

DML USA
PRUSZYŃSKI



INSTALLATION MANUAL

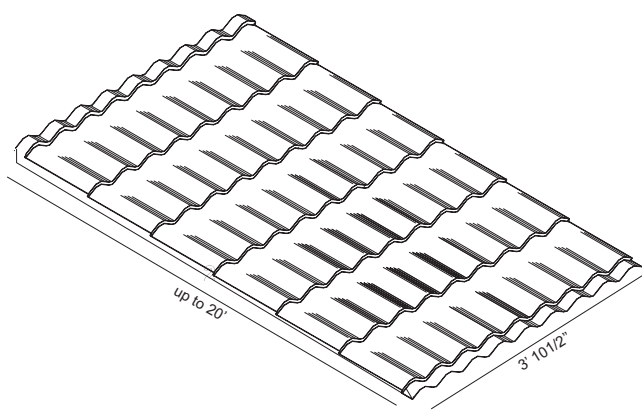
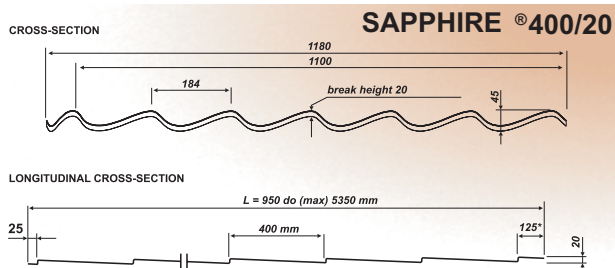
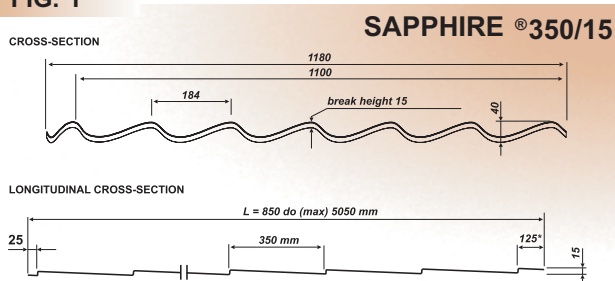
architectural sheet metal roofing panels

Metal roofing installation

Metal Roofing Installation

Subject of Instruction. Types of sheet metal roofing tiles.

FIG. 1



The instruction presents guidelines for installing sheet metal roofing tiles manufactured by DML USA PRUSZYNSKI Company. Roofing sheet metals: SAPPHIRE 350 and SAPPHIRE 400, (available from August 2007) (figure 1) are manufactured from steel sheet of 25 gauge, DX51D grade, plated with Z275 g/m² zinc (acc. to standard PN-EN-10142: 1997) and organic coatings:

- polyester gloss – thickness 25 µm,
- polyester dull gloss – thickness 35 µm,
- pural – thickness 50 µm,

in colors acc. to RAL and RR pallets. The sheet metal roofing tiles are certified for use in building industry pursuant to the approval of ITB No. AT-15-3464/98 and PZH sanitary certificate No. HK/B/0901/01/202 and HK/B/1913/02/2001.

Application, range and conditions of use.

Sheet metal roofing tiles make up modern, durable and aesthetical roofing on residential and multi residential buildings, warehouses, public buildings, churches and other monumental objects. They are made of double-sided zinc plated sheet metal coated with several layers of varnish which guarantees their durability. Wide range of colors and possibility to match various planes makes the roof adaptable to the elevation and surroundings.

Manufacture of sheets of a specified length reduces material wastes to minimum.

Sheet metal roofing tiles weight only about 97lb/100sq ft, which means that it is almost 10-times lighter than traditional roof tiles.

Sheet metal roofing tiles:

SAPPHIRE 350 and SAPPHIRE 400, can be used to cover roofs with minimum slope equal 3:12 of buildings located in B, L, and U environment acc. to standard PN-70/H-046051.

Metal roofing installation

Application and installation method of DML USA PRUSZYNSKI panels as mentioned above should comply with technical design of the building developed pursuant to valid standards and technical-building regulations and recommendations resulting from this instruction manual.

Transportation and storage of sheet metal roofing tiles.

The transportation of roofing panels should be carried out using special delivery truck with open platform to facilitate loading and unloading. The sheets should not protrude from the vehicle contour because of risk of sheets damage and in consequence guarantee loss. During transportation sheets should be secured against displacements and getting wet.

Unloading should be carried out using special equipment or by a suitable number of people, i.e. at sheet length of 20 linear feet there should be 6 people or 3 people on each side. It is forbidden to shift one sheet on the other or pulling it on the ground. In case of any scratches or friction traces on the sheet, it is necessary to clean immediately the damaged place and then to coat it with a touch up paint. Unloading sheets in original packaging with mechanical devices such as lift trucks is the most suitable. Special attention should be paid when unloading in winter and storing in heated warehouses.

Sheets should be stored in dry and airy rooms. The packages are not to be put directly on the ground, but on blocks about 8" high. Sheets for longer storage should be inspected and then individual sheets separated by spacers to provide free air circulation.

ATTENTION!

Sheet metal roofing tiles should be installed on the roof no later than half year from the manufacture date under threat of guarantee loss.

The DML USA PRUSZYNSKI Company shall not be liable for any damages of coating of sheets stored against this installation manual.

Before assembly of sheet metal roofing tiles please check color shades.



Metal roofing installation

Installation Considerations

There are **two methods** of installing DML USA PRUSZYNSKI sheet metal roofing tiles.

METHOD A - on direct baling, where no plywood decking is required.

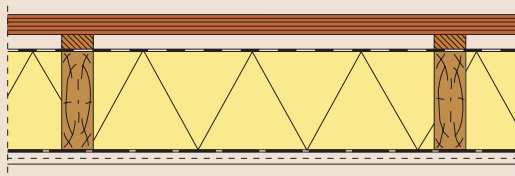
METHOD B - on plywood decking or over existing shingle roof.

Both installation methods are close to each other - the differences occur from different building construction methods within Europe and USA. **METHOD A** is a method widely used in Europe, **METHOD B** in turn is suitable for the American needs, it allows to install the sheet metal roofing on plywood or over existing shingle roof.

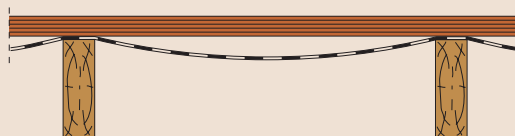
It is important to remember when following **METHOD B**, that the roof should be inspected for any trapped moisture or structural damage such as warped or loose roof decking. These areas should be repaired before installing new metal panels. Also, before the installation please make sure that there are no nails or fasteners protruding from the plywood decking or existing shingle roof which could damage the panels and impede the installation process.

METHOD A

We recommend:
high steam permeability roof paper, which can be in contact with
thermal insulation layer installed to the rafters, counterbattens, battens

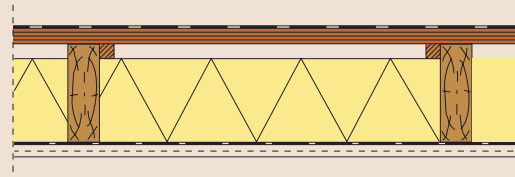


low steam permeability roof paper, installed with overhang
(such solution is allowable where thermal insulation is laid on
the floor without counterbattens), battens



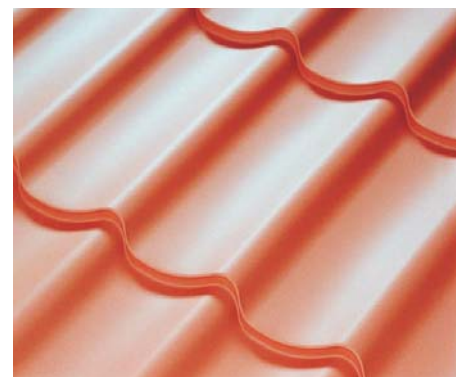
METHOD B

We recommend:
Premiminary Covering Foil (PCF) which can be substituted with any other
underlayment recommended for metal roof.



DML USA PRUSZYNSKI
ensures you with:

- simplification of construction
- maximum benefits from properties of the materials used
- achieving required functional effect



Metal roofing installation

METHOD A - Direct backing under sheet metal roofing tiles - no plywood required.

1. Wooden framework:
 - counterbattens: dimensions: 1 x 2
 - battens: dimensions: 2 x 2 - 2 x 3 (depending on spacing of rafters).
 The wood should be impregnated, at least class 2.
2. Metal framework:
 - counterbattens and battens are most often made of steel, zinc plated thin-walled shapes of thickness more than 0.7 mm (.028) with channel, z, or hat cross-section

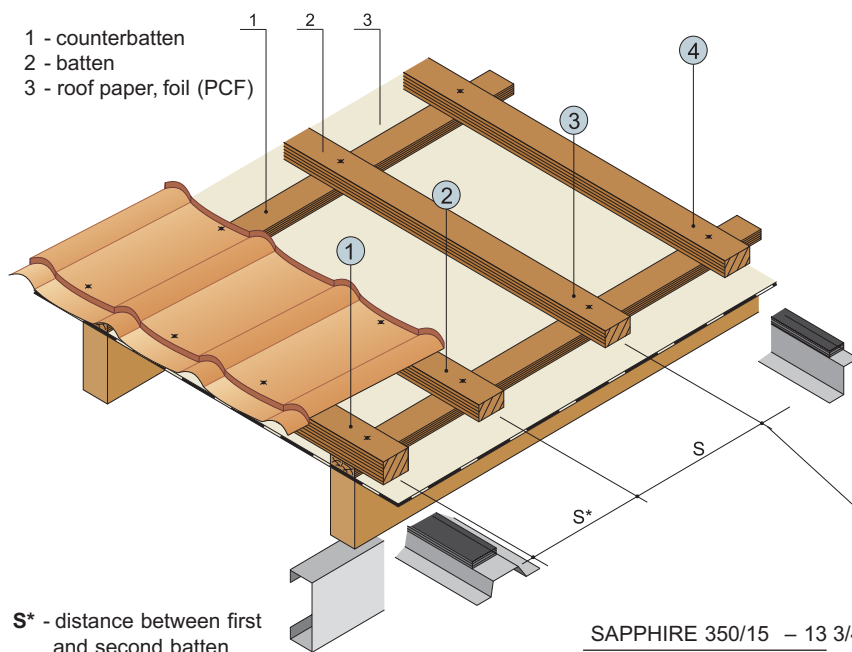
The counterbattens are used for fastening of roof foil (PCF) to rafters. Roofing sheets are fastened directly to battens.

ATTENTION! The distance between battens depend on lateral overpress imitating tile (fig. 2), with the exception of the distance between 1st and 2nd batten, which is determined in practice and which depends on eaves construction, roof slope, and roof gutter system.

FIG. 2

Direct backing

- 1 - counterbatten
- 2 - batten
- 3 - roof paper, foil (PCF)



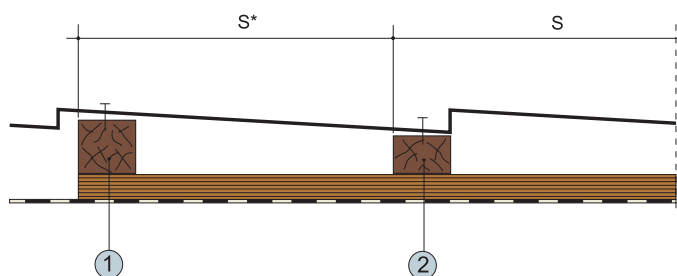
- S* - distance between first and second batten
– to be determined in practice
- S - distance between next battens
– resulting from the module of sheet metal roof tile

In general the batten No. 1 must be higher than other battens, because the roofing sheet supported in this place is of a higher overpress.

In case of sheet fastening before overdress, the first batten remains the same as the other battens.

The use of counter battens guarantees air space by which water vapour (moisture) is carried away from the inside of the object, which is necessary for the proper functioning of the metal roofing.

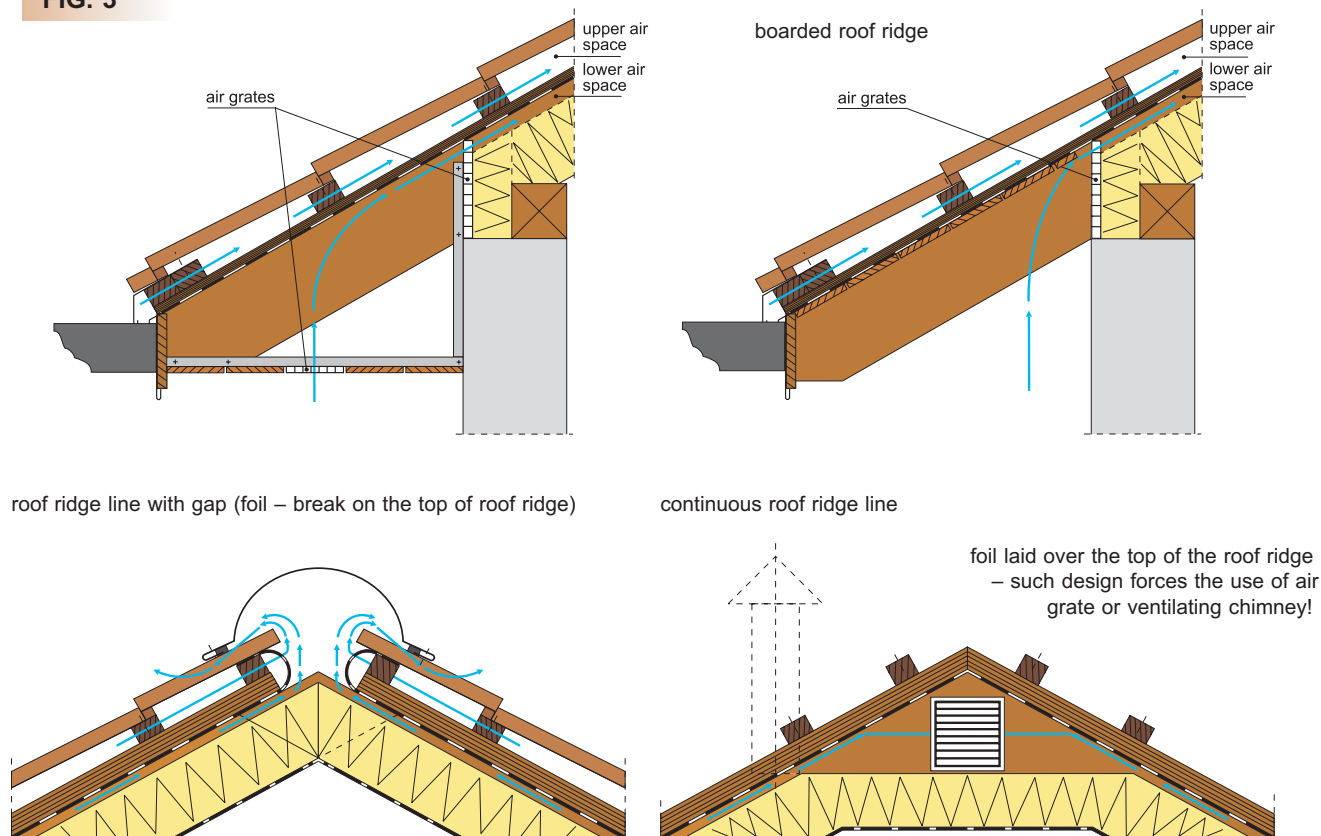
The size of gap at the eaves and at the roof ridge (upper space above PCF) should be min. 200 cm²/rm



Metal roofing installation

Design examples of roof ridge and eaves lines
 – unboarded roof
 – low steam permeability PCF

FIG. 3



Due to broad use of PCF of low steam permeability, Fig. 3 presents the roof design at the eaves and at the roof ridge.

The following disadvantages of designs with the use of PCF of low steam permeability:

- decrease of insulating power of thermal insulation layer as a result of its aeration
- worse utilization of rafter height in relation to reduced insulation thickness
- necessity of using ventilation chimneys or air grates at the top of the buildings
- necessity of using the stem isolation with additional layer of aluminium foil on the "warm" side
- difficulties of creating gap at eaves.

Sheet metal roofing tiles installation

Fastening roof foils

When fastening roof foils/papers (PCF) it is necessary to follow manufacturer recommendations, paying special attention to the proceedings concerning holes for roof windows and chimneys.

Roof foils can be fastened to the eaves as follows:

1. Onto the gutter, where possible condensate can flow down into it.
2. Under the gutter, where possible condensate can flow down under it, but snow or ice caps will not choke the air gap at the eaves.

ATTENTION! Roof foils should be glued to the flashing with double sided adhesive tape, so it will not be pulled by the wind.

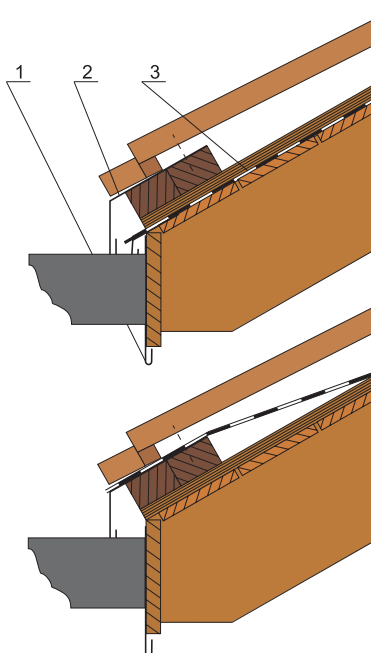
Metal roofing installation

FIG. 5

Methods of fastening PCF to eaves and installing fascia cover and flashing.

a) foil put into gutter

- 1 - fascia cover
- 2 - flashing
- 3 - PCF



Regardless of installation methods of thermal insulation layers, steam-proof foil should be fastened from the “warm” side, while its joints should be glued by self-adhesive tapes.

In principle, that steam-proof polyethylene (PE) foils should be used with PCF with high steam permeability, however, foil with additional metal (Al) layer be used as steam insulation should with PCF with low steam permeability.

Installation of sheet metal roofing tiles— Fig. 6.

Before installation work it is necessary to check roof geometry. In case of rectangular roof slope it is necessary to measure diagonals, which should be equal. All errors of roof slope should be localized on base of roof side edges and roof ridge, because these places will later be covered by flashing.

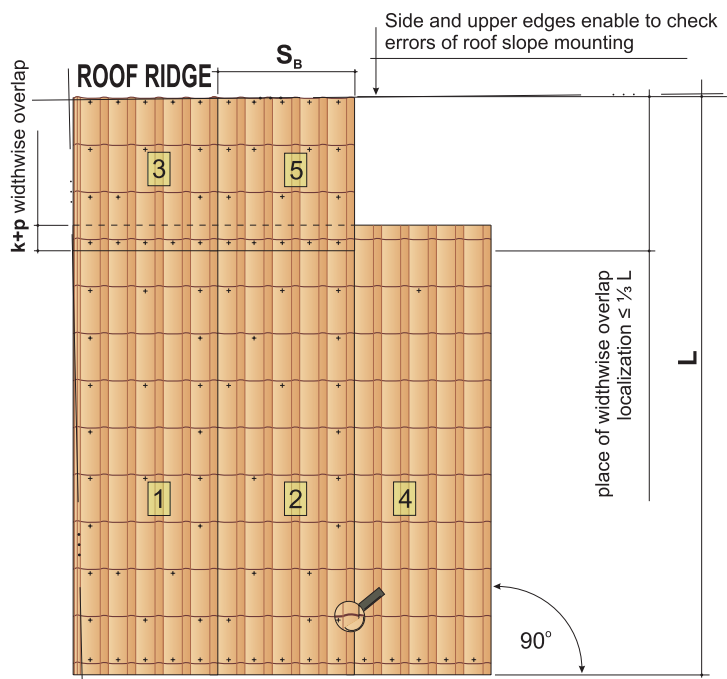
Eaves line is always the base of sheet metal roofing tiles installation.

Special care should be taken during backing installation – concerning mainly battens. They must be installed (using zinc plated screw nails) in parallel to the eaves with equal spacing.

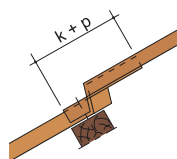
Installing from left to right is more convenient (if the sheets have capillary groove on the left side). **Then, after preliminary installation of the first sheet, the next sheet is put under the previous one and its position is checked in relation to the eaves.**

The ideal connection is made on lengthwise overlap and on overpresses imitating tile shape.

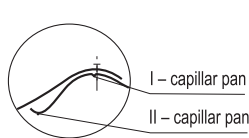
After preliminary installation of the next sheet, the previous one can be fastened. The chosen method depends mostly on rafter framing and the choice of roofing installers.



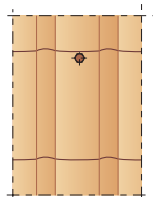
EAVES is the base for assembly of roofing sheets
1, 2, 3, 4, 5 – order of sheets overlapping



Sheets connecting on widthwise overlap



Sheets connecting on lengthwise overlap



Place of sheets installing

Metal roofing installation

Metal Roofing Installation



For securing roofing panels use selfdrilling screws provided by DML USA PRUSZYNSKI. These selfdrilling screws included with special washers that are resistant to temperature changes and solar radiation ensure a tight fit.

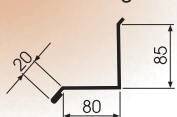
Screws should be secured in the lowest place of the tile wave by driller with continuous power regulation. The estimated screw consumption is 70-80 pcs/sq of the roof slope and depends on the quantity of flashings.

ATTENTION! Any other screws and washers not meeting these requirements void the guarantee conditions.

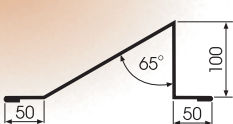
FIG. 7

Typical flashings

Wall flashing



Snow barrier



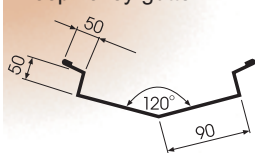
Fascia



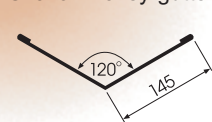
Side wind brace



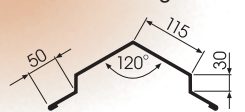
Deep valley gutter



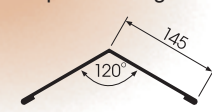
Shallow valley gutter



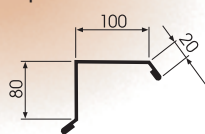
Conical roof ridge



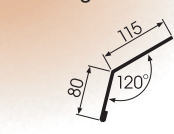
Simple roof ridge



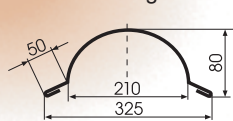
Top wind brace



Flashing



Barrel roof ridge



Sheet metals are to be secured on each wave in places:

- at eaves,
- at roof ridge,
- at lengthwise overlap
- at roof side edges
- on valley gutter.

ATTENTION! The roofing sheets in around chimneys and skylights should be longer at minimum by one overpress imitating tile.

All errors of roof slope are to be eliminated by flashing of all roof edges.

5.3. Making flashings.

Fig. 7 shows typical flashings made of the same grade, color, and coat type roofing sheets.

Flashings are also made of flat sheet metals directly on the building site by roofing installers.

ATTENTION! It is not allowed to use any flashings (including chimney caps, gutter gargoyles etc.) made of copper plates on roofs covered with zinc plated or lacquered sheets.

The flashings should fulfil two basic functions:

1. assure the coverage tightness on breaks and edges of roof surface,
2. assure the coverage aesthetics by covering mistakes made by previous building teams.

5.3.1. Flashing – fig. 5 and 5a.

The aim of this flashing is as follows:

1. to direct rainwater to the gutter (when sheet metals are laid on the belt and finish before their edge)
2. to direct condensate flowing down PCF laying on belt to the gutters
3. to cover the backing (counterbattens and battens)

Flashing with its edges is placed into the gutter at 1/3 of its width and is installed after installation of gutter system. After mounting of on-gutter belts, the roofing assembly may begin.

5.3.2. Fascia – fig. 5 and 5a.

They are decorative and protect vertical eaves board which is used for gutter system fixing. They are to be mounted before installation of gutter system.



Chimney flashing. – Fig. 8 and 9.

It is especially important because its wrong construction most often causes roof leaks.

Fig. 8 shows an example of flashing of chimney located at a distance of less than 1.5m (5') from roof ridge. In such case the belt of flashing behind chimney is covered with roofing sheet.

ATTENTION! The sheet in this place should be longer at minimum by one overpress imitating tile to achieve connection with lateral lock on the cut sheet (behind chimney).

The side aprons of flashing should overlap beyond the whole wave crest of the roofing sheet.

Roofwork self-adhesive tapes are also used for chimney flashing. In such case chimney flashing serves only as a decoration which masks the roofwork tape.

FIG. 8

Example of flashing of chimney which is located at a distance of less than 1.5 m (5') from roof ridge

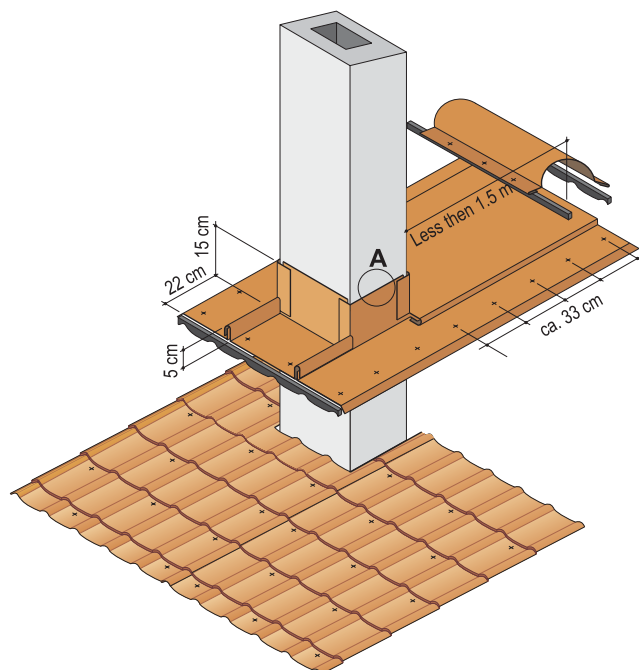
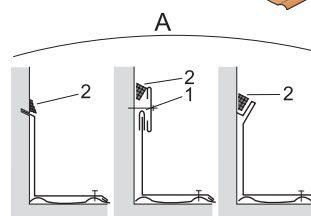
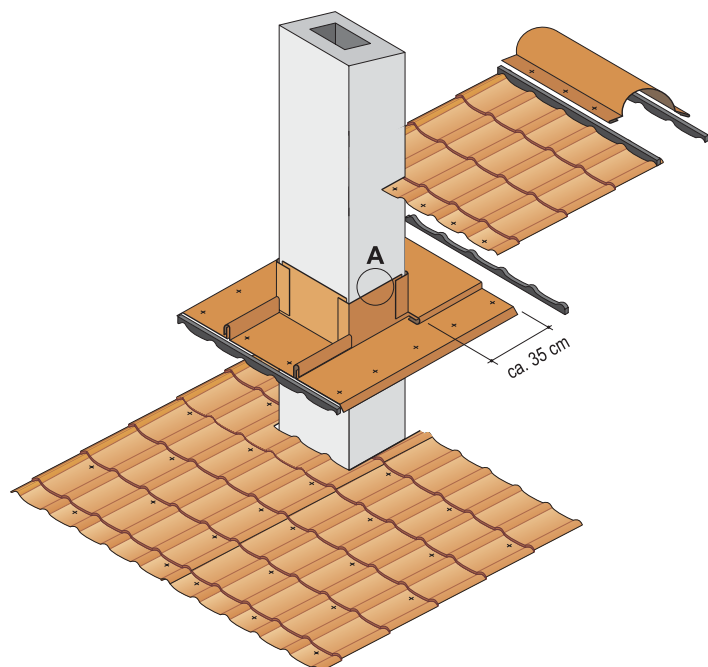


FIG. 9

Example of flashing of chimney, which is located at a distance of more than 1.5 m (5') from roof ridge



- 1 - roofwork self-adhesive tape
- 2 - silicon sealing



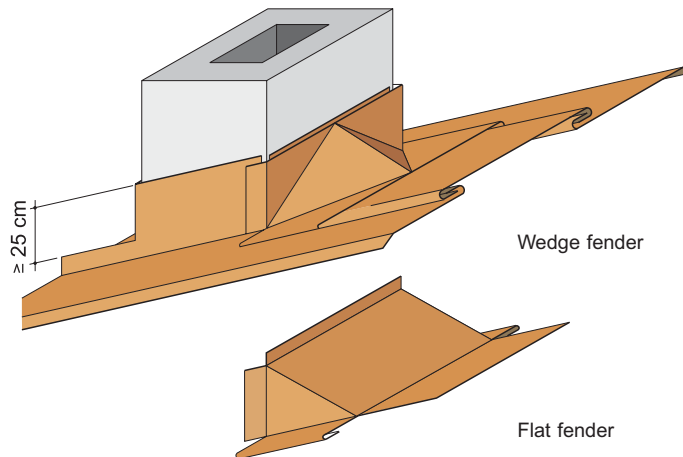
Metal roofing installation

Chimney fenders (crickets). – Fig. 10.

Fenders should be installed on roof slopes inclined more than 30°, behind chimneys. They protect the back of chimney against the stream of rainwater which thus passes the chimney by.

FIG. 10

Example of design and installation of fenders (crickets).



Flashing – very significant but reluctantly used by roofers due to its work consumption.

5.3.5. Valley gutters. – fig.11.

They are located at the junction of the two roof slopes, at the so called flow valley. Their task is to direct rainwater it into gutter. They are mounted before assembly of roofing metals.

FIG. 11

Example of use of valley gutter

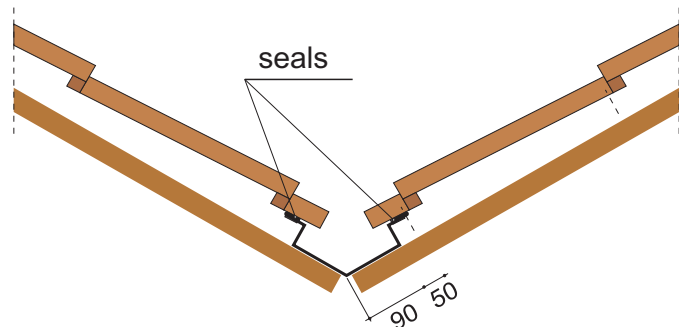
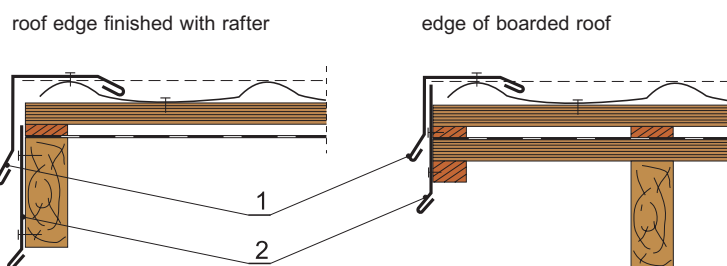


FIG. 12

Example of use of top and side wind brace



1 - top wind brace
2 - side wind brace

5.3.6. Top wind brace.

Side wind brace. – fig. 12.

Wind braces shield side edges of the roof.

Fig. 12 shows installation of both wind braces on the edge finished with a rafter as well as boarded roof edge flashing.

The wind braces are mounted after assembly of roofing sheets.



FIG. 13 Example of use of barrel and conical roof ridge

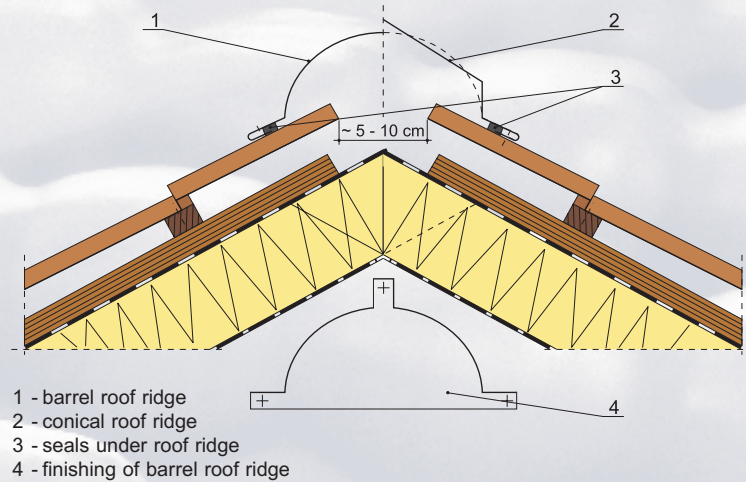
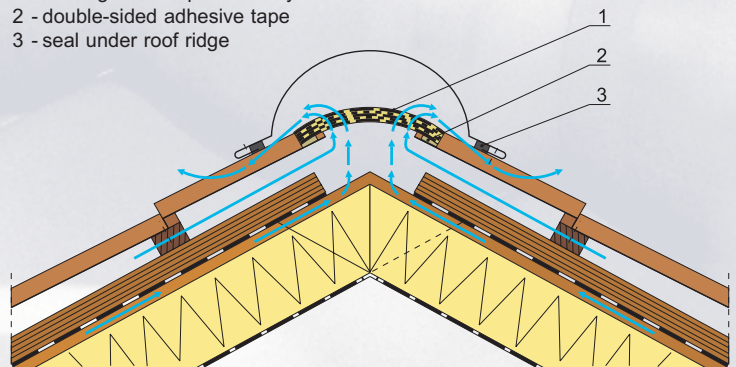


FIG. 14

Example of „lower air space” protection against rain and snow being blown in

- 1 - tape with diffusively opened structural layer or PCF with high steam permeability
- 2 - double-sided adhesive tape
- 3 - seal under roof ridge



Roof ridges.– fig. 13.

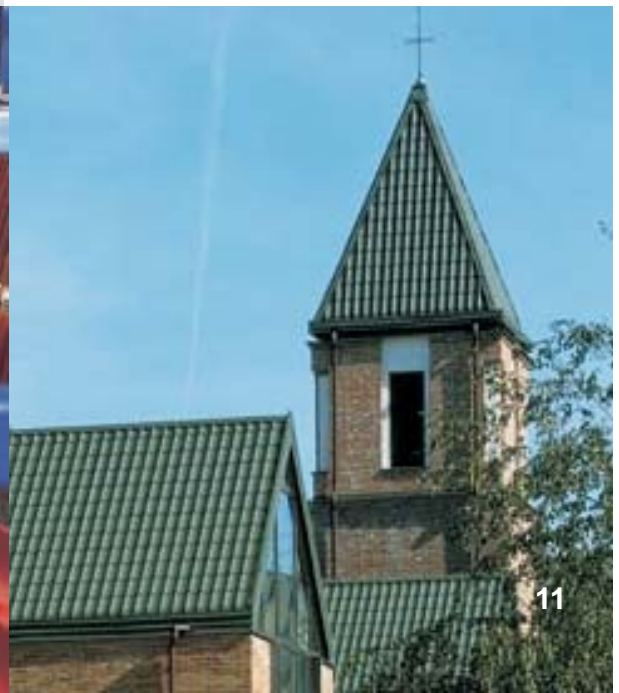
The barrel roof ridge protects roof top and edges, where two roof slopes meet at salient angle.

The mounting of roof ridge should enable roofing and thermal insulation to “breathe” freely through one or two air spaces.

Fig. 17 shows recommendable solution, where PCF belt with high steam permeability is glued to the edge of roofing sheets.

The tips of roof ridge are closed by finishing.

Roof ridge is installed minimum on every other wave crest of roofing sheet.

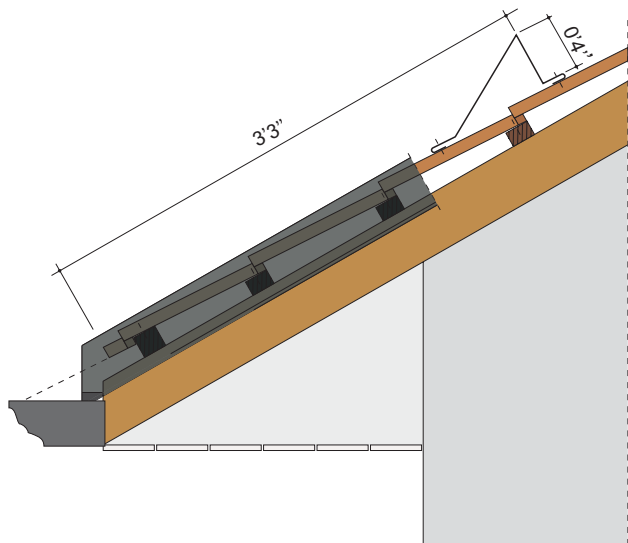


Metal roofing installation

Metal Roofing Installation

FIG. 15

Example of snow barrier installation



Snow barriers. – fig. 15.

Installation of snow barriers depends on local weather conditions and experience in the surrounding houses exploitation.

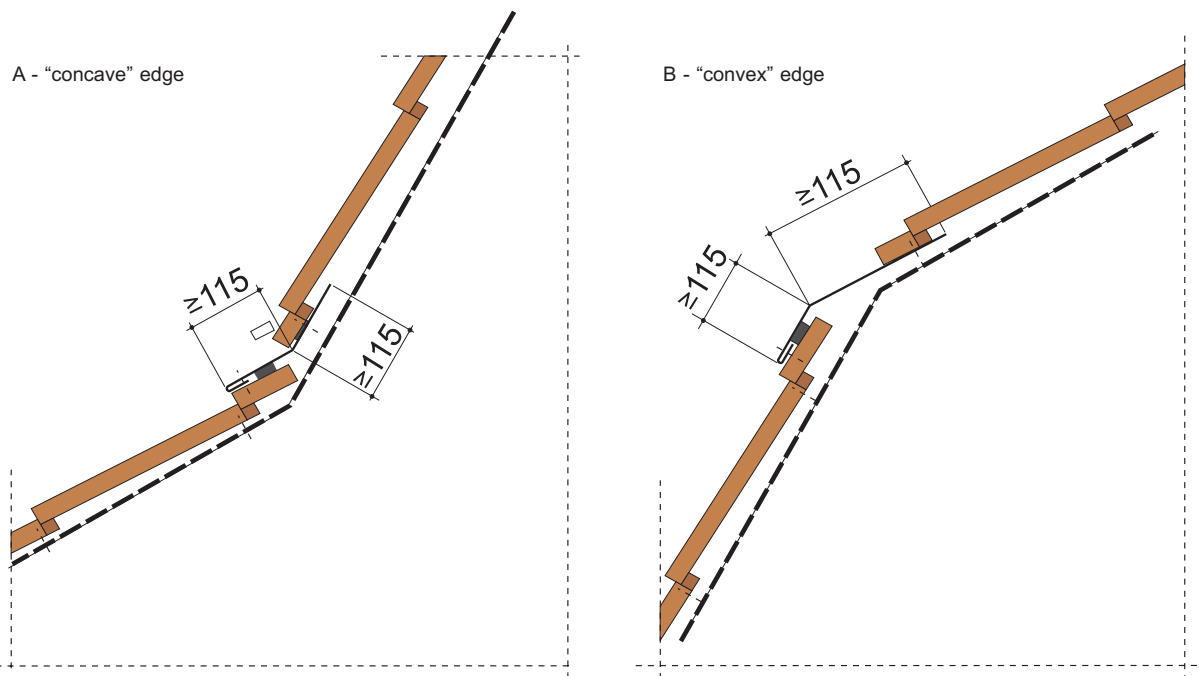
Depending on rain intensity and weather changes they can be installed in one row or in several rows in the distance of about 3'3" from the eaves, at the height of rafter support (rafter plate).

In case of installing of snow barriers, the increase of roof load from 20 to 40 % should be taken into account, caused by more quantity of snow in the barrier area.

Edge flashing of variously inclined roof slope, wall and fire-proof brickwork flashing. – Fig. 15 and 16.

FIG. 16

Example of edge flashing of variously inclined roof slope





ATTENTION! All flashings, which shield roof edges are located on roof edge belts with the highest loads caused by the suction of wind – hence it is necessary to fasten them at minimum spacing of 1'1".

Flashing of ventilating pipes, ventilators, antennas, etc.

All elements with circular section protruding from the roof are sealed with sealing flanges made of EPDM rubber. The bases of these flanges enable forming according to shape of sheet backing and additionally they are sealed by silicon and fastened by selfdrilling screws.

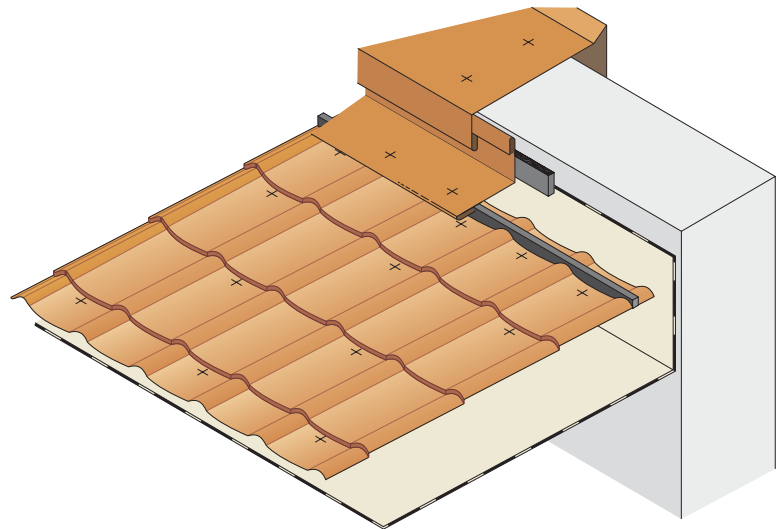
Roofing of livestock buildings

In livestock buildings, in which animals are bred, there are especially aggressive environment conditions. Animal excrements gases (i.e. methane, hydrogen sulphide or ammonia) in connection with steam create solutions with very strong corrosive activity, therefore appropriate ventilation system is essential. Relinquishment of this can cause considerable shortening of roof covering life – even by half.

In this case it is possible to use ordinary ways of ventilation by means of air-holes in top parts of buildings, air grates or ventilation ducts that run above the roof – it is necessary to pay special attention to possible corrosion at the outlets.

FIG. 17

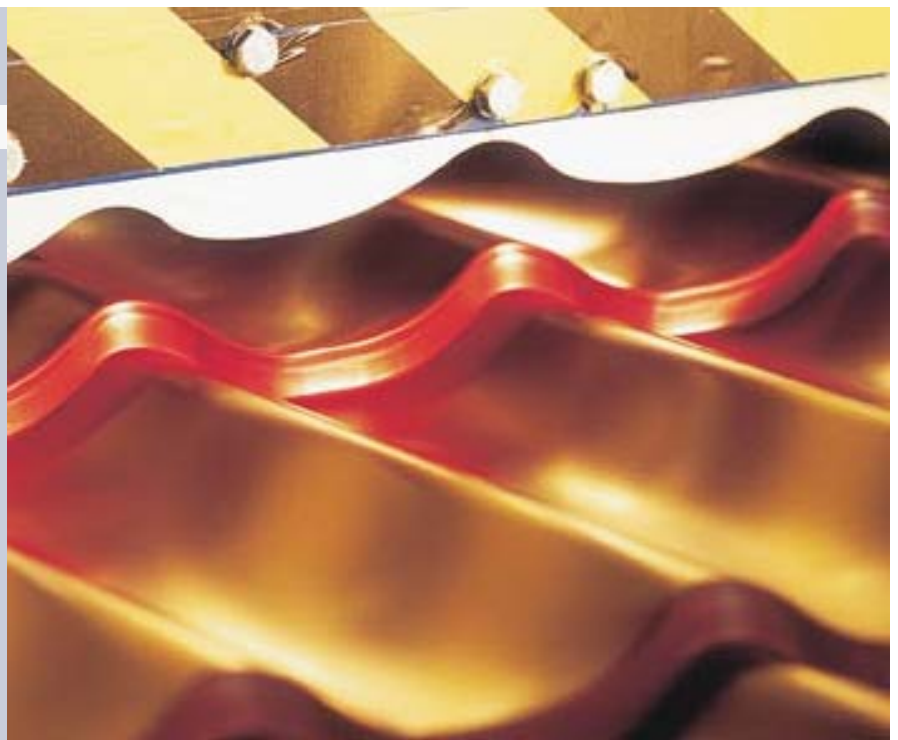
Example of flashing of fire-proof brickwork and use of wall and fire-proof brickwork flashing



Maintenance.

Roofs made of tileformed roofing sheets in principle do not require special maintenance. However, it is necessary to carry out following operations:

- removing leaves from roof surface, whose decaying causes discoloration of the organic coat of sheets
- removing layers of industrial dusts (e.g. originating from limestone processing plants, cement plants, steelworks and mines), which reacts with water and causes damages of the organic coat of sheets.



Metal roofing installation



METHOD B - Installation over existing shingle roof or on plywood decking.

Method B is very similar to Method A with the difference of decking. In Method B, sheet metal roofing tiles can be installed on plywood either existing shingle roof. Such solution simplifies the installation procedure. All of subsequent installation steps remain the same as in Method A.

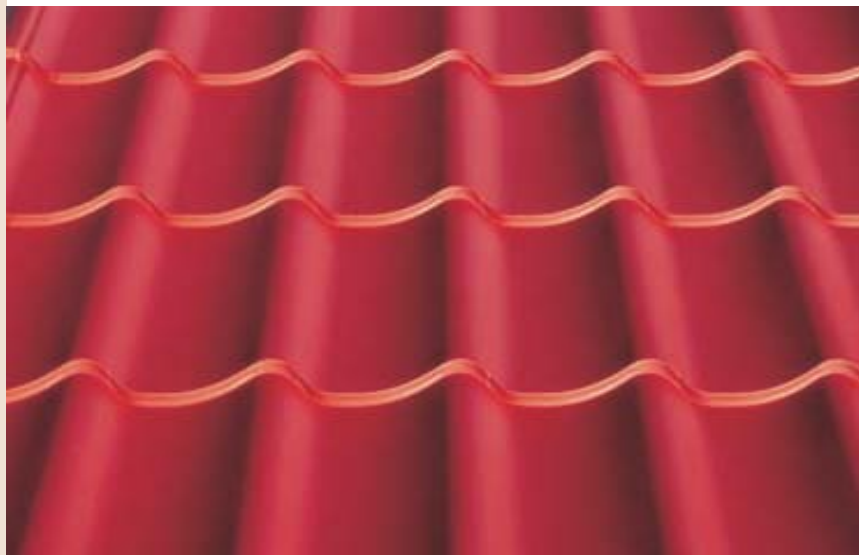
NEW CONSTRUCTION ON PLYWOOD DECKING

If the sheet metal roofing tiles are installed on plywood decking, DML USA PRUSZYNSKI recommends to cover it with the Preliminary Covering Foil (PCF) roof paper, which can be substituted with any other underlayment that is recommended for metal roofing.

It is recommended that valleys have 36" wide self-adhesive underlayment on both sides of valley as additional protection. The recommended minimum pitch for DML USA PRUSZYNSKI panels is 3:12.

DML USA PRUSZYNSKI TILES OVER EXISTING SHINGLE ROOF

DML USA PRUSZYNSKI panels can be installed directly over existing shingle roof. However a complete inspection of existing roofing deck needs to be done, prior to installing new metal panels. Also, at least 3 rows of shingles should be removed in order to check for the possible water damage. If there is any damaged plywood, it needs to be replaced and covered with PCF paper or any other underlayment recommended for metal roofing.



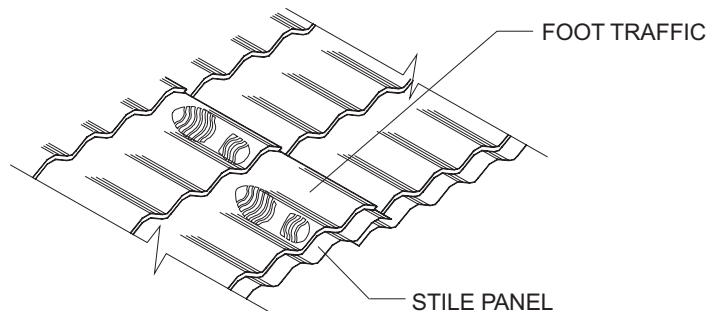
Metal roofing installation

Final notes

1. For cutting sheets use electric vibrating or step shears, nibblers as well as snips.

Do not use tools which cause damage of the varnished and zinc plated coat as a result of heat generation, i.e. angular grinders.

2. It is allowed to walk on the roof using footwear with soft shoe bottoms and placing feet only in wave troughs



Screw down all screws before stepping on the roof.

3. Small damages of the coat during assembly can be painted by touch up paint. The surface should be cleaned from dirt and fat. The surfaces adjacent to damages should be covered.
4. Steel chips, from cutting and drilling should be removed with a soft brush, to avoid damages of sheet surface when covered with rust.
5. Dirt should be removed with normal detergents.
6. It is recommended to protect places of cuts by colorless varnish.





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