

APPLICATION GUIDE

Concrete roof tiles



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

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

PART I. General rules and informations



I. Standards and regulations

General design and construction rules and regulations for the swissporTON concrete 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 490:1995 Concrete roofing tiles and fittings. Product specifications.

ÉMSZ* Cserépfedések tervezési és kivitelezési szabályai.

ÉMSZ* Bádogos munkák tervezési és kivitelezési szabályai.

ÉMSZ* Alátéthéjazatok tervezési és kivitelezési szabályai.

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

The most important 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. The concrete tile:

1. Main properties of the raw material:

The three main components of concrete tile material are cement, water, and the aggregates.

The binder is cement, which, when exposed to water, first gels and then begins to crystallize (cement hydration), thus forming the cement stone that provides spatial strength. The fine, graded aggregate (sand mixture) ensures that the concrete material is homogeneous and compact, and closes the pores



created during hydration. Thus, the hardened cement-bound concrete will have adequate strength and will also be resistant to freezing in the long term.

The history of cement and concrete dates back to ancient times. The ancient Romans already used so-called Roman cement, the main ingredient of which was ground tuff of volcanic origin. Today, this has been replaced by "Portland cement", the main ingredients of which are clinker (heated lime) and gypsum. The concrete made from this is now one of the most common building materials, strong and easy to shape.

2. Colors and coatings:

2.1. "Planar" surface

The matte "Planar" surface provides natural protection against the elements. The "Planar" concrete tile is more resistant to aging and color fading, as well as temperature changes. The increased surface smoothness promotes unhindered drainage of rainwater and makes the concrete tile resistant to water penetration.

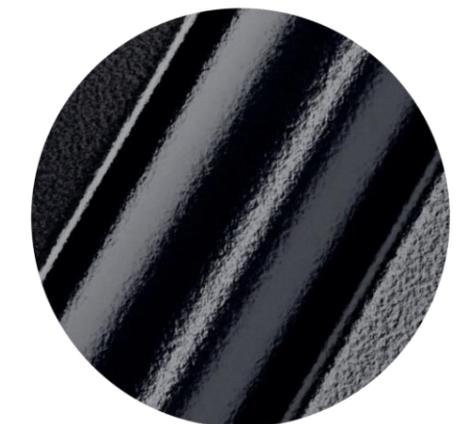
The "Planar" surface makes it more difficult for dirt and moss to settle and adhere, improving the aesthetic quality of the roof. The intense, fashionable colors and the matte surface emphasize the modern character of the roof tiles.



2.2. "Duratop Pro" surface

The glossy "Duratop Pro" surface stands out with its unique aesthetics. It gives the concrete tile a unique and durable appearance and makes it a higher quality product. It has hydrophobic properties, thanks to which water droplets roll off the surface. It protects it from dirt sticking and accumulating. Rain does not leave streaks on the tile, but also cleans it naturally.

The surface of "Duratop Pro" is exceptionally smooth, so dust, moss and other dirt can be easily removed. Roof tiles with a "Duratop Pro" coating retain their excellent appearance for a long time.



3. Manufacturing technology:

The production process begins with carefully selected and graded raw materials. The various raw materials (cement, graded sand mix and water) are fed into a computer-controlled mixer, which ensures the correct and constant proportions.

The raw material mix is fed into the so-called extruder in a moist state. Here, it is poured into the mold and pressed using a steel roller. The upper surface of the concrete tile will be formed by a scraper that matches the profile.

After the mold is formed, the surface treatment takes place, where several layers of paint are applied to the outside of the concrete tiles.

After the surface treatment, the raw products are sent to the curing chamber, where cement hydration occurs at a specific temperature and humidity, so the product gains its final strength.

After curing, the fully hardened products are sent to the packaging department, where a robotic arm packs them into bundles and then places these bundles on pallets. At the end of the process, the pallets are foiled, which facilitates the safe transportation of the product.

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 roof system offers a timeless and aesthetic solution for every need.

1. Layers of the general roof structure:

- Rafter
- Underlayment
- Counter-batten
- Roof batten
- Concrete 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				
2./ supported underlays	windproof underlayment	welded or glued joints and overlaps or sealed groove	insulating sheets, membranes or plates	under the counter-batten	
	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 underlayment type for concrete roof tile covers:

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
$\alpha < \alpha_k$ $\alpha \geq \alpha_k - 6^\circ$	free laid underlayment	free laid underlayment	free overlapping underlayment	windproof underlayment
$\alpha < \alpha_k - 6^\circ$ $\alpha \geq \alpha_k - 10^\circ$	watertight underlayment	watertight underlayment	watertight underlayment	watertight underlayment
$\alpha < \alpha_k - 10^\circ$	watertight underlayment	waterproof underlayment	waterproof underlayment	waterproof underlayment
$\alpha < 10^\circ$	Concrete roof tile cover can't be made!			

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

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

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

Grouping the swissporTON roof tiles by roof pitch:

Model	DIN*	swissporTON**	Free laid underlayment	Windproof underlayment	Watertight underlayment	Waterproof underlayment
			“ECO”	“BASIC”	“PRO”	“ULTRA”
“BREMA”	22°		$\geq 18^\circ$	$\geq 16^\circ$	$\geq 14^\circ$	$\geq 10^\circ$
“GÖTEBORG”	22°		$\geq 18^\circ$	$\geq 16^\circ$	$\geq 14^\circ$	$\geq 10^\circ$
“KAPSTADT”	35°	30°	$\geq 24^\circ$	$\geq 22^\circ$	$\geq 18^\circ$	$\geq 10^\circ$
“MAGNUM”	22°		$\geq 16^\circ$	$\geq 14^\circ$	$\geq 12^\circ$	$\geq 10^\circ$
“BALANCE”	22°		$\geq 16^\circ$	$\geq 14^\circ$	$\geq 12^\circ$	$\geq 10^\circ$
“TITANIA”	22°		$\geq 16^\circ$	$\geq 14^\circ$	$\geq 12^\circ$	$\geq 10^\circ$
“FUTURA”	22°	18°	$\geq 14^\circ$	$\geq 12^\circ$	$\geq 10^\circ$	$\geq 7^\circ$
“PREMION”	22°	18°	$\geq 14^\circ$	$\geq 12^\circ$	$\geq 10^\circ$	$\geq 7^\circ$
“MZ3”	22°		$\geq 16^\circ$	$\geq 14^\circ$	$\geq 12^\circ$	$\geq 10^\circ$
“HARMONIE”	22°		$\geq 16^\circ$	$\geq 14^\circ$	$\geq 12^\circ$	$\geq 10^\circ$
“CANTUS”	25°		$\geq 18^\circ$	$\geq 16^\circ$	$\geq 14^\circ$	$\geq 10^\circ$
“OPTIMA”	25°		$\geq 18^\circ$	$\geq 16^\circ$	$\geq 14^\circ$	$\geq 10^\circ$
“SIMPLA”	25°		$\geq 18^\circ$	$\geq 16^\circ$	$\geq 14^\circ$	$\geq 10^\circ$
“DOMINO”	25°		$\geq 18^\circ$	$\geq 16^\circ$	$\geq 14^\circ$	$\geq 10^\circ$
“MIKADO”	25°		$\geq 18^\circ$	$\geq 16^\circ$	$\geq 14^\circ$	$\geq 10^\circ$
“RAPIDO”	25°		$\geq 18^\circ$	$\geq 16^\circ$	$\geq 14^\circ$	$\geq 10^\circ$
“RATIO”	25°		$\geq 18^\circ$	$\geq 16^\circ$	$\geq 14^\circ$	$\geq 10^\circ$
“RUSTICO”	25°		$\geq 18^\circ$	$\geq 16^\circ$	$\geq 14^\circ$	$\geq 10^\circ$
“SINFONIE”	22°	18°	$\geq 14^\circ$	$\geq 12^\circ$	$\geq 10^\circ$	$\geq 7^\circ$
“MELODIE”	22°		$\geq 16^\circ$	$\geq 14^\circ$	$\geq 12^\circ$	$\geq 10^\circ$
Plain tiles	30°	30°	$\geq 24^\circ$	$\geq 22^\circ$	$\geq 18^\circ$	$\geq 10^\circ$
Side interlocking plain tiles	35°	30°	$\geq 24^\circ$	$\geq 22^\circ$	$\geq 18^\circ$	$\geq 10^\circ$

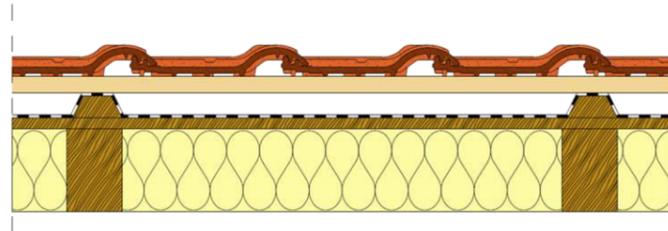
DIN*: Standard roof pitch defined by DIN (the lowest roof pitch where the roof tile cover considered rainproof on its own)

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.

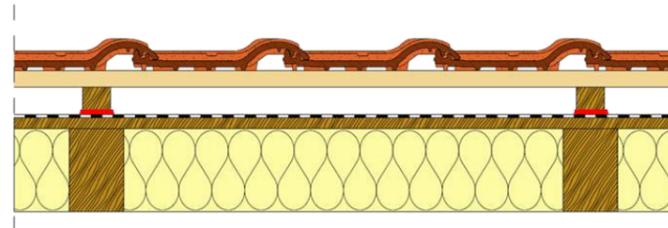


swissporTON "ULTRA", waterproof underlayment

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.

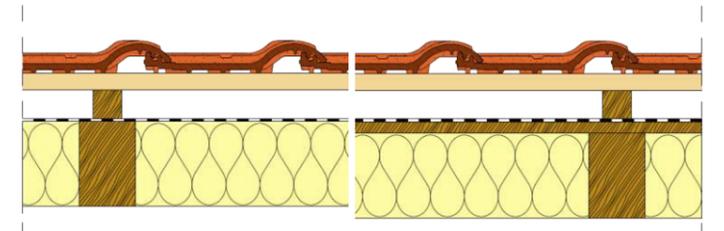


swissporTON "PRO", watertight underlayment

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 watertight!



3.1.4. Free overlapping underlayment:

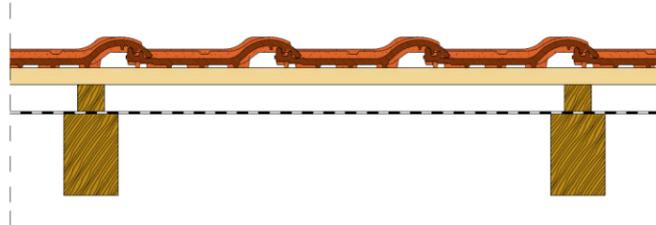
Overlapping sheets, foils, and / or grooved boards which are laid on a full surface, rigid formwork. The underlayment laid below the counter-battens, and perforated by the fastening of the counter-battens.

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-battens. In the case of a thermally insulated structure, a free laid underlayment can only be made as a double-ventilated roof. The required thickness of the air layer formed above the thermal insulation must be ensured regardless of the degree of overhang! Free-laid underlayment must not be used below a roof pitch of 20°!



swissporTON „ECO”, free laid underlayment:

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

Underlay accessories:

	“SKL” adhesive For foil seams and for other connections <ul style="list-style-type: none"> • cc. 19 lm adhesion 	“UAB” connection tape For sealing connections (e.g. wall edges). <ul style="list-style-type: none"> • 25 cm width • 5 m / roll 	
	“NKS” seam adhesive tape To seal longitudinal and transverse seams. <ul style="list-style-type: none"> • 50 mm width • 25 m / roll 	“QSM” welding liquid & bottle For welding the longitudinal and transverse joints of ULTRA <ul style="list-style-type: none"> • 1000 ml / canister • 1 liter per cc. 200 m² roof surface 	
	“NDS” nail sealing tape To seal nail holes below the counter battens. <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • PE raw material • 60 mm width • 30 m / roll 	“KKS” counter-batten tape To cover the counter batten for welded waterproof underlays <ul style="list-style-type: none"> • 30 cm width • 20 m / roll 	
	“NDM” nail sealing mastic To seal nail holes below the counter battens. <ul style="list-style-type: none"> • 1000 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 ($S_d < 0.3$ 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

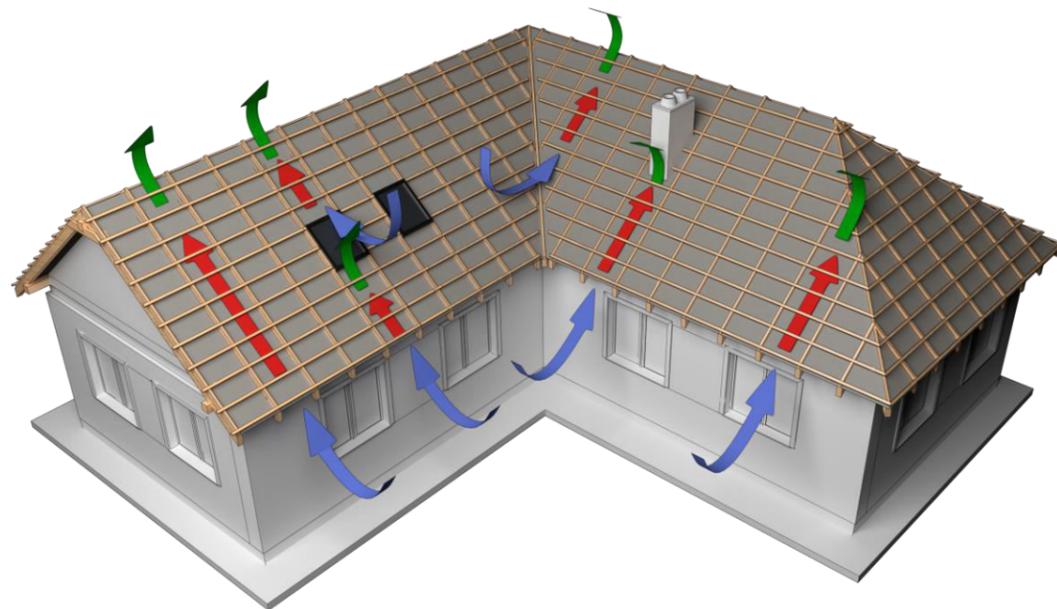
Model	310	320	330	340	350	360	370	380	390	400	410	420	430	440	450
"BREMA"			310-345 mm (1)												
"GÖTEBORG"			310-345 mm (1)												
"KAPSTADT"			310-340 mm (1)												

1) The 90 mm overlap verge tile can only be used in the range shown!

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 cm² / eaves meter!
- The minimum free ventilation cross-section to be formed on the general parts of the roof must be at least 200 cm² / 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: $S_{di} > 2m$

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

- $S_{de} \leq 0,1 m$ and $S_{di} \geq 10 m$, or
- $S_{de} \leq 0,3 m$ and $S_{di} \geq 20 m$, or
- $S_{de} \geq 0,3 m$ and $S_{di} \geq 6 \cdot S_{de}$

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

- $S_{di} \geq 100,0 m$

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 ² /m	eave
Aluminium eave comb	Depends on the height of the tile profile	eave, valley
Ventilation tile	See in the charts later	ridge, hip, valley, eave
Aluminium ridge and hip roll	150 cm ² /lm for 300 mm width	ridge, hip
Ridge and hip roll, PP	165 cm ² /lm for 310 mm width	ridge, hip

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

VI. Snow guard:

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

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

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

2. Surface snow guard

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

$$S_d = \gamma_s * \mu * C_e * C_t * S_k$$

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

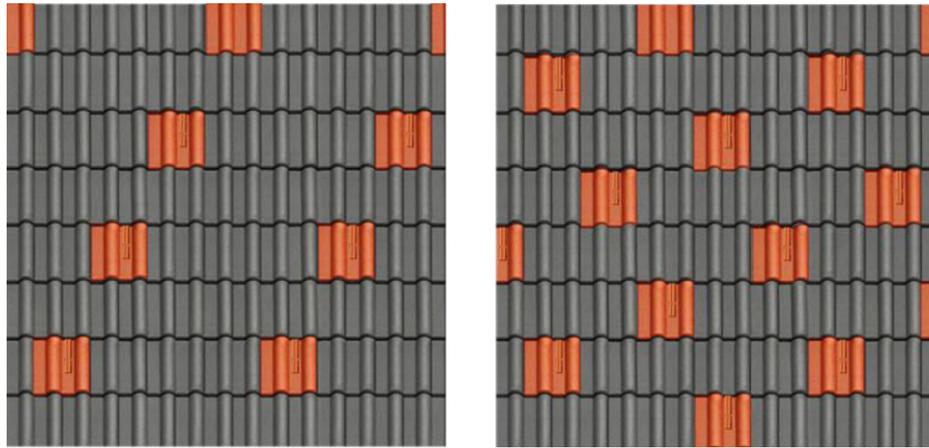
The amount of snow noses can be determined from the following tables.

Base value of the snow load (kN/m²)

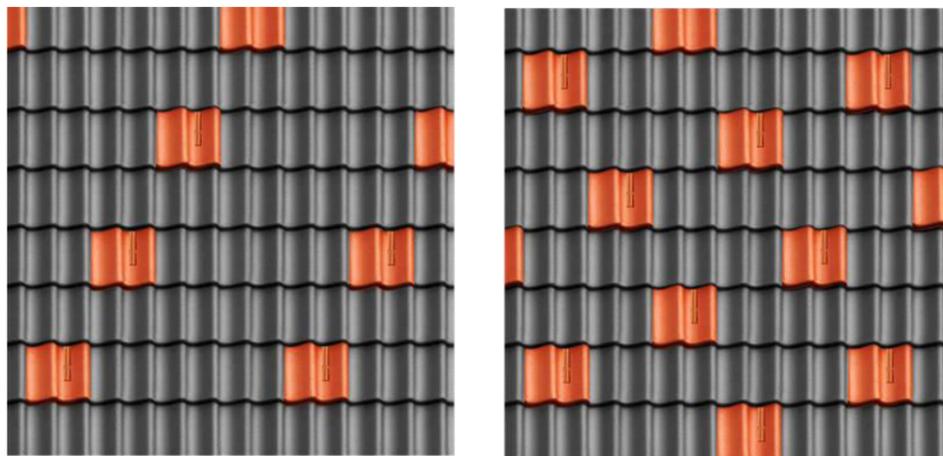
α*	1,00	2,00	3,00	4,00	5,00	6,00	7,00	8,00	9,00	10,00	12,00
20°	3,0	3,0	3,0	3,0	3,0	3,1	3,4	4,0	4,2	4,6	5,6
25°	3,0	3,0	3,0	3,0	3,2	3,3	3,8	4,2	4,8	5,3	6,3
30°	3,0	3,0	3,0	3,0	3,4	3,9	4,6	5,1	5,6	5,9	6,6
35°	3,0	3,0	3,1	3,1	3,5	4,	4,7	5,3	5,6	6,3	7,5
40°	3,1	3,1	3,2	3,2	3,6	4,1	5,1	5,4	6,0	6,4	8,2
45°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

α*: roof pitch

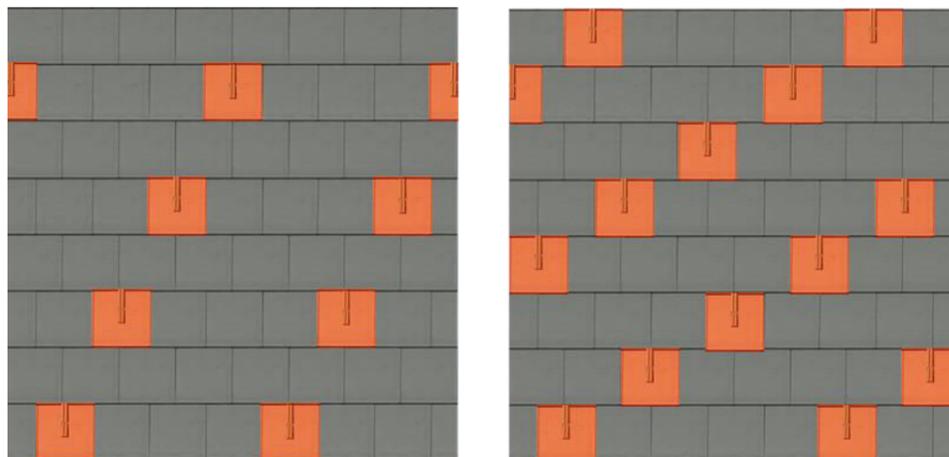
Placement of the snow stop noses for different tile models in quantities of 3,0 pcs/m² and 4,0 pcs/m²



swissporTON "BREMA", 9,8 db/m² covering capacity



swissporTON "GÖTEBORG", 9,8 db/m² covering capacity



swissporTON "KAPSTADT", 9,7 db/m² covering capacity

1. Linear snow guard

The purpose of using linear snow guard is to prevent the snow mass from slipping on the roof surface and to tear off the gutter.

Universal snow guard grid

- Only in snow guard grid variant
- 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.

VI. 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.

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 specifically designed safety hook should be used. The hook has to be installed into the steel beam which can be found in the package

The distance between the safety hook can't exceed:

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



VII. Fixing the tiles:

1. Mechanical fastening along the edges of roof surfaces:

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

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

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



2. Mechanical fastening against the falling of the tile

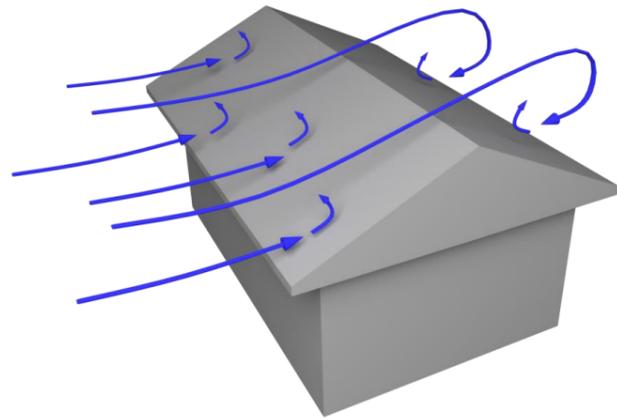
The protection against the falling tile is crucial, because any falling tiles present a significant risk to human life and our valuables (eg. parked cars). This risk should be considered to determine how many tiles will be fixed in certain cases. The main factors which should be considered are: the height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

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

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

3. Mechanical fastening against wind loads

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



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

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

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

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

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

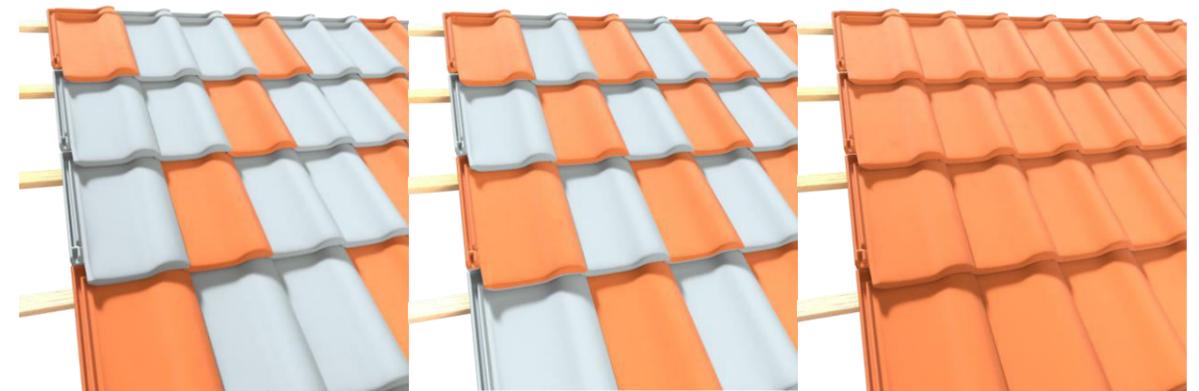
- "γ_w": safety coefficient (equals to 1,5)
- "q_p(z)": peak velocity pressure
- "c_{pe}": external pressure coefficient (see later)
- "c_{eq}": pressure equalizing factor (depend on the roof layers)

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



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

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



Schema 1:3, schema 1:2 and schema 1:1, with concrete roof tiles installed in mesh



Schema 1:3, schema 1:2 and schema 1:1, with concrete roof 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 necessary by the local conditions (eg prevailing wind direction or the highest wind pressure that has occurred in the past), it must be adjusted! The exact windload values must be determined by the roofer or the structural engineer!

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

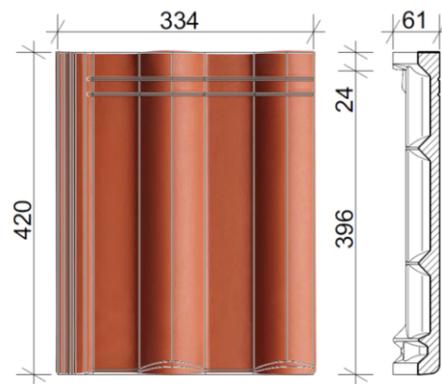
We use stormclips of different sizes for different products.



PART II. Technical specifications



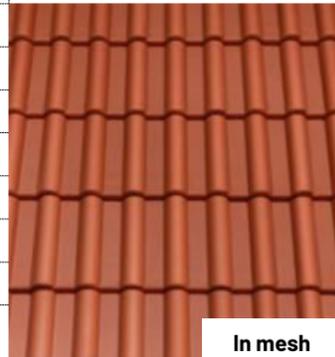
"BREMA"[®]



Product datas

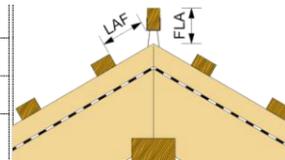
Size	width:	334 mm
	length:	420 mm
	height:	61 mm
	thickness:	12 mm
Packaging	Weight:	4,3 kg
	pack:	40 pcs
	pallet:	240 pcs
Standard roof pitch:		22°

Covering method



Specification of the roof covering

Pitch of the roof:	< 22°	22° - 30°	30° <
Batten distance	310 - 320 mm	310 - 335 mm	310 - 345 mm
Covering width	300 mm	300 mm	300 mm
Tile requirement	10,75 - 10,42 pcs/m²	10,75 - 9,95 pcs/m²	10,75 - 9,7 pcs/m²
Covering type	Single cover		
Covering weight	kb. 46,23 kg/m²	kb. 42,79 kg/m²	kb. 41,71 kg/m²



LAF: distance of the upper batten
FLA: height of the ridge batten

UNI ridge tile 30x50 roof batten

Roof pitch	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°
LAF [mm]	✗	35	33	32	30	29	28	26	25	25	25
FLA [mm]	✗	113	107	102	98	93	89	85	82	79	76

UNI ridge tile 40x60 roof batten

LAF [mm]	✗	35	33	32	30	29	28	26	25	25	25
FLA [mm]	✗	122	117	112	108	104	101	98	92	89	86

Underlayment requirement

Unsupported underlayment	"ECO"	≥ 18°
Windproof underlayment	"BASIC"	≥ 16°
Watertight underlayment	"PRO"	≥ 14°
Waterproof underlayment	"ULTRA"	≥ 10°

Required batten dimensions

Rafter distance	Batten dimension
≤ 800 mm	30 x 50 mm
810 - 900 mm	30 x 50 mm
910 - 1000 mm	40 x 60 mm

"UNI" ridge tile 2,5 pcs/m



"UNI" Hip starter



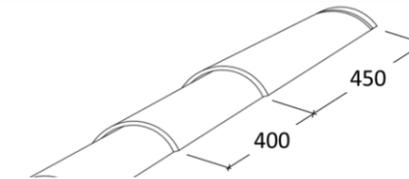
"UNI" Closing plate



"UNI" Hip cap



"UNI" Ridge clip



Concrete accessories

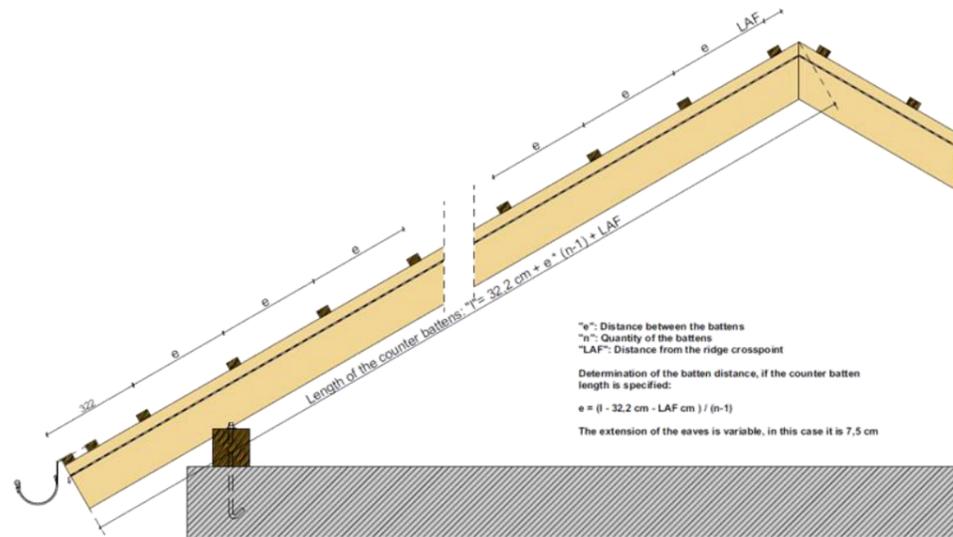
Concrete accessories	Size	Quantity
Half tile	184x420	as needed
Verge tile - left 90 mm	334x420	3 pcs/m
Verge tile - right 90 mm	334x420	3 pcs/m
Verge tile - left 120 mm	334x420	3 pcs/m
Verge tile - right 120 mm	334x420	3 pcs/m
Ventilation tile LQ36	334x420	as required
Shed roof tile		3,3 pcs/m
Shed roof verge tile - left		as needed t

Concrete accessories

Concrete accessories	Size	Quantity
Shed roof verge tile - right		as needed

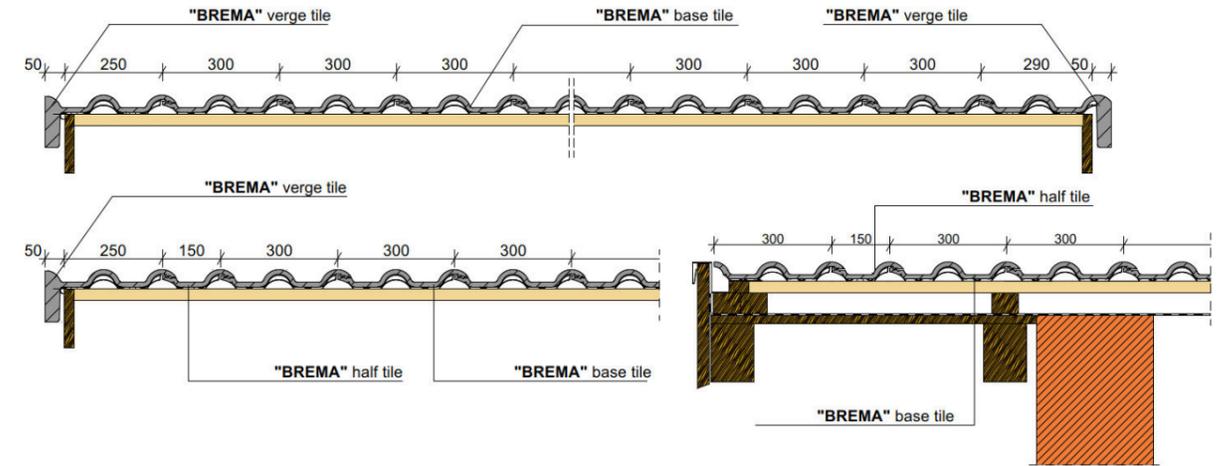
Fixing products

Name	Material	Application field
Nail-in stromclip	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the general roof surface
Fixing screw with EPDM sealing ring, 70 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
Universal screw-in stormclip	zinc-aluminium	Fixing against the wind along the eave and to fix the shed roof tiles



Roof batten alignment for "BREMA" concrete roof tile

Specification: 7,5 cm eave overhang and 30° roof pitch "UNI" ridge tile and 30x50 mm roof battens, LAF = 30 mm			
Number of battens (n)	Min. batten distance (e)	Avg. batten distance (e)	Max. batten distance (e)
	310 mm	328 mm	345 mm
10	3 142	3 304	3 457
11	3 452	3 632	3 802
12	3 762	3 960	4 147
13	4 072	4 288	4 492
14	4 382	4 616	4 837
15	4 692	4 944	5 182
16	5 002	5 272	5 527
17	5 312	5 600	5 872
18	5 622	5 928	6 217
19	5 932	6 256	6 562
20	6 242	6 584	6 907
21	6 552	6 912	7 252
22	6 862	7 240	7 597
23	7 172	7 568	7 942
24	7 482	7 896	8 287
25	7 792	8 224	8 632
26	8 102	8 552	8 977
27	8 412	8 880	9 322
28	8 722	9 208	9 667
29	9 032	9 536	10 012
30	9 342	9 864	10 357
31	9 652	10 192	10 702
32	9 962	10 520	11 047
33	10 272	10 848	11 392
34	10 582	11 176	11 737
35	10 892	11 504	12 082
36	11 202	11 832	12 427
37	11 512	12 160	12 772
38	11 822	12 488	13 117
39	12 132	12 816	13 462
40	12 442	13 144	13 807



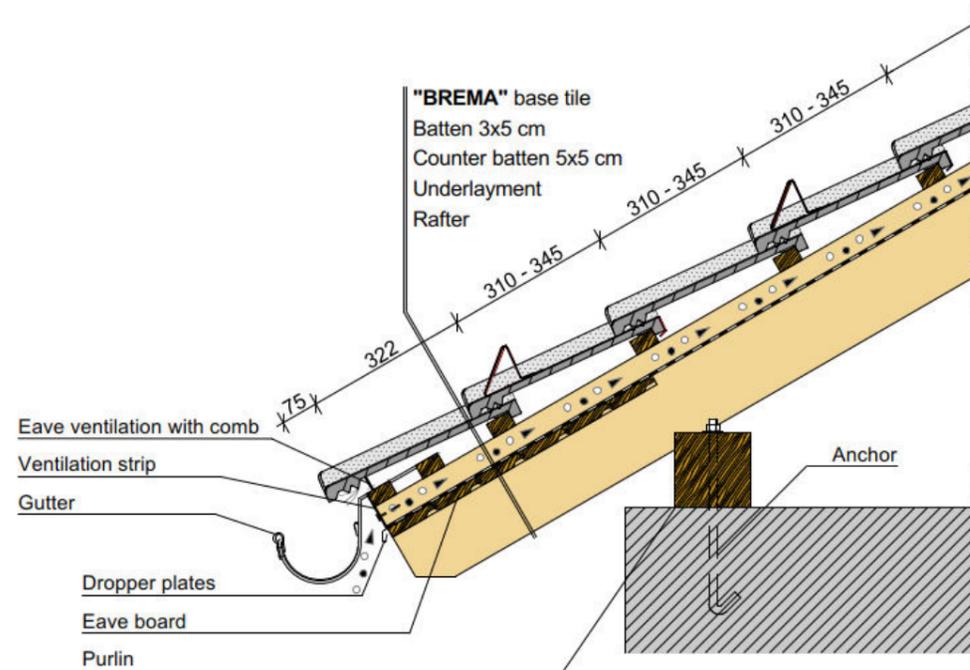
Structural width between the verge boards

	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
0	-	150	300	450	540	690	840	990	1140	1290
10	2 940	3 090	3 240	3 390	3 540	3 690	3 840	3 990	4 140	4 290
20	5 940	6 090	6 240	6 390	6 540	6 690	6 840	6 990	7 140	7 290
30	8 940	9 090	9 240	9 390	9 540	9 690	9 840	9 990	10 140	10 290
40	11 940	12 090	12 240	12 390	12 540	12 690	12 840	12 990	13 140	13 290
50	14 940	15 090	15 240	15 390	15 540	15 690	15 840	15 990	16 140	16 290
60	17 940	18 090	18 240	18 390	18 540	18 690	18 840	18 990	19 140	19 290
70	20 940	21 090	21 240	21 390	21 540	21 690	21 840	21 990	22 140	22 290
80	23 940	24 090	24 240	24 390	24 540	24 690	24 840	24 990	25 140	25 290
90	26 940	27 090	27 240	27 390	27 540	27 690	27 840	27 990	28 140	28 290
100	29 940	30 090	30 240	30 390	30 540	30 690	30 840	30 990	31 140	31 290

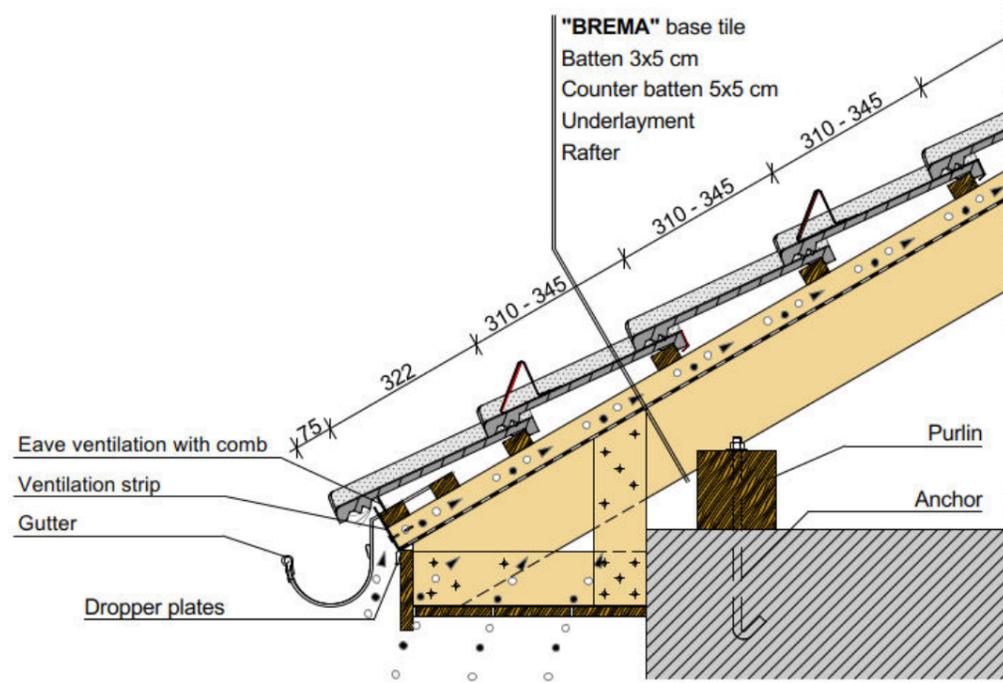
Structural width between the verge boards

	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	1440	1590	1740	1890	2040	2190	2340	2490	2640	2790
10	4 440	4 590	4 740	4 890	5 040	5 190	5 340	5 490	5 640	5 790
20	7 440	7 590	7 740	7 890	8 040	8 190	8 340	8 490	8 640	8 790
30	10 440	10 590	10 740	10 890	11 040	11 190	11 340	11 490	11 640	11 790
40	13 440	13 590	13 740	13 890	14 040	14 190	14 340	14 490	14 640	14 790
50	16 440	16 590	16 740	16 890	17 040	17 190	17 340	17 490	17 640	17 790
60	19 440	19 590	19 740	19 890	20 040	20 190	20 340	20 490	20 640	20 790
70	22 440	22 590	22 740	22 890	23 040	23 190	23 340	23 490	23 640	23 790
80	25 440	25 590	25 740	25 890	26 040	26 190	26 340	26 490	26 640	26 790
90	28 440	28 590	28 740	28 890	29 040	29 190	29 340	29 490	29 640	29 790
100	31 440	31 590	31 740	31 890	32 040	32 190	32 340	32 490	32 640	32 790

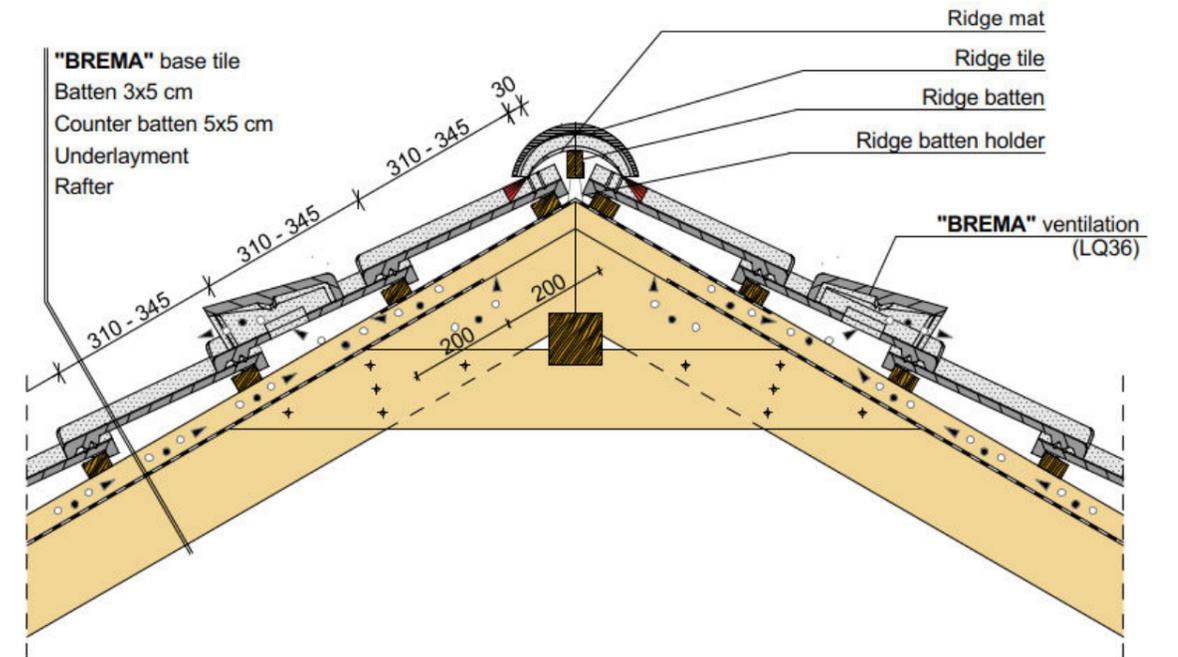
The structural widths below are calculated with 1-1 cm gap between the side plate of the verge tiles and the verge board.



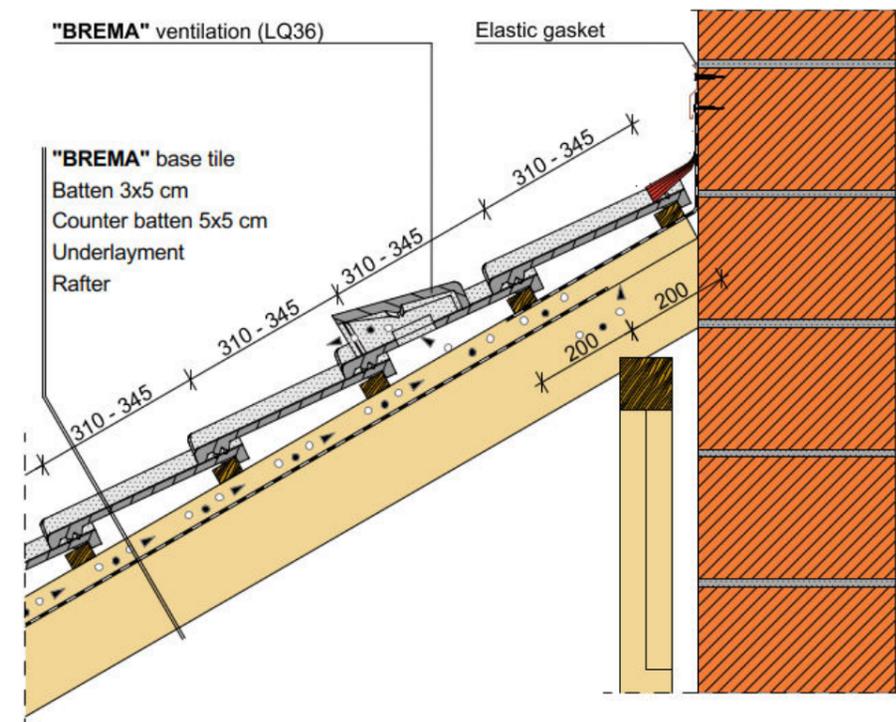
Eave detail



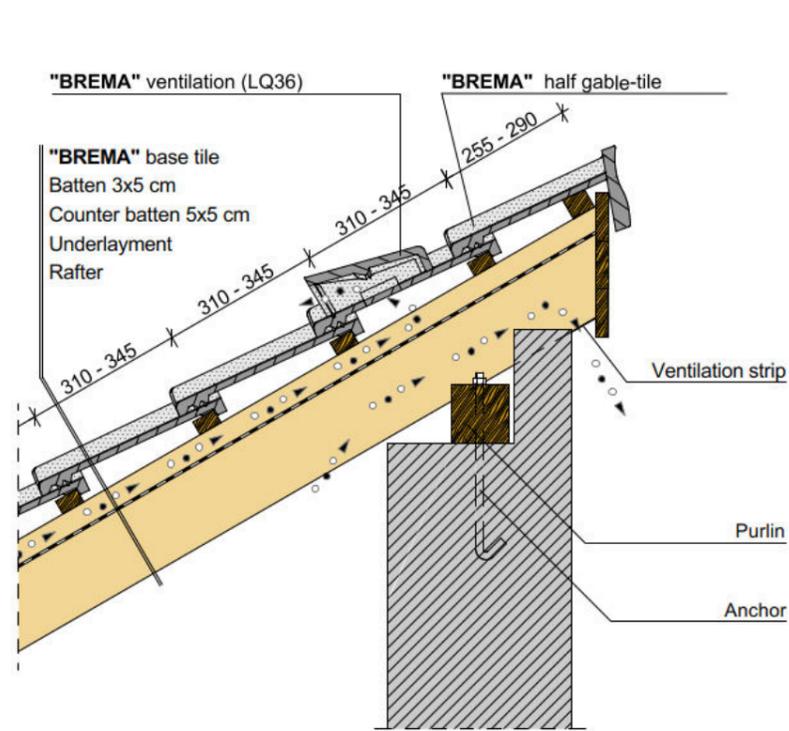
Closed eave detail



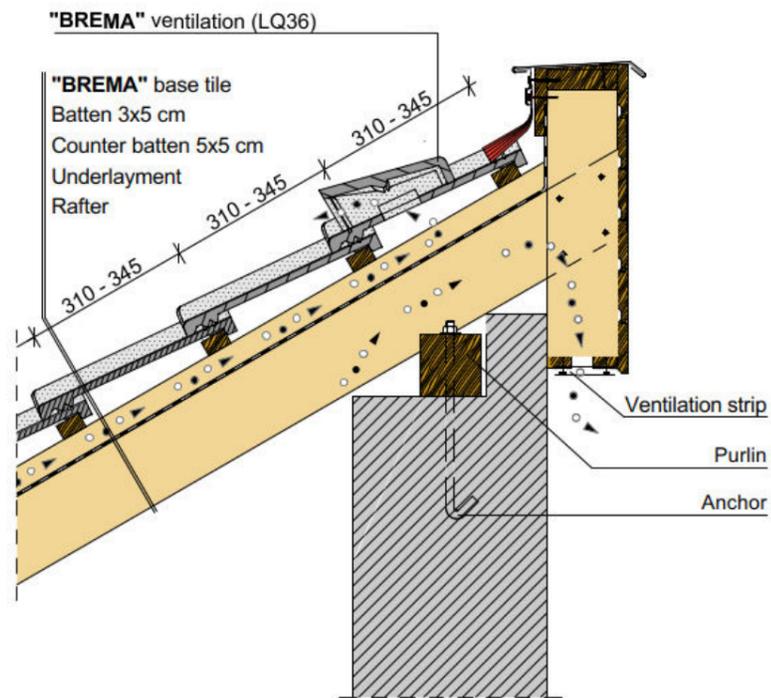
Ridge detail with ventilation tile



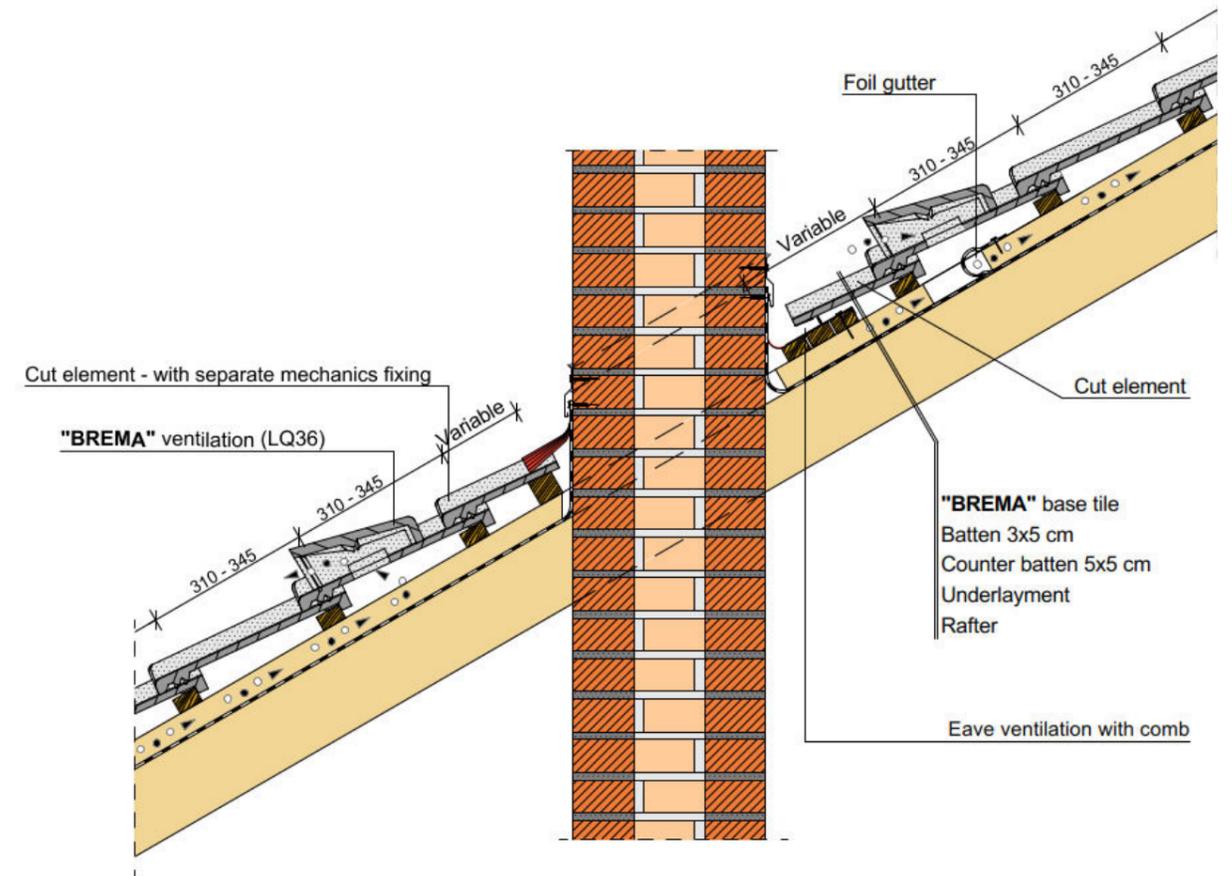
Wall connection detail



Shed roof ridge detail with shed roof tile

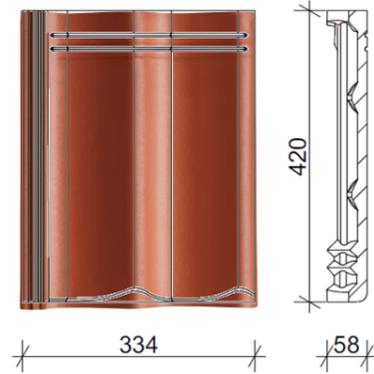


Shed roof ridge detail



Chimney connection detail

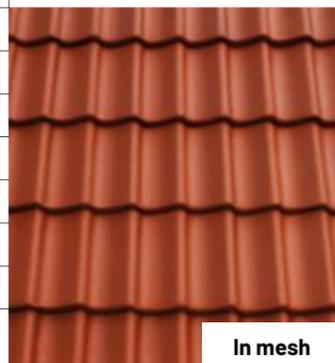
"GÖTEBORG"®



Product datas

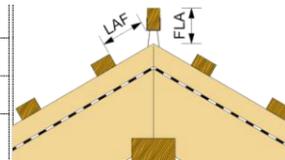
Size	width:	334 mm
	length:	420 mm
	height:	61 mm
	thickness:	12 mm
Packaging	Weight:	4,6 kg
	pack:	40 db
	pallet:	240 db
Standard roof pitch:		22°

Covering method



Specification of the roof covering

Pitch of the roof:	< 22°	22° - 30°	30° <
Batten distance	310 - 320 mm	310 - 335 mm	310 - 345 mm
Covering width	300 mm	300 mm	300 mm
Tile requirement	10,75 - 10,42 pcs/m ²	10,75 - 9,95 pcs/m ²	10,75 - 9,7 pcs/m ²
Covering type	Single cover		
Covering weight	cc. 49,45 kg/m ²	cc. 45,77 kg/m ²	cc. 44,62 kg/m ²



LAF: distance of the upper batten
FLA: height of the ridge batten

UNI ridge tile 30x50 roof batten

Roof pitch	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°
LAF [mm]	✗	35	33	32	30	29	28	26	25	25	25
FLA [mm]	✗	113	107	102	98	93	89	85	82	79	76

UNI ridge tile 40x60 roof batten

LAF [mm]	✗	35	33	32	30	29	28	26	25	25	25
FLA [mm]	✗	122	117	112	108	104	101	98	92	89	86

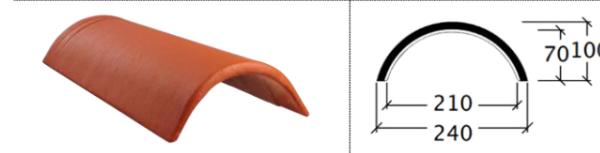
Underlayment requirement

Underlayment type	Requirement	Roof Pitch
Unsupported underlayment	"ECO"	≥ 18°
Windproof underlayment	"BASIC"	≥ 16°
Watertight underlayment	"PRO"	≥ 14°
Waterproof underlayment	"ULTRA"	≥ 10°

Required batten dimensions

Rafter distance	Batten dimension
≤ 800 mm	30 x 50 mm
810 - 900 mm	30 x 50 mm
910 - 1000 mm	40 x 60 mm

"UNI" ridge tile 2,5 pcs/m



"UNI" Hip starter



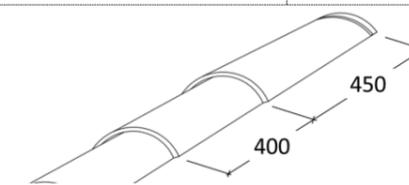
"UNI" Closing plate



"UNI" Hip cap



"UNI" Ridge clip



Concrete accessories

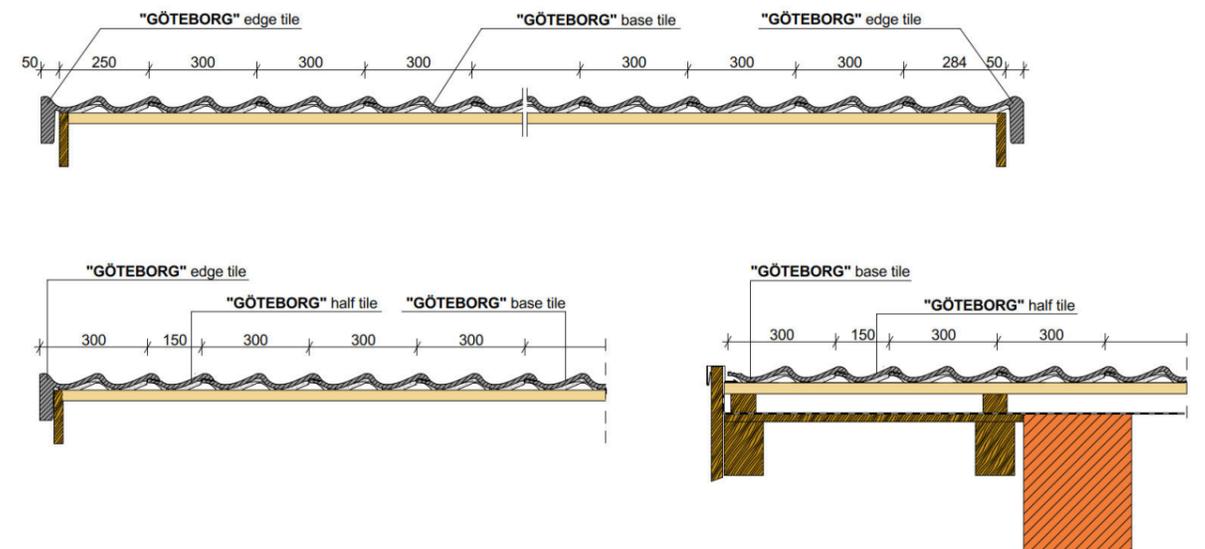
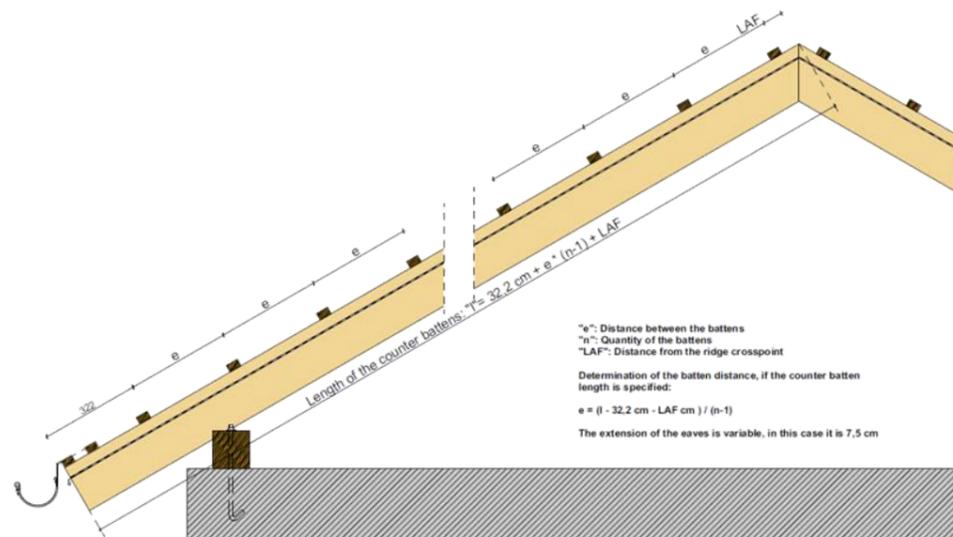
Concrete accessories	Size	Quantity
Half tile	184x420	as needed
Verge tile - left 90 mm	334x420	3 pcs/m
Verge tile - right 90 mm	334x420	3 pcs/m
Verge tile - left 120 mm	334x420	3 pcs/m
Verge tile - right 120 mm	334x420	3 pcs/m
Ventilation tile LQ36	334x420	as required
Shed roof tile		3,3 pcs/m
Shed roof verge tile - left		as needed t

Concrete accessories

Concrete accessories	Size	Quantity
Shed roof verge tile - right		as needed

Fixing products

Name	Material	Application field
Nail-in stormclip	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the general roof surface
Fixing screw with EPDM sealing ring, 70 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
Universal screw-in stormclip	zinc-aluminium	Fixing against the wind along the eave and to fix the shed roof tiles



Roof batten alignment for "GÖTEBORG" concrete roof tile

Specification: 7,5 cm eave overhang and 30° roof pitch "UNI" ridge tile and 30x50 mm roof battens, LAF = 30 mm			
Number of battens (n)	Min. batten distance (e)	Avg. batten distance (e)	Max. batten distance (e)
	310 mm	328 mm	345 mm
10	3 142	3 304	3 457
11	3 452	3 632	3 802
12	3 762	3 960	4 147
13	4 072	4 288	4 492
14	4 382	4 616	4 837
15	4 692	4 944	5 182
16	5 002	5 272	5 527
17	5 312	5 600	5 872
18	5 622	5 928	6 217
19	5 932	6 256	6 562
20	6 242	6 584	6 907
21	6 552	6 912	7 252
22	6 862	7 240	7 597
23	7 172	7 568	7 942
24	7 482	7 896	8 287
25	7 792	8 224	8 632
26	8 102	8 552	8 977
27	8 412	8 880	9 322
28	8 722	9 208	9 667
29	9 032	9 536	10 012
30	9 342	9 864	10 357
31	9 652	10 192	10 702
32	9 962	10 520	11 047
33	10 272	10 848	11 392
34	10 582	11 176	11 737
35	10 892	11 504	12 082
36	11 202	11 832	12 427
37	11 512	12 160	12 772
38	11 822	12 488	13 117
39	12 132	12 816	13 462
40	12 442	13 144	13 807

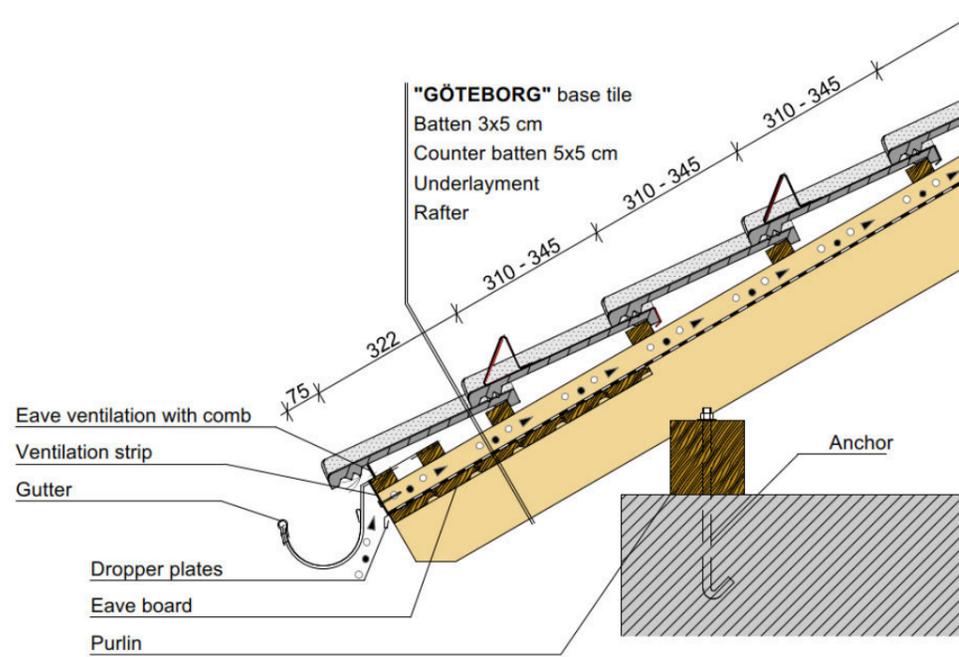
Structural width between the verge boards

	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
0	-	150	300	450	540	690	840	990	1140	1290
10	2 940	3 090	3 240	3 390	3 540	3 690	3 840	3 990	4 140	4 290
20	5 940	6 090	6 240	6 390	6 540	6 690	6 840	6 990	7 140	7 290
30	8 940	9 090	9 240	9 390	9 540	9 690	9 840	9 990	10 140	10 290
40	11 940	12 090	12 240	12 390	12 540	12 690	12 840	12 990	13 140	13 290
50	14 940	15 090	15 240	15 390	15 540	15 690	15 840	15 990	16 140	16 290
60	17 940	18 090	18 240	18 390	18 540	18 690	18 840	18 990	19 140	19 290
70	20 940	21 090	21 240	21 390	21 540	21 690	21 840	21 990	22 140	22 290
80	23 940	24 090	24 240	24 390	24 540	24 690	24 840	24 990	25 140	25 290
90	26 940	27 090	27 240	27 390	27 540	27 690	27 840	27 990	28 140	28 290
100	29 940	30 090	30 240	30 390	30 540	30 690	30 840	30 990	31 140	31 290

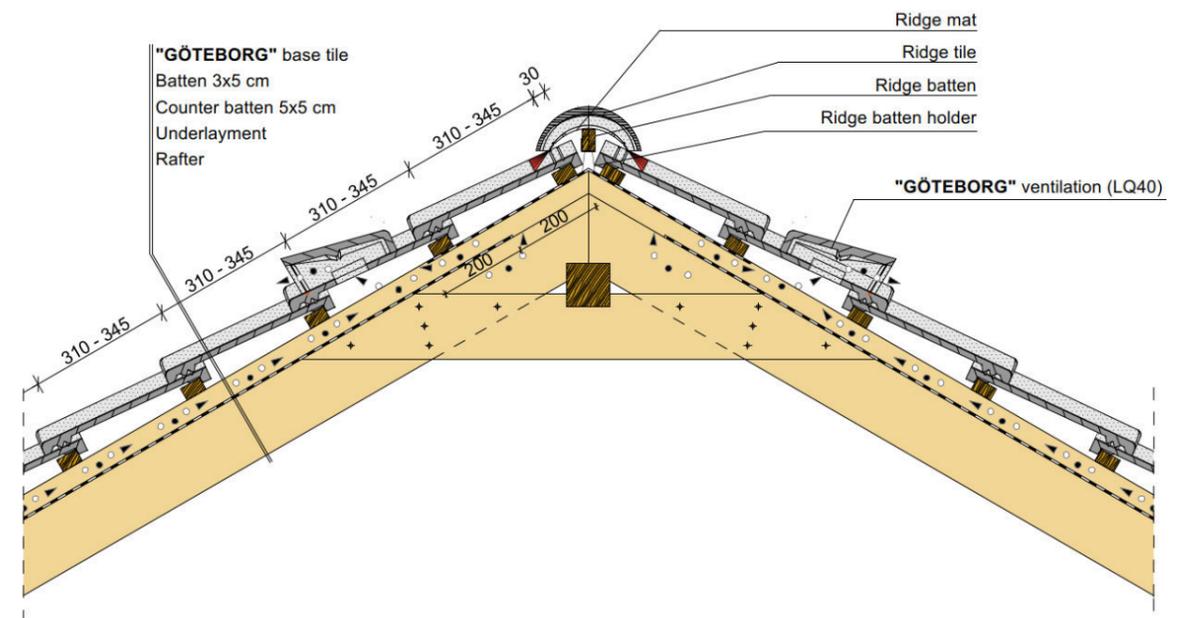
Structural width between the verge boards

	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	1 440	1 590	1 740	1 890	2 040	2 190	2 340	2 490	2 640	2 790
10	4 440	4 590	4 740	4 890	5 040	5 190	5 340	5 490	5 640	5 790
20	7 440	7 590	7 740	7 890	8 040	8 190	8 340	8 490	8 640	8 790
30	10 440	10 590	10 740	10 890	11 040	11 190	11 340	11 490	11 640	11 790
40	13 440	13 590	13 740	13 890	14 040	14 190	14 340	14 490	14 640	14 790
50	16 440	16 590	16 740	16 890	17 040	17 190	17 340	17 490	17 640	17 790
60	19 440	19 590	19 740	19 890	20 040	20 190	20 340	20 490	20 640	20 790
70	22 440	22 590	22 740	22 890	23 040	23 190	23 340	23 490	23 640	23 790
80	25 440	25 590	25 740	25 890	26 040	26 190	26 340	26 490	26 640	26 790
90	28 440	28 590	28 740	28 890	29 040	29 190	29 340	29 490	29 640	29 790
100	31 440	31 590	31 740	31 890	32 040	32 190	32 340	32 490	32 640	32 790

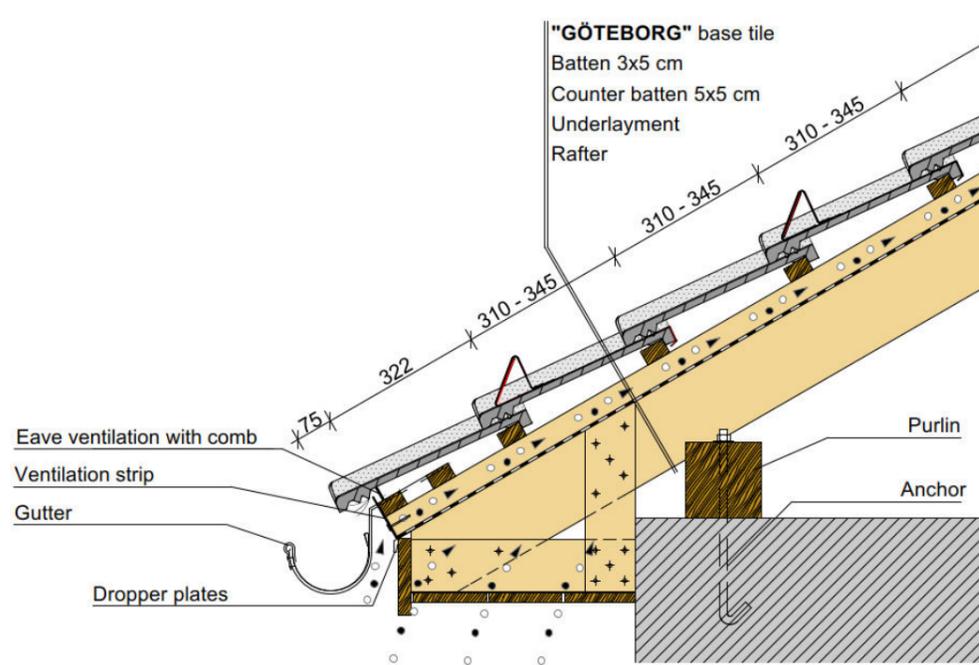
The structural widths below are calculated with 1-1 cm gap between the side plate of the verge tiles and the verge board.



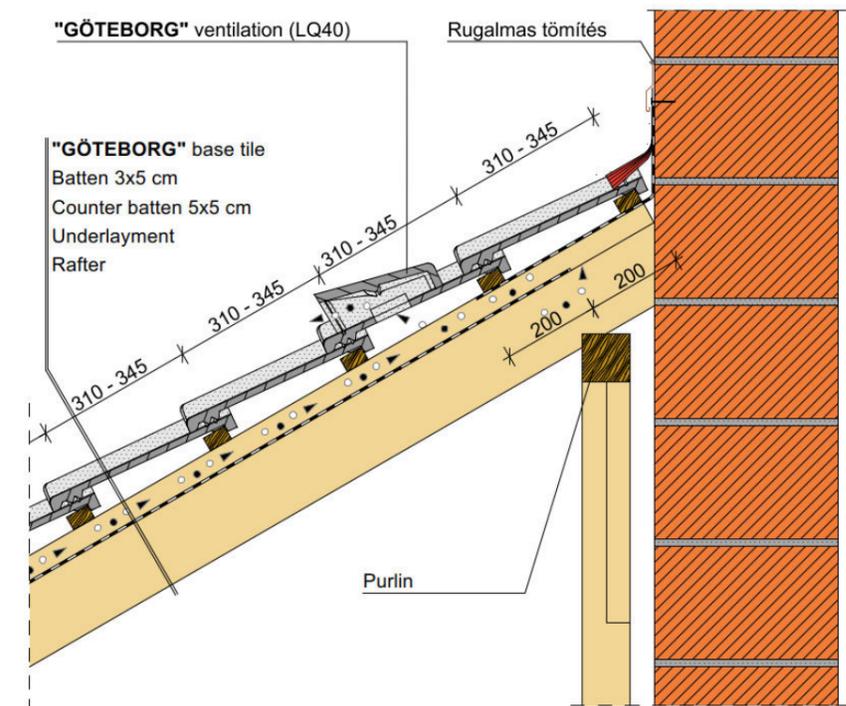
Eave detail



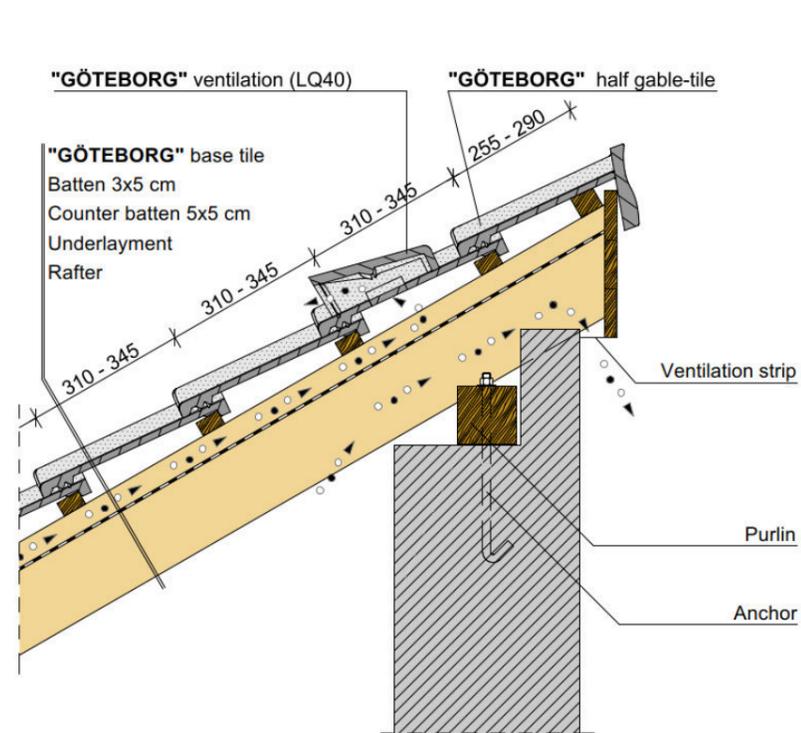
Ridge detail with ventilation tile



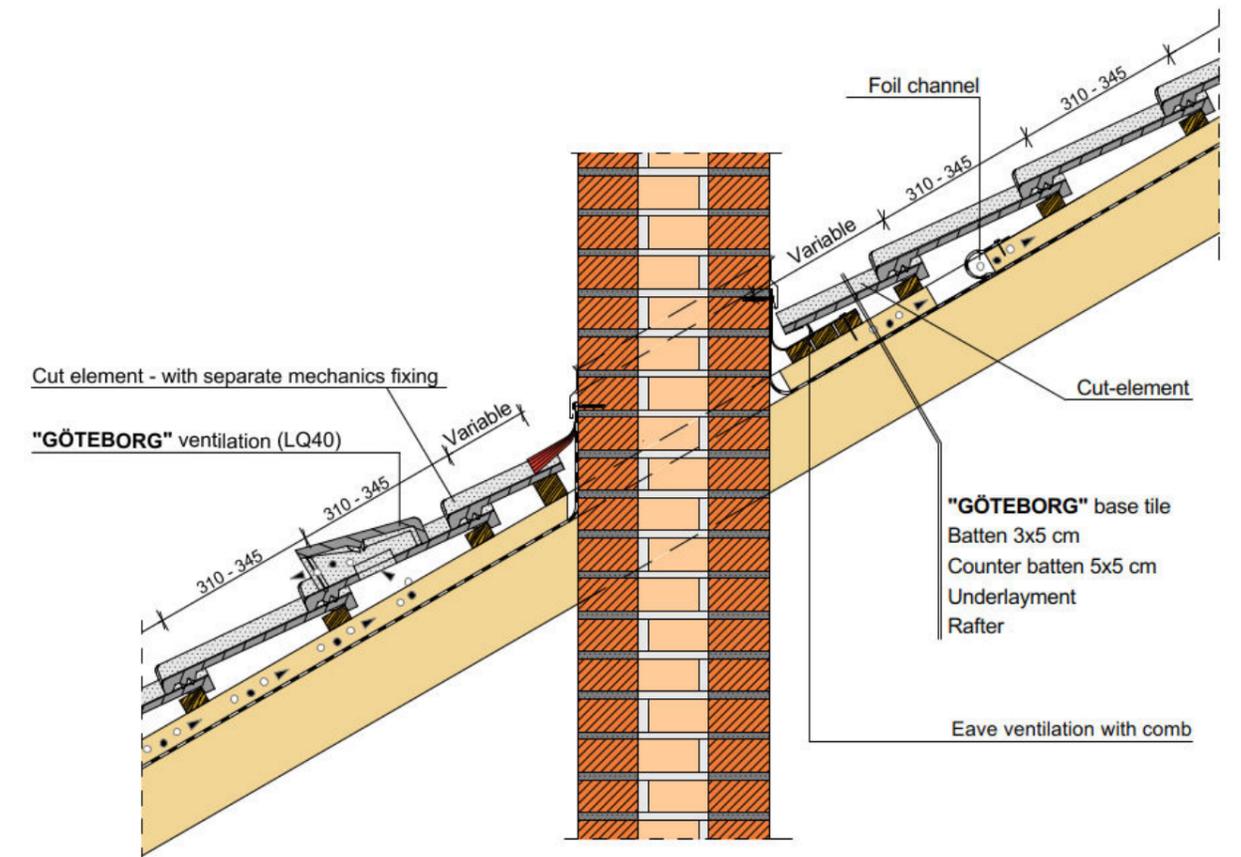
Closed eave detail



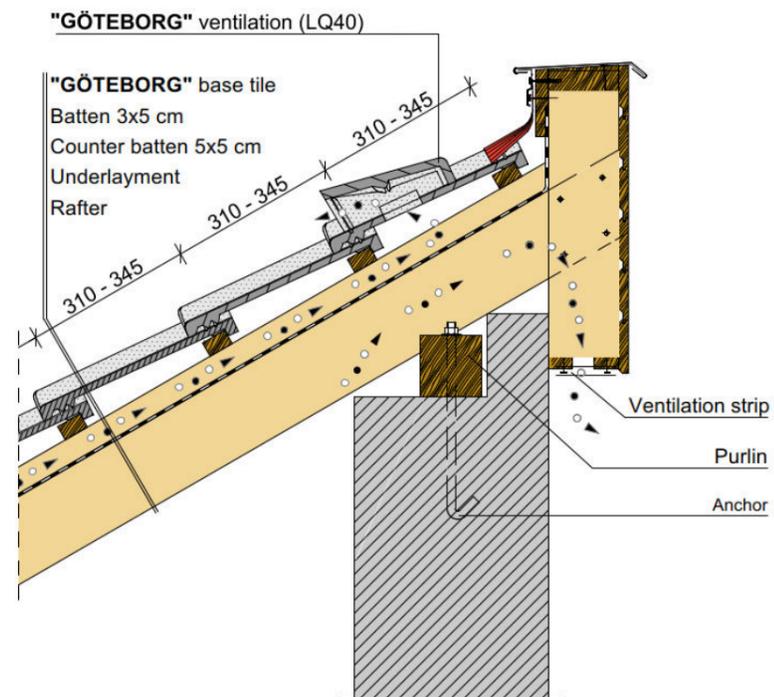
Wall connection detail



Shed roof ridge detail with shed roof tile

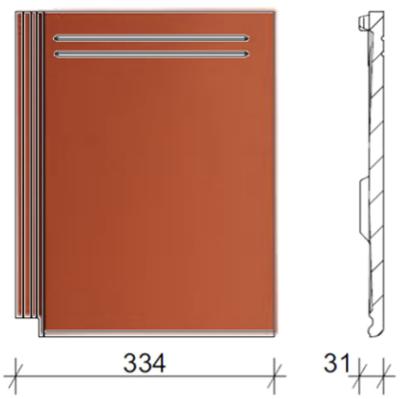


Chimney connection detail



Shed roof ridge detail

"KAPSTADT"[®]



Product datas

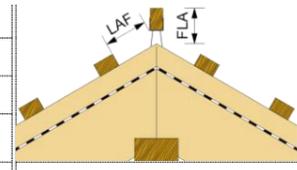
Size	width:	334 mm
	length:	420 mm
	height:	31 mm
	thickness:	20 mm
Packaging	Weight:	4,9 kg
	pack:	36 pcs
	pallet:	216 pcs
Standard roof pitch:		35°

Covering method



Specification of the roof covering

Pitch of the roof:	< 25°	25° - 35°	35° <
Batten distance	310 - 315 mm	310 - 325 mm	310 - 340 mm
Covering width	300 mm	300 mm	300 mm
Tile requirement	10,76 - 10,59 pcs/m²	10,76 - 10,26 pcs/m²	10,76 - 9,81 pcs/m²
Covering type	Single cover		
Covering weight	cc. 51,89 kg/m²	cc. 50,27 kg/m²	cc. 48,07 kg/m²



LAF: distance of the upper batten
FLA: height of the ridge batten

KAPSTADT ridge tile 30x50 roof batten

Roof pitch	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°
LAF [mm]	✗	45	45	45	45	45	45	45	45	✗	✗
FLA [mm]	✗	102	92	83	74	68	61	55	48	✗	✗

KAPSTADT ridge tile 40x60 roof batten

Roof pitch	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°
LAF [mm]	✗	40	40	40	40	40	40	40	40	✗	✗
FLA [mm]	✗	112	103	94	86	80	75	70	64	✗	✗

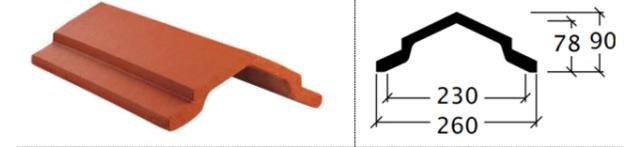
Underlayment requirement

Underlayment type	Requirement	Roof Pitch
Unsupported underlayment	"ECO"	≥ 24°
Windproof underlayment	"BASIC"	≥ 22°
Watertight underlayment	"PRO"	≥ 18°
Waterproof underlayment	"ULTRA"	≥ 10°

Required batten dimensions

Rafter distance	Batten dimension
≤ 800 mm	30 x 50 mm
810 - 900 mm	30 x 50 mm
910 - 1000 mm	40 x 60 mm

"KAPSTADT" ridge tile 2,3 pcs/m



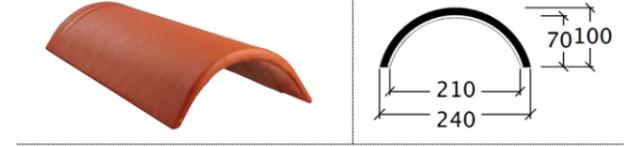
"KAPSTADT" Starting and closing tile



"KAPSTADT" Ridge tile



"UNI" ridge tile 2,5 pcs/m



"UNI" Hip starter

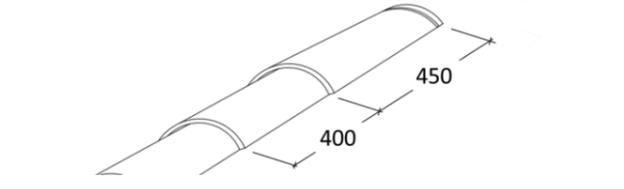


"UNI" Closing plate



"UNI" Hip cap

"UNI" Ridge clip

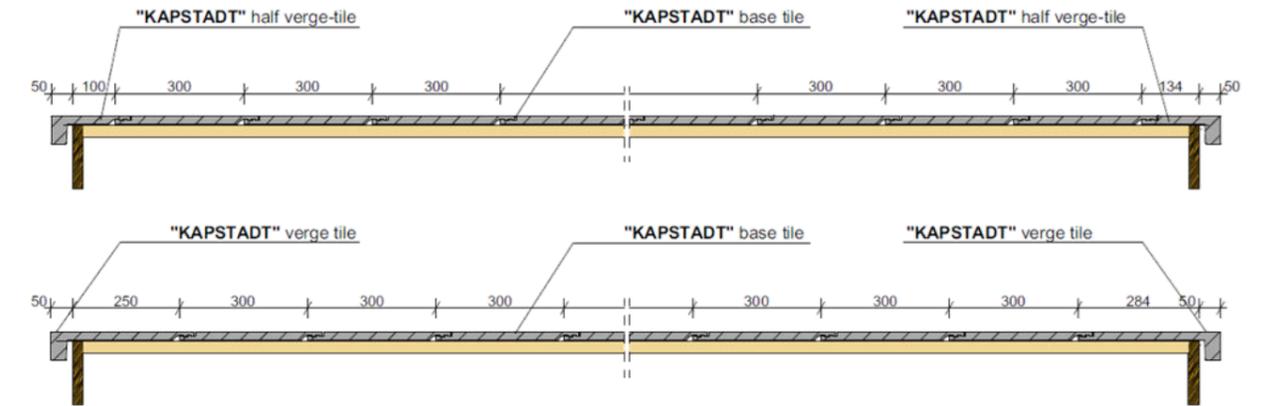
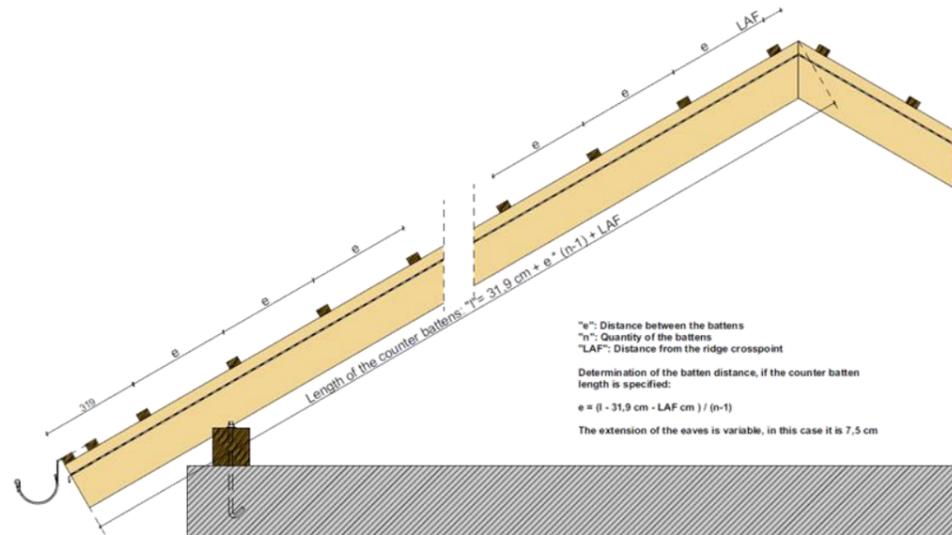


Concrete tile accessories	Size	Quantity.
Half tile	184x420	as needed
Verge tile - left 90 mm	334x420	1,5 / 3 pcs/m
Verge tile - right 90 mm	334x420	1,5 / 3 pcs/m
Verge tile - left 120 mm	334x420	1,5 / 3 pcs/m
Verge tile - right 120 mm	334x420	1,5 / 3 pcs/m
Verge half-tile - left 90 mm	184x420	1,5 / 3 pcs/m
Verge half-tile - right 120 mm	184x420	1,5 / 3 pcs/m
Verge half-tile - left 90 mm	184x420	1,5 / 3 pcs/m

Concrete tile accessories	Size	Quantity.
Verge half-tile - right 120 mm	184x420	1,5 / 3 pcs/m
Ventilation tile LQ65	334x420	as required

Fixing products

Name	Material	Application field
Nail-in stormclip	zinc-aluminium	Fixing against the wind in the edge zones and some cases in the general roof surface
Fixing screw with EPDM sealing ring, 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
Universal screw-in stormclip	zinc-aluminium	Fixing against the wind along the eave and to fix the shed roof tiles



Roof batten alignment for "KAPSTADT" concrete roof tile

Specification			
7,5 cm eave overhang and 30° roof pitch "KAPSTADT" ridge tile and 30x50 mm roof battens, LAF = 45 mm			
Number of battens (n)	min. batten distance (e)	avg. batten distance (e)	max. batten distance (e)
	310 mm	325 mm	340 mm
10	3 154	3 289	3 424
11	3 464	3 614	3 764
12	3 774	3 939	4 104
13	4 084	4 264	4 444
14	4 394	4 589	4 784
15	4 704	4 914	5 124
16	5 014	5 239	5 464
17	5 324	5 564	5 804
18	5 634	5 889	6 144
19	5 944	6 214	6 484
20	6 254	6 539	6 824
21	6 564	6 864	7 164
22	6 874	7 189	7 504
23	7 184	7 514	7 844
24	7 494	7 839	8 184
25	7 804	8 164	8 524
26	8 114	8 489	8 864
27	8 424	8 814	9 204
28	8 734	9 139	9 544
29	9 044	9 464	9 884
30	9 354	9 789	10 224
31	9 664	10 114	10 564
32	9 974	10 439	10 904
33	10 284	10 764	11 244
34	10 594	11 089	11 584
35	10 904	11 414	11 924
36	11 214	11 739	12 264
37	11 524	12 064	12 604
38	11 834	12 389	12 944
39	12 144	12 714	13 284
40	12 454	13 039	13 624

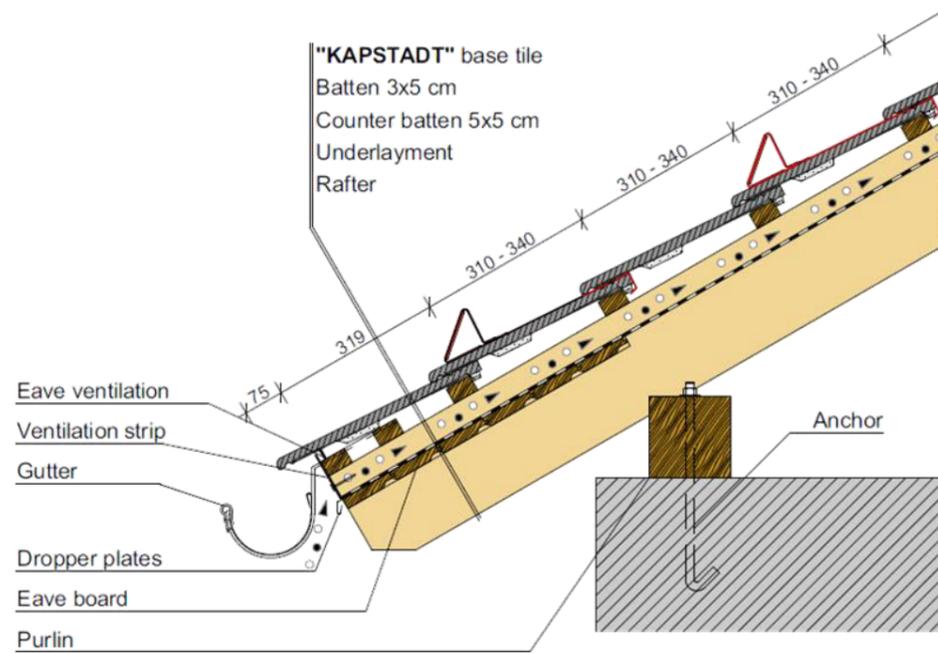
Covering width oromdeszkától-oromdeszkáig

	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
0	-	150	300	450	534	684	834	984	1134	1284
10	2 934	3 084	3 234	3 384	3 534	3 684	3 834	3 984	4 134	4 284
20	5 934	6 084	6 234	6 384	6 534	6 684	6 834	6 984	7 134	7 284
30	8 934	9 084	9 234	9 384	9 534	9 684	9 834	9 984	10 134	10 284
40	11 934	12 084	12 234	12 384	12 534	12 684	12 834	12 984	13 134	13 284
50	14 934	15 084	15 234	15 384	15 534	15 684	15 834	15 984	16 134	16 284
60	17 934	18 084	18 234	18 384	18 534	18 684	18 834	18 984	19 134	19 284
70	20 934	21 084	21 234	21 384	21 534	21 684	21 834	21 984	22 134	22 284
80	23 934	24 084	24 234	24 384	24 534	24 684	24 834	24 984	25 134	25 284
90	26 934	27 084	27 234	27 384	27 534	27 684	27 834	27 984	28 134	28 284
100	29 934	30 084	30 234	30 384	30 534	30 684	30 834	30 984	31 134	31 284

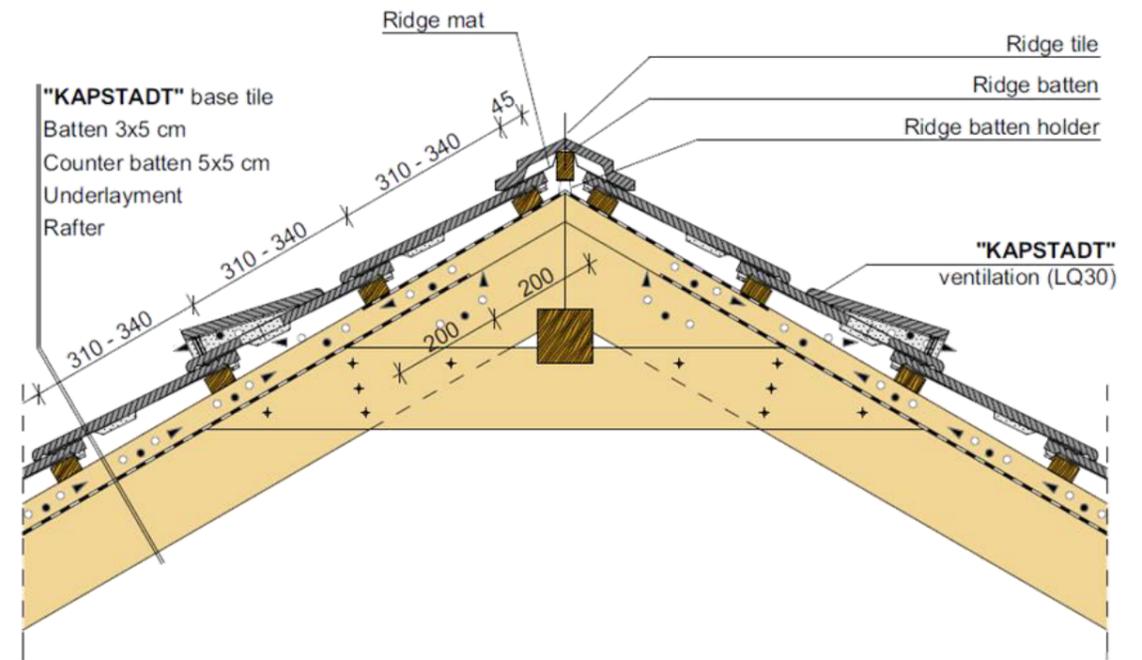
Covering width oromdeszkától-oromdeszkáig

	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2
0	1 434	1 584	1 734	1 884	2 034	2 184	2 334	2 484	2 634	2 784
10	4 434	4 584	4 734	4 884	5 034	5 184	5 334	5 484	5 634	5 784
20	7 434	7 584	7 734	7 884	8 034	8 184	8 334	8 484	8 634	8 784
30	10 434	10 584	10 734	10 884	11 034	11 184	11 334	11 484	11 634	11 784
40	13 434	13 584	13 734	13 884	14 034	14 184	14 334	14 484	14 634	14 784
50	16 434	16 584	16 734	16 884	17 034	17 184	17 334	17 484	17 634	17 784
60	19 434	19 584	19 734	19 884	20 034	20 184	20 334	20 484	20 634	20 784
70	22 434	22 584	22 734	22 884	23 034	23 184	23 334	23 484	23 634	23 784
80	25 434	25 584	25 734	25 884	26 034	26 184	26 334	26 484	26 634	26 784
90	28 434	28 584	28 734	28 884	29 034	29 184	29 334	29 484	29 634	29 784
100	31 434	31 584	31 734	31 884	32 034	32 184	32 334	32 484	32 634	32 784

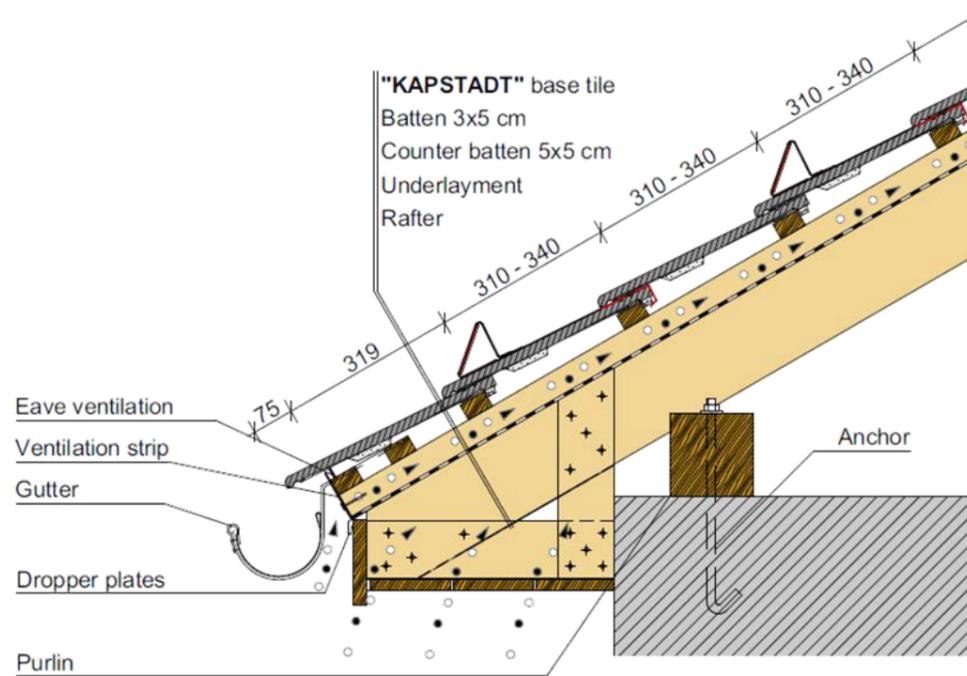
The structural widths below are calculated with 1-1 cm gap between the side plate of the verge tiles and the verge board.



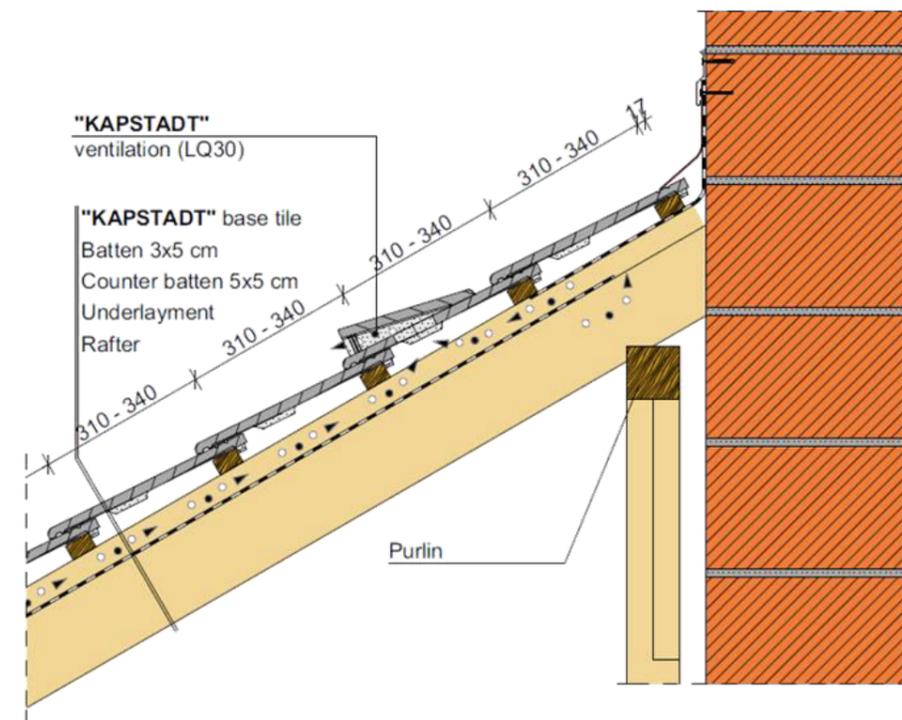
Eave detail



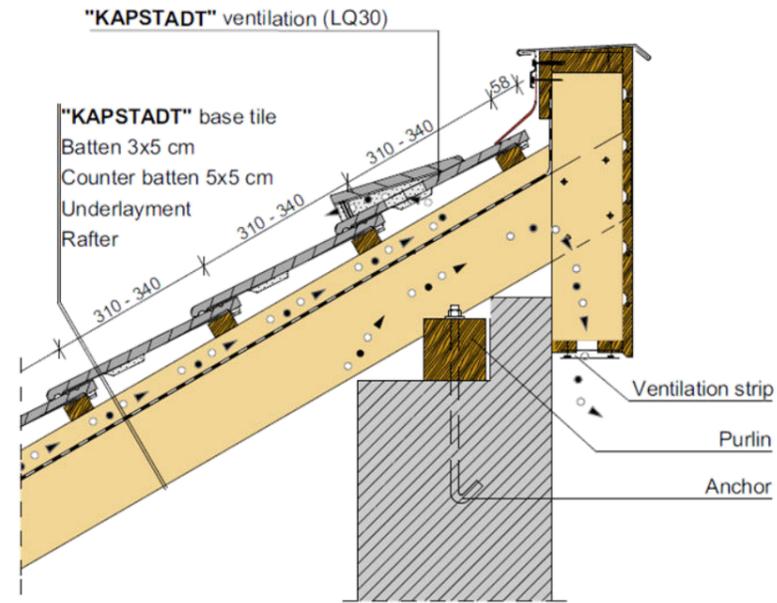
Ridge detail with ventilation tile



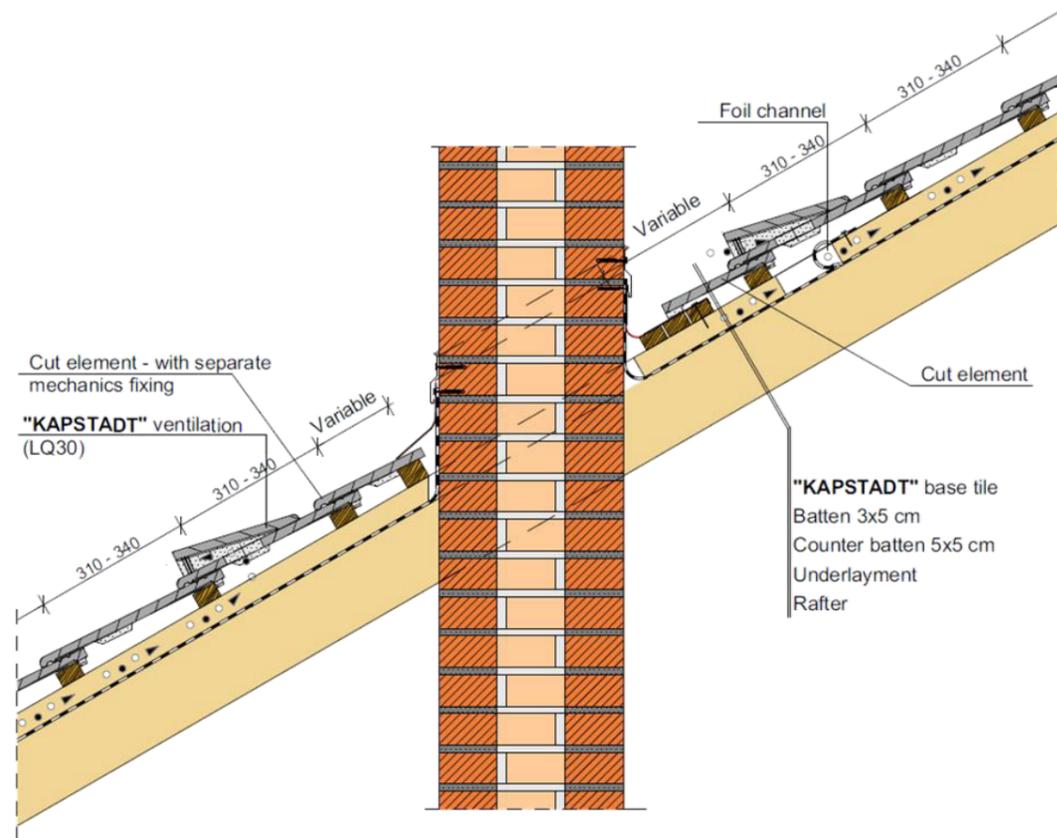
Closed eave detail



Wall connection detail



Shed roof ridge detail



Chimney connection detail



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