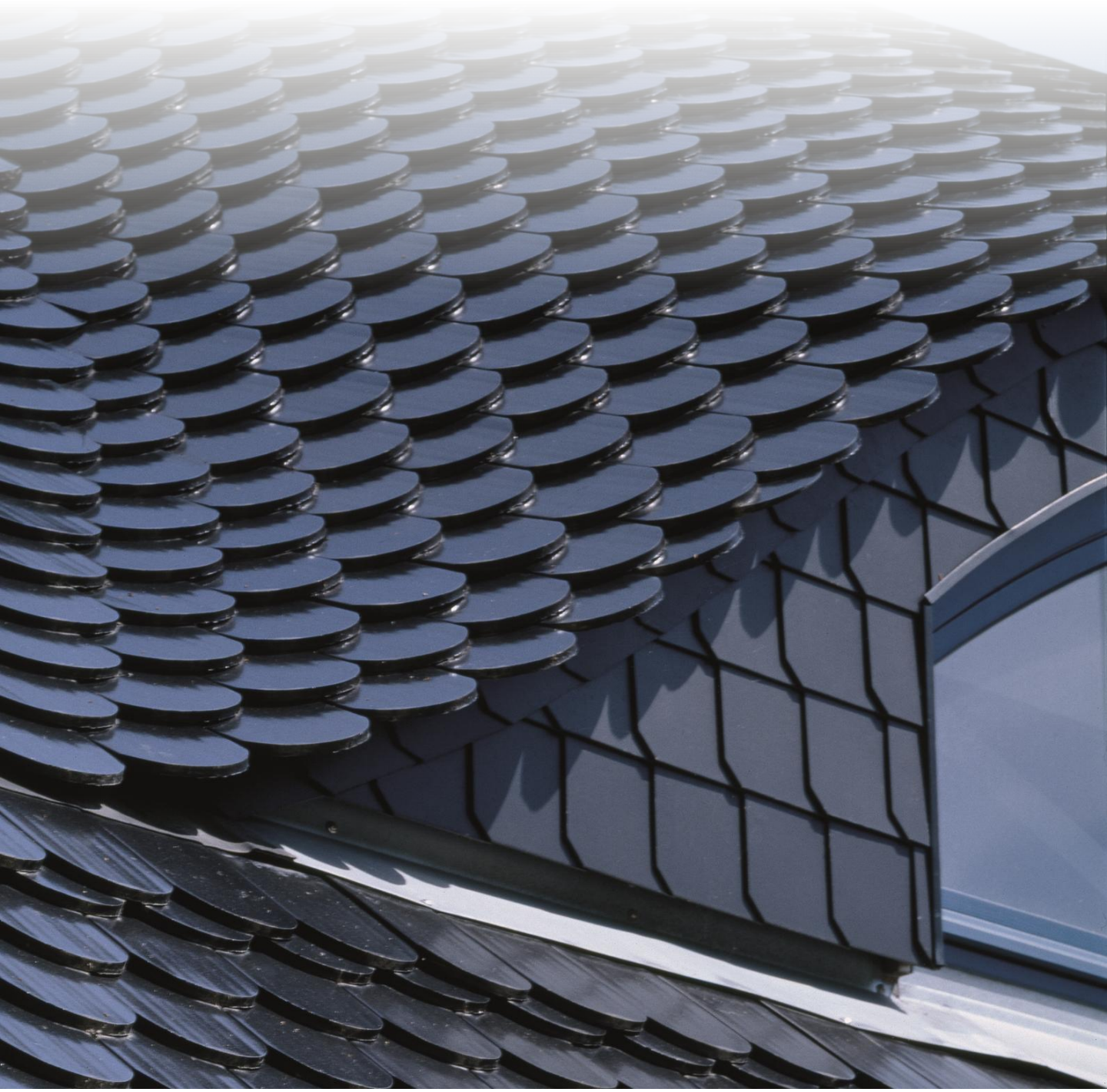
swissporton

APPLICATION GUIDE

Clay plain roof tiles



swisspor Hungary SEE Kft.

Technical department

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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 swisspor Hungary SEE 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! swisspor Hungary SEE Kft. disclaims all warranties related the provided informations. This includes typographical errors and the subsequent changes to the specifications.

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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 plain roof 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

ZVDH Central Association of the Roofing Trade.

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

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. Plain tiles:

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
- Plain roof 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 type of the underlayment in case of plain roof 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**
$\alpha < 10°$	**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:

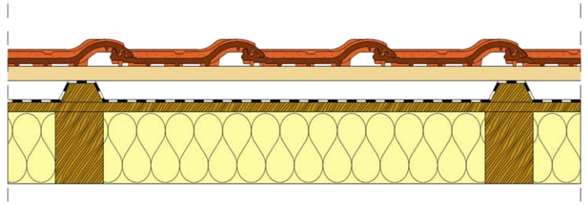
Modell	DIN*	swissporTON **	Free laid underlayment	Windproof underlayment	Watertight underlayment	Waterproof underlayment
			"CORE"	"BASIC"	"PRO"	"ULTRA"
"CLASSIC"	**30°**	**30°**	**≥ 24°**	**≥ 22°**	**≥ 18°**	**≥ 10°**
"AUSTRIAN BIBER"	**30°**	**30°**	**≥ 24°**	**≥ 22°**	**≥ 18°**	**≥ 10°**
"CASTA"	**30°**	**30°**	**≥ 24°**	**≥ 22°**	**≥ 18°**	**≥ 10°**
"AVIREL"	22°		≥ 16°	≥ 14°	≥ 12°	≥ 10°
"BALANCE"	22°		≥ 16°	≥ 14°	≥ 12°	≥ 10°
"TITANIA"	22°		≥ 16°	≥ 14°	≥ 12°	≥ 10°
"GENEVO"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"NOMINA"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"NIVELO"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"SIMPLA"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"RAPIDO"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"RAVELO"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"MAXIMA PRO"	25°		≥ 18°	≥ 16°	≥ 14°	≥ 10°
"PROFIL"	35°	30°	≥ 24°	≥ 22°	≥ 18°	≥ 10°
"RÓNA"	35°	30°	≥ 24°	≥ 22°	≥ 18°	≥ 10°
"KERKA"	35°	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:

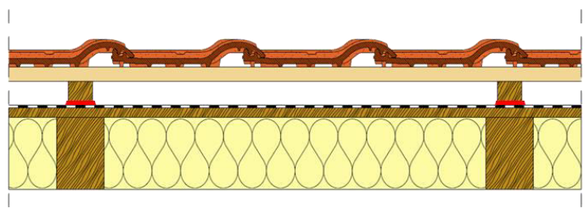


The waterproof underlayment is supported with a rigid formwork. The underlay covers the counter-battens, so the holes caused their nail fastenings are elevated from the level of the possible waterflow. Waterproof underlayment can only be made with qualified bituminous, plastic or synthetic rubber insulation 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:

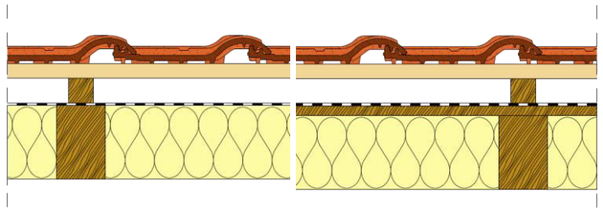


The watertight underlayment is supported with a rigid formwork., laid under the counter-battens and perforated by the fastenings of the counter-battens. These perforations has to be sealed under the counter battens. Watertight underlayment may only be made with certified bituminous, plastic or synthetic 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!

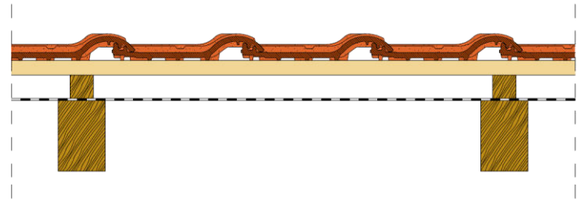
3.1.4. Free overlapping underlayment:

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 „CORE", 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			

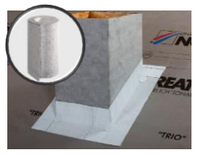


Underlay accessories:



"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

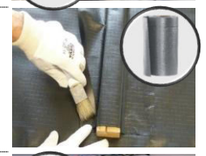
Hot air gun
For welding the longitudinal and transverse joints of ULTRA.





"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.

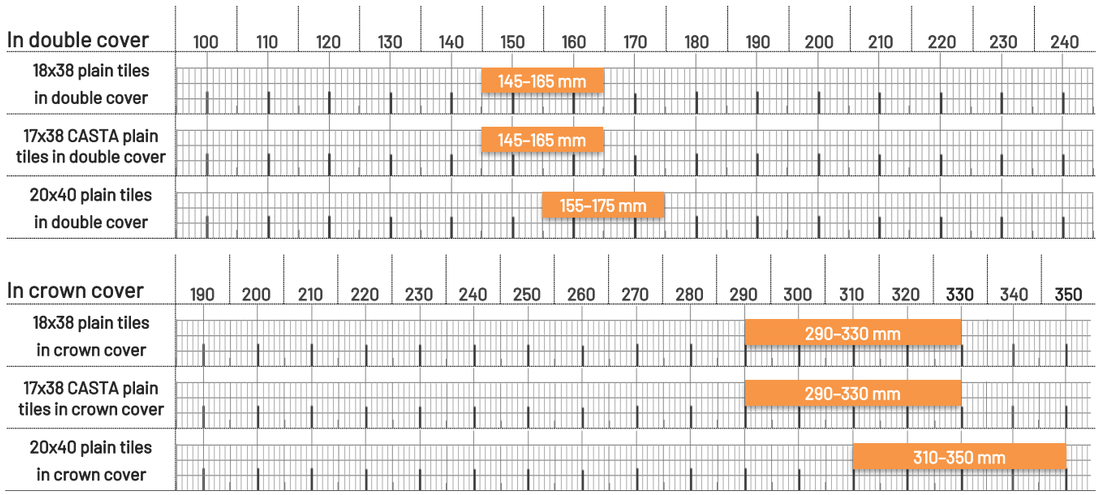
The counter-batten must comply at least with the requirement of the S 10 class according to the DIN 4074-1 (Strength grading of wood - Part 1: Coniferous sawn timber) standard.

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



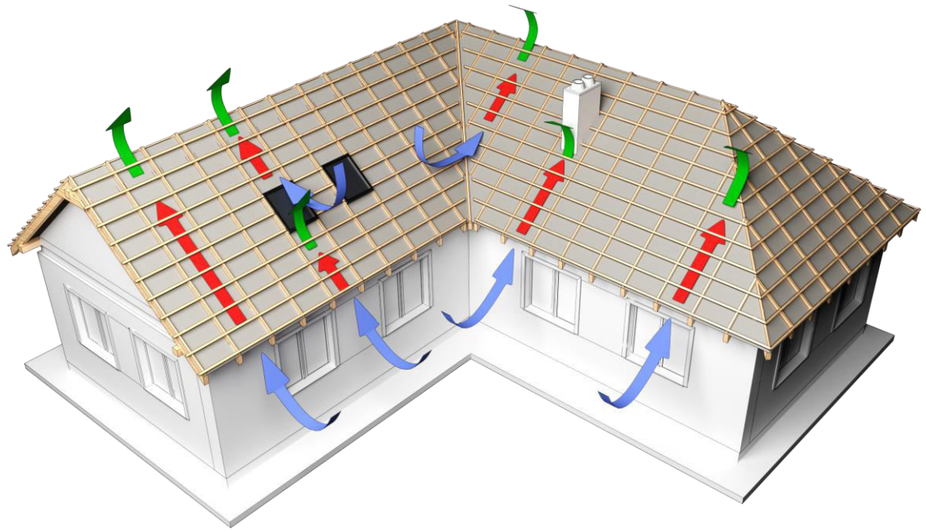
Note: The batten distance is defined by the pitch of the roof surface (and thus the overlapping of the tiles)

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 cm^2/lm for 10 cm width	eave, shed roof ridge
Ventilation batten with comb	200 cm^{2l}/m	eave
Ventilation tile[(1)]	25 cm^2/pcs	ridge, hip, valley, eave
Ventilation base tile	10 cm^2/pcs	ridge, eave
Ventilation ridge tile	10 cm^2/pcs	ridge
Ventilation eave tile	10 cm^2/pcs	eave
Aluminium ridge and hip roll	150 cm^2/lm for 220 mm width	ridge, hip
Ridge and hip roll, PP	100 cm^2/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.

[(1)] AFor the double and crown covered plain tiles, it is necessary to cut the tiles below the ventilation tile to ensure their proper work.





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)

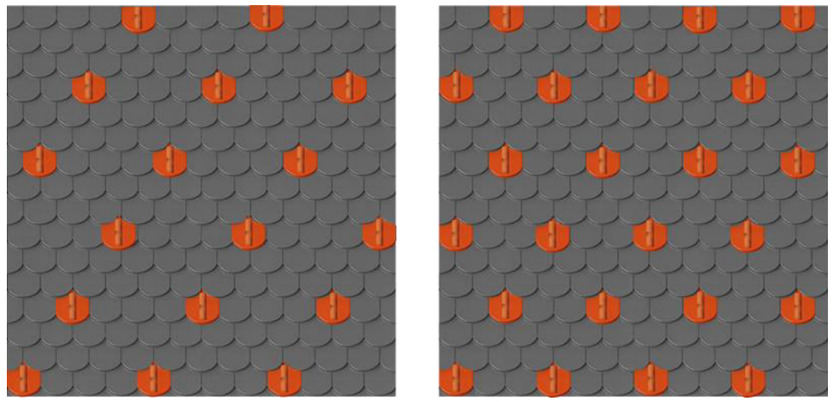
The amount of snow noses can be determined from the following tables.

Base value of the snow load (kN/m^2)

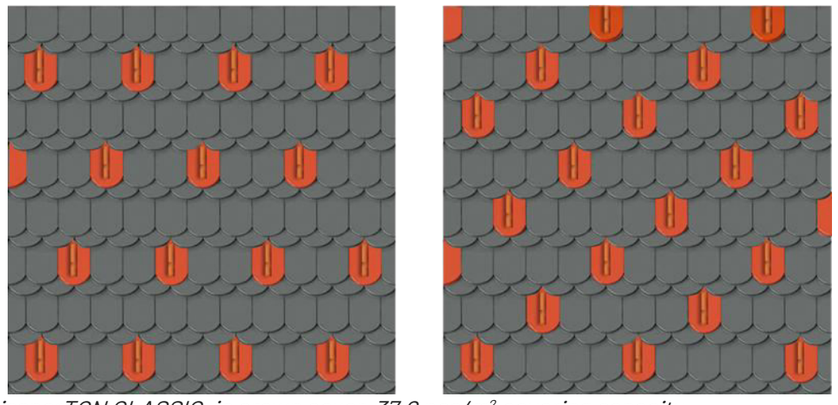
α*	1,00	2,00	3,00	4,00	5,00	6,00	7,00	8,00	9,00	10,00	12,00
20°	3,0	3,0	3,0	3,0	3,0	3,1	3,4	4,0	4,2	4,6	5,6
25°	3,0	3,0	3,0	3,0	3,2	3,3	3,8	4,2	4,8	5,3	6,3
30°	3,0	3,0	3,0	3,0	3,4	3,9	4,6	5,1	5,6	5,9	6,6
35°	3,0	3,0	3,1	3,1	3,5	4,	4,7	5,3	5,6	6,3	7,5
40°	3,1	3,1	3,2	3,2	3,6	4,1	5,1	5,4	6,0	6,4	8,2
45°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

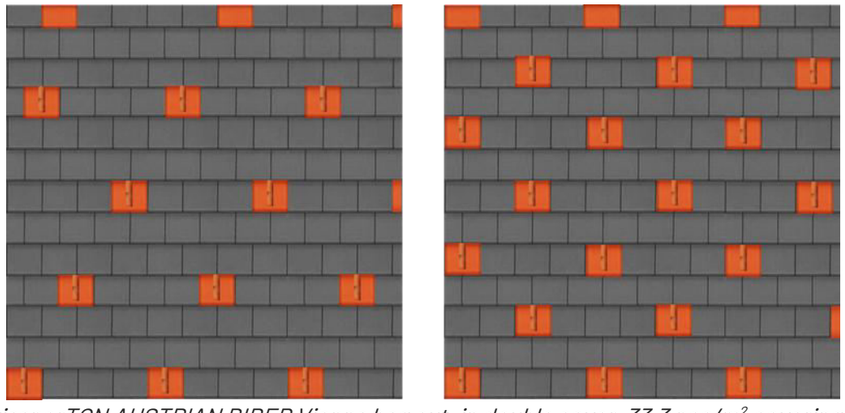
Placement of the snow stop noses for different tile models in quantities of 3,0 pcs/m² and 4,0 pcs/m²



swissporTON CLASSIC, in double cover, 37,0 pcs/m² covering capacity



swissporTON CLASSIC, in crown cover, 37,0 pcs/m² covering capacity

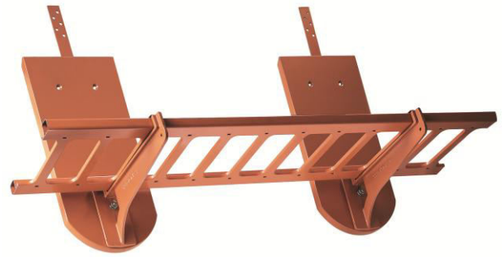


swissporTON AUSTRIAN BIBER Vienna bag cut, in double cover, 33,3 pcs/m² covering capacity

3. 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
- There is no need for additional support below the aluminium base tiles

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.

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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
- There is no need for additional support below the aluminium base tiles



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

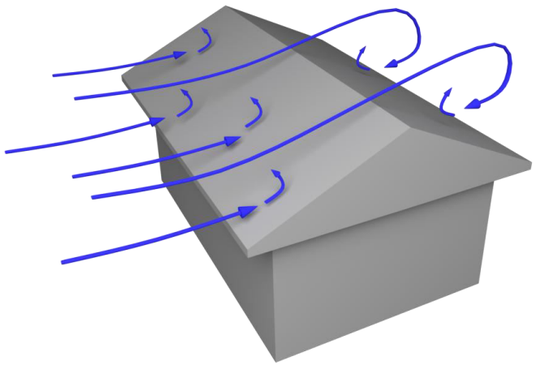
The protection against the falling tile is crucial, because any falling tiles present a significant risk to human life and our valuables (eg. parked cars). This risk should be considered to determine how many tiles will be fixed in certain cases. The main factors which should be considered are: the height 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
below 40°	no need for additional fixing
40°- 50°	every third and every second tile
above 50°	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:

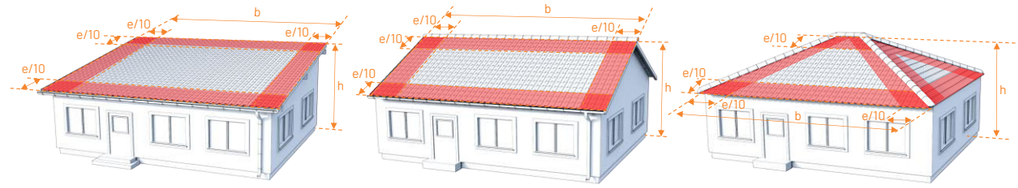
- • The height of the building does not exceed 200 m
- • On the windward side of the building, the average slope of the terrain is less than 3 °
- • There is no building or other object in the vicinity of the building that has at least twice its average height
- • If the air space under the tile roof 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.

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

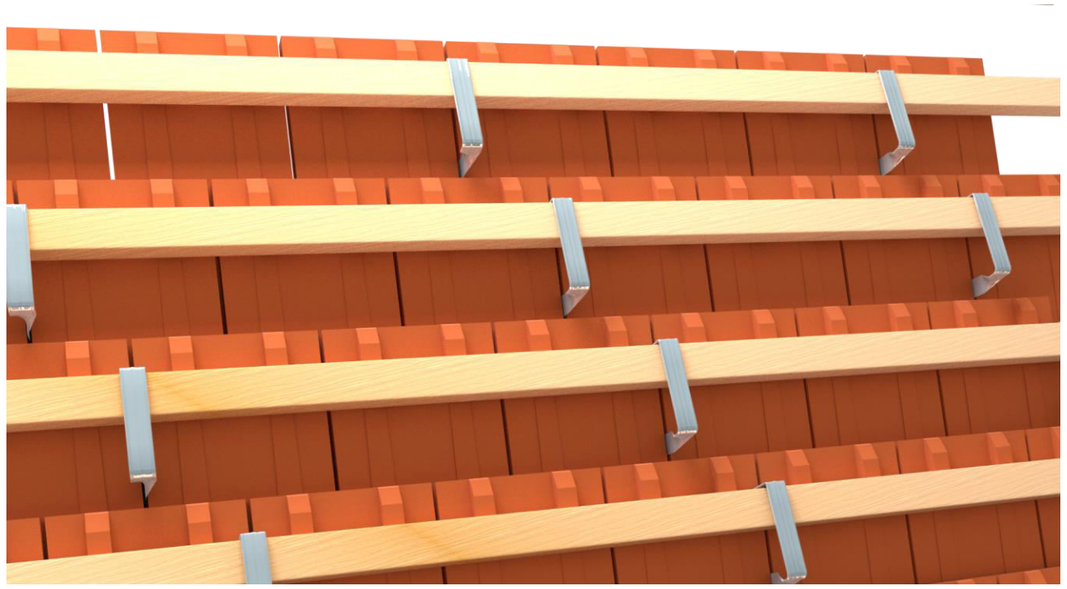
- *"γ_s"*: safety coefficient (equals to 1,5)
- *"$q_p(z)$"*: peak velocity pressure
- *"c_{pe}"*: external pressure coefficient (see later)
- *"c_{eq}"*: pressure equalizing factor (depend on the roof layers)

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

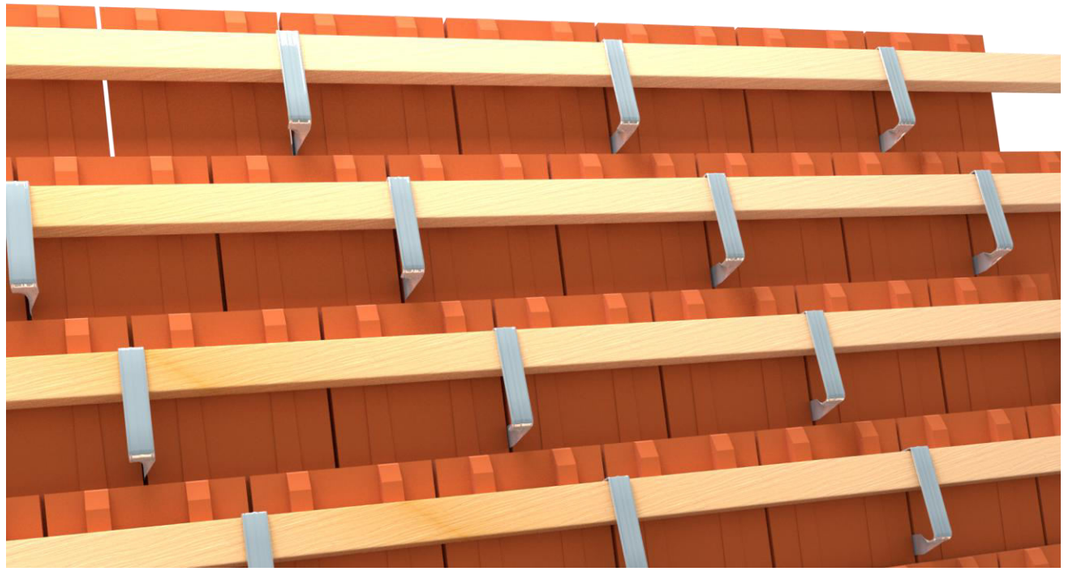


In each case, the roof surfaces are divided into zones, so different values are determined for the eaves, edges, hips, ridges and the remaining roof surfaces.

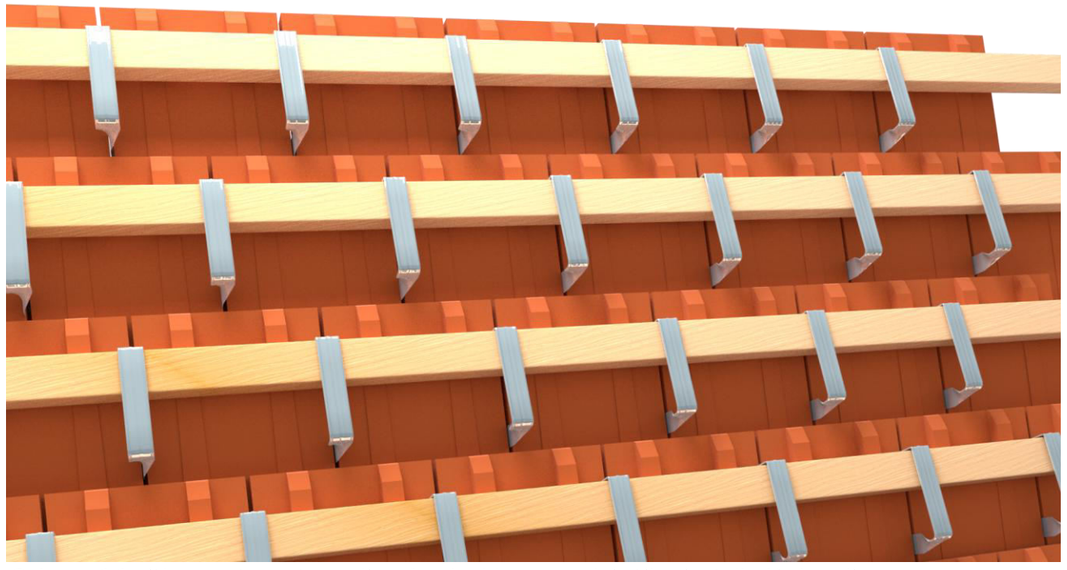
Stormclips must be used on surfaces where the wind load exceeds the resisting weight load! The density of stormclips is determined from the ratio of these two effects, so it may be necessary to fix each tile (1: 1), every second tile (1: 2), or every third tile (1: 3).



Schema 1:3 with mount-on stormclips, for double cover plain tiles installed in bonding

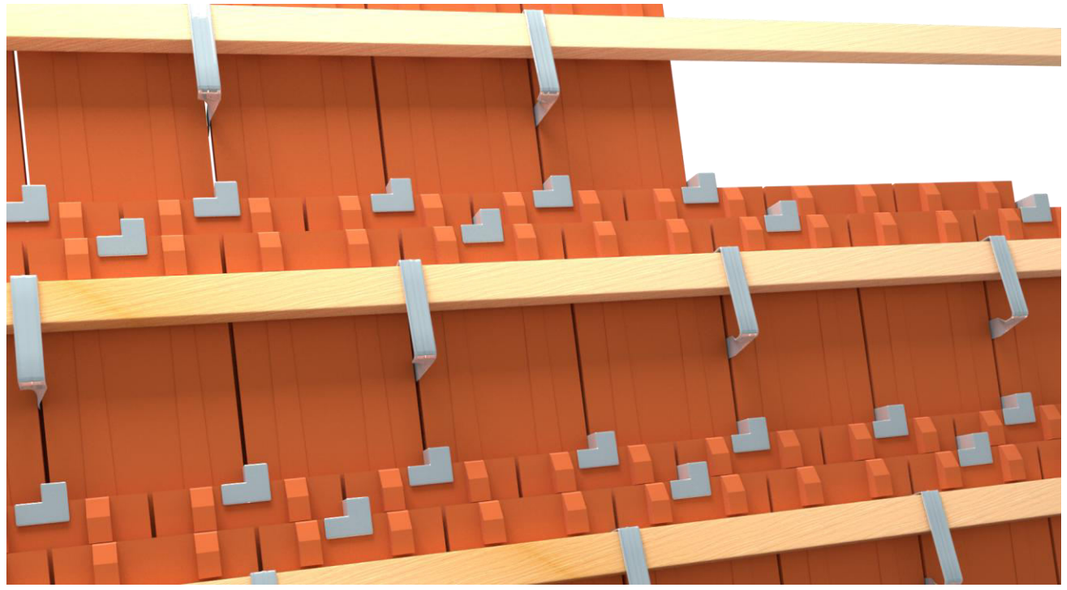


Schema 1:2 with mount-on stormclips, for double cover plain tiles installed in bonding



Schema 1:1 with mount-on stormclips, for double cover plain tiles installed in bonding

Crown covers are more exposed to the wind, so they require special fixing. There is no way to create 1:3, 1:2 fixing schemes for these. Traditional hook-on storm clips must be mount-on the roof batten for every second tile. Then, each of the tiles above (in the so-called “crown row”) must be fixed to the tiles below, with the special storm clip developed for crown covering. The next row of tiles is also placed to the batten, and all of these tiles are attached to the crown row below with the crown cover storm clip, and every second tile is attached to the roof batten with the traditional hook-on storm clip.



Schema for mount-on stormclips for crown cover plain tiles installed in bonding

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!

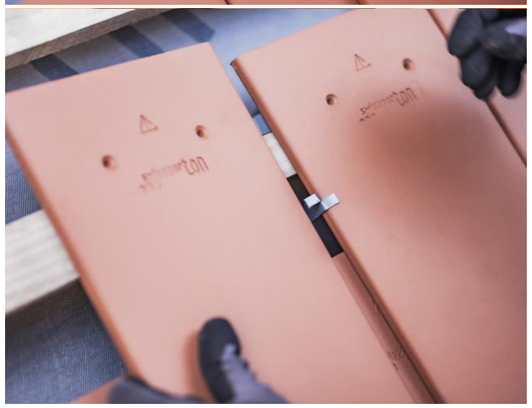
In the design and use of stormclips, we consider that they are placed as far away from the turning axel as possible (usually in the lower half of the sidelock of the tile), so that we can increase the resisting “moment arm” (thus obtaining a higher counterleftancing torque).

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









Mount-on stormclip for plain tiles





Mount-on stormclip for crown covered plain tiles

More informations: swissporTON.hu

PART II.
Technical specifications



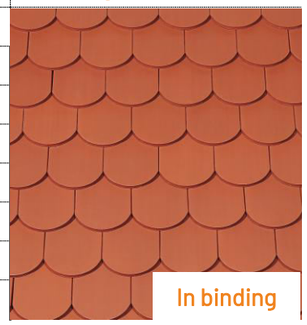
More informations: swissporTON.hu

18x38 cm size plain roof tiles
“CLASSIC”® round cut



Product datas		
Size	width:	180 mm
	length:	380 mm
	height:	28 mm
	thickness:	14 mm
Weight:		1,8 kg
Packaging	pack:	8 pcs
	pallet:	480 pcs
Standard roof pitch:		30°

Covering method



Clay accessories	Size	Quantity
Half tile	90x380	as needed
3/4 tile	135x380	3,1 - 3,5 pcs/m
5/4 tile	225x380	3,1 - 3,5 pcs/m
Ridge connection tile	180x260	5,5 pcs/m
Eave tile	180x260	5,5 pcs/m
Ventilation ridge conn. tile LQ10	180x260	as required
Ventilation eave tile LQ10	180x260	as required
Ventilation base tile LQ10	180x380	as required
Ventilation tile LQ25	180x380	as required
Verge tile 3/4 – left	135x380	3,1 - 3,5 pcs/m

Clay accessories	Size	Quantity
Verge tile 3/4 – right	135x380	3,1 - 3,5 pcs/m
Verge tile 5/4 – left	225x380	3,1 - 3,5 pcs/m
Verge tile 5/4 – right	225x380	3,1 - 3,5 pcs/m
Shed roof tile - short	180x260	5,5 pcs/m
Shed roof tile - long	180x380	5,5 pcs/m
Underlaying tile - left	180x380	as needed
Underlaying tile - right	180x380	as needed
Convex tile	as ordered	as needed
Concave tile	as ordered	as needed

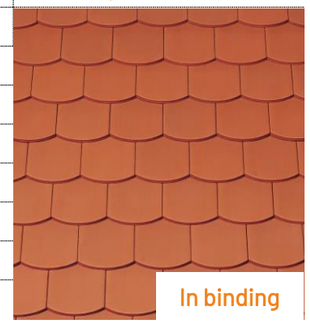
Clay outlets	Package content	Outlet type
Ø110 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room and kitchen ventilation
Ø125 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room and kitchen ventilation
Ø150 outlet vent tile	outlet tile, underlay connection bush	room ventilation kitchen ventilation
Ø200 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 tube outlet tile Ø 70 mm	outlet tile, underlay connection bush	solar and photovoltaic cables
Flue gas outlet tile Ø 110 mm and Ø 125 mm	outlet tile, underlay connection bush	flue pipe of the condensation boilers

18x38 cm size plain roof tiles
“CLASSIC”® segmented cut



Product datas		
Size	width:	180 mm
	length:	380 mm
	height:	28 mm
	thickness:	14 mm
Weight:		1,9 kg
Packaging	pack:	8 pcs
	pallet:	480 pcs
Standard roof pitch:		30°

Covering method



Clay accessories	Size	Quantity
Half tile	90x380	as needed
3/4 tile	135x380	3,1 - 3,5 pcs/m
5/4 tile	225x380	3,1 - 3,5 pcs/m
Ridge connection tile	180x260	5,5 pcs/m
Eave tile	180x260	5,5 pcs/m
Ventilation ridge conn. tile LQ10	180x260	as required
Ventilation eave tile LQ10	180x260	as required
Ventilation base tile LQ10	180x380	as required
Ventilation tile LQ25	180x380	as required
Verge tile 3/4 – left	135x380	3,1 - 3,5 pcs/m

Clay accessories	Size	Quantity
Verge tile 3/4 – right	135x380	3,1 - 3,5 pcs/m
Verge tile 5/4 – left	225x380	3,1 - 3,5 pcs/m
Verge tile 5/4 – right	225x380	3,1 - 3,5 pcs/m

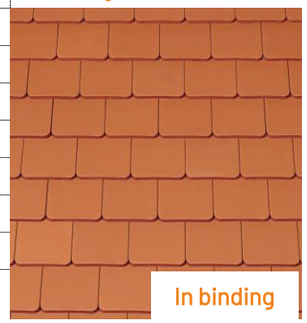
Clay outlets	Package content	Outlet type
Ø110 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room and kitchen ventilation
Ø125 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room and kitchen ventilation
Ø150 outlet vent tile	outlet tile, underlay connection bush	room ventilation kitchen ventilation
Ø200 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 tube outlet tile Ø 70 mm	outlet tile, underlay connection bush	solar and photovoltaic cables
Flue gas outlet tile Ø 110 mm and Ø 125 mm	outlet tile, underlay connection bush	flue pipe of the condensation boilers

18x38 cm size plain roof tiles
“CLASSIC”® straight cut



Product datas		
Size	width:	180 mm
	length:	380 mm
	height:	28 mm
	thickness:	14 mm
Weight:		1,9 kg
Packaging	pack:	8 pcs
	pallet:	480 pcs
Standard roof pitch:		30°

Covering method



Clay accessories	Size	Quantity
Half tile	90x380	as needed
3/4 tile	135x380	3,1 - 3,5 pcs/m
5/4 tile	225x380	3,1 - 3,5 pcs/m
Ridge connection tile	180x260	5,5 pcs/m
Eave tile	180x260	5,5 pcs/m
Ventilation ridge conn. tile LQ10	180x260	as required
Ventilation eave tile LQ10	180x260	as required
Ventilation base tile LQ10	180x380	as required
Ventilation tile LQ25	180x380	as required

Clay accessories	Size	Quantity
Verge tile 3/4 – left	135x380	3,1 - 3,5 pcs/m
Verge tile 3/4 – right	135x380	3,1 - 3,5 pcs/m
Verge tile 5/4 – left	225x380	3,1 - 3,5 pcs/m
Verge tile 5/4 – right	225x380	3,1 - 3,5 pcs/m

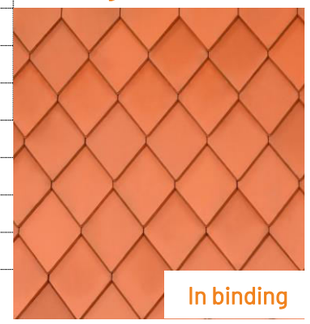
Clay outlets	Package content	Outlet type
Ø110 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room and kitchen ventilation
Ø125 outlet vent tile with “A” type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room and kitchen ventilation
Ø150 outlet vent tile	outlet tile, underlay connection bush	room ventilation kitchen ventilation
Ø200 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 tube outlet tile Ø 70 mm	outlet tile, underlay connection bush	solar and photovoltaic cables
Flue gas outlet tile Ø 110 mm and Ø 125 mm	outlet tile, underlay connection bush	flue pipe of the condensation boilers

18x38 cm size plain roof tiles
“CLASSIC”® pointed cut[1]



Product datas		
Size	width:	180 mm
	length:	380 mm
	height:	28 mm
	thickness:	14 mm
Weight:		1,7 kg
Packaging	pack:	8 pcs
	pallet:	480 pcs
Standard roof pitch:		30°

Covering method



Clay accessories	Size	Quantity
Half tile	90x380	as needed
3/4 tile	135x380	3,1 - 3,5 pcs/m
Ridge connection tile	180x260	5,5 pcs/m
Eave tile	180x260	5,5 pcs/m
Ventilation ridge conn. tile LQ10	180x260	as required
Ventilation eave tile LQ10	180x260	as required

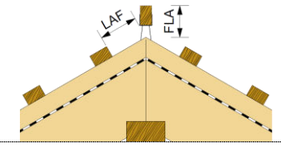
[1] The pointed cut CLASSIC plain tile is produced only in the case when it is requested

18x38 cm size plain roof tiles

Technical specification of the roof cover the 18x38 cm size plain roof tiles

The pitch of the roof:		< 35°	35° - 40°	40° - 45°	45° - 60°	60° <
Covering width		180 mm	180 mm	180 mm	180 mm	180 mm
Batten distance(for double cover)		145 mm	150 mm	155 mm	160 mm	165 mm
Batten distance(for crown cover)		290 mm	300 mm	310 mm	320 mm	330 mm
Capacity		38,3 pcs/m²	37,0 pcs/m²	35,8 pcs/m²	34,7 pcs/m²	33,6 pcs/m²
Type of the cover		double cover / crown cover				
Covering	**CLASSIC** round cut	68,94 kg/m²	66,60 kg/m²	64,44 kg/m²	62,46 kg/m²	60,48 kg/m²
	CLASSIC segment cut	72,77 kg/m²	70,30 kg/m²	68,02 kg/m²	65,93 kg/m²	63,84 kg/m²
	CLASSIC straight cut	72,77 kg/m²	70,30 kg/m²	68,02 kg/m²	65,93 kg/m²	63,84 kg/m²
	CLASSIC pointed cut	65,11 kg/m²	62,90 kg/m²	60,86 kg/m²	58,99 kg/m²	57,12 kg/m²

Rafter distance	Batten dimensions	
	Double cover	Crown cover
below 70 cm	30 x 50 mm	30 x 50 mm
70 – 80 cm	30 x 50 mm	40 x 60 mm
80 – 90 cm	30 x 50 mm	individually sized
90 - 100 cm	40 x 60 mm	individually sized



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

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

LAF [mm] value, 30x50 batten

Roof pitch	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°
LH / BZ ridge tile	✘	✘	90	85	80	75	75	75	75	80	✘

LAF [mm] value, 40x60 batten

Roof pitch	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°
LH / BZ ridge tile	✘	✘	85	80	75	70	70	65	60	65	✘

LAF [mm] value, 50x50 batten

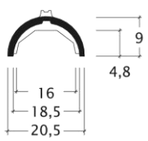
Roof pitch	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°
LH / BZ ridge tile	✘	✘	80	75	70	60	60	55	50	55	✘

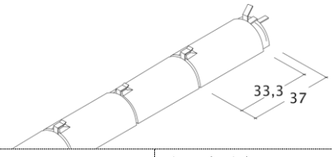
Fixing products

Name	Material	Application field
Mount-on stormclip 30x50 mm batten	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the genereal roof surface .
Mount-on stormclip 40x60 mm batten	zinc-aluminium	
Mount-on stormclip For crown cover 12-14 mm	stainless-steel	
Mount-on stormclip For crown cover 14-16 mm	stainless-steel	
Fixing screw with EPDM sealing, 50 mm length	stainless-steel	Fixing against loosed tiles along the edges and some cases in the average roof surfaces .
Clip with wire, 7-22 mm	stainless-steel	Fixing cutted tiles along the hips and valleys

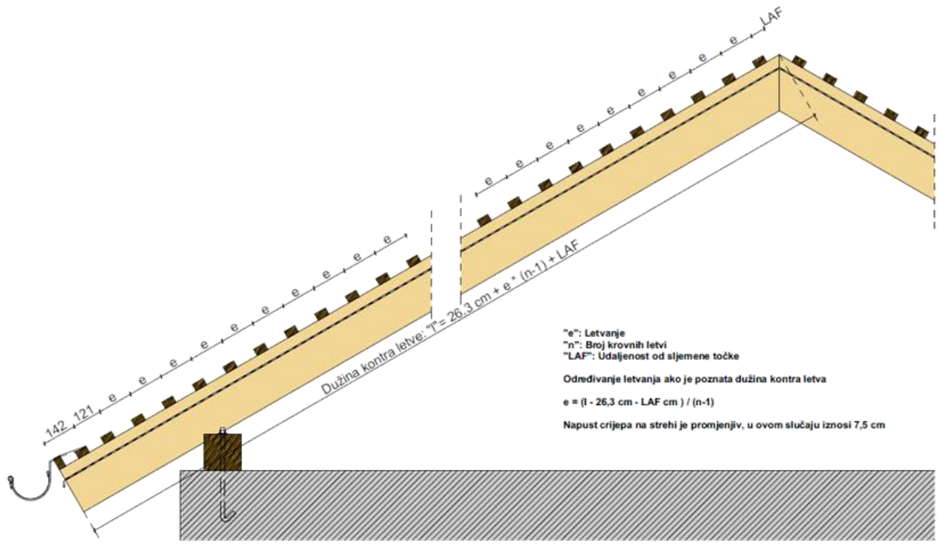
"LH" / „BZ" ridge tile 3,0 pcs/lm





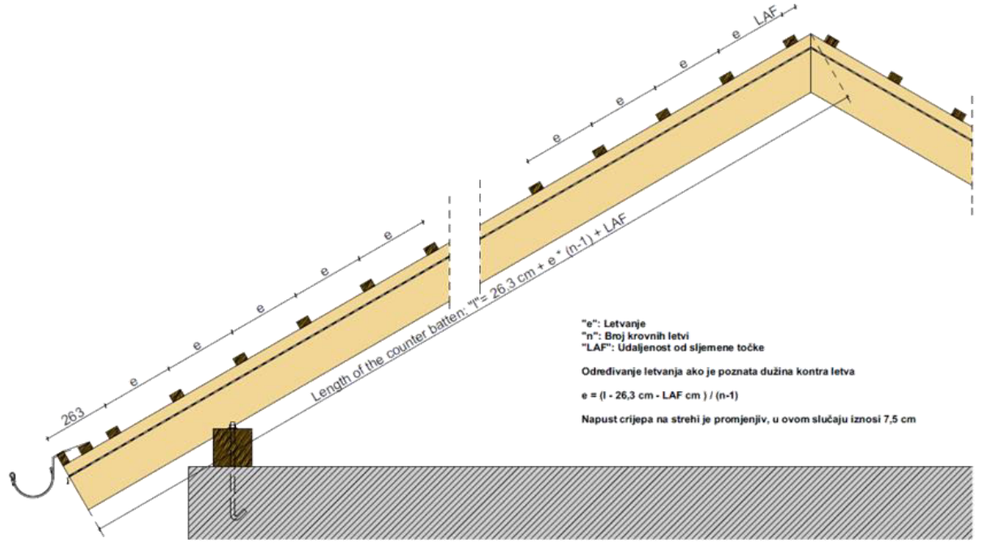


Closing plate	Hip starter	3 axis hip cap	4 axis hip cap
			



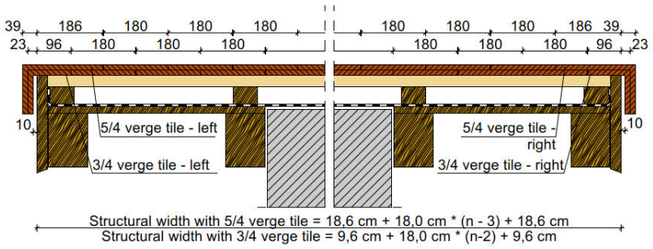
Roof batten alignement for 18x38 cm size, double covered plain roof tiles

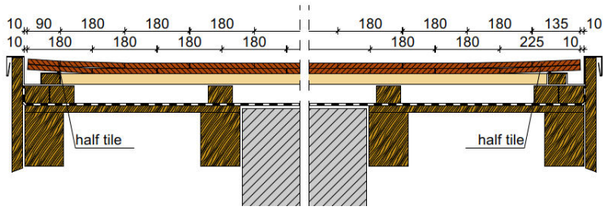
Specification:	7,5 cm eave overhang and 30° roof pitch "LH" / „BZ" ridge tile and 30x50 mm roof battens, LAF = 80 mm				
Number of battens(n)	145 mm	150 mm	155 mm	160 mm	165 mm
10	1 648	1 693	1 738	1 783	1 828
11	1 793	1 843	1 893	1 943	1 993
12	1 938	1 993	2 048	2 103	2 158
13	2 083	2 143	2 203	2 263	2 323
14	2 228	2 293	2 358	2 423	2 488
15	2 373	2 443	2 513	2 583	2 653
16	2 518	2 593	2 668	2 743	2 818
17	2 663	2 743	2 823	2 903	2 983
18	2 808	2 893	2 978	3 063	3 148
19	2 953	3 043	3 133	3 223	3 313
20	3 098	3 193	3 288	3 383	3 478
21	3 243	3 343	3 443	3 543	3 643
22	3 388	3 493	3 598	3 703	3 808
23	3 533	3 643	3 753	3 863	3 973
24	3 678	3 793	3 908	4 023	4 138
25	3 823	3 943	4 063	4 183	4 303
26	3 968	4 093	4 218	4 343	4 468
27	4 113	4 243	4 373	4 503	4 633
28	4 258	4 393	4 528	4 663	4 798
29	4 403	4 543	4 683	4 823	4 963
30	4 548	4 693	4 838	4 983	5 128
31	4 693	4 843	4 993	5 143	5 293
32	4 838	4 993	5 148	5 303	5 458
33	4 983	5 143	5 303	5 463	5 623
34	5 128	5 293	5 458	5 623	5 788
35	5 273	5 443	5 613	5 783	5 953
36	5 418	5 593	5 768	5 943	6 118
37	5 563	5 743	5 923	6 103	6 283
38	5 708	5 893	6 078	6 263	6 448
39	5 853	6 043	6 233	6 423	6 613
40	5 998	6 193	6 388	6 583	6 778



Roof batten alignement for 18x38 cm size, crown covered plain roof tiles

Specification:	7,5 cm eave overhang and 30° roof pitch "LH" / „BZ" ridge tile and 30x50 mm roof battens, LAF = 80 mm				
Number of battens(n)	290 mm	300 mm	310 mm	320 mm	330 mm
10	2 953	3 043	3 133	3 223	3 313
11	3 243	3 343	3 443	3 543	3 643
12	3 533	3 643	3 753	3 863	3 973
13	3 823	3 943	4 063	4 183	4 303
14	4 113	4 243	4 373	4 503	4 633
15	4 403	4 543	4 683	4 823	4 963
16	4 693	4 843	4 993	5 143	5 293
17	4 983	5 143	5 303	5 463	5 623
18	5 273	5 443	5 613	5 783	5 953
19	5 563	5 743	5 923	6 103	6 283
20	5 853	6 043	6 233	6 423	6 613
21	6 143	6 343	6 543	6 743	6 943
22	6 433	6 643	6 853	7 063	7 273
23	6 723	6 943	7 163	7 383	7 603
24	7 013	7 243	7 473	7 703	7 933
25	7 303	7 543	7 783	8 023	8 263
26	7 593	7 843	8 093	8 343	8 593
27	7 883	8 143	8 403	8 663	8 923
28	8 173	8 443	8 713	8 983	9 253
29	8 463	8 743	9 023	9 303	9 583
30	8 753	9 043	9 333	9 623	9 913
31	9 043	9 343	9 643	9 943	10 243
32	9 333	9 643	9 953	10 263	10 573
33	9 623	9 943	10 263	10 583	10 903
34	9 913	10 243	10 573	10 903	11 233
35	10 203	10 543	10 883	11 223	11 563
36	10 493	10 843	11 193	11 543	11 893
37	10 783	11 143	11 503	11 863	12 223
38	11 073	11 443	11 813	12 183	12 553
39	11 363	11 743	12 123	12 503	12 883
40	11 653	12 043	12 433	12 823	13 213





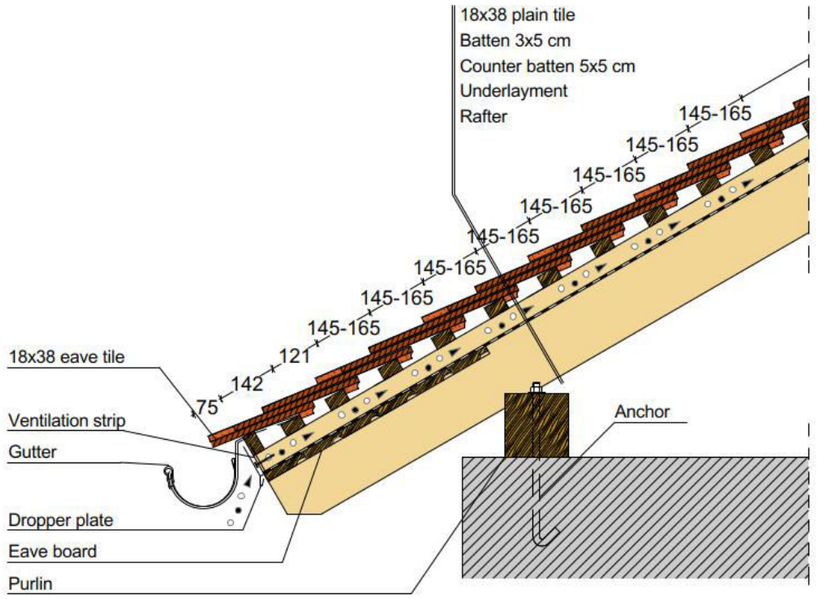
Structural width between the verge boards

	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
0	-	-	180	-	370	460	550	640	730	820
10	1 810	1 900	1 990	2 080	2 170	2 260	2 350	2 440	2 530	2 620
20	3 610	3 700	3 790	3 880	3 970	4 060	4 150	4 240	4 330	4 420
30	5 410	5 500	5 590	5 680	5 770	5 860	5 950	6 040	6 130	6 220
40	7 210	7 300	7 390	7 480	7 570	7 660	7 750	7 840	7 930	8 020
50	9 010	9 100	9 190	9 280	9 370	9 460	9 550	9 640	9 730	9 820
60	10 810	10 900	10 990	11 080	11 170	11 260	11 350	11 440	11 530	11 620
70	12 610	12 700	12 790	12 880	12 970	13 060	13 150	13 240	13 330	13 420
80	14 410	14 500	14 590	14 680	14 770	14 860	14 950	15 040	15 130	15 220
90	16 210	16 300	16 390	16 480	16 570	16 660	16 750	16 840	16 930	17 020
100	18 010	18 100	18 190	18 280	18 370	18 460	18 550	18 640	18 730	18 820

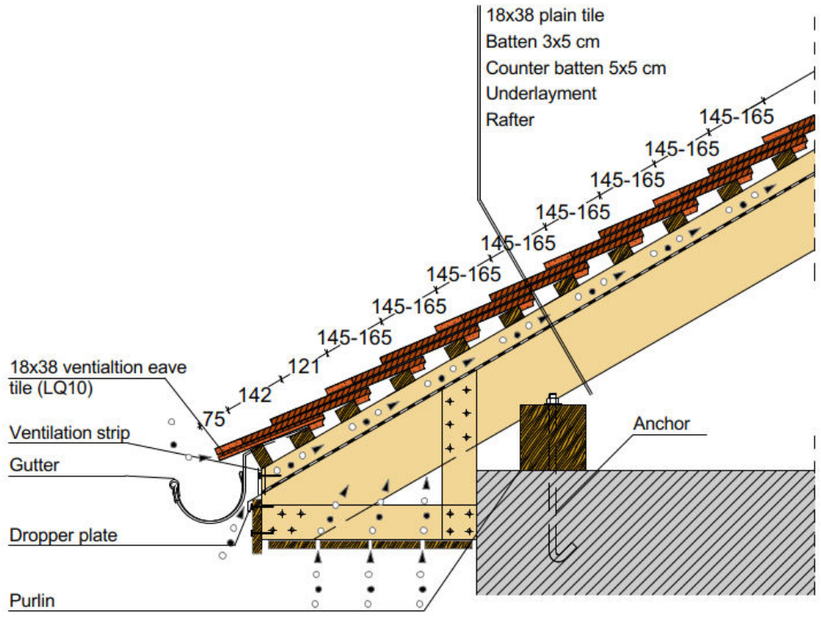
Structural width between the verge boards

	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	910	1 000	1 090	1 180	1 270	1 360	1 450	1 540	1 630	1 720
10	2 710	2 800	2 890	2 980	3 070	3 160	3 250	3 340	3 430	3 520
20	4 510	4 600	4 690	4 780	4 870	4 960	5 050	5 140	5 230	5 320
30	6 310	6 400	6 490	6 580	6 670	6 760	6 850	6 940	7 030	7 120
40	8 110	8 200	8 290	8 380	8 470	8 560	8 650	8 740	8 830	8 920
50	9 910	10 000	10 090	10 180	10 270	10 360	10 450	10 540	10 630	10 720
60	11 710	11 800	11 890	11 980	12 070	12 160	12 250	12 340	12 430	12 520
70	13 510	13 600	13 690	13 780	13 870	13 960	14 050	14 140	14 230	14 320
80	15 310	15 400	15 490	15 580	15 670	15 760	15 850	15 940	16 030	16 120
90	17 110	17 200	17 290	17 380	17 470	17 560	17 650	17 740	17 830	17 920
100	18 910	19 000	19 090	19 180	19 270	19 360	19 450	19 540	19 630	19 720

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

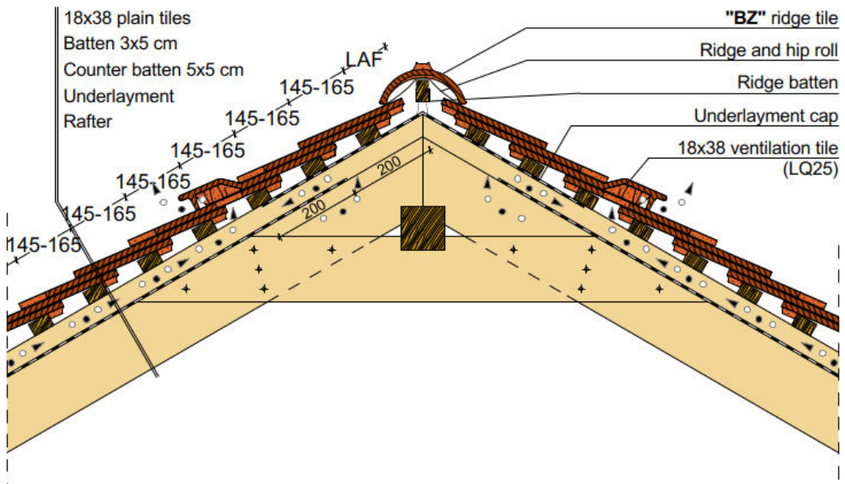


Eave details

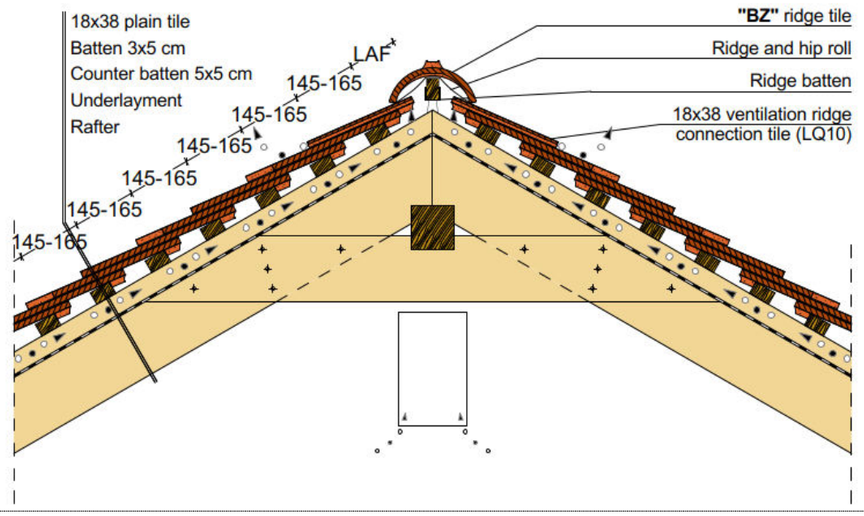


Closed eave detail

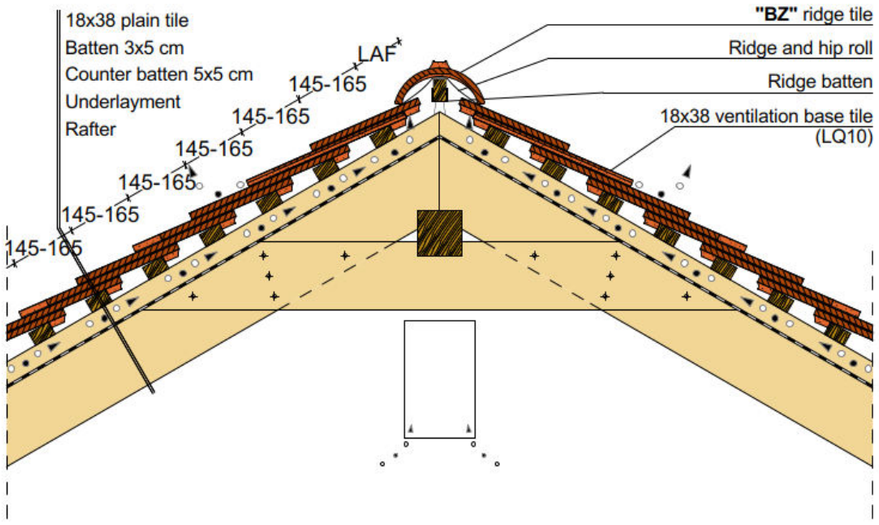
More informations: swissporTON.hu



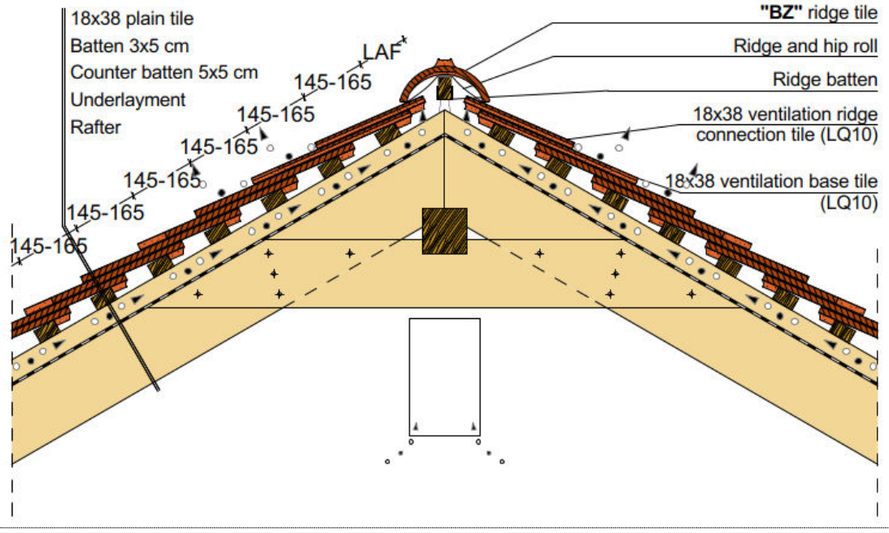
Ridge detail, with ventilation tiles



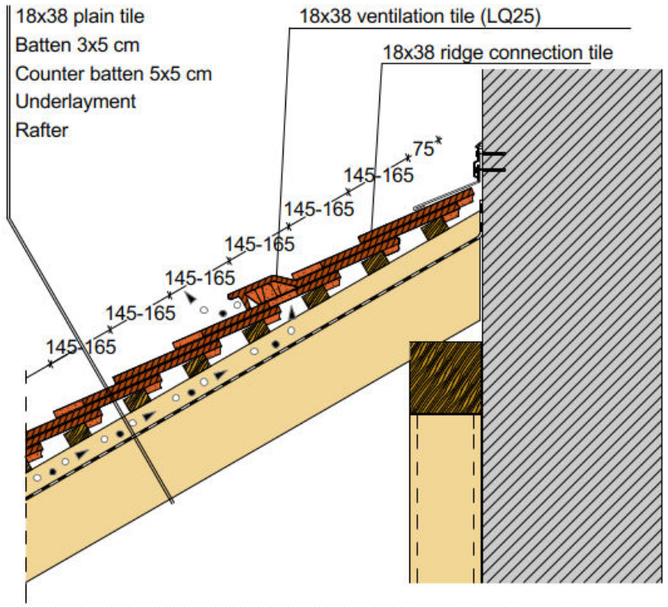
Ridge detail, with Ventilation ridge conn. tiles



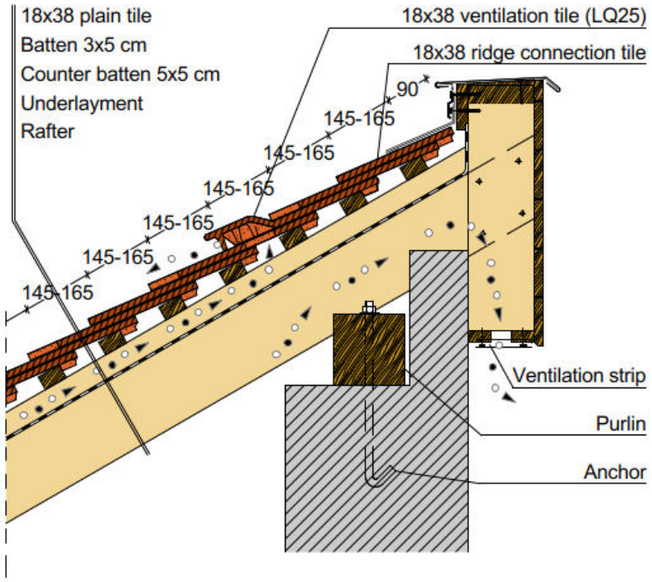
Ridge detail, with ventilation base tiles



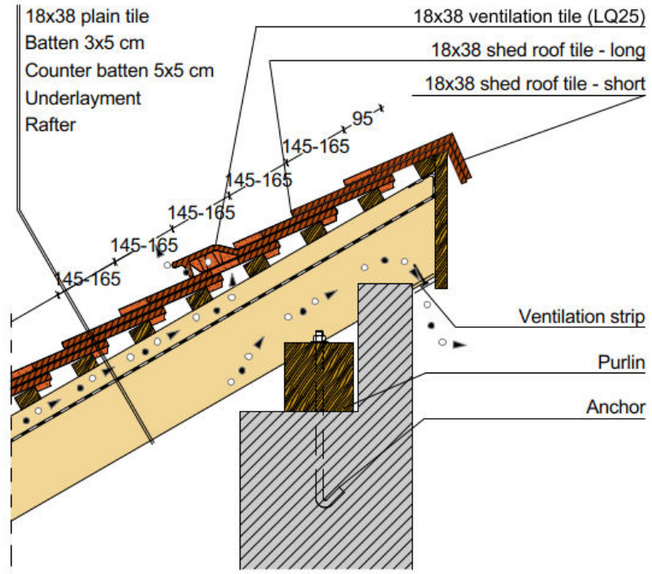
Ridge detail, with ventilation ridge connection and with ventilation base tiles



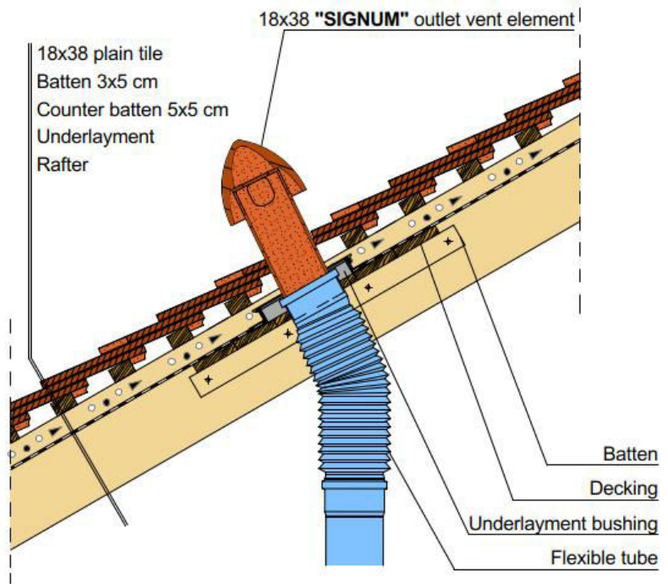
Wall edge detail



Shed roof ridge detail

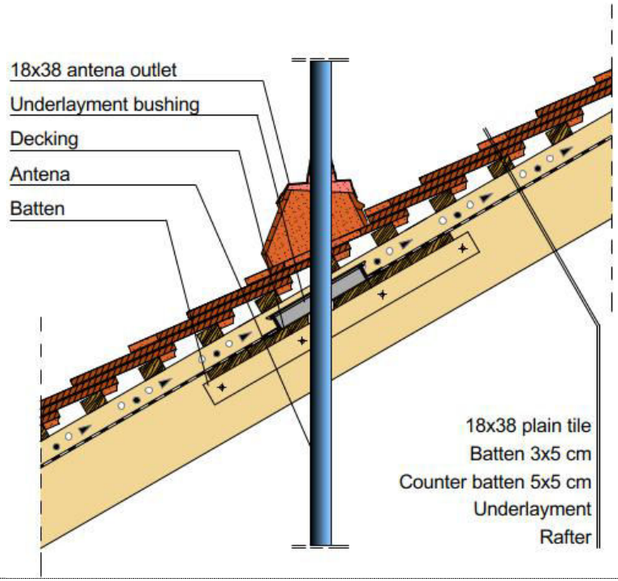


Shed roof ridge detailwith shed roof tile

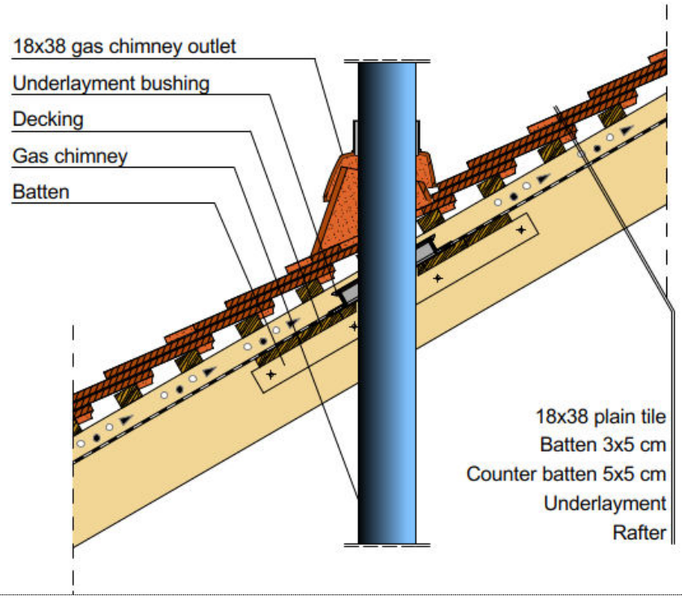


„SIGNUM“ clay vent. outlet tile

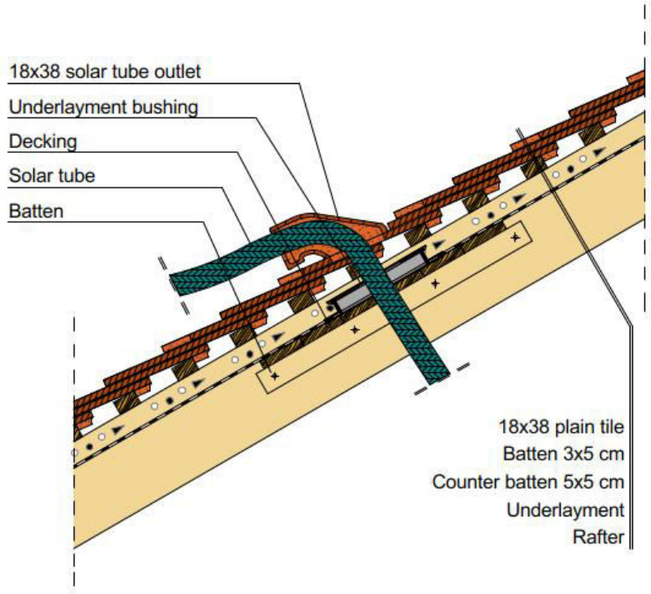
More informations: swissporTON.hu



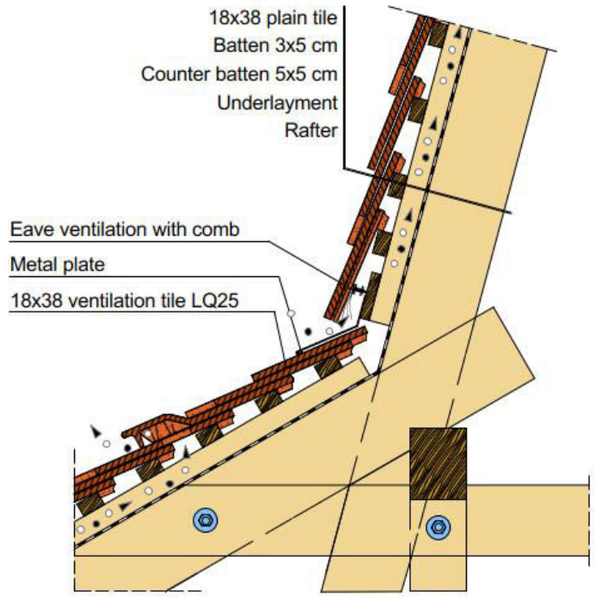
Clay antena outlet tile



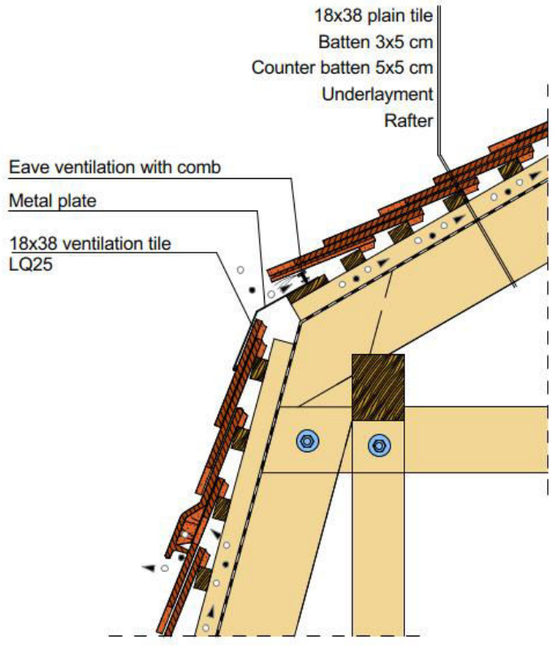
Clay gas chimney outlet detail



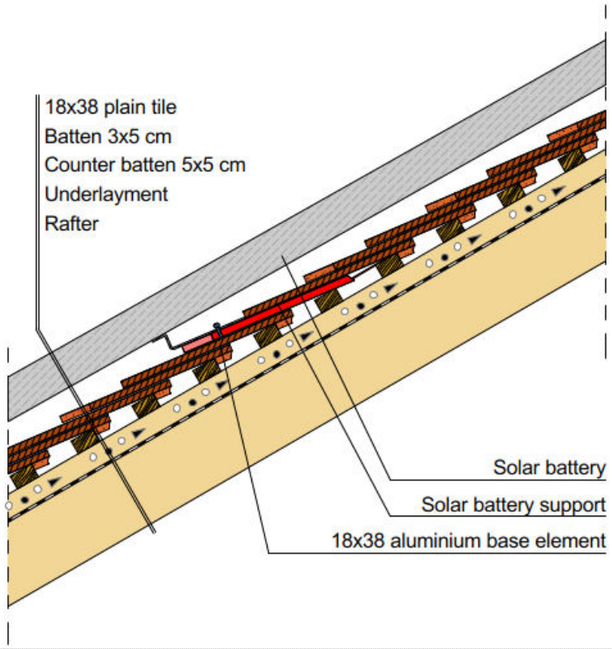
Clay solar tube outlet detail



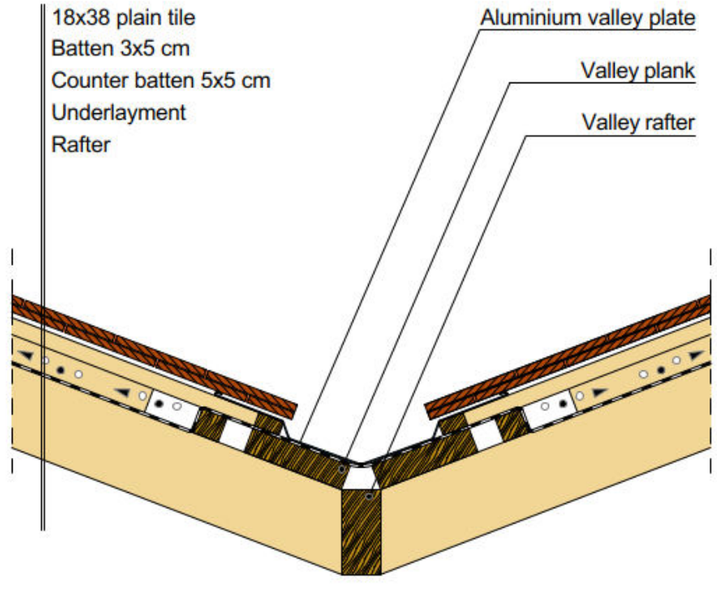
Conkave roof pitch change



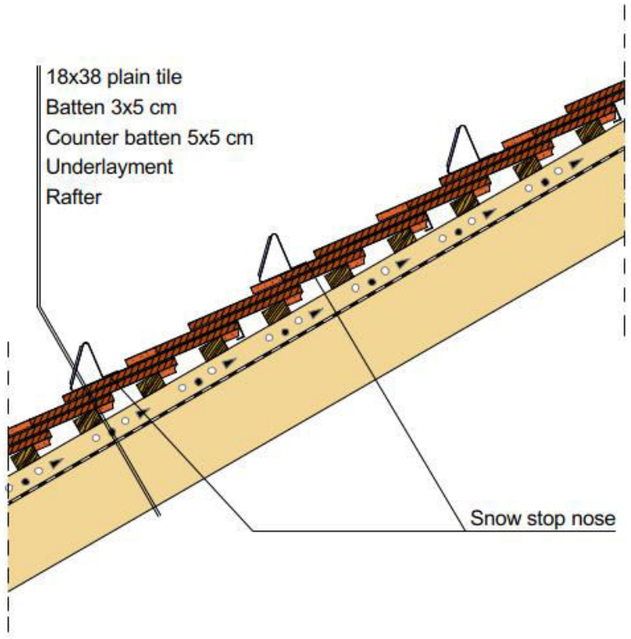
Convex roof pitch change



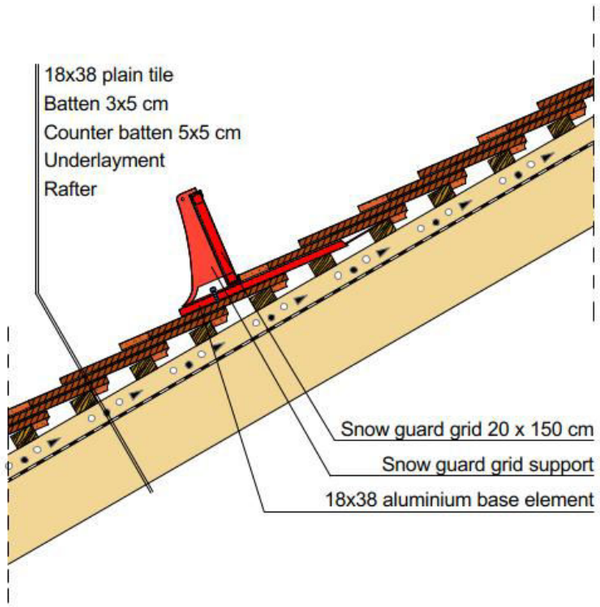
Aluminium solar support detail



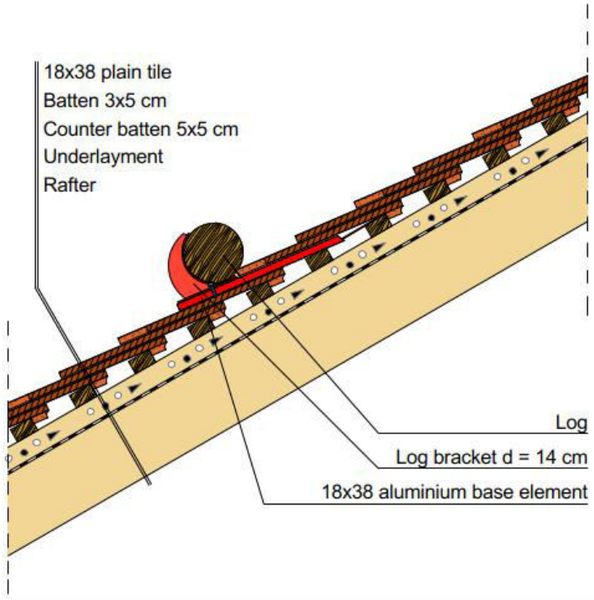
Valley detail



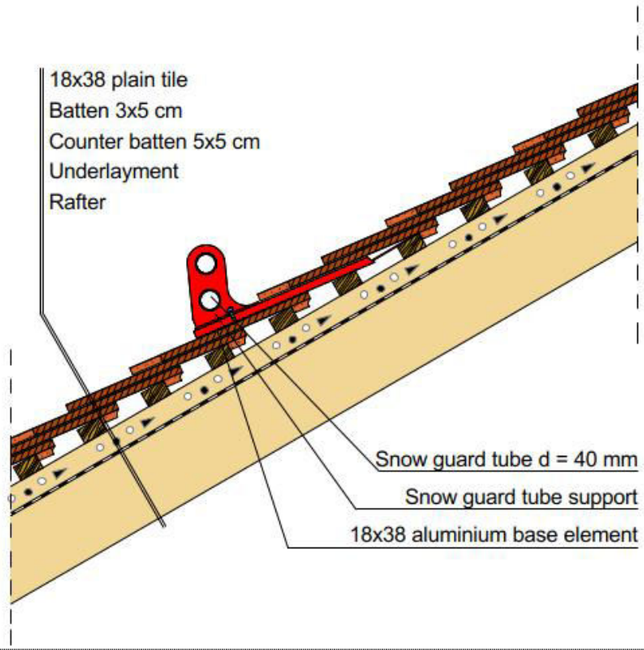
Snow stop nose placement



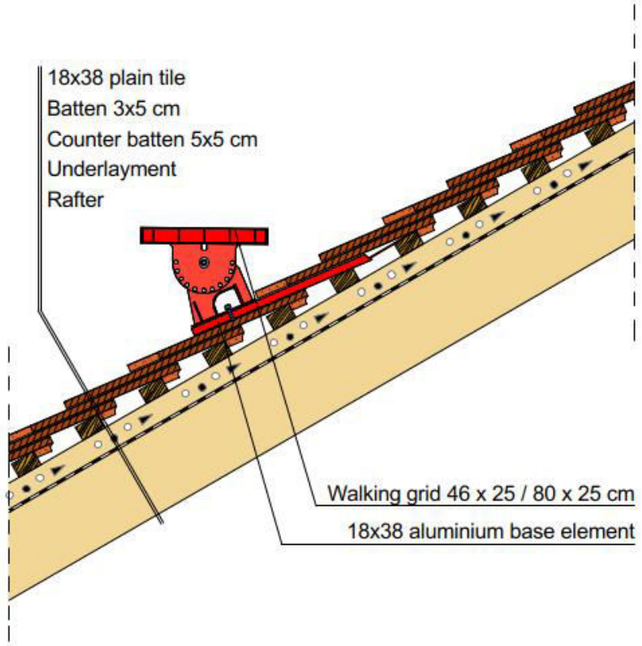
Snow guard grid placement



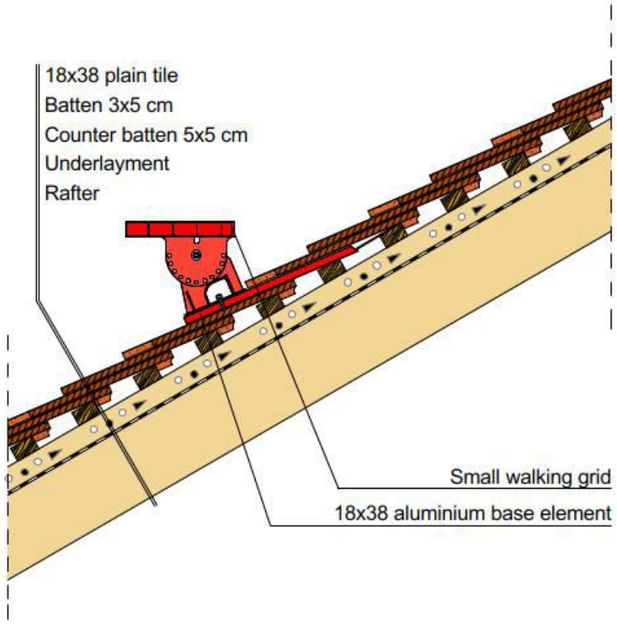
Snow guard log placement



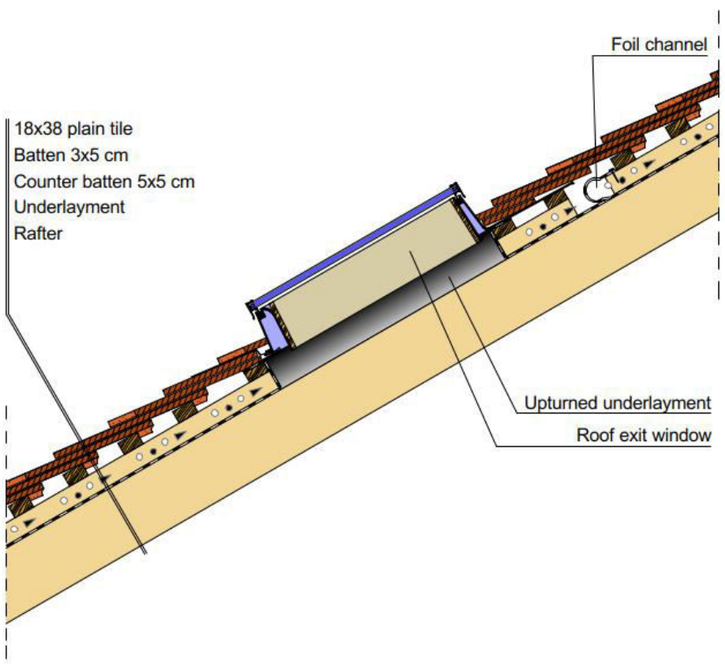
Snow guard tube placement



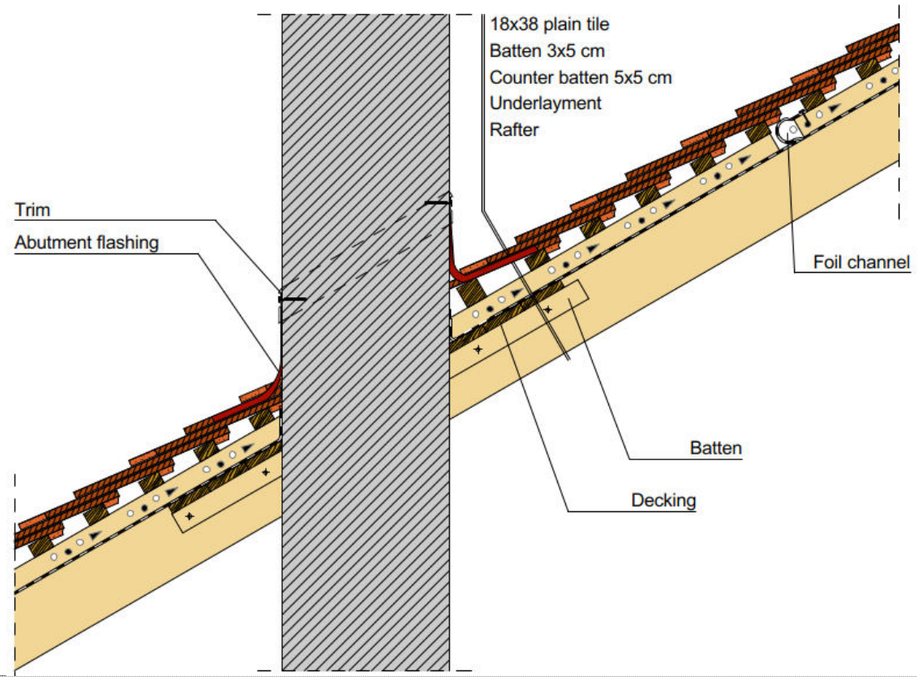
Walking grid placement



Single step placement

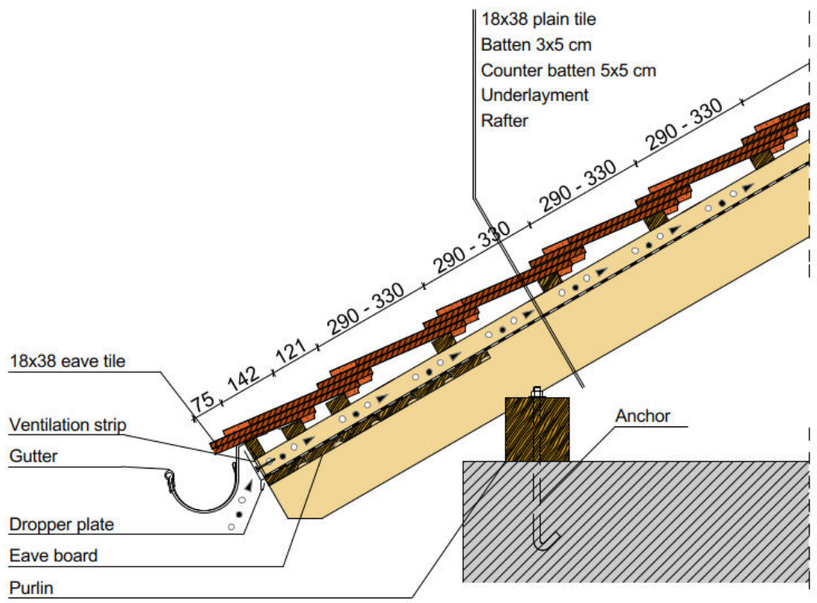


Roof exit window placement

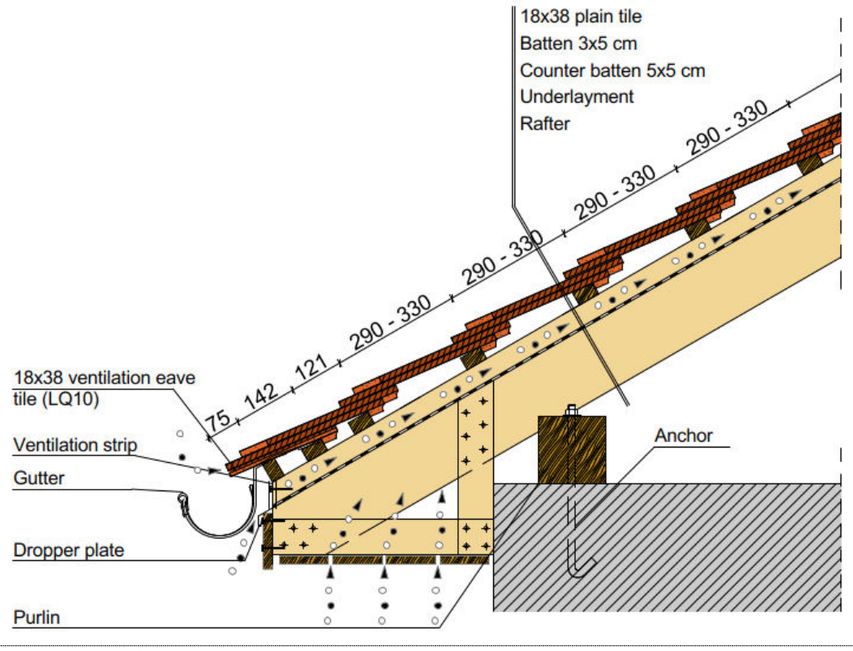


Chimney edge detail

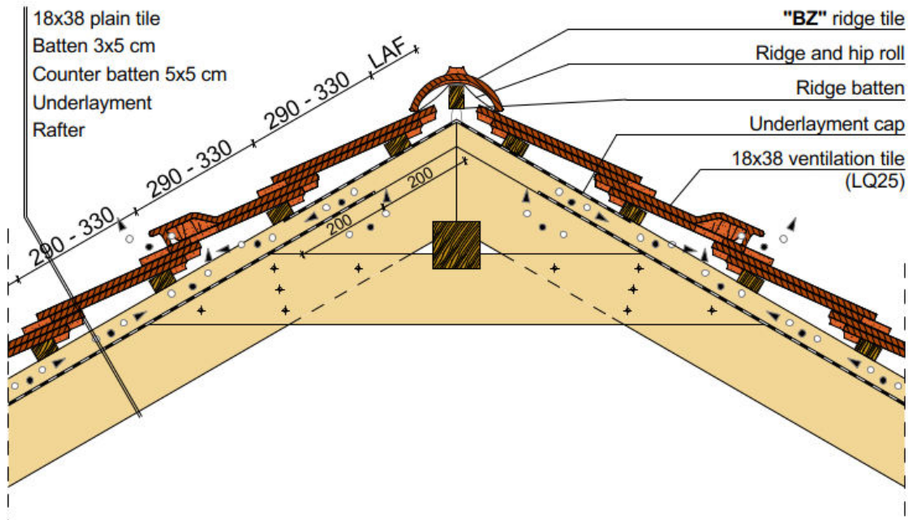
More informations: swissporTON.hu



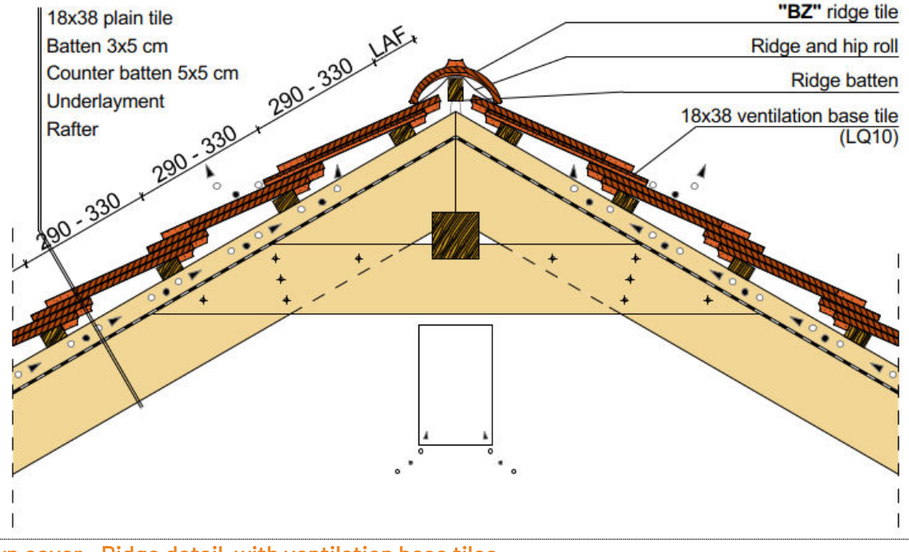
Crown cover - Eave details



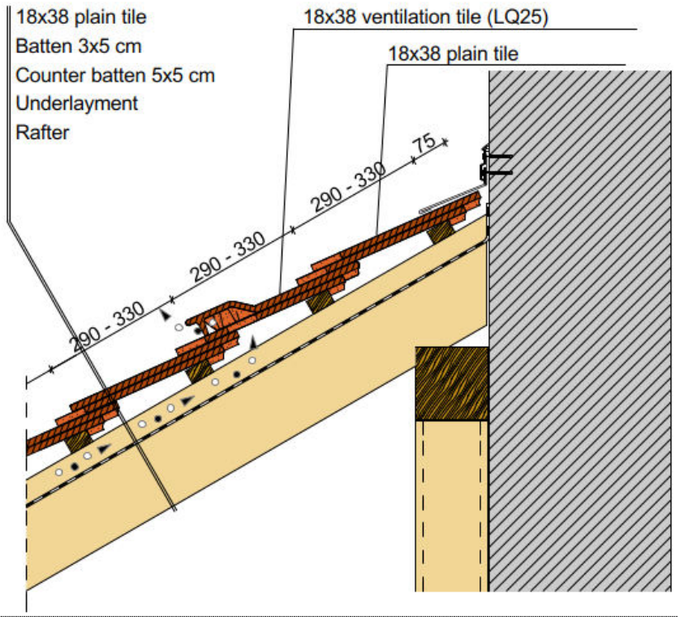
Crown cover - Closed eave detail



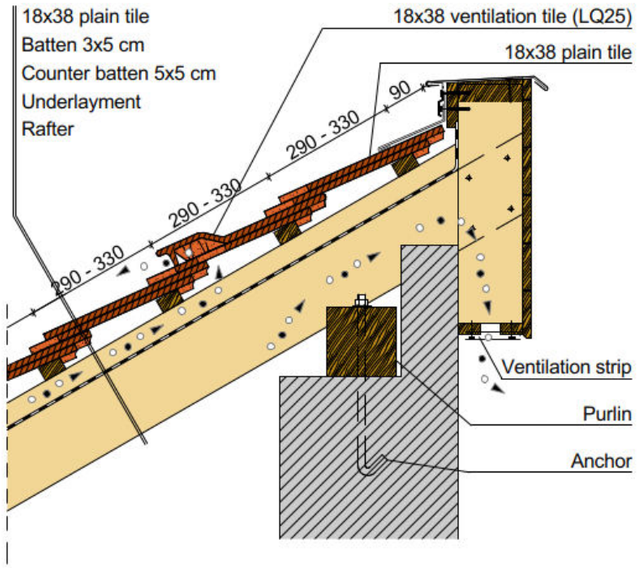
Crown cover - Ridge detail, with ventilation tiles



Crown cover - Ridge detail, with ventilation base tiles



Crown cover - Wall edge detail



Crown cover - Shed roof ridge detail

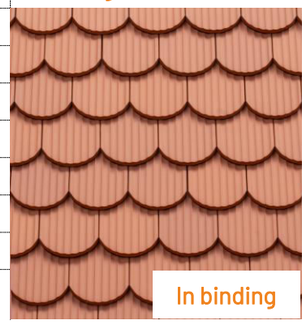
More informations: swissporTON.hu

17x38 cm sized CASTA plain roof tiles
“CASTA”® round cut



Product datas		
Size	width:	170 mm
	length:	380 mm
	height:	32 mm
	thickness:	18 mm
Weight:		2,1 kg
Packaging	pack:	6 pcs
	pallet:	480 pcs
Standard roof pitch:		30°

Covering method



Clay accessories	Size	Quantity
Half tile	85x380	as needed
3/4 tile	127x380	6,2 – 7,0 pcs/m
Ridge connection tile	170x260	5,9 pcs/m
Eave tile	170x260	5,9 pcs/m
Ventilation base tile LQ9	170x380	as required

Technical specification of the roof cover the 17x38 cm CASTA round-cut tile

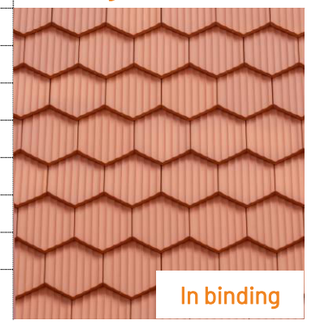
The pitch of the roof:	**< 35°**	**35° - 40°**	**40° - 45°**	**45° - 60°**	**60° <**
Covering width	170 mm	170 mm	170 mm	170 mm	170 mm
Batten distance(for double cover)	145 mm	150 mm	155 mm	160 mm	165 mm
Batten distance(for crown cover)	290 mm	300 mm	310 mm	320 mm	330 mm
Capacity	40,6 pcs/m²	39,3 pcs/m²	38,0 pcs/m²	36,8 pcs/m²	35,7 pcs/m²
Type of the cover	double cover / crown cover				
Covering weight	85,3 kg/m²	82,5 kg/m²	79,8 kg/m²	77,3 kg/m²	75,0 kg/m²

17x38 cm sized CASTA plain roof tiles
“CASTA”® hexagonal cut



Product datas		
Size	width:	170 mm
	length:	380 mm
	height:	32 mm
	thickness:	18 mm
Weight:		2,1 kg
Packaging	pack:	6 pcs
	pallet:	480 pcs
Standard roof pitch:		30°

Covering method



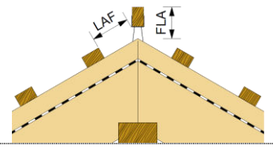
Clay accessories	Size	Quantity
Half tile	85x380	as needed
3/4 tile	127x380	6,2 – 7,0 pcs/m
Ridge connection tile	170x260	5,9 pcs/m
Eave tile	170x260	5,9 pcs/m
Ventilation base tile LQ9	170x380	as required

Technical specification of the roof cover the 17x38 cm CASTA hexagonal-cut tile

The pitch of the roof:	**< 35°**	**35° - 40°**	**40° - 45°**	**45° - 60°**	**60° <**
Covering width	170 mm	170 mm	170 mm	170 mm	170 mm
Batten distance(for double cover)	145 mm	150 mm	155 mm	160 mm	165 mm
Batten distance(for crown cover)	290 mm	300 mm	310 mm	320 mm	330 mm
Capacity	40,6 pcs/m²	39,3 pcs/m²	38,0 pcs/m²	36,8 pcs/m²	35,7 pcs/m²
Type of the cover	double cover / crown cover				
Covering weight	85,3 kg/m²	82,5 kg/m²	79,8 kg/m²	77,3 kg/m²	75,0 kg/m²

17x38 cm sized CASTA plain roof tiles

Rafter distance	Batten dimensions	
	Double cover	Crown cover
below 70 cm	30 x 50 mm	30 x 50 mm
70 – 80 cm	30 x 50 mm	40 x 60 mm
80 – 90 cm	30 x 50 mm	individually sized
90 - 100 cm	40 x 60 mm	individually sized



LAF: distance of the upper batten

FLA: height of the ridge batten

LAF [mm] value, LH ridge tile

Roof pitch	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°
30x50 mm	✘	✘	90	85	80	75	75	75	75	80	✘
40x60 mm	✘	✘	85	80	75	70	70	65	60	65	✘
50x50 mm	✘	✘	80	75	70	60	60	55	50	55	✘

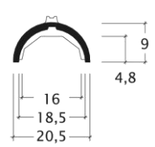
Fixing products

Name	Material	Application field
Mount-on stormclip 30x50 mm batten	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the genereal roof surface .
Mount-on stormclip 40x60 mm batten	zinc-aluminium	
Mount-on stormclip For crown cover 12-14 mm	stainless-steel	
Mount-on stormclip For crown cover 14-16 mm	stainless-steel	
Fixing screw with EPDM sealing, 50 mm length	stainless-steel	Fixing against loosed tiles along the edges and some cases in the average roof surfaces .
Clip with wire, 7-22 mm	stainless-steel	Fixing cutted tiles along the hips and valleys

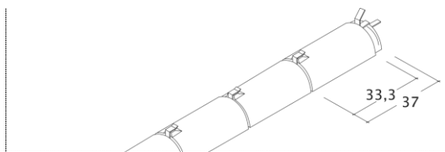
"LH" ridge tile 3,0 pcs/lm



Closing plate



Hip starter



3 axis hip cap

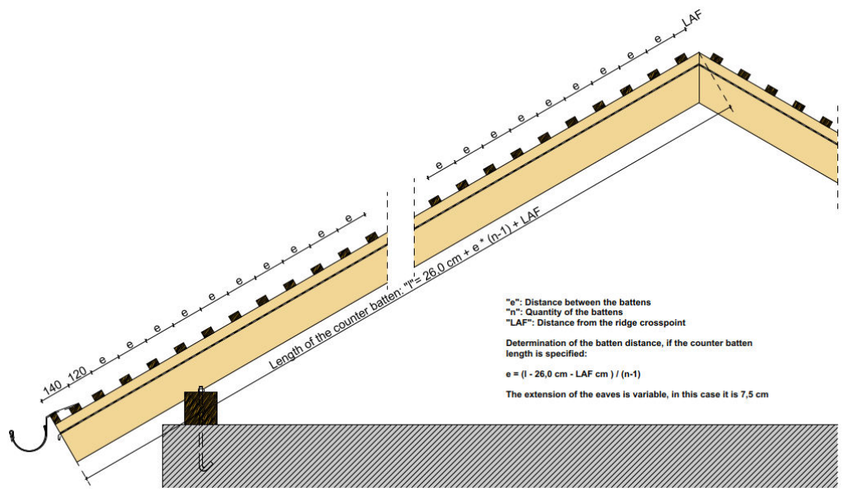
4 axis hip cap







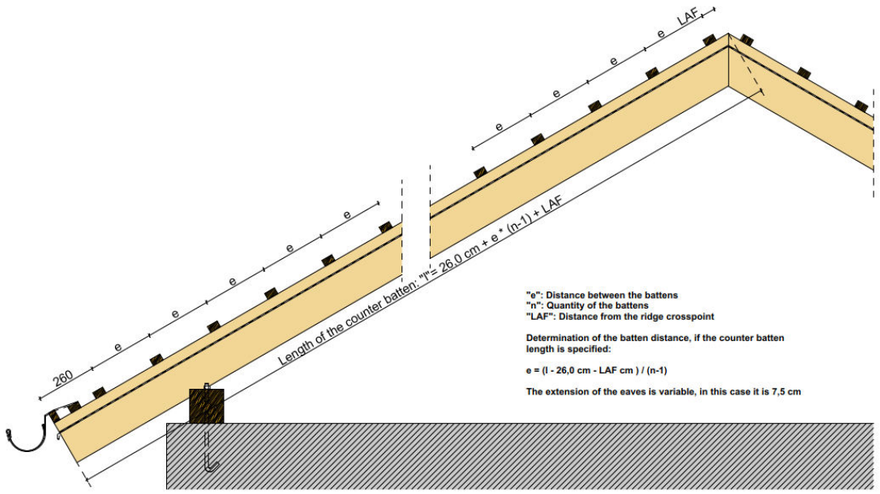




Roof batten alignement for 17x38 cm Size, Double cover CASTA roof tile cover

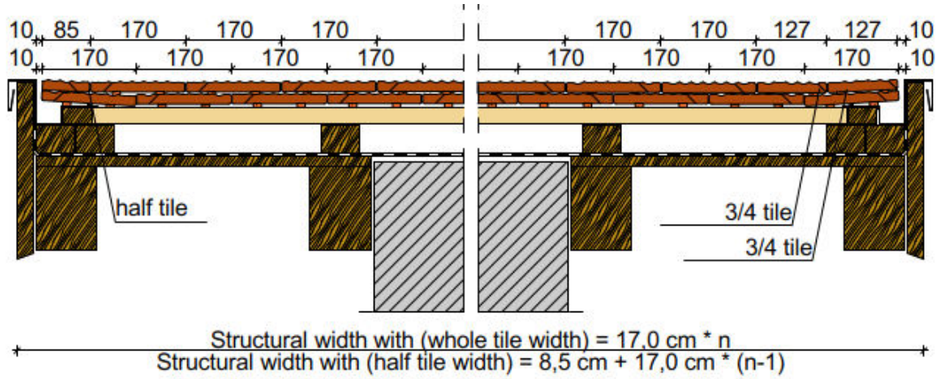
Specification:	7,5 cm eave overhang and 30° roof pitch "LH" ridge tile and 30x50 mm roof battens, LAF = 80 mm				
Number of battens(n)	145 mm	150 mm	155 mm	160 mm	165 mm
10	1 648	1 693	1 738	1 783	1 828
11	1 793	1 843	1 893	1 943	1 993
12	1 938	1 993	2 048	2 103	2 158
13	2 083	2 143	2 203	2 263	2 323
14	2 228	2 293	2 358	2 423	2 488
15	2 373	2 443	2 513	2 583	2 653
16	2 518	2 593	2 668	2 743	2 818
17	2 663	2 743	2 823	2 903	2 983
18	2 808	2 893	2 978	3 063	3 148
19	2 953	3 043	3 133	3 223	3 313
20	3 098	3 193	3 288	3 383	3 478
21	3 243	3 343	3 443	3 543	3 643
22	3 388	3 493	3 598	3 703	3 808
23	3 533	3 643	3 753	3 863	3 973
24	3 678	3 793	3 908	4 023	4 138
25	3 823	3 943	4 063	4 183	4 303
26	3 968	4 093	4 218	4 343	4 468
27	4 113	4 243	4 373	4 503	4 633
28	4 258	4 393	4 528	4 663	4 798
29	4 403	4 543	4 683	4 823	4 963
30	4 548	4 693	4 838	4 983	5 128
31	4 693	4 843	4 993	5 143	5 293
32	4 838	4 993	5 148	5 303	5 458
33	4 983	5 143	5 303	5 463	5 623
34	5 128	5 293	5 458	5 623	5 788
35	5 273	5 443	5 613	5 783	5 953
36	5 418	5 593	5 768	5 943	6 118
37	5 563	5 743	5 923	6 103	6 283
38	5 708	5 893	6 078	6 263	6 448
39	5 853	6 043	6 233	6 423	6 613
40	5 998	6 193	6 388	6 583	6 778

More informations: swissporTON.hu



Roof batten alignement for 17x38 cm Size, Crown cover - CASTA roof tile cover

Specification:	7,5 cm eave overhang and 30° roof pitch „LH" ridge tile and 30x50 mm roof battens, LAF = 80 mm				
Number of battens(n)	290 mm	300 mm	310 mm	320 mm	330 mm
10	2 953	3 043	3 133	3 223	3 313
11	3 243	3 343	3 443	3 543	3 643
12	3 533	3 643	3 753	3 863	3 973
13	3 823	3 943	4 063	4 183	4 303
14	4 113	4 243	4 373	4 503	4 633
15	4 403	4 543	4 683	4 823	4 963
16	4 693	4 843	4 993	5 143	5 293
17	4 983	5 143	5 303	5 463	5 623
18	5 273	5 443	5 613	5 783	5 953
19	5 563	5 743	5 923	6 103	6 283
20	5 853	6 043	6 233	6 423	6 613
21	6 143	6 343	6 543	6 743	6 943
22	6 433	6 643	6 853	7 063	7 273
23	6 723	6 943	7 163	7 383	7 603
24	7 013	7 243	7 473	7 703	7 933
25	7 303	7 543	7 783	8 023	8 263
26	7 593	7 843	8 093	8 343	8 593
27	7 883	8 143	8 403	8 663	8 923
28	8 173	8 443	8 713	8 983	9 253
29	8 463	8 743	9 023	9 303	9 583
30	8 753	9 043	9 333	9 623	9 913
31	9 043	9 343	9 643	9 943	10 243
32	9 333	9 643	9 953	10 263	10 573
33	9 623	9 943	10 263	10 583	10 903
34	9 913	10 243	10 573	10 903	11 233
35	10 203	10 543	10 883	11 223	11 563
36	10 493	10 843	11 193	11 543	11 893
37	10 783	11 143	11 503	11 863	12 223
38	11 073	11 443	11 813	12 183	12 553
39	11 363	11 743	12 123	12 503	12 883
40	11 653	12 043	12 433	12 823	13 213



Structural width between the verge boards

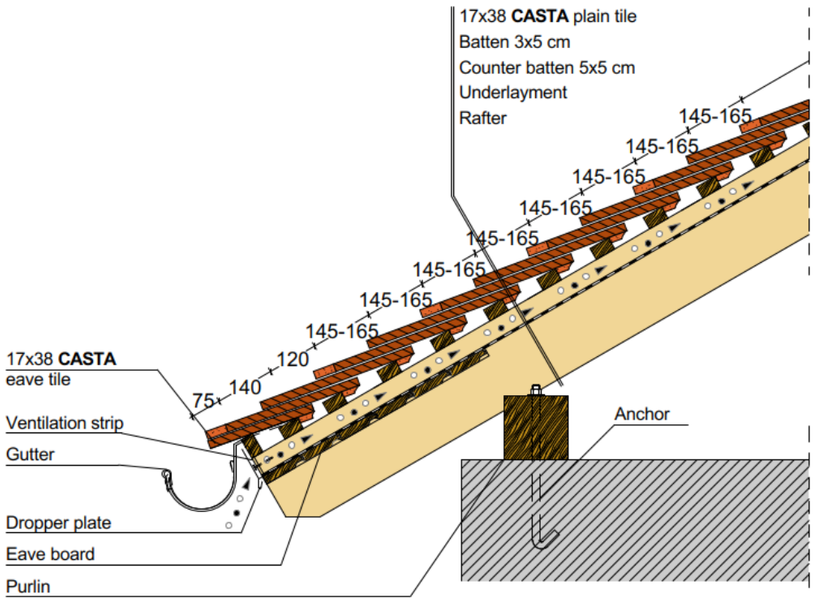
	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
0	-	-	170	-	340	255	510	425	680	595
10	1 360	1 615	1 530	1 785	1 700	1 955	1 870	2 125	2 040	2 295
20	3 060	3 315	3 230	3 485	3 400	3 655	3 570	3 825	3 740	3 995
30	4 760	5 015	4 930	5 185	5 100	5 355	5 270	5 525	5 440	5 695
40	6 460	6 715	6 630	6 885	6 800	7 055	6 970	7 225	7 140	7 395
50	8 160	8 415	8 330	8 585	8 500	8 755	8 670	8 925	8 840	9 095
60	9 860	10 115	10 030	10 285	10 200	10 455	10 370	10 625	10 540	10 795
70	11 560	11 815	11 730	11 985	11 900	12 155	12 070	12 325	12 240	12 495
80	13 260	13 515	13 430	13 685	13 600	13 855	13 770	14 025	13 940	14 195
90	14 960	15 215	15 130	15 385	15 300	15 555	15 470	15 725	15 640	15 895
100	16 660	16 915	16 830	17 085	17 000	17 255	17 170	17 425	17 340	17 595

Structural width between the verge boards

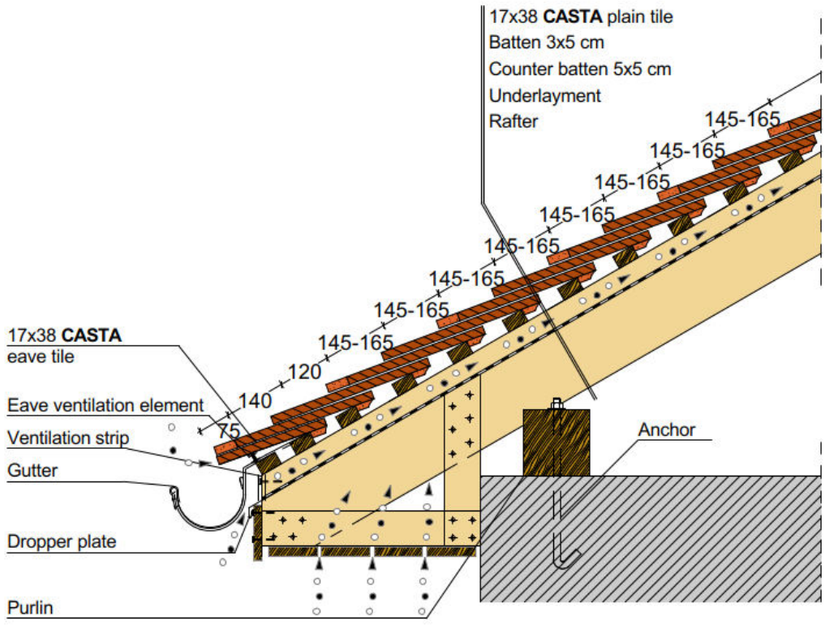
	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	850	935	1 020	1 105	1 190	1 275	1 360	1 445	1 530	1 615
10	2 550	2 635	2 720	2 805	2 890	2 975	3 060	3 145	3 230	3 315
20	4 250	4 335	4 420	4 505	4 590	4 675	4 760	4 845	4 930	5 015
30	5 950	6 035	6 120	6 205	6 290	6 375	6 460	6 545	6 630	6 715
40	7 650	7 735	7 820	7 905	7 990	8 075	8 160	8 245	8 330	8 415
50	9 350	9 435	9 520	9 605	9 690	9 775	9 860	9 945	10 030	10 115
60	11 050	11 135	11 220	11 305	11 390	11 475	11 560	11 645	11 730	11 815
70	12 750	12 835	12 920	13 005	13 090	13 175	13 260	13 345	13 430	13 515
80	14 450	14 535	14 620	14 705	14 790	14 875	14 960	15 045	15 130	15 215
90	16 150	16 235	16 320	16 405	16 490	16 575	16 660	16 745	16 830	16 915
100	17 850	17 935	18 020	18 105	18 190	18 275	18 360	18 445	18 530	18 615

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

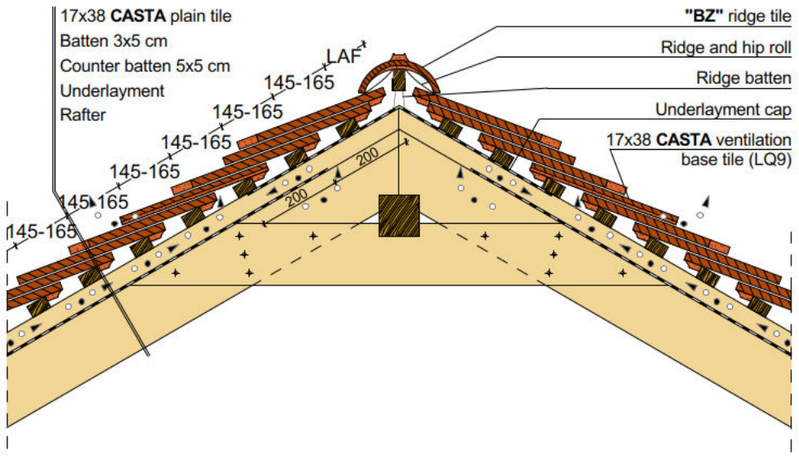
More informations: swissporTON.hu



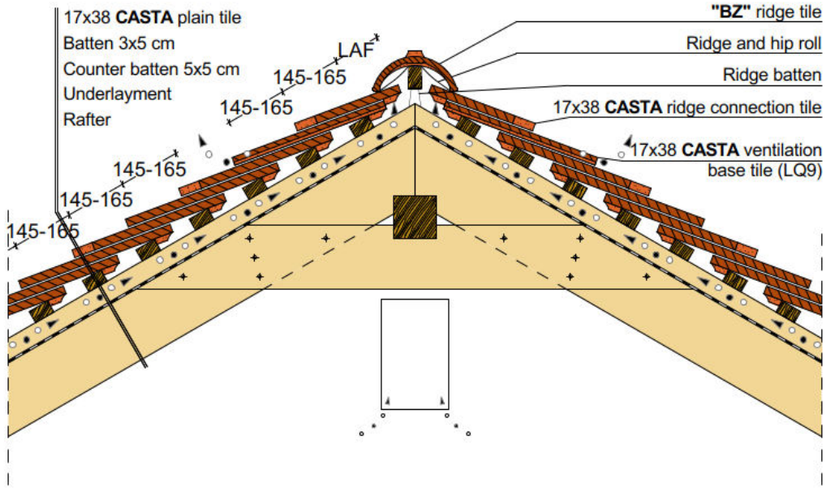
Eave details



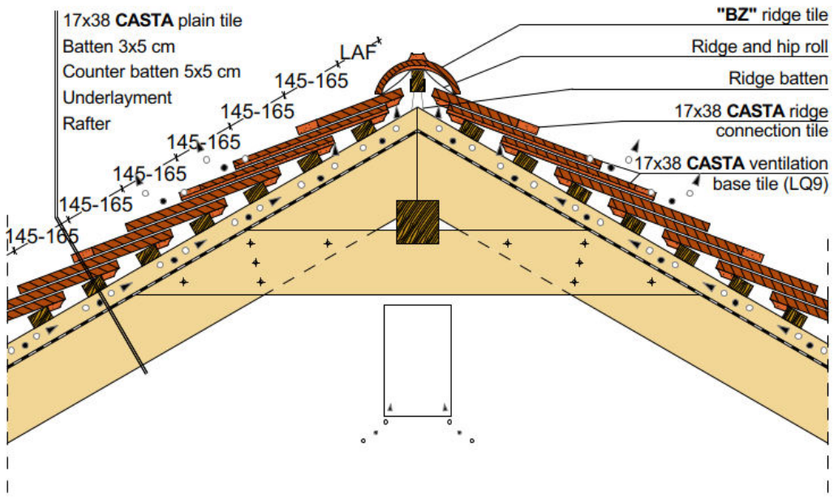
Closed eave detail



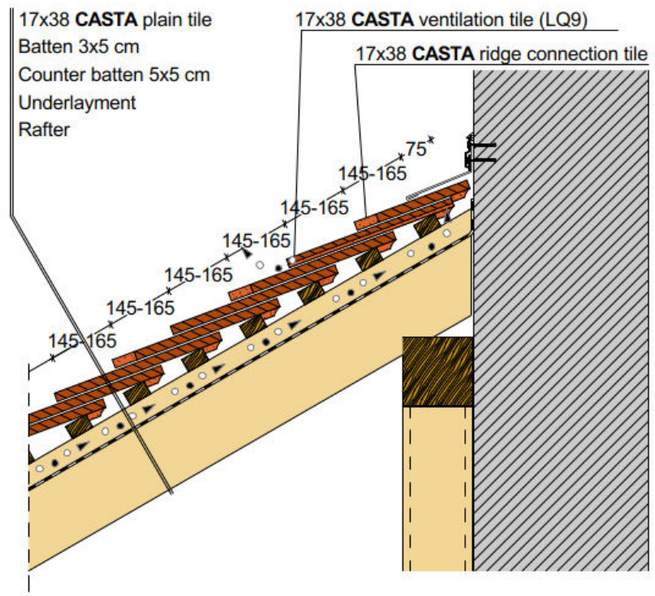
Ridge detail with foil cap



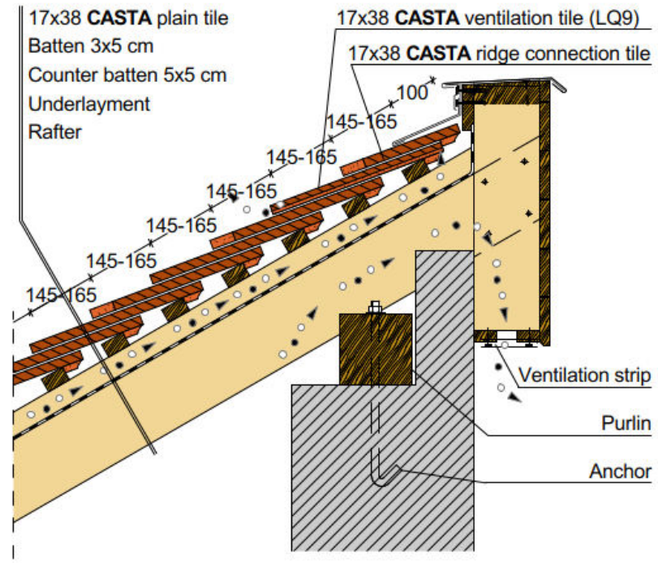
Ridge detail, with ventilation base tiles



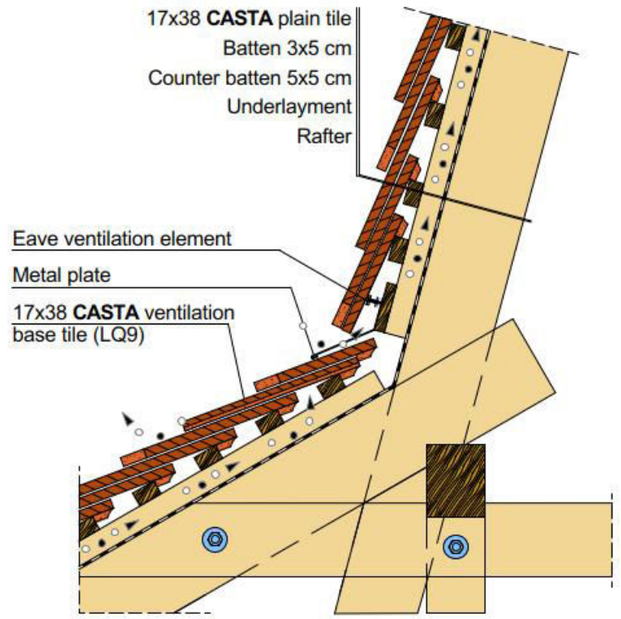
Ridge detail, with ventilation base tiles



Wall edge detail

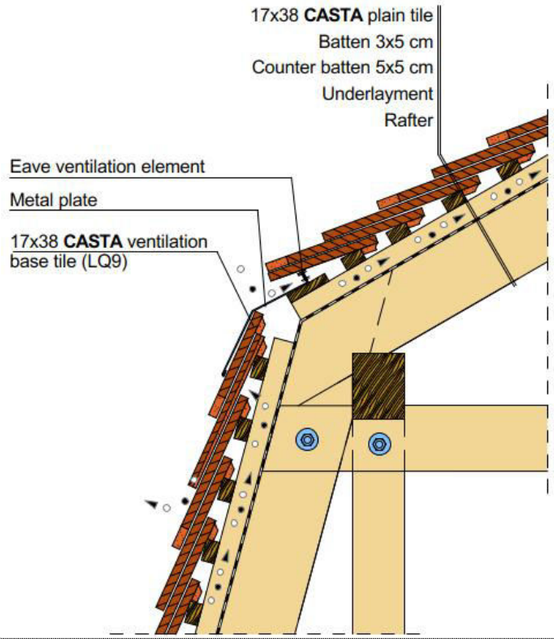


Shed roof ridge detail

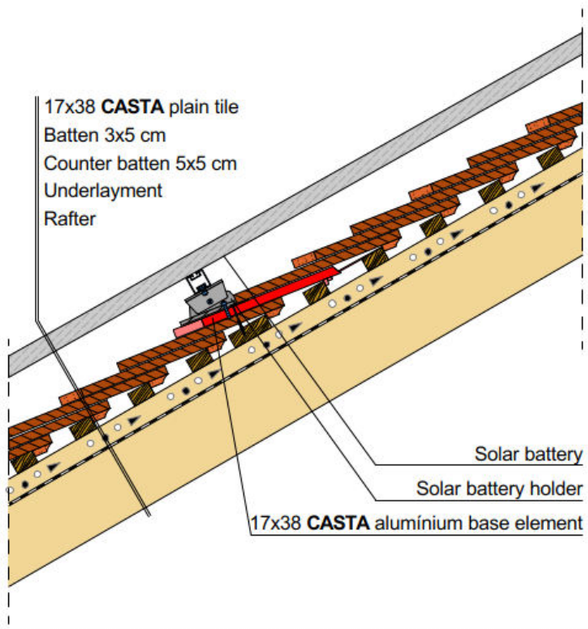


Conkave roof pitch change

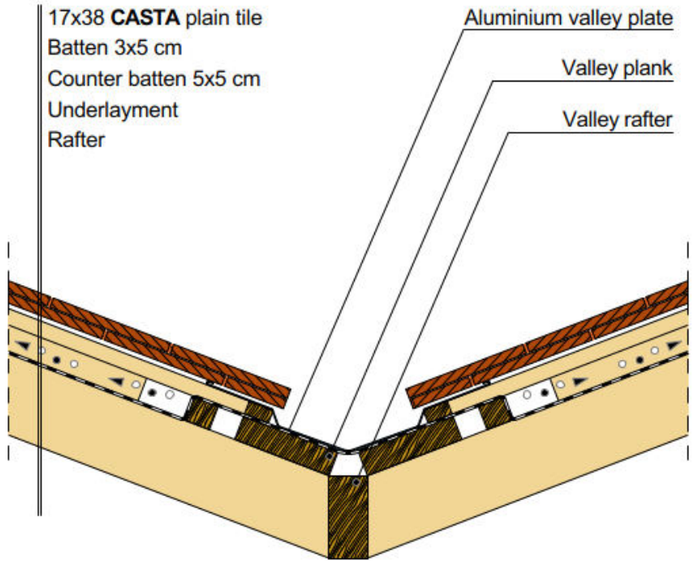
More informations: swissporTON.hu



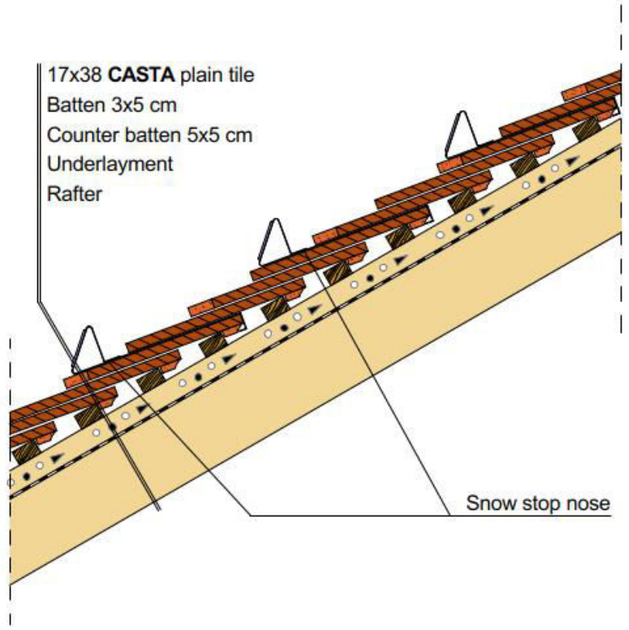
Convex roof pitch change



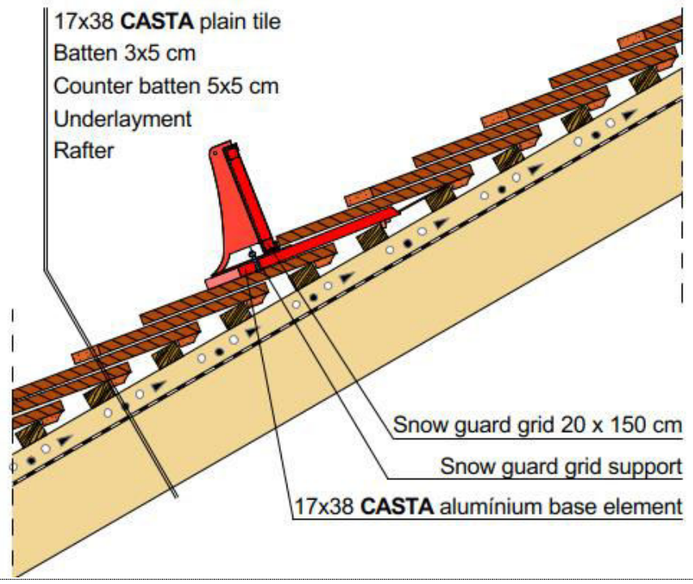
Aluminium solar support detail



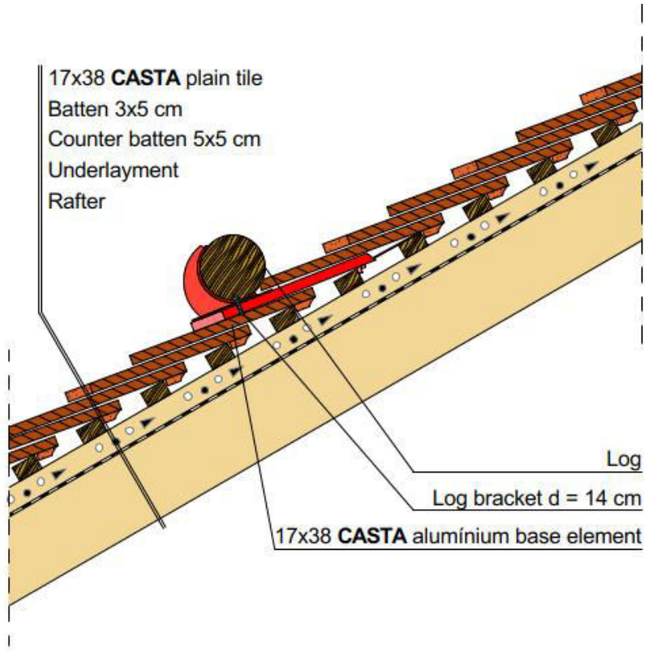
Valley detail



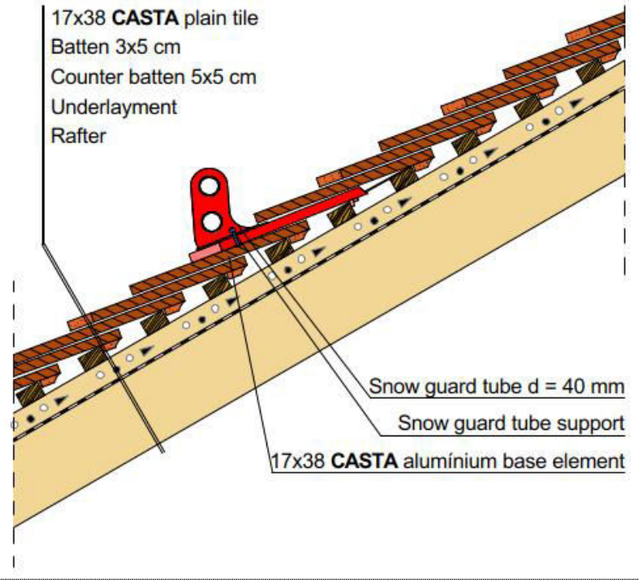
Snow stop nose placement



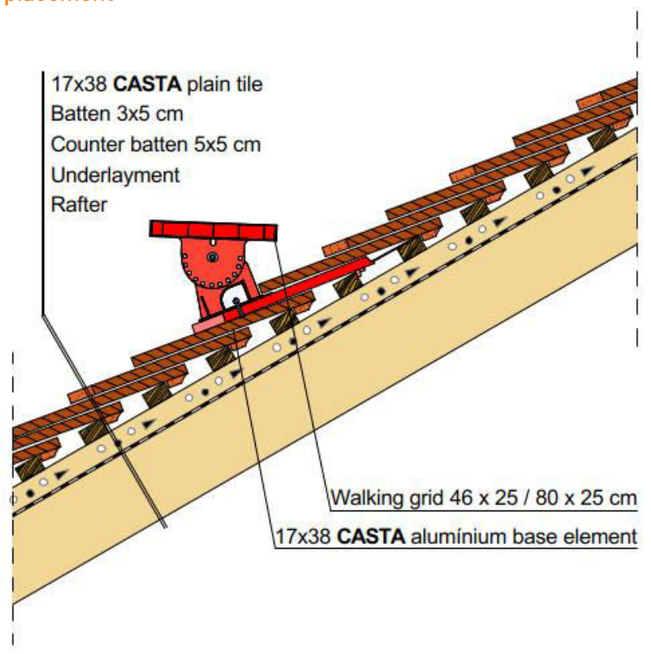
Snow guard grid placement



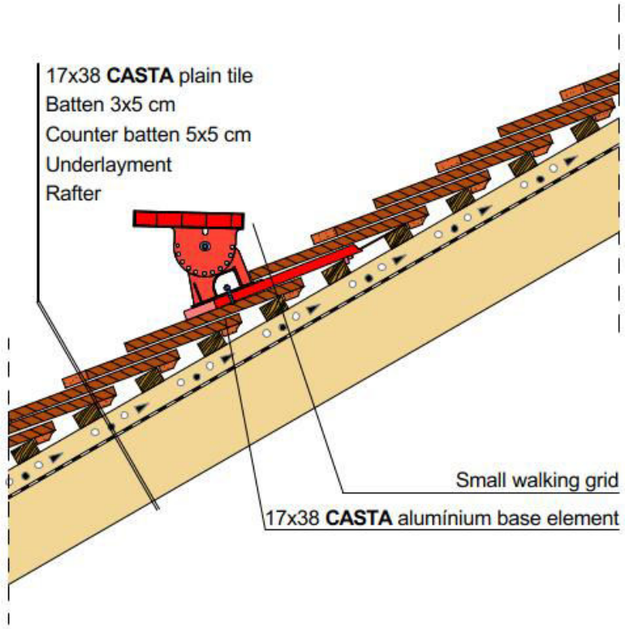
Snow guard log placement



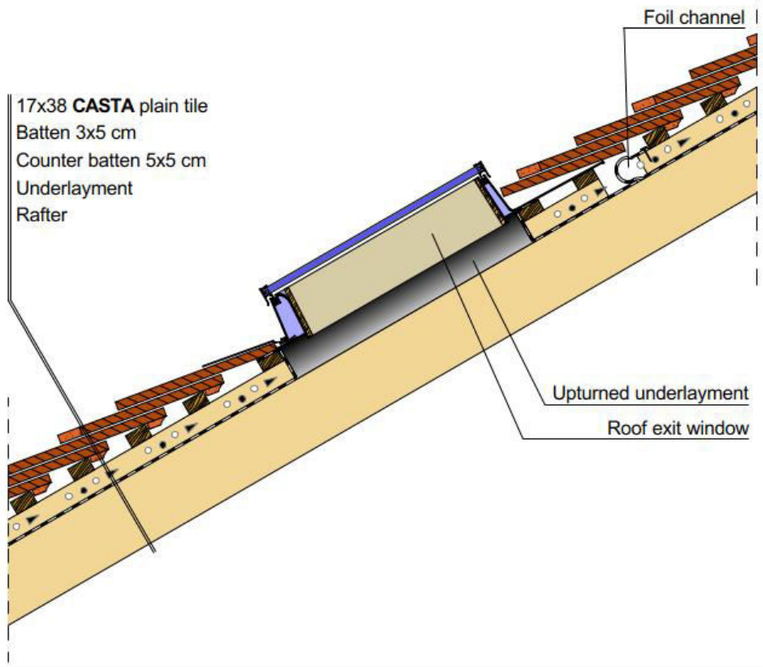
Snow guard tube placement



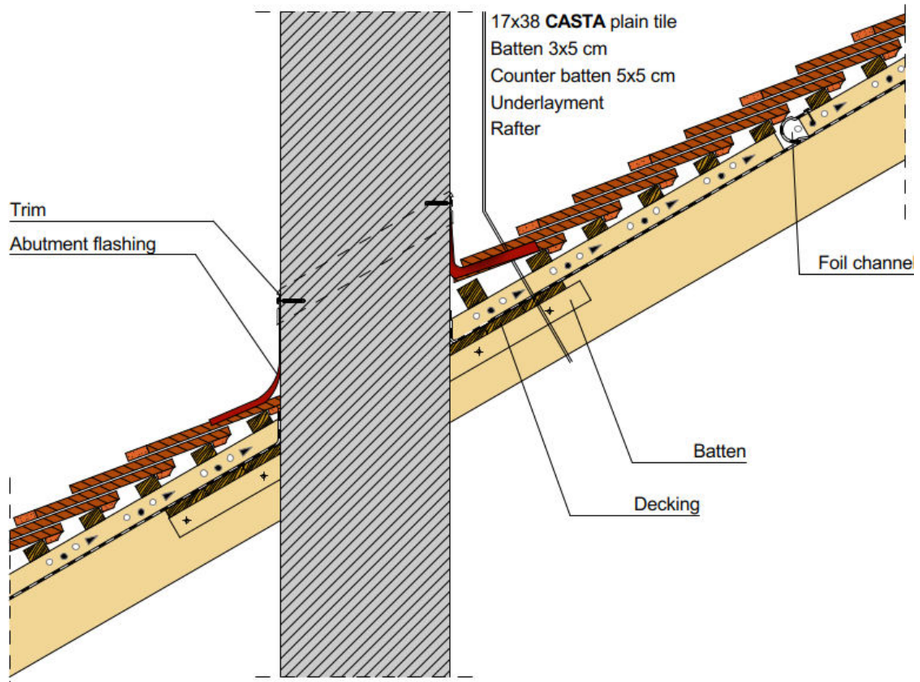
Walking grid placement



Single step placement

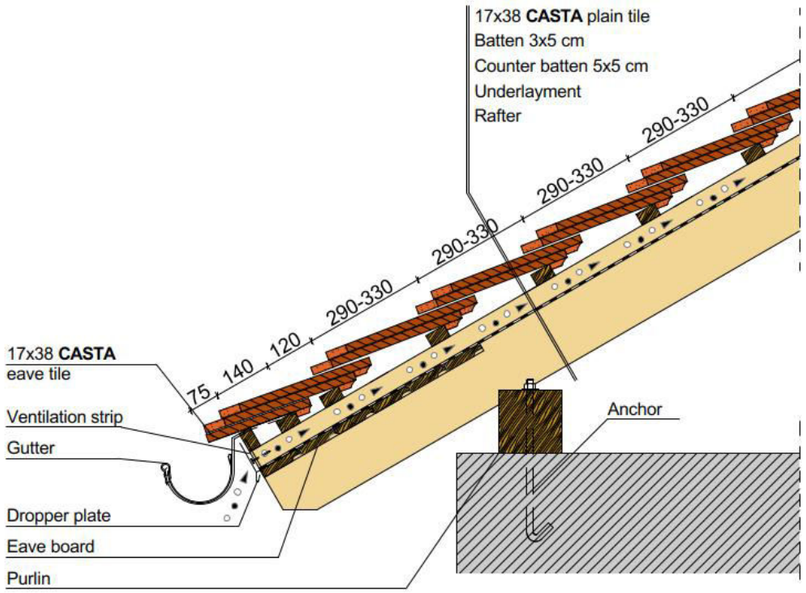


Roof exit window placement

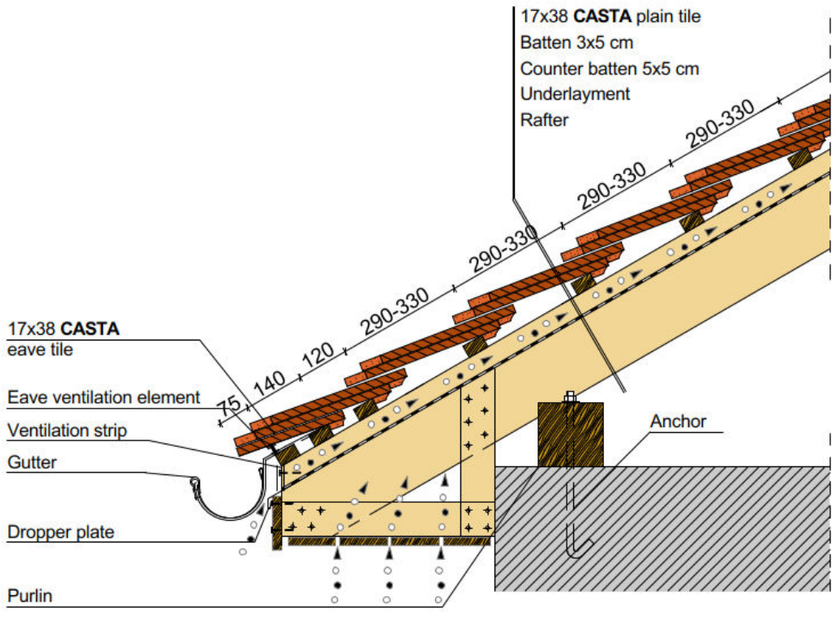


Chimney edge detail

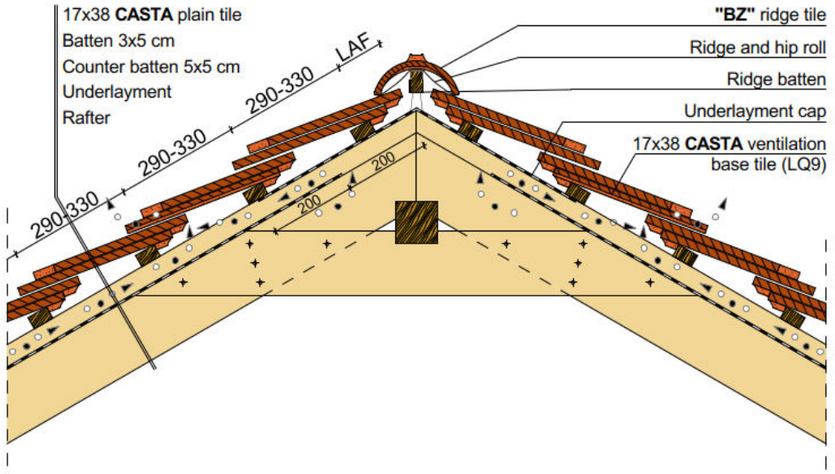
More informations: swissporTON.hu



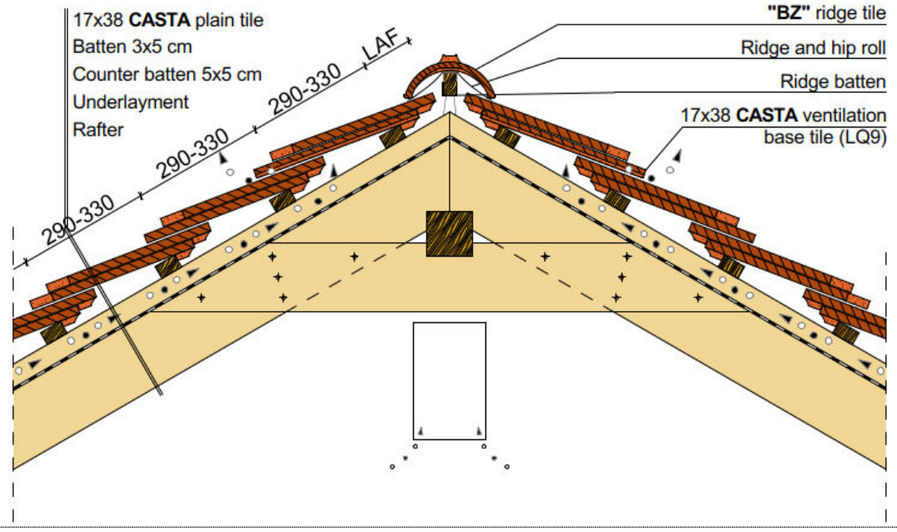
Crown cover - Eave details



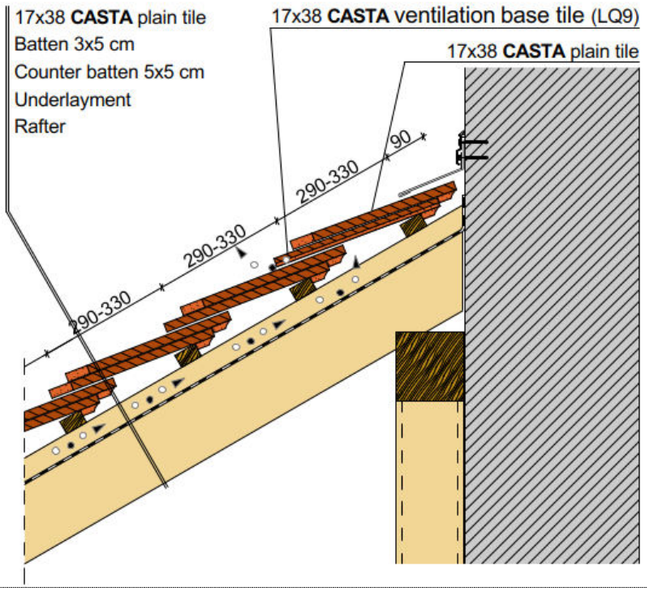
Crown cover - Closed eave detail



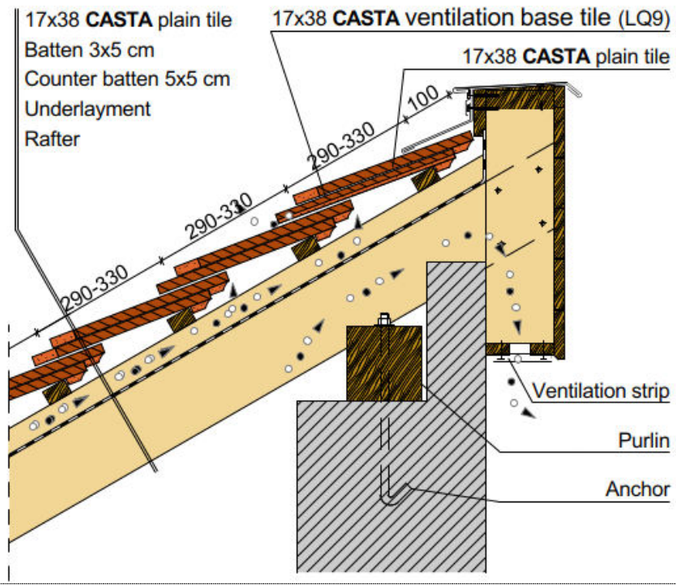
Crown cover - Ridge detail, with ventilation tiles,



Crown cover - Ridge detail, with ventilation base tiles



Crown cover - Wall edge detail



Crown cover - Shed roof ridge detail

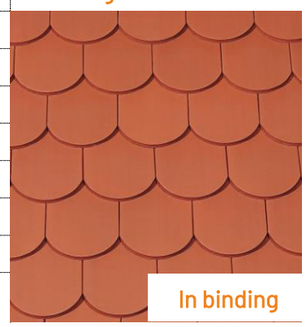
More informations: swissporTON.hu

20x40 cm size plain roof tiles
AUSTRIAN BIBER round cut



Product datas		
Size	width:	200 mm
	length:	400 mm
	height:	28 mm
	thickness:	14 mm
Weight:		2,2 kg
Packaging	pack:	8 pcs
	pallet:	480 pcs
Standard roof pitch:		30°

Covering method



Clay accessories	Size	Quantity
3/4 tile	150x400	5,9 - 6,9 pcs/m
Ridge connection tile	200x280	5 pcs/m
Eave tile	200x280	5 pcs/m
Ventilation tile LQ25	200x400	as required

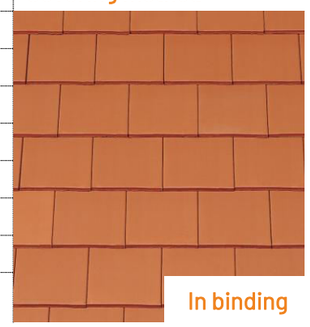
Clay outlets	Package content	Outlet type
Ø110 outlet vent tile with "A" type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room and kitchen ventilation
Ø125 outlet vent tile with "A" type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room and kitchen ventilation
Ø150 outlet vent tile	outlet tile, underlay connection bush	room ventilation kitchen ventilation
Ø200 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 tube outlet tile Ø 70 mm	outlet tile, underlay connection bush	solar and photovoltaic cables
Flue gas outlet tile Ø 110 mm and Ø 125 mm	outlet tile, underlay connection bush	flue pipe of the condensation boilers

20x40 cm size plain roof tiles
AUSTRIAN BIBER, Vienna bag cut



Product datas		
Size	width:	200 mm
	length:	400 mm
	height:	28 mm
	thickness:	14 mm
Weight:		2,3 kg
Packaging	pack:	8 pcs
	pallet:	480 pcs
Standard roof pitch:		30°

Covering method



Clay accessories	Size	Quantity
3/4 tile	150x400	5,9 - 6,9 pcs/m
Ridge connection tile	200x280	5 pcs/m
Eave tile	200x280	5 pcs/m
Ventilation base tile LQ10	200x400	5 pcs/m
Ventilation tile LQ25	200x400	as required

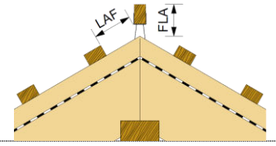
Clay outlets	Package content	Outlet type
Ø110 outlet vent tile with "A" type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room and kitchen ventilation
Ø125 outlet vent tile with "A" type unscrewable cap	outlet tile, underlay connection bush	waste pipe ventilation room and kitchen ventilation
Ø150 outlet vent tile	outlet tile, underlay connection bush	room ventilation kitchen ventilation
Ø200 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 tube outlet tile Ø 70 mm	outlet tile, underlay connection bush	solar and photovoltaic cables
Flue gas outlet tile Ø 110 mm and Ø 125 mm	outlet tile, underlay connection bush	flue pipe of the condensation boilers

20x40 cm size plain roof tiles

Technical specification of the roof cover the 20x40 cm size plain roof tiles

The pitch of the roof:	**< 35°**	**35° - 40°**	**40° - 45°**	**45° - 60°**	**60° <**
Covering width	200 mm	200 mm	200 mm	200 mm	200 mm
Batten distance(for double cover)	155 mm	160 mm	165 mm	170 mm	175 mm
Batten distance(for crown cover)	310 mm	320 mm	330 mm	340 mm	350 mm
Capacity	32,3 pcs/m²	31,3 pcs/m²	30,4 pcs/m²	29,5 pcs/m²	28,6 pcs/m²
Type of the cover	double cover / crown cover				
Covering weight					
Austrian plain tile round cut	71,06 kg/m²	68,86 kg/m²	66,88 kg/m²	64,90 kg/m²	62,92 kg/m²
Austrian plain tile vienna bag cut	74,62 kg/m²	72,31 kg/m²	70,23 kg/m²	68,15 kg/m²	66,07 kg/m²

Rafter distance	Batten dimensions	
	Double cover	Crown cover
below 70 cm	30 x 50 mm	30 x 50 mm
70 – 80 cm	30 x 50 mm	40 x 60 mm
80 – 90 cm	30 x 50 mm	individually sized
90 - 100 cm	40 x 60 mm	individually sized



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

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

LAF értékei a batten and a tetőRoof pitch függvényében

Roof pitch	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°
LH ridge tile and 30x50 batten											
LAF [mm]	✘	✘	90	85	80	75	75	75	75	80	✘
LH ridge tile and 40x60 batten											
LAF [mm]	✘	✘	85	80	75	70	70	65	60	65	✘
LH ridge tile and 50x50 batten											
LAF [mm]	✘	✘	80	75	70	60	60	55	50	55	✘

Fixing products

Name	Material	Application field
Mount-on stormclip 30x50 mm batten	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the genereal roof surface .
Mount-on stormclip 40x60 mm batten	zinc-aluminium	
Mount-on stormclip For crown cover 12-14 mm	stainless-steel	
Mount-on stormclip For crown cover 14-16 mm	stainless-steel	
Fixing screw with EPDM sealing, 50 mm length	stainless-steel	Fixing against loosed tiles along the edges and some cases in the average roof surfaces .
Clip with wire, 7-22 mm	stainless-steel	Fixing cutted tiles along the hips and valleys

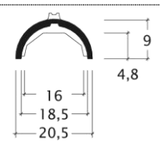
20x40 cm size plain roof tiles

"LH" ridge tile 3,0 pcs/lm



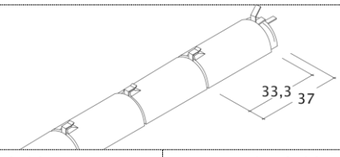
Closing plate





Hip starter





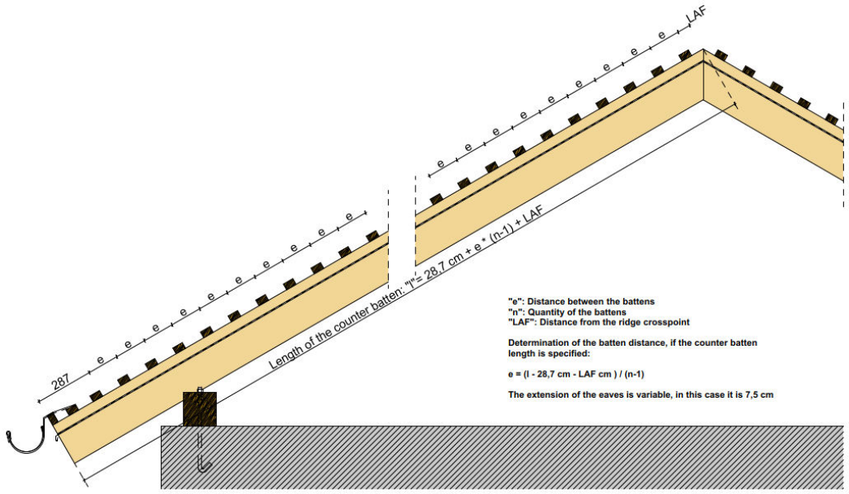
3 axis hip cap



4 axis hip cap

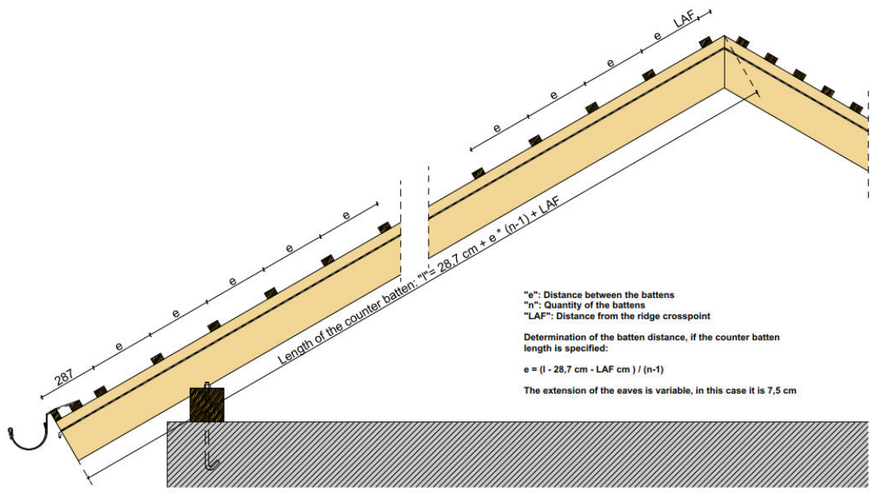


More informations: swissporTON.hu



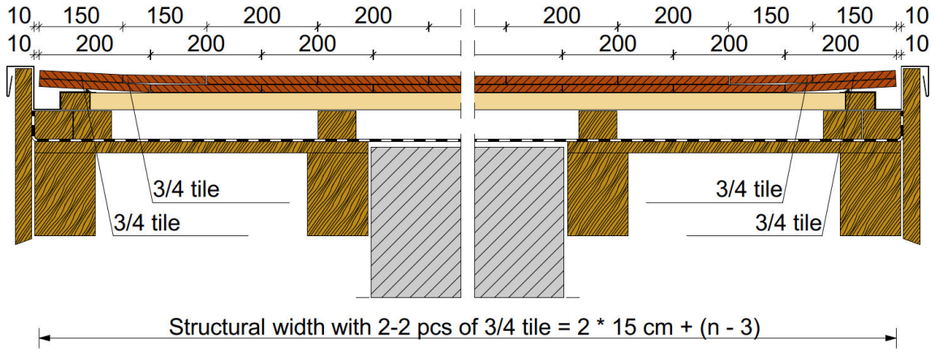
Roof batten alignement for 20x40 cm size, double covered plain roof tiles

Specification:	7,5 cm eave overhang and 30° roof pitch „LH" ridge tile and 30x50 mm roof battens, LAF = 80 mm				
Number of battens(n)	**155 mm**	**160 mm**	**165 mm**	**170 mm**	**175 mm**
10	1 762	1 807	1 852	1 897	1 942
11	1 917	1 967	2 017	2 067	2 117
12	2 072	2 127	2 182	2 237	2 292
13	2 227	2 287	2 347	2 407	2 467
14	2 382	2 447	2 512	2 577	2 642
15	2 537	2 607	2 677	2 747	2 817
16	2 692	2 767	2 842	2 917	2 992
17	2 847	2 927	3 007	3 087	3 167
18	3 002	3 087	3 172	3 257	3 342
19	3 157	3 247	3 337	3 427	3 517
20	3 312	3 407	3 502	3 597	3 692
21	3 467	3 567	3 667	3 767	3 867
22	3 622	3 727	3 832	3 937	4 042
23	3 777	3 887	3 997	4 107	4 217
24	3 932	4 047	4 162	4 277	4 392
25	4 087	4 207	4 327	4 447	4 567
26	4 242	4 367	4 492	4 617	4 742
27	4 397	4 527	4 657	4 787	4 917
28	4 552	4 687	4 822	4 957	5 092
29	4 707	4 847	4 987	5 127	5 267
30	4 862	5 007	5 152	5 297	5 442
31	5 017	5 167	5 317	5 467	5 617
32	5 172	5 327	5 482	5 637	5 792
33	5 327	5 487	5 647	5 807	5 967
34	5 482	5 647	5 812	5 977	6 142
35	5 637	5 807	5 977	6 147	6 317
36	5 792	5 967	6 142	6 317	6 492
37	5 947	6 127	6 307	6 487	6 667
38	6 102	6 287	6 472	6 657	6 842
39	6 257	6 447	6 637	6 827	7 017
40	6 412	6 607	6 802	6 997	7 192



Roof batten alignement for 20x40 cm size, crown covered plain roof tiles

Specification:	7,5 cm eave overhang and 30° roof pitch „LH" ridge tile and 30x50 mm roof battens, LAF = 80 mm				
Number of battens(n)	**310 mm**	**320 mm**	**330 mm**	**340 mm**	**350 mm**
10	3 157	3 247	3 337	3 427	3 517
11	3 467	3 567	3 667	3 767	3 867
12	3 777	3 887	3 997	4 107	4 217
13	4 087	4 207	4 327	4 447	4 567
14	4 397	4 527	4 657	4 787	4 917
15	4 707	4 847	4 987	5 127	5 267
16	5 017	5 167	5 317	5 467	5 617
17	5 327	5 487	5 647	5 807	5 967
18	5 637	5 807	5 977	6 147	6 317
19	5 947	6 127	6 307	6 487	6 667
20	6 257	6 447	6 637	6 827	7 017
21	6 567	6 767	6 967	7 167	7 367
22	6 877	7 087	7 297	7 507	7 717
23	7 187	7 407	7 627	7 847	8 067
24	7 497	7 727	7 957	8 187	8 417
25	7 807	8 047	8 287	8 527	8 767
26	8 117	8 367	8 617	8 867	9 117
27	8 427	8 687	8 947	9 207	9 467
28	8 737	9 007	9 277	9 547	9 817
29	9 047	9 327	9 607	9 887	10 167
30	9 357	9 647	9 937	10 227	10 517
31	9 667	9 967	10 267	10 567	10 867
32	9 977	10 287	10 597	10 907	11 217
33	10 287	10 607	10 927	11 247	11 567
34	10 597	10 927	11 257	11 587	11 917
35	10 907	11 247	11 587	11 927	12 267
36	11 217	11 567	11 917	12 267	12 617
37	11 527	11 887	12 247	12 607	12 967
38	11 837	12 207	12 577	12 947	13 317
39	12 147	12 527	12 907	13 287	13 667
40	12 457	12 847	13 237	13 627	14 017



Structural width between the verge boards

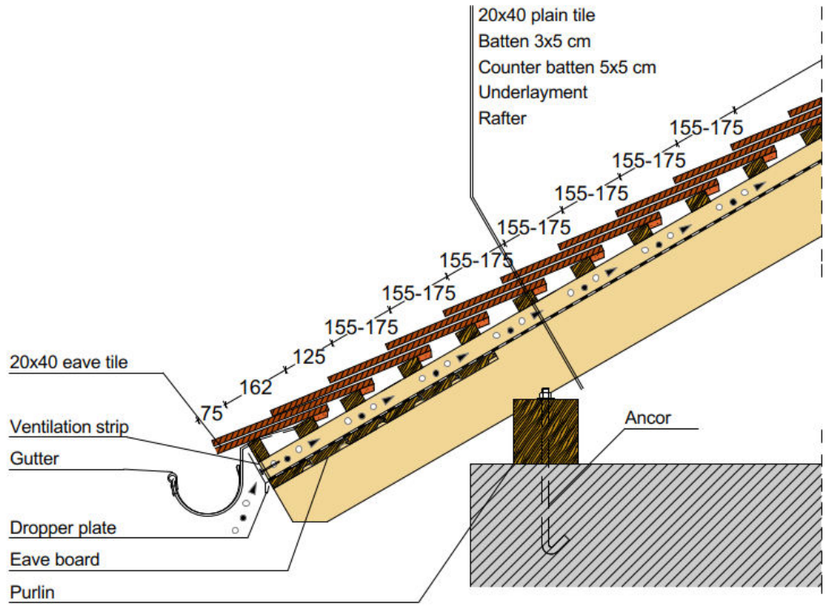
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0	-	100	200	300	400	500	600	700	800	900
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20	4 000	4 100	4 200	4 300	4 400	4 500	4 600	4 700	4 800	4 900
30	6 000	6 100	6 200	6 300	6 400	6 500	6 600	6 700	6 800	6 900
40	8 000	8 100	8 200	8 300	8 400	8 500	8 600	8 700	8 800	8 900
50	10 000	10 100	10 200	10 300	10 400	10 500	10 600	10 700	10 800	10 900
60	12 000	12 100	12 200	12 300	12 400	12 500	12 600	12 700	12 800	12 900
70	14 000	14 100	14 200	14 300	14 400	14 500	14 600	14 700	14 800	14 900
80	16 000	16 100	16 200	16 300	16 400	16 500	16 600	16 700	16 800	16 900
90	18 000	18 100	18 200	18 300	18 400	18 500	18 600	18 700	18 800	18 900
100	20 000	20 100	20 200	20 300	20 400	20 500	20 600	20 700	20 800	20 900

Structural width between the verge boards

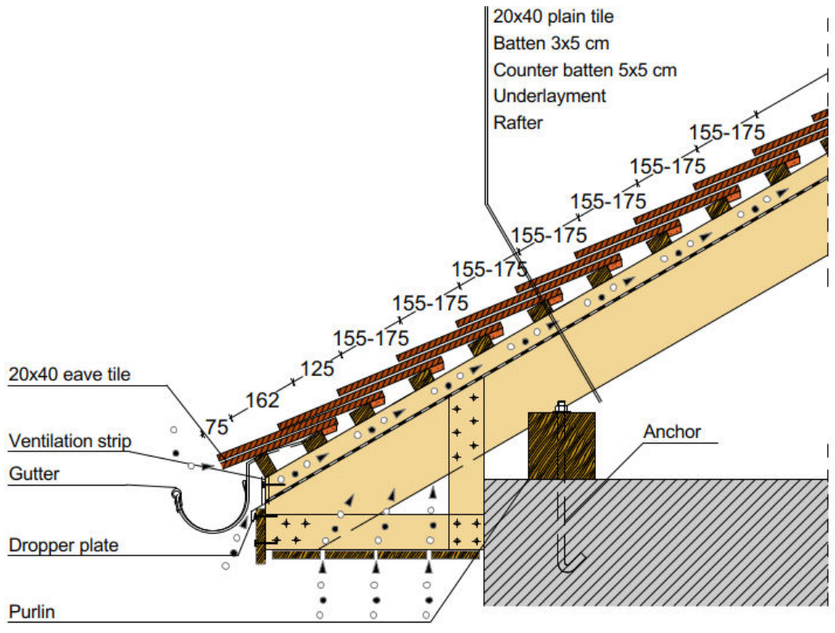
	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	1 000	1 100	1 200	1 300	1 400	1 500	1 600	1 700	1 800	1 900
10	3 000	3 100	3 200	3 300	3 400	3 500	3 600	3 700	3 800	3 900
20	5 000	5 100	5 200	5 300	5 400	5 500	5 600	5 700	5 800	5 900
30	7 000	7 100	7 200	7 300	7 400	7 500	7 600	7 700	7 800	7 900
40	9 000	9 100	9 200	9 300	9 400	9 500	9 600	9 700	9 800	9 900
50	11 000	11 100	11 200	11 300	11 400	11 500	11 600	11 700	11 800	11 900
60	13 000	13 100	13 200	13 300	13 400	13 500	13 600	13 700	13 800	13 900
70	15 000	15 100	15 200	15 300	15 400	15 500	15 600	15 700	15 800	15 900
80	17 000	17 100	17 200	17 300	17 400	17 500	17 600	17 700	17 800	17 900
90	19 000	19 100	19 200	19 300	19 400	19 500	19 600	19 700	19 800	19 900
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The structural widths below are calculated with 1-1 cm gap between the side plate of the verge tiles and the verge board.

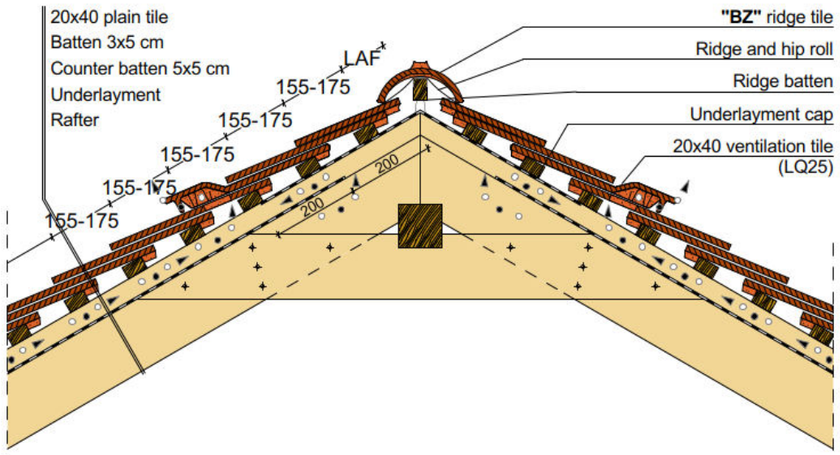
More informations: swissporTON.hu



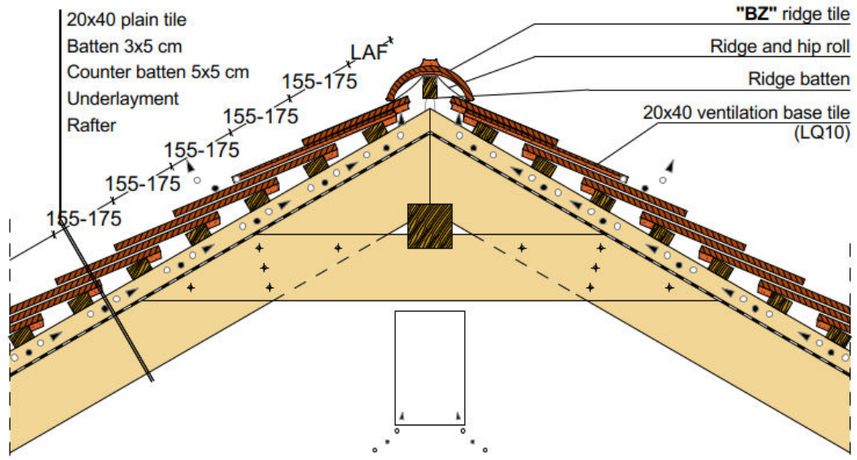
Eave details



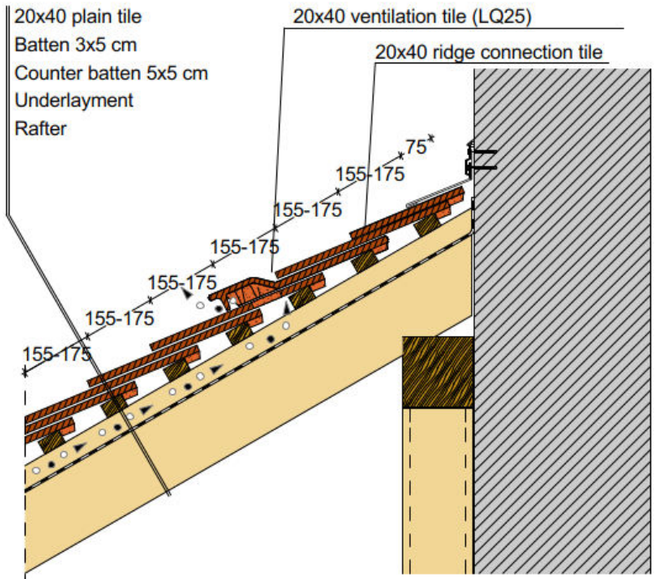
Closed eave detail



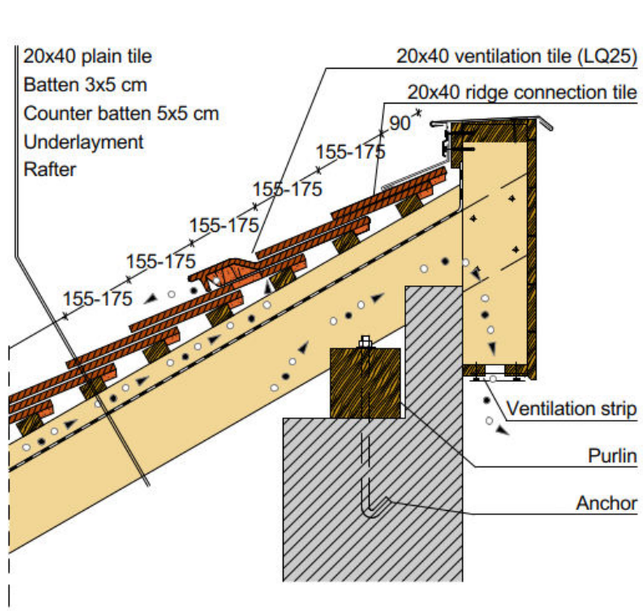
Ridge detail, with ventilation tiles



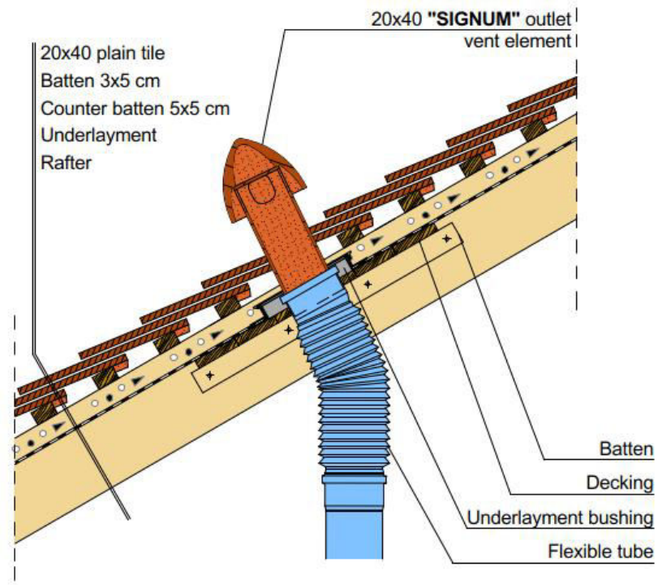
Ridge detail, with ventilation base tiles



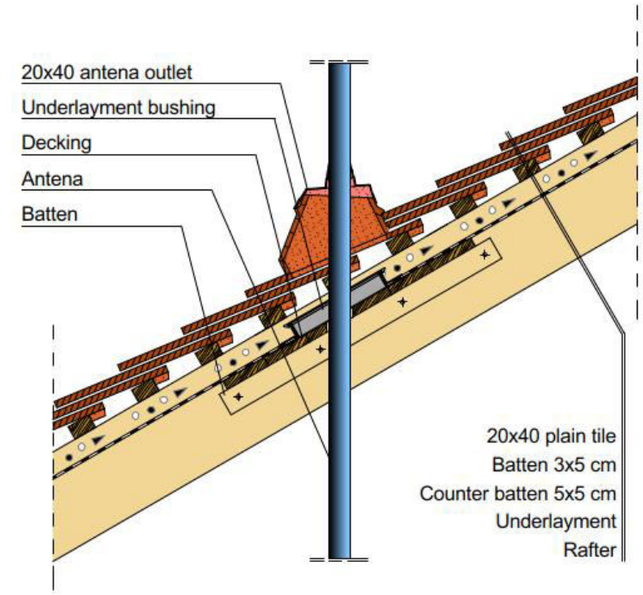
Wall edge detail



Shed roof ridge detail

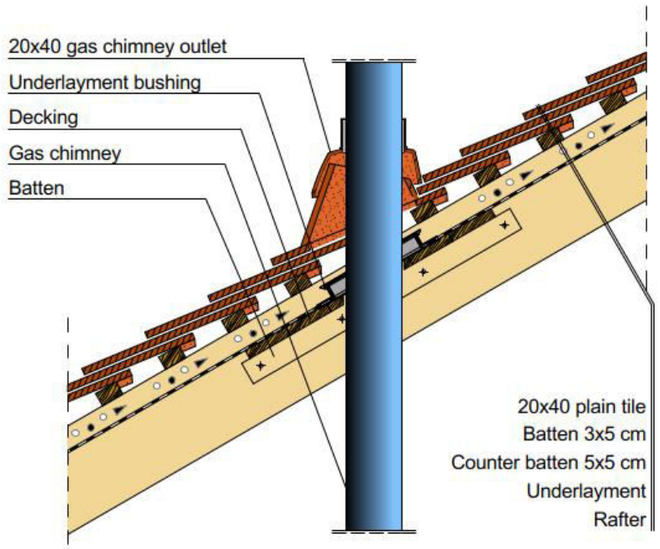


„SIGNUM" clay vent. outlet tile

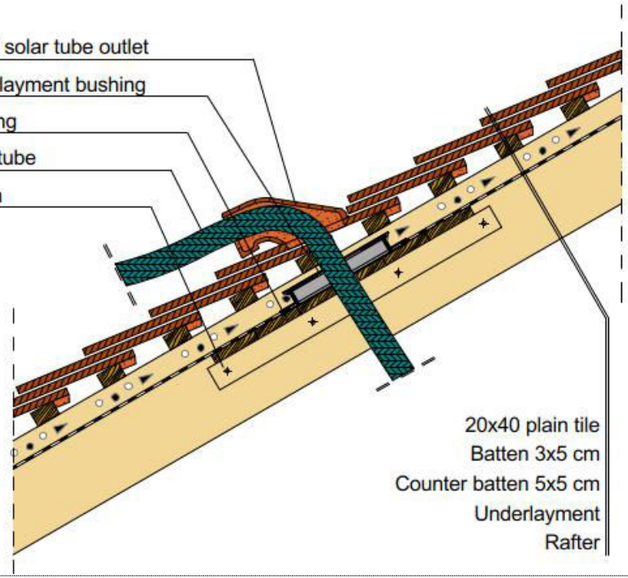


Clay antena outlet tile

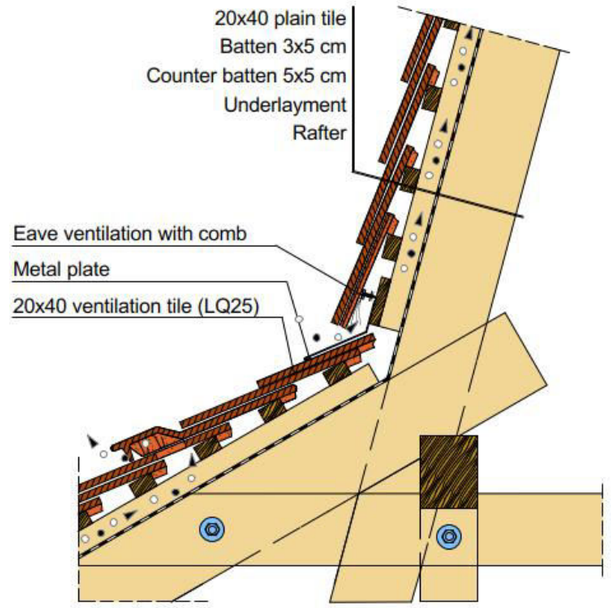
More informations: swissporTON.hu



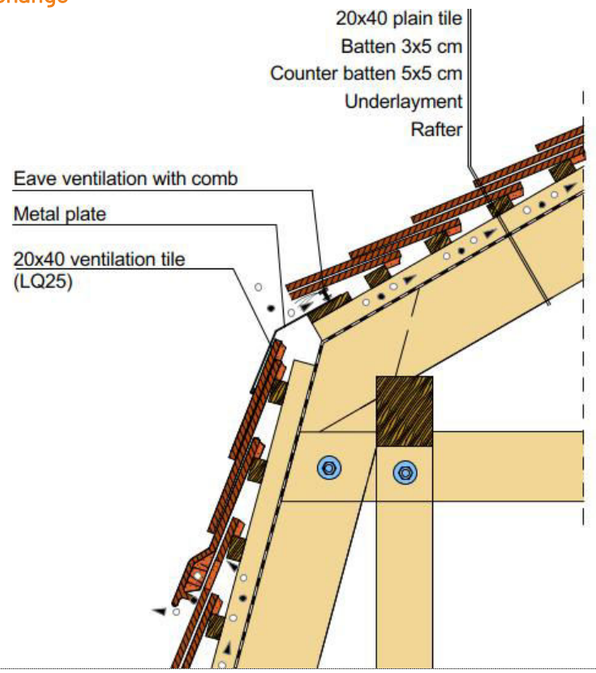
Clay gas chimney outlet detail



Clay solar tube outlet detail

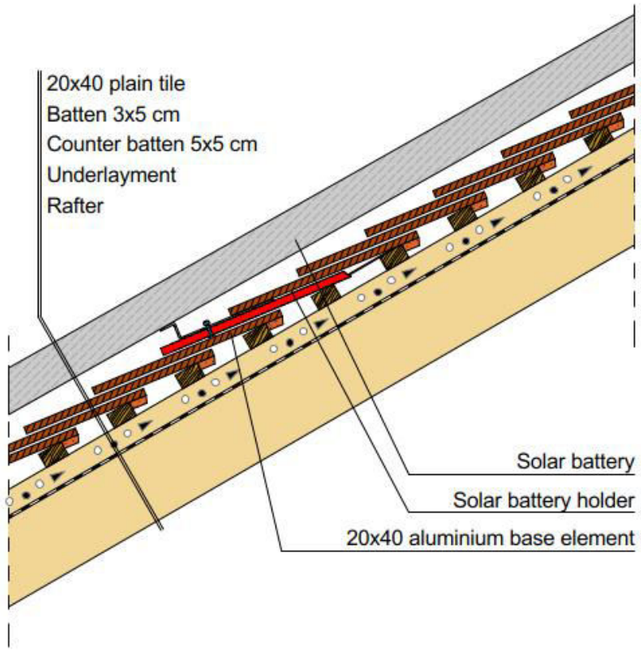


Conkave roof pitch change

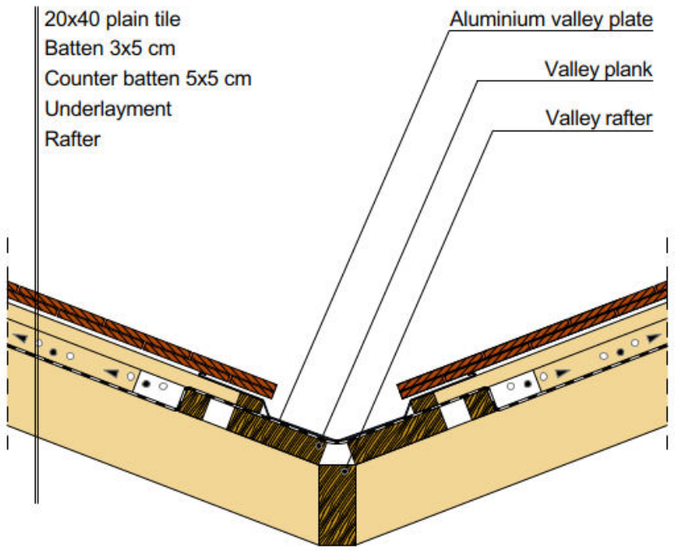


Convex roof pitch change

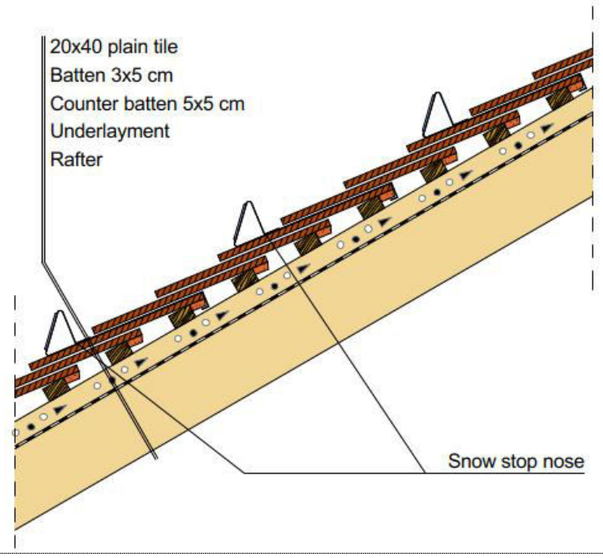
More informations: swissporTON.hu



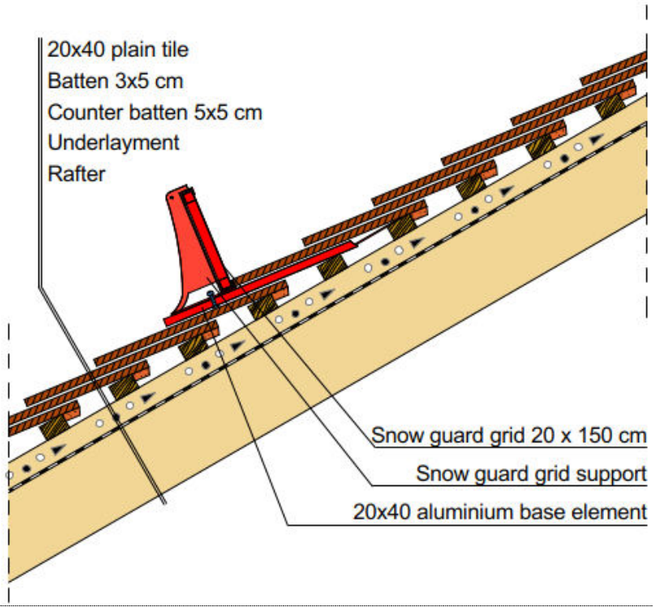
Aluminium solar support detail



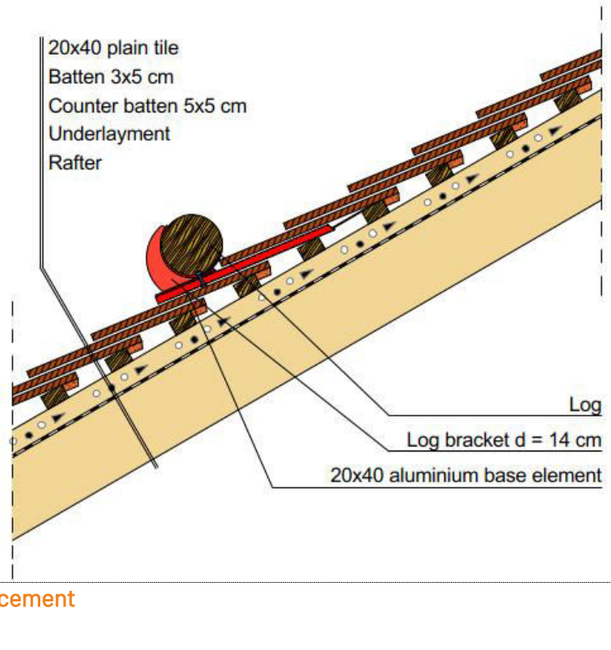
Valley detail



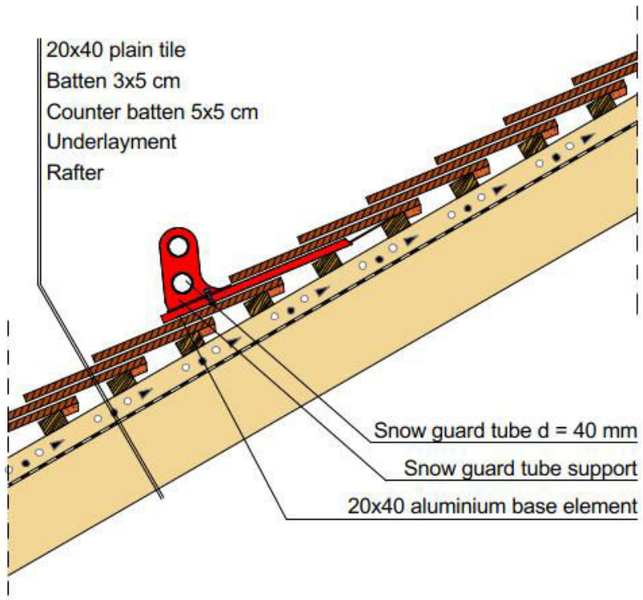
Snow stop nose placement



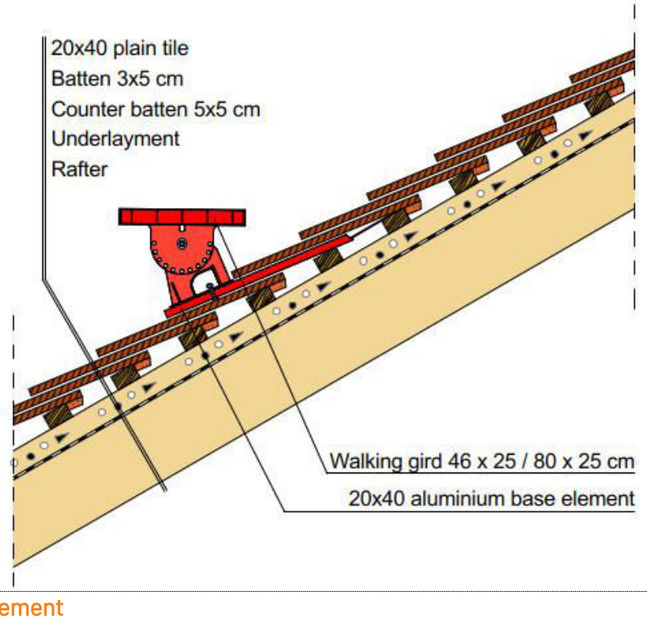
Snow guard grid placement



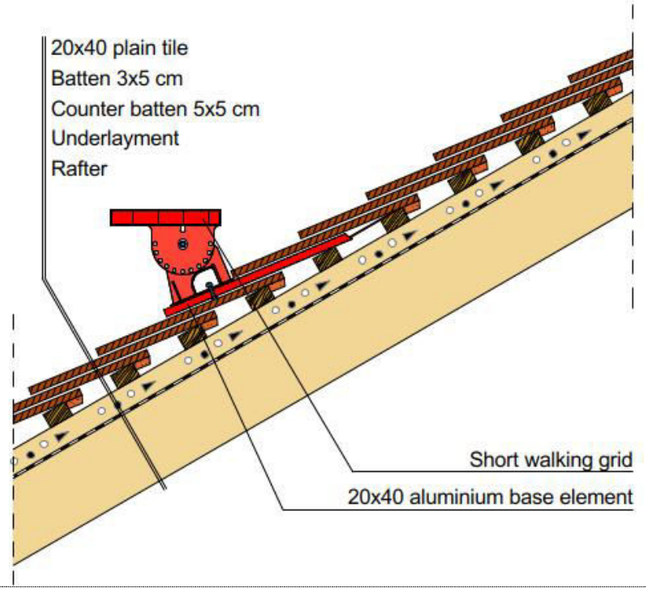
Snow guard log placement



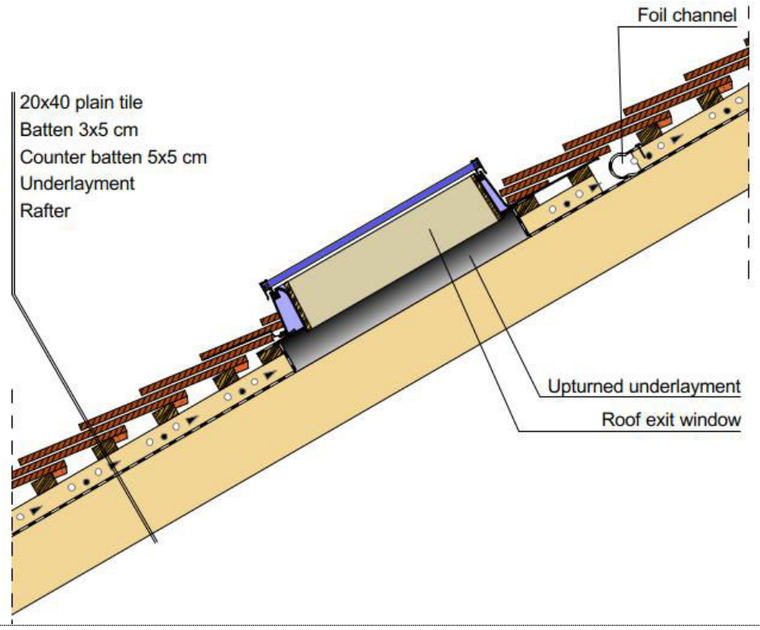
Snow guard tube placement



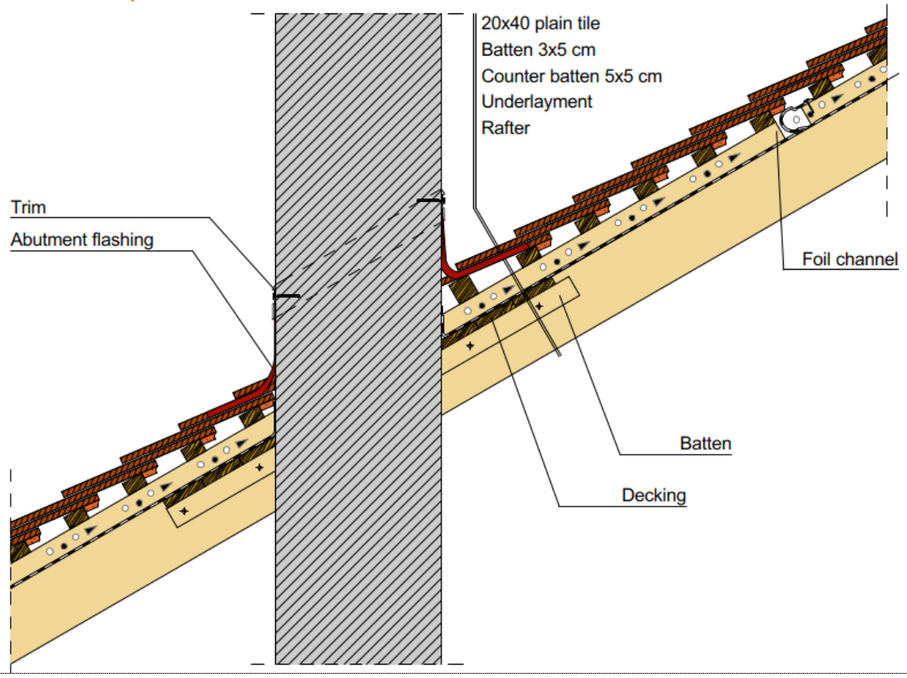
Walking grid placement



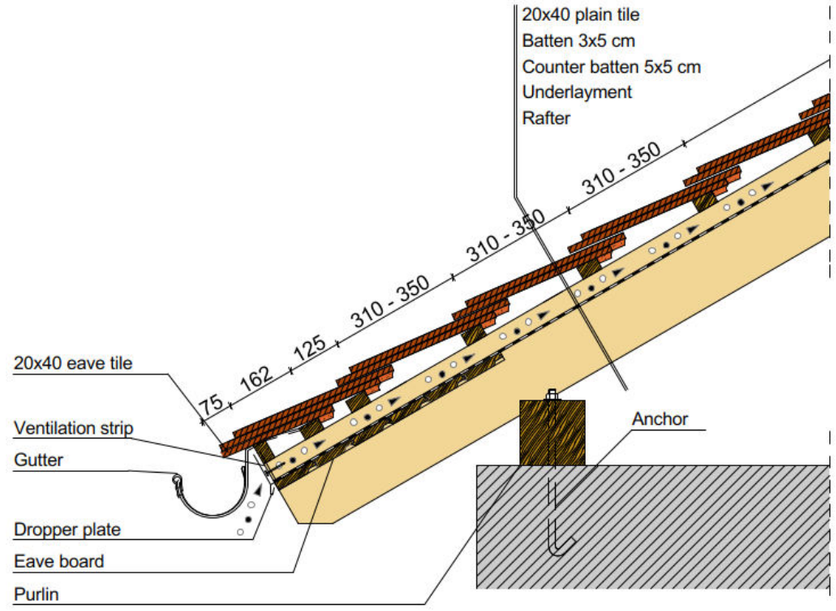
Single step placement



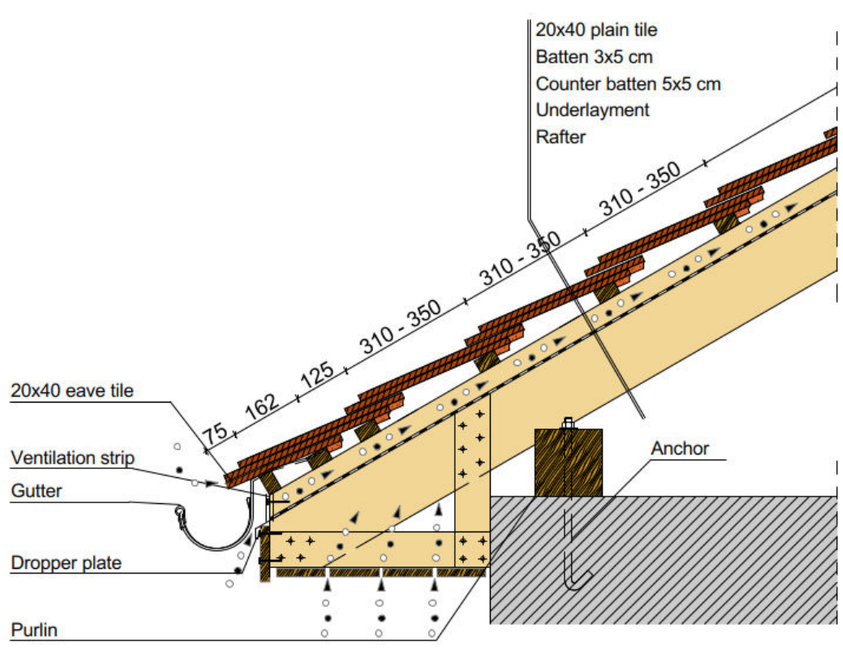
Roof exit window placement



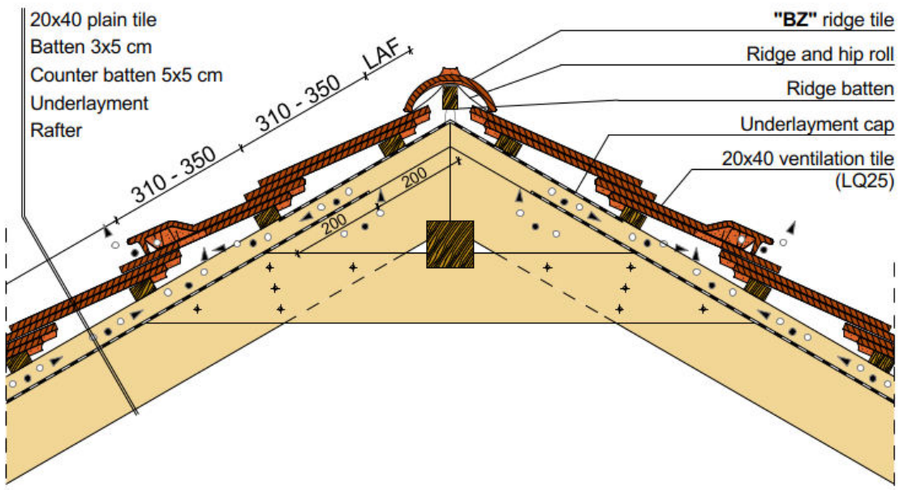
Chimney edge detail



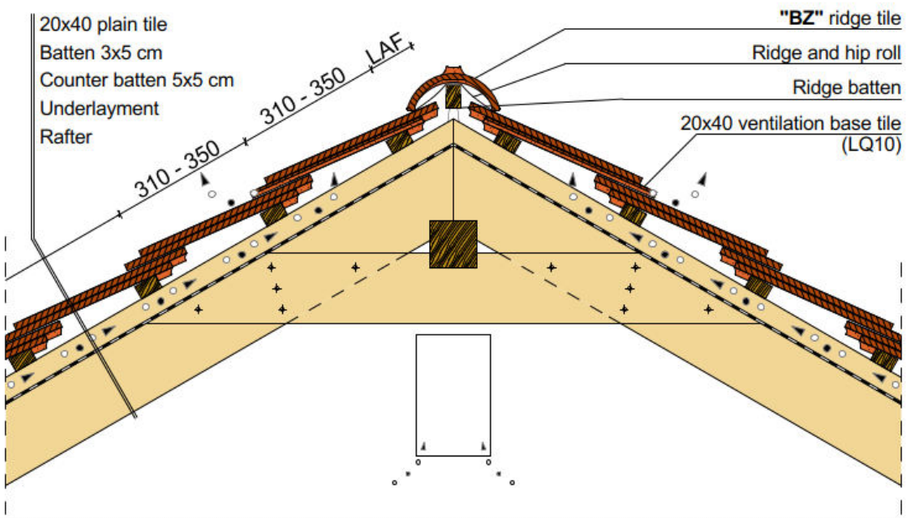
Crown cover - Eave details



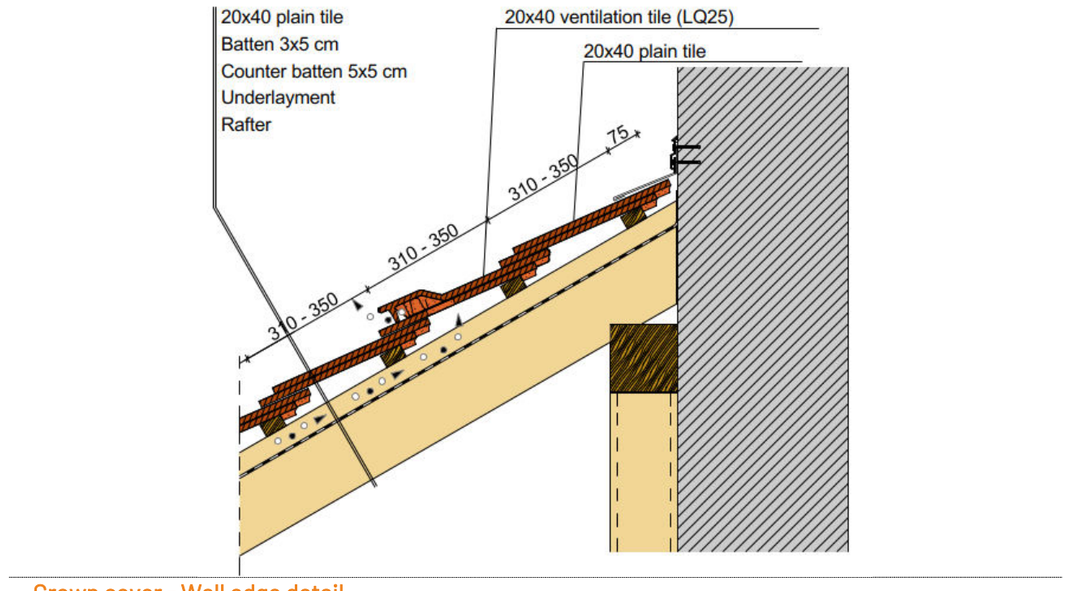
Crown cover - Closed eave detail



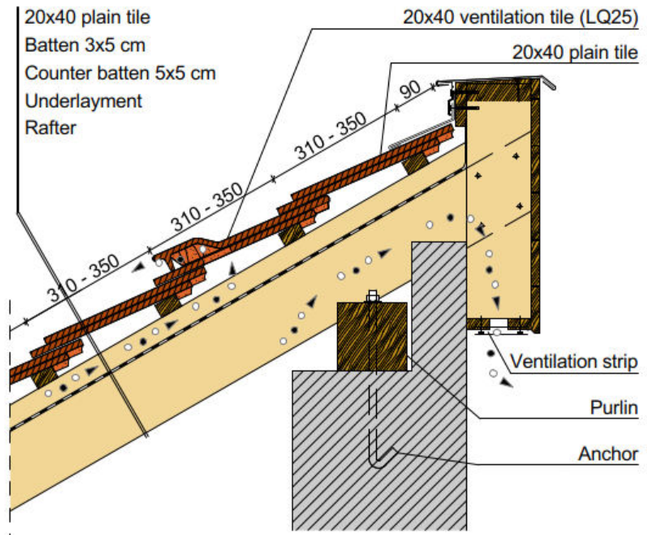
Crown cover - Ridge detail, with ventilation tiles,



Crown cover - Ridge detail, with ventilation base tiles



Crown cover - Wall edge detail



Crown cover - Shed roof ridge detail

Notes

More informations: swissporTON.hu



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