow guard grid, tube and log support variants
- The supports are installed into the aluminium base tiles
- The distance between the supports can't exceed 80 cm
- For some specific batten distance, an additional batten may required for the harness of the base tile

Universal snow guard grid

- Only in snow guard grid vartiant
- The distance between the supports can't exceed 90 cm
- Additional support battens required for the grid supporting brackets

The most suitable place for the linear snow guard is the 2nd row of tiles from the eave in case of single covering and the 3rd row in case of double covering.

For rafter lengths higher than 10 m, they must be placed in at least two rows.

In the case of a large eave overhang, it must be pulled close to the plane of the wall to reduce the torque acting on the rafters.

VII. Walking on the roof:

The safety regulations must be compliance during the construction and maintenance of the roof which is covered with swissporTON tiles. It is not permitted to enter tile covered roofs without the necessary measures (eg. roof ladders or walkways). If a roof part requires maintenance (eg solar or ventilation equipment), it is essential to use a walking grid that complies with the safety regulations. In the swissporTON product range, there are two groups of the walking systems:

Aluminium walking grid system

- Available in 4 sizes (single step, 46, 80 and 150 cm), of which the 150 cm length is connectable
- The walking grid supports are installed into the aluminium base tiles
- For some specific batten distance, an additional batten may required for the harness of the base tile

Universal walking grid system

- Available in 5 sizes (40, 60, 80, 100 and 250 cm), all of them are connectable
- •Additional support battens required for the grid supporting brackets

Walking grids, ladders and other accessories of the swissporTON system shall not be considered as an anchoring point for safety harnesses.

For this purpose, only the specificly designed safety hook should be used. The hook has to be fixed into the rafter through the counter-batten.

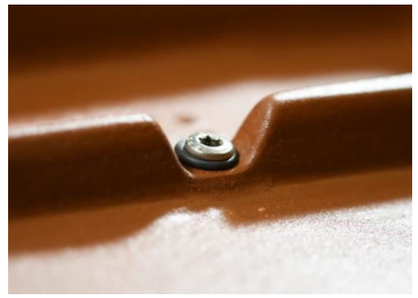
The distance between the safety hook can't exceed:

- 4 meter in the direction of the roof pitch
- 1,4 meter sidewise

VIII. Fixing the tiles:

1. Mechanical fastening along the edges of roof surfaces:

Irrespective of the angle of inclination of the roof, additional fastening shall be applied along the edges, eaves, valleys, hips and the ridge or shed roof ridge. In this case, the fastening is done by screwing with a self-tapping screw with a sealing ring. Traditional nailing is not recommended as it does not provide proper fastening in the long run! These screws must be used through the pre-formed nail hole (in the case of cutted tiles, a new hole must be made) using a hand drill. When the screw is in place, the sealing ring fills the gap between the hole and the screw, thus sealing the drilled tile against any moisture.



This additional fastening must be carried out for each tile along the listed edges (edge zones) as well as for the fastening of each ridge tile (eg. ridge clip)!

Along the hips and valleys, the cutted tiles can be fixed with a wire. A specially developed product for this purpose is the "Stainless steel clip with wire for cutted tiles", which can be found in the system accessories (see product data sheets) group. In this case, there is no need for a new hole in the tile (so no screw with a sealing head is needed).

2. Mechanical fastening against the falling of the tile

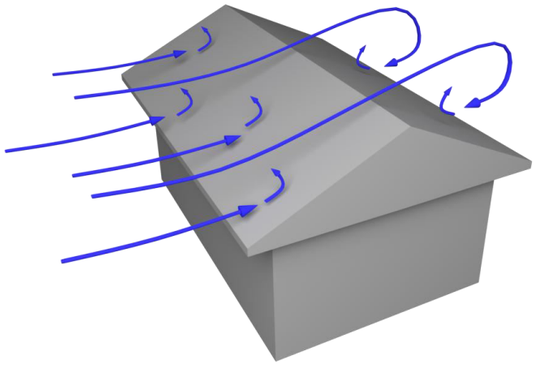
The protection against the falling tile is crucial, because any falling tiles present a significant risk to human life and our valuables (eg. parked cars). This risk should be considered to determine how many tiles will be fixed in certain cases. The main factors which should be considered are: the height of the building, the angle of the roof and the function / location of the building.

The table below is a guideline for the amount of additional fixings to be used depending on the roof pitch angle. The values in the table must be increased when the earlier mentioned reasons require it!

Roof pitch	Amount of the fastened tiles in the general roof surface
up to 45°	no need for additional fixing
45°- 60°	every third and every second tile
above 60°	every one of the tiles

3. Mechanical fastening against wind loads

An additional fastening shall be applied if the amount of wind suction due to wind load exceeds the self-weight of the tiles which act as a resisting force (or torque). The wind pressure on one side of the roof always causes wind suction on the opposite side of the roof! In addition, the effect of turbulent wind flow due to the geometric design of the roof must be taken into account.



The determination of the wind load must be determined based on the Eurocode standard (EN 1991-1-4) and calculated by a structural engineer. The standard is valid for all European Member States, and the geographical and meteorological differences (and the resulting data) for each country are included in the national annexes.

This standard provides a so-called simplified procedure, which can be used when the following conditions are met:

- • The height of the building does not exceed 200 m
- • On the windward side of the building, the average slope of the terrain is less than 3 °
- • There is no building or other object in the vicinity of the building that has at least twice its average height
- • If the air space under the tile roof is not closed, the building must not have two or more sides with a ratio of opening surfaces of more than 30%

The simplified procedure takes into account the reference pressure depending on the height above ground level and the installation category, as well as the shape factors depending on the geometric design of the roof.

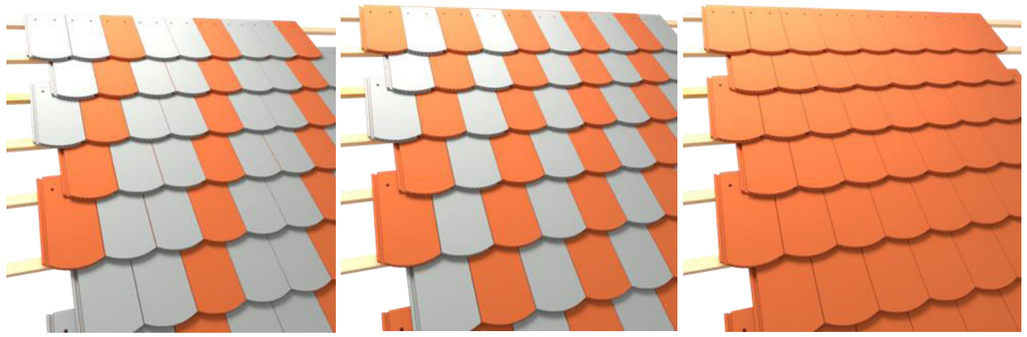
$$w_d = \gamma_w * q_p(z) * c_{pe} * c_{eq}$$

- "γ_s": safety coefficient (equals to 1,5)
- "$q_p(z)$": peak velocity pressure
- "c_{pe}": external pressure coefficient (see later)
- "c_{eq}": pressure equalizing factor (depend on the roof layers)

The value of the external pressure coefficient is determined by the simplified procedure for three roof forms: shed roof, gabble roof and hip roof.

In each case, the roof surfaces are divided into zones, so different values are determined for the eaves, edges, hips, ridges and the remaining roof surfaces.

Stormclips must be used on surfaces where the wind load exceeds the resisting weight load! The density of stormclips is determined from the ratio of these two effects, so it may be necessary to fix each tile (1: 1), every second tile (1: 2), or every third tile (1: 3).



Schema 1:3, schema 1:2 and schema 1:1, with side interlocking plain tiles installed in bonding

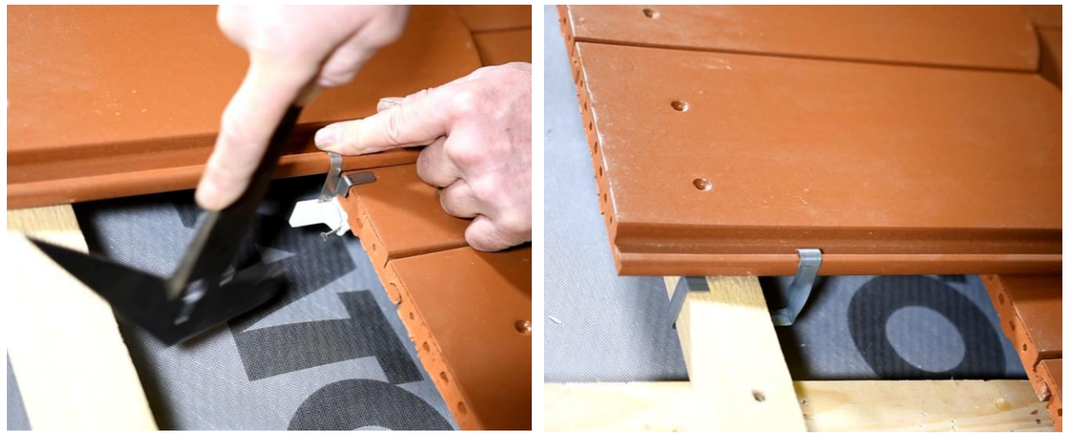
More informations: **swissporTON.hu**

Turbulent air flow is a major risk in the vicinity of roof breakthroughs (dormers, chimneys etc.). The use of stormclips around them is recommended for all tiles (in the previously determined width)!

The amount of stormclips calculated using the simplified procedure must always be checked and, if it is neccessary by the local conditions (eg prevailing wind direction or the highest wind pressure that has occurred in the past), it must be adjusted! The exact windload values must be determined by the roofer or the structural engineer!

In the design and use of stormclips, we consider that they are placed as far away from the turning axel as possible (usually in the lower half of the sidelock of the tile), so that we can increase the resisting "moment arm" (thus obtaining a higher counterbalancing torque).

We use stormclips of different sizes for different products, and you can also choose between nail-in and mount-on stormclips.



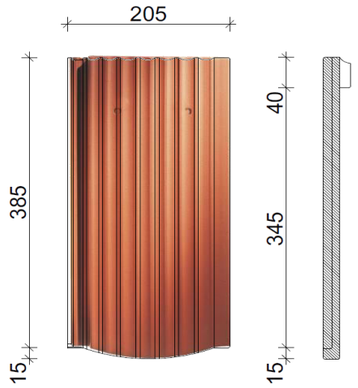
Nail-in (left) and mount-on (right) stormclip installation

More informations: **swissporTON.hu**

PART II.
Technical specifications

More informations: **swissporTON.hu**

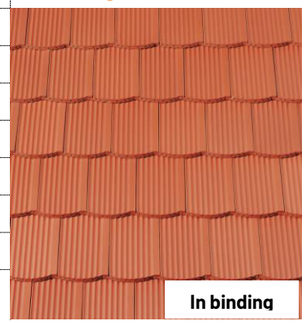
“PROFIL”® segment cut



Product datas

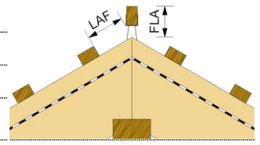
Size	width:	**205 mm**
	length:	**400 mm**
	height:	**35 mm**
	thickness:	**21 mm**
Weight:		**2,48 kg**
Packaging	bundle :	**6 pcs**
	pallet :	**324 pcs**
Standard roof pitch:		**30°**

Covering method



Technical specification of the roof cover

Roof pitch:	**< 30°**	**30° - 35°**	**35° - 40°**	**40° - 45°**	**45° <**
Covering length	**265 mm**	**274 mm**	**285 mm**	**295 mm**	**305 mm**
Covering widthg	**180 mm**	**180 mm**	**180 mm**	**180 mm**	**180 mm**
Consumption	**21,0 pcs/m²**	**20,2 pcs/m²**	**19,5 pcs/m²**	**18,8 pcs/m²**	**18,2 pcs/m²**
Covering type	**single cover**				
Covering weight	**52,08 kg/m²**	**50,10 kg/m²**	**48,36 kg/m²**	**46,62 kg/m²**	**45,14 kg/m²**



***LAF**: distance of the upper batten*

***FLA**: height of the ridge batten*

„LH” ridge tile with 30x50 batten

Roof pitch	**10°**	**15°**	**20°**	**25°**	**30°**	**35°**	**40°**	**45°**	**50°**	**55°**	**60°**
LAF [mm]	55	55	55	55	55	55	50	50	50	50	50

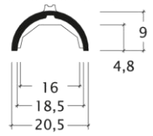
Underlayment requirement

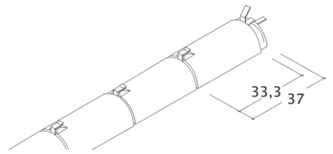
Unsupported underlayment	“ECO”	≥ 24°
Windproof underlayment	“BASIC”	≥ 22°
Watertight underlayment	“PRO”	≥ 18°
Waterproof underlayment	“ULTRA”	≥ 10°

Required batten dimensions

Rafter distances	**Batten dimension**
≤ 800 mm	30 x 50 mm
810 – 900 mm	30 x 50 mm
910 – 1000 mm	40 x 60 mm

“LH” ridge tile 3,0 pcs/lm





Closing plate

3 way hip cap tile

Hip starter

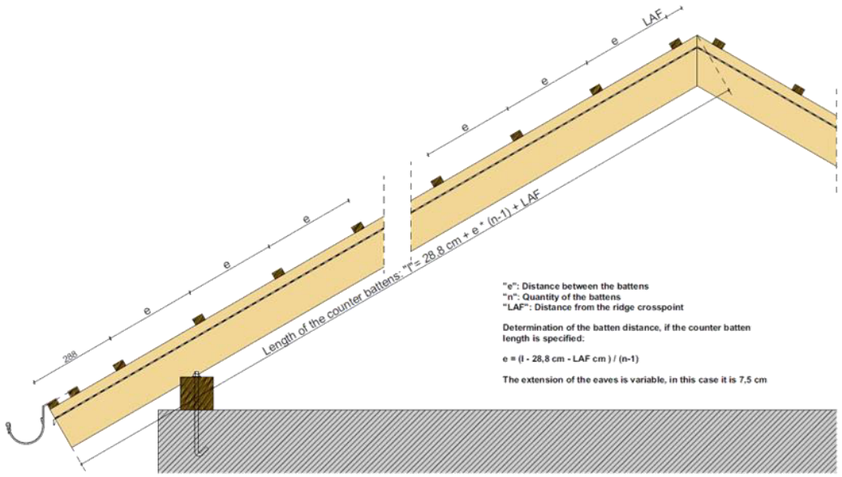
4 way hip cap tile

Clay accessories	**Sizes**	**Quantity**
Half-tile	115x400	as needed
Verge tile – left	205x400	3,3 pcs/m - 3,8 pcs/m
Verge tile – right	205x400	3,3 pcs/m - 3,8 pcs/m
Ventialtaion base tile LQ 10	205x400	5,5 pcs/m
Ventilation tile LQ 25	205x400	as required

Clay outlets	**Package content**	**Outlet type**
“SIGNUM 3.0” 110 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room ventilation kitchen ventilation
“SIGNUM 3.0” 125 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room ventilation kitchen ventilation
“SIGNUM” 150 outlet vent tile	outlet tile, underlay connection bush	room ventilation kitchen ventilation
“SIGNUM” 200 outlet vent tile	outlet tile, underlay connection bush,	room ventilation kitchen ventilation
Antenna outlet tile Ø60 mm	outlet tile, underlay connection bush,	antenna and telecommunication tubes
Solar outlet tile Ø 70 mm	outlet tile, underlay connection bush,	solar and photovoltaic cables
Flue gas outlet tile Ø 110 mm or Ø 125 mm	outlet tile, underlay connection bush,	flue pipe of the condensation boilers

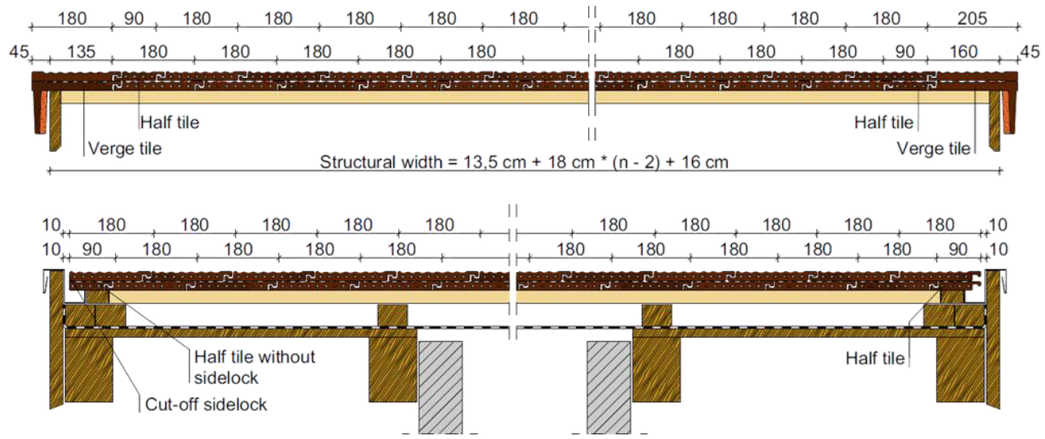
Fixing products

Name	**Material**	**Application field**
Mount-on stromclip for 30x50 mm battens	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the genereal roof surface .
Mount-on stromclip for 40x60 mm battens	zinc-aluminium	
Nail-in stromclip	stainless steel, CELANEX® PBT	
Fixing screw with EPDM sealing ring, 60 mm length	stainless steel	Fixing against loosed tiles along the edges and some cases in the average roof surfaces
Clip with wire, 17-21 mm	stainless steel	Fixing cutted tiles along the hips and valleys
Universal screw-in stormlcip	zinc-aluminium	Fixing tiles along the eaves



Roof batten alignement for "PROFIL" segment cut clay roof tile

Specification:	7,5 cm eave overhang and 30° roof pitch „LH" ridge tile and 30x50 mm roof battens, LAF = 55 mm				
Number of battens (n)	**265 mm**	**274 mm**	**285 mm**	**295 mm**	**305 mm**
10	2 728	2 809	2 908	2 998	3 088
11	2 993	3 083	3 193	3 293	3 393
12	3 258	3 357	3 478	3 588	3 698
13	3 523	3 631	3 763	3 883	4 003
14	3 788	3 905	4 048	4 178	4 308
15	4 053	4 179	4 333	4 473	4 613
16	4 318	4 453	4 618	4 768	4 918
17	4 583	4 727	4 903	5 063	5 223
18	4 848	5 001	5 188	5 358	5 528
19	5 113	5 275	5 473	5 653	5 833
20	5 378	5 549	5 758	5 948	6 138
21	5 643	5 823	6 043	6 243	6 443
22	5 908	6 097	6 328	6 538	6 748
23	6 173	6 371	6 613	6 833	7 053
24	6 438	6 645	6 898	7 128	7 358
25	6 703	6 919	7 183	7 423	7 663
26	6 968	7 193	7 468	7 718	7 968
27	7 233	7 467	7 753	8 013	8 273
28	7 498	7 741	8 038	8 308	8 578
29	7 763	8 015	8 323	8 603	8 883
30	8 028	8 289	8 608	8 898	9 188
31	8 293	8 563	8 893	9 193	9 493
32	8 558	8 837	9 178	9 488	9 798
33	8 823	9 111	9 463	9 783	10 103
34	9 088	9 385	9 748	10 078	10 408
35	9 353	9 659	10 033	10 373	10 713
36	9 618	9 933	10 318	10 668	11 018
37	9 883	10 207	10 603	10 963	11 323
38	10 148	10 481	10 888	11 258	11 628
39	10 413	10 755	11 173	11 553	11 933
40	10 678	11 029	11 458	11 848	12 238



Structural width between the verge boards

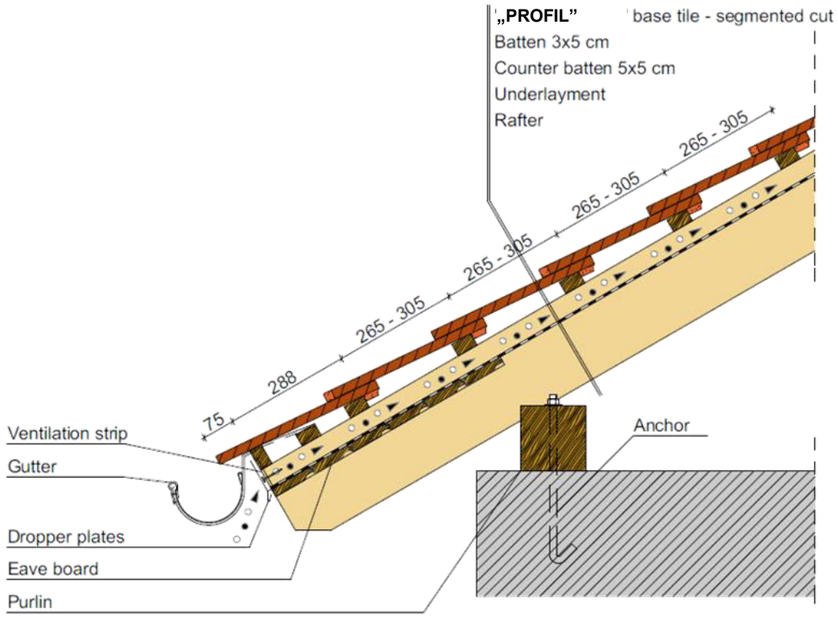
	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
0	-	90	180	270	295	385	475	565	655	745
10	1 735	1 825	1 915	2 005	2 095	2 185	2 275	2 365	2 455	2 545
20	3 535	3 625	3 715	3 805	3 895	3 985	4 075	4 165	4 255	4 345
30	5 335	5 425	5 515	5 605	5 695	5 785	5 875	5 965	6 055	6 145
40	7 135	7 225	7 315	7 405	7 495	7 585	7 675	7 765	7 855	7 945
50	8 935	9 025	9 115	9 205	9 295	9 385	9 475	9 565	9 655	9 745
60	10 735	10 825	10 915	11 005	11 095	11 185	11 275	11 365	11 455	11 545
70	12 535	12 625	12 715	12 805	12 895	12 985	13 075	13 165	13 255	13 345
80	14 335	14 425	14 515	14 605	14 695	14 785	14 875	14 965	15 055	15 145
90	16 135	16 225	16 315	16 405	16 495	16 585	16 675	16 765	16 855	16 945
100	17 935	18 025	18 115	18 205	18 295	18 385	18 475	18 565	18 655	18 745

Structural width between the verge boards

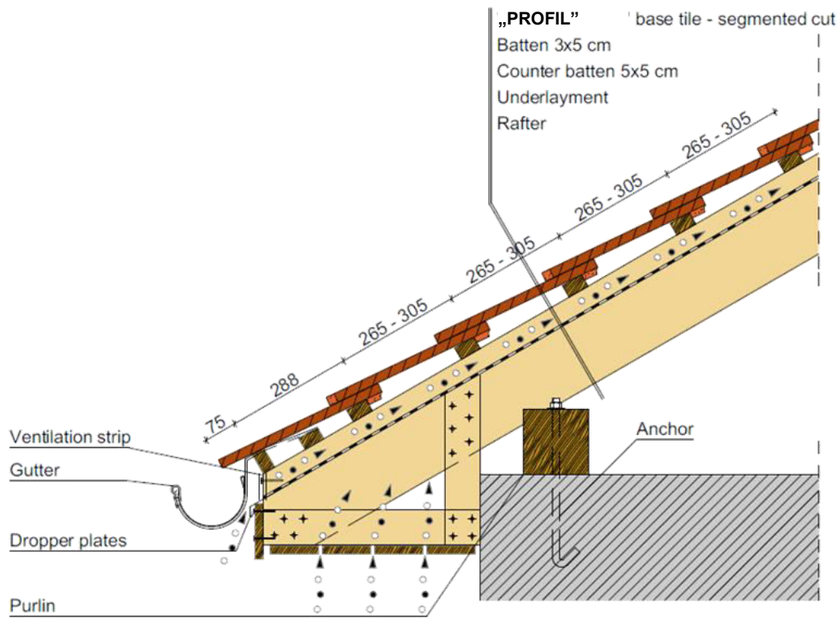
	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	835	925	1 015	1 105	1 195	1 285	1 375	1 465	1 555	1 645
10	2 635	2 725	2 815	2 905	2 995	3 085	3 175	3 265	3 355	3 445
20	4 435	4 525	4 615	4 705	4 795	4 885	4 975	5 065	5 155	5 245
30	6 235	6 325	6 415	6 505	6 595	6 685	6 775	6 865	6 955	7 045
40	8 035	8 125	8 215	8 305	8 395	8 485	8 575	8 665	8 755	8 845
50	9 835	9 925	10 015	10 105	10 195	10 285	10 375	10 465	10 555	10 645
60	11 635	11 725	11 815	11 905	11 995	12 085	12 175	12 265	12 355	12 445
70	13 435	13 525	13 615	13 705	13 795	13 885	13 975	14 065	14 155	14 245
80	15 235	15 325	15 415	15 505	15 595	15 685	15 775	15 865	15 955	16 045
90	17 035	17 125	17 215	17 305	17 395	17 485	17 575	17 665	17 755	17 845
100	18 835	18 925	19 015	19 105	19 195	19 285	19 375	19 465	19 555	19 645

The structural widths below are calculated with 1-1 cm gap between the side plate of the verge tiles and the verge board.

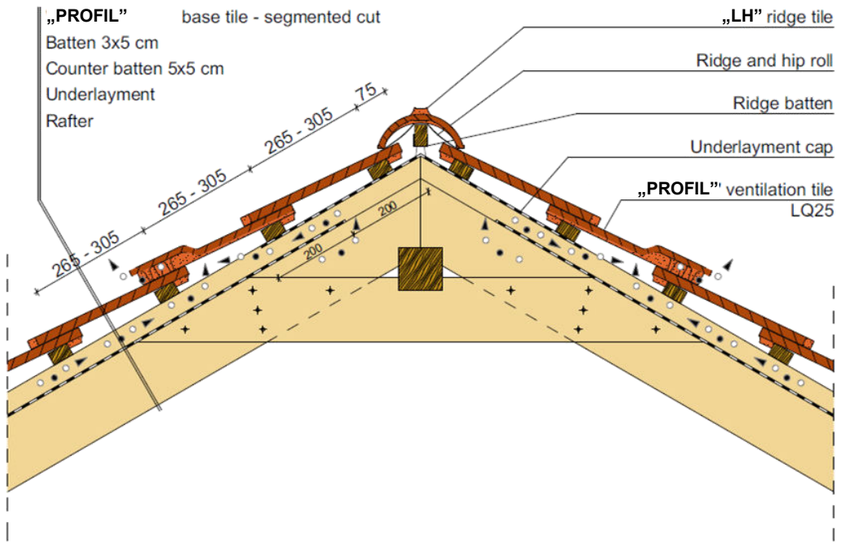
More informations: **swissporTON.hu**



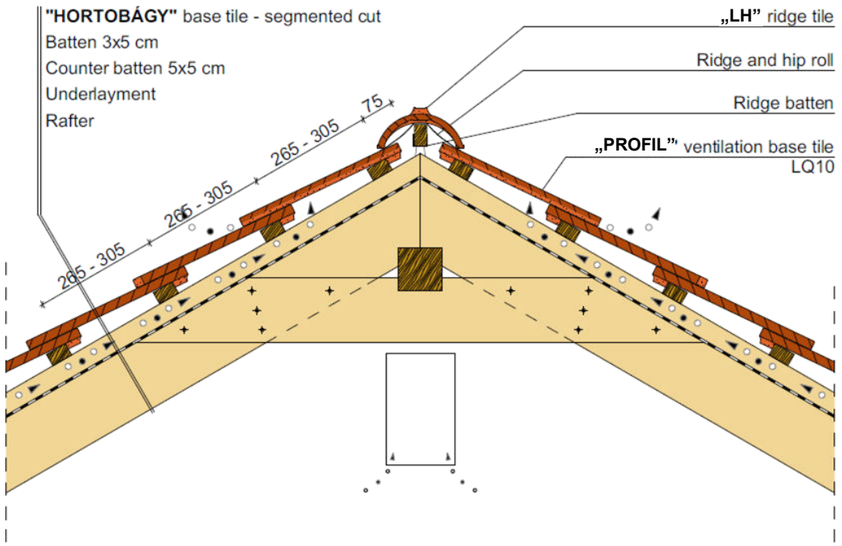
Eave detail



Closed eave detail

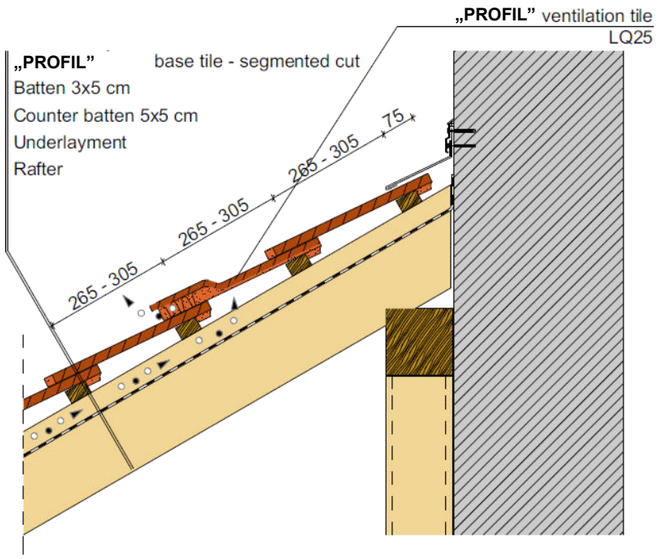


Ridge detail with ventilation tile

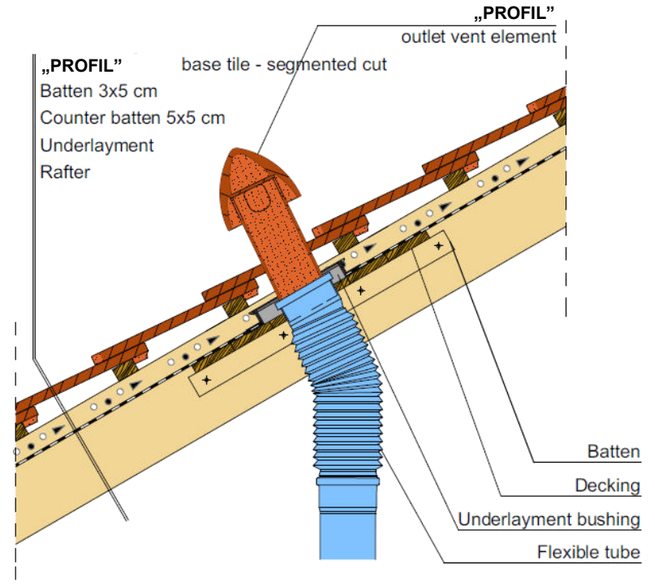


Ridge detail with ventilation base tile

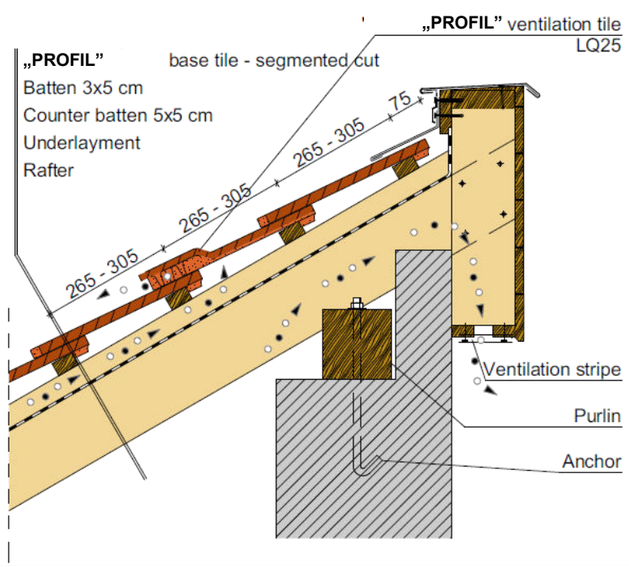
More informations: **swissporTON.hu**



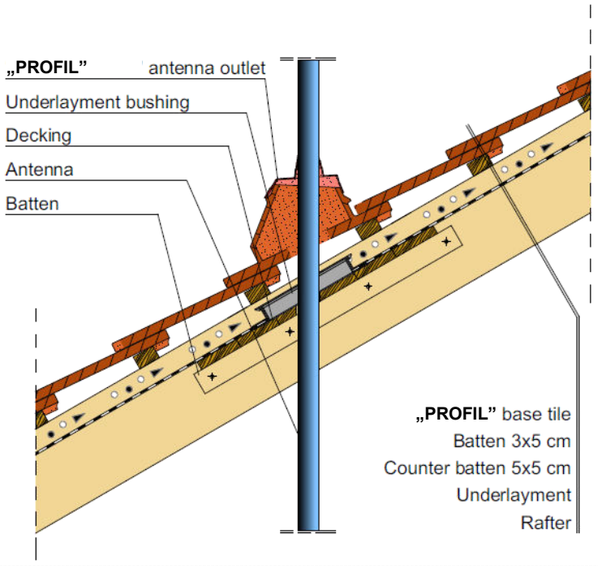
Wall connection detail



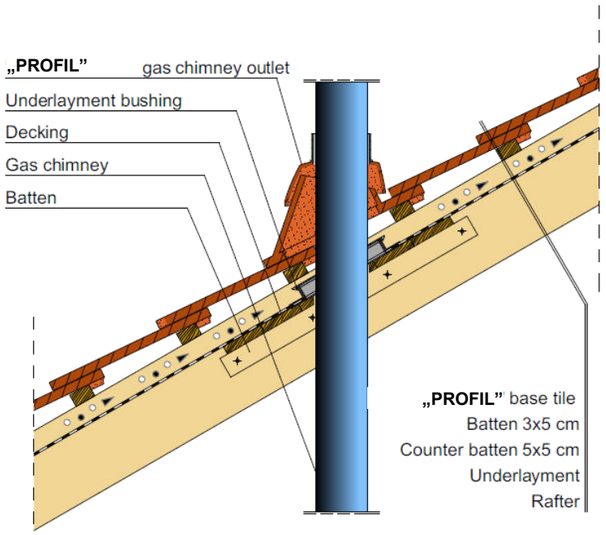
Clay outlet detail



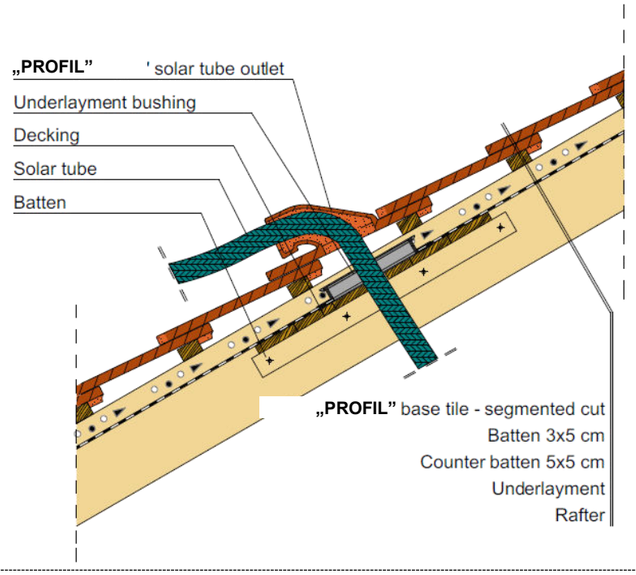
Shed roof ridge detail



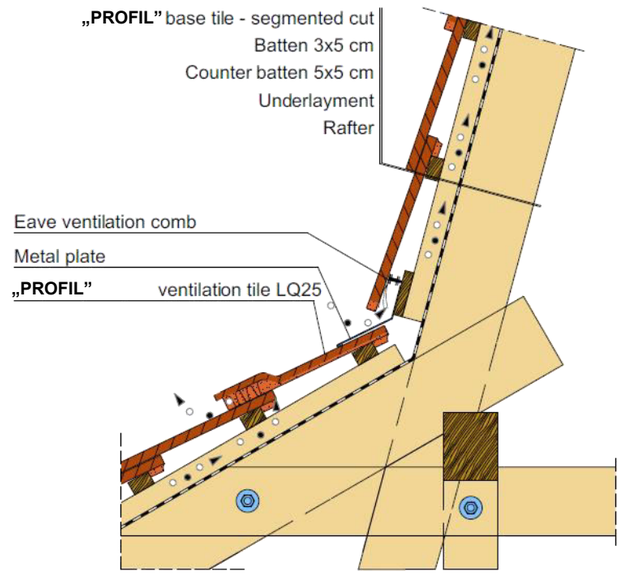
Clay antena outlet detail



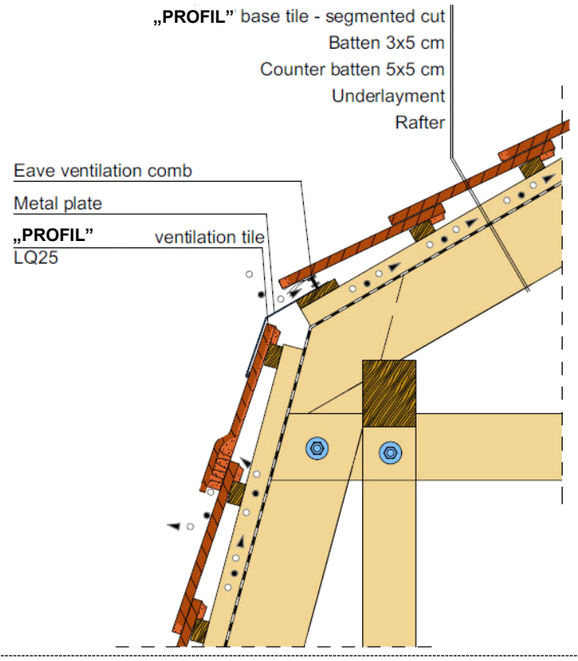
Clay gas chimney outlet detail



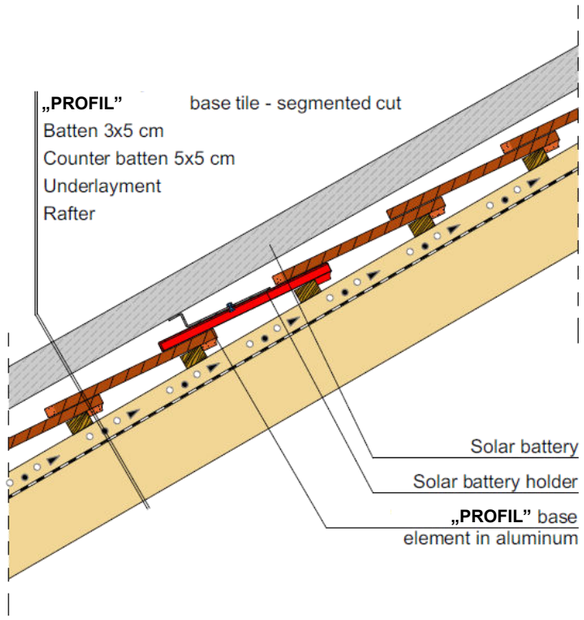
Clay solar tube outlet detail



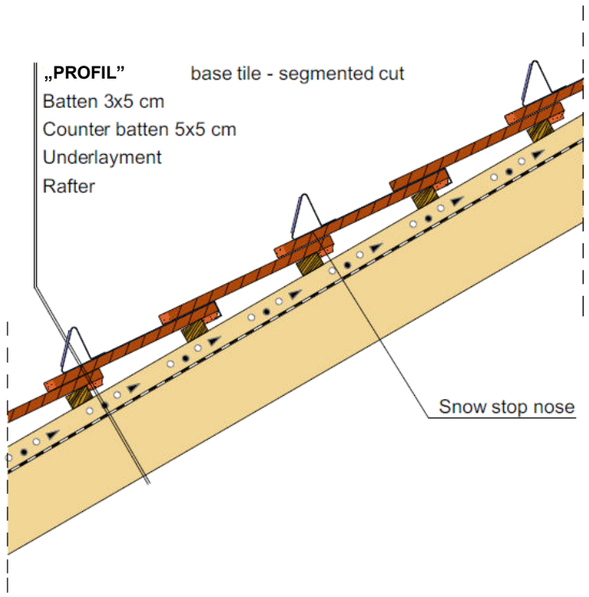
Konkav roof pitch change



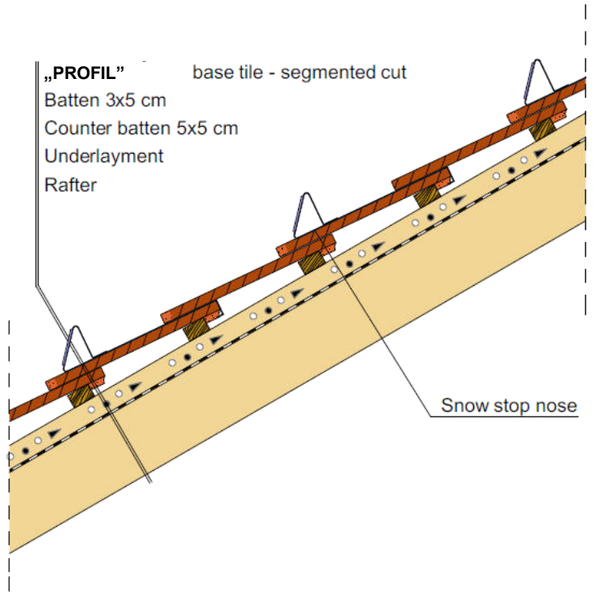
Konvex roof pitch change



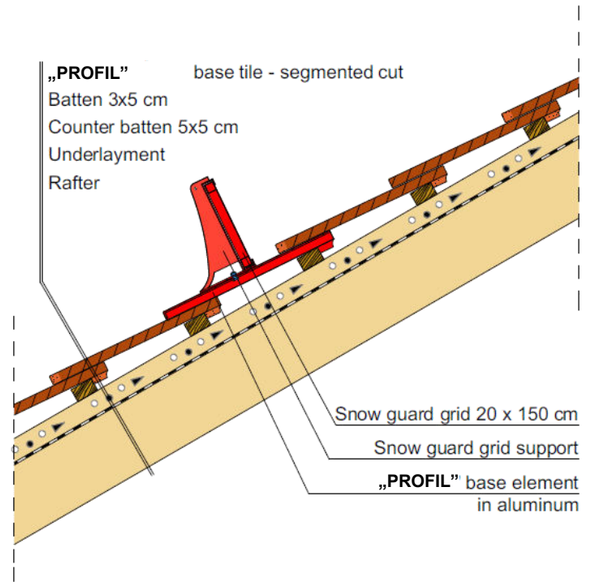
Aluminium solar support detail



Valley detail

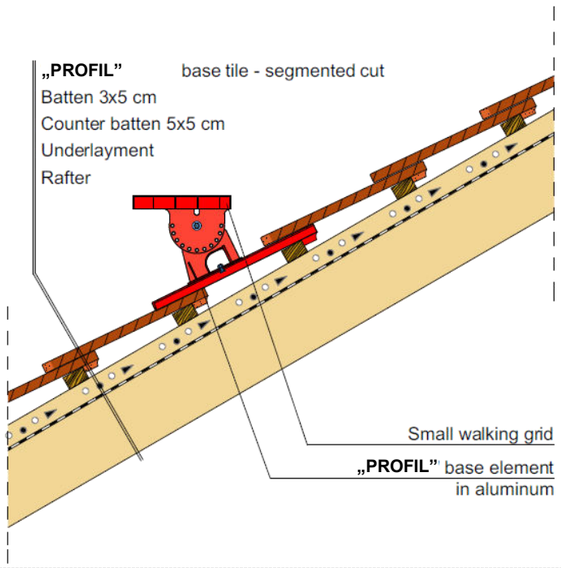


Snow stop nose placement

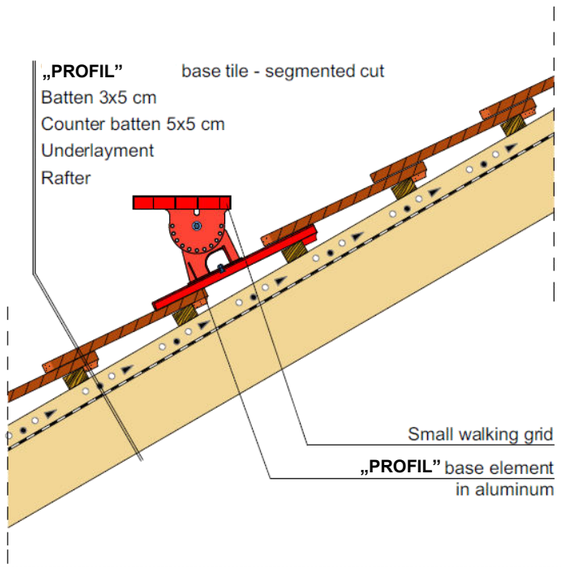


Snow guard grid placement

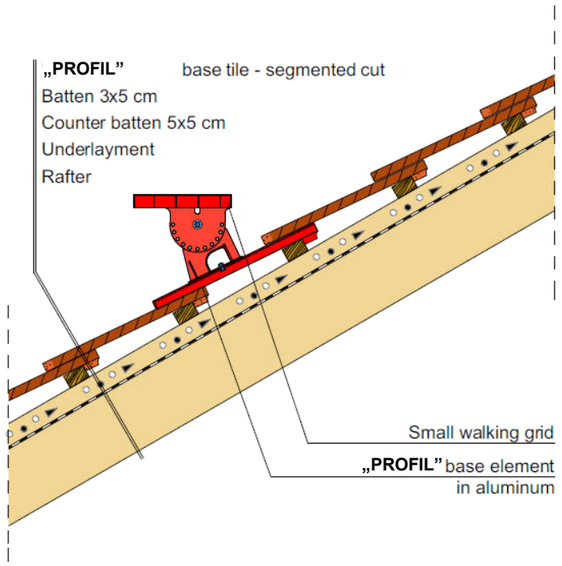
More informations: **swissporTON.hu**



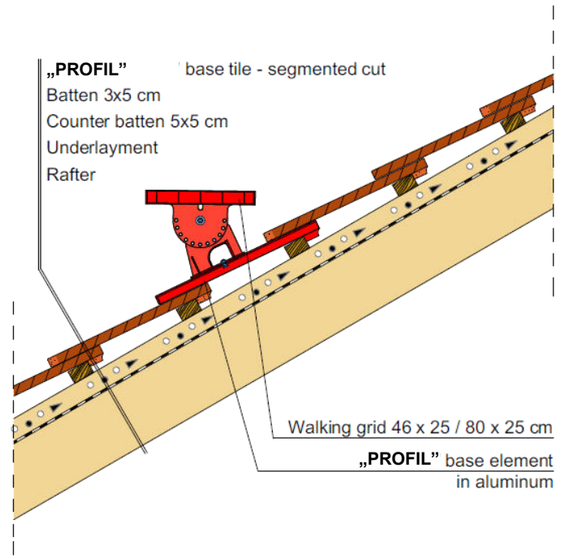
Log support placement



Snow guard tube placement

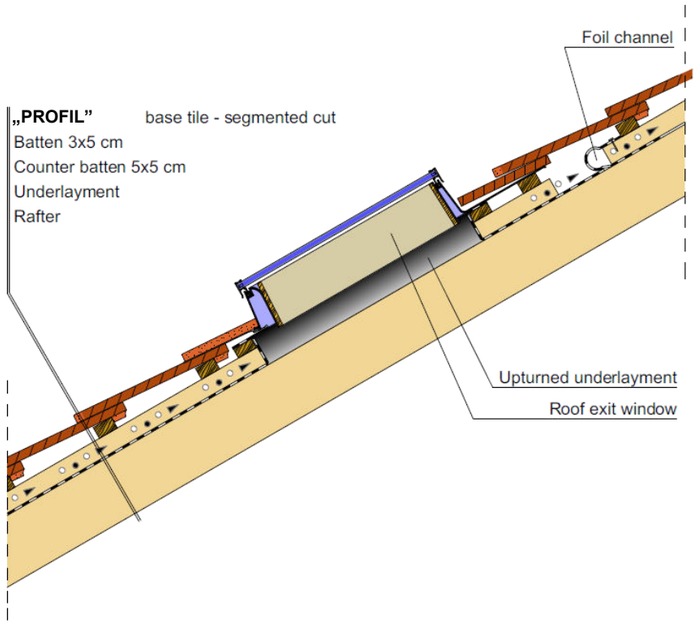


Single step placement

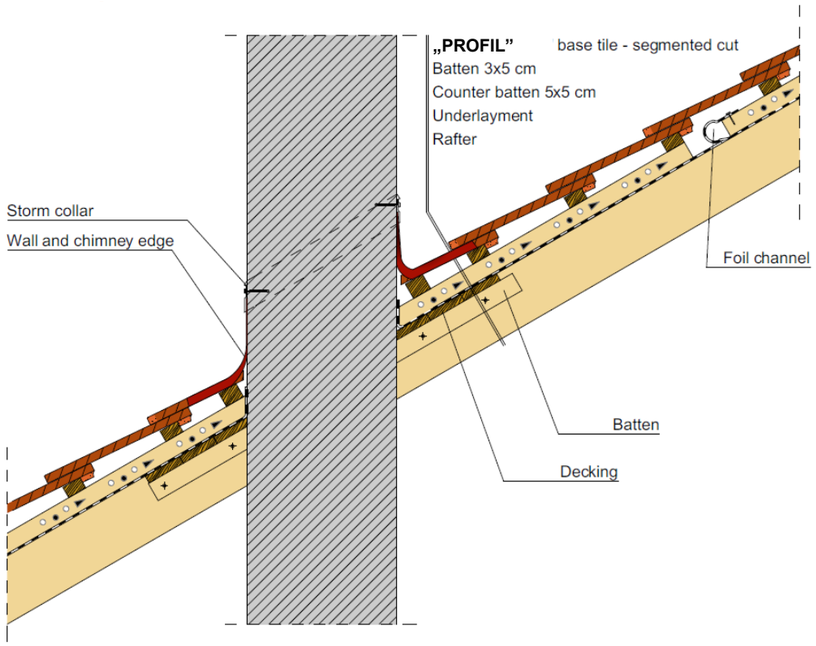


Walking grid placement

More informations: **swissporTON.hu**



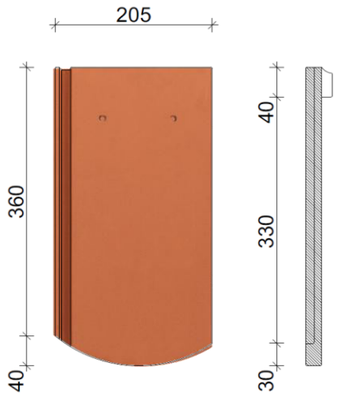
Roof exit window placement



Chimney connection detail

More informations: **swissporTON.hu**

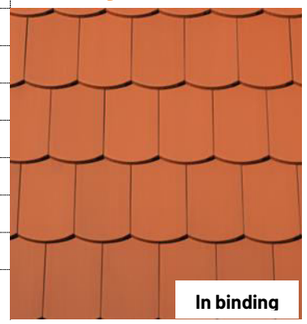
“RÓNA”® segment cut



Product datas

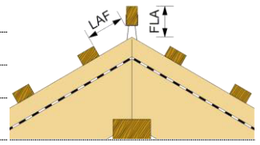
Size	width:	**205 mm**
	length:	**400 mm**
	height :	**35 mm**
	thickness :	**21 mm**
Weight:		**2,55 kg**
Packaging	bundle:	**6 pcs**
	pallet:	**324 pcs**
Standard roof pitch:		**30°**

Covering method



Technical specification of the roof cover

Roof pitch:	**< 30°**	**30° - 35°**	**35° - 40°**	**40° - 45°**	**45° <**
Covering length	**240 mm**	**250 mm**	**260 mm**	**270 mm**	**280 mm**
Covering width	**180 mm**	**180 mm**	**180 mm**	**180 mm**	**180 mm**
Consumption	**23,1 pcs/m²**	**22,2 pcs/m²**	**21,4 pcs/m²**	**20,6 pcs/m²**	**19,8 pcs/m²**
Covering type	**single cover**				
Covering weight	**58,91 kg/m²**	**56,61 kg/m²**	**54,57 kg/m²**	**52,53 kg/m²**	**50,49 kg/m²**



***LAF**: distance of the upper batten*

***FLA**: height of the ridge batten*

„LH” ridge tile with 30x50 battens

Roof pitch	**10°**	**15°**	**20°**	**25°**	**30°**	**35°**	**40°**	**45°**	**50°**	**55°**	**60°**
LAF [mm]	55	55	55	55	55	55	50	50	50	50	50

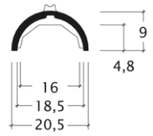
Underlayment requirement

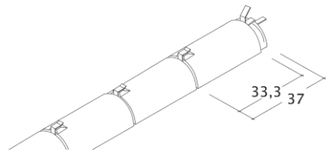
Unsupported underlayment	“ECO”	≥ 24°
Windproof underlayment	“BASIC”	≥ 22°
Watertight underlayment	“PRO”	≥ 18°
Waterproof underlayment	“ULTRA”	≥ 10°

Required batten dimensions

Rafter distances	**Batten dimension**
≤ 800 mm	30 x 50 mm
810 – 900 mm	30 x 50 mm
910 – 1000 mm	40 x 60 mm

“LH” ridge tile 3,0 pcs/lm





Closing plate

3 way hip cap tile

Hip starter

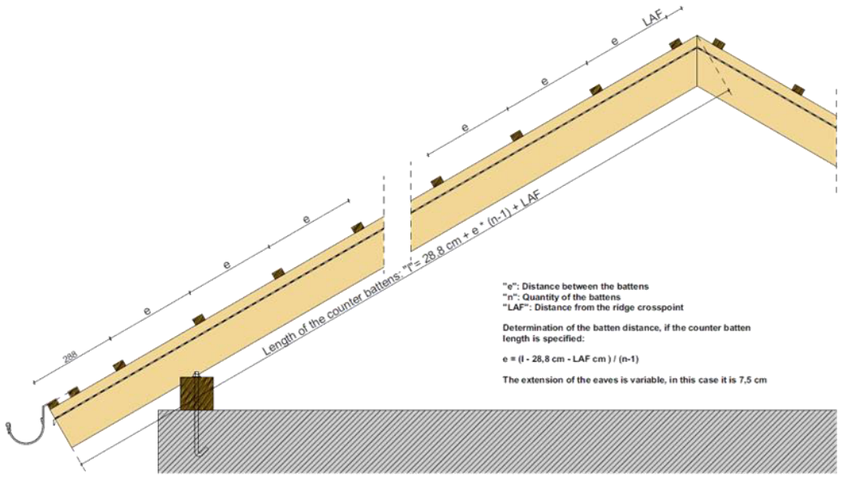
4 way hip cap tile

Clay accessories	**Size**	**Quantity**
Half tile	115x400	as needed
Conical verge tile – left	205x400	3,6 pcs/m – 4,1 pcs/m
Conical verge tile – right	205x400	3,6 pcs/m – 4,1 pcs/m
Ventilation base tiles LQ 10	205x400	5,5 pcs/m
Ventilation tile LQ 25	205x400	as required

Clay outlets	**Package content**	**Outlet type**
“SIGNUM 3.0” 110 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room ventilation kitchen ventilation
“SIGNUM 3.0” 125 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room ventilation kitchen ventilation
“SIGNUM” 150 outlet vent tile	outlet tile, underlay connection bush	room ventilation kitchen ventilation
“SIGNUM” 200 outlet vent tile	outlet tile, underlay connection bush,	room ventilation kitchen ventilation
Antenna outlet tile Ø60 mm	outlet tile, underlay connection bush,	antenna and telecommunication tubes
Solar outlet tile Ø 70 mm	outlet tile, underlay connection bush,	solar and photovoltaic cables
Flue gas outlet tile Ø 110 mm or Ø 125 mm	outlet tile, underlay connection bush,	flue pipe of the condensation boilers

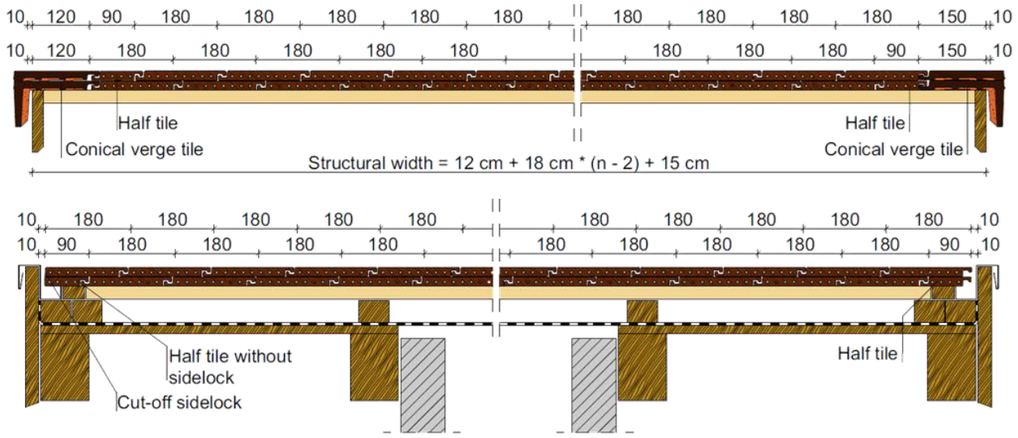
Fixing prodcuts

Name	**Material**	**Application field**
Mount-on stromclip for 30x50 mm battens	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the genereal roof surface .
Mount-on stromclip for 40x60 mm battens	zinc-aluminium	
Nail-in stromclip	stainless steel, CELANEX® PBT	
Fixing screw with EPDM sealing ring, 60 mm length	stainless steel	Fixing against loosed tiles along the edges and some cases in the average roof surfaces
Clip with wire, 17-21 mm	stainless steel	Fixing cutted tiles along the hips and valleys
Universal screw-in stormlcip	zinc-aluminium	Fixing tiles along the eaves



Roof batten alignement for "RÓNA" segment cut clay roof tile

Specification:	7,5 cm eave overhang and 30° roof pitch „LH" ridge tile and 30x50 mm roof battens, LAF = 55 mm				
Number of battens (n)	**240 mm**	**250 mm**	**260 mm**	**270 mm**	**280 mm**
10	2 503	2 593	2 683	2 773	2 863
11	2 743	2 843	2 943	3 043	3 143
12	2 983	3 093	3 203	3 313	3 423
13	3 223	3 343	3 463	3 583	3 703
14	3 463	3 593	3 723	3 853	3 983
15	3 703	3 843	3 983	4 123	4 263
16	3 943	4 093	4 243	4 393	4 543
17	4 183	4 343	4 503	4 663	4 823
18	4 423	4 593	4 763	4 933	5 103
19	4 663	4 843	5 023	5 203	5 383
20	4 903	5 093	5 283	5 473	5 663
21	5 143	5 343	5 543	5 743	5 943
22	5 383	5 593	5 803	6 013	6 223
23	5 623	5 843	6 063	6 283	6 503
24	5 863	6 093	6 323	6 553	6 783
25	6 103	6 343	6 583	6 823	7 063
26	6 343	6 593	6 843	7 093	7 343
27	6 583	6 843	7 103	7 363	7 623
28	6 823	7 093	7 363	7 633	7 903
29	7 063	7 343	7 623	7 903	8 183
30	7 303	7 593	7 883	8 173	8 463
31	7 543	7 843	8 143	8 443	8 743
32	7 783	8 093	8 403	8 713	9 023
33	8 023	8 343	8 663	8 983	9 303
34	8 263	8 593	8 923	9 253	9 583
35	8 503	8 843	9 183	9 523	9 863
36	8 743	9 093	9 443	9 793	10 143
37	8 983	9 343	9 703	10 063	10 423
38	9 223	9 593	9 963	10 333	10 703
39	9 463	9 843	10 223	10 603	10 983
40	9 703	10 093	10 483	10 873	11 263



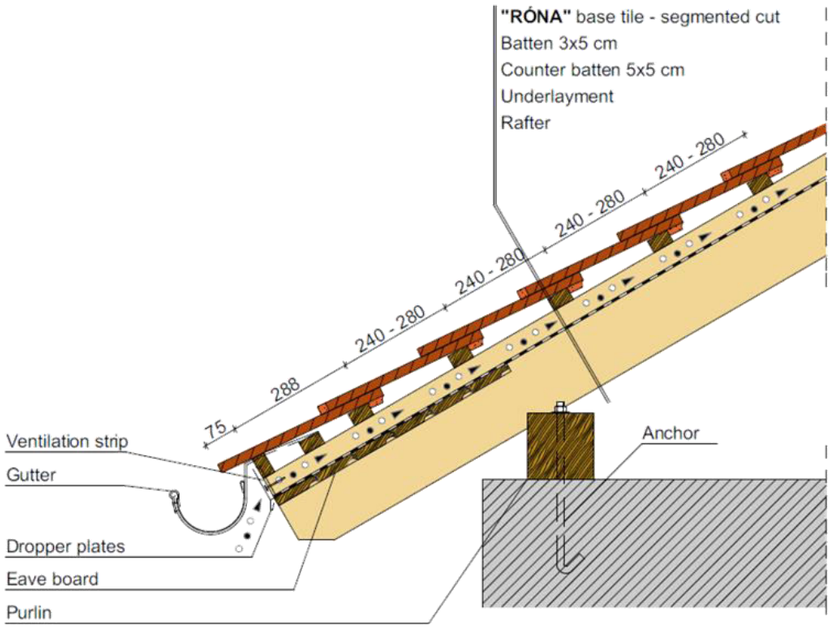
Structural width between the verge boards

	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
0	-	90	180	270	270	360	450	540	630	720
10	1 710	1 800	1 890	1 980	2 070	2 160	2 250	2 340	2 430	2 520
20	3 510	3 600	3 690	3 780	3 870	3 960	4 050	4 140	4 230	4 320
30	5 310	5 400	5 490	5 580	5 670	5 760	5 850	5 940	6 030	6 120
40	7 110	7 200	7 290	7 380	7 470	7 560	7 650	7 740	7 830	7 920
50	8 910	9 000	9 090	9 180	9 270	9 360	9 450	9 540	9 630	9 720
60	10 710	10 800	10 890	10 980	11 070	11 160	11 250	11 340	11 430	11 520
70	12 510	12 600	12 690	12 780	12 870	12 960	13 050	13 140	13 230	13 320
80	14 310	14 400	14 490	14 580	14 670	14 760	14 850	14 940	15 030	15 120
90	16 110	16 200	16 290	16 380	16 470	16 560	16 650	16 740	16 830	16 920
100	17 910	18 000	18 090	18 180	18 270	18 360	18 450	18 540	18 630	18 720

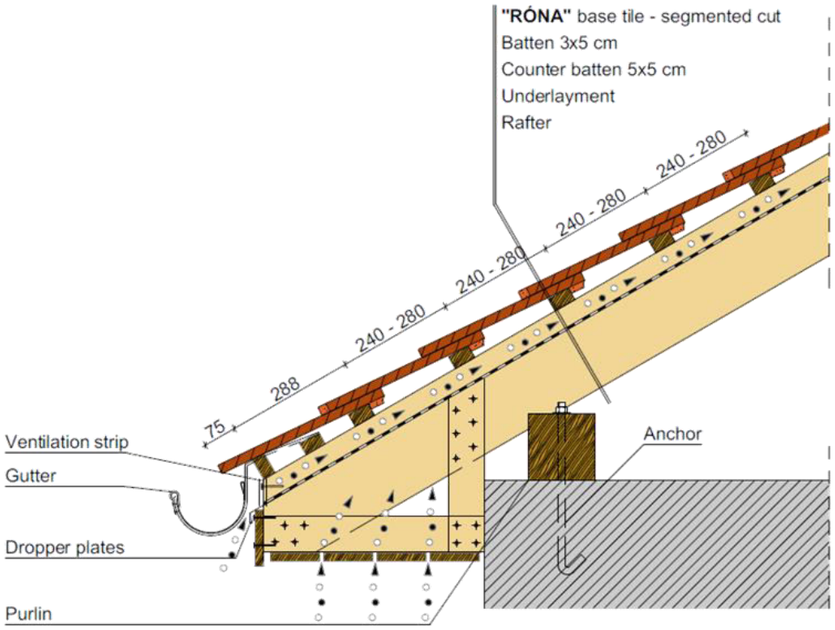
Structural width between the verge boards

	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	810	900	990	1 080	1 170	1 260	1 350	1 440	1 530	1 620
10	2 610	2 700	2 790	2 880	2 970	3 060	3 150	3 240	3 330	3 420
20	4 410	4 500	4 590	4 680	4 770	4 860	4 950	5 040	5 130	5 220
30	6 210	6 300	6 390	6 480	6 570	6 660	6 750	6 840	6 930	7 020
40	8 010	8 100	8 190	8 280	8 370	8 460	8 550	8 640	8 730	8 820
50	9 810	9 900	9 990	10 080	10 170	10 260	10 350	10 440	10 530	10 620
60	11 610	11 700	11 790	11 880	11 970	12 060	12 150	12 240	12 330	12 420
70	13 410	13 500	13 590	13 680	13 770	13 860	13 950	14 040	14 130	14 220
80	15 210	15 300	15 390	15 480	15 570	15 660	15 750	15 840	15 930	16 020
90	17 010	17 100	17 190	17 280	17 370	17 460	17 550	17 640	17 730	17 820
100	18 810	18 900	18 990	19 080	19 170	19 260	19 350	19 440	19 530	19 620

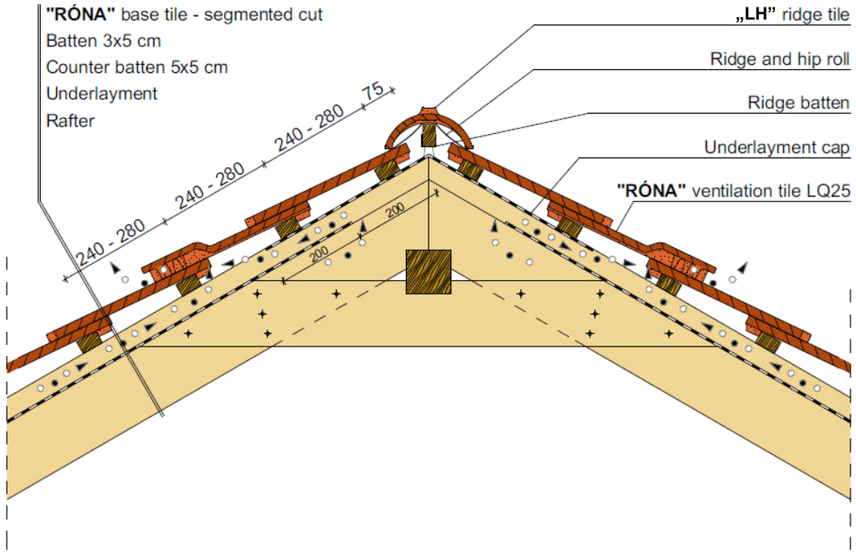
The structural widths below are calculated with 1-1 cm gap between the side plate of the verge tiles and the verge board.



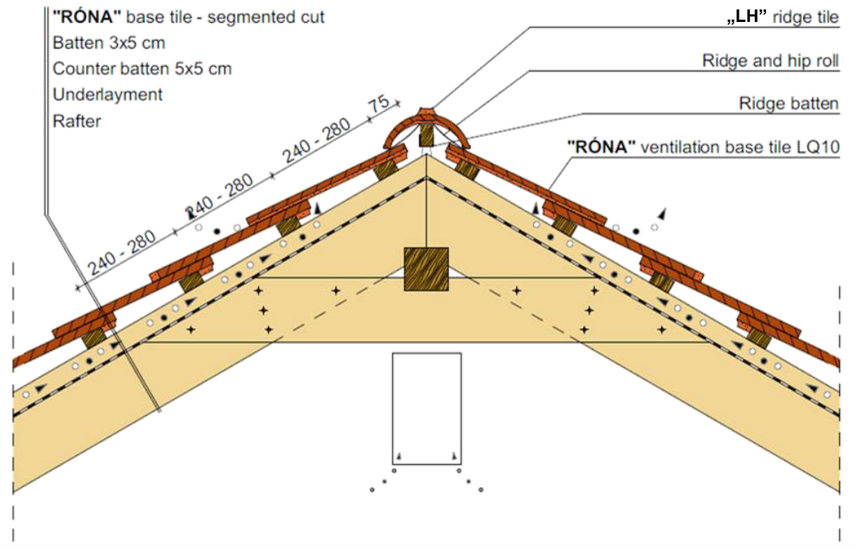
Eave detail



Closed eave detail

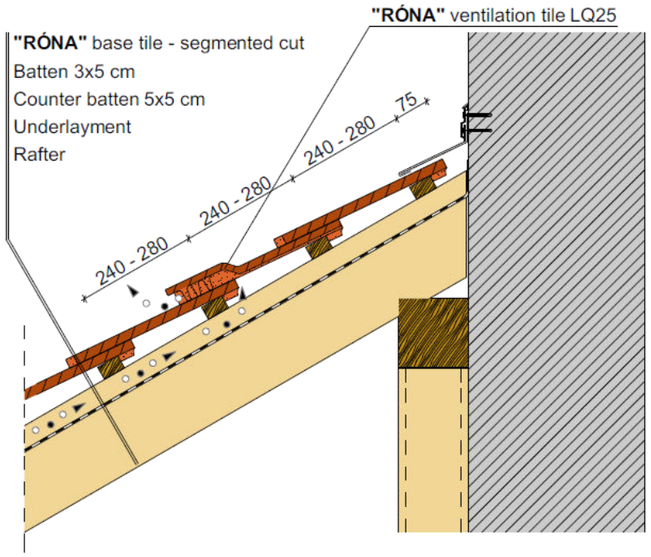


Ridge detail with ventilation tile

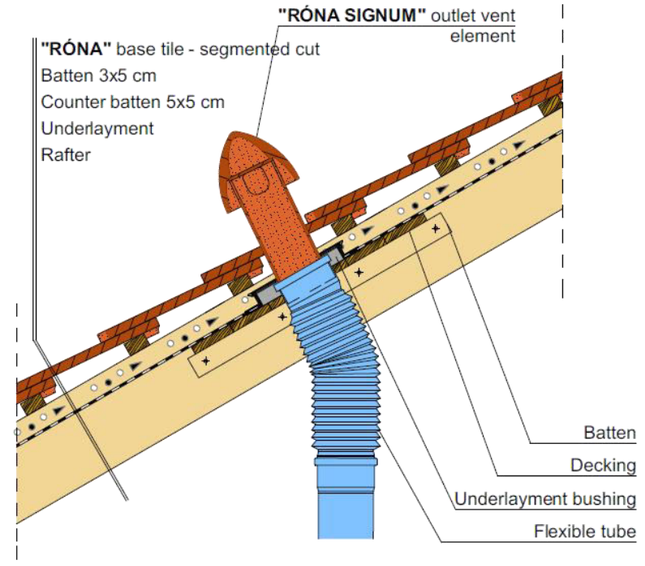


Ridge detail with ventilation base tile

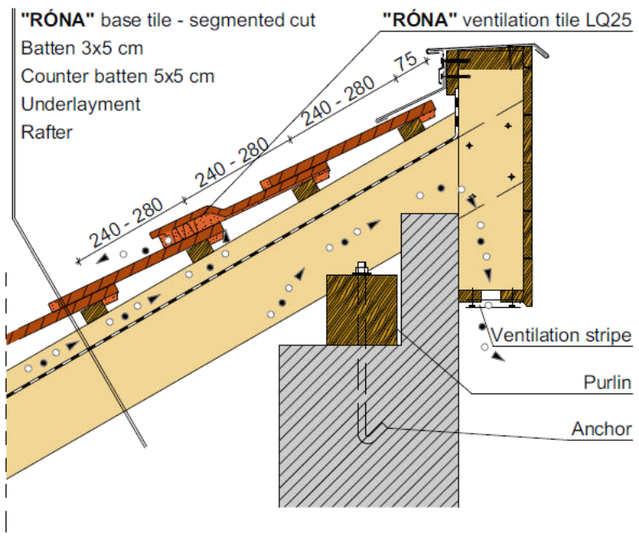
More informations: **swissporTON.hu**



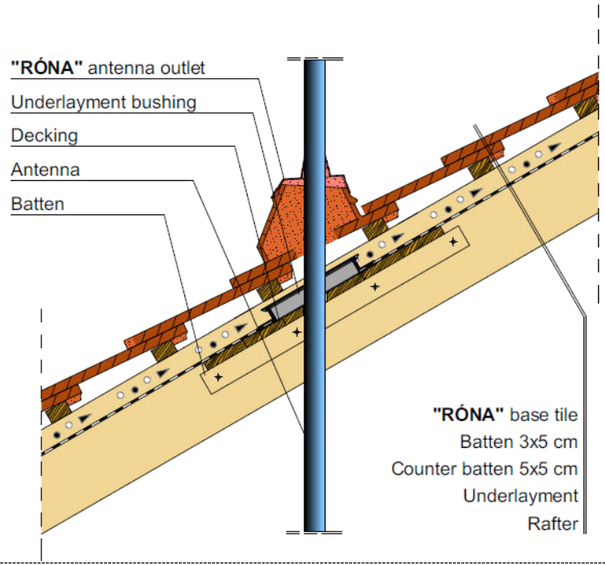
Wall connection detail



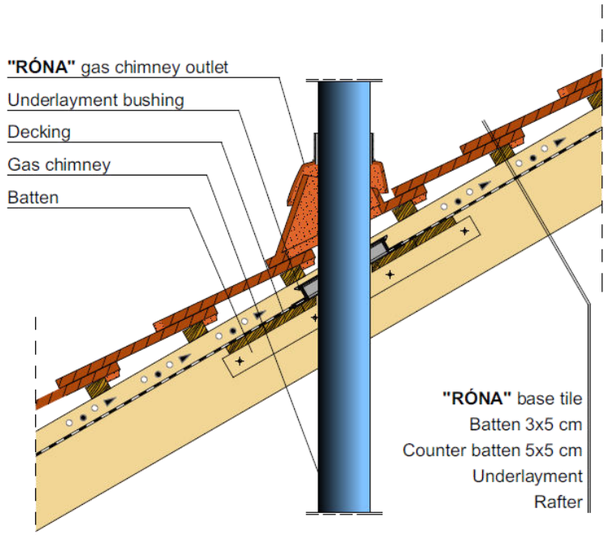
Clay outlet detail



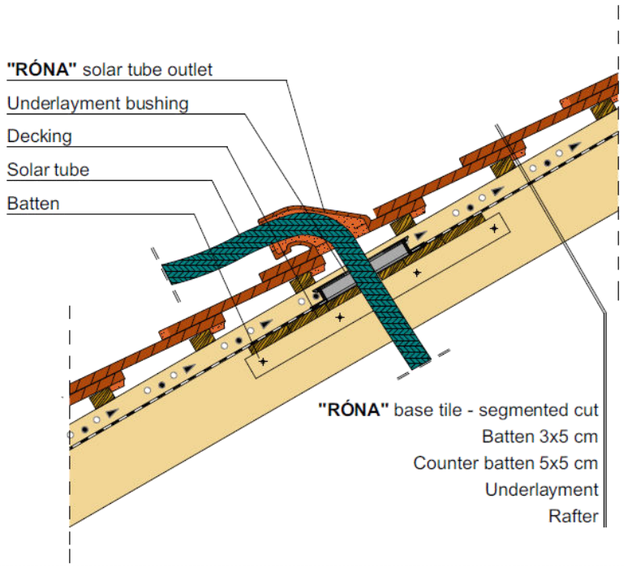
Shed roof ridge detail



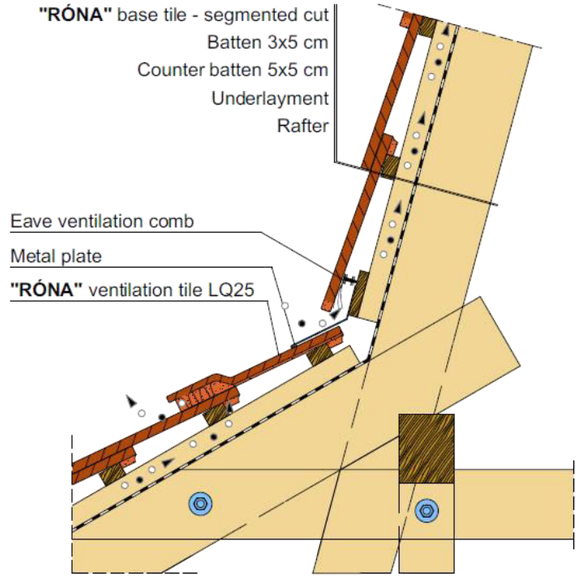
Clay antena outlet detail



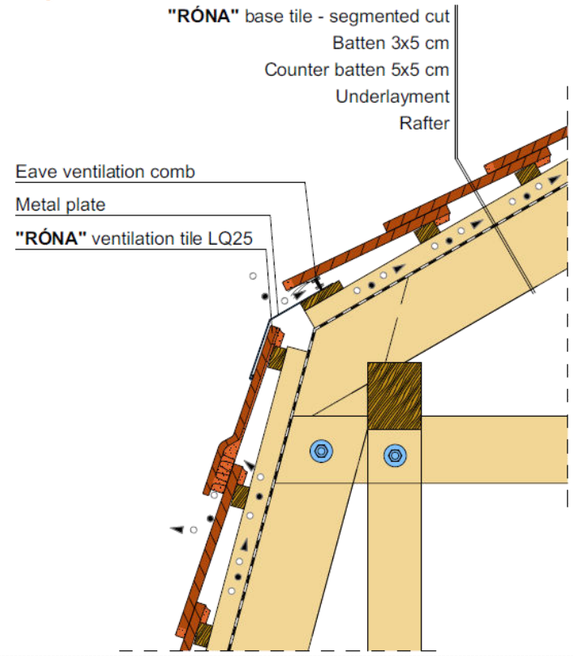
Clay gas chimney outlet detail



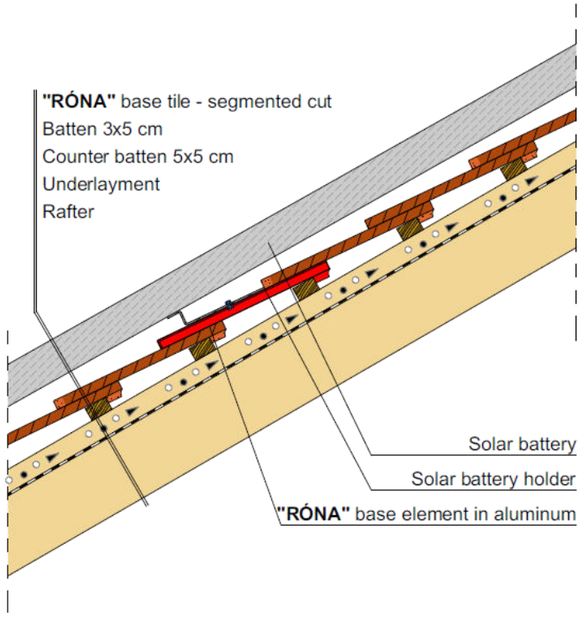
Clay solar tube outlet detail



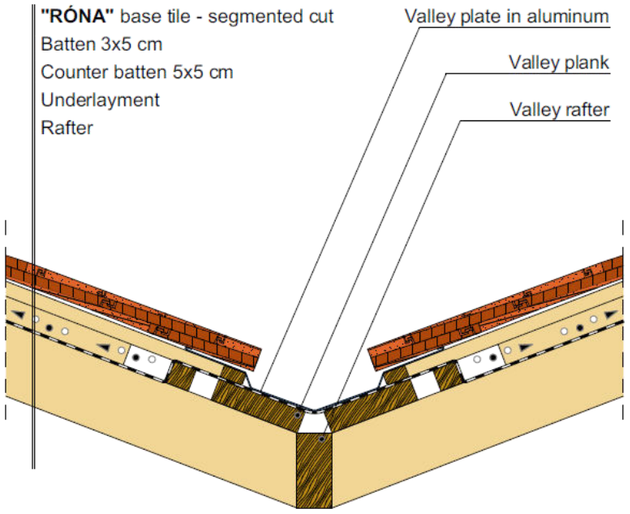
Konkav roof pitch change



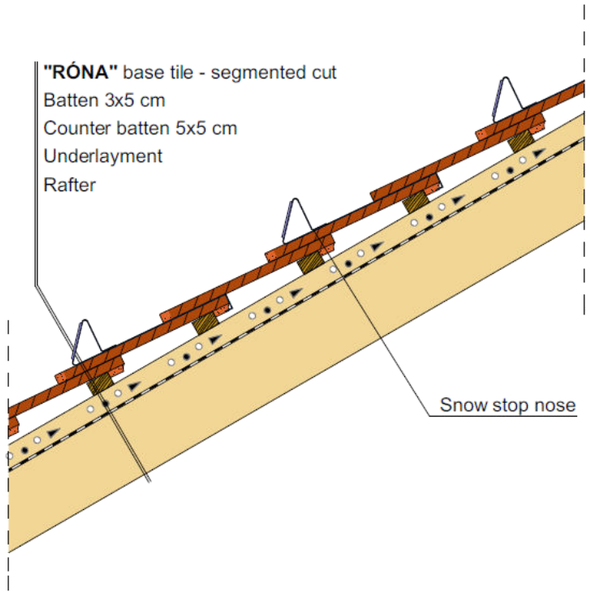
Konvex roof pitch change



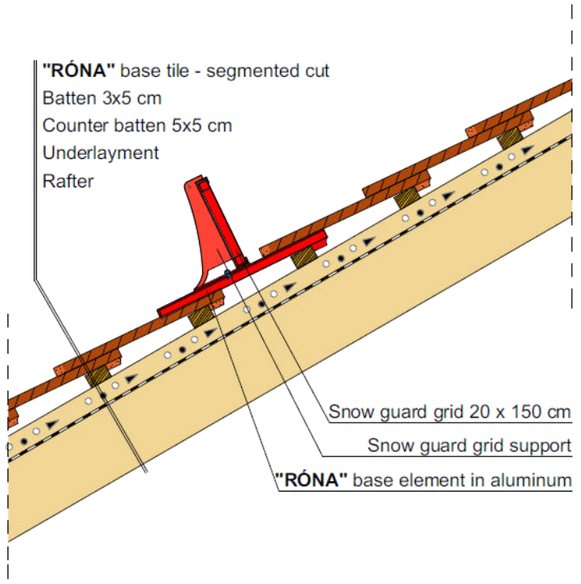
Aluminium solar support detail



Valley detail

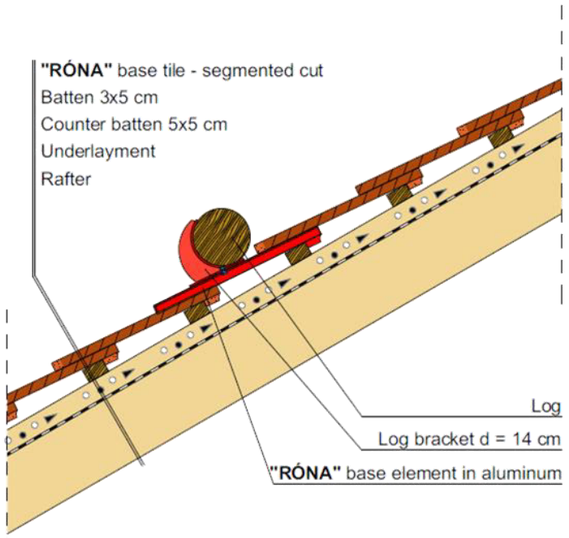


Snow stop nose placement

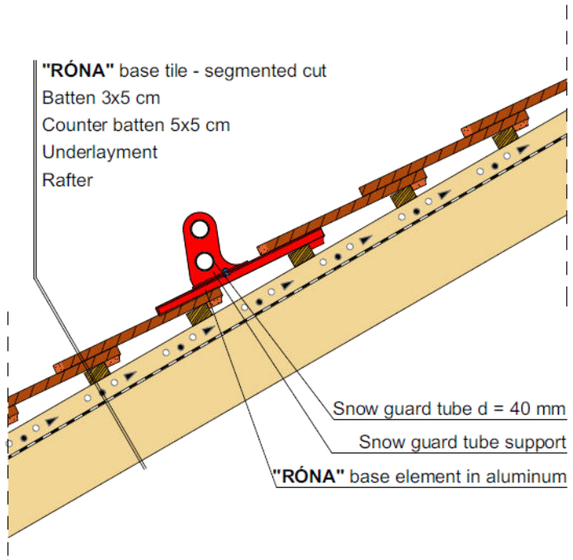


Snow guard grid placement

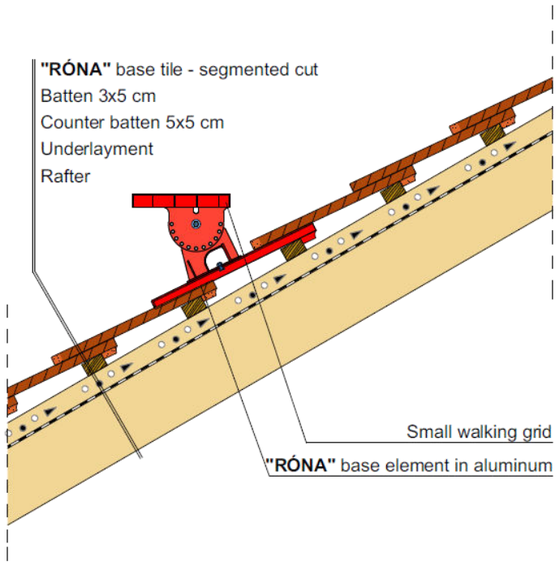
More informations: **swissporTON.hu**



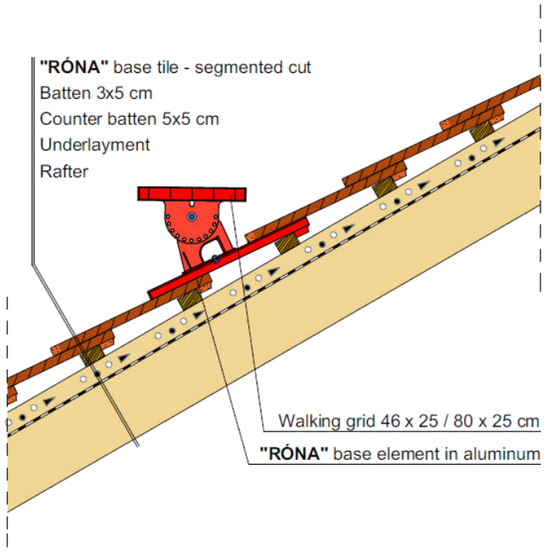
Log support placement



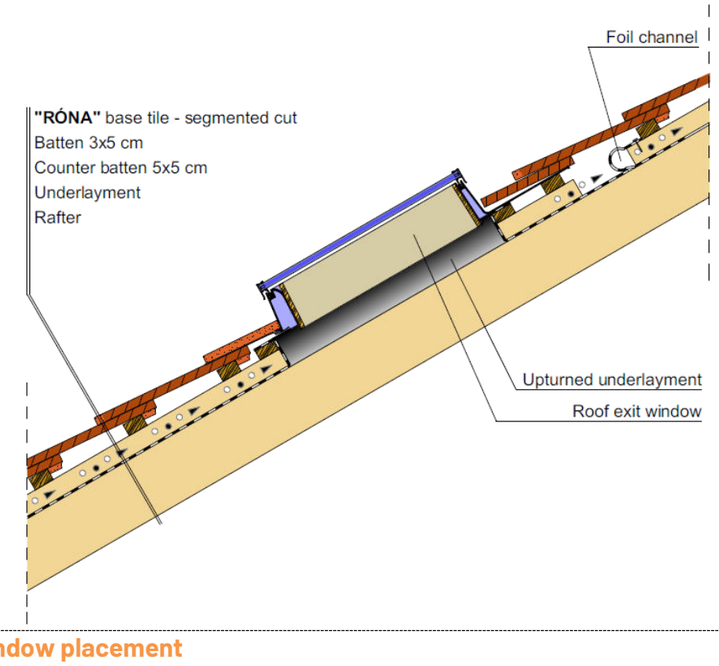
Snow guard tube placement



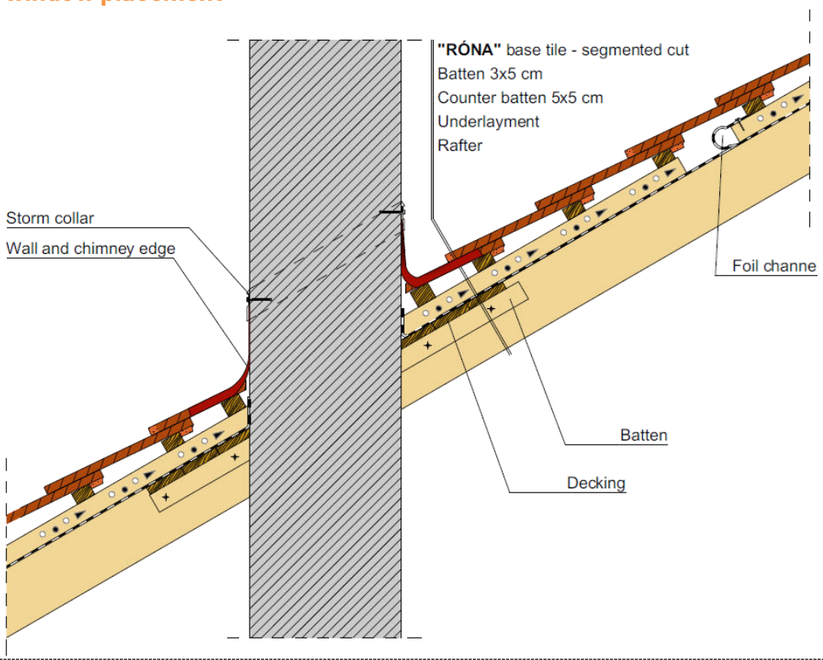
Single step placement



Walking grid placement



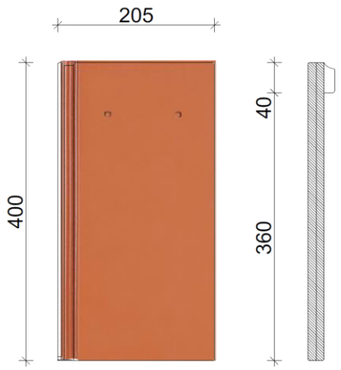
Roof exit window placement



Chimney connection detail

More informations: **swissporTON.hu**

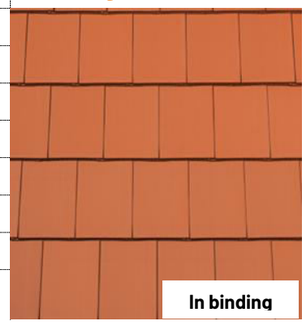
“RÓNA”® straight cut



Product datas

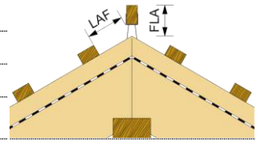
Size	width:	**205 mm**
	length:	**400 mm**
	height	**35 mm**
	thickness :	**21 mm**
Weight :		**2,74 kg**
Packaging	bundle:	**6 db**
	pallet:	**324 db**
Standard roof pitch:		**30°**

Covering method



Technical specification of the roof cover

Roof pitch:	**< 30°**	**30° - 35°**	**35° - 40°**	**40° - 45°**	**45° <**
Covering length	**280 mm**	**290 mm**	**300 mm**	**310 mm**	**320 mm**
Covering width	**180 mm**	**180 mm**	**180 mm**	**180 mm**	**180 mm**
Consumption	**19,8 pcs/m²**	**19,2 pcs/m²**	**18,5 pcs/m²**	**17,9 pcs/m²**	**17,4 pcs/m²**
Covering type	**single cover**				
Covering weight	**54,26 kg/m²**	**52,61 kg/m²**	**50,69 kg/m²**	**49,05 kg/m²**	**47,68 kg/m²**



***LAF**: distance of the upper batten*

***FLA**: height of the ridge batten*

„LH” ridge tile with 30x50 battens

Roof pitch	**10°**	**15°**	**20°**	**25°**	**30°**	**35°**	**40°**	**45°**	**50°**	**55°**	**60°**
LAF [mm]	55	55	55	55	55	55	50	50	50	50	50

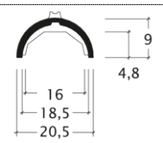
Underlayment requirement

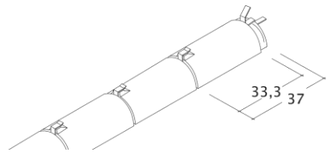
Unsupported underlayment	“ECO”	≥ 24°
Windproof underlayment	“BASIC”	≥ 22°
Watertight underlayment	“PRO”	≥ 18°
Waterproof underlayment	“ULTRA”	≥ 10°

Required batten dimensions

Rafter distances	**Batten dimension**
≤ 800 mm	30 x 50 mm
810 – 900 mm	30 x 50 mm
910 – 1000 mm	40 x 60 mm

“LH” ridge tile 3,0 pcs/lm

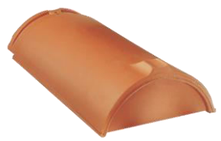




Closing plate

3 way hip cap tile

Hip starter



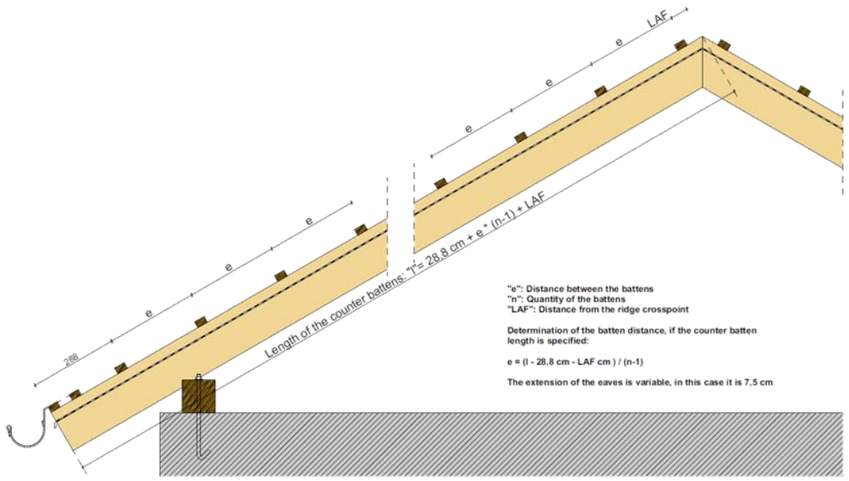
4 way hip cap tile

Clay accessories	**Size**	**Quantity**
Half tile	115x400	as needed
Verge tile – left	205x400	3,1 pcs/m – 3,6 pcs/m
Verge tile – right	205x400	3,1 pcs/m – 3,6 pcs/m
Ventilation base tiles LQ 10	205x400	5,5 pcs/m
Ventilation tile LQ 25	205x400	as required

Clay outlets	**Package content**	**Outlet type**
“SIGNUM 3.0” 110 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room ventilation kitchen ventilation
“SIGNUM 3.0” 125 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room ventilation kitchen ventilation
“SIGNUM” 150 outlet vent tile	outlet tile, underlay connection bush	room ventilation kitchen ventilation
“SIGNUM” 200 outlet vent tile	outlet tile, underlay connection bush,	room ventilation kitchen ventilation
Antenna outlet tile Ø60 mm	outlet tile, underlay connection bush,	antenna and telecommunication tubes
Solar outlet tile Ø 70 mm	outlet tile, underlay connection bush,	solar and photovoltaic cables
Flue gas outlet tile Ø 110 mm or Ø 125 mm	outlet tile, underlay connection bush,	flue pipe of the condensation boilers

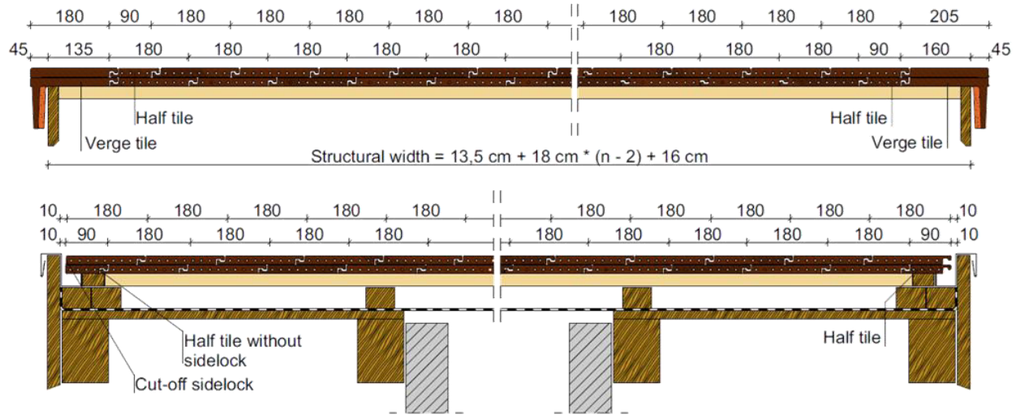
Fixing products

Name	**Material**	**Application field**
Mount-on stromclip for 30x50 mm battens	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the genereal roof surface .
Mount-on stromclip for 40x60 mm battens	zinc-aluminium	
Nail-in stromclip	stainless steel, CELANEX® PBT	
Fixing screw with EPDM sealing ring, 60 mm length	stainless steel	Fixing against loosed tiles along the edges and some cases in the average roof surfaces
Clip with wire, 17-21 mm	stainless steel	Fixing cutted tiles along the hips and valleys
Universal screw-in stormlcip	zinc-aluminium	Fixing tiles along the eaves



Roof batten alignement for "RÔNA" straight cut clay roof tile

Specification:	7,5 cm eave overhang and 30° roof pitch „LH" ridge tile and 30x50 mm roof battens, LAF = 55 mm				
Number of battens (n)	**280 mm**	**290 mm**	**300 mm**	**310 mm**	**320 mm**
10	2 863	2 953	3 043	3 133	3 223
11	3 143	3 243	3 343	3 443	3 543
12	3 423	3 533	3 643	3 753	3 863
13	3 703	3 823	3 943	4 063	4 183
14	3 983	4 113	4 243	4 373	4 503
15	4 263	4 403	4 543	4 683	4 823
16	4 543	4 693	4 843	4 993	5 143
17	4 823	4 983	5 143	5 303	5 463
18	5 103	5 273	5 443	5 613	5 783
19	5 383	5 563	5 743	5 923	6 103
20	5 663	5 853	6 043	6 233	6 423
21	5 943	6 143	6 343	6 543	6 743
22	6 223	6 433	6 643	6 853	7 063
23	6 503	6 723	6 943	7 163	7 383
24	6 783	7 013	7 243	7 473	7 703
25	7 063	7 303	7 543	7 783	8 023
26	7 343	7 593	7 843	8 093	8 343
27	7 623	7 883	8 143	8 403	8 663
28	7 903	8 173	8 443	8 713	8 983
29	8 183	8 463	8 743	9 023	9 303
30	8 463	8 753	9 043	9 333	9 623
31	8 743	9 043	9 343	9 643	9 943
32	9 023	9 333	9 643	9 953	10 263
33	9 303	9 623	9 943	10 263	10 583
34	9 583	9 913	10 243	10 573	10 903
35	9 863	10 203	10 543	10 883	11 223
36	10 143	10 493	10 843	11 193	11 543
37	10 423	10 783	11 143	11 503	11 863
38	10 703	11 073	11 443	11 813	12 183
39	10 983	11 363	11 743	12 123	12 503
40	11 263	11 653	12 043	12 433	12 823



Structural width between the verge boards

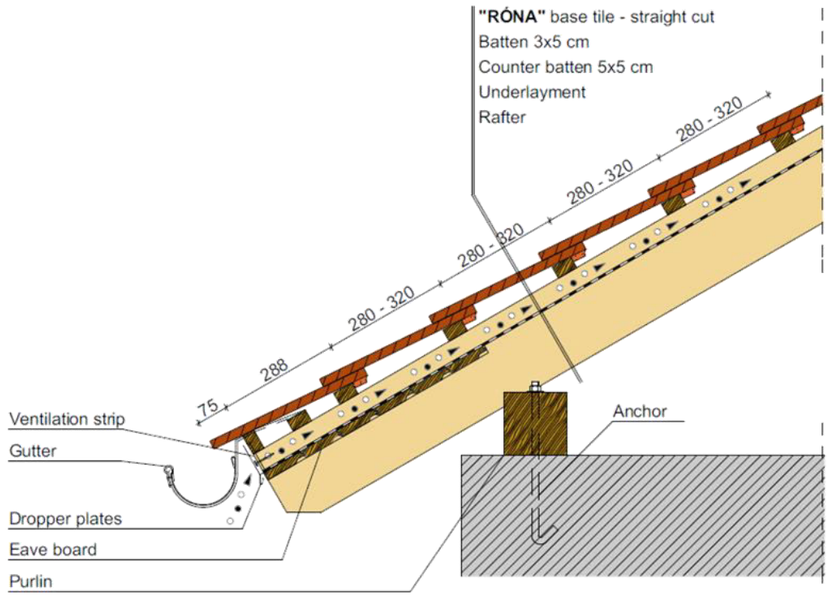
	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
0	-	90	180	270	295	385	475	565	655	745
10	1 735	1 825	1 915	2 005	2 095	2 185	2 275	2 365	2 455	2 545
20	3 535	3 625	3 715	3 805	3 895	3 985	4 075	4 165	4 255	4 345
30	5 335	5 425	5 515	5 605	5 695	5 785	5 875	5 965	6 055	6 145
40	7 135	7 225	7 315	7 405	7 495	7 585	7 675	7 765	7 855	7 945
50	8 935	9 025	9 115	9 205	9 295	9 385	9 475	9 565	9 655	9 745
60	10 735	10 825	10 915	11 005	11 095	11 185	11 275	11 365	11 455	11 545
70	12 535	12 625	12 715	12 805	12 895	12 985	13 075	13 165	13 255	13 345
80	14 335	14 425	14 515	14 605	14 695	14 785	14 875	14 965	15 055	15 145
90	16 135	16 225	16 315	16 405	16 495	16 585	16 675	16 765	16 855	16 945
100	17 935	18 025	18 115	18 205	18 295	18 385	18 475	18 565	18 655	18 745

Structural width between the verge boards

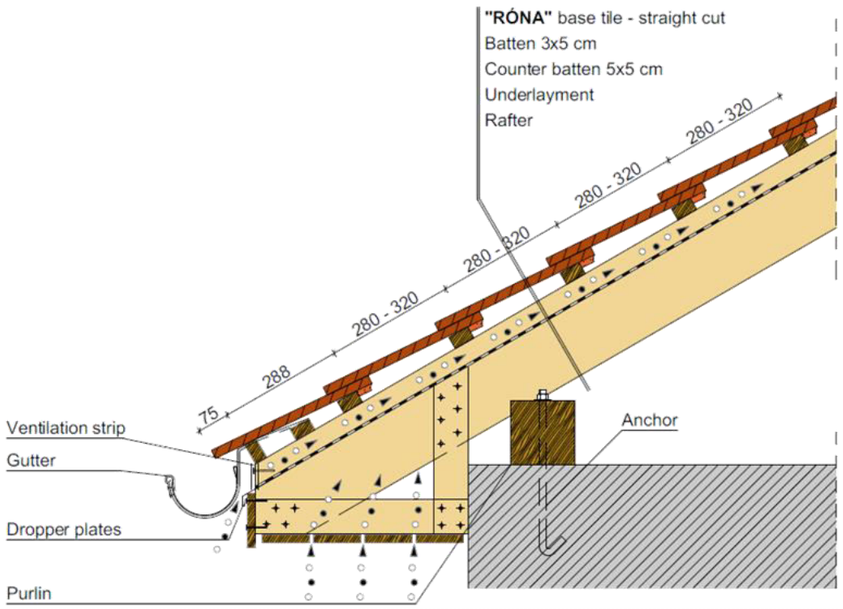
	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	835	925	1 015	1 105	1 195	1 285	1 375	1 465	1 555	1 645
10	2 635	2 725	2 815	2 905	2 995	3 085	3 175	3 265	3 355	3 445
20	4 435	4 525	4 615	4 705	4 795	4 885	4 975	5 065	5 155	5 245
30	6 235	6 325	6 415	6 505	6 595	6 685	6 775	6 865	6 955	7 045
40	8 035	8 125	8 215	8 305	8 395	8 485	8 575	8 665	8 755	8 845
50	9 835	9 925	10 015	10 105	10 195	10 285	10 375	10 465	10 555	10 645
60	11 635	11 725	11 815	11 905	11 995	12 085	12 175	12 265	12 355	12 445
70	13 435	13 525	13 615	13 705	13 795	13 885	13 975	14 065	14 155	14 245
80	15 235	15 325	15 415	15 505	15 595	15 685	15 775	15 865	15 955	16 045
90	17 035	17 125	17 215	17 305	17 395	17 485	17 575	17 665	17 755	17 845
100	18 835	18 925	19 015	19 105	19 195	19 285	19 375	19 465	19 555	19 645

The structural widths below are calculated with 1-1 cm gap between the side plate of the verge tiles and the verge board.

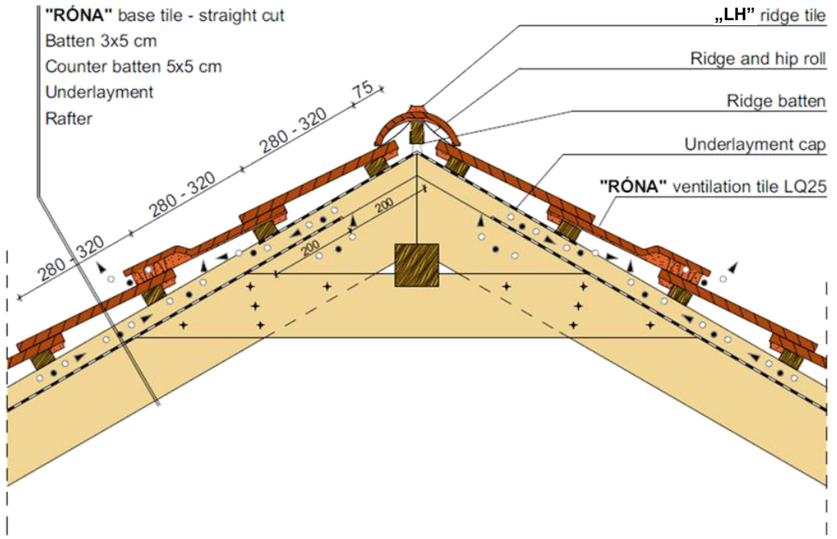
More informations: **swissporTON.hu**



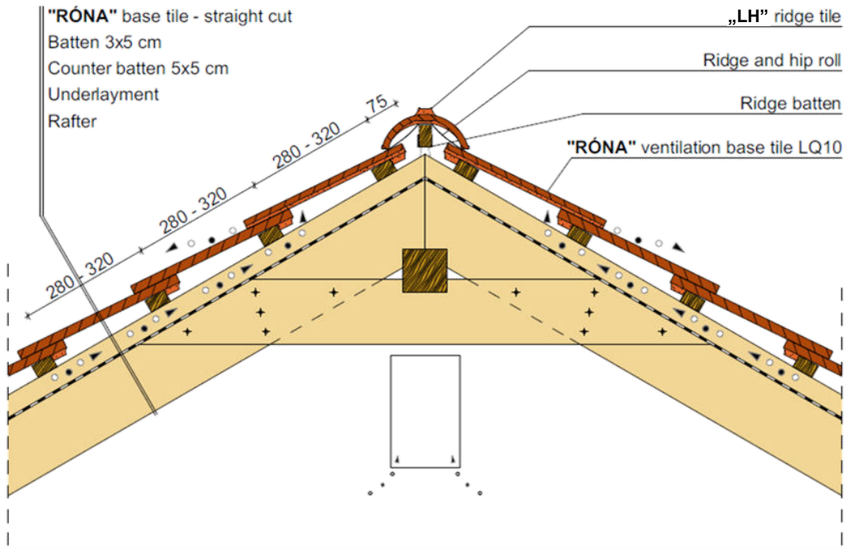
Eave detail



Closed eave detail

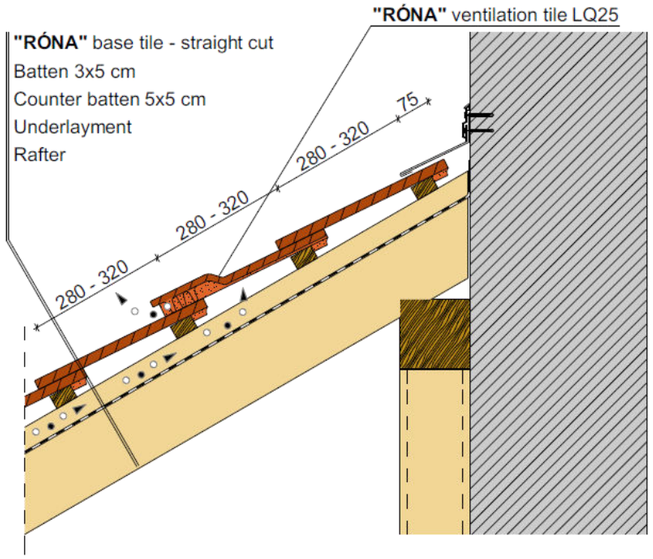


Ridge detail with ventilation tile

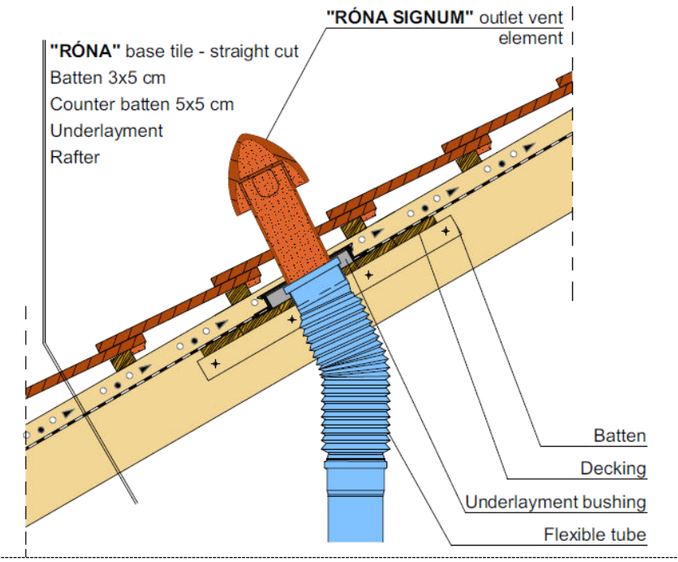


Ridge detail with ventilation base tile

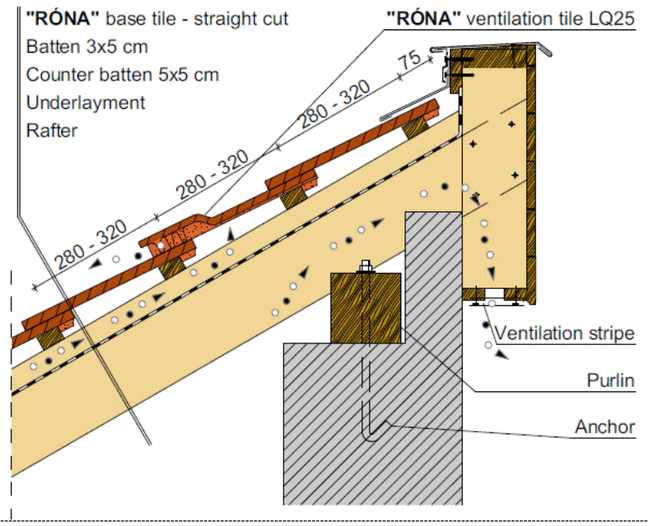
More informations: **swissporTON.hu**



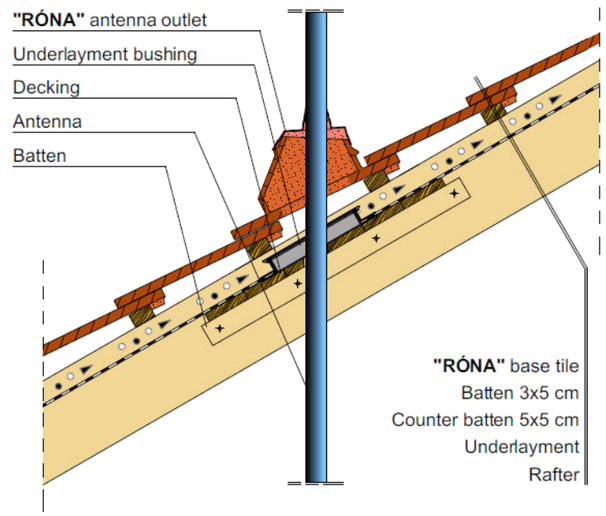
Wall connection detail



Clay outlet detail

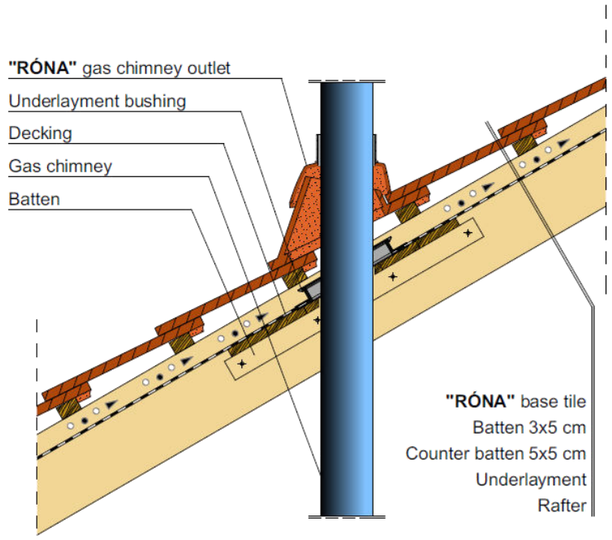


Shed roof ridge detail

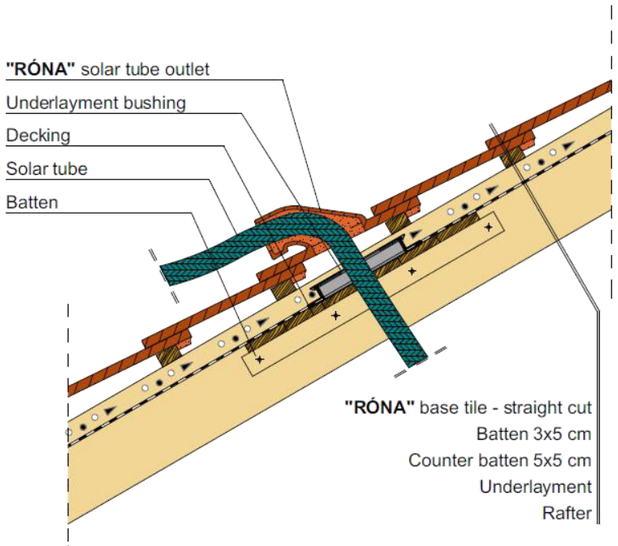


Clay antena outlet detail

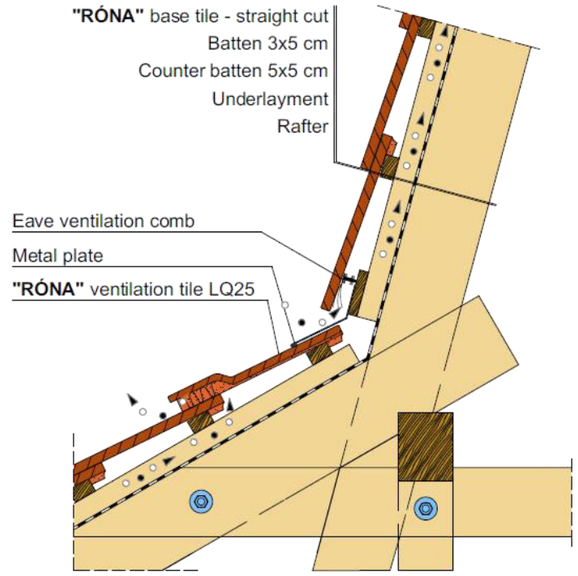
More informations: **swissporTON.hu**



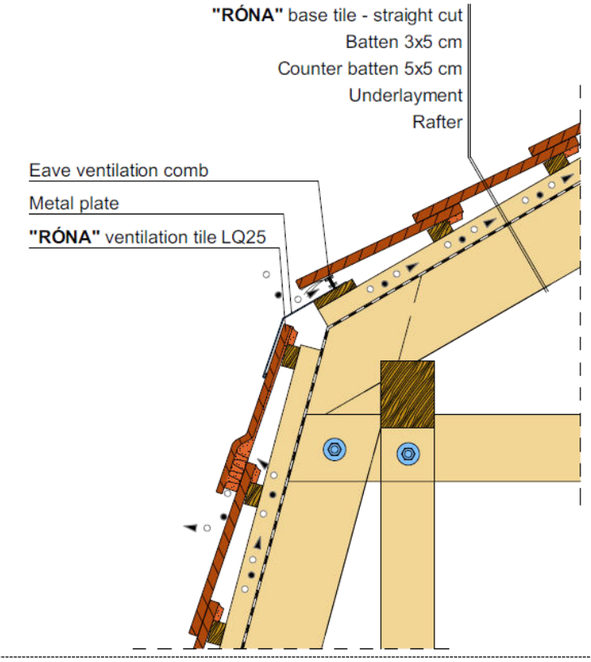
Clay gas chimney outlet detail



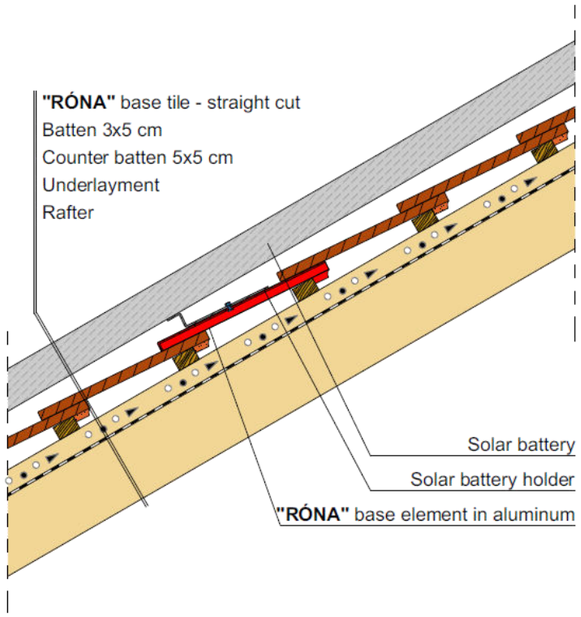
Clay solar tube outlet detail



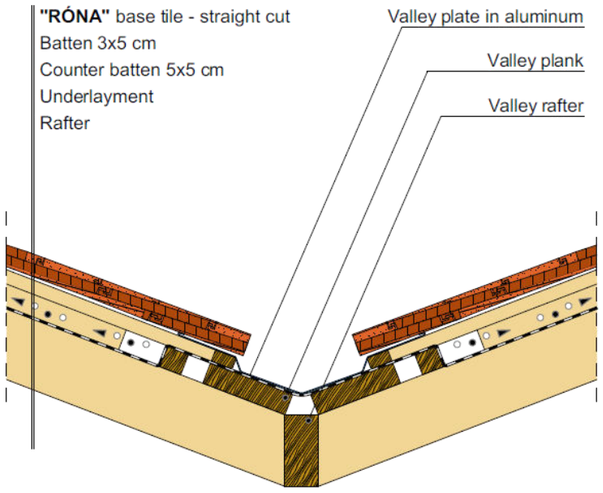
Konkav roof pitch change



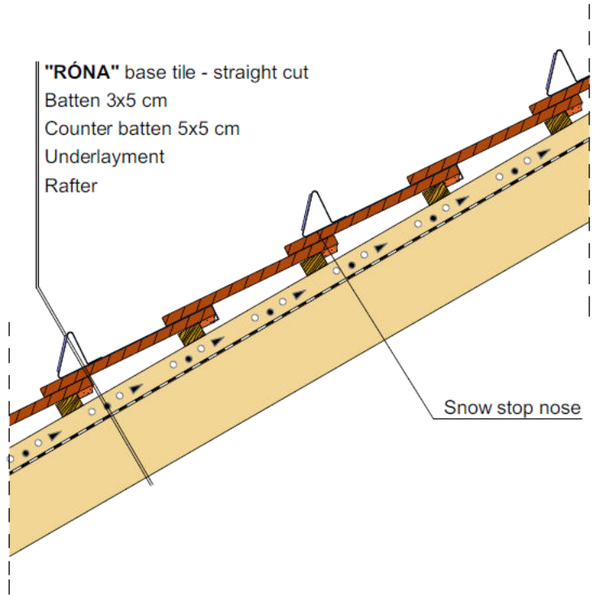
Konvex roof pitch change



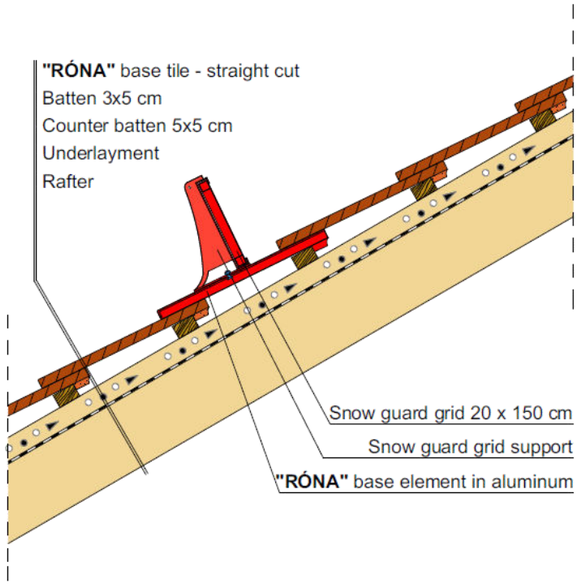
Aluminium solar support detail



Valley detail

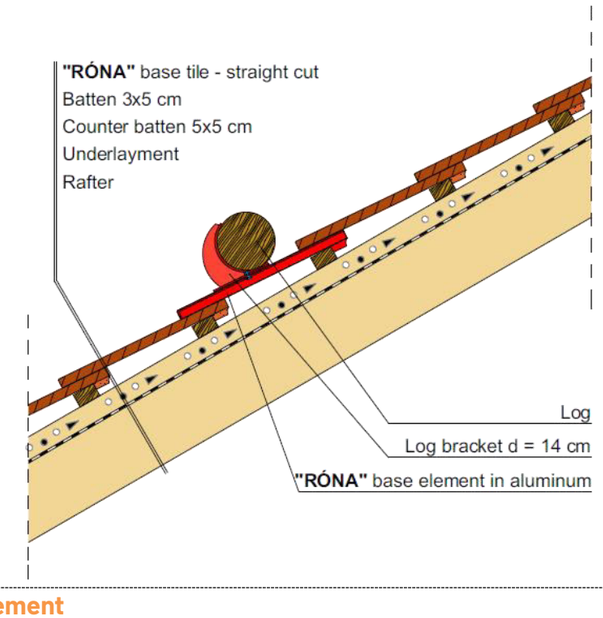


Snow stop nose placement

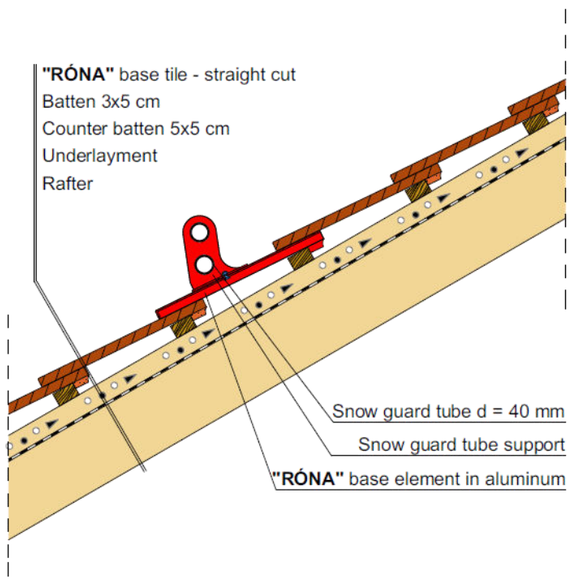


Snow guard grid placement

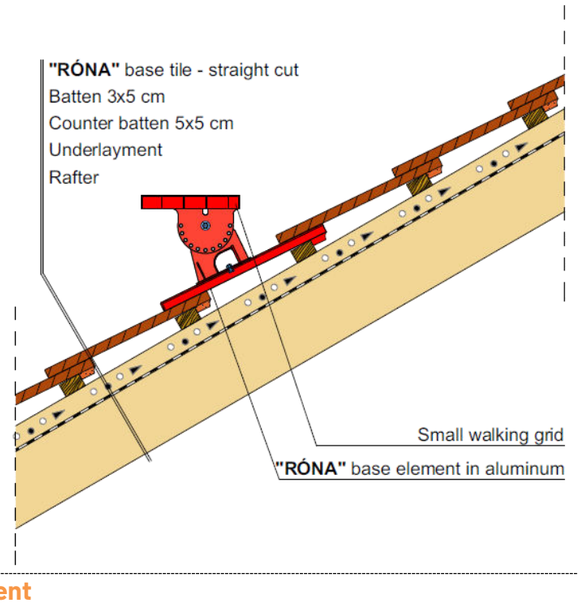
More informations: **swissporTON.hu**



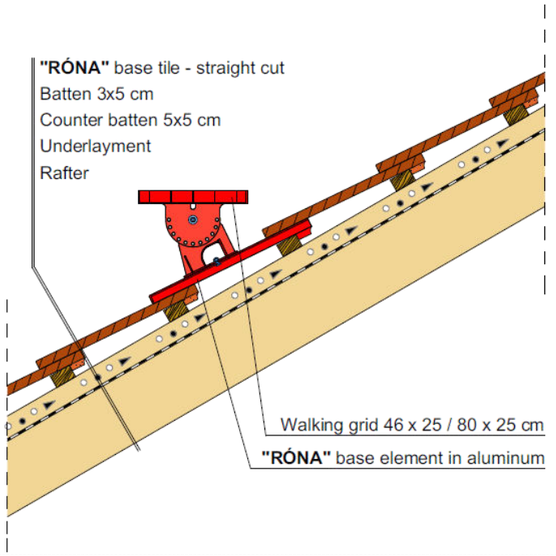
Log support placement



Snow guard tube placement

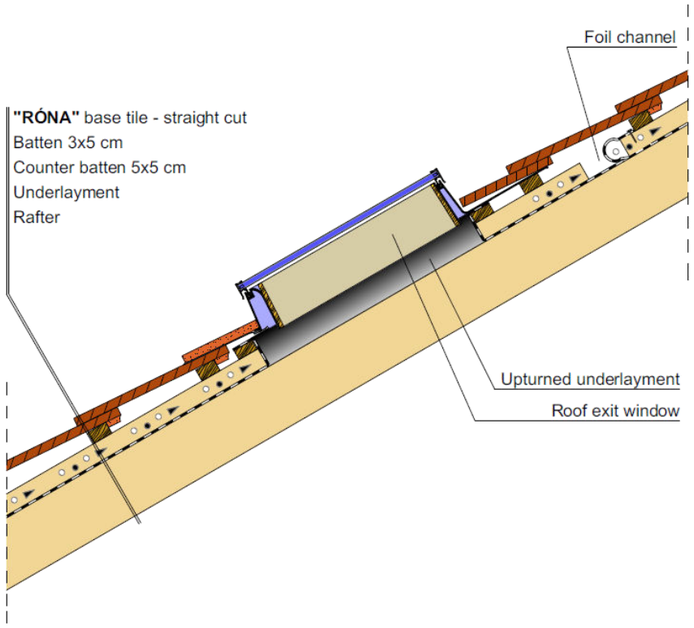


Single step placement

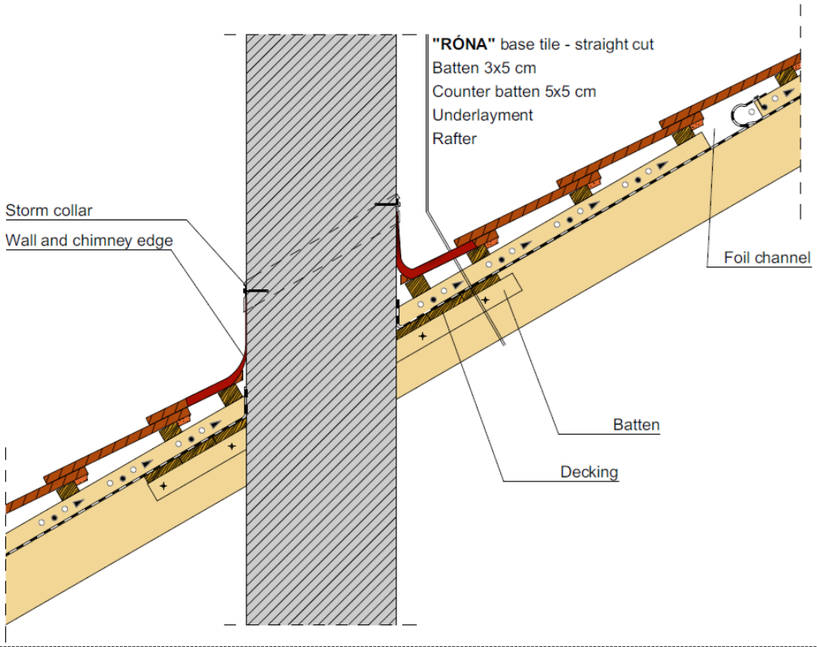


Walking grid placement

More informations: **swissporTON.hu**



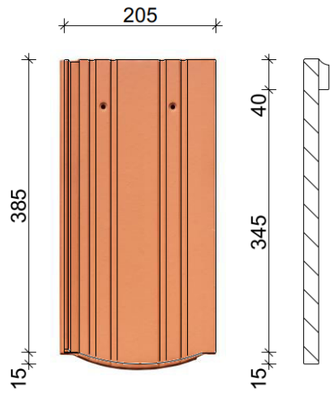
Roof exit window placement



Chimney connection detail

More informations: **swissporTON.hu**

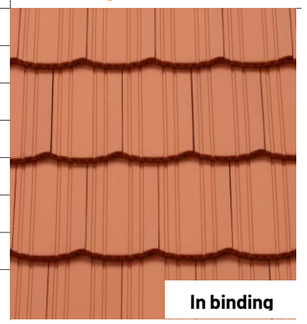
“KERKA”® segment cut



Product datas

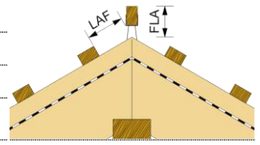
Size	width:	**205 mm**
	length:	**400 mm**
	height:	**35 mm**
	thickness:	**21 mm**
Weight:		**2,42 kg**
Packaging	bundle :	**6 pcs**
	pallet :	**324 pcs**
Standard roof pitch:		**30°**

Covering method



Technical specification of the roof cover

Roof pitch:	**< 30°**	**30° - 35°**	**35° - 40°**	**40° - 45°**	**45° <**
Covering length	**265 mm**	**274 mm**	**285 mm**	**295 mm**	**305 mm**
Covering widthg	**180 mm**	**180 mm**	**180 mm**	**180 mm**	**180 mm**
Consumption	**21,0 pcs/m²**	**20,2 pcs/m²**	**19,5 pcs/m²**	**18,8 pcs/m²**	**18,2 pcs/m²**
Covering type	**single cover**				
Covering weight	**50,82 kg/m²**	**48,89 kg/m²**	**47,19 kg/m²**	**45,50 kg/m²**	**44,05 kg/m²**



***LAF**: distance of the upper batten*

***FLA**: height of the ridge batten*

„LH” ridge tile with 30x50 batten

Roof pitch	**10°**	**15°**	**20°**	**25°**	**30°**	**35°**	**40°**	**45°**	**50°**	**55°**	**60°**
LAF [mm]	55	55	55	55	55	55	50	50	50	50	50

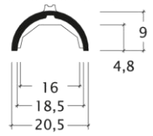
Underlayment requirement

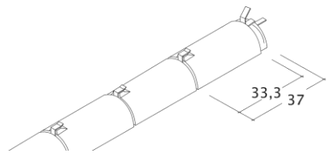
Unsupported underlayment	“ECO”	≥ 24°
Windproof underlayment	“BASIC”	≥ 22°
Watertight underlayment	“PRO”	≥ 18°
Waterproof underlayment	“ULTRA”	≥ 10°

Required batten dimensions

Rafter distances	**Batten dimension**
≤ 800 mm	30 x 50 mm
810 – 900 mm	30 x 50 mm
910 – 1000 mm	40 x 60 mm

“LH” ridge tile 3,0 pcs/lm

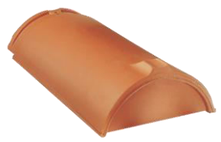




Closing plate

3 way hip cap tile

Hip starter

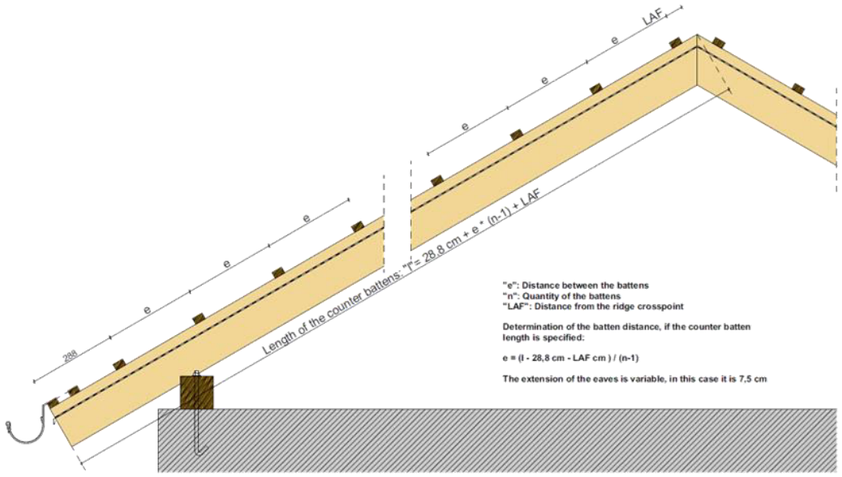


4 way hip cap tile

Clay accessories	**Sizes**	**Quantity**
Half-tile	115x400	as needed
RÓNA Ventilation tile LQ 25	205x400	as required

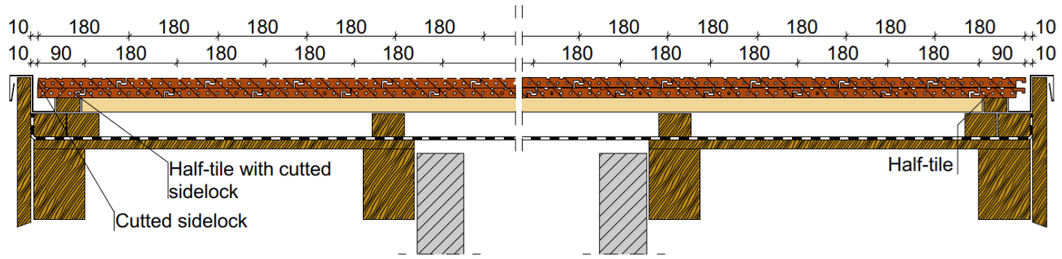
Fixing products

Name	**Material**	**Application field**
Mount-on stromclip for 30x50 mm battens	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the genereal roof surface .
Mount-on stromclip for 40x60 mm battens	zinc-aluminium	
Nail-in stromclip	stainless steel, CELANEX® PBT	
Fixing screw with EPDM sealing ring, 60 mm length	stainless steel	Fixing against loosed tiles along the edges and some cases in the average roof surfaces
Clip with wire, 17-21 mm	stainless steel	Fixing cutted tiles along the hips and valleys
Universal screw-in stormlcip	zinc-aluminium	Fixing tiles along the eaves



Roof batten alignement for "KERKA" segment cut clay roof tile

Specification:	7,5 cm eave overhang and 30° roof pitch „LH" ridge tile and 30x50 mm roof battens, LAF = 55 mm				
Number of battens (n)	**265 mm**	**274 mm**	**285 mm**	**295 mm**	**305 mm**
10	2 728	2 809	2 908	2 998	3 088
11	2 993	3 083	3 193	3 293	3 393
12	3 258	3 357	3 478	3 588	3 698
13	3 523	3 631	3 763	3 883	4 003
14	3 788	3 905	4 048	4 178	4 308
15	4 053	4 179	4 333	4 473	4 613
16	4 318	4 453	4 618	4 768	4 918
17	4 583	4 727	4 903	5 063	5 223
18	4 848	5 001	5 188	5 358	5 528
19	5 113	5 275	5 473	5 653	5 833
20	5 378	5 549	5 758	5 948	6 138
21	5 643	5 823	6 043	6 243	6 443
22	5 908	6 097	6 328	6 538	6 748
23	6 173	6 371	6 613	6 833	7 053
24	6 438	6 645	6 898	7 128	7 358
25	6 703	6 919	7 183	7 423	7 663
26	6 968	7 193	7 468	7 718	7 968
27	7 233	7 467	7 753	8 013	8 273
28	7 498	7 741	8 038	8 308	8 578
29	7 763	8 015	8 323	8 603	8 883
30	8 028	8 289	8 608	8 898	9 188
31	8 293	8 563	8 893	9 193	9 493
32	8 558	8 837	9 178	9 488	9 798
33	8 823	9 111	9 463	9 783	10 103
34	9 088	9 385	9 748	10 078	10 408
35	9 353	9 659	10 033	10 373	10 713
36	9 618	9 933	10 318	10 668	11 018
37	9 883	10 207	10 603	10 963	11 323
38	10 148	10 481	10 888	11 258	11 628
39	10 413	10 755	11 173	11 553	11 933
40	10 678	11 029	11 458	11 848	12 238



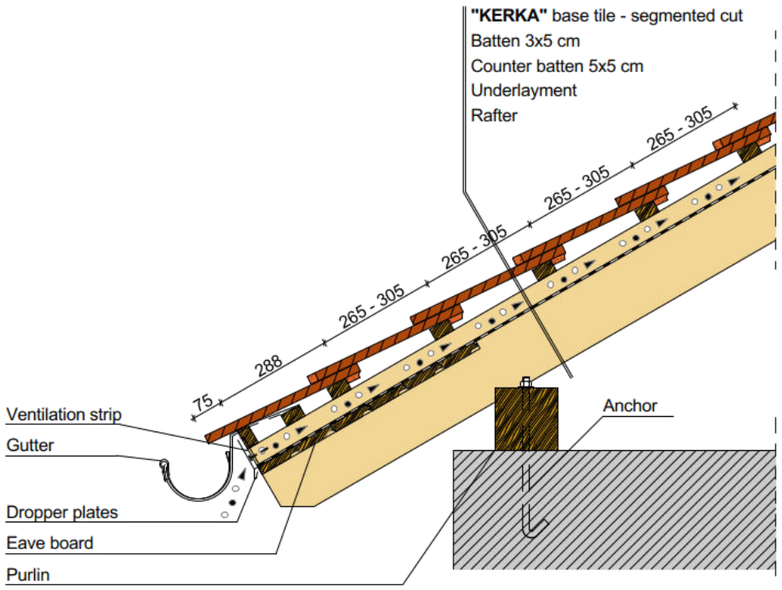
Structural width between the verge boards

	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
0	-	90	180	270	295	385	475	565	655	745
10	1 735	1 825	1 915	2 005	2 095	2 185	2 275	2 365	2 455	2 545
20	3 535	3 625	3 715	3 805	3 895	3 985	4 075	4 165	4 255	4 345
30	5 335	5 425	5 515	5 605	5 695	5 785	5 875	5 965	6 055	6 145
40	7 135	7 225	7 315	7 405	7 495	7 585	7 675	7 765	7 855	7 945
50	8 935	9 025	9 115	9 205	9 295	9 385	9 475	9 565	9 655	9 745
60	10 735	10 825	10 915	11 005	11 095	11 185	11 275	11 365	11 455	11 545
70	12 535	12 625	12 715	12 805	12 895	12 985	13 075	13 165	13 255	13 345
80	14 335	14 425	14 515	14 605	14 695	14 785	14 875	14 965	15 055	15 145
90	16 135	16 225	16 315	16 405	16 495	16 585	16 675	16 765	16 855	16 945
100	17 935	18 025	18 115	18 205	18 295	18 385	18 475	18 565	18 655	18 745

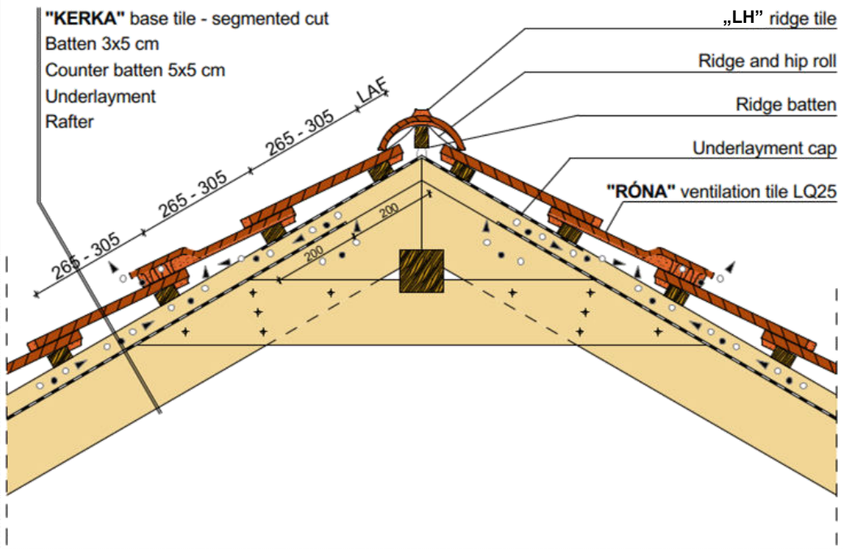
Structural width between the verge boards

	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	835	925	1 015	1 105	1 195	1 285	1 375	1 465	1 555	1 645
10	2 635	2 725	2 815	2 905	2 995	3 085	3 175	3 265	3 355	3 445
20	4 435	4 525	4 615	4 705	4 795	4 885	4 975	5 065	5 155	5 245
30	6 235	6 325	6 415	6 505	6 595	6 685	6 775	6 865	6 955	7 045
40	8 035	8 125	8 215	8 305	8 395	8 485	8 575	8 665	8 755	8 845
50	9 835	9 925	10 015	10 105	10 195	10 285	10 375	10 465	10 555	10 645
60	11 635	11 725	11 815	11 905	11 995	12 085	12 175	12 265	12 355	12 445
70	13 435	13 525	13 615	13 705	13 795	13 885	13 975	14 065	14 155	14 245
80	15 235	15 325	15 415	15 505	15 595	15 685	15 775	15 865	15 955	16 045
90	17 035	17 125	17 215	17 305	17 395	17 485	17 575	17 665	17 755	17 845
100	18 835	18 925	19 015	19 105	19 195	19 285	19 375	19 465	19 555	19 645

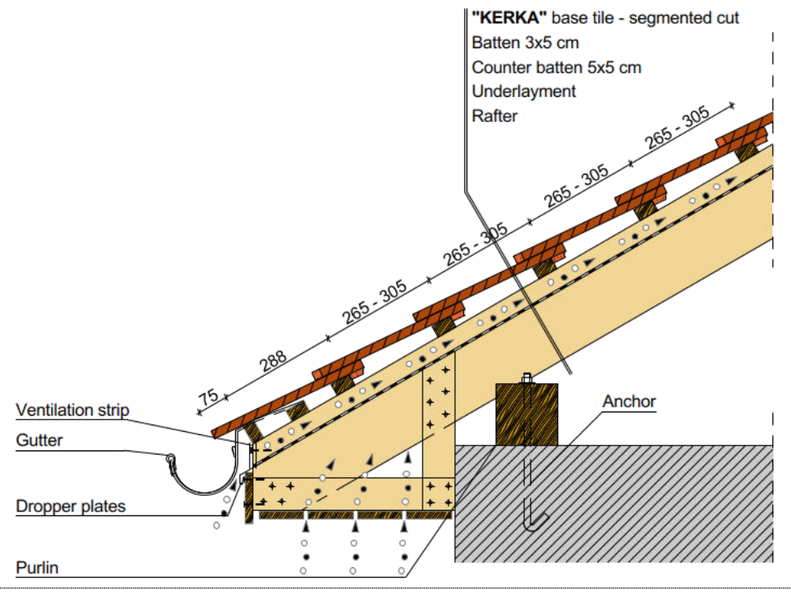
The structural widths below are calculated with 1-1 cm gap between the side plate of the verge tiles and the verge board.



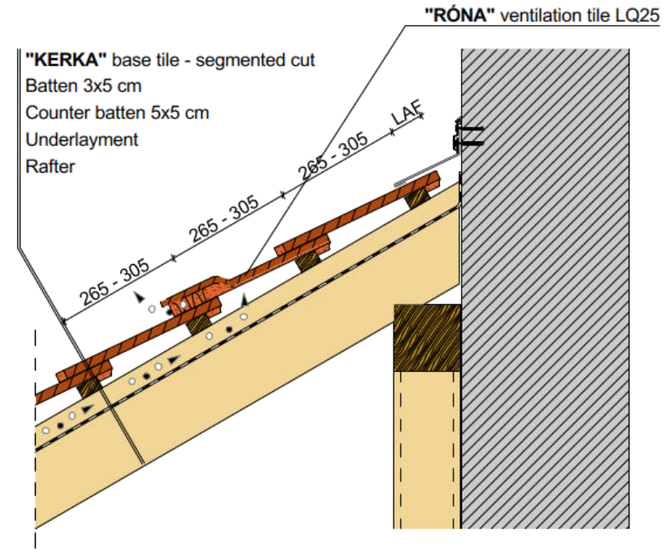
Eave detail



Ridge detail with ventilation tile

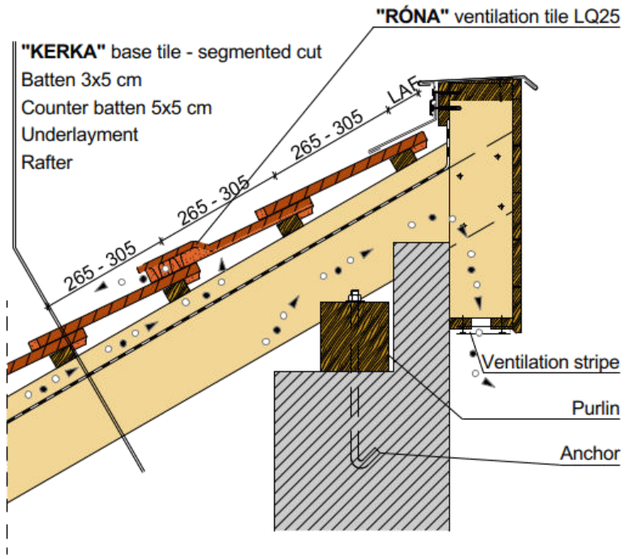


Closed eave detail

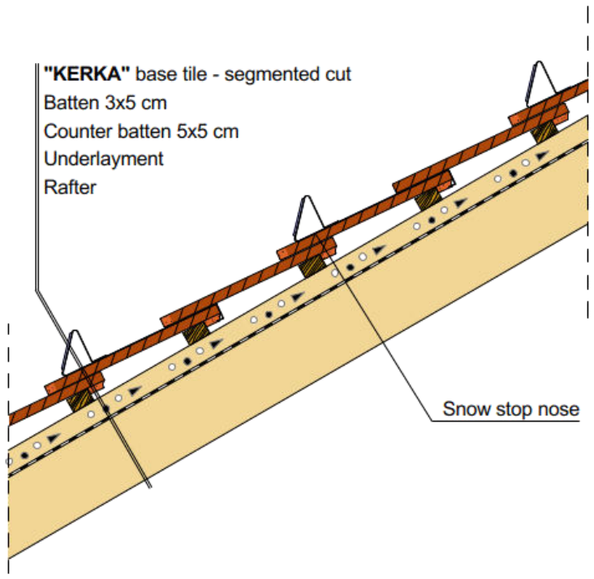


Wall connection detail

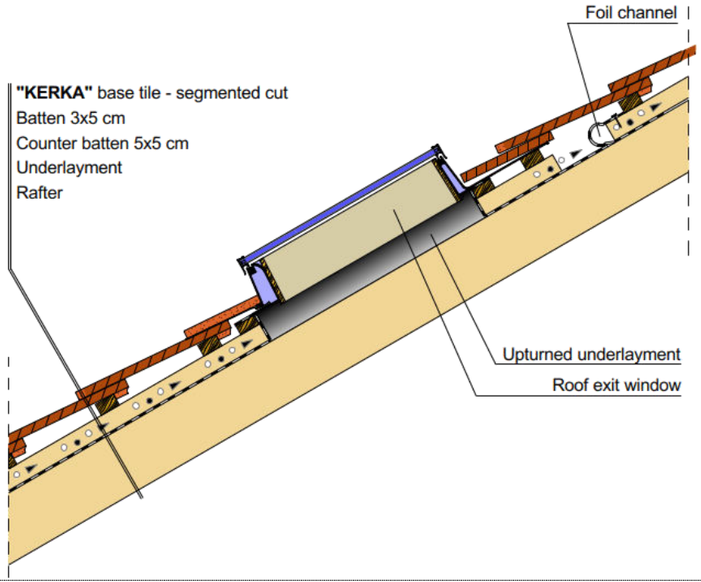
More informations: **swissporTON.hu**



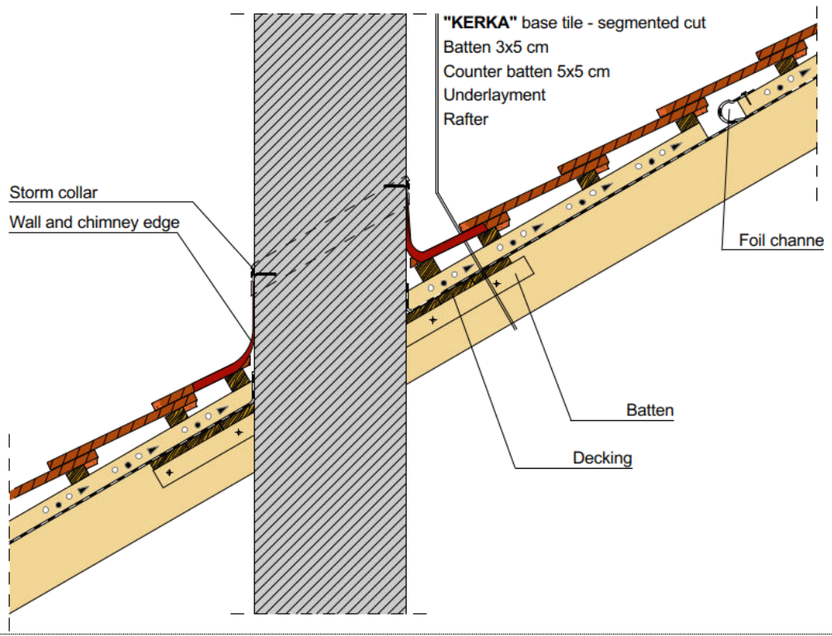
Shed roof ridge detail



Snow stop nose placement



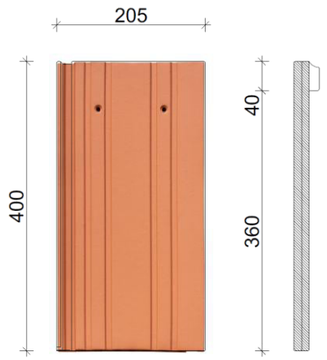
Roof exit window placement



Chimney connection detail

More informations: **swissporTON.hu**

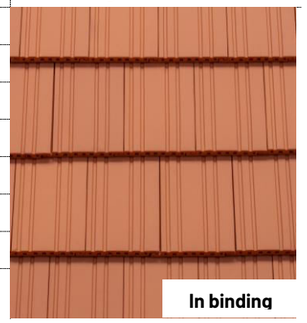
“KERKA”® straight cut



Product datas

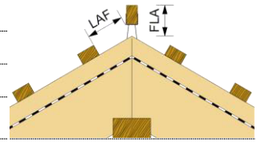
Size	width:	**205 mm**
	length:	**400 mm**
	height	**35 mm**
	thickness :	**21 mm**
Weight :		**2,47 kg**
Packaging	bundle:	**6 db**
	pallet:	**324 db**
Standard roof pitch:		**30°**

Covering method



Technical specification of the roof cover

Roof pitch:	**< 30°**	**30° - 35°**	**35° - 40°**	**40° - 45°**	**45° <**
Covering length	**280 mm**	**290 mm**	**300 mm**	**310 mm**	**320 mm**
Covering width	**180 mm**	**180 mm**	**180 mm**	**180 mm**	**180 mm**
Consumption	**19,8 pcs/m²**	**19,2 pcs/m²**	**18,5 pcs/m²**	**17,9 pcs/m²**	**17,4 pcs/m²**
Covering type	**single cover**				
Covering weight	**51,87 kg/m²**	**49,90 kg/m²**	**48,17 kg/m²**	**46,44 kg/m²**	**44,96 kg/m²**



***LAF**: distance of the upper batten*

***FLA**: height of the ridge batten*

„LH” ridge tile with 30x50 battens

Roof pitch	**10°**	**15°**	**20°**	**25°**	**30°**	**35°**	**40°**	**45°**	**50°**	**55°**	**60°**
LAF [mm]	55	55	55	55	55	55	50	50	50	50	50

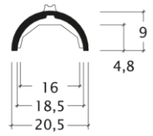
Underlayment requirement

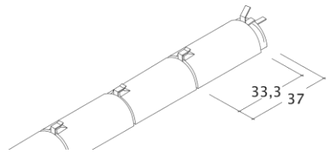
Unsupported underlayment	“ECO”	≥ 24°
Windproof underlayment	“BASIC”	≥ 22°
Watertight underlayment	“PRO”	≥ 18°
Waterproof underlayment	“ULTRA”	≥ 10°

Required batten dimensions

Rafter distances	**Batten dimension**
≤ 800 mm	30 x 50 mm
810 – 900 mm	30 x 50 mm
910 – 1000 mm	40 x 60 mm

“LH” ridge tile 3,0 pcs/lm





Closing plate

3 way hip cap tile

Hip starter

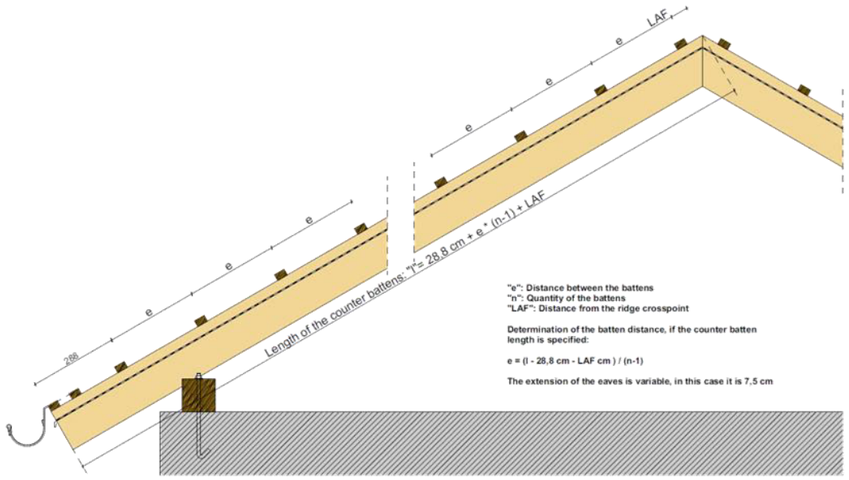
4 way hip cap tile

Clay accessories	**Size**	**Quantity**
Half tile	115x400	as needed
RÓNA Ventilation tile LQ 25	205x400	as required

Fixing products

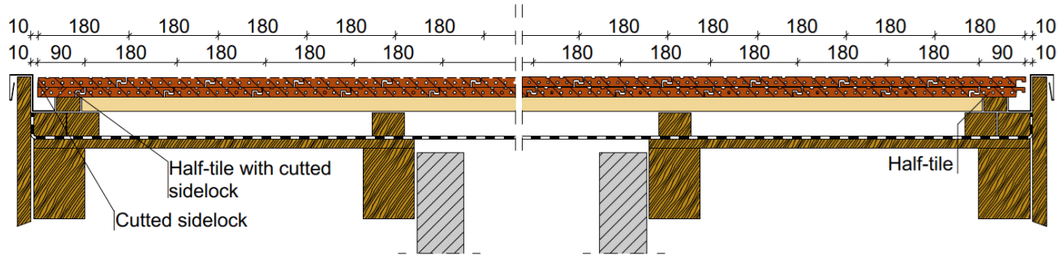
Name	**Material**	**Application field**
Mount-on stromclip for 30x50 mm battens	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the genereal roof surface .
Mount-on stromclip for 40x60 mm battens	zinc-aluminium	
Nail-in stromclip	stainless steel, CELANEX® PBT	
Fixing screw with EPDM sealing ring, 60 mm length	stainless steel	Fixing against loosed tiles along the edges and some cases in the average roof surfaces
Clip with wire, 17-21 mm	stainless steel	Fixing cutted tiles along the hips and valleys
Universal screw-in stormlcip	zinc-aluminium	Fixing tiles along the eaves

More informations: **swissporTON.hu**



Roof batten alignement for "KERKA" straight cut clay roof tile

Specification:	7,5 cm eave overhang and 30° roof pitch „LH" ridge tile and 30x50 mm roof battens, LAF = 55 mm				
Number of battens (n)	**280 mm**	**290 mm**	**300 mm**	**310 mm**	**320 mm**
10	2 863	2 953	3 043	3 133	3 223
11	3 143	3 243	3 343	3 443	3 543
12	3 423	3 533	3 643	3 753	3 863
13	3 703	3 823	3 943	4 063	4 183
14	3 983	4 113	4 243	4 373	4 503
15	4 263	4 403	4 543	4 683	4 823
16	4 543	4 693	4 843	4 993	5 143
17	4 823	4 983	5 143	5 303	5 463
18	5 103	5 273	5 443	5 613	5 783
19	5 383	5 563	5 743	5 923	6 103
20	5 663	5 853	6 043	6 233	6 423
21	5 943	6 143	6 343	6 543	6 743
22	6 223	6 433	6 643	6 853	7 063
23	6 503	6 723	6 943	7 163	7 383
24	6 783	7 013	7 243	7 473	7 703
25	7 063	7 303	7 543	7 783	8 023
26	7 343	7 593	7 843	8 093	8 343
27	7 623	7 883	8 143	8 403	8 663
28	7 903	8 173	8 443	8 713	8 983
29	8 183	8 463	8 743	9 023	9 303
30	8 463	8 753	9 043	9 333	9 623
31	8 743	9 043	9 343	9 643	9 943
32	9 023	9 333	9 643	9 953	10 263
33	9 303	9 623	9 943	10 263	10 583
34	9 583	9 913	10 243	10 573	10 903
35	9 863	10 203	10 543	10 883	11 223
36	10 143	10 493	10 843	11 193	11 543
37	10 423	10 783	11 143	11 503	11 863
38	10 703	11 073	11 443	11 813	12 183
39	10 983	11 363	11 743	12 123	12 503
40	11 263	11 653	12 043	12 433	12 823



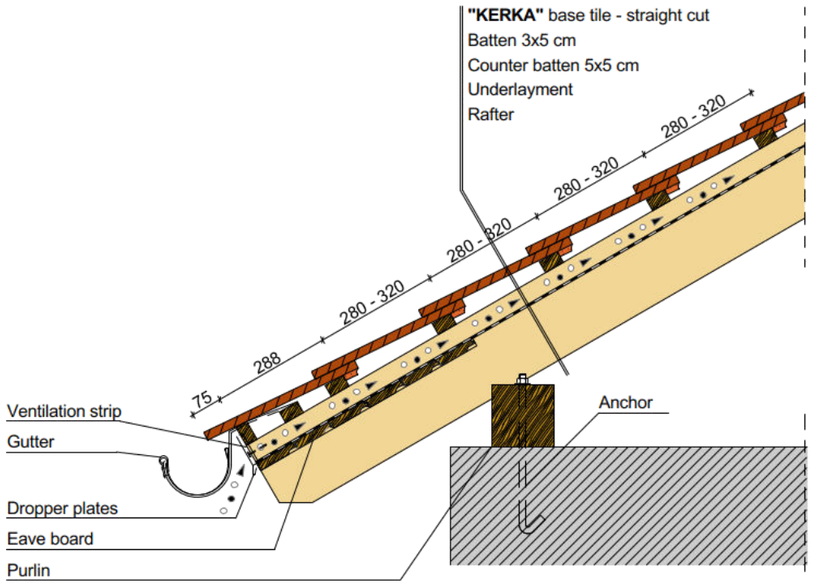
Structural width between the verge boards

	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
0	-	90	180	270	295	385	475	565	655	745
10	1 735	1 825	1 915	2 005	2 095	2 185	2 275	2 365	2 455	2 545
20	3 535	3 625	3 715	3 805	3 895	3 985	4 075	4 165	4 255	4 345
30	5 335	5 425	5 515	5 605	5 695	5 785	5 875	5 965	6 055	6 145
40	7 135	7 225	7 315	7 405	7 495	7 585	7 675	7 765	7 855	7 945
50	8 935	9 025	9 115	9 205	9 295	9 385	9 475	9 565	9 655	9 745
60	10 735	10 825	10 915	11 005	11 095	11 185	11 275	11 365	11 455	11 545
70	12 535	12 625	12 715	12 805	12 895	12 985	13 075	13 165	13 255	13 345
80	14 335	14 425	14 515	14 605	14 695	14 785	14 875	14 965	15 055	15 145
90	16 135	16 225	16 315	16 405	16 495	16 585	16 675	16 765	16 855	16 945
100	17 935	18 025	18 115	18 205	18 295	18 385	18 475	18 565	18 655	18 745

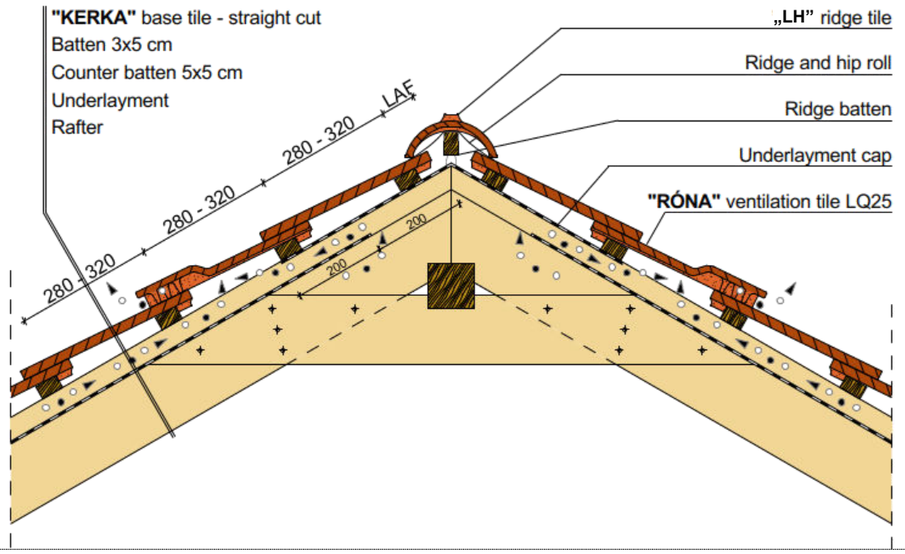
Structural width between the verge boards

	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	835	925	1 015	1 105	1 195	1 285	1 375	1 465	1 555	1 645
10	2 635	2 725	2 815	2 905	2 995	3 085	3 175	3 265	3 355	3 445
20	4 435	4 525	4 615	4 705	4 795	4 885	4 975	5 065	5 155	5 245
30	6 235	6 325	6 415	6 505	6 595	6 685	6 775	6 865	6 955	7 045
40	8 035	8 125	8 215	8 305	8 395	8 485	8 575	8 665	8 755	8 845
50	9 835	9 925	10 015	10 105	10 195	10 285	10 375	10 465	10 555	10 645
60	11 635	11 725	11 815	11 905	11 995	12 085	12 175	12 265	12 355	12 445
70	13 435	13 525	13 615	13 705	13 795	13 885	13 975	14 065	14 155	14 245
80	15 235	15 325	15 415	15 505	15 595	15 685	15 775	15 865	15 955	16 045
90	17 035	17 125	17 215	17 305	17 395	17 485	17 575	17 665	17 755	17 845
100	18 835	18 925	19 015	19 105	19 195	19 285	19 375	19 465	19 555	19 645

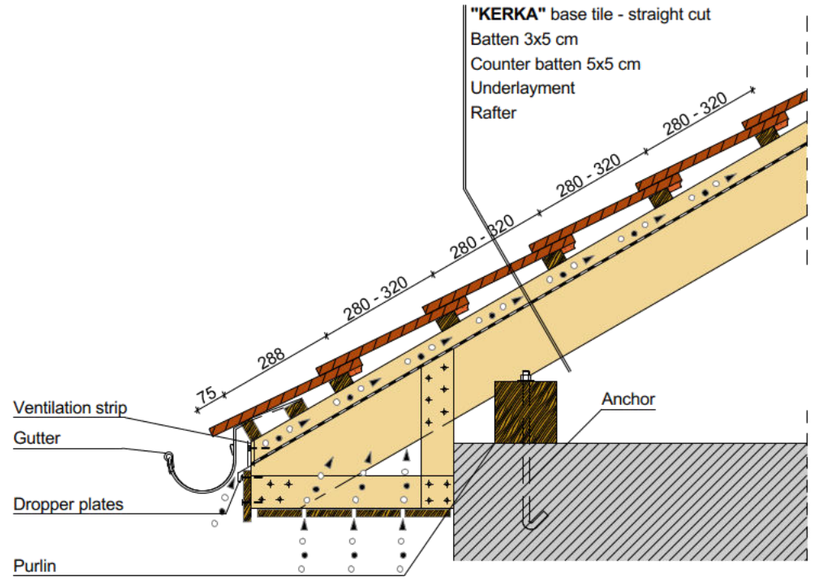
The structural widths below are calculated with 1-1 cm gap between the side plate of the verge tiles and the verge board.



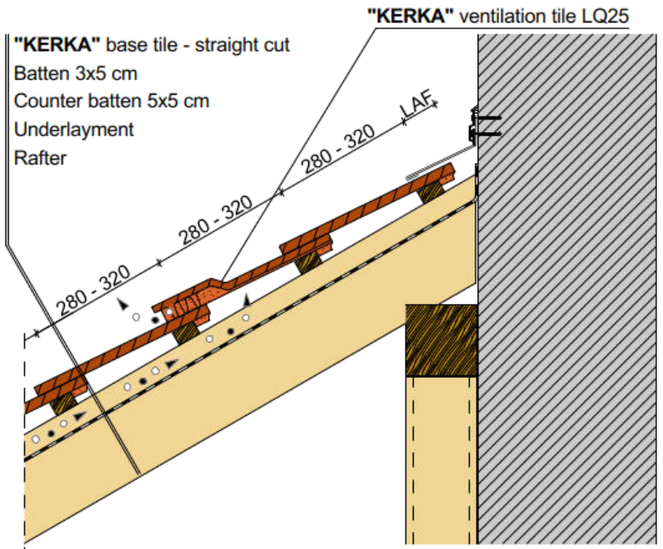
Eave detail



Ridge detail with ventilation tile

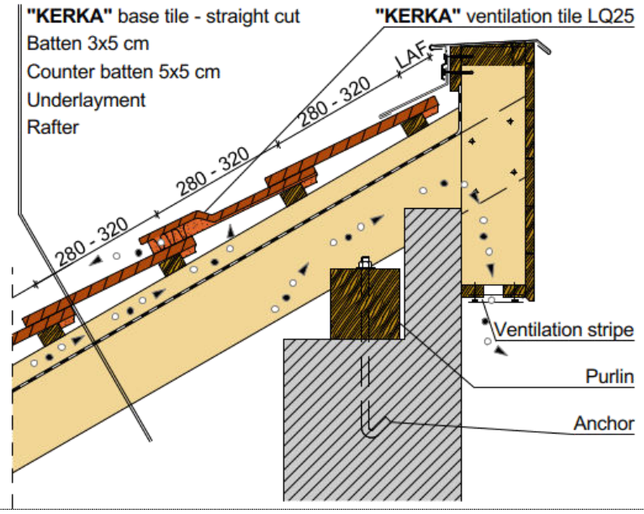


Closed eave detail

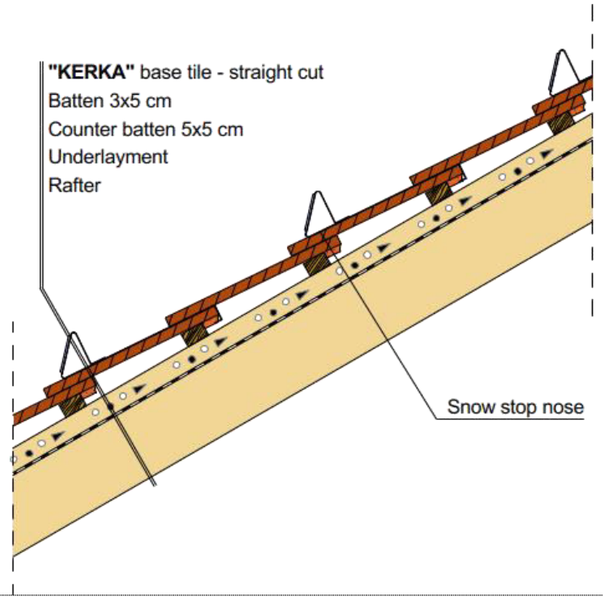


Wall connection detail

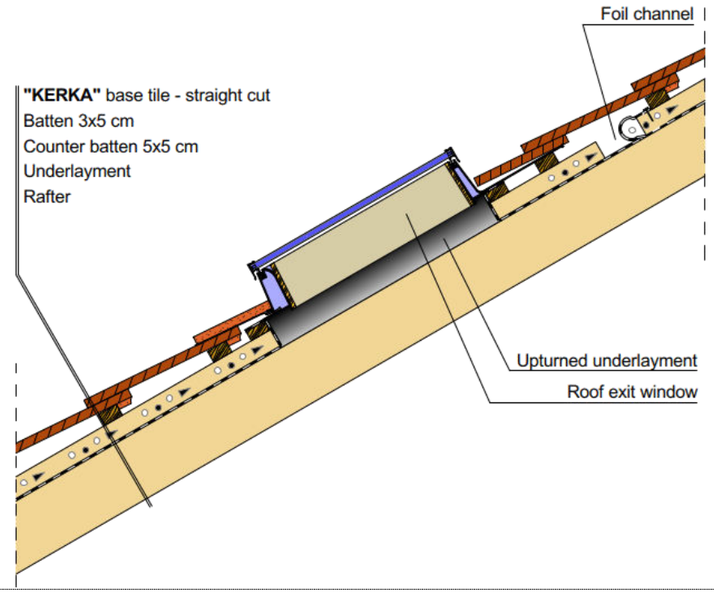
More informations: **swissporTON.hu**



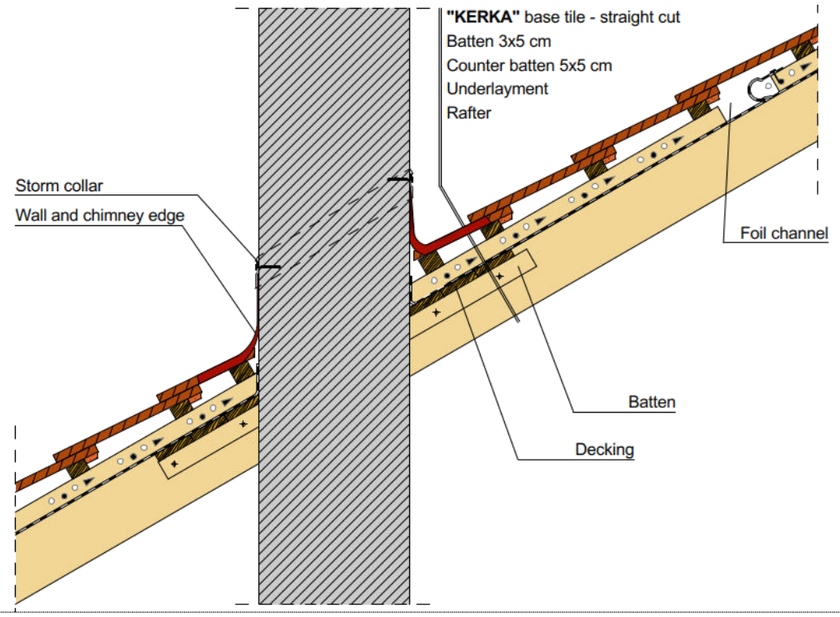
Shed roof ridge detail



Snow stop nose placement



Roof exit window placement



Chimney connection detail

More informations: **swissporTON.hu**

Notes

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