Technical Data

Neptunus corrugated sheets

Export
March 2018

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TABLE OF CONTENT

This technical information is meant to inform you about the SVK Neptunus corrugated sheets and how to apply them.

Information about the bearing construction, fixing materials and other products / accessories is only informative and not binding. Always ask information from the manufacturer or the supplier of these products and follow their advice.

SVK Neptunus corrugated sheets must be applied in compliance with the national and/or local building regulations and guidelines. If these do not correspond with the SVK-guidelines, SVK must be contacted before construction starts.

Our product guarantee is only valid if construction is carried out in accordance with our most recent technical product data, which can be acquired by simple request. You can also find the technical product data on our website www.svk.be.

MATERIAL DATA

1. APPLICATION AREA

This technical information relates to the application of Neptunus corrugated sheets in Belgium. It is only valid for corrugated sheets with profile number 76 (6¼ corrugations).

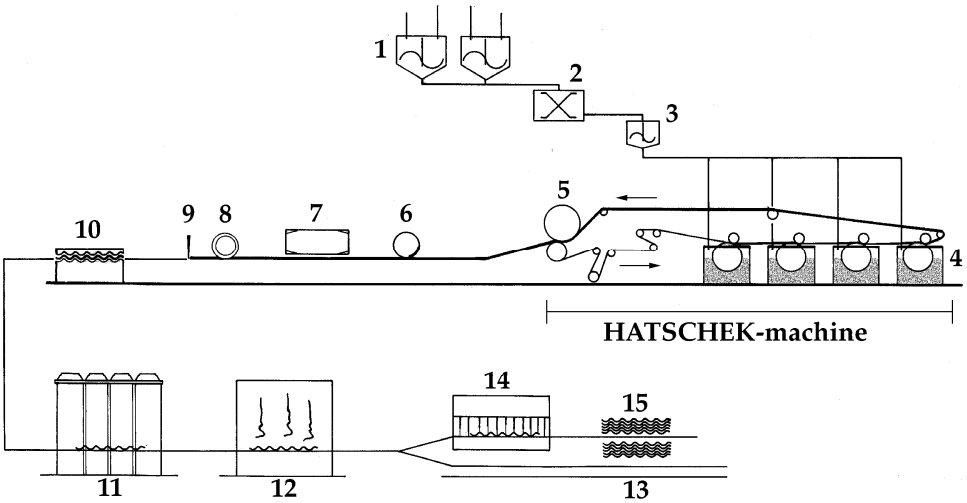
Neptunus corrugated sheets are installed on agricultural and industrial buildings, halls, warehouses etc.
Under special circumstances a specific construction study must be made. This applies when corrugated sheets are exposed to:

- high concentrations of harmful substances (acids, fungi etc);
- extreme humidity;
- extreme temperatures;
- overpressure in the building;
- a permanently high humidity level, indoor climate class IV (e.g. swimming pools, laundries, etc.).

2. COMPOSITION AND PRODUCTION

Neptunus corrugated sheets are manufactured on the basis of a homogeneous mixture of *Portland cement, organic fibres, selected mineral additives* and water. These raw materials are mixed in the right proportion. Under constant pressure, the mixture is transmitted by means of a sieve cylinder (Hatschek) in thin layers to a format roller until the required sheet thickness is obtained. At this stage safety strips are placed (located in the flanks of the corrugations).
A stamp is put into the flat sheet, the corners are pre-grooved and it is cut to size. Subsequently, the sheet is corrugated and **pressed**. Thanks to this process and the carefully selected composition, a very dense structure is obtained. Neptunus corrugated sheets are extremely strong, watertight, rust free and incombustible. They do not rot and they are resistant to vermin and most weather circumstances.

Production process Neptunus corrugated sheets:



1: raw material mixers
2: big stirring barrel
3: thinning stirring barrel
4: mixture containers
5: format roller + safety strips
6: stamp
7: pre-grooved corners
8: cut to width
9: cut to length
10: corrugating table
11: press
12: drying chamber
13: natural grey Neptunus corrugated sheets
14: painting installation
15: coated Neptunus corrugated sheets

Permanent control thanks to the fully computer-controlled production process, as well as regular quality checks of the finished products ensure that Neptunus corrugated sheets amply meet the high requirements set out in standards and certificates.

The accessories have the same composition as the corrugated sheets. These fittings are produced mechanically (by means of an injection machine) or manually. They allow the most common connections and finishings to be completed effectively and in a short time span.

3. PRODUCT DATA

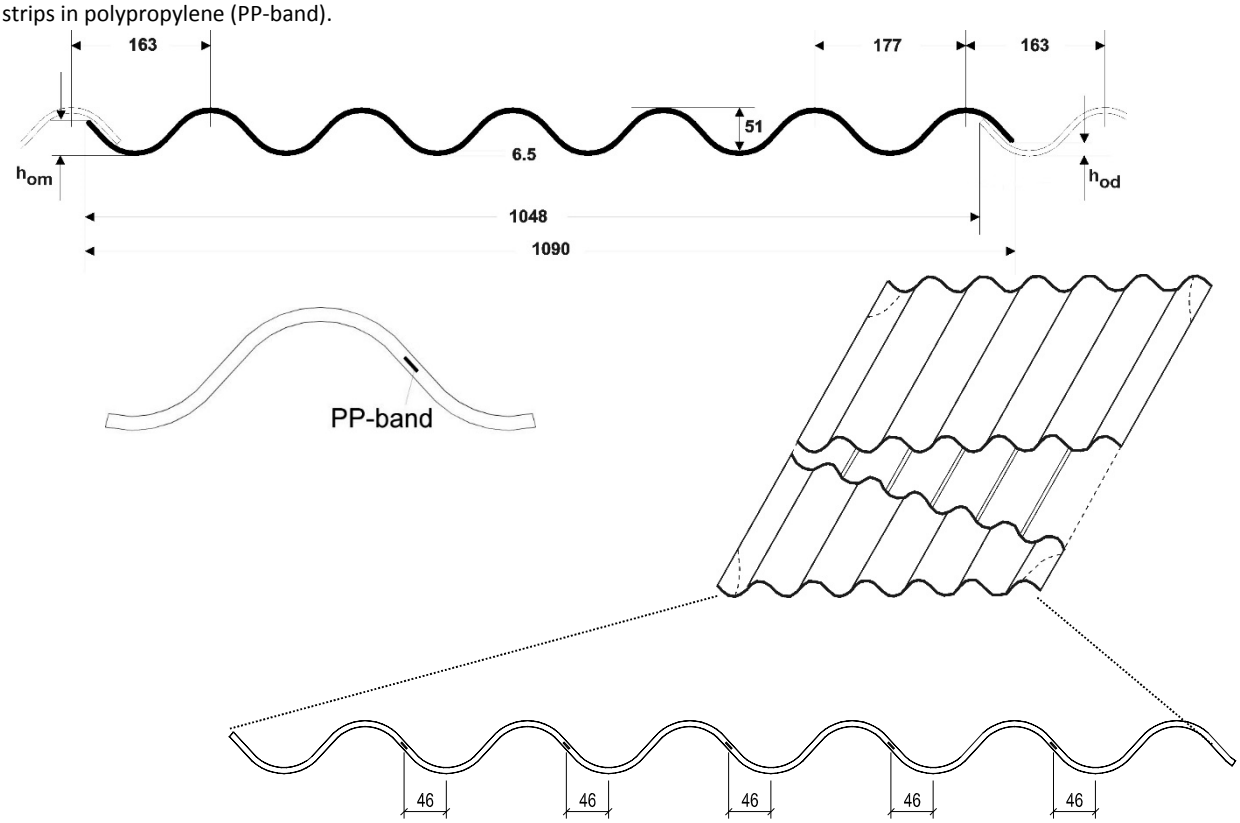
3.1. FINISH

Neptunus corrugated sheets have a multiple layer of acrylic water-based coating on the front side which strongly counteracts growth of moss.

- Spots and slight damage caused by loading, transportation and/or handling, as well as efflorescence, do not affect the normal practical value of the corrugated sheets.
- When installing the sheets all available pallets need to be used simultaneously.
- The visual evaluation of the possible colour degradation should always be done from ground level. When destacking the corrugated sheets it may occur that some fibrecement material from the overlying plate is left behind on the coating. This causes “white spots” on the coating. The "white spots" can simply be wiped off, or will disappear over time due to weather conditions.
- The SVK guarantee on corrugated sheets expires when an additional paint coating is applied on either side of the sheet as SVK is not able to examine whether the roof was painted in a correct way, nor can SVK check whether that paint was of good quality and if it has influenced the vapour permeability. In any case, it is not permitted to paint the underside of the corrugated sheets.

3.2. GEOMETRICAL PROPERTIES

The Neptunus corrugated sheets are manufactured in profile number 76 (6 ¼ corrugations). They are equipped with 5 black safety strips in polypropylene (PP-band).



Important: corrugated sheets must always be installed in such a manner that the distance between the corrugation crests at the side lap is **163 mm**. Please use the SVK placement gauge (see figure § 5.3.4).

Dimensions		**Tolerance (EN 494)**
Length	1220, 1250, 1525, 1585, 1830 2135, 2440, 3050 mm	± 10 mm
Nominal width	1090 mm	+ 10 mm / - 5 mm
Net covering width	1048 mm	
Expanded width	1300 mm	
Corrugation width	177 mm	± 2 mm
Corrugation height	51 mm	± 3 mm
Thickness	6,5 mm	± 0,6 mm [± 1 mm (accessories)]
Number of corrugations	6 ¼	
Straightness	≤ 6 mm	
Ascending corrugation	40 mm ≤ h_{om} ≤ 50 mm	
Descending corrugation	7 mm ≤ h_{od} ≤ 20 mm	

3.3. MECHANICAL PROPERTIES

Mechanical characteristics		**Norm**
Breaking load	≥ 4250 N/m	EN 494
Bending moment	≥ 55 Nm/m	EN 494
Elasticity modulus (wet)	ca. 10.000 N/mm²	EN 494
Deflection	< 16,6 mm	EN 494
Thermal movement (length direction)	1,1 x 10^{-5} m/mK	
Thermal movement (width direction)	1,7 x 10^{-5} m/mK	
Impact resistance	600 J	EN 494
Impact resistance (support distance 1380mm)	900 J	NF P 33-303-2
Durability		
Water impermeabilty	No water drops	EN 494
Wet-dry resistance	R_L ≥ 0,70	EN 494
Warm water resistance	R_L ≥ 0,70	EN 494
Frost resistance	R_L ≥ 0,70	EN 494
Heat-rain resistance	Pass	EN 494
Fire behaviour		
Fire reaction class	A2 – s1, d0	EN 13501-1

3.4. PHYSICAL PROPERTIES

Physical characteristics		Norm
Density (oven dry)	≥ 1.400 kg/m³	EN 494
Weight (moisture content: 12%)	14,7 kg/m²	
Thermal conductivity: λ	0,37 W/mK	
Water absorption	± 25 % (weight)	

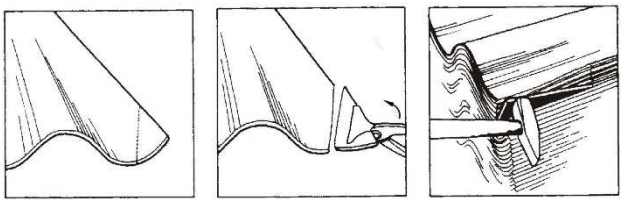
3.5. WEIGHTS

Length [mm]	Weight per sheet* [kg]
1220	19.54
1250	20.06
1525	24.48
1585	25.40
1830	29.40
2135	34.24
2440	39.18
3050	48.94

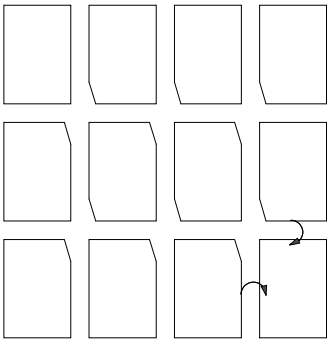
* These weights are based on a moisture content of 12%.

3.6. PRE-GROOVED CORNERS

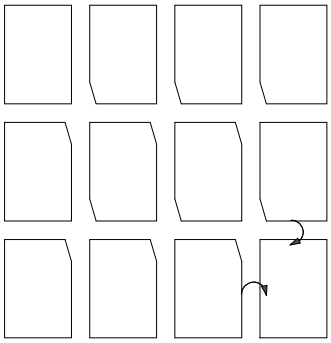
In view of the execution, the time needed for installation and undesired dust formation, the corrugated sheets are **pre-grooved at the 4 corners** during production, based on a standard lap of **200 mm**. Mitring can be done manually by means of a hammer, a set of pliers (with broad jaws) or another suitable tool. The placement of the sheets can either be done from right to left (R → L) or from left to right (L → R).



Origin and benefit of pre-grooving:
In order to avoid four layers of sheeting on top of each other at the junction of side and end laps, two of the sheets at each junction need to be mitred at opposite corners. The removed mitre areas are covered by the top sheet.



Lay R → L



Lay L → R

When a standard endlap of 200 mm is insufficient (e.g. exposition to extreme rain and wind, extended roof length from eaves to ridge, …), a longer lap can be foreseen, e.g. 250 mm. In that case, the mitres are adjusted to the required length. The end lap must not exceed 300 mm.

3.7. QUALITY

CE

Z31.4-161

BENOR

BB - 213 - 683 - 494 - 01

kiwa gecertificeerd

KOMO

BRL 1103
Geprofileerde vezelcementplaten

CERTIFIÉ PAR CSTB

NF

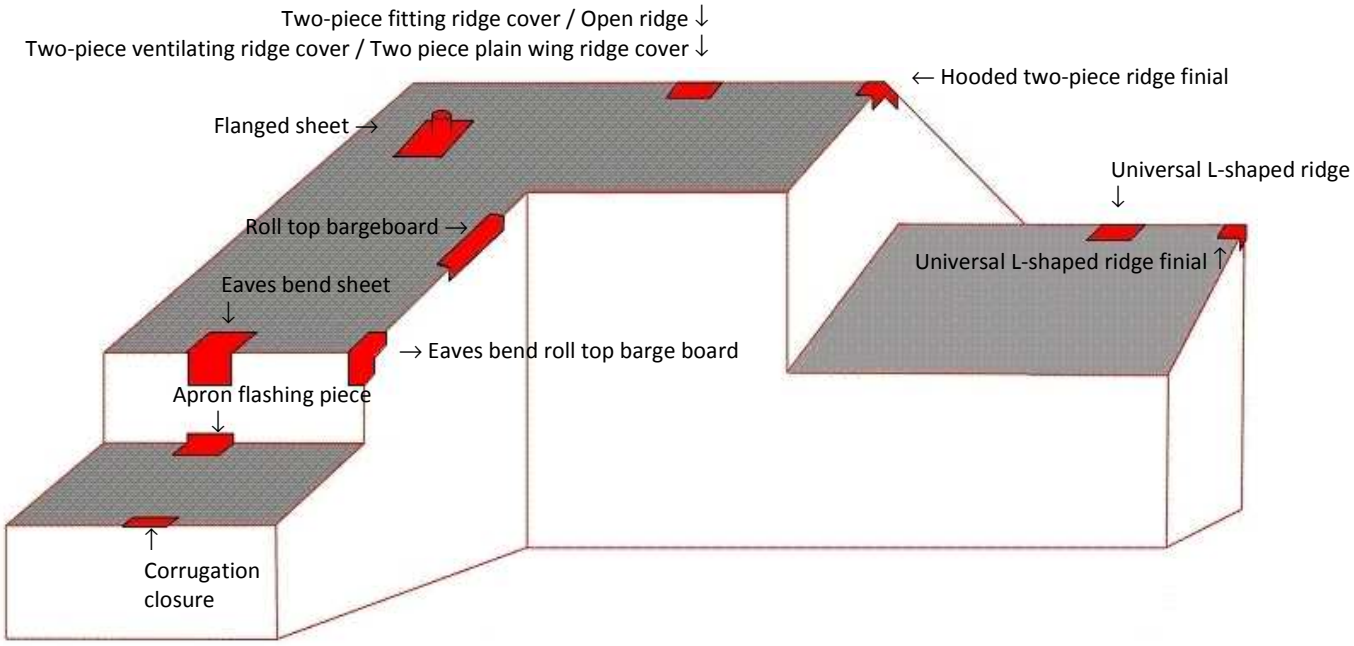
NF DTU 40.37

PLAQUES PROFILÉES EN FIBRES-CIMENT

CETTE MARQUE CERTIFIE :
- LE RESPECT DU RÉFÉRENTIEL DE CERTIFICATION NF 249
- LES VALEURS DES CARACTÉRISTIQUES ANNONCÉES GRÂCE A UN CONTRÔLE PERMANENT EXERCÉ PAR LE CSTB.

4. ACCESSORIES

A number of accessories are available to carry out all common connections and finishing in an effective and quick way.



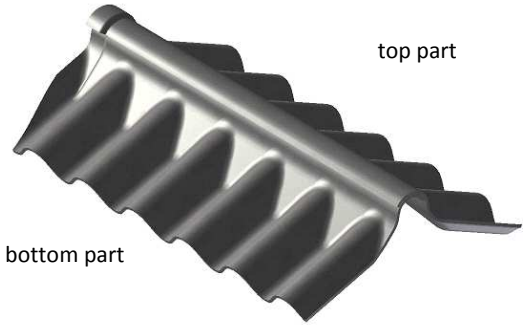
Determination of type left and right:
The roof surface must be looked at from ground level, standing in front of the roof. In case the corrugated sheets or accessories are installed from right to left, they are called type right; if the placement of the sheets or accessories start on the left, to the right, we deal with type left.

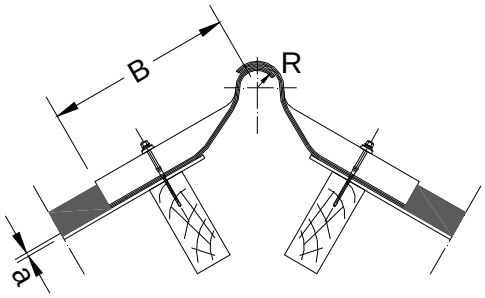
Please use our application form to specify all necessary details (see website SVK).

Remarks:

- Compatibility of the Neptunus sheets and accessories with sheets and accessories of a different brand cannot be guaranteed.
- Unless otherwise indicated, all sizes are in mm.

4.1. TWO-PIECE CLOSE FITTING RIDGE COVER





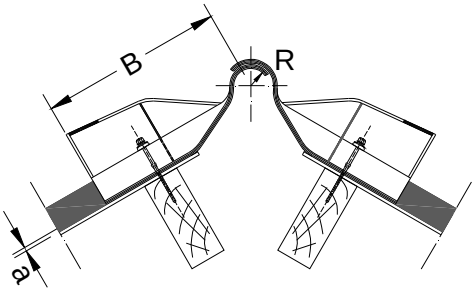
Net covering width [mm]	Total width [mm]	a [mm]	B [mm]	R [mm]	Weight [kg]
1048	1090	6,5	350	35	6.8 + 6.8

For application with roof pitches from 5° to 45°, both for classical as for round lay.
Two-piece close fitting ridge covers are always installed using the round lay method, independent of the sheeting method. As a consequence, both top and bottom part are covered from R → L. The bottom part is placed on the roof surface where the sheets are placed from R → L.

Both top and bottom part are delivered with a pre-mitred corner for a lap of 200 mm.

Detailed installation guidelines: see § 5.4.1

4.2. TWO-PIECE VENTILATING RIDGE COVER



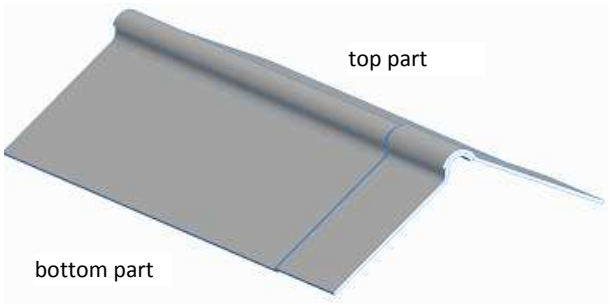
Net covering width [mm]	Total width [mm]	a [mm]	B [mm]	R [mm]	Free air area [cm²/ridge]	Weight [kg]
1048	1090	6,5	350	35	208 cm² x 2	7.5 + 7.5

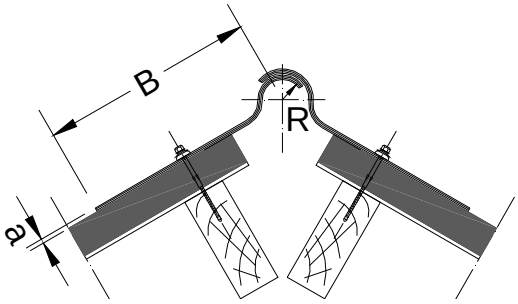
For application with roof pitches from 5° to 45°, both for classical and for round lay.
Two-piece close fitting ventilating covers are always installed round, independent of the sheeting method. As a consequence, both top and bottom are installed from R → L. The bottom part is placed on the roof surface where the corrugated sheets are placed from R → L.

Both top and bottom part are delivered with a pre-mitred corner for a lap of 200 mm.
Inside is a PVC vent (see picture). The hood is provided with a rectangular opening of 200 x 60 mm.

Installation: see two-piece close fitting ridge cover, see § 5.4.1.

4.3. TWO-PIECE PLAIN WING RIDGE COVER





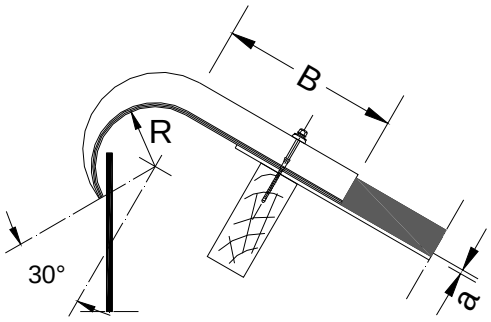
Net covering width [mm]	Total width [mm]	a [mm]	B [mm]	R [mm]	Free air area [cm²/m]	Weight [kg]
1000	1120	6,5	350	35	500	7 + 7

For application with roof pitches from 5° to 45°, both for classical as for round lay.
The lower part is placed from R → L. The upper part is placed from L → R, independent of the placing system of the corrugated sheets.

A minimum lap of 250 mm is required with the underlying corrugated sheet.

It is advisable to place the two-piece plain wing ridge covers with the same spacing ad the corrugated sheets (so with a net covering width of 1.048 mm instead of 1.000 mm), so the covers overlap 72 mm (use a sealing kit in unfavourable conditions).

4.4. UNIVERSAL L-SHAPED RIDGE



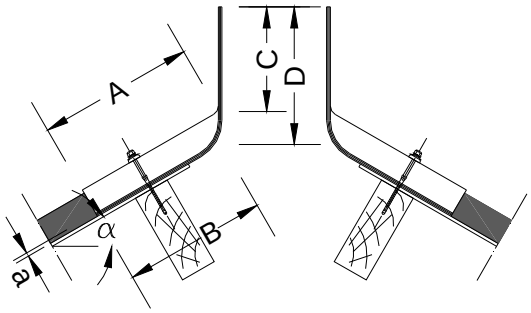
Net covering width [mm]	Total width [mm]	a [mm]	B [mm]	R [mm]	Weight [kg]
1048	1090	6,5	300	100	6.6

Please indicate the type on your order: left type (for right lay L → R) or right type (for left lay R → L).

For application with roof pitches from 5° to 45°.

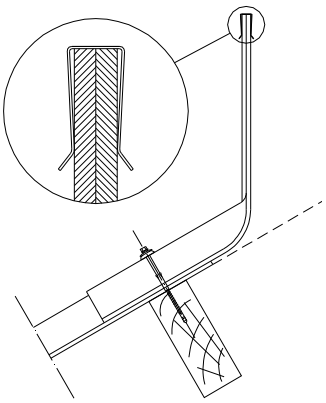
4.5. CORRUGATED OPEN RIDGE

2 x type right (for round lay)



Net covering width [mm]	Total width [mm]	a [mm]	A [mm]	B [mm]	C [mm]	D [mm]	Roof pitch α	Weight (kg)
1048	1090	6,5	300	280	200	250	20°	7.00 + 7.00
1048	1090	6,5	300	280	300	350	20°	7.92 + 7.92
1048	1090	6,5	300	280	300	350	30°	7.92 + 7.92

The corrugated open ridge is built up by 2 apron flashing pieces.
The apron flashing pieces are equipped with a socket.
Both parts are delivered with a pre-mitred corner for a lap of 200 mm.



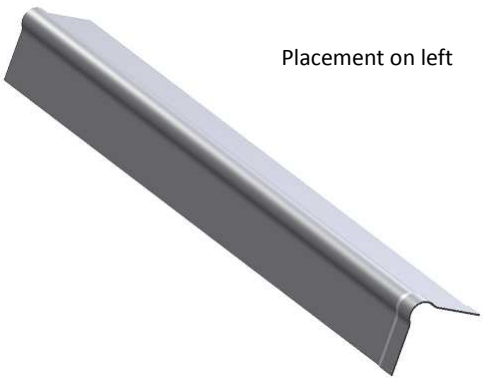
Please indicate the type on your order: left type (for right lay L → R) or right type (for left lay R → L).

- Round lay: 2 x right.
- Classical lay: 1 x left and 1 x right.

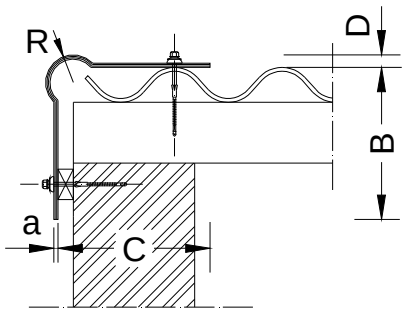
If desired, a **stainless steel clip** can be obtained to keep the open ridge pieces together at the overlap (see drawing).

Please use our application form to specify all necessary details of a corrugated open ridge (see website SVK).
* Other roof pitches on demand.

4.6. ROLL TOP BARGEBOARD



Placement on left

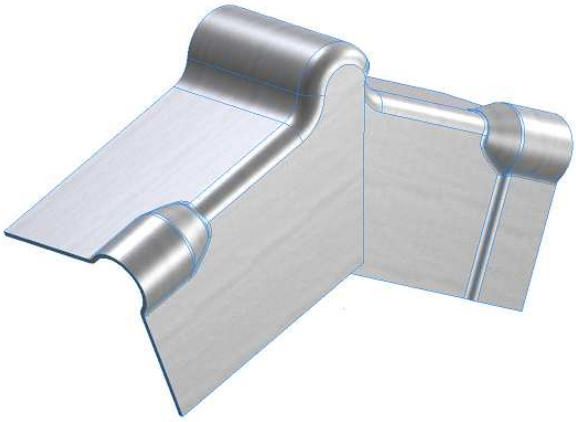


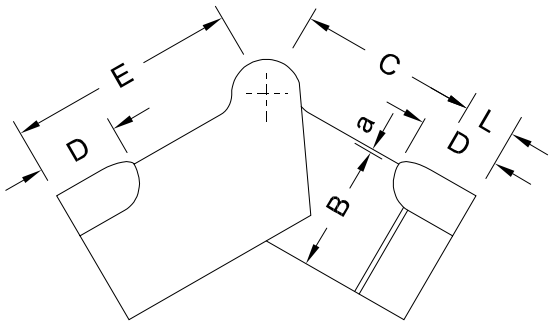
Net covering length [mm]	Total length [mm]	a [mm]	B – C [mm]	D [mm]	R [mm]	Weight [kg]
2500	2600	6,5	250	20	45	19.2

They are mounted subsequent to the installation of the corrugated sheets.
The socket is always directed downwards.

Installation guidelines: see § 5.9.3.1 & § 5.9.3.2

4.7. HOODED TWO-PIECE RIDGE FINIAL



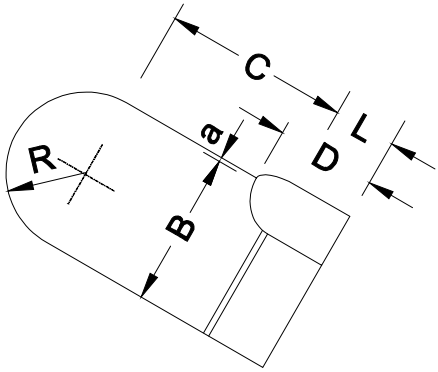


Width [mm]	a [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]	Weight [kg]
250	6,5	250	350	160	450	100	3.6 + 3.6

For application with roof pitches from 5° to 45°.
They are mounted subsequent to the installation of the two-piece close fitting ridge covers and roll top bargeboards.

4.8. UNIVERSAL L-SHAPED RIDGE FINIAL

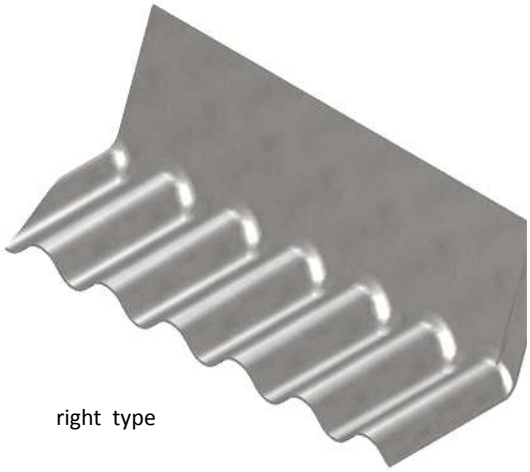
left type



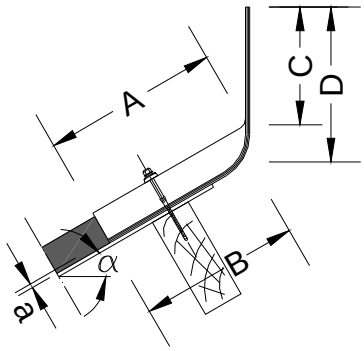
Width [mm]	a [mm]	B [mm]	C [mm]	D [mm]	L [mm]	R [mm]	Weight [kg]
250	6,5	250	300	160	100	125	4.4

They are mounted subsequent to the installation of universal L-shaped ridges and roll top bargeboards.
Please indicate left or right type on your order (see website SVK).

4.9. APRON FLASHING PIECE



right type



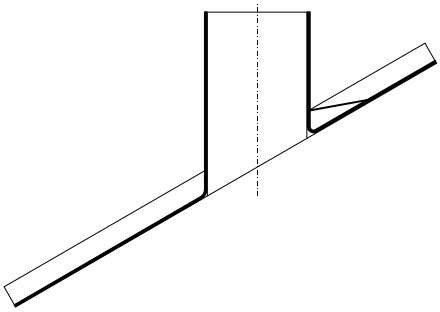
Net covering width [mm]	Total width [mm]	a [mm]	A [mm]	B [mm]	C [mm]	D [mm]	Roof pitch α* [°]	Weight [kg]
1048	1090	6,5	300	280	200	250	20	7.00
1048	1090	6,5	300	280	300	350	20	7.92
1048	1090	6,5	300	280	300	350	30	7.92

The apron flashing piece is equipped with a socket.
Delivered with a pre-mitred corner for a lap of 200 mm.
Use with open ridge constructions (see § 5.9.2) or wall connections.

Please indicate the type on your order: left type (for right lay L → R) or right type (for left lay R → L).
Please use our application form to specify all necessary details of the apron flashing piece (see website SVK www.svk.be).

* Other roof pitches on demand

4.10. FLANGED SHEET



right type

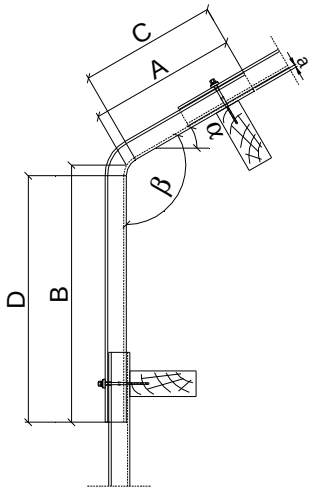
Flanged sheets are available in all sheet lengths, type left or right, for various roof pitches. The height and position of the flange can be determined as desired, within production possibilities.

- Inner diameter tube: 100 – 150 – 200 – 250 – 300 – 400 – 500 – 600 mm (round tube).
- Inner diameter tube: 100 – 150 – 200 – 250 – 300 – 400 – 500 – 600 mm (square tube).
- Standard height: 310 mm (= maximum height).

It is recommended to provide a trimmer construction around the roof opening, for support; with tube diameters starting from 400 mm this is obligated.
Orders are only carried out provided that sufficient waterproofness can be guaranteed; the roof pitch and the dimensions of both sheet and flange are thereby considered.
Please use our application form to specify all necessary details of the flanged sheet (see website SVK).

4.11. EAVES BEND SHEET

right type

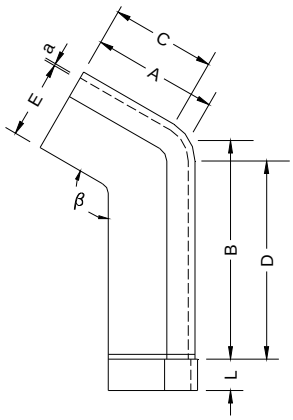


Net covering width [mm]	Total width [mm]	a [mm]	Standard dimensions A [mm]	C [mm]	B [mm]	D [mm]	Roof pitch α [°]	Aperture angle β [°]	Weight [kg]
1.048	1.090	6,5	400	370	700	670	15° ≤ α ≤ 65° per 5°	105° ≤ β ≤155° per 5°	17.6

Use for transitions from roof to wall. Ratio pitch – aperture angle: α + 90° = β.
Please indicate the type on your order: left type (for right lay L → R) or right type (for left lay R → L).
Other wing lengths on request.
If the roof is connected to a perfectly vertical wall, the aperture angle β of 105 ° to 155 ° corresponds to a roof pitch of respectively 15 ° to 65 °. Installation guidelines: see § 5.4.2.
Please use our application form to specify all necessary details of the eaves bend sheet (see website SVK)

4.12. EAVES BEND ROLL TOP BARGE BOARD

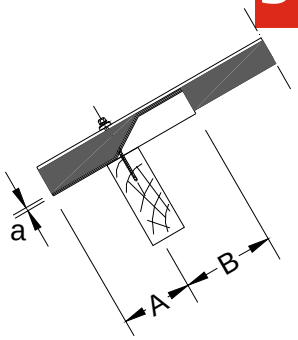
Type left



Width [mm]	a [mm]	Standard dimensions A [mm]	C [mm]	B [mm]	D [mm]	E [mm]	L [mm]	Aperture angle β [°]	Weight [kg]
250	6,5	400	370	700	670	250	100	105° ≤ β ≤155° per 5°	7.5

To be applied with an eaves bend sheet and a roll top bargeboard.
They are mounted together with the roll top bargeboards subsequent to the installation of the eaves bend sheets.
Please indicate type left or right on your order.
Installation guidelines: see § 5.4.2.
Please use our application form to specify all necessary details of the eaves bend roll top barge board (see website SVK).

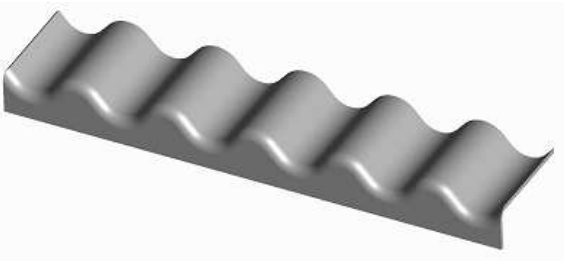
4.13. EAVES FILLER

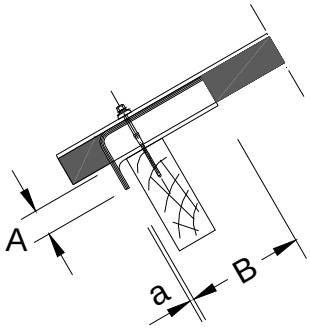


Total width = net covering width [mm]	a [mm]	A [mm]	B [mm]	Weight [kg]
1048	6,5	140	180	4.84

The eaves fillers are placed together with the first row of corrugated sheets and fixed with the same fixing materials.

4.14. EAVES CORRUGATION CLOSURE

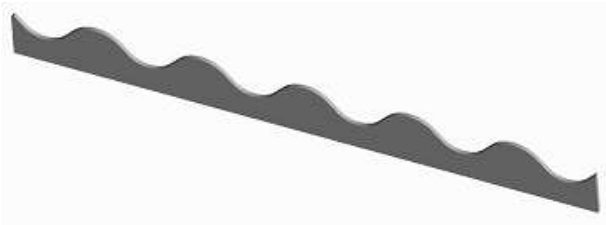


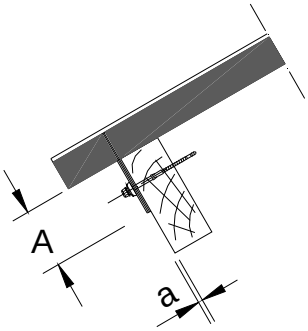


Total width = net covering width [mm]	a [mm]	A [mm]	B [mm]	Weight [kg]
1048	6,5	45	200	4.84

The eaves closures are placed together with the first row of corrugated sheets and fixed with the same fixing materials.

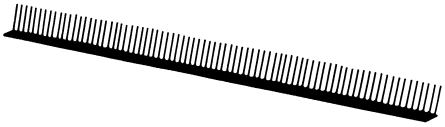
4.15. PLAIN CORRUGATION CLOSURE

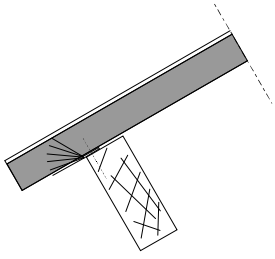




Total width =net covering width [mm]	a [mm]	A [mm]	Weight [kg]
1048	6,5	150	2.64

4.16. VENTILATION COMB



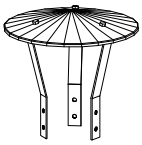


Comb height: 55 mm
Material: polypropylene
Width: 1 m
Colour: black

4.17. ROUND CHIMNEY HOOD

For tubes with inner diameter: 100 - 150 - 200 - 250 mm

4.18. ROUND CHIMNEY HOOD + BRACES



Inner diameter: 300 - 400 - 500 - 600 mm

4.19. FIXING MATERIALS

Application: see § 5.3.3.1.

- Common screw for timber purlin
- Common screw for metal purlin
- Self-drilling screw for timber purlin
- Self-drilling screw for metal purlin
- Hookbolt for metal I-purlin
- Flat crookbolt for metal I-purlin
- S-crookbolt for metal I-purlin

4.20. BUTYL RIBBON AND SEALING KIT

Application: see § 5.3.5.

Both have to comply with following demands:

- thickness 8 to 10 mm (the kit must fill up the space between the 2 corrugations entirely);
- remain plastic with temperatures from – 20° to + 80°C;
- remain supple and compressible;
- adhere well to fibrecement;
- not contain any components affecting fibrecement;
- be alkali-proof.

5. INSTALLATION

5.1. BASIC GUIDELINES

5.1.1. GENERAL

- When the roof is not square, the corrugated sheets are placed perpendicular to the ridge purlin to make sure the ridge pieces can be placed correctly.
- Corrugated sheets may not be placed in stretching bond .
- Fitting sheets are always at least 3 corrugations wide.
- The following phenomena may occur under unfavourable conditions and are not attributable to the quality of the sheets and / or the placement:
  - the penetration of wind, dust, soot, snow;
  - the moist indoor air can condense at low outdoor temperature at the underside of the sheets and drip off or freeze there;
  - the snow can accumulate or freeze at some places of the roof, especially gutters, valley gutters and on the outer edges of the roof surface. When fast thaw occurs, the normal water drain may be obstructed in such a way that melt water penetrates through the joints at these places;
  - the drainage may also be obstructed by pollution of the roof: dust, leaves, moss etc.

Depending on the phenomenon this can be overcome, wholly or partly, by:
- a sealant;
- a water draining underroof;
- a correct roof structure (see § 5.2);
- a larger overlap (max. 300 mm);
- a larger roof pitch (minimum roof pitch is 5 °);
- regular maintenance of the roof.

5.1.2. SAFETY

When walking over a corrugated sheets roof, security measures must always be taken in accordance with the national safety regulations. This includes that corrugated sheets must never be walked on directly. Thoroughly attached walkways should always be used (crawling boards, roof ladders or other similar provisions).

5.1.3. WORKING

Working must be carried out with tools which are made for treatment of stone like materials.

In order to avoid dust generation:
- the sheets are pre-mitred for a lap of 200 mm, so they can be easily removed (see also § 3.6).
- If a bigger lap is required, the sheets can be mitred by means of a suitable tool (pliers, Widia cutting hook, slow speed reciprocating power saw);
- only slow speed saws are used (portable band saw, circular saw).

The holes in the corrugated sheets and accessories are pre-drilled with a larger diameter than the fastener shaft (Ø fastener + 3 mm) in order to enable the sheet to move and expand. Pre-drilling (if no self-drilling screws are used) is carried out by means of a portable drilling machine, which has a stone-drill with a hard metal cutting tip.
The tightening of the fasteners is best done with a machine that works with a depth control instead of a coupling to resistance or strength.

5.1.4. TRANSPORTATION AND STORAGE

- Transportation

Neptunus corrugated sheets are supplied on pallets and shrink-wrapped. As this packaging is not fully weatherproof, the materials must be well covered during transportation.

- Storage at the warehouse

As the shrink-wrapped foil in which the corrugated sheets are packed only provides limited protection, the packages must be stored in a dry area.
Store the sheets in a ventilated sheltered space, which has a dry, flat and stable floor.
The sheets must be protected from all kinds of weather conditions: rain, sun, wind, …
Make holes in the plastic covers in order to avoid condensation and consequently efflorescence on the sheets.

- Storage on site

If possible, corrugated sheets on site are stored under the same conditions as with warehouse storage.
If the sheets cannot be stored inside, the covers must be removed. The sheets can be protected by covering them with a breathing waterproof canvas.
Storage under canvas must be as short as possible; the sheeting must be carried out as soon as possible upon delivery.

The maximum stacking height for Neptunus corrugated sheets is 1 m. At the building material dealer's warehouse, stacks of 2 or 3 pallets can be made. Before stacking, either place a corrugated sheets pallet upside down on the pallet below, or 2 profiled wooden beams.

The accessories are delivered on pallets, with or without shrink wrap.

With transportation or manipulation of the materials, the legislation related to mobile work equipment for hauling and lifting loads must be respected at all times.

The sliding of coloured corrugated sheets or accessories over each other must be avoided in order not to damage the coating.

5.2. ROOF COMPOSITION

In a roof structure, many variants are possible. The basic structure consists of trusses, purlins and corrugated sheets.
Unless otherwise indicated the following guidelines apply for this roof composition.

An underroof, counter battens and/or insulation can be added. Provided that the necessary precautions are taken, it is possible to install just the insulation and no counter battens or underroof.

5.2.1. ROOF STRUCTURE

The support frame consists of timber, concrete or metal roof trusses and must be strong enough to carry the installed weight and snow, wind,... loads.
The support frame dimensions should be calculated by an engineering agency.

The **minimum roof pitch** for Neptunus sheeting is **5°** (= 8.7%).

Converting percentage (cm/m) into degrees:

9% =	5° 08′	38% =	20° 48′	67% =	33° 49′	96% =	43° 50′
10% =	5° 42′	39% =	21° 18′	68% =	34° 13′	97% =	44° 08′
11% =	6° 16′	40% =	21° 48′	69% =	34° 36′	98% =	44° 25′
12% =	6° 50′	41% =	22° 18′	70% =	35° 00′	99% =	44° 43′
13% =	7° 24′	42% =	22° 47′	71% =	35° 22′	100% =	45° 00′
14% =	7° 58′	43% =	23° 16′	72% =	35° 45′	105% =	46° 24′
15% =	8° 31′	44% =	23° 45′	73% =	36° 08′	110% =	47° 44′
16% =	9° 05′	45% =	24° 14′	74% =	36° 30′	120% =	50° 12′
17% =	9° 38′	46% =	24° 42′	75% =	36° 52′	130% =	52° 26′
18% =	10° 12′	47% =	25° 10′	76% =	37° 14′	140% =	54° 28′
19% =	10° 45′	48% =	25° 38′	77% =	37° 36′	150% =	56° 19′
20% =	11° 17′	49% =	26° 06′	78% =	37° 57′	160% =	58° 00′
21% =	11° 52′	50% =	26° 34′	79% =	38° 19′	170% =	59° 32′
22% =	12° 24′	51% =	27° 01′	80% =	38° 40′	180% =	60° 57′
23% =	12° 57′	52% =	27° 29′	81% =	39° 00′	190% =	62° 14′
24% =	13° 30′	53% =	27° 55′	82% =	39° 21′	200% =	63° 26′
25% =	14° 02′	54% =	28° 22′	83% =	39° 42′	220% =	65° 33′
26% =	14° 34′	55% =	28° 49′	84% =	40° 02′	240% =	67° 23′
27% =	15° 07′	56% =	29° 15′	85% =	40° 22′	260% =	68° 58′
28% =	15° 39′	57% =	29° 41′	86% =	40° 42′	280% =	70° 28′
29% =	16° 10′	58% =	30° 07′	87% =	41° 01′	300% =	71° 34′
30% =	16° 42′	59% =	30° 32′	88% =	41° 20′	350% =	74° 03′
31% =	17° 13′	60% =	30° 58′	89% =	41° 40′	400% =	75° 58′
32% =	17° 45′	61% =	31° 23′	90% =	41° 59′	450% =	77° 28′
33% =	18° 16′	62% =	31° 48′	91% =	42° 18′	500% =	78° 41′
34% =	18° 47′	63% =	32° 13′	92% =	42° 37′	600% =	80° 32′
35% =	19° 17′	64% =	32° 37′	93% =	42° 55′	700% =	81° 52′
36% =	19° 48′	65% =	33° 01′	94% =	43° 14′	800% =	83° 52′
37% =	20° 18′	66% =	33° 25′	95% =	43° 32′	900% =	83° 40′
						1000% =	84° 17′

5.2.2. PURLINS

Whilst designing the building, it is advisable to take into account the dimensions of corrugated sheets and accessories. This way sheet adjustment can be avoided or reduced to a minimum.

For the sake of fixing, timber purlins need to be at least 50 mm wide, metal purlins at least 40 mm. **The exact dimensions are determined by the designer**.
Timber conditions: impregnated pinewood, straight, no waney edges, equal thickness.

The corrugated sheet support frame must be and remain perfectly level. Make sure no differential movement can occur. The permissible deflection is described in the European Standard EN 494.
It is recommended to link the top two purlins (see § 5.9.2.1)

5.2.3. PURLIN DISTANCE AND OVERHANG

The maximum allowed purlin distance is determined by taking into account the demands set in Eurocode 1: NBN EN 1991-1-4 and the European standard EN 494.

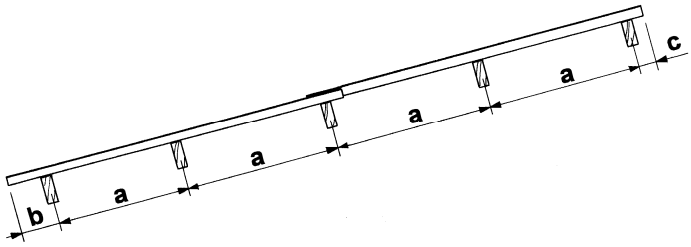
The standard end lap is 200 mm. Smaller end laps are not allowed. In case the standard end lap of 200 mm is insufficient (e.g. in case of small roof pitches, extreme exposure to rain and wind, extended length from eaves to ridge, …) a bigger lap can be provided, e.g. 250 mm. In that case, the sheets are mitred to the required length. The end lap must not exceed 300 mm.

The purlin distances indicated in the table below must not be exceeded. The **maximum purlin distance is 1385 mm** for a sheet length of 1585 mm.

They are valid for closed buildings with a height up to 10 m and for open buildings up to 7 m high. In coastal areas the distance between coast and building must equal at least 50 times the building height above ground level. In all other cases the purlin distance has to be calculated by an engineering agency.

Maximum allowed purlin distances (a, see figure below):

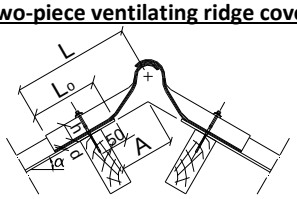
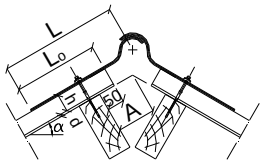
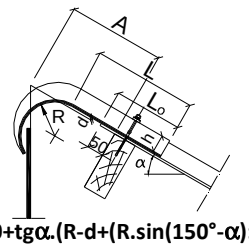
Sheet length [mm]	200 mm lap [min.]		250 mm lap		300 mm lap (max.)	
	Net covering length [mm]	Purlin distance [mm]	Net covering length [mm]	Purlin distance [mm]	Net covering length [mm]	Purlin distance [mm]
1.220	1.020	1.020	970	970	920	920
1.250	1.050	1.050	1.000	1.000	950	950
1.525	1.325	1.325	1.275	1.275	1.225	1.225
1.585	1.385	1.385	1.335	1.335	1.285	1.285
1.830	1.630	815	1.580	790	1.530	765
2.135	1.935	967	1.885	942	1.835	917
2.440	2.240	1.120	2.190	1.095	2.140	1.070
3.050	2.850	950	2.800	933	2.750	1.375



The maximum overhang length of the corrugated sheets past the purlins:
- Below (b), without gutter: max. **300 mm**
- Below (b), with gutter fixed to the corrugated sheets: max. **150 mm**. Check on obstruction regularly in order to avoid extra weight. Placing a ladder against the gutter must also be avoided.
- Above (c), at the ridge: max. **100 mm**.

5.2.4. POSITION OF RIDGE WHEN USING WITH SVK ACCESSORIES

The installation of the ridge purlin is determined by the roof pitch, the roof composition, the ridge construction and the used accessory. The dimensions indicated in the following table are calculated for an end lap of 200 mm. If a bigger end lap (Lo) is applied, the purlin distances are adjusted accordingly.

	Two-piece close fitting ridge cover **Two-piece ventilating ridge cover**	**Two-piece plain wing ridge cover**	**Universal L-shaped ridge**
			
	A=L-Lo+50-(h+2.d).tgα	**A=L-Lo+50-(h+2.d).tgα**	**L-Lo+50+tgα.(R-d+(R.sin(150°-α):sinα)**
L=	350 mm	350 mm	300 mm
Lo=	200 mm	**250 mm** (minimum lap)	200 mm
d=	6,5 mm	6,5 mm	6,5 mm
h=	51 mm	51 mm	51 mm
R=			100 mm
Roof pitch α	**A**	**A**	**A**
5°	194 mm	144 mm	216 mm
6°	193 mm	143 mm	219 mm
7°	192 mm	142 mm	222 mm
8°	191 mm	141 mm	225 mm
9°	190 mm	140 mm	229 mm
10°	189 mm	139 mm	232 mm
11°	188 mm	138 mm	235 mm
12°	186 mm	136 mm	238 mm
13°	185 mm	135 mm	242 mm
14°	184 mm	134 mm	245 mm
15°	183 mm	133 mm	248 mm
16°	182 mm	132 mm	252 mm
17°	180 mm	130 mm	255 mm
18°	179 mm	129 mm	259 mm
19°	178 mm	128 mm	262 mm
20°	177 mm	127 mm	266 mm
21°	175 mm	125 mm	269 mm
22°	174 mm	124 mm	273 mm
23°	173 mm	123 mm	276 mm
24°	172 mm	122 mm	280 mm
25°	170 mm	120 mm	284 mm
26°	169 mm	119 mm	288 mm
27°	167 mm	117 mm	292 mm
28°	166 mm	116 mm	296 mm
29°	165 mm	115 mm	300 mm
30°	163 mm	113 mm	304 mm
31°	162 mm	112 mm	308 mm
32°	160 mm	110 mm	313 mm
33°	158 mm	108 mm	317 mm
34°	157 mm	107 mm	321 mm
35°	155 mm	105 mm	326 mm
36°	154 mm	104 mm	331 mm
37°	152 mm	102 mm	336 mm
38°	150 mm	100 mm	341 mm
39°	148 mm	98 mm	346 mm
40°	146 mm	96 mm	351 mm
41°	144 mm	94 mm	357 mm
42°	142 mm	92 mm	362 mm
43°	140 mm	90 mm	368 mm
44°	138 mm	88 mm	374 mm
45°	136 mm	86 mm	380 mm

5.2.5. INSULATION

Caution:
In special circumstances a specific study must be made of the construction. This is, for example, the case when corrugated sheets are exposed to:

- high concentrations of harmful substances (acids, fungi etc);
- extreme humidity;
- extreme temperatures;
- overpressure in the building;
- a permanently high humidity level, indoor climate class IV (e.g. swimming pools, laundries, etc.).

5.2.6. NON-INSULATED ROOFS

Non-insulated corrugated sheet roofs are only suitable for non-heated warehouses or coverings where neither minimum or maximum inside temperatures are required and where incidental dripping condensation doesn't form a problem.

Dripping condensation moisture is minimised through good building ventilation, also in the area directly under the roof surface.

5.2.7. INSULATED ROOFS

Due to increasing insulation demands, sheeted roofs are being insulated more often. The final thermal quality mainly depends upon a correct installation.

The main condition in order to obtain a trouble-free roof construction – from a building physical point of view – is to keep it **air- and vapour-tight.** Unless the insulation is air and vapour tight on its own, an air and vapour barrier must be attached to the underside of the insulation at the interior of the structure. Any air transport through the roof structure is prohibited. Insufficient air tightness may cause a number of important risks:

- internal condensation that can cause moisture damage and accelerated degrading of the roof structure and the corrugated sheets;
- comfort complaints due to draught;
- substantial increase of energy consumption due to uncontrolled ventilation loss.

When airtight insulation boards are used, the joints between the boards and all connections to other materials must be made airtight.

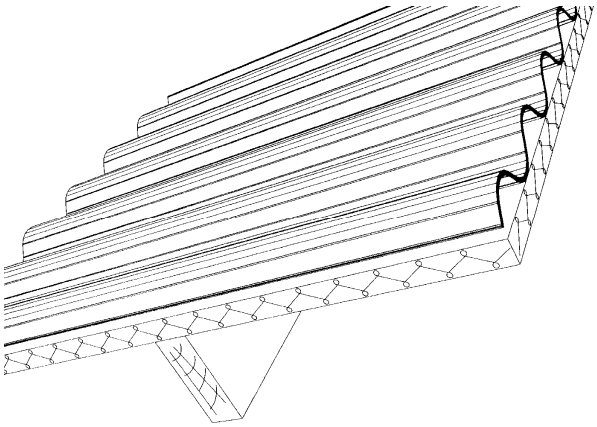
When using non-airtight insulation boards or rolls, airtightness is obtained by attaching an air screen underneath the insulation. The installation of such a screen must be carried out carefully. Always provide sufficient overlapping joints that are taped in an airtight way together with all connections.

The type of insulation and potential coating is dependent on the application and is determined by the insulation manufacturer.

The application of insulation foam directly on the underside of the corrugated sheets is not allowed because the sheets would not be able to move individually anymore, with tensions as a result.

On following page, the most commonly used insulation system is described.

Rigid self-supporting insulation boards, on top of the purlins:



These insulation boards must either be airtight or have an airtight cladding. Air- and damptightness is obtained by closing the joints (with joint profiles, tape, foam or foaming tape between purlins and insulation, …) or with a sound tongue-groove connection. Applying insulation board dimensions in accordance with purlin distances is advisable; it is also interesting to provide insulation in one length from eaves to ridge. If this distance is too large, make sure that the end connection is realized at the level of an underlying purlin and is finished on the top side with a water-tight, elastic tape.

The insulation boards must have a sufficient compressive strength to withstand the weight of the roofing and the various loads that take place on it. The length of the fixings must also be adjusted to the thickness of the insulation.

Subcooling condensation should be avoided.

It's better not to use insulation boards provided with an aluminum coating on the top side because of thermal tensions.

5.2.8. VENTILATION

Non-insulated roofs
Buildings where no insulation is provided under the sheets should still be adequately ventilated on the underside. For this, ventilating accessories can be used at the ridge and the eave as in insulated roofs.

Caution:
When, at low outdoor temperature, indoor air with high humidity comes against the cold roofing sheets, condensation occurs here, where drops will form as a result. If this condition persists, with frost this condensation can form an ice layer against the sheets which can cause water nuisance with defrost.

Insulated roofs
When a perfect air and vapour tightness is ensured, the space between the insulation (or underroof) and the corrugated sheets isn't ventilated.

In the absence of a perfect air and vapour tightness this space is ventilated through the use of custom fittings. At the location of the eave, closing pieces cannot be used.

The ventilating accessories for the ridge are:
- two-piece ventilating ridge cover (see § 4.2)
- two-piece plain wing ridge cover (see § 4.3)
- corrugated open ridge (see § 4.5)

The ventilating accessories for the eave are:
- ventilating comb (see § 4.16)
- perforated corrugated profile

Ventilation from the building or from the space under the roof must be made by means of flange plates and not through the ventilation space under the corrugated sheets.

5.3. INSTALLATION OF CORRUGATED SHEETS FOR ROOF COVERING

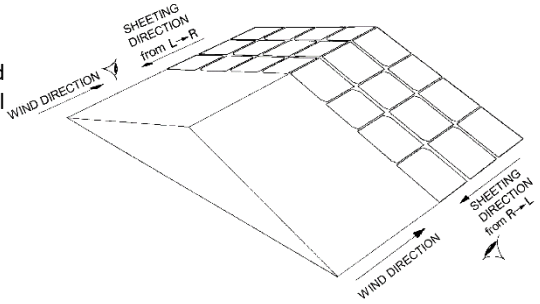
5.3.1. SHEETING METHODS

First, the sheeting method must be determined.

To indicate the placing direction one always looks at the roof from below, standing in front of the roof surface (also see § 4 Determination of left and right installation type).

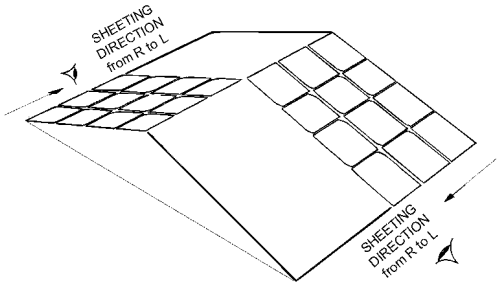
Classical lay:

The sheeting direction is opposite to the predominant wind direction (usually south-west to west). The covering direction will determine where the sheets need to be mitred.



Round lay:

The corrugated sheets are installed from right to left (R → L) on both roof surfaces. Where the sheets are mitred, the top right and/or bottom left mitres are cut.



5.3.2. INSTALLATION OF CORRUGATED SHEETS

First, the roof is outlined, starting at the right hand side below (or possibly left hand side below in case classical lay is applied, for installation from L → R). In order to install the corrugated sheets in the longitudinal direction perfectly square to the purlins, an auxiliary structure as indicated on next the page can be used. The corrugated sheets are installed perpendicular to the ridgeline, in order to make the ridge accessories fit exactly. Minor deviations on the squareness of the construction can be compensated in the verge areas by the roll-top bargeboards. If the deviation is too substantial, special measures are required.

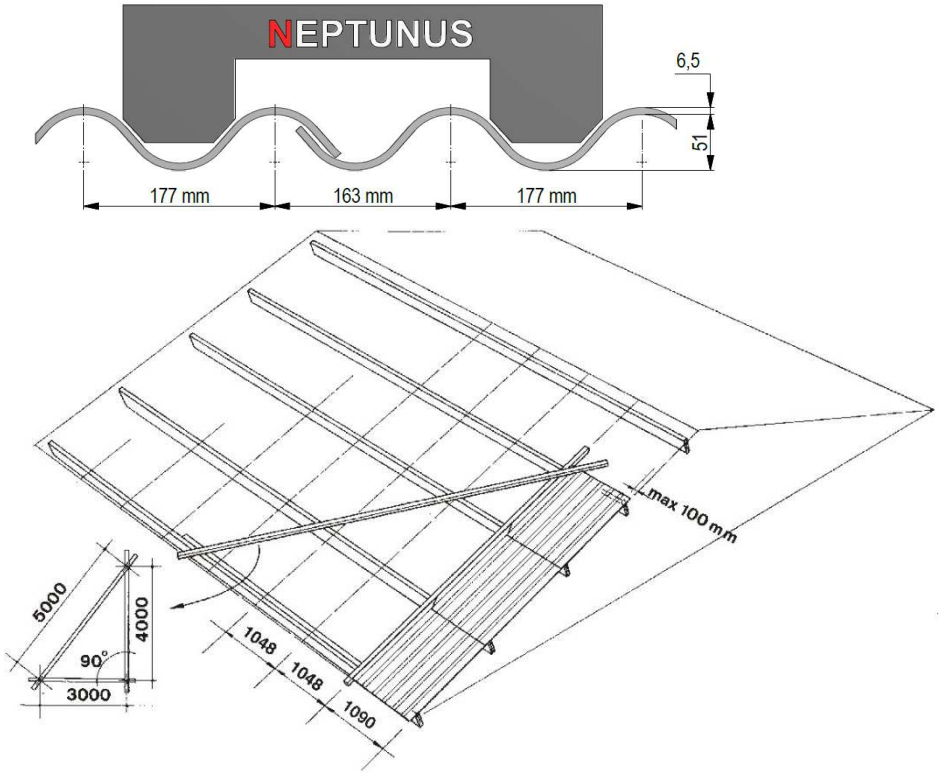
Taking into account the selected edge finishing, a full sheet width – 1090 mm – is indicated first, for the next sheets a covering width – 1048 mm – is indicated. The table below shows how many sheets are required theoretically for a particular covering width.

It may be useful to make marks after multiple sheets (e.g. every 5 sheets) by means of a chalk line on the corrugation crests or valleys.

Covering width:

Number of sheets	Width [m]	Number of sheets	Width [m]	Number of sheets	Width [m]
1	1.090	18	18.906	35	36.722
2	2.138	19	19.954	36	37.770
3	3.186	20	21.002	37	38.818
4	4.234	21	22.050	38	39.866
5	5.282	22	23.098	39	40.914
6	6.330	23	24.146	40	41.962
7	7.378	24	25.194	41	43.010
8	8.426	25	26.242	42	44.058
9	9.474	26	27.290	43	45.106
10	10.522	27	28.338	44	46.154
11	11.570	28	29.386	45	47.202
12	12.618	29	30.434	46	48.250
13	13.666	30	31.482	47	49.298
14	14.714	31	32.530	48	50.346
15	15.762	32	33.578	49	51.394
16	16.810	33	34.626	50	52.442
17	17.858	34	35.674		

Important: The outlining of the sheets is based on the net covering width of 1048 mm, the nominal width of 1090 mm is approximate (see § 3.2 Tolerances on dimensions). Therefore, it is advisable to always check the sidelap by means of the placement gauge, in such a way that the distance between the corrugation crests at the sidelap is always **163 mm**.



Auxiliary structure

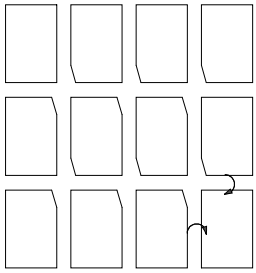
Normally, the corrugated sheets are positioned in vertical rows from eaves to ridge, starting at the roof edge. This method offers a number of important advantages:

- the corrugated sheets need not be walked over during the installation;
- the walkways and the hauling device have to be moved less frequently;
- the ridges can be immediately installed row by row.

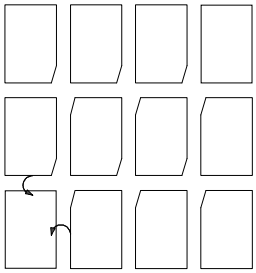
Take into account the edge finishing when placing the sheets. If roll top bargeboards or other accessories are used, keep enough room available for their fixing.

The following drawing shows where the sheets are to be mitred, depending on the sheeting method. Mitring the top row of corrugated sheets at the upper corners depends on the ridge type that is applied.

Left lay: R → L



Right lay: L → R



If the roof width is not a multiple of complete sheet widths, adjusted sheets must be used at the verge of the roof surface. An adjusted sheet must be at least 3 corrugations wide. If necessary, the next row of sheets is also cut in order to have at least 3 corrugations. Length-adjusted sheets are installed at the edge of the roof surface (preferably the top sheet).

5.3.3. FIXING

5.3.3.1 Fixing material

Neptunus corrugated sheets can be installed in the following two ways:
- with hookbolts or topfix fasteners in normal circumstances;
- with crookbolts for a flexible fixing.

The fixing materials are adjusted to the shape and the dimensions of the purlins and to the end lap. They are made of **stainless or galvanized steel**. The fasteners and hooks, as well as the washers must have a long life cycle and be of good quality. The washers and similar must **remain elastic**.

Hookbolts or topfix fasteners

They are applied with support frames where no abnormal movements are to be expected.
The corrugated sheets are installed in such a way that their top edge is **50 mm** upslope from the purlin. **The hookbolts and topfix fasteners must be placed at least 50 mm from the sheet edge.**

The clearance holes must be 3 mm bigger than the diameter of the fastener shaft. Punching the fixing holes with a fastener or an awl is prohibited. The bolts or nuts should be tightened until the washer sufficiently covers the drilling hole. Over-tightening causes abnormal sheet tensions, which may result in cracking (see 5.3.3.2).

We recommend to use ***self-drilling screws or topfix fasteners (with wings)***: with these screwbolts, corrugated sheets can be installed in a single operation on a timber (Fig. A) or metal (Fig. B) support frame: the drill point drills a hole in the corrugated sheet and support frame, the wings enlarge the hole in the corrugated sheet, the EPDM washer assures a watertight seal.

When self-drilling screws aren't used (screws without wings), the clearance holes in the corrugated sheets and accessories have to be predrilled with a diameter of 3 mm bigger than the diameter of the fastener shaft to enable expansion and movement of the sheet.

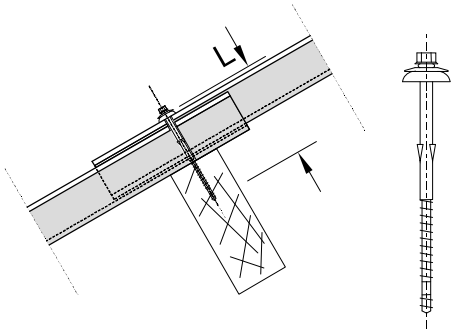


Fig. A: self-drilling screw for timber purlin

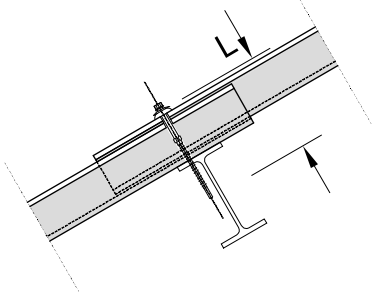


Fig. B:self-drilling screw for metal purlin

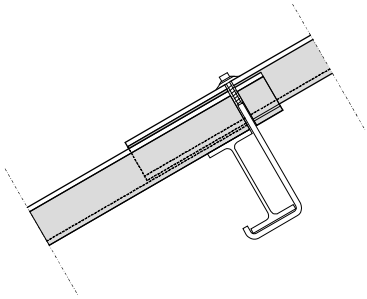


Fig.C: hookbolt for metal I-purlin

Topfix fasteners for *timber purlins* are at least 130 mm long (length L, see Fig. A). They are equipped with EPDM seals and a stainless steel washer.

Topfix fasteners and hookbolts for *metal purlins* are at least 105 mm long for metal up to 3 mm thick; they have a length of at least 110 mm for a metal thickness up to 12 mm (length L, see Fig. B). They have a diameter of 6.3 mm and are equipped with an EPDM seal and a stainless steel washer.
Hookbolts have a diameter of 7 mm and are equipped with a three-piece gasket ring.

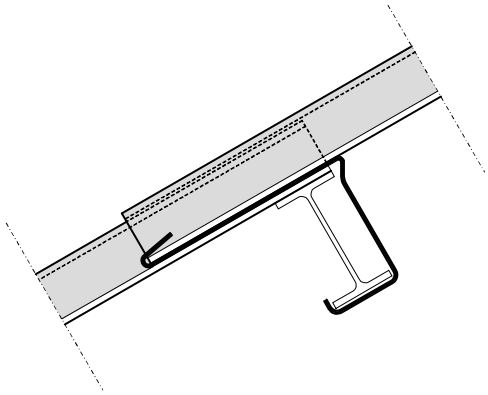
Hookbolts for *concrete purlins* have a diameter of 7 mm and are provided with a three-piece gasket ring. Their length and shape depend on the purlin type being used.

Crookbolts
Crookbolts are used in buildings where substantial temperature fluctuations may occur, e.g. ovens, iron works, … or in buildings that are subject to strong vibrations caused by machines, roller bridges, … Crookbolts must not be installed in open buildings.

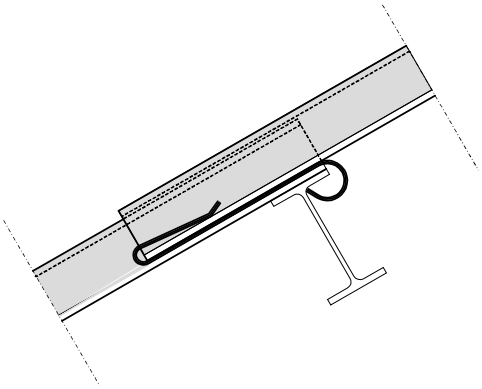
The maximum sheet length is in this case 1585 mm as intermediate purlins cannot be installed.
The top edge of the corrugated sheets is aligned with the purlins (see figure below).
Corrugated sheets in the edge area are fixed by means of hookbolts or topfix fasteners (in that case the corrugated sheets are installed level with the purlins).

Crookbolts for metal I-purlin:

Flat hook:



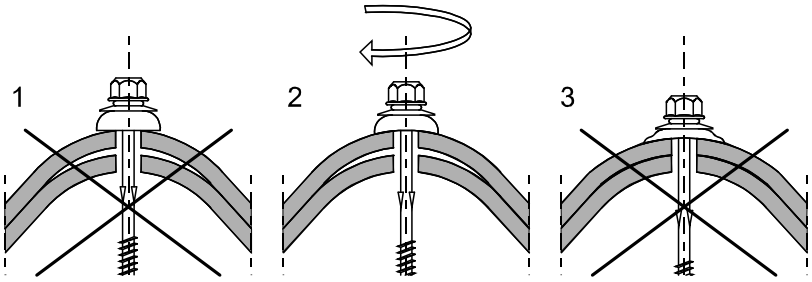
S-hook:



5.3.3.2 Installation of fasteners

The fasteners must be installed in such a way that no unwanted tension is caused in the corrugated sheets resulting in possible cracks in the sheet.

The drawing below shows how the fasteners are checked on tightness and the correct connection of the gasket to the corrugated sheet, for **self-drilling screws** (with EPDM seal and stainless steel washer).



1: too loosely tightened, insufficient water tightness.
2: correctly tightened, the gasket ring can hardly be turned by hand.
3: over tightened, the deformation of the gasket ring is too high. Risk of cracks in the corrugated sheet.

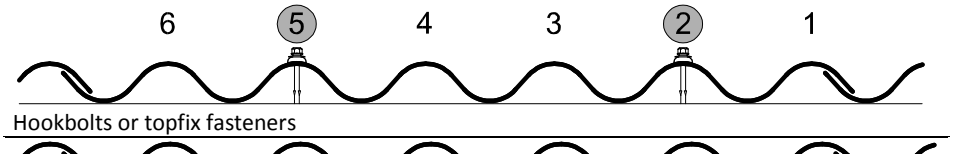
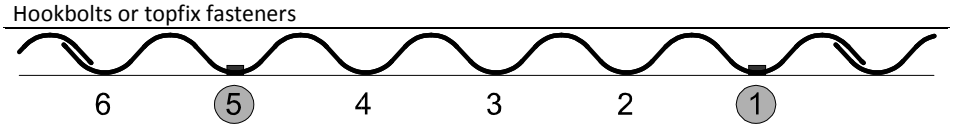
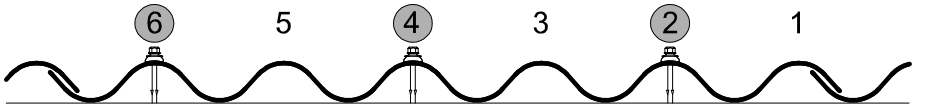
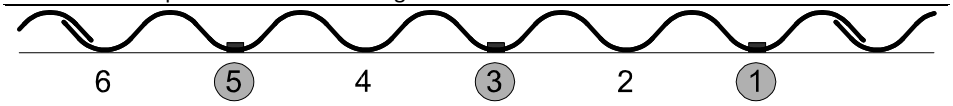
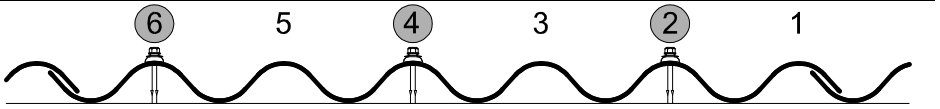
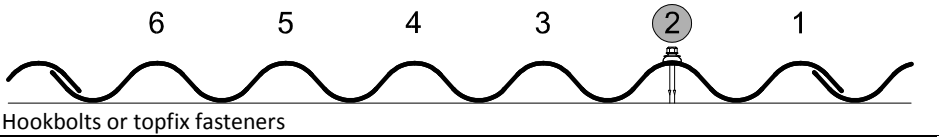
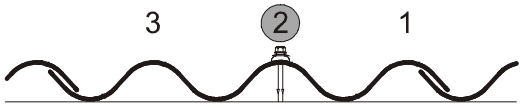
These self-drilling screws can be installed using a depth locating powertool in order to prevent under or over tightening.

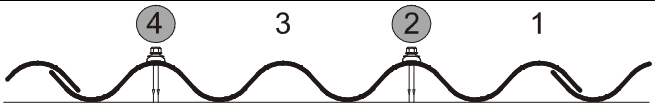
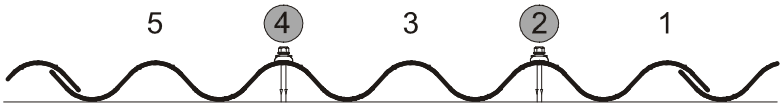
5.3.3.3 Position and number of fixings

Fasteners are always installed at the **corrugation crest** as indicated in the table below.

In the middle of the roof surface, the corrugated sheets are attached with 2 fixings. At the roof surface edges, as well as at the level of roof bend and around roof apertures, every sheet is attached with 3 fasteners.

In case corrugated sheets are installed with a length of 1830 mm or more, an additional fixing in the 2nd corrugation crest at the intermediate purlin is made.

In the roof surface	 Hookbolts or topfix fasteners  Crookbolts
Edge, at the level of the bend, around roof apertures	 Hookbolts or topfix fasteners in the verge area  Crookbolts
Ridges	 Hookbolts or topfix fasteners
Intermediate purlin	 Hookbolts or topfix fasteners
Fitting sheets 3 corrugations wide	 Hookbolts or topfix fasteners

Fitting sheets 4 corrugations wide	 Hookbolts or topfix fasteners
Fitting sheets 5 corrugations wide	 Hookbolts or topfix fasteners

5.3.3.4 Roof areas

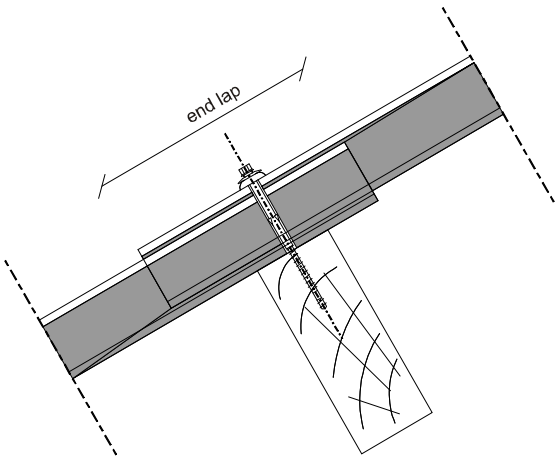
The wind load on a roof surface is greater at the roof edges, at the level of a bend and around roof vents than in the middle of the roof surface. Therefore, the corrugated sheets in these areas are provided with additional fixings. The determination of the edges has to be determined according to Eurocode 1: NBN EN 1991-1-4.

As a simplification, one can assume a 1 m edge area at eaves, near a bend and around roof vents.

5.3.4. LAP

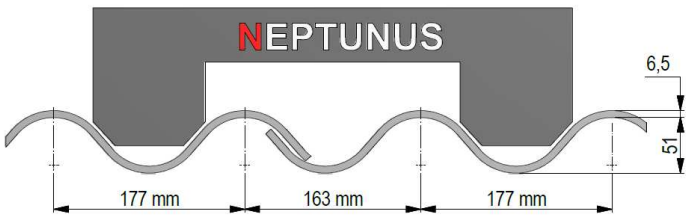
End lap

The **minimum standard lap is 200 mm**. When the overlap of 200 mm is insufficient (e.g. with strong exposure to rain and wind, a large roof length from eave to ridge, ...) one can provide a larger end lap, e.g. 250 mm. In that case, the angles are mitered at the appropriate length. The end lap must never exceed 300 mm.



Side lap

The distance between the corrugation crests at the side lap is 163 mm. It is essential that this distance always be respected. Neptunus corrugated sheets are installed with a standard side lap (horizontal projection where the corrugations overlap) of 42 mm. This is a theoretical value, because the tolerances need to be taken into account as well (see § 3.2). Please use the *SVK placement gauge*:



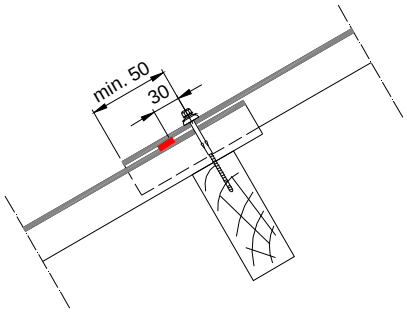
5.3.5. SEALING KIT

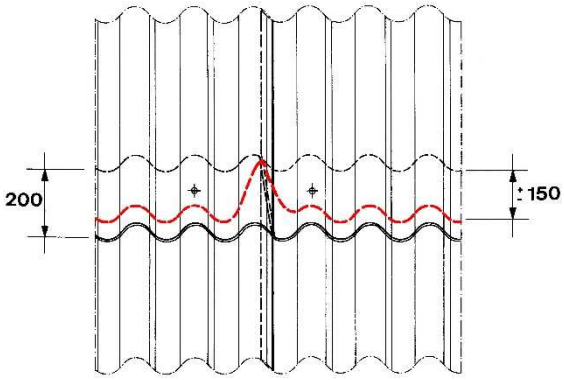
Sealing kits are available in two variants: butyl *strip* and *sealing kit*.
Both have to comply with following demands:

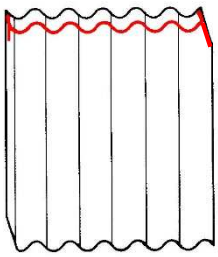
- thickness 8 to 10 mm (the kit must fill up the space between the 2 corrugations entirely);
- remain plastic with temperatures from – 20° to + 80°C;
- remain supple and compressible;
- adhere well to fibrecement;
- not contain any components affecting fibrecement;
- be alkali-proof.

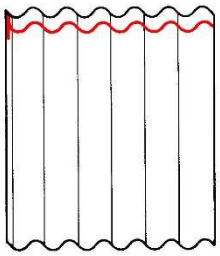
The sealing kit is always applied on a dry, fat and dust free surface.
If a sealing kit is applied at the end lap, it should be positioned approximately 30 mm below the fixings. The unfolded width of a corrugated sheet is 1300 mm.
At the mitres, the sealing kit is diverted upwards in order not to obstruct the water discharge (see figures hereafter).

Way of applying:
sealing kit between end lap:

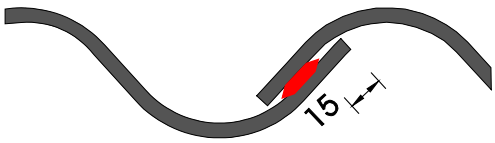


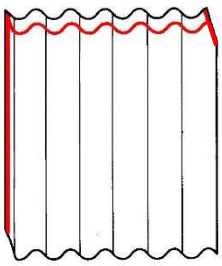


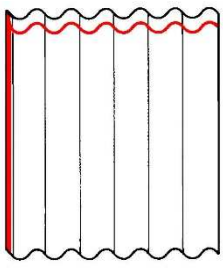




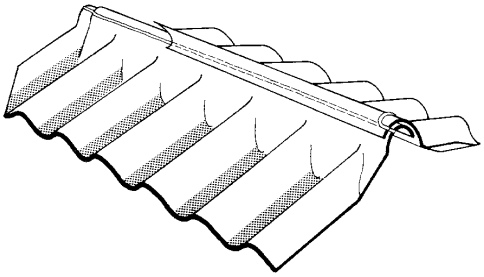
sealing kit between end and side lap:

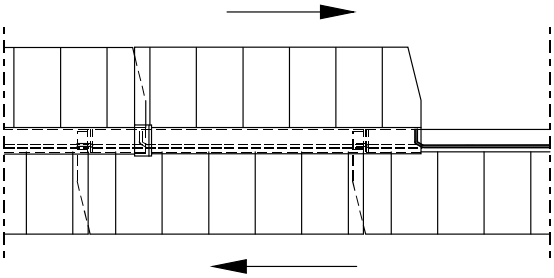






Kitting the two-piece close fitting ridge cover
For the watertightness and in order to avoid light penetration, a sealing kit is applied both in the collar as well as in the overlap of both parts:





5.3.6. WIND AND RAINPROOF ROOF

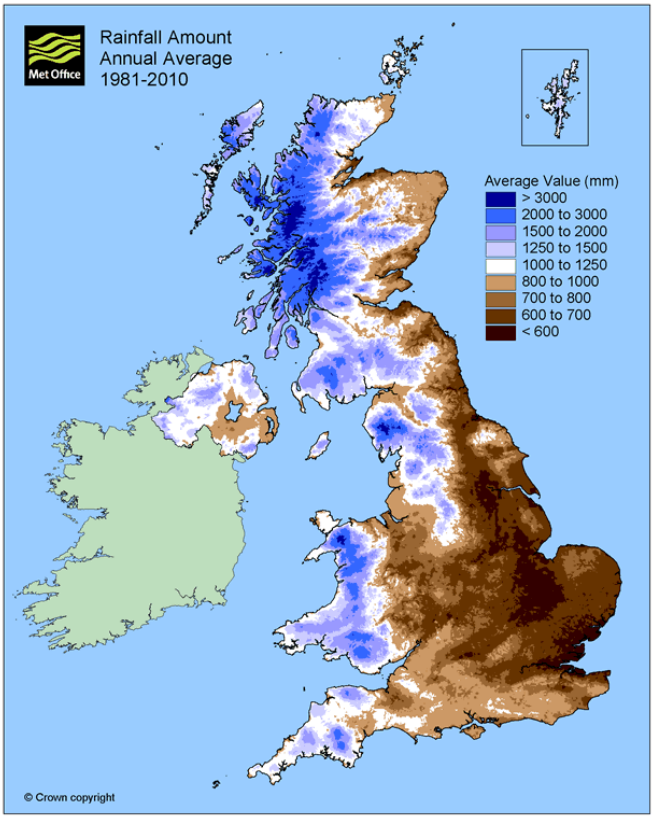
Both the end lap as well as the sealing of end and side lap, depend on wind and precipitation exposure of the roof. Various factors are important in this regard:

- roof pitch;
- roof length;
- roof height;
- geographic location;
- weather conditions;
- protection by adjacent buildings;
- special building requirements;
- …

The wind and precipitation exposure of a roof can easily be calculated:

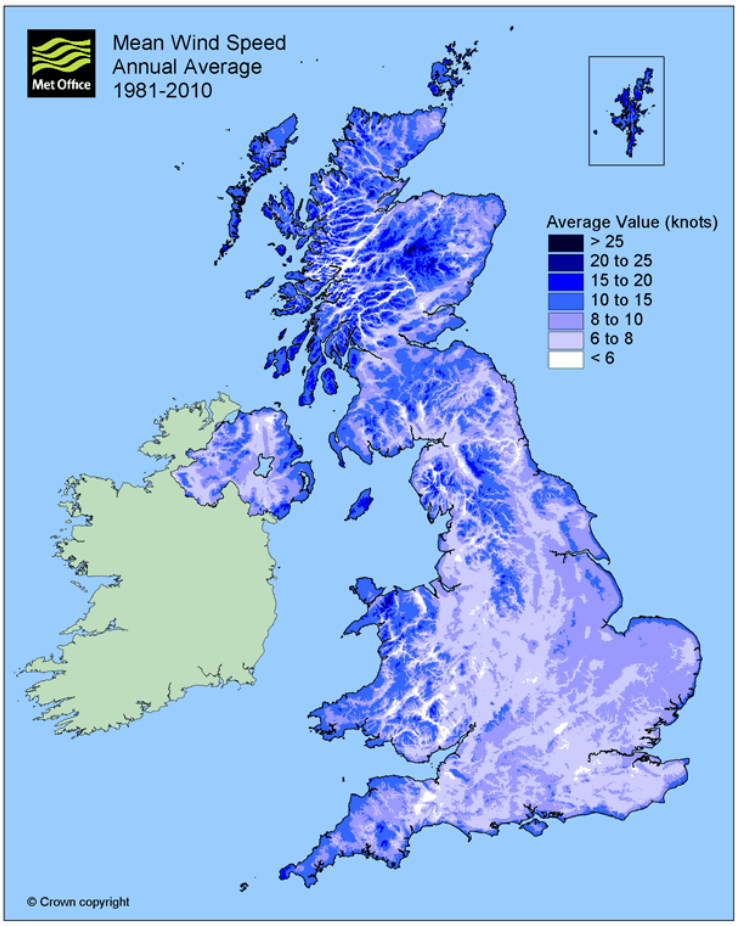
Calculation:

Determination of the annual pluviometric average. This is indicated on the following map of the UK.

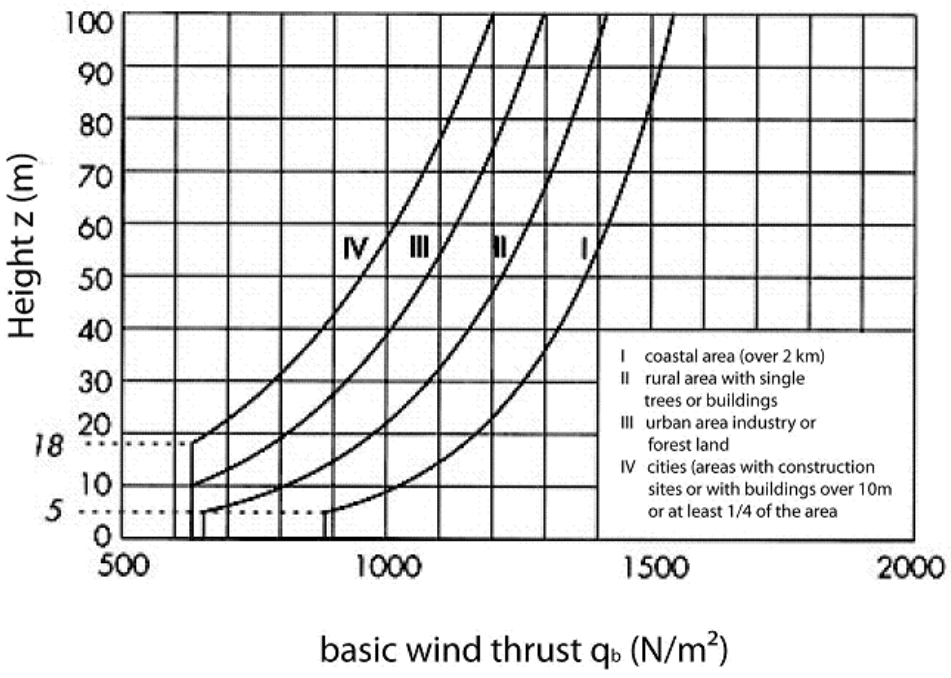


annual pluviometric average in UK (in mm) for the period 1980 – 2010 (source: metoffice.gov.uk)
(For calculation purposes the obtained value in mm needs be converted into m)

Basic wind speed



Determination of the basic wind thrust. This is indicated on the below mentioned diagram. This value is based on the ridge height and the location of the building (rural, urban, coastal area, …).



basic wind thrust (N/m² = Pa)

As soon as the necessary details are known, the calculation can be made:

downpour intensity (Pa.m) = annual pluviometric average (m) x basic wind thrust (Pa)

Based on the value obtained, the downpour intensity class is shown in the following table:

Downpour intensity	Indication	Class
< 600 Pa.m	Weak	Class I
≥ 600 Pa.m <1200 Pa.m	Moderate	Class II
≥ 1200 Pa.m	Strong	Class III

Sealing kit with a 200 mm lap for class I:

Roof pitch	CLASS I	
	Max. roof length (eaves to ridge) [m]	Sealing kit [L or W]
> 5° and ≤ 6°	15	L + W
> 6° and ≤ 7°	20	L + W
> 7° and ≤ 9°	25	L + W
> 9° and ≤ 12°	30	L
> 12° and ≤ 15°	35	L
> 15° and ≤ 19°	40	L
> 19°	40	-

Sealing kit with a 200 mm lap for class II:

Roof pitch	CLASS II	
	Max. roof length (eaves to ridge) [m]	Sealing kit [L or W]
> 5° and ≤ 6°	12	L + W
> 6° and ≤ 7°	15	L + W
> 7° and ≤ 9°	20	L + W
> 9° and ≤ 12°	25	L + W
> 12° and ≤ 15°	30	L + W
> 15° and ≤ 19°	35	L
> 19°	35	L

Sealing kit with a 200 mm lap for class III:

Roof pitch	CLASS III	
	Max. roof length (eaves to ridge) [m]	Sealing kit [L or W]
> 5° and ≤ 6°	10	L + W
> 6° and ≤ 7°	12	L + W
> 7° and ≤ 9°	15	L + W
> 9° and ≤ 12°	20	L + W
> 12° and ≤ 15°	25	L + W
> 15° and ≤ 19°	30	L + W
> 19°	30	L

L = sealing in end lap
W = sealing in side lap

For roof lengths longer than the ones indicated in the tables above, please contact our technical-commercial department.

Roof pitch	Sealing kit [L or W]
5° to 15°	L + W
15° to 22°	L

The side lap must be 42 mm (~ ¼ of a corrugation). At the point of intersection of four corrugated sheets, the opposite corners of two of the sheets need to be mitred. The distance between the corrugated sheets at the height of the mitred corners has to be 5 to 10 mm.

In any case, the prescriptions indicating the relationship between the minimum roof-pitch and the roof-length must be followed. The risk of water-leakage can be diminished by placing packings on roofs with pitches up to 20° (36,4%).

Special attention needs to be paid to gutters, eaves, valley gutters etc. where impermeability problems might appear due to freezing or snowing. The end lap over flanged sheets and roof lights must be provided with a sealant kit in order to avoid stagnant water seeping in through the upstands.

Not only watertightness, but also dust, powder snow, wind and light tightness can only be optimised by sealing both end and side laps. Please take into account that the more a roof is sealed, the more attention needs to be paid to limiting the condensation on the bottom part of the sheets.

For roofs where special demands are necessary, like for example special climatic circumstances, strongly exposed buildings, special constructions and big distances from gutter to ridge as well as used ceilings, special measures have to be made to avoid water-leakage. In this cases the use of a underlay has to be recommended as a supplementary measure for roof-pitches lower than 15°. Thermic insulation-systems with comparable functions can be used as well.

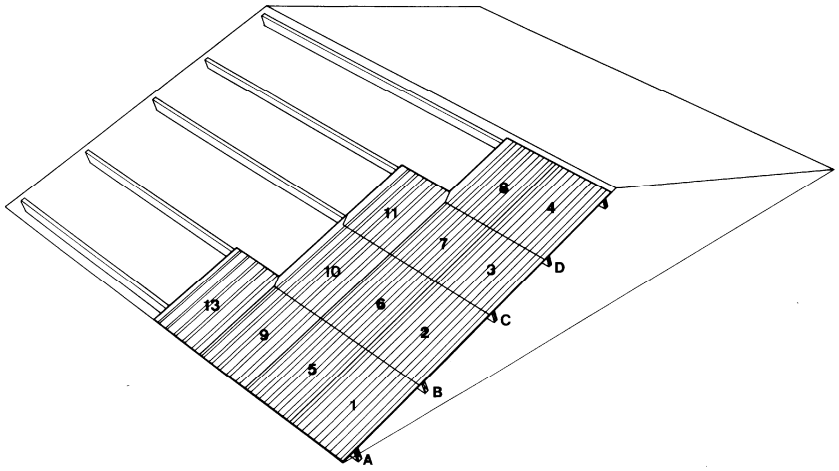
5.3.7. EXAMPLE

Below you will find an example of sheeting with topfix fasteners (taking into account an edge area of 1 m). The sheeting is carried out from R → L. No sealing kit is used.

1st row

- Sheet No. 1 is installed on purlins A and B, the top edge 50 mm upslope from purlin B. The sheet is fixed on purlin A, in the 2nd, 4th and 6th corrugation crest. **The distance of the fastener to the bottom edge of the sheet must be at least 50 mm.**
- Sheet No. 2 is mitred at the bottom left hand corner after which it is laid on sheet No. 1 and purlin C, the top edge
- 50 mm past purlin C. This sheet is fixed on purlin B in the 2nd, 4th and 6th corrugation crest.
- The installation of the other corrugated sheets in the 1st row is carried out in the same way. Sheet No. 4 may need to be cut.
- The 1st ridge part can already be positioned, but not yet fixed. The mitering of the upper corners of the ridge sheets is dependent on the used ridge type and of the placing system.

Installation of the ridges: see § 5.9.2.



2nd row:

- Sheet No. 5 is mitred at the top right hand corner, after which it is installed next to sheet No. 1, taking into account
- the correct side lap. This sheet is fixed on purlin A, in the 2nd, 4th and 6th corrugation crest.
- Sheet No. 6 is mitred at the bottom left hand and top right hand corners, after which it is installed on sheets Nos. 5
- and 2 and on purlin C. This sheet is fixed on purlin B, in the 2nd and 5th corrugation crest.
- All intermediate sheets are installed in this way.

Following rows: like the 2nd row.

Last row

Here again, the sheets are fixed with 3 fasteners.

In case the roof surface does not end in a complete sheet width, fitting sheets are used in the last row but one, or even in more than one row, if required.

Fitting sheets need to be at least 3 corrugations wide.

5.4. INSTALLATION OF ACCESSORIES

The general placement guidelines of corrugated sheets should always be observed:
- Respect the spacing of 163 mm between the corrugation crests at the side lap;
- Use the placement gauge (available on request);
- Don't tighten the screws bolts too hard;
- Preferably use self-drilling screw bolts.

5.4.1. INSTALLATION OF TWO-PIECE CLOSE FITTING RIDGE COVERS

The ridge of a corrugated sheet roof is usually finished with two-piece close fitting ridge covers.
Two-piece close fitting ridge covers can almost always be applied, with roof pitches of 5 ° to 45 °. The corrugation crests of the two roof surfaces do not need to be in the same line. **It is important that the axis of the "crown" (= ridge line) of the lower and upper part coincide.**

They are always installed from right to left, both on roofs covered according to the round lay method as well as those that are classically covered.

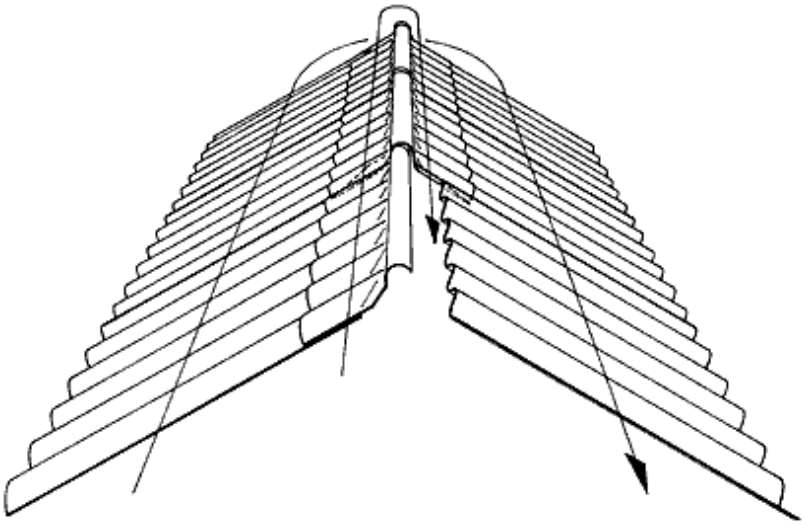
Both parts are always installed from right to left.
The lower part is always placed on the roof surface where the corrugated sheets are placed from right to left.

5.4.1.1 Round lay

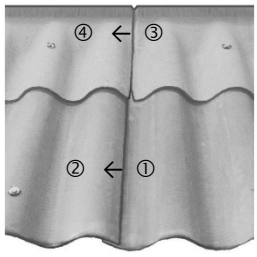
(See figure § 5.3.1)

- Corrugated sheets
  - Covering direction: from R → L
  - Mitring of the top course of corrugated sheets: top hand right and bottom hand left, on both roof surfaces.

- Two piece close fitting ridge covers
  - Covering direction: both top and bottom from R → L
  - Is delivered with mitred corners of 200 mm.



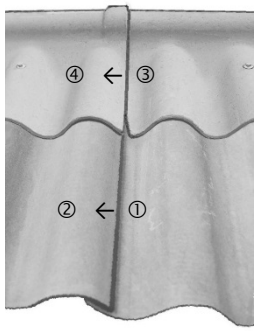
Roof surface 1 Roof surface 2



top
right to left

corrugated
sheets

Roof surface 1

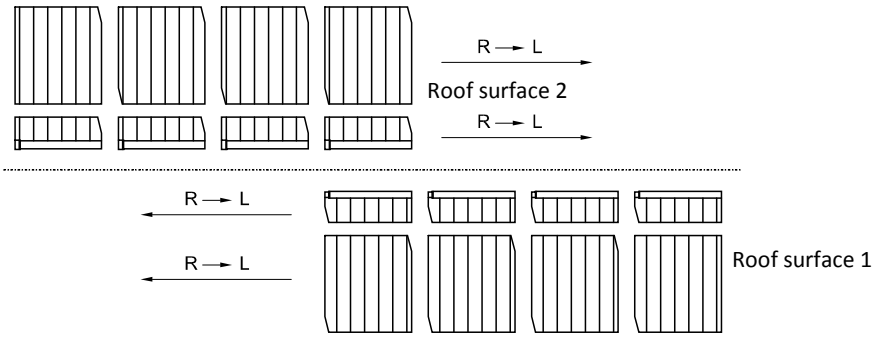


top
right to left

corrugated
sheets

Roof surface 2

①-②-③-④ = installation order



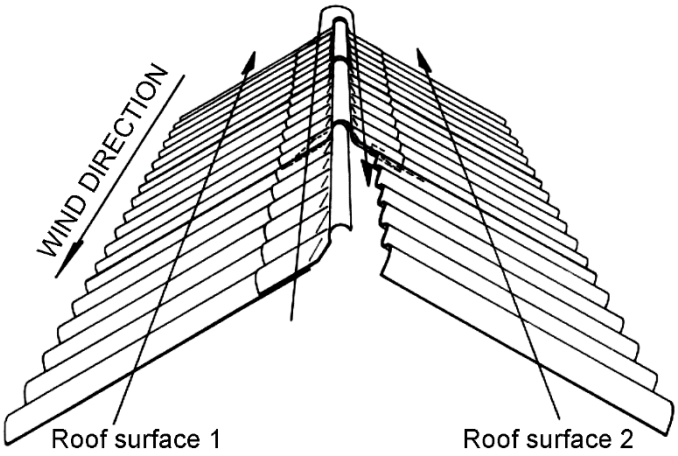
If a ridge finial needs to be installed, the external socket of the 1st top part of the ridge cover is removed by means of a suitable tool.

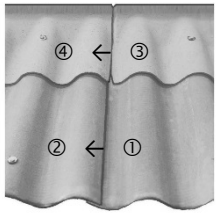
5.4.1.2 Classical method

(See figure § 5.3.1)

- Corrugated sheets
  - Covering direction: against the predominant wind direction. So: roof surface 1 from R → L, roof surface 2 from L → R.
  - Mitring of the top course of corrugated sheets: roof surface 1: top hand right and bottom hand left; roof surface 2: bottom right.

- Two piece close fitting ridge covers
  - Covering direction: both top and bottom part from R → L. The bottom part is installed on the roof surface where the corrugated sheets have been installed from R → L (= roof surface 1).
  - Mitring: as two-piece close fitting ridge covers can be used for any covering method, the sheets are always mitred both at the top and bottom part.
  - Remark: when roofs are covered according to the classical method, the sockets of the top and bottom part are usually not in line.

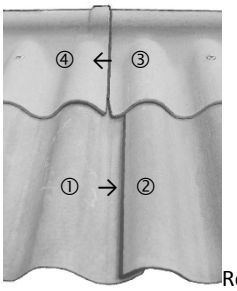




bottom
right to left

corrugated
sheets

Roof surface 1



top
right to left

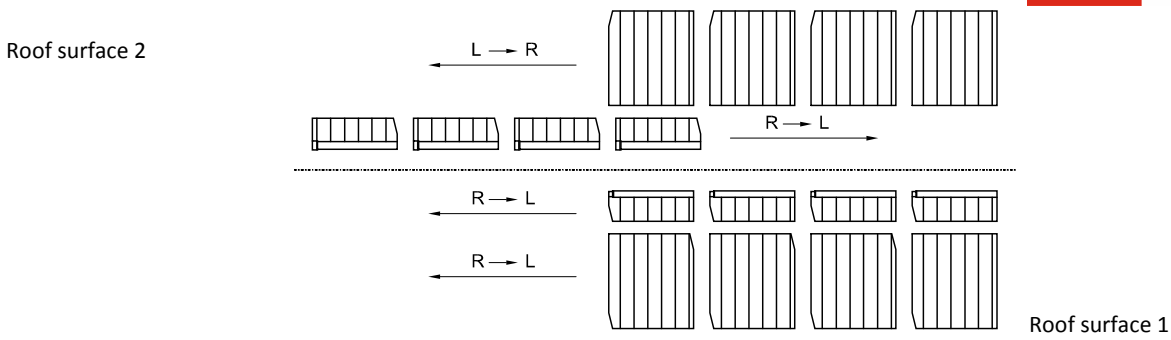
corrugated
sheets

Roof surface 2

The joint between the top parts is not in line with the joint between the corrugated sheets

①-②-③-④ = installation order

As both top and bottom parts are standard mitred for round lay, the corners are unnecessarily mitred for a roof covered according to the classical lay method. However, this mitred corner is covered by the following top part.



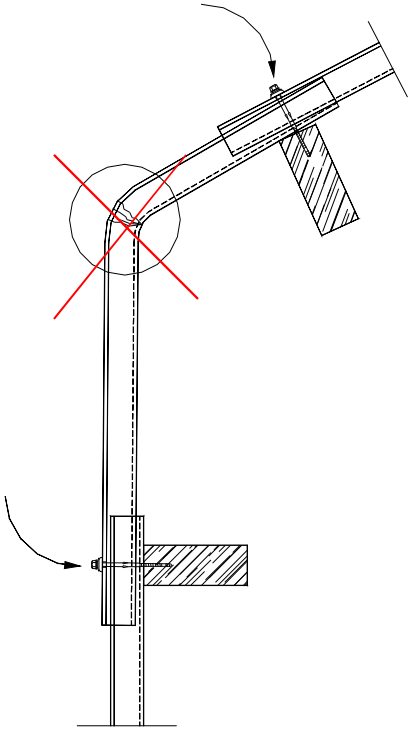
If a hooded two-piece ridge finial needs to be installed, the external socket of the 1st top part of the ridge cover is removed by means of a suitable tool.

5.4.2. INSTALLATION OF EAVES BEND SHEETS / EAVES BEND ROLL TOP BARGE BOARDS

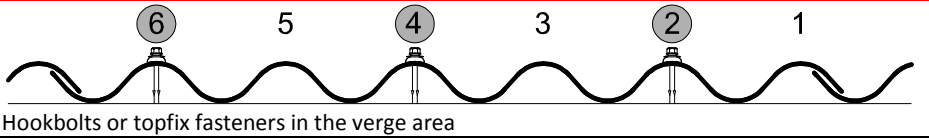
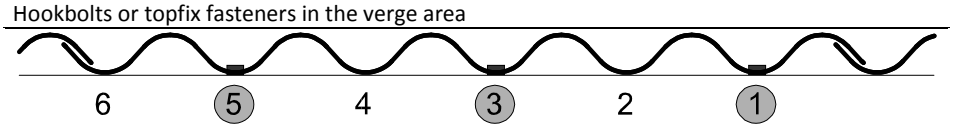
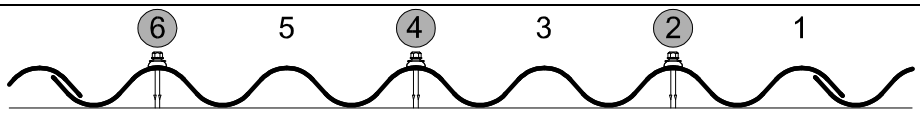
The topfix fasteners may not be tightened too hard when fixing, to avoid possible cracks at the bend (see figure for illustration of wrong situation). When the angle of the eaves bend pieces doesn't correspond 100% with the actual angle between facade an roof, the eaves bend pieces may by no means be forced when tightening the fasteners.

The angle is better rounded down instead of upwards (per 5°).

For example: a roof pitch of 17°, so the angle of eaves bend piece is 107°. Than an eaves bend piece with angle 105° should be used.



5.4.3. FIXING

Edge, at the level of the bend, around roof apertures	 Hookbolts or topfix fasteners in the verge area  Crookbolts
Ridges	 Hookbolts or topfix fasteners at ridges

5.5. INSTALLATION OF CORRUGATED SHEETS FOR FAÇADE CLADDING

5.5.1. INTRODUCTION

Neptunus corrugated sheets and accessories can also be applied for façade cladding. In this application, the corrugations are usually installed vertically on a horizontal support frame.
The corrugations can also be positioned horizontally on a vertical support frame.
Corrugated sheets for facade cladding installed with the corrugations in vertical direction, are installed on a horizontal timber or metal support frame with a minimum width of respectively 50 and 40 mm.
Mitring is carried out the same way as for roof sheeting.

5.5.2. LAP AND PURLIN DISTANCE

Basically, an end lap of 100 mm is sufficient. For practical reasons however (pre-mitred corners), we advise to apply a 200 mm lap.
The side lap is identical to the one applied on the roof.
The table below shows the maximum support distances for facade cladding.

Purlin distances with a 200 mm end lap:

	Building height	
	≤ 10m	**≤ 40m**
Sheet length (mm)	**Support distance (mm)**	**Support distance (mm)**
1220	1020	1020
1250	1050	1050
1525	1325	1325
1585	1385	1385
1830	1630	815
2135	967	967
2440	1120	1120

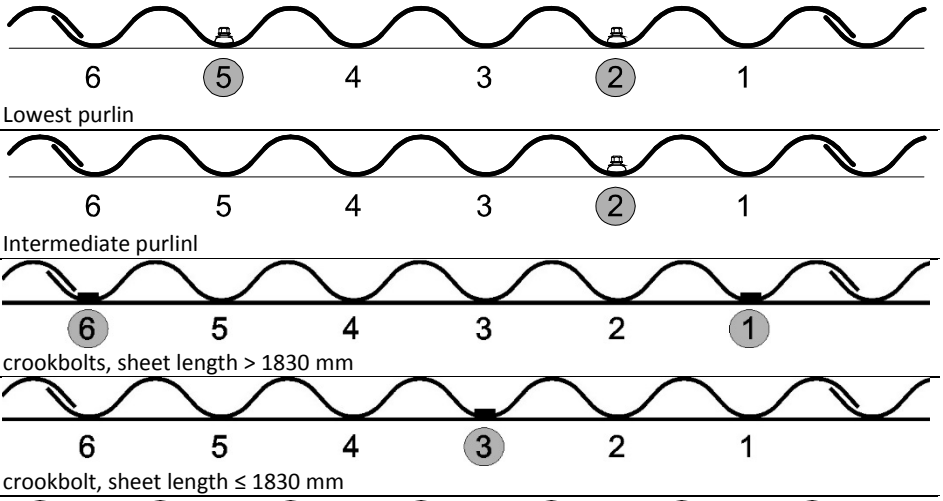
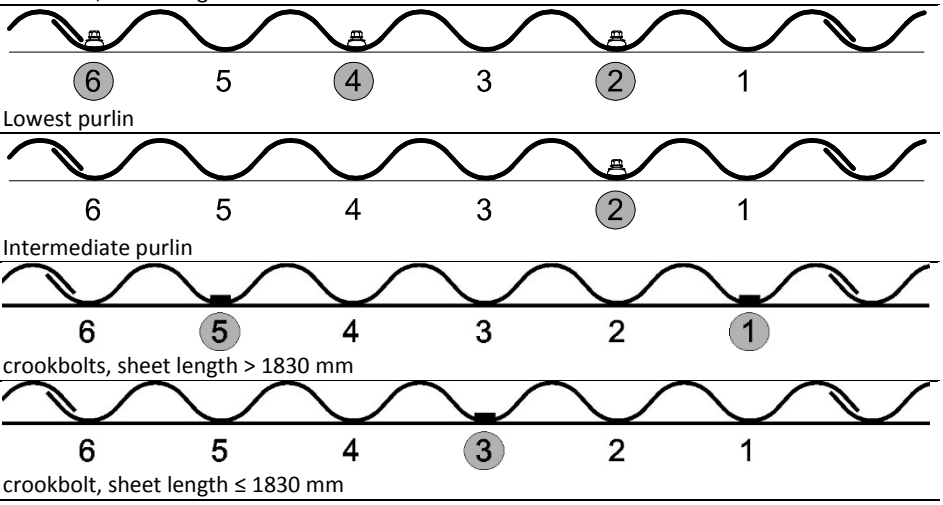
5.5.3. POSITION AND NUMBER OF FIXINGS

In order to facilitate sheeting and to avoid cracking of the sheets at the fasteners, one crookbolt for lengths up to 1.83 m is provided and two pieces are required for lengths above 1.83 m. In case only one crookbolt is installed, it is evident that it is positioned right in the middle of the sheet; in case two pieces are required, we refer to the figures below.

As soon as the sheet has been placed on the crookbolts below, the bolts for the next course, one level up, are installed. This way, the first sheet stays in place.
Subsequently, the sheet is fixed by means of fasteners. In the façade surface, two fasteners are provided on the lower purlin and 1 additional fastener is needed on the intermediate purlin(s), as shown in the figures below.

For facade cladding, fasteners are preferably installed in **the corrugation valley**.

At the corners of a building and at the top edge of a facade, 3 fasteners are provided on the lower purlin, as shown in the figure below.

Facade – midsection	
Facade – edge and corners	

5.6. INSTALLATION OF TRANSLUCENT SHEETS

The roof lights are profiled sheets of hard PVC or polycarbonate with the same cross section as the fibre-cement corrugated sheets.

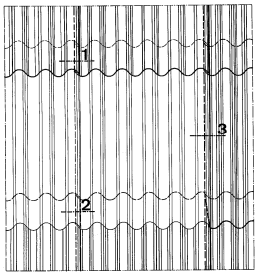
The use of translucent sheets at the edge of the roof surface must be avoided. The combination of translucent sheets under fibre cement accessorises is not allowed.

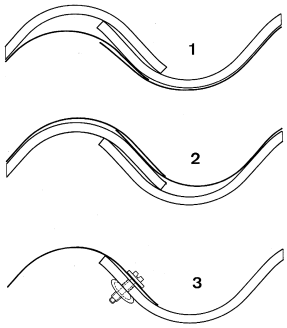
For the fixing of translucent sheets we refer to the regulations of the manufacturer.
However, when both the translucent sheet and the fibre-cement corrugated sheet are fixed together, the following rules apply:

- When the fibre-cement corrugated sheet is on top of the translucent sheet: fix according to guidelines in § 5.3.3
- When the translucent sheet is on top of the fibre-cement corrugated sheet: fix according to guidelines of the manufacturer of the translucent sheets.

Lap:
Single skin translucent sheets are not mitred. Triple skin translucent sheets have the same thickness as fibre-cement sheets, and are there for better mitred at the corners and closed up again.

At the junction of translucent sheets and fibre-cement sheets (see figures. 1 and 2), the translucent sheets are installed on top of each other. As a consequence, there are no translucent sheets between fibre-cement sheets.
The tightness at the side lap is ensured every 400 mm with connecting bolts (e.g. Lap-Lox: see figure 3)





Make sure, that with the use of **polycarbonate** translucent sheets, any grinding dust from the fibre-cement corrugated sheets is all wiped away before the placement of the translucent sheets.

With the transport and storage of the **PVC** translucent sheets, they may by no means be exposed to heat and/or sunlight.

Besides the above mentioned guidelines, it is evident that the recommendations of the relevant manufacturers need to be taken into account.

5.7. INSTALLATION OF CORRUGATED SHEETS ON Z-PROFILES

When corrugated sheets are installed on Z-profiles, the following has to be taken into account:

- Always point the top flange of the Purlin to the ridge of the roof
- Provide permanent connector sleeves between the upper rafters. Make sure that they are strong enough to prevent distortion of the purlin. If both roof surfaces have a different slope or at a pent roof, equivalent measures are taken.
- Connect all purlins to avoid swinging over and bending. The number and location of the connections is specified by the metal constructor. Make sure that the connections provided are for a roof finished with fibre-cement corrugated sheets.
- The necessary measures have to be made when installing purlins placed with a cantilever, in order to avoid deformation of the cantilever purlins.

5.8. INSTALLATION OF SOLAR PANELS

When solar panels are placed on top of corrugated sheets, following points should be considered:

- Solar panels may only be placed on corrugated asbestos-free sheets.
- All involved parties must give their agreement on the work to be performed. The original constructor of the building needs to make stability calculations and give his agreement concerning the responsibilities after the installation.

- The guidelines for placing the corrugated sheets must always be strictly followed, even when placing of solar panels.
- The solar panels are mounted with special fasteners (see example), in a way that no additional fixing points are added to the corrugated sheets, and existing fixing points are not being moved.
- All the tensions and forces exerted by the solar panels are directly transferred to the underlying support structure. The corrugated sheets may not be charged and their thermal-hygrical movement should not be prevented
- An EPDM washer that does not obstruct the movement of the sheet, but assures a watertight seal.

During the installation of the solar panels it is not allowed to walk directly on the corrugated sheets, walkways should always be used. Damage to corrugated after placing solar panels is not covered by the warranty

5.9. CONSTRUCTION DETAILS

In this chapter, some details are elaborated. However, there are many other possibilities. For the sake of the clarity of the drawings, not all data was always drawn. Please always take into account the following requirements:

- waterproofness;
- where required, ventilation provisions;
- air- and vapourtightness on the inside;
- possible continuous insulation to avoid thermal bridges.

If a suitable accessory does not exist, other materials must be used in order to guarantee watertightness.

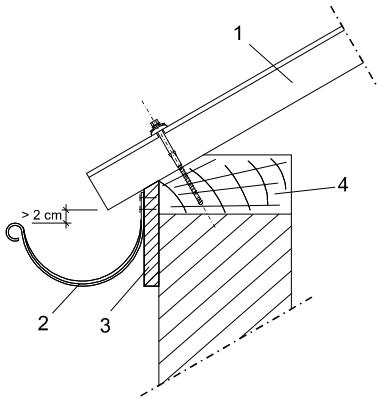
5.9.1. EAVE - GUTTER

The gutter is preferably installed outside the wall, so leaks can be noticed quickly and causes no harm to the construction.
It is very important that corrugated sheets are installed high enough (> 20 mm) over the gutter in order to prevent them from absorbing stagnant water from the gutter.

Eaves pieces are installed simultaneously with the corrugated sheets.

Hanging gutters are preferably fixed to the support structure and not to the corrugated sheets. Gutter boxes are always fixed to the support structure.

Hanging gutters:



1. Neptunus corrugated sheet
2. gutter
3. eaves board
4. wall plate

5.9.2. RIDGE

5.9.2.1 General

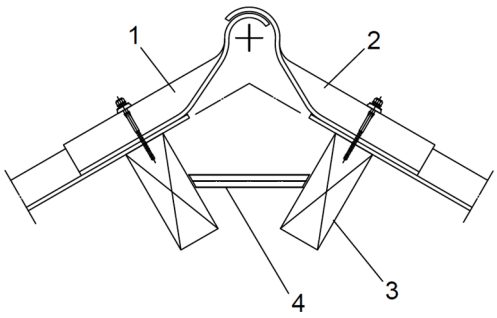
The ridge is finished with the suitable accessories (see § 4).
Our general installation guidelines for corrugated sheets are also valid for ridges, e.g. mitring, end and side lap, fixing and sealing.

For the position of the ridge purlins: see § 5.2.4. Position of ridge when using with SVK accessories.
After a period of time the upper purlins may start sagging, with result that the ridge pieces will be pulled apart. To avoid this, one can use an aid (e.g. a metal bracket) to connect the upper purlins.

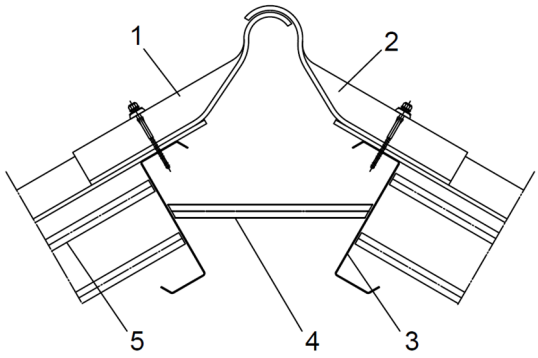
The general placement guidelines of corrugated sheets should always be observed:
- Respect the spacing of 163 mm between the corrugation crests at the side lap;
- Use the placement gauge (available on request);
- Don't tighten the screws bolts too hard;
- Preferably use self-drilling screw bolts.

5.9.2.2 Two-piece close fitting ridge cover

See § 5.4.1 Installation of two-piece close fitting ridge covers



Installation of two-piece close fitting ridge covers on metal purlins



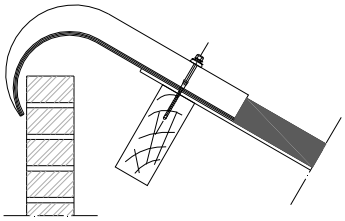
5.9.2.3 Two-piece ventilating ridge cover

Besides non-ventilating two-piece close fitting ridges, there are also ridge finishings, which enable ventilation and air evacuation:

- Two-piece ventilating ridge cover see § 4.2
- Two-piece plain wing ridge cover see § 4.3
- Corrugated open ridge see § 4.5

5.9.2.4 Single pitch roof ridge

The ridge of a single pitch roof is finished by means of universal L-shaped ridges.
In case the ridge of a single pitch roof is finished with a free overhang, this must not exceed 100 mm (see § 5.2.3).
Measures must be taken in order to make the roof watertight.



5.9.3. VERGE

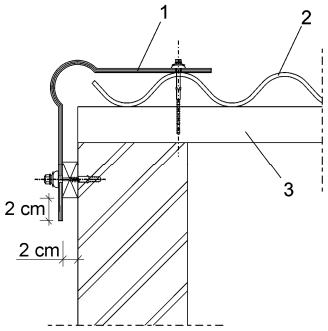
5.9.3.1 Verge with roll top bargeboard

Both the top wing as the descending wing of the bargeboard are fixed at least three times in the longitudinal direction: the 1st fixing just after the socket, the 2nd one in the middle and the 3rd fixing just before the socket of the next bargeboard. **Bargeboards must never be fixed in the end lap.**

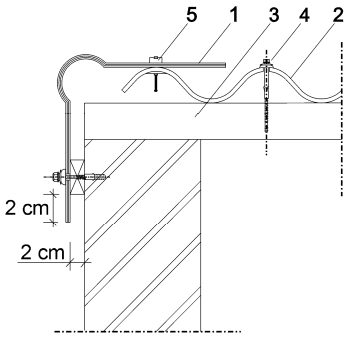
In the latitudinal direction, bargeboards are fixed twice:

- The descending wing of the bargeboard is fixed on the facade, at a distance of approximately 20 mm from the wall, preferably in conjunction with an auxiliary frame, such as an edge board or an intermediate batten. This is to be considered when setting out the roof surface. The descending wing of the bargeboard must be installed approximately 20 mm past the subframe or auxiliary frame.
- We recommend to install the bargeboard top in the corrugation crest of the underlying sheet. The distance between the fixing to the edge of the roll top bargeboard must be at least 50 mm and it should not exceed 125 mm.

In case the sheet ends in a descending corrugation, a toggle bolt with indentation is used, which prevents the sheet from cracking. See figure right below.



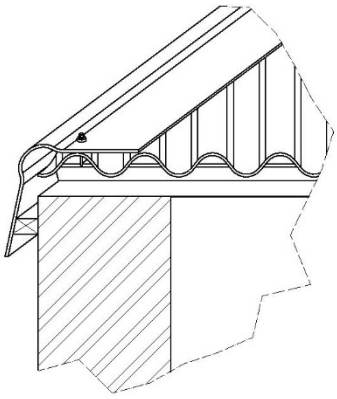
1. roll top bargeboard
2. Neptunus corrugated sheet
3. purlin



1. roll top bargeboard
2. Neptunus corrugated sheet
3. purlin
4. fixing Neptunus corrugated sheet
5. toggle bolt

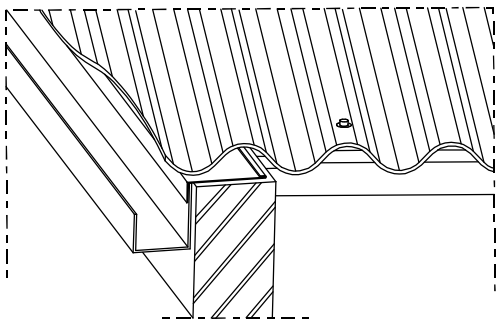
5.9.3.2 Asymmetrical verge (eaves length greater than ridge length)

In this situation, rainwater is removed from the roof edge so a bargeboard can be used.



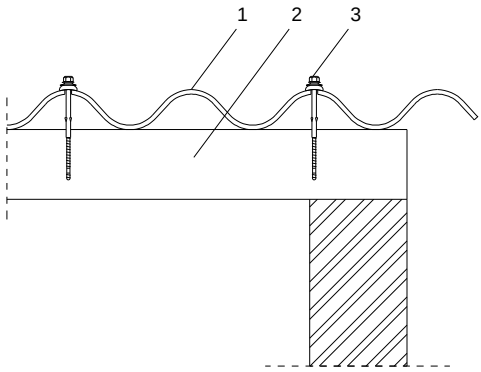
Asymmetrical verge (eaves length smaller than ridge length)

In this situation, rainwater will head for the verge of the roof. Therefore, sufficient precautions must be taken in order to enable a good rainwater discharge: by means of a gutter construction, a hidden gutter or with a free roof overhang.



5.9.3.3 Free verge

In case there is a free roof edge without accessories, the first and last corrugation valleys must lie on the substructure. The corrugated sheets must finish with a descending corrugation. To the side, the corrugated sheets may only protrude max. 100 mm past the purlins.



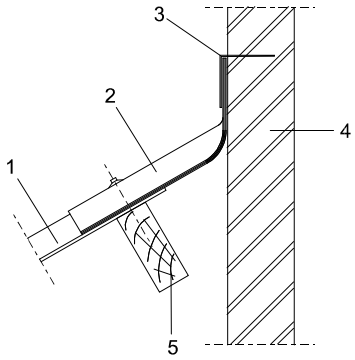
1. Neptunus corrugated sheet
2. Purlin
3. Self-drilling screws

5.9.4. CONNECTION TO AN ASCENDING WALL

Use an apron flashing piece for finishing a straight upper edge (see § 4.9).

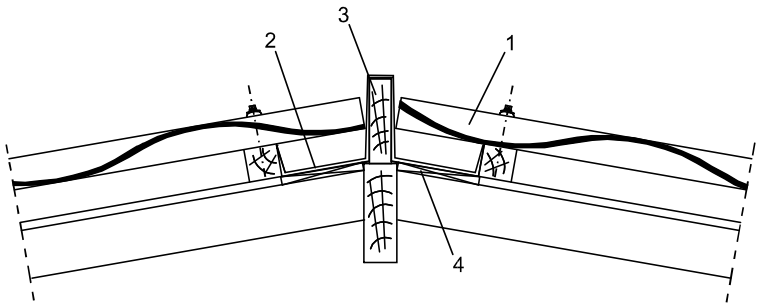
If the ascending wall is finished with corrugated sheets, you can use counter eaves bend pieces.

The water tightness must be guaranteed by using a lead flashing.



1. Neptunus corrugated sheet
2. apron flashing piece
3. zinc cover flashing
4. ascending wall
5. purlin

5.9.5. HIP



1. Neptunus corrugated sheet
2. concealed gutter
3. ridge board
4. board

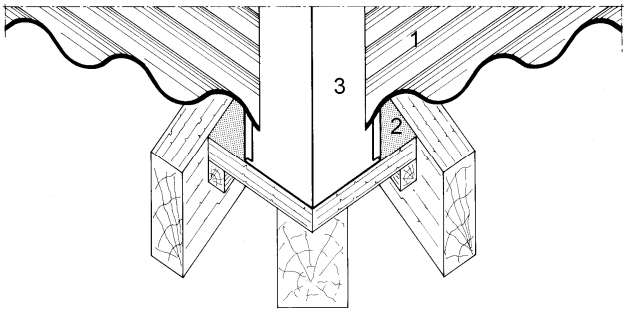
A hip can also be finished with flat ridge pieces, lead substitutes or hip ridge pieces.
Hip finishing with concealed gutter:

5.9.6. VALLEY

At the valley, rainwater from two adjacent roof surfaces flows together. The roof pitch of the valley can be up to 10° lower than the roof pitch of the adjacent roof surfaces.

A good detailing is a must:

- Leave sufficient distance between the cut corrugated sheets, in order to promote good cleaning and counteract blockages.
- Use a synthetic foam strip to close the opening at the valley gutter.



1. Neptunus corrugated sheet
2. gutter bottom
3. gutter

5.10. MAINTENANCE

Neptunus corrugated sheets do not require a lot of maintenance. We advise however to carry out an annual check and to remove possible dust and moss.
Not only the corrugated sheets need maintenance, but also gutters, wall connections, valley gutters etc.

Regular maintenance will prolong the life cycle of your roof and it will protect your roof from larger damage.

An elaborate maintenance advice can be obtained upon request.

SPACED SHEETING

1. APPLICATION AREA

These guidelines are specifically made for the application of spaced sheeting of a ventilated system. These are additional information on our technical data for the SVK Neptunus corrugated sheets. **It is necessary to consult our general technical data to obtain the complete information.**

Spaces sheeting or ventilated sheeting of the Neptunus corrugated sheets is only applicable on buildings where no water-, light-, and airtightness is necessary. The corrugated sheets do not overlap in the width, as a result ventilation at the opening between the sheets is possible. The is recommended only at stable for dairy and beef cattle.

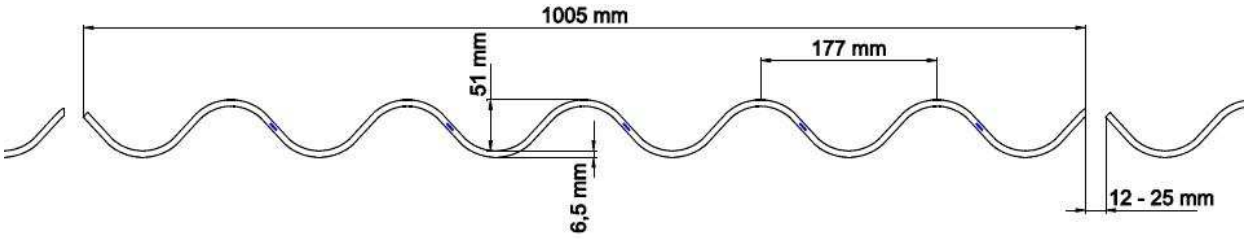
"The Department of Agriculture and Food" in Ireland gives direction for the opening between the corrugated sheets, depending on the animals sheltered in the building.

- 12 mm to 15 mm for dairy cattle
- 20 mm tot 25 mm for beef cattle

2. CHARACTERISTICS

2.1. DIMENSIONS

The Neptunus corrugated sheets for ventilated installation are sawn corrugated sheets of the profile 76 (6 ¼ waves) so that both sides end with an upwards wave. The corrugated sheets are equipped with 5 safety strips in polypropylene, placed in the flanks of the corrugations. Sawing of the corrugated sheets is done by SVK before they leave the factory.
The picture below shows a schematic of the sawing dimensions.



Important: the corrugated sheets need to always be installed with a minimal gap of 12mm and a maximal gap of 25mm in the width direction. The longitudinal a minimal overlap of 200mm and maximal of 300mm must be provided.
de golfplaten moeten steeds zo geplaatst worden dat tussen de golfplaten in de breedte een spatie gelaten wordt van minimum 12 mm en maximum 25 mm. De lengteoverlap blijft minimum 200 mm (maximum 300 mm).

Dimensions	
Length	1220, 1250, 1525, 1585, 1830 2135, 2440, 2750, 3050 mm
Nominal width	1005 mm
Net covering width	1005 mm
Corrugation width	177 mm
Corrugation height	51 mm [Cat C according EN 494]
Thickness	6,5 mm
Number of corrugations	5 ¾

2.2. WEIGHT

Length [mm]	Weight per sheet* [kg]
1220	18,02
1250	18,50
1525	22,57
1585	23,42
1830	27,11
2135	31,57
2440	36,12
2750	40,61
3050	45,12

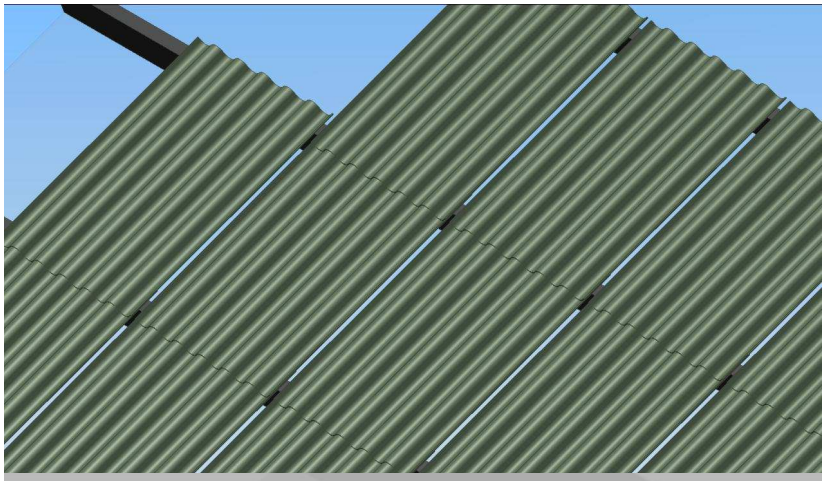
* These weights are based on a moisture content of 12%.

3. INSTALLATION

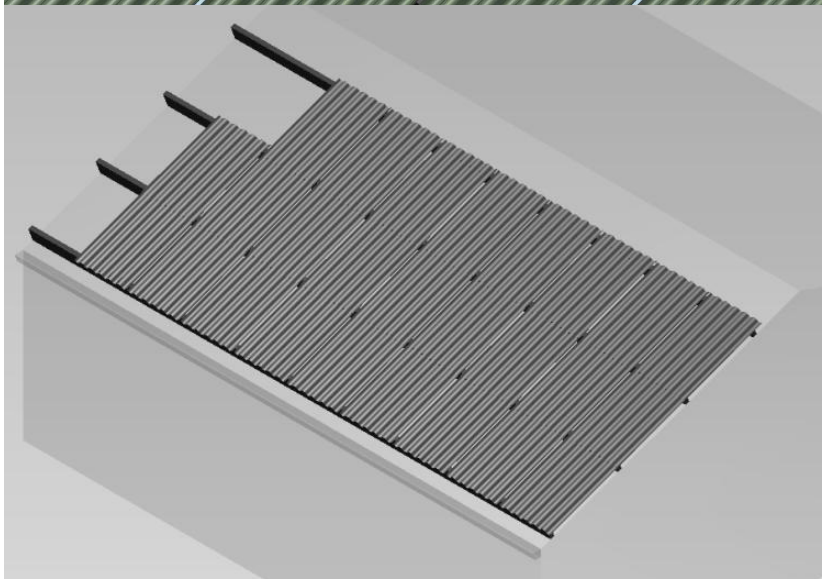
3.1. GENERAL

Spaced sheeting of ventilated installation has following advantages:

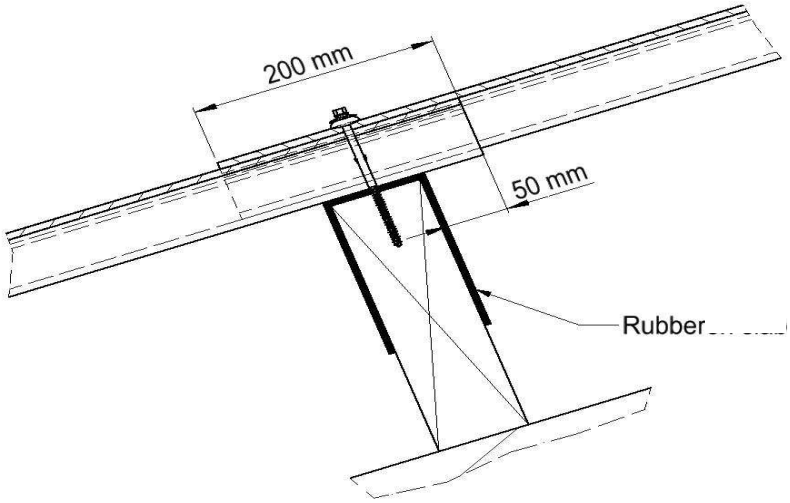
- High ventilation flow;
- Natural light;
- Minimal condensation;
- Edge cut not required;



Unlike the traditional way of round or classical laying of the corrugated sheets, in spaced sheeting there is now left or right laying. There is no side lap as an opening between 12 and 25mm is provided. The minimal end lap remains 200mm.



The support frame consists of timber, concrete or metal roof trusses and must be strong enough to carry the installed weight and snow, wind,... loads The maximal purlin distance is 1385mm and a minimal roof pitch of 15° is recommended.

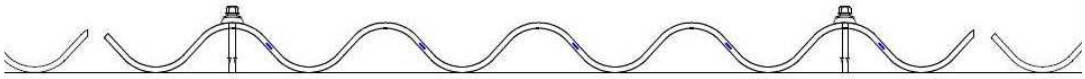


If no cattle is inside the building and as such no humid, warm and raising air is produced, there is a good chance that precipitation can enter the building. This is why it is required to protect the timber at the openings with rubber, EPD, neoprene or similar. Metal trusses can be treated against corrosion.

3.2. FIXING

Fasteners are always installed at the corrugation crest as indicated in the table below.
In the middle of the roof surface, the corrugated sheets are attached with 2 fixings. At the roof surface edges, as well as at the level of roof bend and around roof apertures, every sheet is attached with 3 fasteners.
In case corrugated sheets are installed with a length of 1830 mm or more, an additional fixing in the 2nd corrugation crest at the intermediate purlin is made.

In the roof surface



Edge, at the level of the bend, around roof apertures and ridges

Intermediate purlin (length > 1585 mm)

3.3. VENTILATION

Good ventilation is critical for accommodating animals. This roofing system can provide a large ventilation rate.
For big stable with a large humidity production it may occur that ventilation at the eaves and ridges insufficient is, spaced sheeting can be applied in these cases for providing additional ventilation.

If a minimal opening of 20mm between the corrugated sheets is applied to the entire roof surfaces, ridge ventilation is no longer a requirement.

The minimal recommended in- and outlet section are:
Building up to 15m width:

- Outlet at the ridge: 300 mm;
- Inlet at the eaves (at both sides): 300 mm.

Buildings from 15 to 24m wide:

- Outlet at the ridge: 600 mm;
- Inlet at the eaves (at both sides): 450 mm.

Building wider than 24 m:

- Outlet at the ridge: 600 mm;
- Inlet at the eaves (at both sides): 600 mm.

REFERENCE DOCUMENTS

- EN 494: 2012+A1:2015: Profiled fibre cement corrugated sheets and accessories – Product specification and test methods.
- Eurocode 1: NBN EN 1991-1-4: 2005: Actions on structures – Part 1-4: General actions – Wind load.
- Eurocode 1: NBN EN 1991-1-1 to 1-5: 2005: Actions on structures: General actions.
- BS EN 1991-1-4: 2005+A1: 2010: UK National Annex to Eurocode 1. Actions on structures. General actions.
- EN 13501-1:2010 Fire classification of construction products and building elements - Part 1: Classification based on results of testing of the fire behaviour.
- BS 8219: 2001 +A1: 2013 – Installation of sheet roof and wall coverings. Profiled fibre cement. Code of practice".
- BS 5427-1: -1:1996 - Code of practice for the use of profiled sheet for roof and wall cladding on buildings. Design
- ICP:2002 – Irish code of practice for slating and tiling, with attention to BS 8000 – Workmanship on Building sites
- BS5250
- S. 101: "Minimum specifications for the structure of agricultural buildings", Department of Agriculture and Food – March 2006