

CEMBRIT

Roofing - Slates

Installation manual

Index

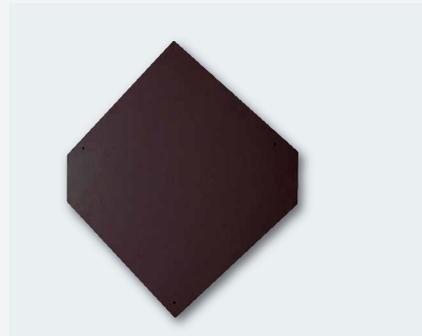
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CEMBRIT



...it is so
easy



FIBRECEMENT
ROOFING
SYSTEMS

Low weight

- suitable for wooden constructions, new build and also refurbishment

Colour stability

- new UV stable colour

Detailed description of installation procedures

- installation procedures available on www.cembrit.cz



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Cembrit Diamond 40/40, Cembrit Quadra oblong 60/30, Rhombus, Rhombus Shablone, Cembrit Quadra - Beaver, Dolmen and Bravan contain cement, cellulose and polymer fibres. They are used for cladding housing and industrial buildings and for roofs and walls. The products have special surface-layers, based on three stages colouring. The first layer is cement slurry spray with pigment content. After curing a transparent coating applied to both sides. The face is then sprayed with acrylic paint, which ensures a perfect surface finish. The rear is waxed. The hard, abrasion proof, durable surface resists all climatic impacts and moss. Betternit slates have smooth surface. Dominant slates have rustic surface. Strengthened Horal slates are designed for higher locations for climatic areas K3. Dolmen and Bravan have special designed dressed edges.

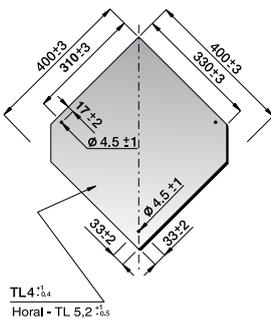
Technical parameters of products

Technical parameters chart	Characteristic	Standard
Storage moisture level	6 - 14 %	
Thermal conductivity	0,3 - 0,4 W/mK	
Water impermeability	without droplets	EN 492
Acidity	pH 10 -12	
Reaction to fire	A1	EN 13501 - 1
Frost resistance	RL= min. 0,75 (100 cykles)	EN 492
Absorption capacity (average)	15%	
Weight (average)	Diamond- 1,33 kg/ks, Quadra 50/25 - 1,04 kg/ks Diamond (Horal) - 1,73 kg/ks, Oblong (Horal) -1,69 kg/ks, Beaver, Dolmen - 0,79 kg/ks, Rhombus - 1,9 kg/ks, Rhombus slate 1,75 kg/ks	
Volume weight (average)	1,85 g/cm ²	EN 492
Bending moment (min)	50 Nm/m	EN 492, class. B
Breaking strength in pull under bending (average)	20 N/mm ²	
Material composition	Organic fibres, cement, mineral fillers agents	

Cembrit Diamond, Cembrit Quadra, Rhombus, Rhombus Shablone, Cembrit Quadra-Beaver, Dolmen and Bravan comprise cement, silicon additives reinforced with organic fibres. They are used for roofing of housing, municipal, agriculture and industrial buildings. Coloured products can show shade variation from samples, or reproduction printed materials. The roofing slates have been awarded: The European Statement of consistency No. CCZ/EC/05/2007 - fibre cement boards. Cembrit slates hold an Environmental Product Declaration EPD-CEM-2012211-E according to ISO 14025.

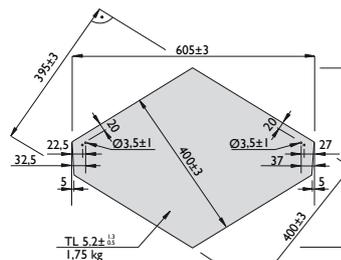
Cembrit Diamond 40/40

S Slates - smooth surface,
T Slates - rustic surface,
H Slates - Horal (K3)



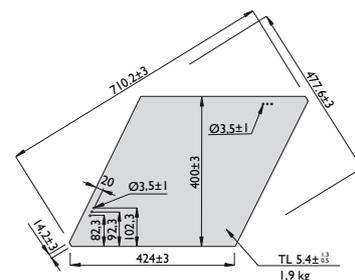
Rhombus Shablone 40/44

S Slates - smooth surface



Rhombus 40/44

S Slates - smooth surface

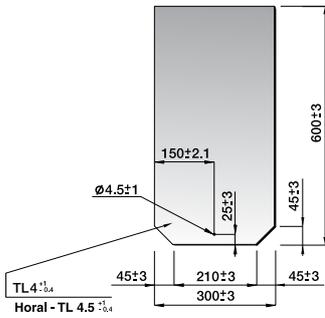




I. Product range

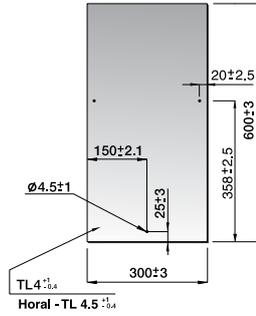
Cembrit Quadra - Danish oblong 60/30

S Slates - smooth surface,
T Slates - rustic surface,
H Slates - Horal (K3)



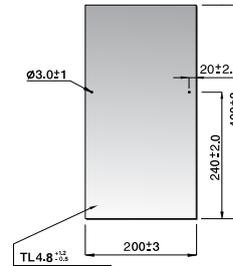
Cembrit Quadra - English oblong 60/30

S Slates - smooth surface,
H Slates - Horal (K3)



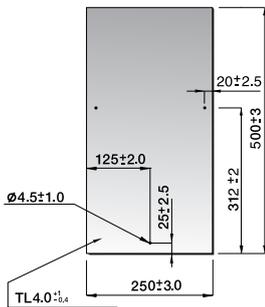
Cembrit Quadra 40/20

S Slates - smooth surface



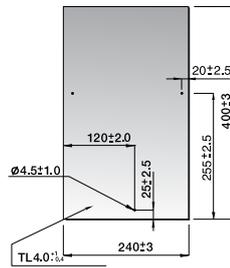
Cembrit Quadra - 50/25

S Slates - smooth surface



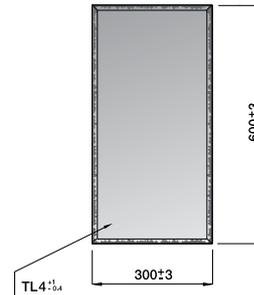
Cembrit Quadra - 40/24

S Slates - smooth surface



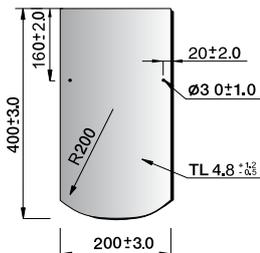
Bravan - 60/30

S Slates - smooth surface,
T Slates - rustic surface



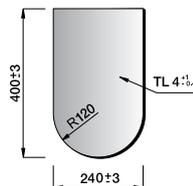
Cembrit Quadra - Beaver 40/20

S Slates - smooth surface



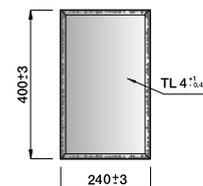
Cembrit Quadra - Beaver 40/24

S Slates - smooth surface



Dolmen - 40/24

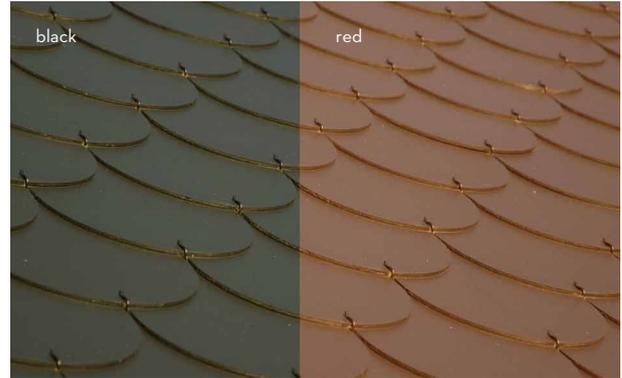
S Slates - smooth surface,
T Slates - rustic surface



Cembrit Diamond 40/40



Cembrit Quadra - Beaver 40/20



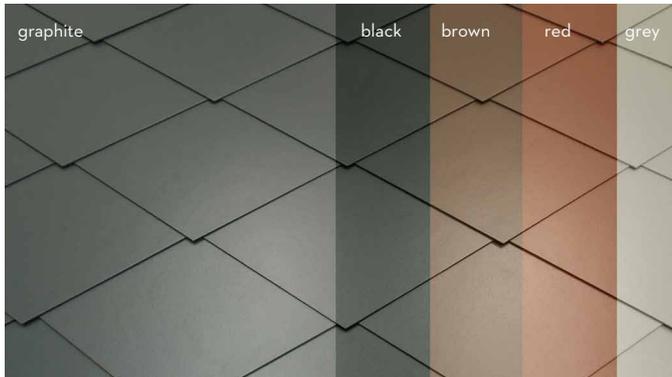
Cembrit Quadra - Danish oblong 60/30



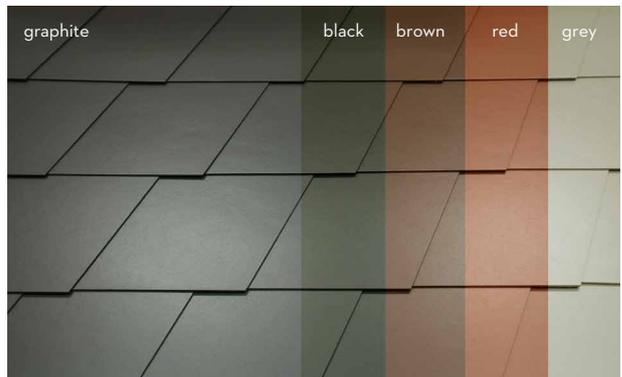
Cembrit Quadra - English oblong 60/30



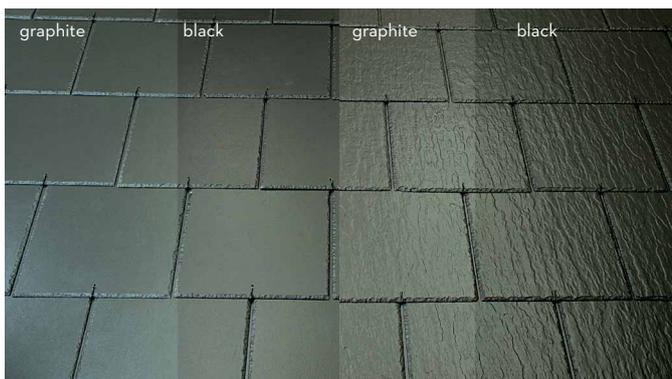
Rhombus Shablone 40/44



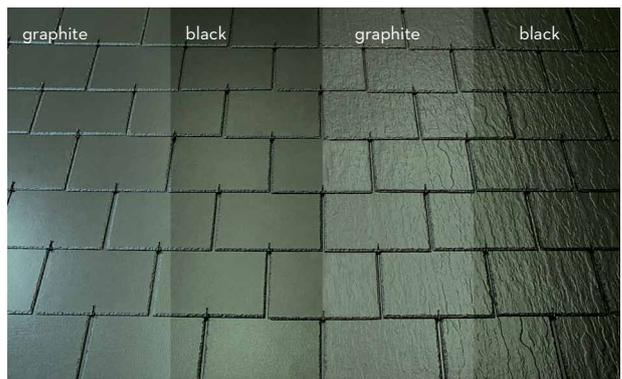
Rhombus 40/44



Bravan - 60/30



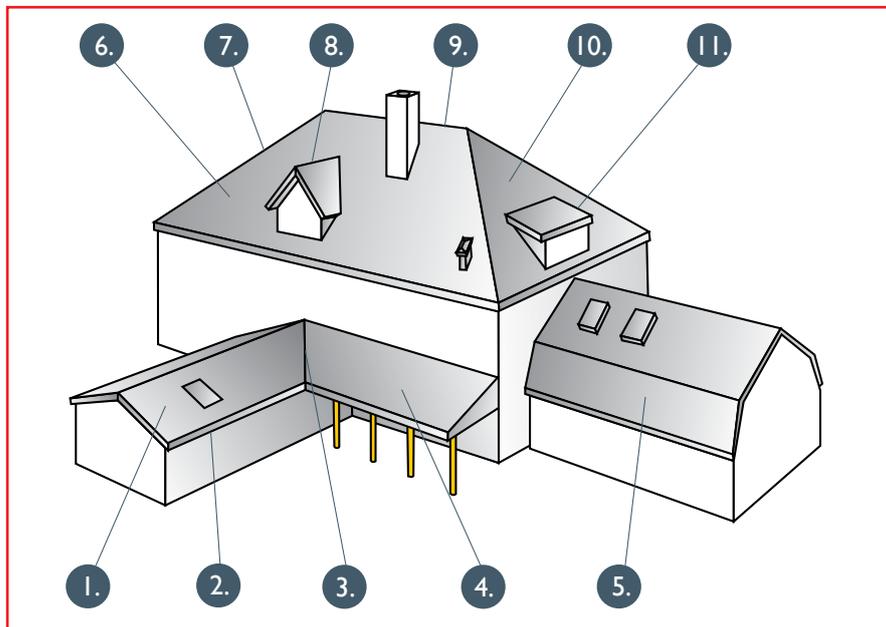
Dolmen - 40/24





2. Mandatory installation requirements

2.1 Legislative requirements



1. Duopitch
2. Eave
3. Valley
4. Monopitch roof
5. Mansard roof
6. Hip roof
7. Hip
8. Dormer
9. Ridge
10. Hipped end
11. Flat rooted dormer

This installation manual includes basic rules for handling of all roofing materials. It incorporates installation instructions and will be the prime document in the event of disputes.

The technical information reflects the companies current experience and latest specification. The roof construction must be in accordance with local building regulations and roofing practise. The individual site expose and conditions must be considered when designing the roof.

- Minimum pitch must comply with recommendations and local building regulations.
- Roof slates are installed on battens 30 × 50 mm or 40 × 60 mm.
- The roof construction must be designed with regard to local environmental factors as to full fill its primary roofing function. Consideration must be taken of: latitude, relative degree of humidity, rain intensity and wind, snow, ice and frost charge.
- Slates are easy to process to required shape and it is possible to create custom-type shapes of roofs.
- Slates are very light, weight 13,4-19,5 kg/m², which enables reduced structural members within compared with clay. When refurbishing older roofs, it is not necessary to renovate frames. Every roof construction must be reviewed according to local legislative requirements

(Euro code 1: Load of constructions).

- The space below the slates must have a ventilated air path from eave to ridge.
- When installing the slates it is necessary to follow safety procedures which are crucial for construction workers. The installation of slates is performed from scaffolding. The roofing works supplier is bound to ensure all safety procedures during the work according to local legislative requirements.
- Restraints for tools and maintenance equipment must be designed for inclined and steep roofs.
- Snow catch systems must be placed on roofs to protect pedestrians and eaves where required by regulation or good practise.
- Built-up sheets in general are not leak-proof against powder snow, dust and wa-

ter taking effect of hydrostatic pressure; therefore it is recommended that an impermeable membrane is incorporated in the design.

- When preparing the complete solution of the roof the designer or contractor must consider local conditions, function of surrounding buildings, traffic safety around the building (snow fall from the roof) and exposure of the roof according to the local climatic conditions.

2.2 Climate zones

The headlap is changed according to installation method, slates format and angle of roof pitch. These factors depend on climate zone. Climate zone is defined by snow area and latitude. Exact information are stated in snow loading factors in local standards.

Local standards take precedence over the requirements of the installation instructions. In disagreements please contact Cembrit representative.

Climate zones		
	Snow area - load kN/m ²	Latitude
Climate zones K1	< 1,5	up to 400 m a.s.l.
Climate zones K2	1,5 - 2,5	up to 600 m a.s.l.
Climate zones K3	2,5 - 4,0	up to 900 m a.s.l.
☎ For buildings in snow areas > 4,0 kN/m ² please to consult our representative!		

Chart headlap		headlap (mm)/ spacing batten (mm)					
	Roof pitch (°) from- -to	Diamond 40×40 cm 	Beaver, Dolmen 40×24 cm 	Oblong 60×30 cm 	Bravan 60×30 cm 	Rhombus 40×44 cm 	Rhombus Shablone 40×44 cm 
Climate zone K1	18°-24°			150/225	150/225		
	25°-29°			120/240	120/240	100/295	90/174
	30°-39°		120/140			100/295	90/174
	40°-45°	85/210	100/150	100/250	100/250	90/305	80/186
Climate zone K2	45°-more					80/315	
	25°-29°			150/225 ○	150/225 ○		
	30°-39°	85/210 ○	120/140	120/240 ○	120/240 ○	100/295 ○	90/174 ○
	40°-45°		120/140			90/305 ○	80/186 ○
Climate zone K3	45°-more	85/210 ○	100/140	100/250 ○	100/250 ○	80/315 ○	80/186 ○
	30°-39°			150/225 ○	150/225 ○		
	40°-45°			120/240 ○	120/240 ○	100/295 ○	90/174 ○
	45°-more	85/210 ○		100/250 ○	100/250 ○	90/305 ○	90/174 ○

○ Due to construction loading it is necessary to use 40×60 mm battens (rafter spacing 1 m). In climate zone K3 it is necessary to use Cembrit Diamond Horal.

Safe roof pitch - minimum level is set by local legislative requirements.

Higher requirement for impermeability of under-roof space.

It is prohibited to install slates at these pitches in given climate zones.

☎ Ask for consultation with Cembrit representative.



2. Mandatory installation requirements

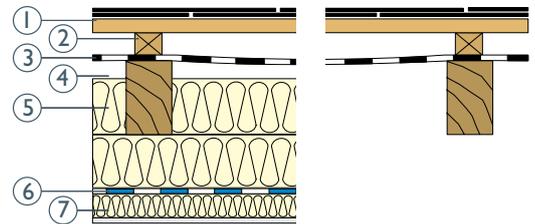
2.3 Composition of pitched roof - permeability of roofing underlay

Three layer roof

protective impermeable membrane without contact with decking or slates loosely fastened with above and below membrane

1. battens
2. counter battens
3. protective hydro-insulation
4. air space
5. thermo insulation
6. vapour control membrane
7. thermo insulation

PHI 1



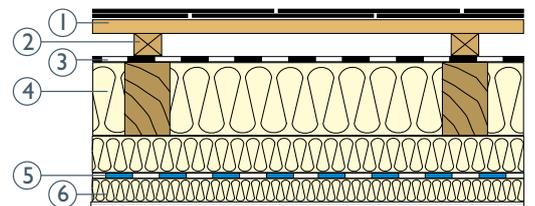
Less costly solution, which can be used for simple valley roofs with steeper roof pitches.

Two layer roof

protective contact impermeable membrane on thermo insulation with ventilation above protective vapour permeable membrane

1. battens
2. counter battens
3. protective vapor permeable membrane (PHI 2.grade, class A - protective foil, class C - protective foil welded-glued)
4. thermo insulation
5. vapour control membrane
6. thermo insulation

PHI 2



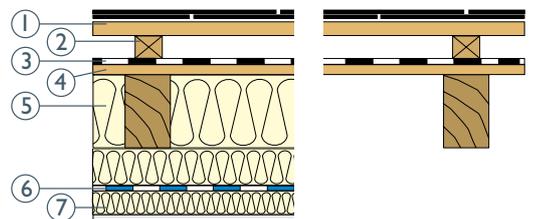
Economic solution of roof frame, with medium impermeability of roof frame.

Two layer roof

protective contact impermeable membrane decking with ventilation above impermeable membrane

1. battens
2. counter battens
3. protective hydro-insulation diffusively opened (PHI 2.grade, class A - protective foil, free overhang)
4. decking
5. thermo insulation
6. vapour control membrane
7. thermo insulation

PHI 2



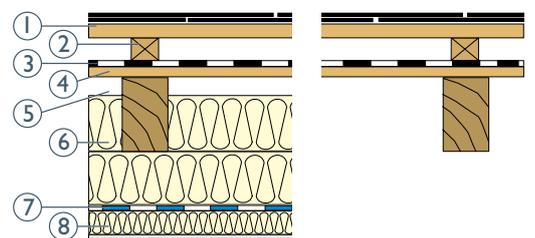
It is possible to use this solution when refurbishing boarded roofs. It is applicable for low pitched of roofs.

Three layer roof

protective contact impermeable membrane on decking with ventilation above and below membrane

1. battens
2. counter battens
3. protective impermeable membrane (PHI 2.grade, class A - protective foil, free overhang) (PHI 3.grade, class A - bitumen belt under contra-lathes on decking)
4. decking
5. air space
6. thermo insulation
7. vapour control membrane
8. thermo insulation

PHI 2
PHI 3



It is possible to use even materials which are not sufficiently diffusively opened with this solution.

Notes: PHI - protective impermeable membrane.

Designer or contractor must take into consideration local climatic conditions when preparing the complete roof solution. The roof construction must be in accordance with local rules and legislation for design of roofs, especially requirements for impermeability of protective membrane.

Increased requirement for impermeability of membranes can be due to: roof slope being below minimum recommended pitch, construction and division of roof, use of attic, local climatic conditions, placing of snow protection system on roof shape (folded ridge, arch hatch, etc.)

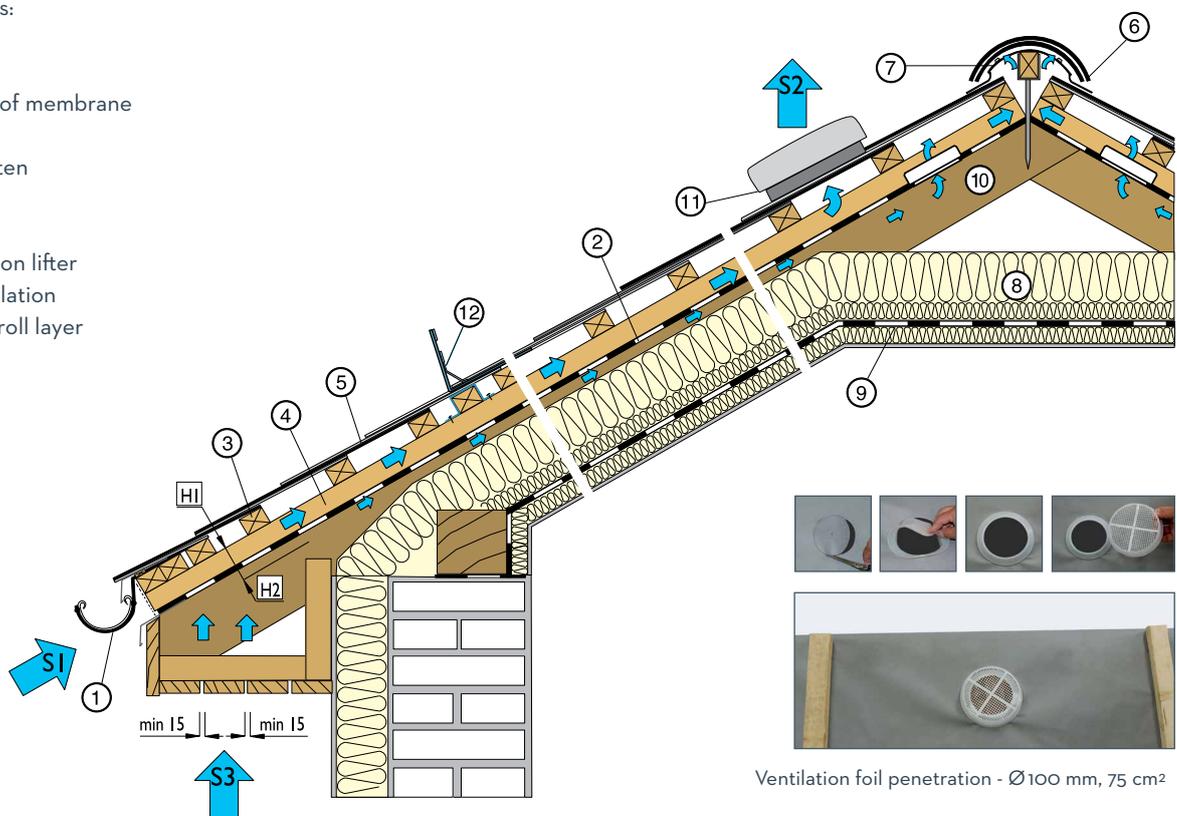
2.4 Roof ventilation

Why ventilate the roof ...

It is necessary to prevent the condensation of water vapour (dew) on the rear slates through ventilation roofing sheets by airing to ensure the right function of roof frame. Especially in buildings with warm roof spaces it is crucial to design the roofs as fully ventilated. This is achieved by air circulation caused by the temperature different at eaves and ridge. It is necessary to correctly specify the ventilation opening at eaves. This must be verified by thermo technical calculation according to local legislative requirements -Thermal protection of buildings.

Bill of materials:

1. eaves gutter
2. weather proof membrane
3. batten
4. counter batten
5. roof slate
6. ridge
7. ridge ventilation lifter
8. thermal insulation
9. vapour controll layer
10. rafter
11. cowl vent
12. snow stop



Ventilation foil penetration - Ø100 mm, 75 cm²

Protective impermeable membrane

Foil preventing penetration of air vapour from under roof space into thermo insulation layers (protective impermeable membrane) must always be placed above thermo insulation material and in outside position towards the dew point spot. This enables penetration of possible dampness from thermo-insulation area to air space. The section "Layers of roof frame" describes the basic variants of protective hydro-insulation used in roofs. If non contact foil, is used ventilation must be provided

above and under foil.

Foil touch the thermal insulation and must be cut about 50 mm from the roof ridge. If the space under protective insulation is not ventilated (two layers pitched roof), vapour permeable membrane must be used, membranes with a thickness less than 0,3 mm are recommended. These materials can rest on thermo-insulation materials, or can be freely hung between rafters.

Vapour permeable membranes materials

must be always used in two layer pitched roofs. The space below membrane and at roof ridge must be ventilated, this can be reached by cutting of the foil about 55 mm or we can use ventilation foil penetration. These ventilation penetrations can be used also around roof windows.

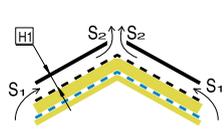
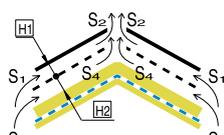


2. Mandatory installation requirements

2.5 Roof ventilation recommendation

The roof construction must be in accordance with local practise and regulations for design of roofs.

The chart specifies eave inlet and ridge outlet apertures and clear airpath depth on roofs with a rafter length up to 10 m. For roofs with longer rafter length the airpath depth is increased by 10% of the value of smallest depth corresponding to the roof pitch. Accepted minimum thickness of clear airpath for roofs with the rafters up to 6 m with roof pitch > 25° is 40 mm (*). When designing roof ventilation we must count with the reduction of entrance and exit hole according to the percentage of penetration of used grid.

Roof ventilation					
type of roof	air-space	roof pitch (°)	depth of clear airpath H_i (mm)	ventilation holes	
				eave, valley - S_1	ridge, hip - S_2
two layer roof  with vapour permeable membrane	upper air-space H_1	18°-24°	60	$S_1 > 1/200$	$S_2 > 1/400$
		25°-45°	50 (40*)	$S_1 > 1/300$	$S_2 > 1/600$
		>45°	50 (40*)	$S_1 > 1/400$	$S_2 > 1/800$
three layer roof  with vapour impermeable membrane	upper air-space H_1	18°-24°	60	$S_1 > 1/200$	$S_2 > 1/400$
		25°-45°	50 (40*)	$S_1 > 1/300$	$S_2 > 1/600$
		>45°	50 (40*)	$S_1 > 1/400$	$S_2 > 1/800$
	lower air-space H_2	18°-24°	40	$S_3 > 1/200$	$S_4 > 1/400$
		25°-45°	30	$S_3 > 1/300$	$S_4 > 1/600$
		>45°	20	$S_3 > 1/400$	$S_4 > 1/800$



Ventilation of roof frame by combination of ridge ventilation and cowl vents.



The size of exit hole with ridge ventilation is 100 cm² /m. Air space is 1 cm/m.



The size of Oriko cowl ventilation aperture is 100 cm² /1pc.



Ventilation of roof frame with plastic ventilation terminals.



The size in exit hole of plastic cow ventilation apertures is 200 cm² /1pc.



Ventilation of roof frame is by raised roof ridge.

3.1 Cembrit Diamond 40/40

3.1.1 Installation regulations

Cembrit Diamond 40/40 is installed horizontally. Batten spacing for Cembrit Diamond is 210 mm. When installing on battens the apex of the slate is level with the top edge of the batten. Cembrit Diamond is nailed to battens 30x50 mm or 40x60 mm, further on it is fastened with a storm anchor. Each slate is fastened with two nails and one rivet. There must be a 4 mm gap between each slate to place the rivet. The rivet must be bent down the roof slope. Head lap of Cembrit Dia-

mond at apex must be 18 - 23 mm. Slates are installed perpendicular to the eaves ridge line and from right to left (left to right). Cutting slates must be done by special hand or lever shears for fibre cement material cutting. We don't recommend the use of knives to cut slates, as straight cut cannot be achieved. We also don't recommend the use of angle grinders for cutting (the dust stays permanently in the surface colour of the slate). Slates overhang the eave from 1/3 to 1/2 of the gutter. It is nec-

essary to round the slate edge at the leeward lath, penetration edging, etc. in order part in such way, that the water runs to roof space. Part of the slate which is bigger than half of the whole slate is fastened by clip. Battens for Cembrit Diamond must be concentrated at roof edging, hip ridge, valley, chimney and penetrations.

The apex of the slate is aligned with the top edge of the batten, nail holes align with the centre of the previous batten.

The slate is fastened by two nails into the middle of the batten. Nails pass by the slate of previous row, the space around the hole is thus supported.

Before the slate is nailed, the rivet is pushed between the slates beneath. The slate is laid so the rivet shank protrudes through the rivet hole. The slate is then twice nailed. Finally the rivet on apex is bent downwards towards the roof decline.

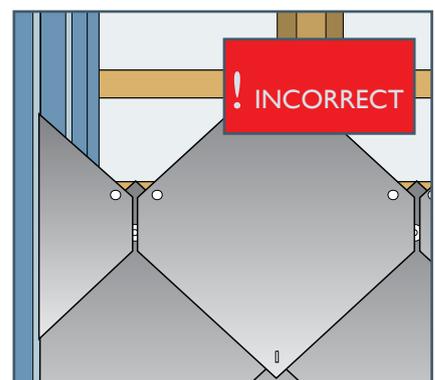
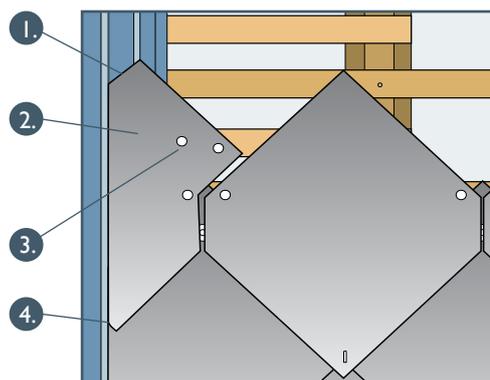
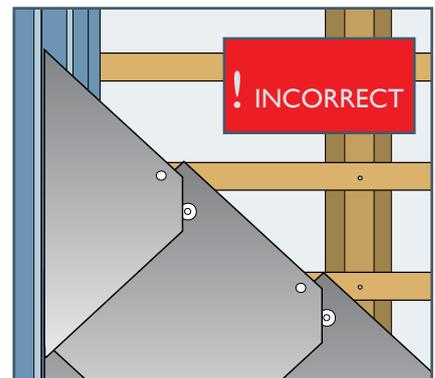
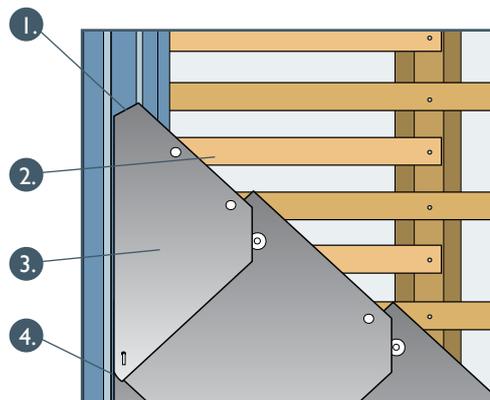
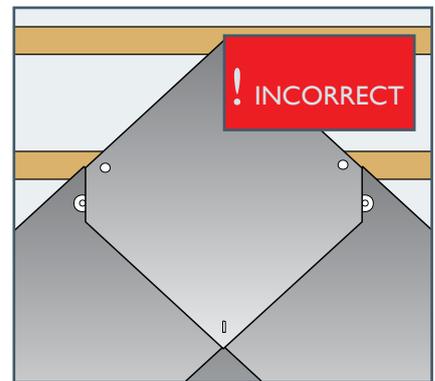
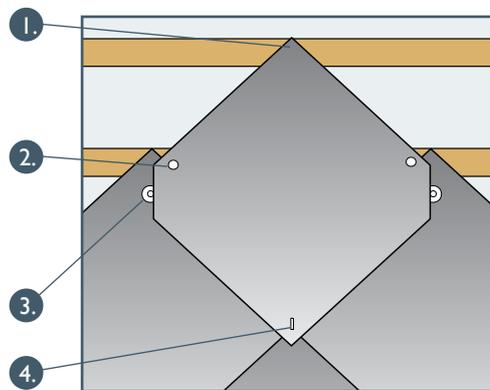
Slate cutting - the slate edge will carry the water away from under-roof space if there occurs blocking of plate edging by leaves or dust.

Use additional battens to safely fasten smaller pieces of slate.

Cut slates larger than half of the whole slate are fastened with a storm anchor.

The picture on the right shows a cut slate which is impossible to sufficiently fasten, therefore the slate cut to be as larger layer as a half of slate. All slates must be installed with 3 fixings.

Slate cutting - it is necessary to round the lower part of slate in such way, that the water runs to roof space.



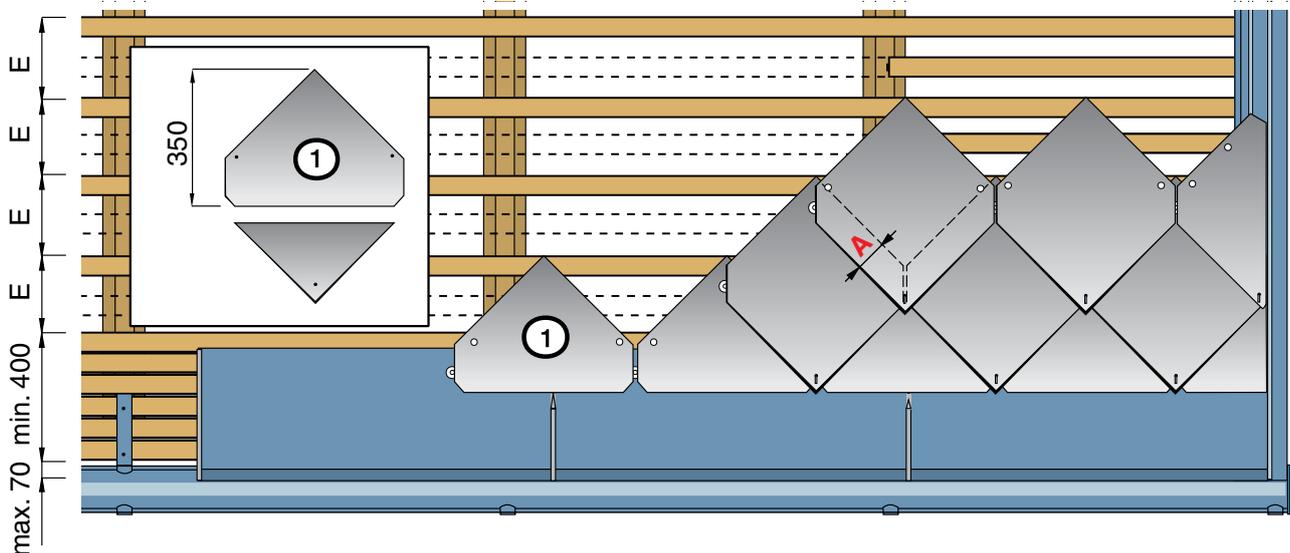


3. Installation of roof slates

3.1.2 Setting out Diamond 40/40 on eaves tray - for climate zones (K1, K2) K3

We recommend using an eaves tray in both climate zones (K1, K2), in zone K3 an eaves tray is compulsory.

It is also necessary to use thicker 5,2 mm slate Horal in climate zone K3. Use battens with higher load-bearing capacity (60 × 40 mm) to improve strength of subframe or you can concentrate on the whole roof area.

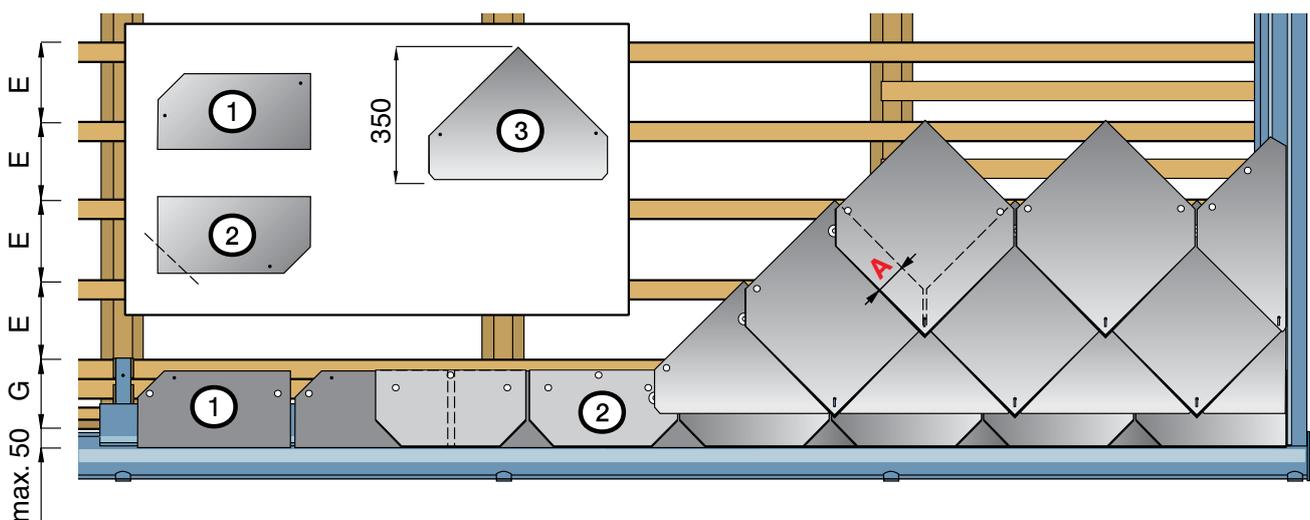


Cembrit Diamond 40/40 headlap, quantities

headlap - A mm	spacing - E mm	slates pcs/m ²	slates pcs/m ²	nails pcs/m ²	battens m/m ²
85	210	10,10	10,10	20,20	4,76

3.1.3 Setting out Diamond 40/40 under eave slate - for climate zones K1 and K2

This type of slate installation enables the slate overhang into the gutter of 50 mm. Water run off can be improved by an eaves tray which also supports the eaves courses. The under eaves course is half of slate No. 1, the second course is made from part of slate one corner is trimmed off. No. 2, the second course is fastened by three nails.

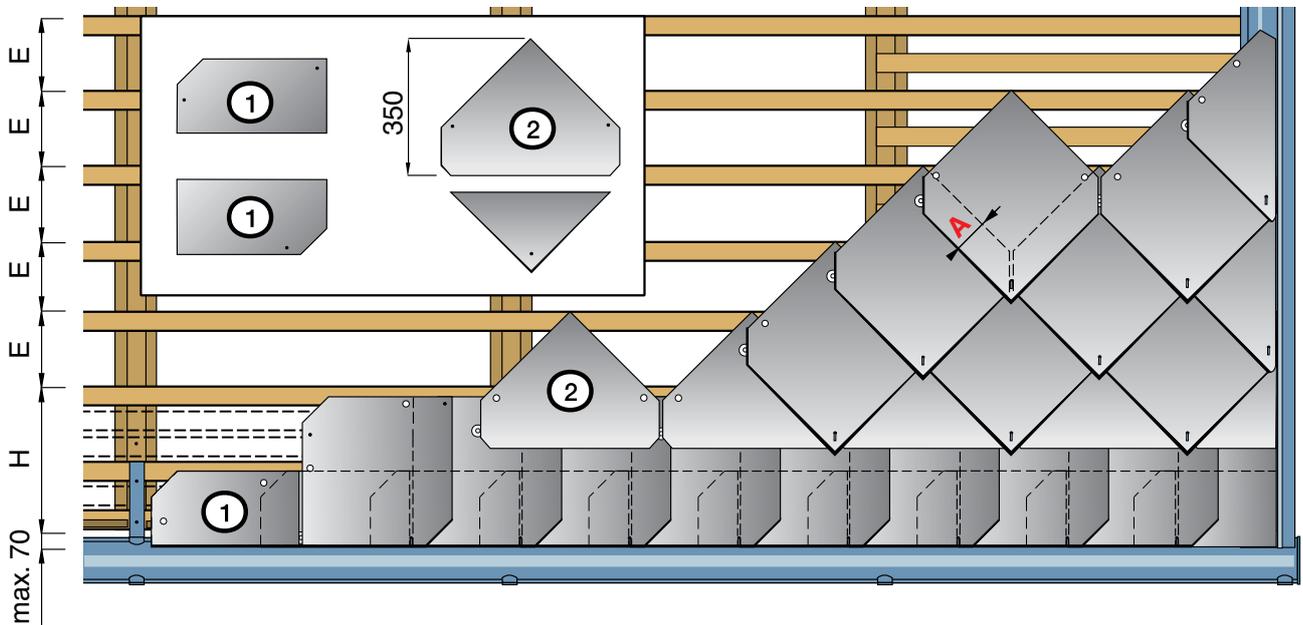


Cembrit Diamond 40/40 headlap, quantities

headlap - A mm	spacing - E mm	spacing - G mm	slates pcs/m ²	rivets pcs/m ²	nails pcs/m ²	battens m/m ²
85	210	175	10,10	10,10	20,20	4,76

3.1.4 Setting out Diamond 40/40 on supported eave - for climate zones K1, K2

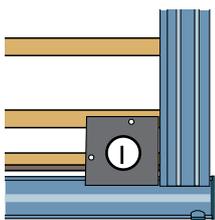
An alternative of installation method is support the eave with a full slate. In this method full and half slates are used. Rivets are supported and connects both courses.



Cembrit Diamond 40/40 headlap, quantities

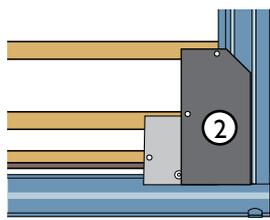
headlap - A mm	spacing - E mm	spacing - H mm	slates pcs/m ²	rivets pcs/m ²	nails pcs/m ²	battens m/m ²
85	210	340	10,10	10,10	20,20	4,76

3.1.5 Fixing sequence for supported eaves



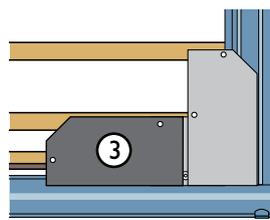
1.

Butt first cut slate to verge trim.



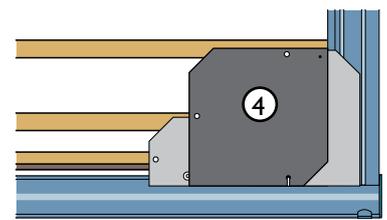
2.

The second cut slate is fastened with two nails. Rivet is pushed under the edge of this cut slate.



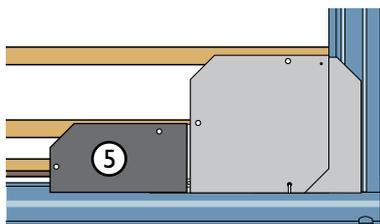
3.

Third cut slate is covers the rivet. The whole slate is set on prepared rivet.

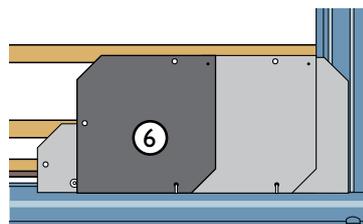


4.

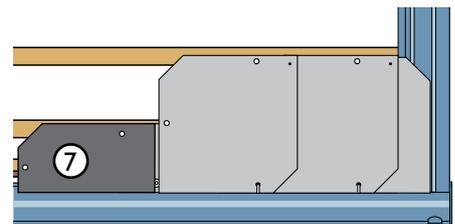
The first whole slate laid so the rivet protrudes through the rivet hole. Rivet for next course of slates is pushed under the edge



5. Repeat as in point 3.



6. Repeat as in point 4.



7. Repeated until the verge is reached.



3. Installation of roof slates

3.2 Cembrit Quadra - Danish and English oblong, Bravan 60/30

3.2.1 Installation regulations

Folded sheets are stronger and more durable when double installed than in simple covering. We recommend fixing Cembrit Quadra with hooks or with two nails and one rivet. The slates are twice nailed into timber battens 30 x 50 mm or 40 x 60 mm, the tail is rivet fastened. We recommend fixing Bravan only with hooks.

There must be a gap of 4 mm between each slate to accommodate the rivet. Rivets are bent down the roof slope rivet.

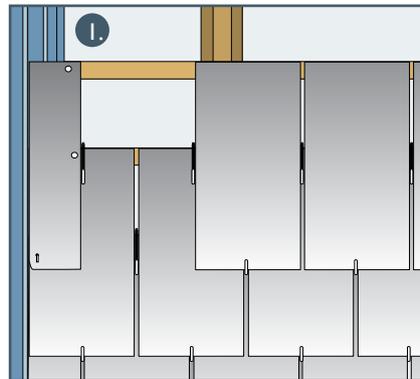
Cembrit Quadra - oblong and beaver can also be hook fixed. Hooks are intended for 30 mm, 40 mm thick battens. The hooks wrap over or are nailed to battens. Slates are installed in the perpendicular to the line from eaves to ridge from right to left (left to right). Cutting must be done with special hand or lever shears for fibre cement material cutting.

We don't recommend the use of knife to cut the slates, as a straight cut can not

be achieved. We also don't recommend the use of angle grinders (the dust stays permanently in the surface colour of the slate). Slates overhang the eaves from 1/3 to 1/2 of the gutter width. It is necessary to round the slate edge at the leeward lath, penetration edging, etc. in lower part in such way, that the water runs to roof space.

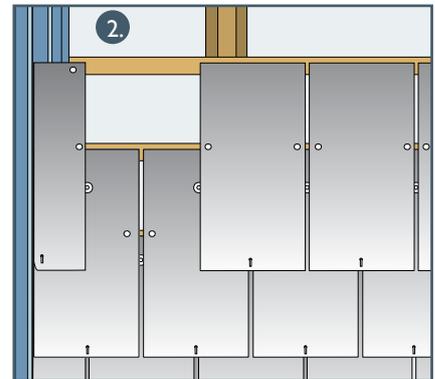
Left picture: hook fixing. This method is very easy and quick. Further more slates are not under stress in the event of the movement. Top edge of oblong is aligned together with the top edge of batten.

1.



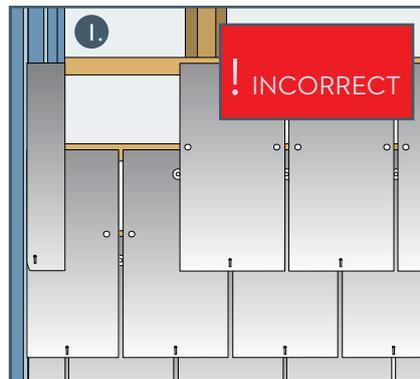
Right picture: the slate is fastened with two nails and one rivet. Cembrit Quadra is placed on battens in such way to allow a gap for rivets.

2.



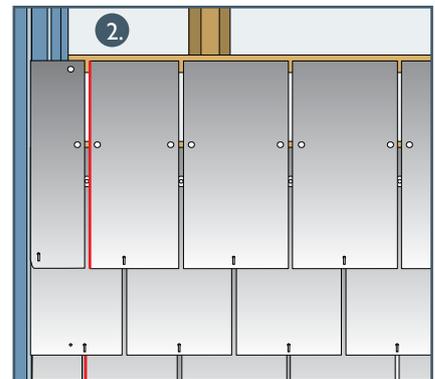
Left picture: the verge cut is impossible to sufficiently fasten - it is too narrow, it is not possible to use nails.

1.



Right picture: the width of the last verge cut is enlarged in such way that it is possible to fasten this piece sufficiently by two nails and one rivet.

2.

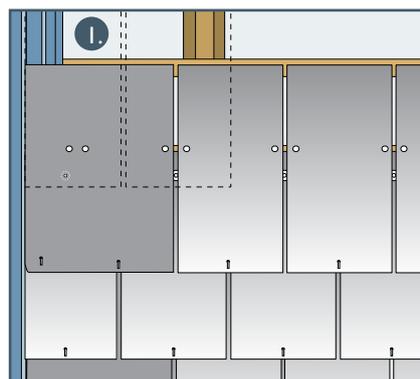


The width of the whole part of the slate which joins the last piece in course is accordingly reduced. (The cut is marked red).

In the next course above it is necessary to drill a new rivet hole.

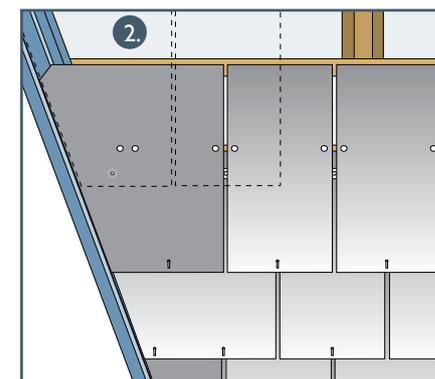
Left picture: The verge slate is created by quadrangle 600 x 600 mm, which is cut accordingly. This slate is fastened with three nails and two rivets.

1.



These quadrangles 600 x 600 mm can be used also for verges. They can be used for valleys, abutments and protrusions. This slate is fastened with three nails and two rivets.

2.

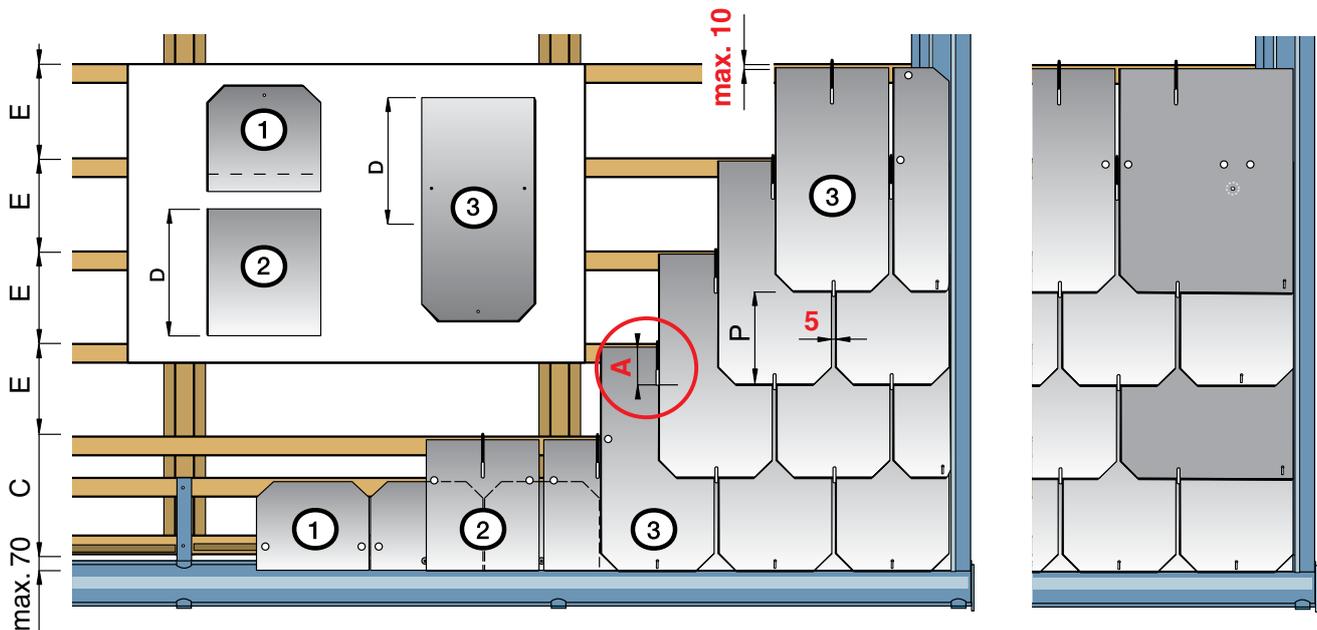
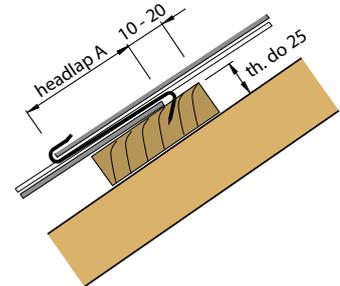
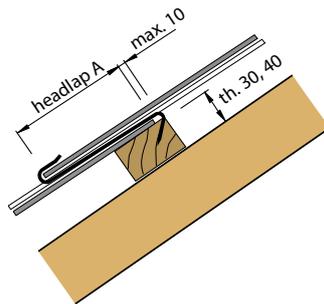
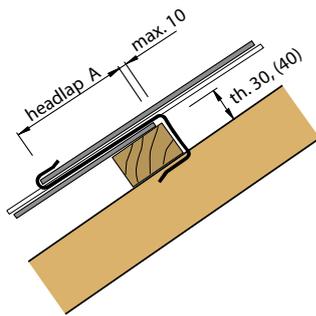


3.2.2 Cembrit Quadra - oblong, Bravan 60/30 installation on hooks

We recommend using hooks when installing durable lap slates. The installation is very easy and fast. Furthermore slates are not stressed in the event of thermal movement. Each slate is hung on one hook.

Wrap hooks are used for 30 mm and 40 mm battens. Nailed hooks are used in all other cases. It is necessary to combine 4/5 of wrap hooks with 1/5 nail hooks (eg. at the location of counter battens where it is not possible to install the hook, nail

hooks are used). The last picture shows wider battens with nail hooks, allowing greater tolerance on batten. Verge slates in the first course are fastened with nails and rivet.



Cembrit Quadra, Dolmen 60/30 on hooks headlap, quantities

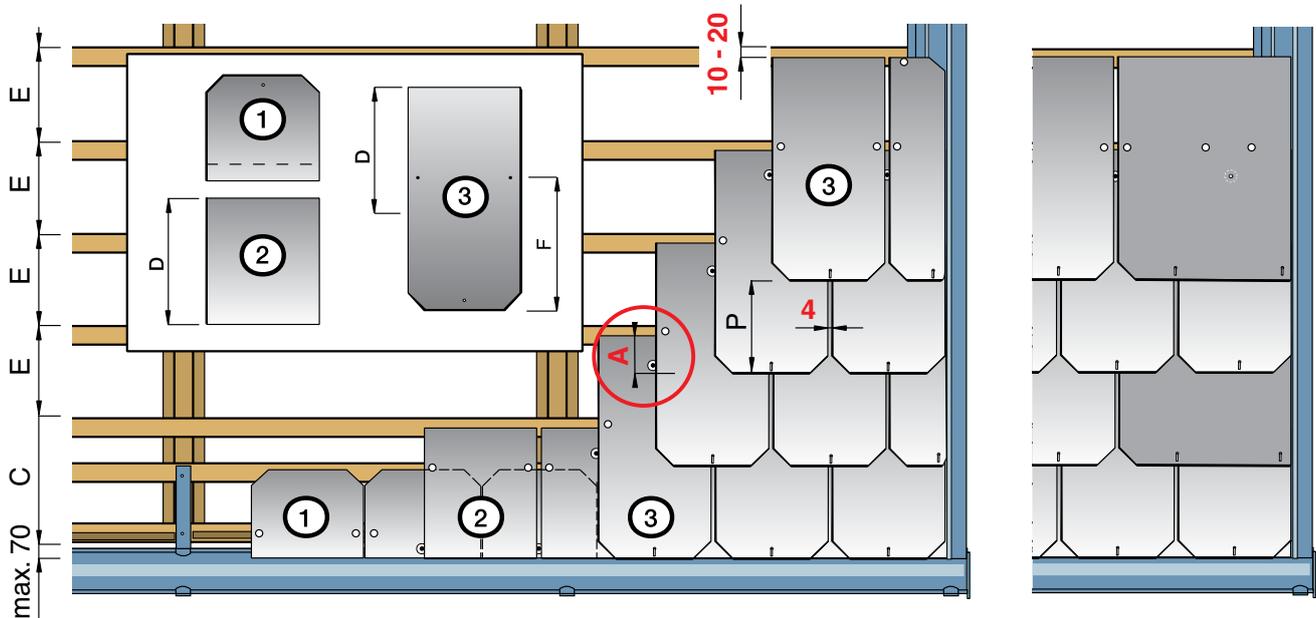
headlap A mm	spacing E=P mm	D mm	C mm	slates pcs/m ²	hooks pcs/m ²	battens m/m ²
100	250	350	295	13,11	13,11	4,00
120	240	360	305	13,66	13,66	4,16
150	225	375	320	14,57	14,57	4,44



3. Installation of roof slates

3.2.3 Cembrit Quadra - oblong 60/30 installation with nails and rivets

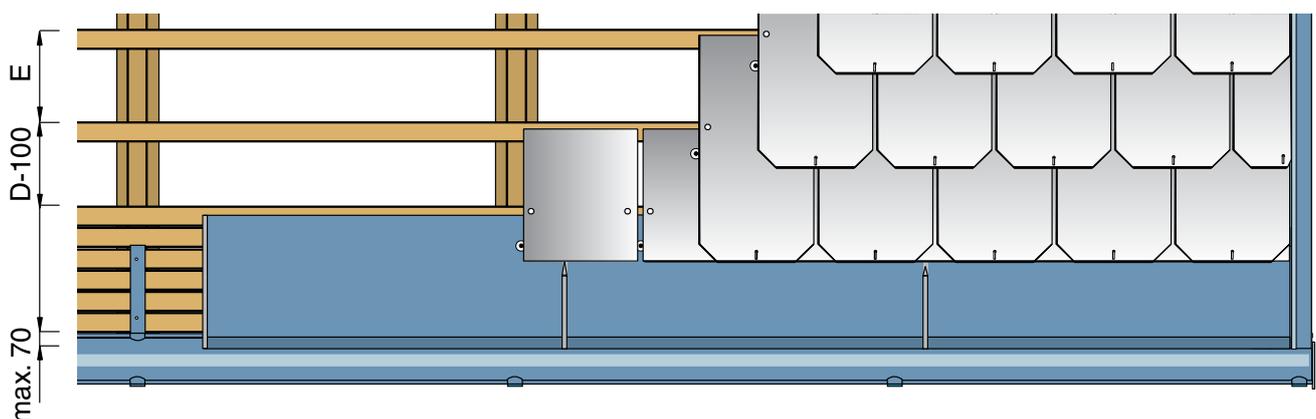
The Cembrit Quadra can be fastened with nails and rivets. The product is delivered with the rivet hole. Nail holes are located for a batten spacing of 250 mm. For other batten spacings nail holes must be drilled on site according to the table below. Each slate is fastened with two nails and one rivet. The picture shows the quadrangle 600 x 600 mm at the end of roof.



Cembrit Quadra 60/30 on nails and rivet headlap, quantities								
headlap A mm	spacing E=P mm	F mm	D mm	C mm	slates pcs/m ²	rivets pcs/m ²	nails pcs/m ²	battens m/m ²
100	250	358	350	295	13,11	13,11	26,22	4,00
120	240	370	360	305	13,66	13,66	27,32	4,16
150	225	385	375	320	14,57	14,57	29,14	4,44

3.2.4 Cembrit Quadra - Oblong 60/30 set on eaves tray

The Cembrit Quadra can be installed with eaves tray replacing the under eaves course. This method is especially suitable for climate zone K3. The roof edging is stronger with regard to possible freezing. In the climate zone K2 and K3, use 60 x 40 mm battens on 1m centred rafters. The width of the eaves tray is determined by local best practise.



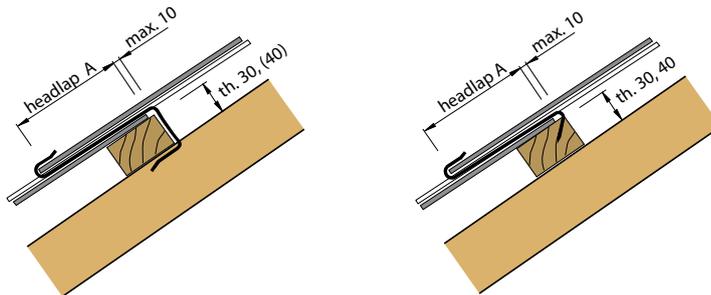
3.3 Cembrit Quadra - Beaver, Dolmen 40/24

3.3.1 Installation regulations

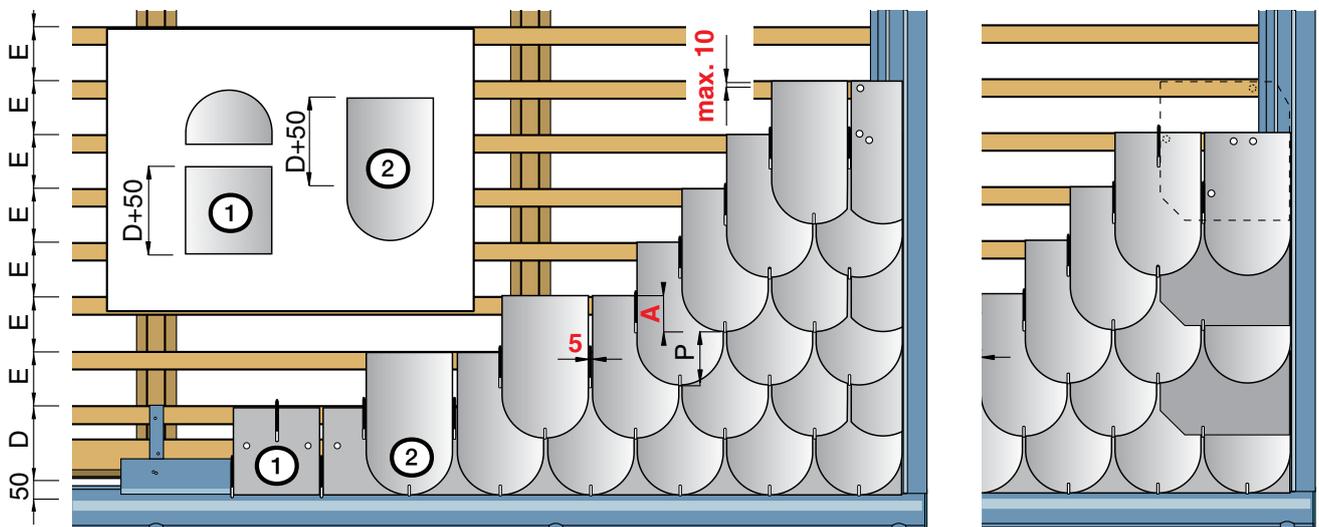
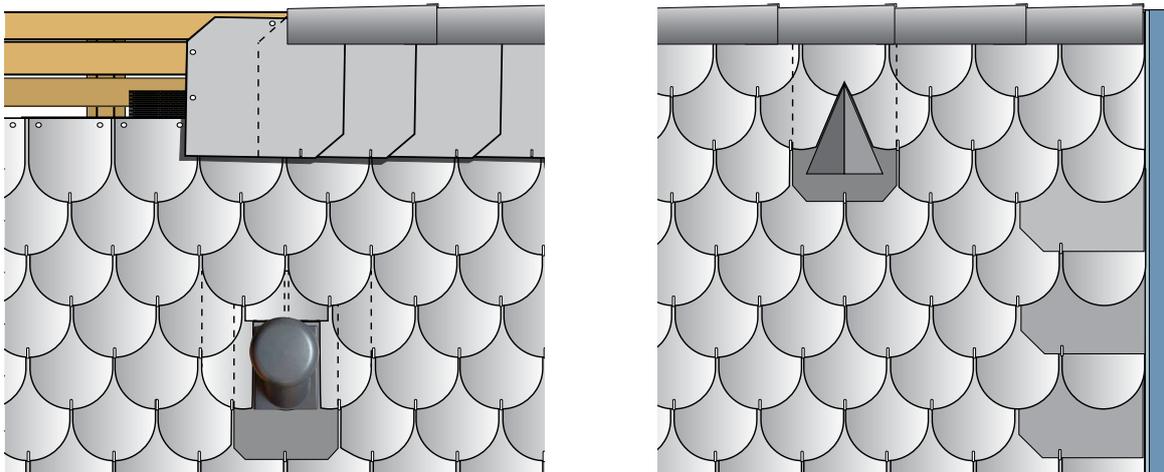
The slates are installed on 30 x 50 mm or 40 x 60 mm battens. The beaver is hook fixed on 30 mm, 40 mm thick battens. The hooks are wrapped or nailed to battens. It is necessary to combine 4/5 of wrap hooks with 1/5 of nail hooks (eg. at counter battens, where it is not possible to use wrap

hooks). Slates are installed perpendicular to the line from eave to ridge and from right to left (left to right). Trimming of slates (by cutting) must be done with special hand or lever shears for fibre cement material.

We don't recommend the use of knives to cut the sheets, the cut is not sufficiently straight. We also don't recommend the use of angle grinders for cutting (the dust stays permanently in the surface colour of the sheet). Drip edge of the slate overhang up to 1/3 to 1/2 of the drip channel.



3.3.2 Cembrit Quadra - beaver 40/24 installation on hooks



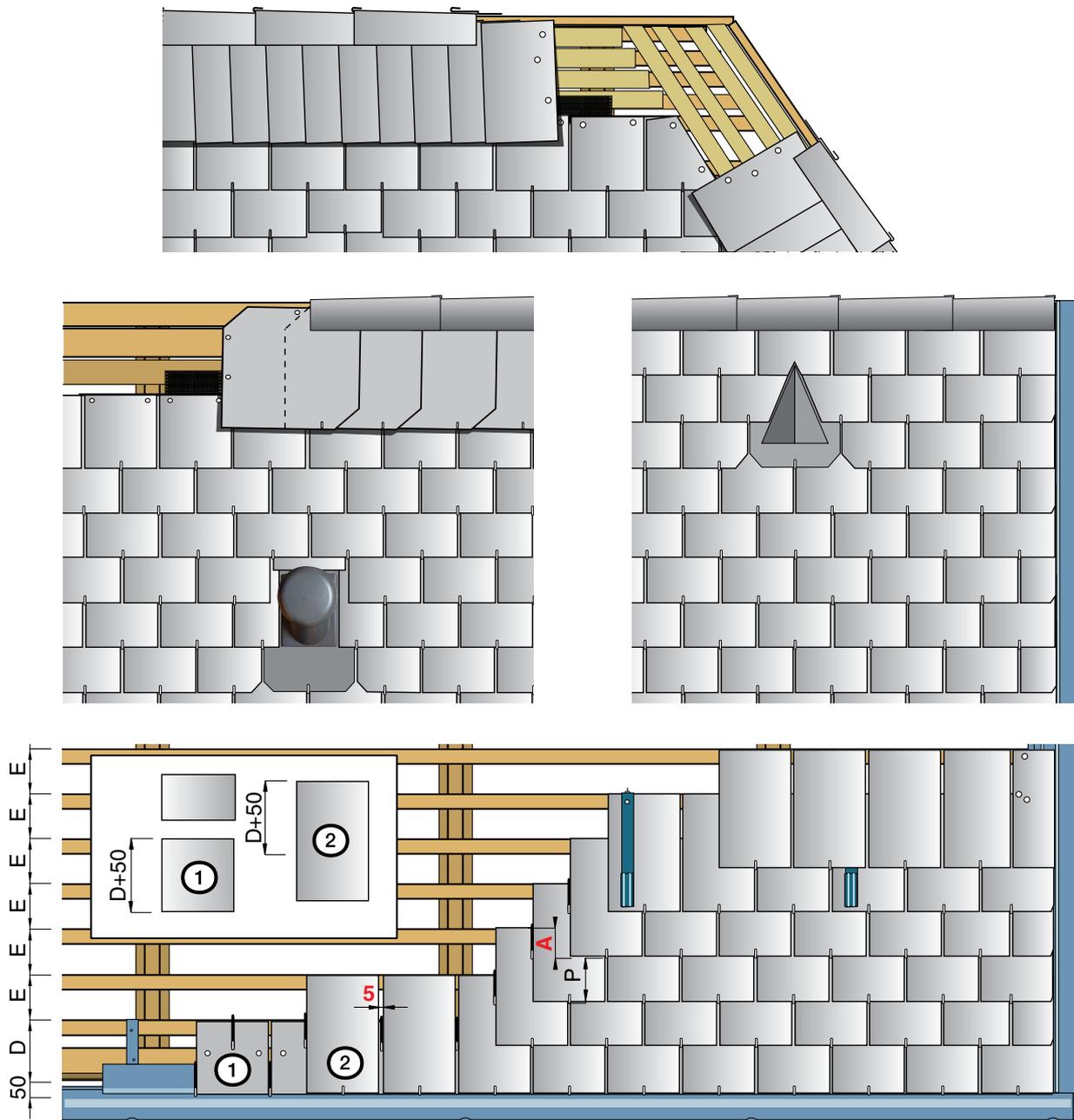


3. Installation of roof slates

It is necessary to use a narrow eaves tray for rain to run into gutter and to support the eaves slates. The under eaves course end verge slates are nailed. Slates are fixed onto 30 mm battens. Cut slates must be fixed with at least one hook. Wrap hooks are used on 30 mm, 40 mm battens. Nailed hooks are used in all other cases. It is necessary to combine 4/5 of wrap hooks with 1/5 of nail hooks (eg. it is possible to use wrap hooks where battens and counterbattens interact). The diagram shows usage of 400 x 400 mm at the verge.

Cembrit Quadra - Beaver, Dolmen 40/24 on hooks sheet overhang, consumption					
headlap A mm	margin E=P mm	spacing D mm	beavers pcs/m ²	hooks pcs/m ²	battens m/m ²
100	150	200	27,10	27,10	6,67
120	140	210	29,04	29,04	7,15

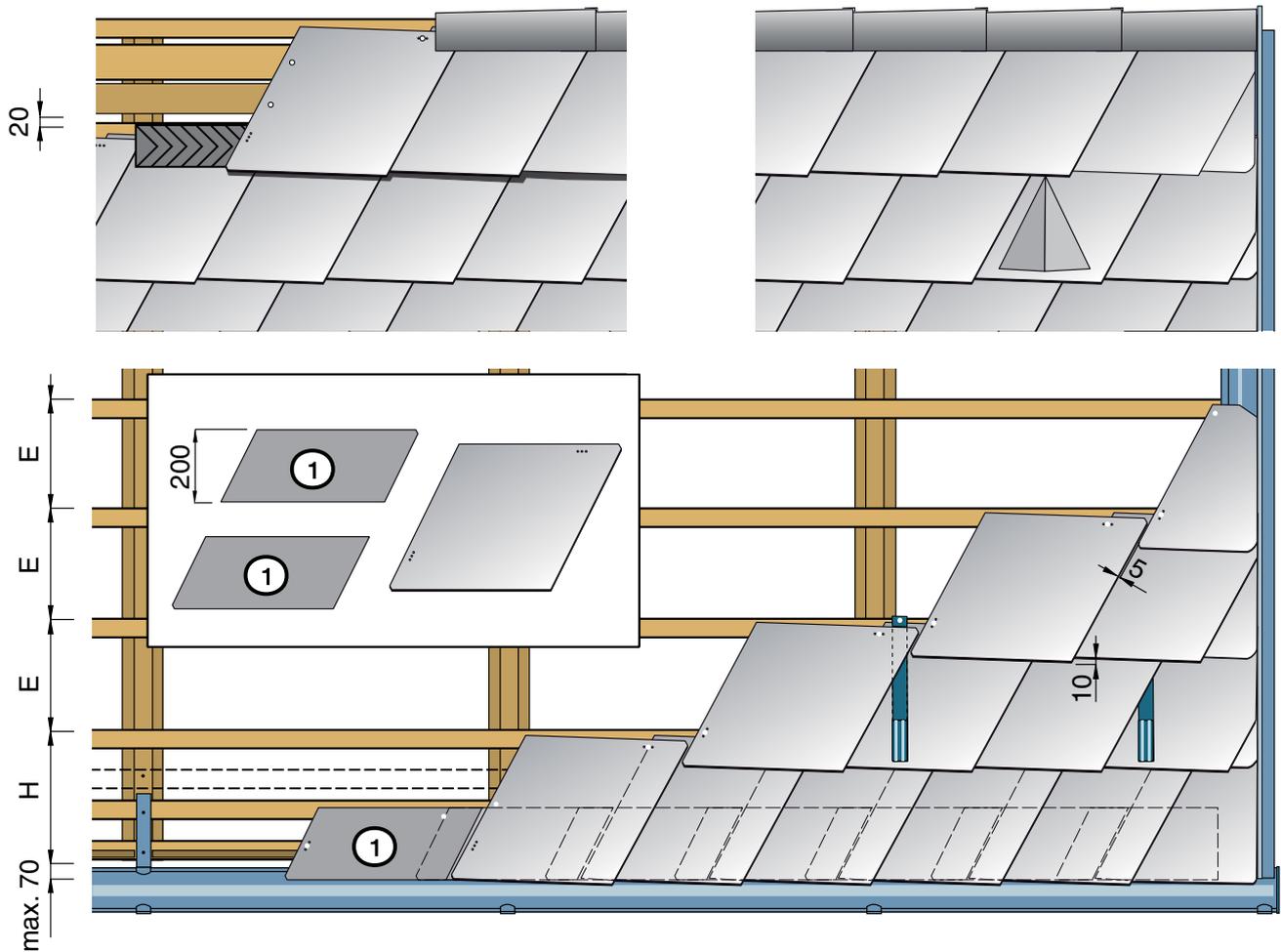
3.3.3 Dolmen 40/24 - installation on hooks



3.4 Rhombus 40/44

3.4.1 Rhombus 40/44

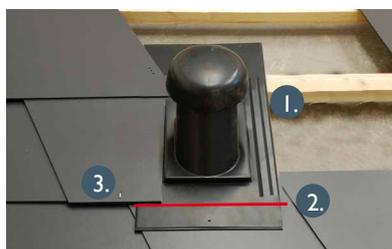
Slates are laid with the side dropped slightly so that the top edge fits to allow a run off. Slates are twice nailed with minimum 37 mm long nails (thickness of Rhombus is 5 mm). Oriko ventilation terminal and universal slate are made in the shape of Rhombus slates to cover from right to left. Other accessories can be the same as those used and designed for English oblong (ventilation penetration SL, antennae penetration).



Rhombus 40/44 hedlap, quantities

headlap - A mm	spacing - E mm	spacing- H mm	slates pcs/m ²	weight kg/m ²	nails pcs/m ²	battens m/m ²
100	295	350	10,1	19,19	20,20	3,38
90	305		9,5	18,05	19,00	3,27
80	315		8,9	16,91	17,80	3,31

1. Placing of sealing strip
2. Cutting of oblong length
3. Additional fastening of Rhombus with rivet.



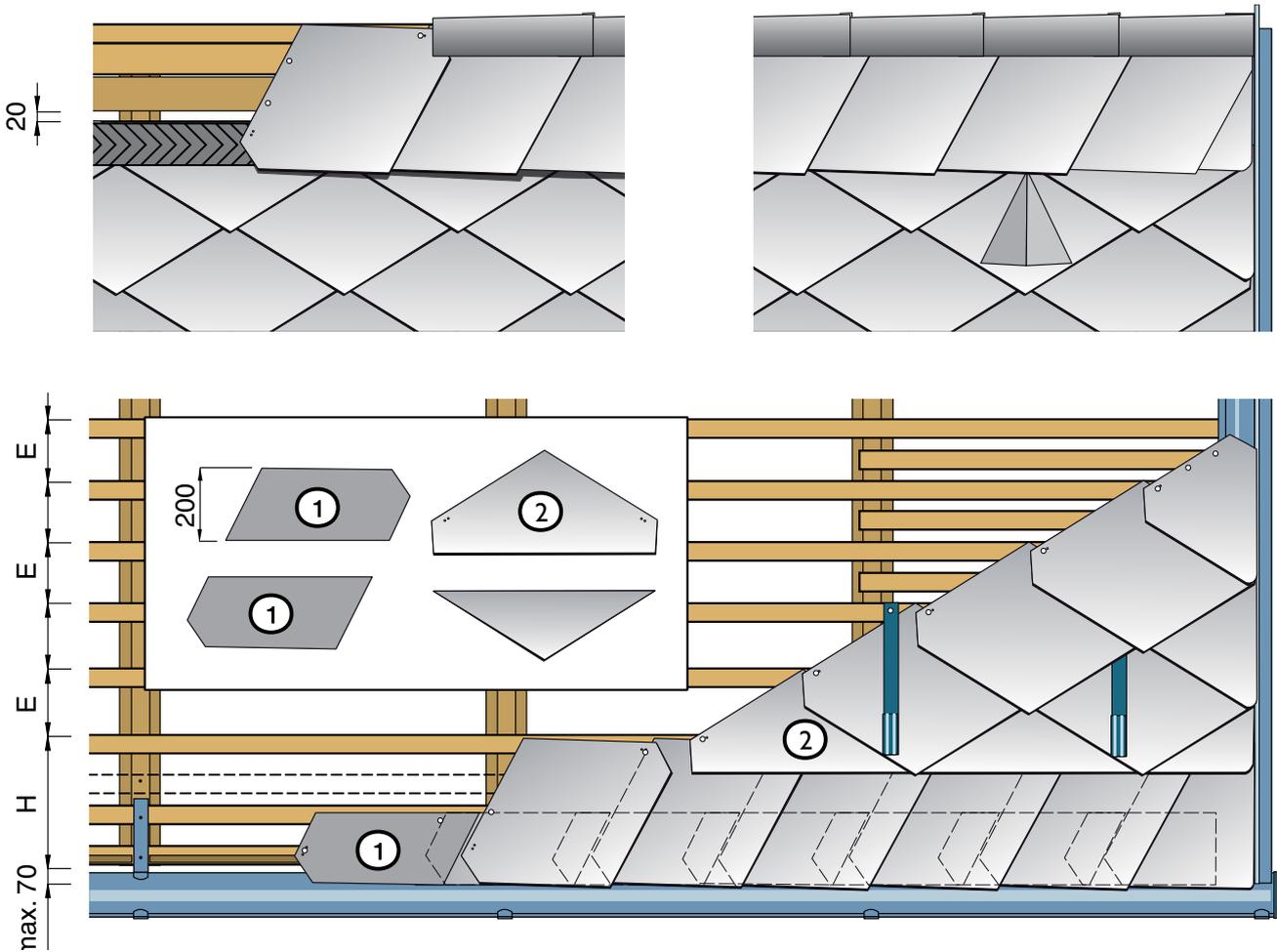


3. Installation of roof slates

3.5 Rhombus Shablone 40/44

3.5.1 Rhombus Shablone 40/44

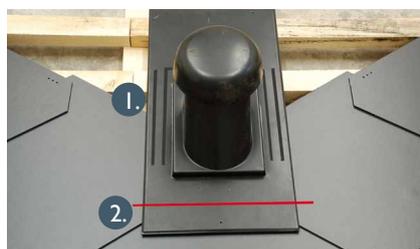
Slates are twice nailed with minimum 37 mm long nails (thickness of Rhombus Shablone is 5 mm). Oriko ventilation terminal and other metal trays are made in the shape of Rhombus Shablone. Other accessories can be used from those designed for cembrit Quadra - English oblong (ventilation penetration SL, antenna soaker).



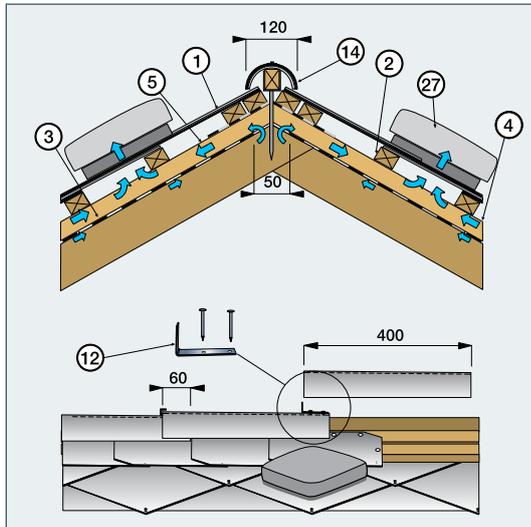
Rhombus Shablone 40/44 headlap, quantities

headlap - A mm	spacing - E mm	spacing - H mm	slates pcs/m ²	weight kg/m ²	nails ks/m ²	battens m/m ²
90	174	350	9,5	16,62	19,00	5,74
80	186		8,9	15,57	17,80	5,37

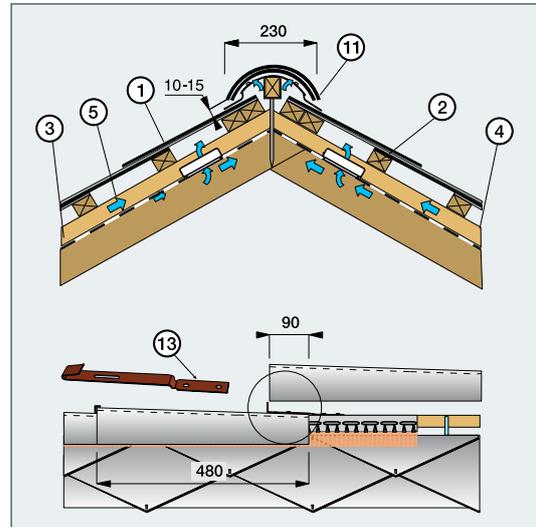
1. Placing of sealing strip.
2. Cutting of oblong length.



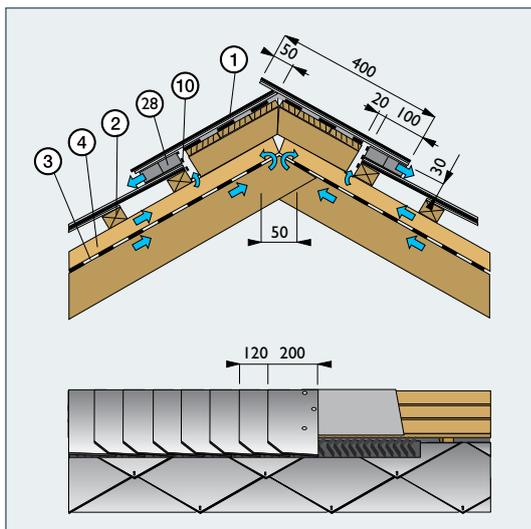
Detailing



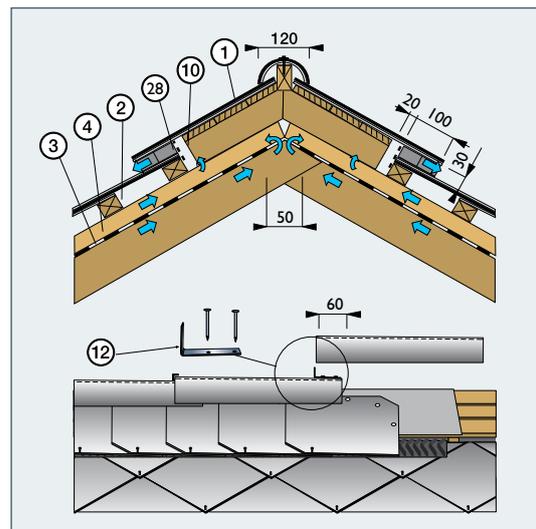
Ridge ventilation incorporating cowl vents



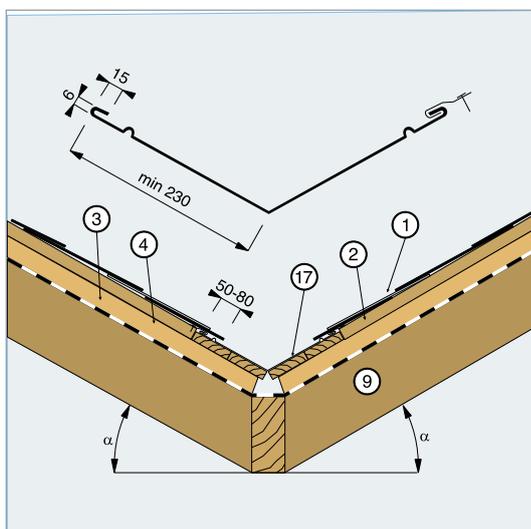
Ridge ventilation incorporating fibrecement ridge capping



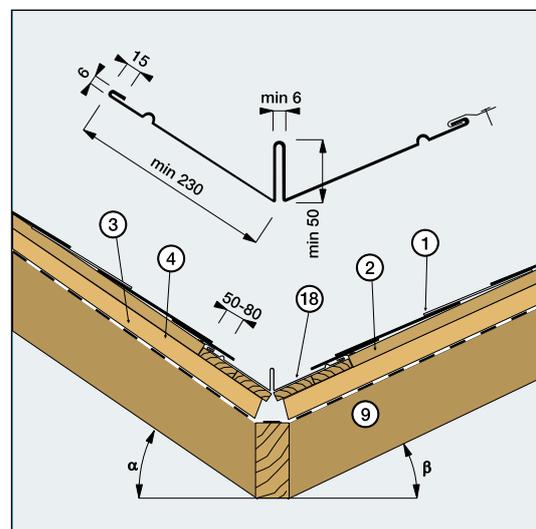
Ridge ventilation incorporating slated ridge



Ridge ventilation incorporating slated ridge with fibrecement ridge capping



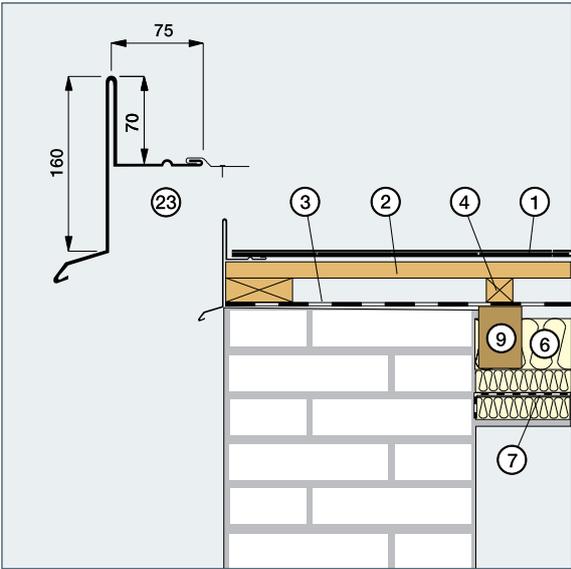
Metal lined valley with both sides of equal pitch



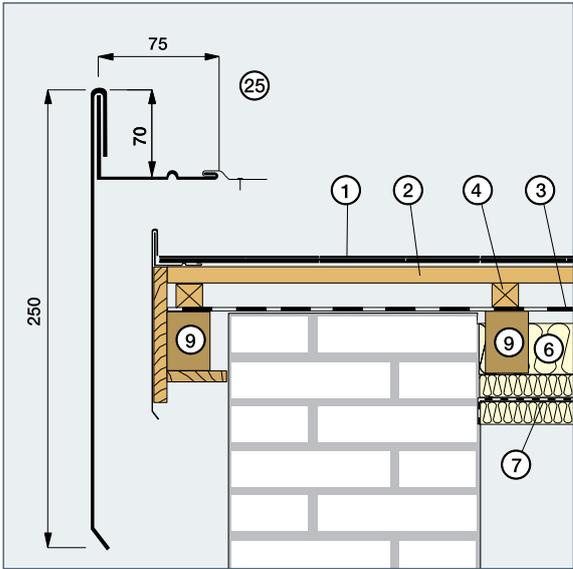
Metal lined valley with sides of different pitch.



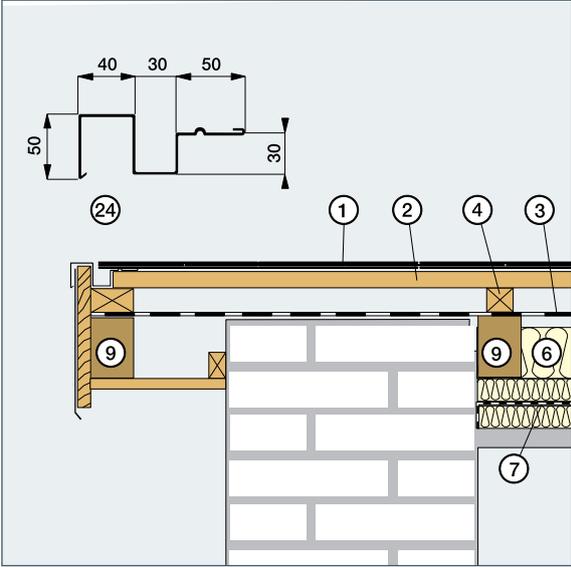
4. Detailing



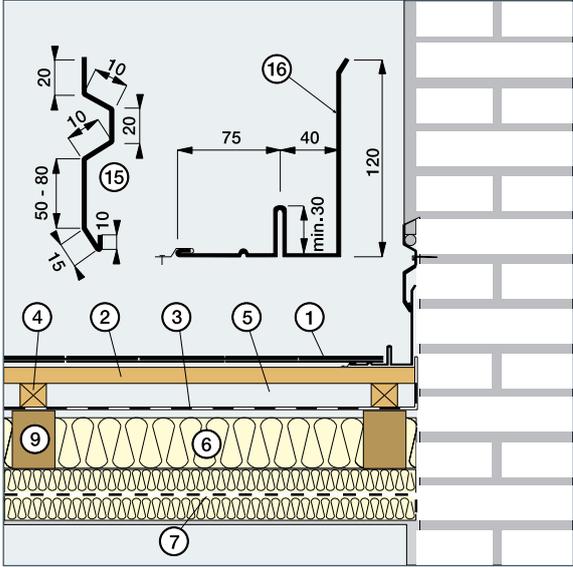
Metal verge trim



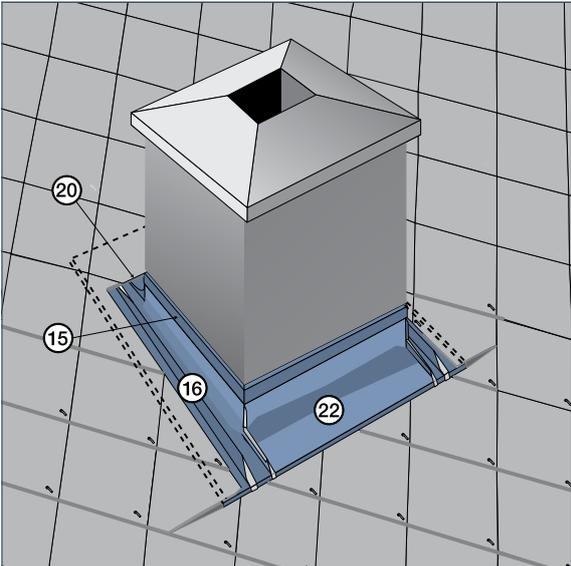
Metal verge trim with leg



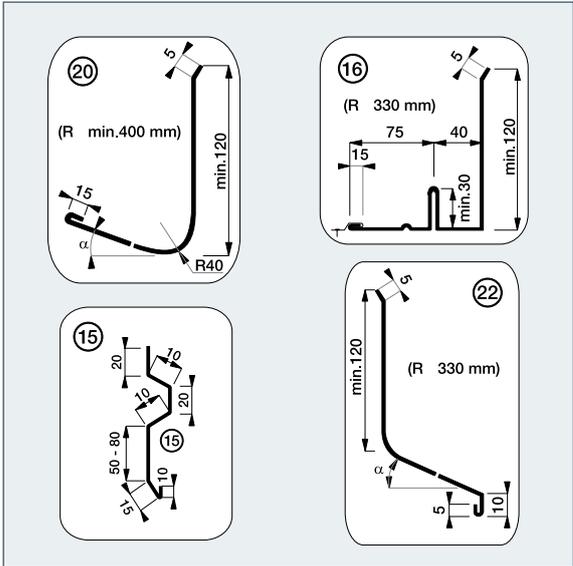
Metal verge trim with gutter



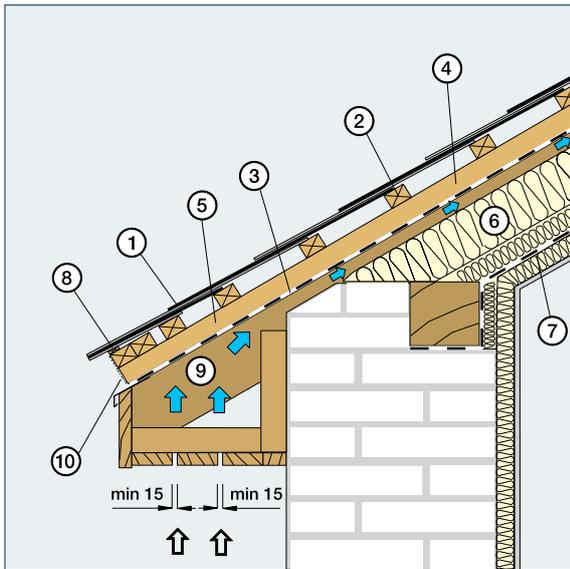
Metal abutment soaker



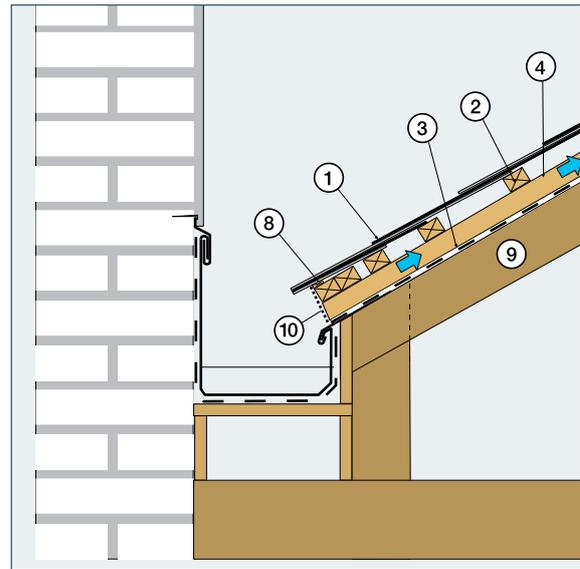
Chimney abutment soaker



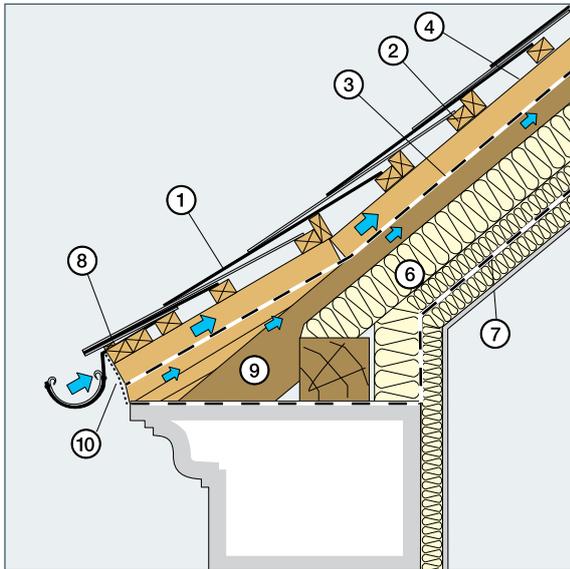
Chimney soaker profiles.



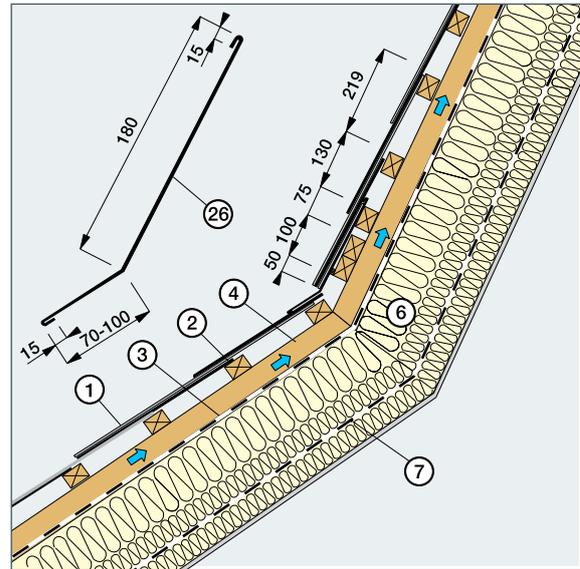
Eaves with soffit ventilation



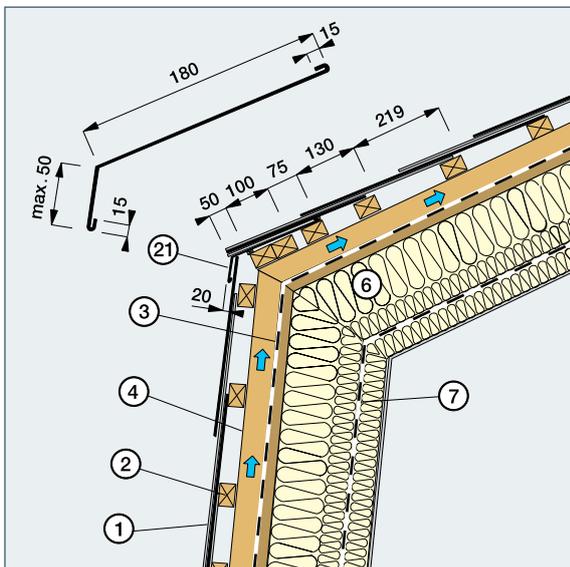
Hidden gutter



Eave with rainwater and fascia ventilation



Change of pitch



Change of the declination of three layers attic roof

Index:

- | | |
|---|--------------------------------|
| 1. roof sheet | 15. metal trim |
| 2. roof battens | 16. abutment |
| 3. permeable membrane | 17. valley lining |
| 4. counter batten | 18. valley lining with upstand |
| 5. air space | 19. compact base |
| 6. insulation | 20. rear soaker |
| 7. vapour control layer | 21. mansard flashing |
| 8. eaves batten | 22. front soaker |
| 9. rafter | 23. verge trim |
| 10. vent | 24. verge trim with gutter |
| 11. fibrecement ridge capping
480x230 mm | 25. verge trim with leg |
| 12. ridge capping clip 16x75 mm | 26. change of pitch flashing |
| 13. ridge capping clip 19x155 mm | 27. cowl |
| 14. ridge capping cone shaped
400x120 mm | 28. ridge vent strip |

This technical information reflects our current technical knowledge and understanding. The roof construction must be in accordance with local building regulation and best practise.



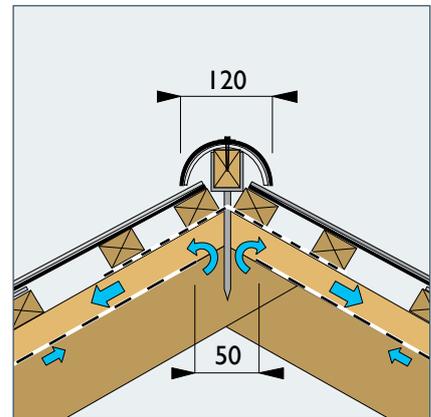
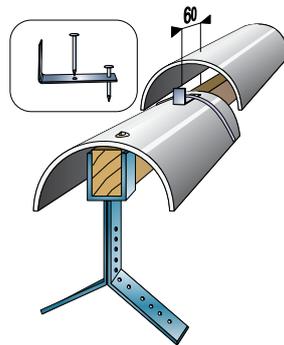
5. Slate accessories

Conic ridge - small

Ridge is used to cover the ridge hips. It has conic shape, fixed with of 60 mm overlap.

Technical parameters

description: cone shaped ridge - small
dimensions: 400×120 mm
usage: 3 pcs/m
material: fibre cement
colour: various to match slates



Installation of conic ridge

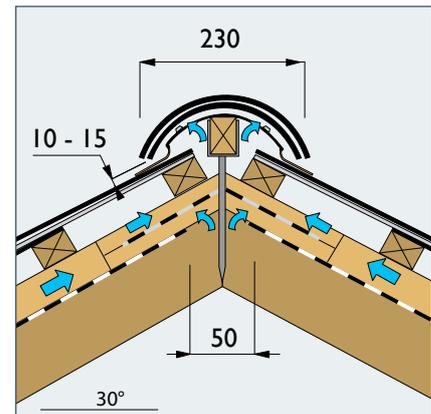
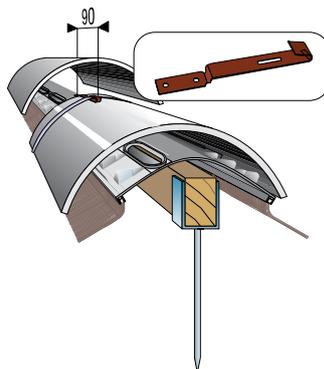
Ridge clips together with ridge batten are installed on top of rafter. The height of ridge batten depends on roof pitch. The first (the last) ridge is screwed to ridge batten by screw with ring (min. diameter 4 mm). The first ridge clip is fastened with 2 nails over ridge into ridge batten, second ridge is installed and the rivet is bent in such way so it holds the second ridge too. Small conic ridge is combined with edging of corner and ridge top.

Conic ridge - large

Ridge is used to cover the ridge hips. It has conic shape, fixed with a 90 mm overlap.

Technical parameters

description: cone shaped ridge - large
dimensions: 480×230 mm
usage: 2,5 pcs/m
ventilation gap: 100 cm²/m
material: fibre cement
colour: various to match slates



Installation of conic ridge

Ridge clips together with ridge batten are installed on the top of rafter. The height of ridge batten depends on roof pitch. The first (the last) ridge is screwed to ridge batten by screw with shank (min. diameter 4 mm). The first ridge clip is fastened with 2 nails over ridge into ridge batten with a 155×19 mm clip and screw into ridge batten, second ridge is installed and the ridge clip is bent in such way so it holds the second ridge too. The roof space is ventilated in 100 cm²/m if the ridge roll is used and the a 10 mm air source is created. It is not necessary to fill the end of roof space, the ridge is sufficiently wide to cover even cut down ridge slates.

Rydge Y solution

Rydge Y is used to connect the hip ridge cappings.

Technical parameters

description: ridge Y
 dimensions: 300x430 mm,
 400x400 mm
 material: fibre glass
 colour: various colour of slate



Installation of multiple ridge

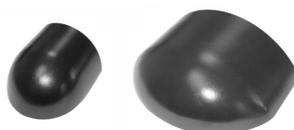
When installing the conic ridge, the top of the hip roof is covered with multiple ridges. The ridge is fastened with hat nail or ring screw. If it is used on low pitched roofs, the fibre-glass part must be adjusted to created geometry.

Enclosure ridge

This product is used to end the large or small ridge on hip ridge.

Technical parameters

description: enclosure ridge
 dimensions: 130x120 mm,
 170x230 mm
 material: fibre glass
 colour: various colour of slate



Installation of enclosure ridge

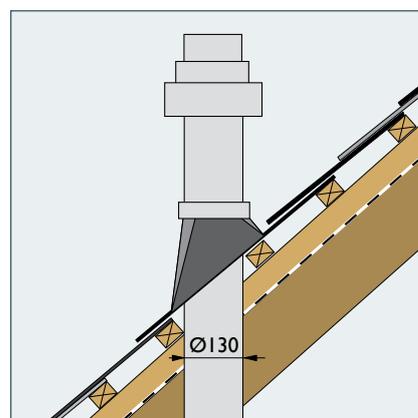
Enclosure is fixed using the same fixing as the fibrecement ridge with overlap at the end ridge.

Chimney for the soaker

This product is used for chimney flues protruding through the roof shape.

Technical parameters

description: Penetration 130
 dimensions: 400x400 mm,
 300x600 mm
 roof pitch: from 30°- 45°
 material: fibre glass
 penetration diameter: max. Ø 130 mm
 colour: various colour of slate



Installation of soaker

The soakers are placed over the respective flue pipes. The installation must be done in cooperation with supplier of the chimney. Collar which covers soaker is part of the chimney delivery. The aperture is designed for pipes Ø 130 mm. The installation procedure is the same as slates. The soaker is installed in respective course and is fastened with two nails and rivet. When installing oblongs, the next course above the soaker is adjusted to required shape. If the soaker is used in area higher snow load zone, it is advisable to place snow blade catch above the ventilation soaker.



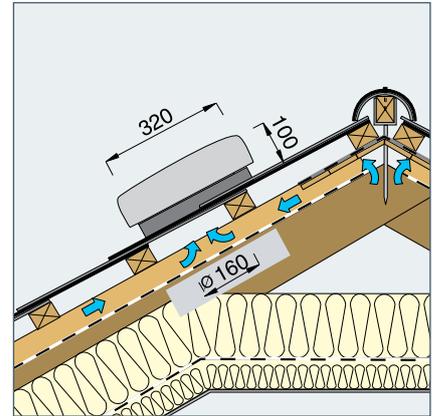
5. Slate accessories

Ventilation Terminal LG 200

LG 200 ventilation terminal in the shape of the slate and oblong are used for roof ventilation.

Technical parameters

description: ventilation terminal LG 200
dimensions: 400×400 mm,
300×600 mm
ventilation area: 200 cm²
material: high impact polystyrene
colour: various colour of slate



Installation of ventilation terminal LG 200

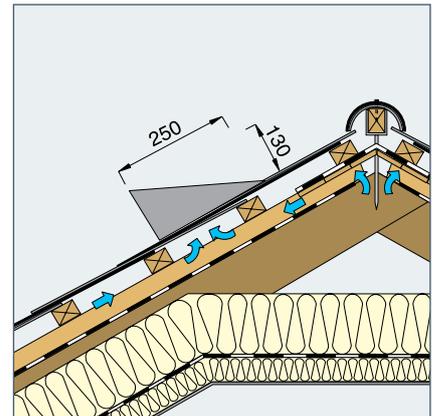
The ventilation terminal LG 200 is placed at the ridge of the roof in such way, that the whole area of roof is ventilated. The installation procedure is the same as for slates. The terminal is fastened with two nails and a rivet. When installing oblongs, the next course above the ventilation head is adjusted into required shape.

Ventilation Terminal Oriko

Oriko ventilation terminal in the shape of the slate and oblong are used for roof ventilation.

Technical parameters

description: ventilation terminal Oriko
dimensions: 400×400 mm,
300×600 mm
ventilation area: 100 cm²
material: fibre cement
colour: various colour of slate



Installation of ventilation terminal Oriko

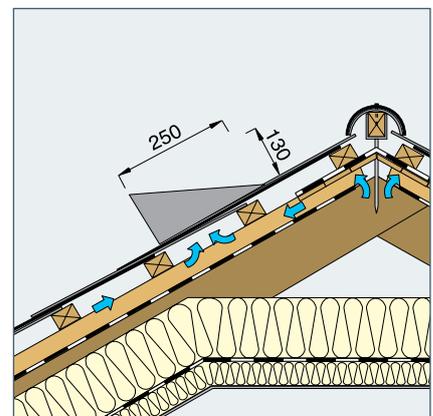
The ventilation Oriko terminal is placed at the ridge of the roof in such way, that the whole area of roof is ventilated. The installation procedure is the same as for slate. The terminal is installed with two nails and a rivet. When installing oblongs, the next course above the ventilation head is adjusted into required shape.

Ventilations Terminal Oriko

Oriko ventilation terminal in the shape of Rhombus and Rhombus slate are used for roof ventilation.

Technical parameters

description: ventilation terminal Oriko
dimensions: 400×440 mm,
400×440 mm
ventilation area: 100 cm²
material: fibre cement
colour: various colour of slate



Installation of ventilation terminal Oriko

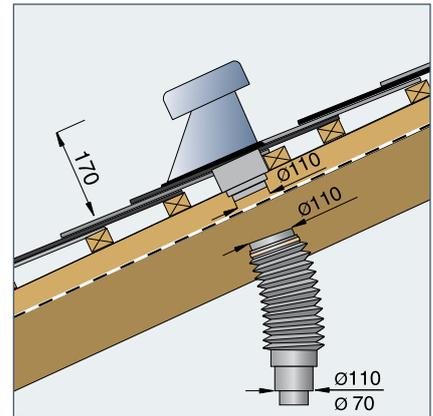
The ventilation Oriko terminal is placed at the ridge of the roof in such way, that the whole area of roof is ventilated. The installation procedure is the same as for slate. The terminal is installed with two nails and a rivet. The ventilation terminal used for Rhombus slate is design to be laid right to left.

Soil ventilation terminal SL

Soil vent terminals are available for oblong and slate formats.

Technical parameters

description: ventilation penetration SL
 dimensions: 400x400 mm,
 300x600 mm
 roof pitch: from 18°
 material: high impact polystyrene
 penetration diameter: max. Ø 110 mm



Installation of soil vent terminal SL

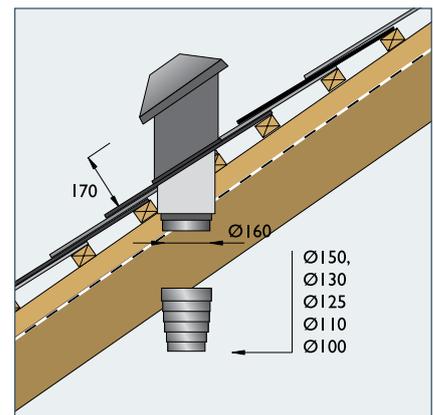
The terminals are placed over the flexible pipe connectors. The installation procedure is the same as for slates. The terminal is installed with two nails and rivet. When installing oblongs, the next course above the terminal head is adjusted into required shape. If the terminal is used in a higher snow load zone, it is advisable to place snow blade catch above the terminal.

Extractor ventilation terminal Ø160 mm

Extractor terminals are available for oblong and slate formats.

Technical parameters

description: ventilation penetration Ø160 mm
 dimensions: 400x400 mm,
 300x600 mm
 roof pitch: from 30°- 45°
 material: high impact polystyrene
 penetration diameter: Ø 160 mm



Installation of extractor vent terminal

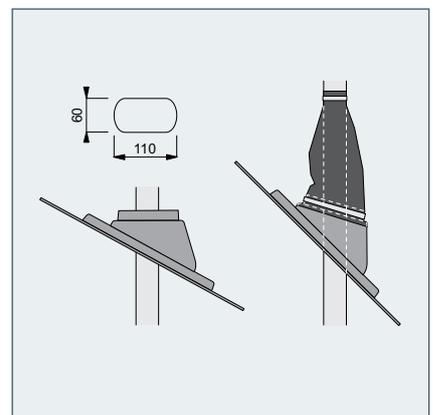
The terminals are placed over the respective pipes. The installation procedure is the same as for slates. The terminal is installed with two nails and rivet. When installing oblongs, the next course above the terminal is adjusted into required shape. If the terminal is used in a higher snow load zone, it is advisable to place snow blade catch above the terminal.

Antennae soaker

Antennae are available for slate and oblong formats.

Technical parameters

description: antennae penetration AZ 16
 dimensions: 400x400 mm,
 300x600 mm
 roof pitch: from 18°
 material: high impact polystyrene
 penetration diameter: Ø 60 mm



Installation of antenna soaker

The installation procedure is the same as for slates. The antennae soaker is installed with two nails and rivet. Bearing bar of antennae must be placed exactly into the hole of antennae penetration and fastened to bearing construction of rafter. Impermeable collar is cut for diameter of bearing antennae bar.



6. Snow protection

Snow protection

Snow protection is used to prevent snow falling from the roof for traffic protection of pedestrians around the building, for protection of roof construction and gutters. Their design and placement is defined by their function, roof pitch, snow load, material and profile of sheets. The roof construction must be in accordance with local regulations and roofing practise. The location and exposure rating of each site must be considered.

Safety is the main factor for snow protection. We place snow protection:

- a) where the snow fall from roof can endanger passersby or damage surrounding constructions,
- b) where the snow collects due to sliding

from roof slopes(eg. valleys),

- c) where there is a danger of roof component damage.

Specification of snow protection depends on snow area and shape of the roof. Snow protection can be installed in several lev-

els of roof according to demand, so that the weight of snow is regularly distributed on the protected area.

Snow hook

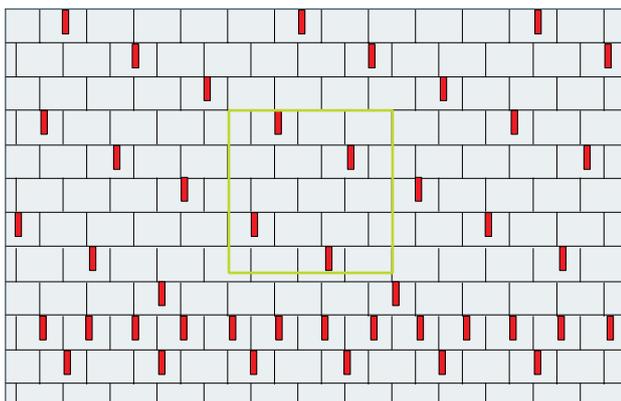
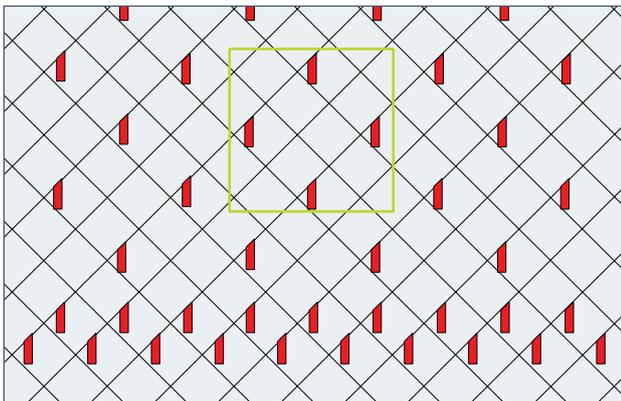
Snow hooks are installed under the slates, they are nailed to battens. Number of snow hooks and their placement depends on roof pitch, snow area and they must be placed over the whole area of roof according to the chart below. These snow hooks are supposed to hold snow over the whole roof. If they are installed

only at the eaves or if their use in the roof area is underestimated, there is a danger of their deformation or break-through of the slate especially in climatic zones K2 and K3.

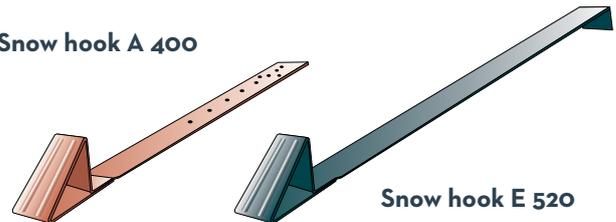
The hook of length of 400 mm is used for slates. The peak of the hook is then placed over the head of the slates. When

using snow hooks in climatic zone K2 and K3 fix them to battens spaced at 105 mm. 520 mm snow hooks are used for oblong slates. They are hanging over the batten and nailed.

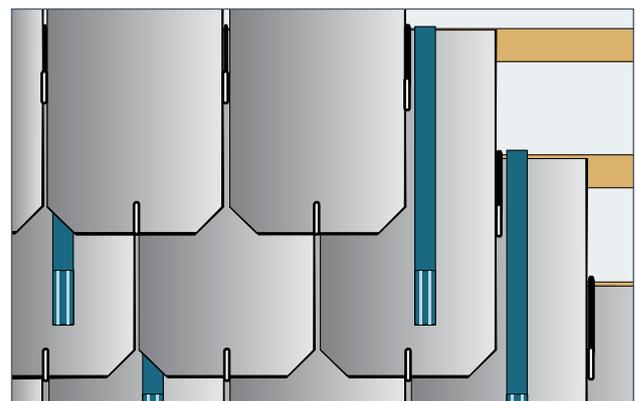
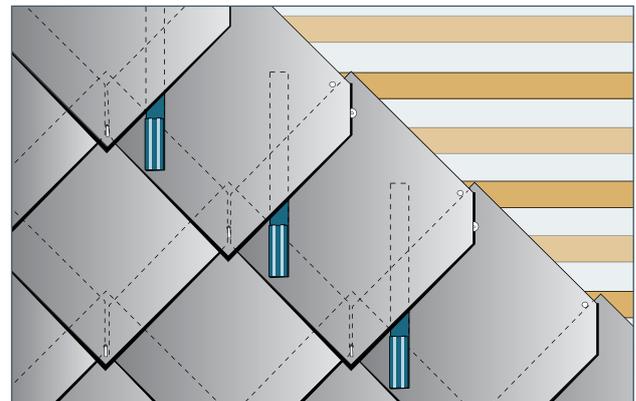
Placement of snow hooks		pcs/m ²		
roof declination	K1	K2	K3	
18° - 25°	2	4	-	
25° - 30°	3	6	8	
30° - 40°	4	7	10	



Snow hook A 400



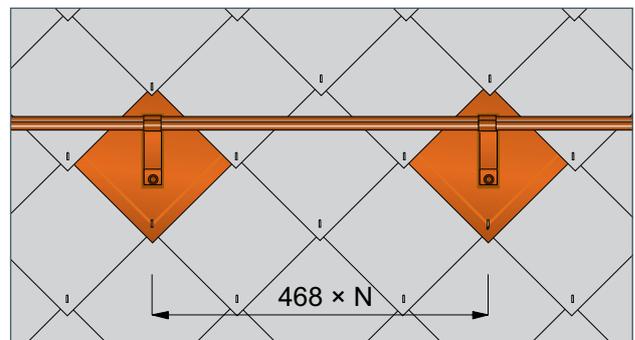
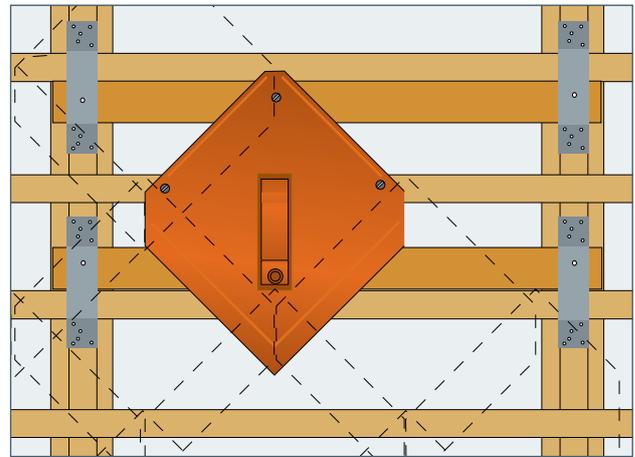
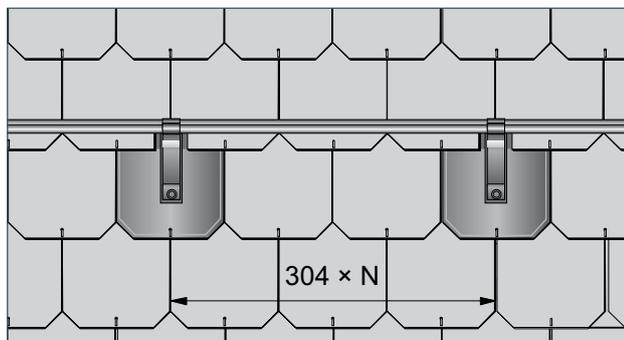
Snow hook E 520



Installation of snow protection system

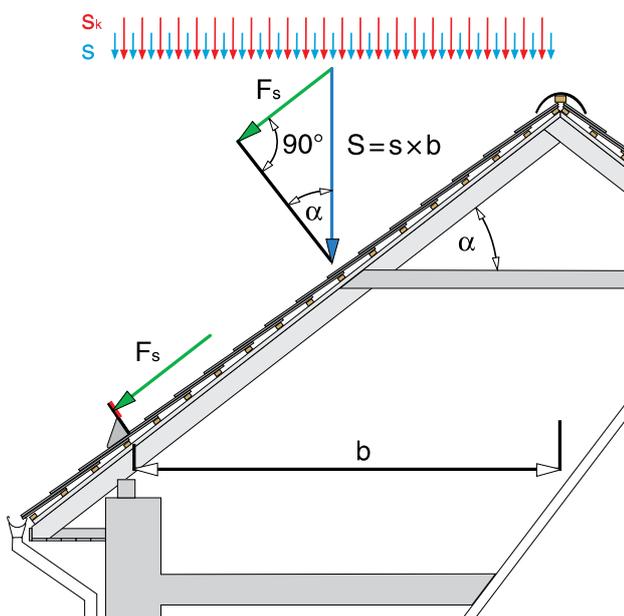
Universal fitting pieces are used to hang snow catch, climbing bench, foot step and solar panel holder. Snow protection consists of universal fitting piece in the shape of Cembrit Diamond, Quadra, Rhombus Shablone, Rhombus and changeable parts, which are installed on the universal fitting piece.

The universal fitting piece is fastened with screws enclosed on a supplementary wooden roof batten with min crosscut 30x80 mm (in a similar way as fibrecement slates). The centre screw has a sealing washer. The additional batten must be sufficiently fastened. The spacing of universal fitting pieces depends on the type of sheet and static calculation or experienced estimation, which defines the number of modules "N".



Dimension of snow protection

Placement and use of snow catches can be specified according to experience at the local conditions. If the project specifies all details of the roof then all these relations are calculated by the designer.



The roof construction must be in accordance with local regulations and roofing practise. The location and exposure rate of each site must be considered.

Sample of calculation

It is necessary to set loadings according to local rules and legislation.

It can be calculated as follows:

$$F_s = s \times b \times \sin$$

$$s = i \times s_k$$

Key:

F_s - snow load on protection in the direction of slide [kNm⁻¹]

s - snow load on roof [kNm⁻²]

b - roof plan distance of the protection from ridge or from previous row of catches [m]

- roof pitch [°]

i - shape coefficient [0,8 - 1,6]

s_k - snow load according to snow area[kNm⁻²]

Abrasion coefficient between slate and snow is considered to be zero. Adjust the distance between catches by comparing bearing capacity of the catch and force F_s . The calculation is defined for static load.

Dynamic force caused by moving snow is not considered. Dynamic component is significantly higher than static one. To reduce this component, it is useful to place snow catches in several rows above each other.



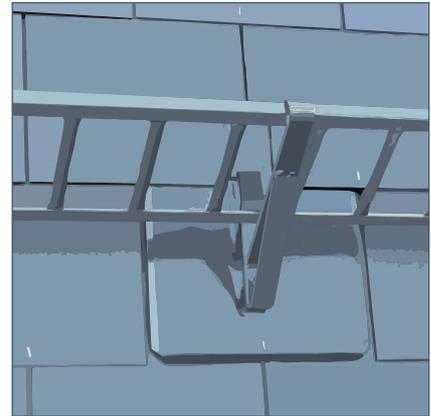
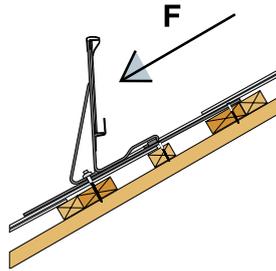
6. Snow protection

Grid snow catch

Prevents snow slide from the roof.
Suitable for use only up to max. K3.

Technical parameters

material: hot dip galvanized steel with powder paint
brace load: $F = \text{max. } 3 \text{ kN}$

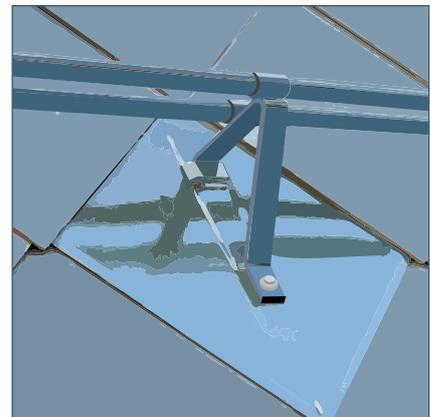
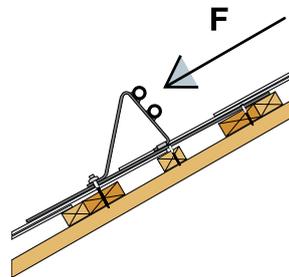


Bar snow catch

For high snow volumes of snow.
Snow freeze doesn't occur.
Suitable for use up to K3.

Technical parameters

material: hot dip galvanized steel with powder paint
brace load: $F = \text{max. } 5 \text{ kN}$

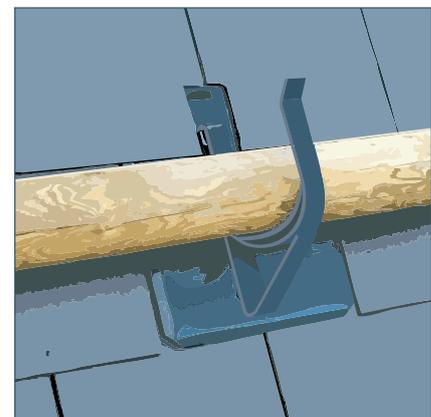
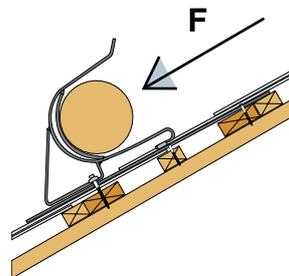


Snow catch with log

For high snow volumes of snow.
Snow freeze doesn't occur. Suitable for use up to K3

Technical parameters

material: hot dip galvanized steel with powder paint
brace load: $F = \text{max. } 5 \text{ kN}$
brace load: $F = \text{max. } 5 \text{ kN}$

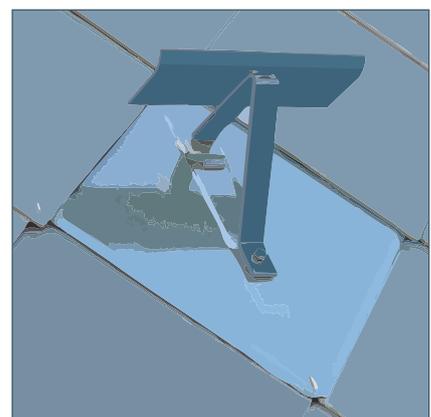
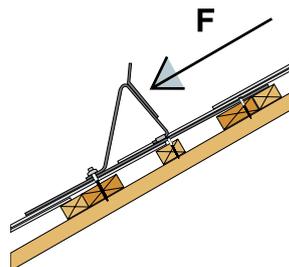


Blade

It is installed near the eaves, in one or two rows. Suitable for use up to K3.

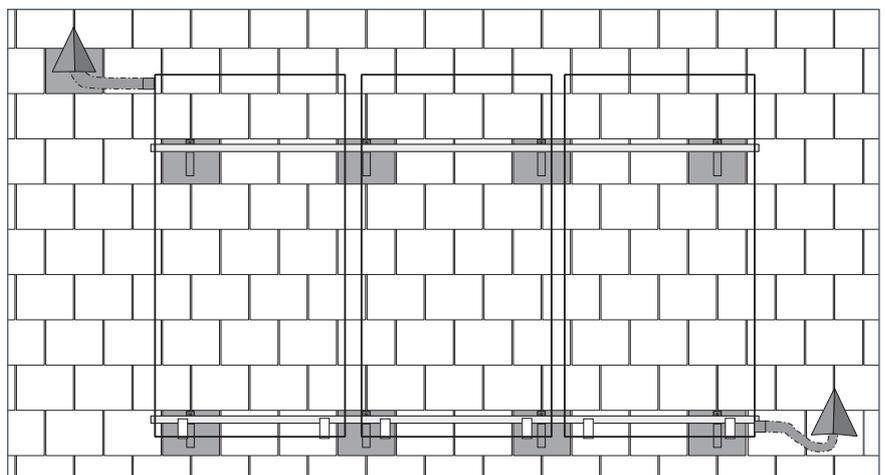
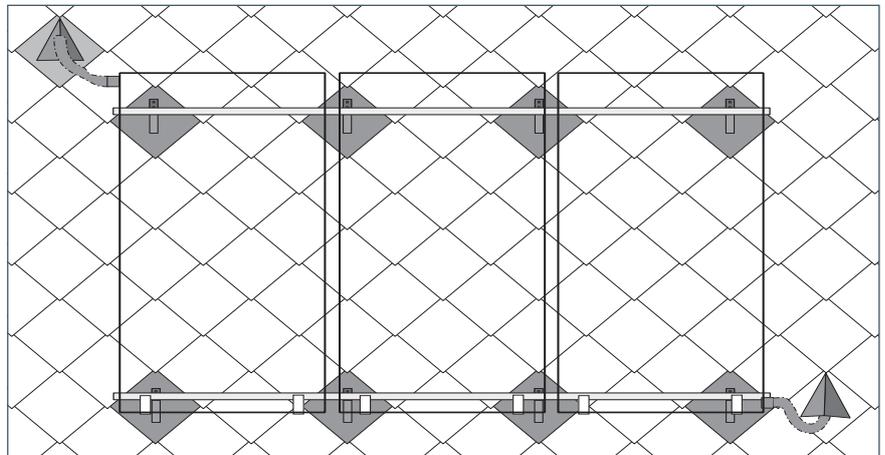
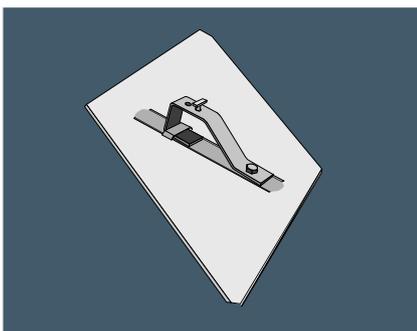
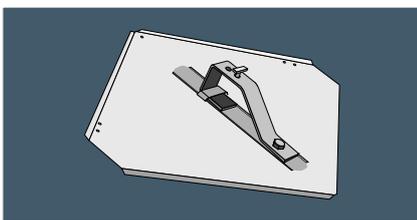
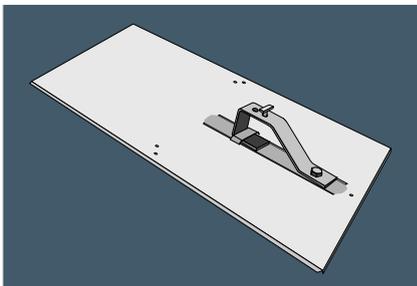
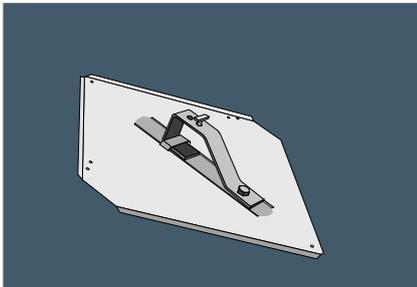
Technical parameters

material: hot dip galvanized steel with powder paint
brace load: $F = \text{max. } 5 \text{ kN}$



Installation of solar panels

Universal metal fitting pieces in the shape of the various slates are used for installation of solar panels: Cembrit Diamond, Quadra, Rhombus Shablone, Rhombus. The solar panel holder is placed and screwed into this fitting piece, which is anchored in the same way as it is described on the page 28 (installation of snow protections). The bearing grid of the respective system is installed directly on to the solar panels holders. Oriko ventilation adapters can be used for wiring and panel connectors.





8. Roof slate repair

Nail fixing

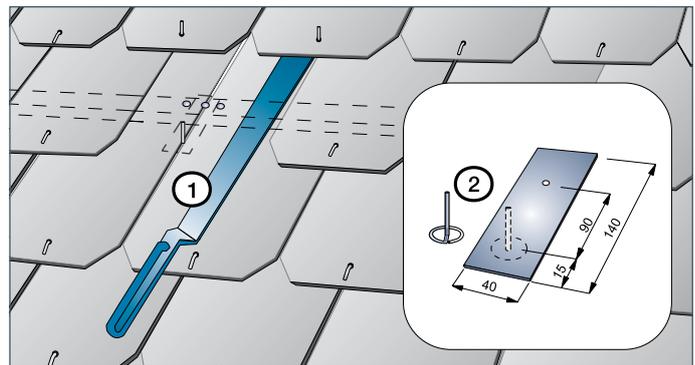
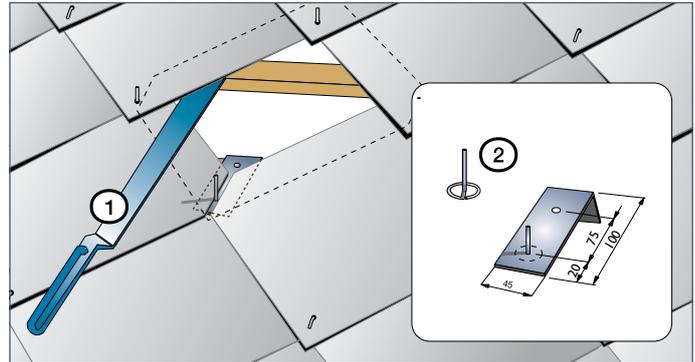
Remove damaged slate or oblong by pulling-out or by tearing-out. Original nails are removed of slates (oblongs) by nail ripper No.1.

Special clip with rivet is placed on original spot No. 2. New slate is pushed onto original position placed over the rivet and the rivet is bent in the direction of eaves (the rivets bent with round head shears). The clip is made of cooper, through which the rivet ripper.

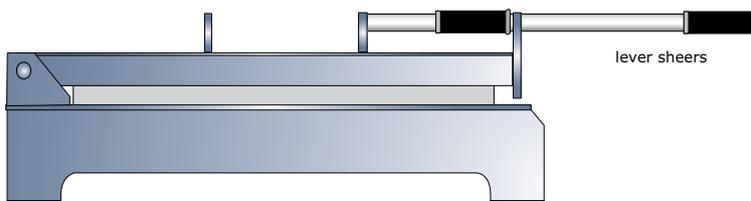
Damaged oblong or beaver slates are replaced by turning part of the hook of 90°degree. The replacement slate is located with the help of the nail ripper. Turn the visible part of the hook to the original shape.

Hook fixing

The damaged oblong or beaver slates are replaced by turning part of the hook of 90°degree. The replacement slate is located with the help of the nail ripper. Turn the visible part of the hook to the original shape.



Roofing tools



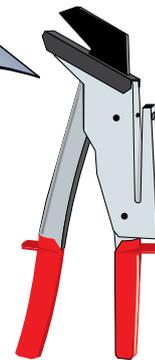
lever shears



nail ripper



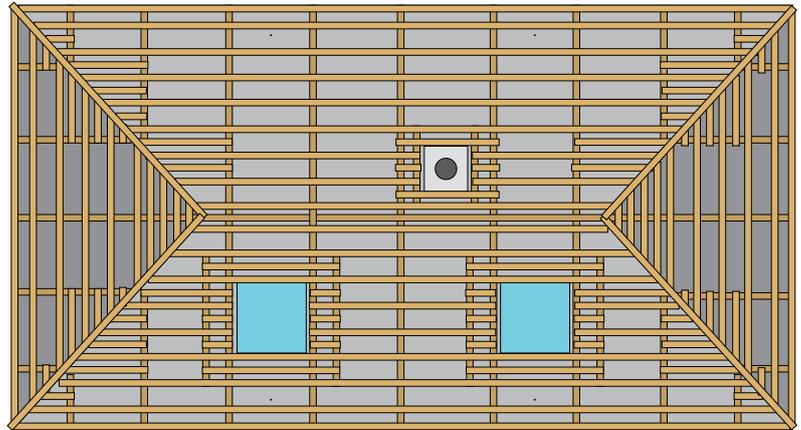
roofing hammer



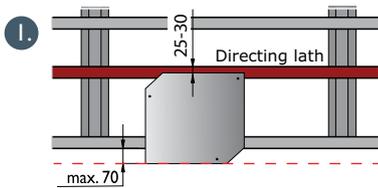
shears

9.1 Preparation of basic construction - battens

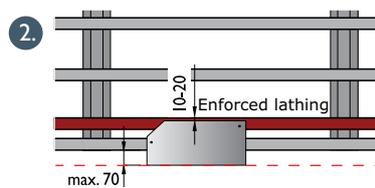
Roof slates are installed on timber battens 30 x 50 mm or 40 x 60 mm. The roof construction must be in accordance with local legislative requirements - Design of roofs. Battens for Cembrit Quadra must be more concentrated at roof perimeters, corner, valley, chimney and all penetrations. The airpath (the height of counter battens) is set by calculation. Counter battens 5 cm are used for regular pitch. It is necessary to measure the roof before installing the first batten and to check the perpendicular line of maximum slope to eaves.



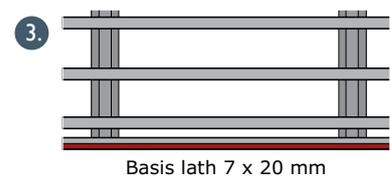
9.2 Batten spacing - setting of slate at roof eaves



Install the bottom edge of slate in level with eave. The top edge of slate locates the 2nd batten. Next battens are spaced 210 mm.

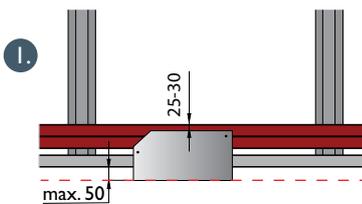


Location of next batten is set by top edge of half slate which is installed in level with eave. It is possible to concentrate battens in the area under the edge.

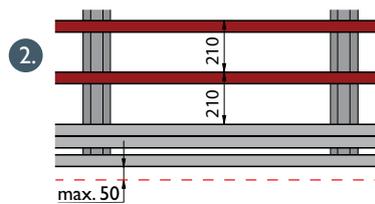


Eave batten 7 x 20 mm is nailed onto the first batten. The edge is slightly up-turned. The first and the second layer of the edge copy the area without bending.

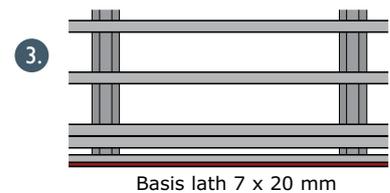
9.3 Batten spacing - setting of slate at eaves



Install the bottom edge of slate in level with the top edge of locates supplementary batten

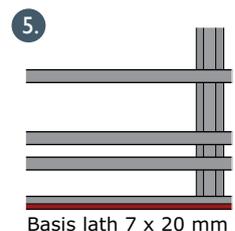
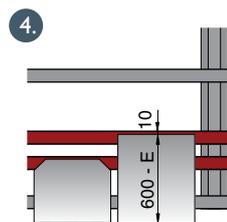
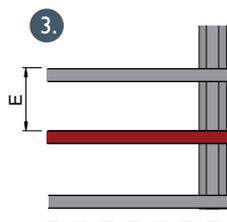
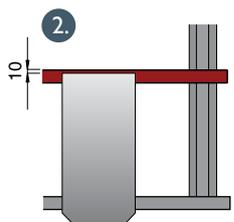
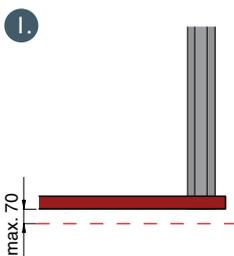


From the supplementary batten others battens are spaced 210 mm. It is possible to concentrate battens in the area under the edge.



Eave batten 7 x 20 mm is nailed on the first lath.

9.4 Measurement of lathing - setting of oblong



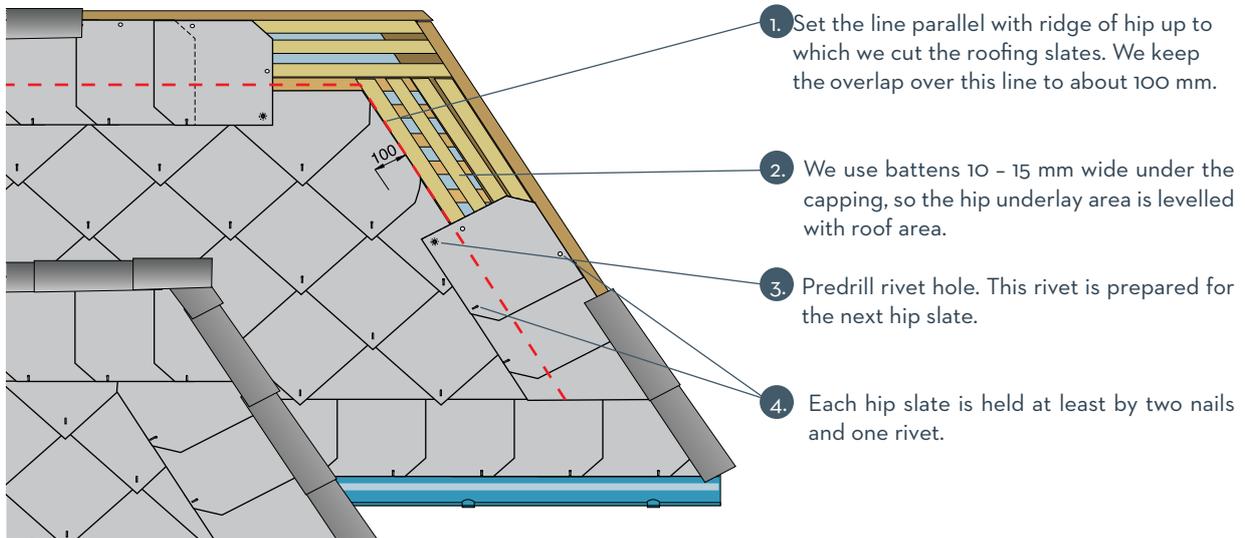
Install the bottom edge of slate in level with eave. The top edge of slate locates the supplementary batten from which we measure all other battens pacing "E" set by roof slope.

The location of additional battens is set by the scheme on page 14, where "E" is spacing of battens.

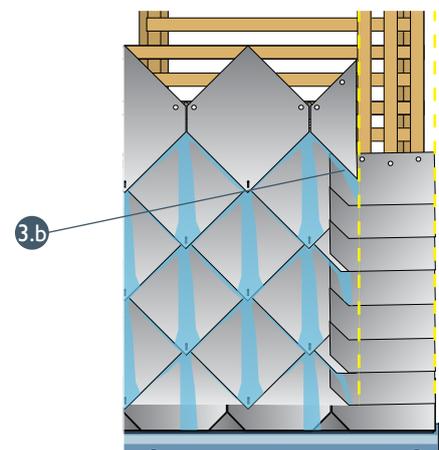
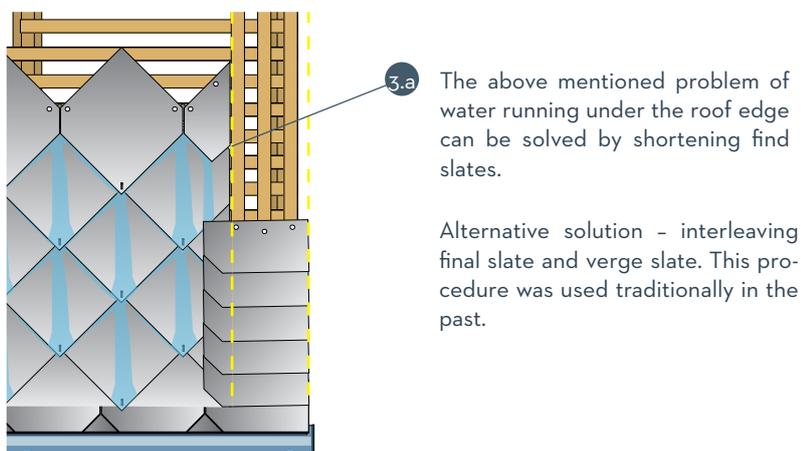
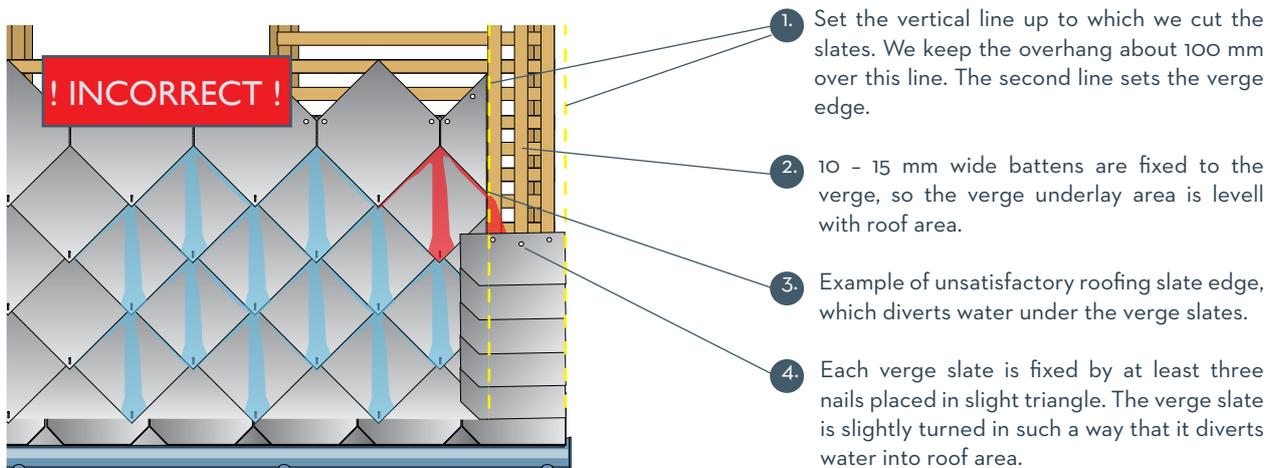


9. Practical advice

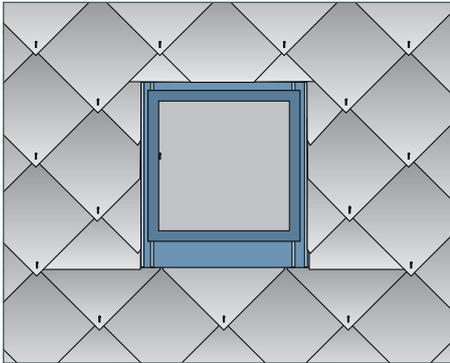
9.5 Procedure of installation of hip capping



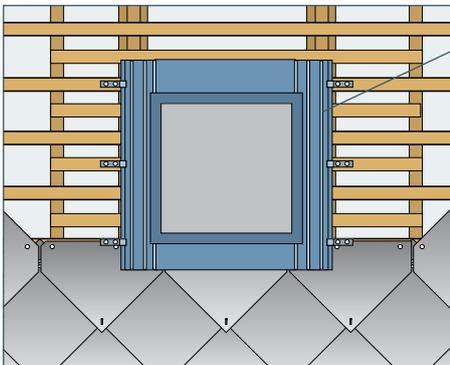
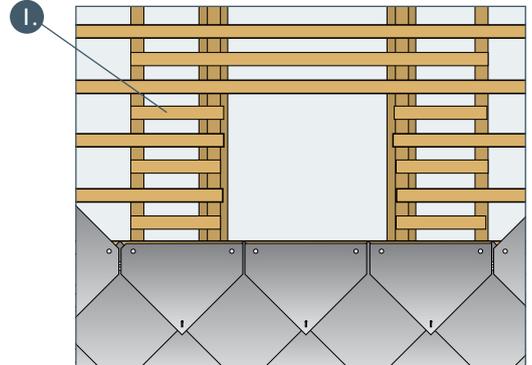
9.6 Installation of verge with cut slates



9.7 Installation of roof window, ceiling access door or chimney

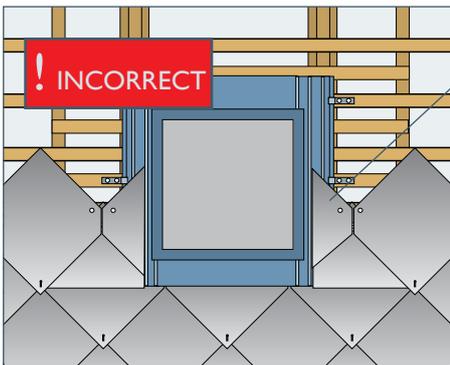
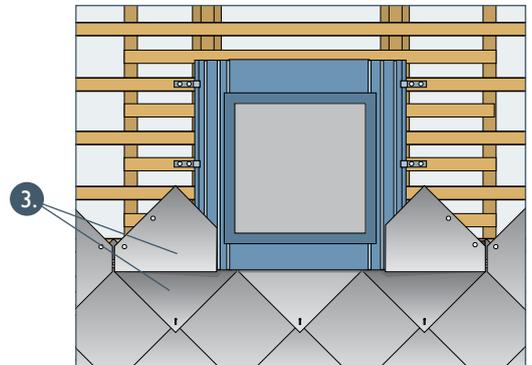


To install Cembrit Quadra we concentrate battens at roof perimeter roof corner, valley, chimney and all penetrations. The following description of installation shows that this preparation is important providing support for smaller cut slates at the edging of penetration holes.



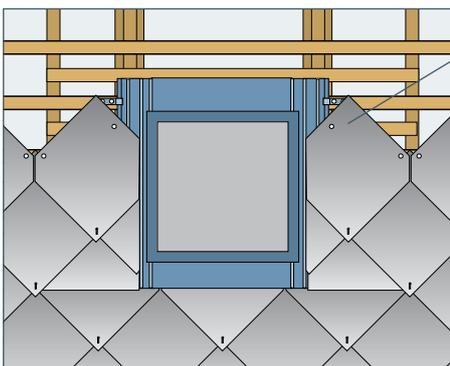
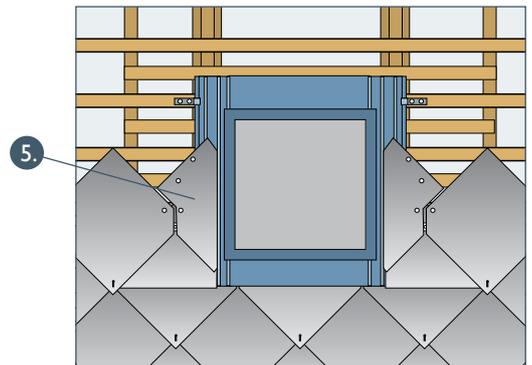
2. Installation of roof exit on prepared hole, its fastening by clip. Bottom part of window covers the first row of slates.

The slate is cut in such a way, that the bottom part is under the flashing edge and top part over it. The top part ends level with the bottom part of the window.



4. It is possible to fasten this part of slate by only one nail, which is not sufficient.

This part of slate is cut in the installation space out of larger piece of material so it is possible nail it sufficiently. We proceed similarly with roof details.



6. To fasten the slates at edging it is necessary to use an increased number of battens.

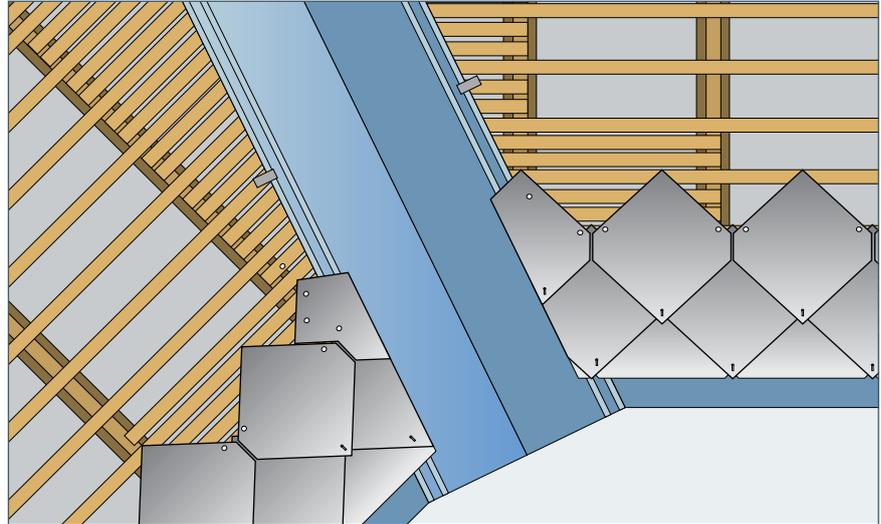
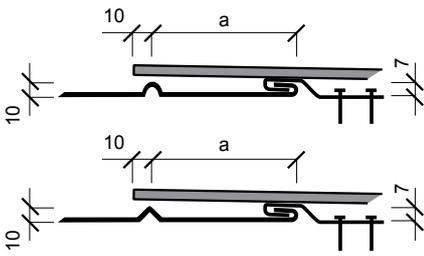
If the cut of end slate is too small and there can occur a danger of its breaking then we must build up this part of two parts of slate with overlay.



9. Practical advice

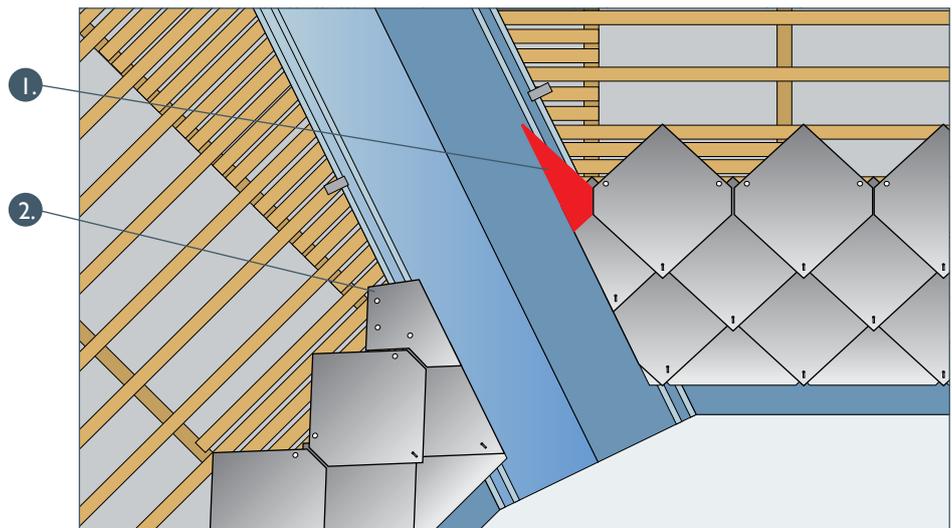
9.8 Installation of valley

Battens under the valley gutter must be concentrated in such a way, that they provide sufficient support for cut slates. The valley is equipped with simple water channels, which support the slates.



It is not possible to sufficiently fasten marked cut. In winter the ice can lean on this part which can result in breakage.

This cut shows the correct installation. In this case it is possible to fasten this cut sufficiently with three nails. The top apex is cut in the direction of ice movement

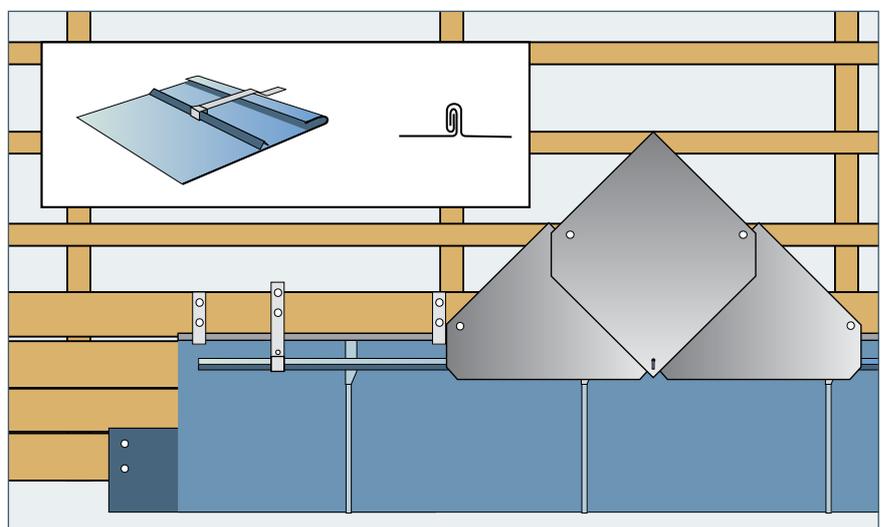


9.9 Setting on eaves tray

The tray finishes with a simple water channel.

The eave is the most loaded area after the roof valley. The slate which overlaps the water channel is placed on the support, which elevates the slates at the same time and so replaces the eaves batten.

To prevent the tray distracting it is made of shorter lengths.



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April 2016

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