

CATALOGUE  
**TILES**



 **TECHNOCIM**  
rooftiles and pavements



# TECHNOCIM - BULGARIAN MANUFACTURER OF CONCRETE TILES AND PAVEMENTS

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**Technocim** is a manufacturer of concrete products from Bulgaria, established as a part of the Balkanstroy AD Group in the beginning of 2007. For this project Balkanstroy has relied on the need for quality and highly technological local production which could satisfy the construction industry and the market of construction materials in Bulgaria.

**Technocim** started its production in May 2008.

Technocim's factory, which is located in the district of Vrazhdebna in Sofia, has an area of 25.000 sq. m. The factory is fully automated and equipped with high-quality machines from the top producers in this branch such as **Hess Maschinenfabrik GmbH & Co KG – Germany and ABECE AB – Sweden.**



Among the concrete products the company manufactures are: **TILES; HALF-, LEFT- AND RIGHT- TILES; ROOF RIDGE TILES; ENDING AND STARTING HIP ROOF RIDGE TILES; 3-WAY APEXES AND 4-WAY APEXES; VIBROPRESSED PAVING BLOCKS; CURBS; SIDEWALK FLAGS; DRAINAGE CHANNELS; PARKING AND CHIMNEY ELEMENTS; BRICKS AND DECORATIVE MASONRY BLOCKS FOR RETAINING WALLS.**

The products of **Technocim** are manufactured from inert materials and linking substances, extracted from the region of Sofia. In order to strengthen the products and to improve their features, one uses various plasticizers and chemical additives. Due to the specific technological processes, two separate halls with dryers have been constructed within the factory premises and the concrete junction point has been designed so as to meet the needs of the two productions simultaneously. All Technocim products are manufactured in compliance with the requirements of the European product standards which are in line with the Bulgarian legislation.

The products are tested in specialized laboratories which have declared compliance with **BDS EN 1338/1339/1340** for the cobbles and the curb stones and **BDS EN 490** for the tiles. These standards show the results from the testing of the strength characteristics, the resistance to frost, the absorption of water, the resistance to wear and tear and many other performance features. The products are not only in compliance with the above mentioned criteria but they even surpass them which is an evidence for their high quality. All of the products, including the genuine materials and fractions have been tested in proprietary laboratory which monitors the main criteria and guarantees continuous quality control. The company has its own warehouse base and keeps fixed amounts in stock which together with the transportation that is provided and the well-developed distribution network in the entire country provide for the quick service and short delivery time.

### TILES

The production of tiles is performed by means of a unique assembly line with three profiles – low, middle wave and flat tile. Such assembly lines are used mainly in Germany and Sweden and are less than 5% of the assembly lines used worldwide. The flat tile is a unique product for the Bulgarian market, too.

The typical feature for the tiles and the roof elements made of concrete is the additional second cover. The production technology follows the principle of drying the raw product at a temperature of 40 °C with strictly fixed amounts of humidity. This technology provides the Technocim products with excellent features: high impact strength, very good water-proof feature, big density, safety and resistance against the "frost-thaw" cycles, fire resistance, storm-proof feature and increased strength in the course of time which means the durability is guaranteed. The tiles from Technocim are produced from natural raw materials and they are nature-friendly product.

### PAVEMENTS

They are produced on the principle of vibropressed products. This way the formation of air pockets is avoided and bigger density and strength are achieved. The products have module sizes allowing for their arrangement in variable combinations in accordance with the ideas and desires of the designers and investors for whose convenience the company offers technical consultations and ready decisions.

### ACCESSORIES AND ELEMENTS

Technocim offers to the customer complete roof solutions performed by means of a system which includes accessories for achieving maximum level of quality, safety and esthetics. Being the first one of its kind on the Bulgarian market, the company offers concrete pavements with drain channels, curb stones and elements for achieving completeness and uniqueness.



# TECHNOCIM

## A FRIEND OF NATURE

The term STEADY DEVELOPMENT means bidirectional performance - meeting people's needs and expectations while preserving the natural resources for the next generations. In other words, the steady development means smart and expedient resource use. It is one of the basic principles of the environmental friendly living. The term has become even more actual during the recent years when the problems related to the changing climate and growing pollution have become even more serious.

All this together will bring about the natural development of different environmental lines in all spheres, especially in the construction sector.

Our attention is drawn to some sensible projects and implementation of numerous new technologies and strategies. The purpose is reducing the consumption of water, energy and other resources as well as the reduction of the impact on the life and exploitation of the buildings.

Last but not least, this type of construction is considered to be in compliance with one of the basic principles of the steady development – recycling. The possibility for recycling the construction materials used is a significant one.

*Technocim, being a company with modern vision and care for the environment, supports very eagerly the minimal environmental impact. That is why it relies on the most environmentally friendly roof covers - concrete tiles.*

The company relies exclusively on the minimal ecological impact from the production process as well. It uses modern technologies which allow for the creation of a concrete tile as an alternative to the ceramic one. It has the same quality as the products known for centuries.

The concrete tile produced by **Technocim** is a much more reliable product with different colors and shapes which has it steady market positions in the world market. It is typical for its long durability. Its exploitation life is more than 100 years and is manufactured by natural and harmless materials such as:

- High quality cement
- Sand with corn size content from 0 to 4 mm
- Water
- Coloring – pigments of iron oxide

Besides it is manufactured of natural raw materials and substances abundant in and typical for the region of production, as well as the fact that it possesses long durability, another fact contributes to its name of being an ecological product – namely the energy needed for its production.

From observations and researches made in European factories after 1999, it has become clear that the energy consumption and the harmful emissions from the production of concrete tiles are significantly lower compared to those from the production of other roof materials including ceramic tiles. According to different researches, the consumption of non-restorable energy remains very low.

Here we should mention the energy cost-efficiency of the product in the construction sector as a quality that should not be underestimated when having in mind the steady development.

Last but not least, we should mention recycling: The modern technological equipment of the factory allows for the realization of a completely no waste leaving technology complying with the highest standards of EU in this field. The unapproved production is processed entirely as a secondary construction product, used for performing of reverse embankments. This possibility for recycling could be implemented also in case of old roofs repair works, when the roofs are made of concrete tiles.

In order to be competitive you have to be aware of the current requirements for environmental friendly construction so that you could reduce the loss of energy and achieve an efficient level of production.

That is why, besides the high quality of the tiles, their perfect look and their undoubted advantages, the care for the environment is included as a main production priority.

# CONCRETE TILES

In the architectural and construction branches around the world there are predominantly two basic types of roofs - slope and flat ones. There are still disputes concerning the technical and economical features and the advantages and the disadvantages of the one or the other type of roofs. A fact which is proven and undisputable is that the space under the slope roof can be used, which results in a cheaper value of the built-up area per square meter.

With the changes in our social, political and public life and the escalating prices of the terrains for construction, the investors, designers and constructors have increasingly started to use preferably the slope roof for both individual and multi-family residence buildings.

The big volume of construction has urged the demand for tiles which are the basic material for the slope roofs. Unfortunately, the number of deposits of high-quality clay for ceramic products used for the construction of slope roofs both in this country and worldwide has decreased significantly. The Bulgarian market has suffered significantly from the lack of quality ceramic products which had urged the need to import them from Greece, Turkey and Macedonia. These have a decent look but the tests showed that they could not comply to the Bulgarian national standard and more specifically to the level of frost resistance.

That is why in order to satisfy the needs of the construction materials market concerning the quality and high-technological production, Technocim has constructed and started to operate an own factory.

The tiles are produced on a last-generation assembly line, and there are only a few manufacturers in the world who have such a line. The production technology undergoes the following phases:

- Homogeneous mixing of concrete with the pigments from iron oxide and extruded in moulds.
- Cutting and rounding the edges – for the low and average wave profiles
- First sealing or first painting on the wet surface with acrylic paint
- Drying under maximal temperature 40 °C in a specially isolated dryer room with 80% humidity for 12 hours - The control of the temperature and humidity are the reason for quality end product. They are the basic difference between the Technocim products and the other manufacturers on the Bulgarian market. Another basic difference is the recipe concrete mix used.
- Second sealing or second painting on the dry surface and additional natural drying on a circulation table for 22 minutes.
- Wrapping with cling film which isolates the products from the harmful influence of the atmosphere conditions in the storehouse.
- Packaging with stretch folio which insulates the products against the harmful influences of the atmosphere conditions in the storehouse.

Technocim offers three profiles on the market – middle wave, low wave and flat tile. The flat tile is a new product on the Bulgarian market and is an allusion to the traditional stone slabs typical for the Bulgarian architecture.

Each one of the 3 profiles could be colored and/or made to look older and the coloring could be in the whole volume. This guarantees the durability of the main color of the product and its covering with protective layers and seals prevents the salts crystallization and leads to homogeneity of the surface and additional protection against climate impacts. Making the products to look older does not affect the quality of the products because it is achieved via spraying of black paint on the whole product surface.

## ADVANTAGES OF THE TECHNOCIM'S CONCRETE ROOF PRODUCTS

1. The accumulation of the strength of the concrete goes on as the years pass by! Related to the ceramic tiles, the concrete ones are growing stronger with the lapse of time i.e. durability of the roof is guaranteed.
2. Technocim's tiles are resistant to frost-thaw cycles. They have high density and that is why they absorb less humidity from rain and snow. The risk level for absorbing humidity and freeze is equal to zero. Technocim tiles are much more frost resistant and durable in comparison to alternative roof materials.

3. Concrete tiles are not susceptible to strong winds, storms and torrent rains no matter what the roof construction might be. They absorb 25% less humidity in comparison to the ceramic tiles and the special fixing brackets add extra stability to the roof. Their own body mass contributes to the better stability of the roof as well when compared to alternative roof products.
4. Technocim's concrete tiles do not increase the pressure of the roof construction per square meter because the norm is 10 tiles per square meter while with the ceramic ones the norm is 15 tiles per square meter.
5. Technocim tiles are manufactured in a completely automated method using technological lines from Europe's leading manufacturer ABECE AB, Sweden. That is why the shapes and sizes of the tiles have the minimal possible diversion levels, which is a condition for ideal and quick fitting during installation.
6. Technocim's tiles are highly resistant to hail. Their high density and the excellent quality of the additional second covering makes them exceptionally resistant to hails which are a common phenomenon in Bulgaria. The ceramic materials with varnished and glazed upper surfaces do form micro cracks during hails. With the lapse of time these cracks tend to enlarge and become a reason for the increasing of water absorption which in turn leads to destruction of the frost-thaw cycles.
7. Technocim concrete tiles do not burn and successfully protect the basic wooden constructions from inflammation.
8. The tiles are colored in four main colors – red, brick red, brown and anthracite. They could be colored (beyond the standards) in other colors according to client requirements and could be made to look older as well.
9. Three types of tiles are produced – low wave (Breeze), middle wave (Onda) and flat (Plano). The last type is unique and the only one available on our market. With its outlook and esthetic advantages, this type of tile adds a vintage look to the buildings. The sizes of all the three types are 33/42 cm. They are laid down under minimal slope angle 18°.

To every single type of tiles also aiding manual items are manufactured.

The supporting accessories include: the roof ridge-tiles, left- and right-end tiles, half tiles, 3-way apex and 4-way apex tiles etc. The application of these items gives to the roof a feel of completeness and reliability, combined with extremely aesthetic view. All products are:

- Manufactured by natural/genuine/ materials
- Ecologically pure
- They have high strength qualities
- Durable to humidity and frost
- Durable to fire
- Long-lasting for exploitation under extreme weather conditions
- They are mounted easy and quick



# CONCRETE TILES



PLANO  
ONDA  
BREEZE



# PLANO

Manufactured in Bulgaria, covering the strength characteristics for concrete tiles and in compliance with the European requirements and standards, Plano creates a unique esthetical look for every building not taking into account the architectural style. The tile has been awarded "BEST CONSTRUCTION PRODUCT" for 2008 and 2009 in the category ROOF SYSTEMS in the online competition of the construction Internet platform citybuild.bg.

Plano is the tile, which fully complies with the contemporary requirements for modern and advanced-guard architecture. Meanwhile, the flat, correct and clean form in combination with the anthracite color brings the feeling for antiquity. Placed on the roof construction it looks like a stone plate and underpins the vintage look of the building. Plano combines functionality and the correct forms and sizes underpin esthetical look and perfection and allow quick and easy placement. The additional range of accessories is a decision even for the most difficult details in the roof construction.

## Technical feature:

- Product Type: Interlocking tile with straight front edge
- Length: 420 mm
- Width: 330 mm
- Hanging length: 398 mm
- Cover width: > 300 mm
- Profile depth: no
- Weight: 4,900 kg.
- Dimensional variation: complies
- Mechanical resistance: > 1200 H
- External fire performance: complies
- Reaction to fire: complies
- Water impermeability: complies
- Durability (freeze-thaw): complies

## Information on the packaging:

- pallet's size: 100 x 120 cm
- quantity of product in a pallet: 180 units sq. m.
- product in a pallet: 16 m<sup>2</sup>
- weight of a pallet: 882 kg.



Anthracite  
K001

Tile red  
K002

Red  
K003

Brown  
K004

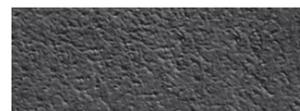
Vintage  
K005

\* The company manufactures concrete tiles in other colors, too, as well as in blue and green (different from the standards) upon agreement with the customer.



# PLANO

## HALF TILE



Anthracite  
K001



Tile red  
K002



Red  
K003



Brown  
K004



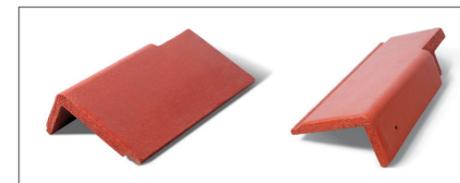
Vintage  
K005



The half tile is the easy solution for the ones who have preferred placement the flat tile PLANO in a checkmate style. In this way one spares the redundant cutting.

# PLANO

## FLAT LEFT- AND RIGHT-END ROOF TILES



The end tiles are a very good and esthetical solution for forming the front-end edges and covering the front beams with the two-layer roofs.

\* The company manufactures concrete tiles in other colors, too, as well as in blue and green (different from the standards) upon agreement with the customer.

### Technical feature:

Product Type: Coordinated complementary element /CO/  
Element Type: flat half roof tile  
Length: 420 mm  
Width: 180 mm  
Weight: 2,650 kg.  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

### Information on the packaging:

pallet's size: 100 x 120 cm  
quantity of product in a pallet: 100 units  
weight of a pallet: 265 kg.



### Technical feature:

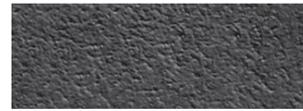
Product Type: Coordinated complementary element /CO/  
Element Type: flat left-end roof tile, (flat right-end roof tile)  
Length: 420 mm  
Width: 225 mm, (flat right-end roof tile - 185 mm)  
Weight: 5,000 kg., (flat right-end roof tile - 4,450 kg.)  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

### Information on the packaging:

pallet's size: 100 x 120 cm  
quantity of product in a pallet: left – 80 items, right – 108 items  
weight of a pallet: left – 400 kg., right – 480,6 kg.

# PLANO

## ROOF RIDGE-TILE



Anthracite  
K001



Tile red  
K002



Red  
K003



Brown  
K004



Vintage  
K005



The roof ridge-tile is an important part of the roof, which gives the final visual and practical finished look and creates protection from the intruding water and the different atmosphere influences. It is laid on the ridge, with a minimum slope from 18°.

# PLANO

## ENDING AND STARTING HIP ROOF RIDGE-TILE



The ending hip roof ridge-tile is suitable for ending the ridge with a two-layered roof. The product is used as a starting hip roof ridge-tile with the various layered roofs and besides being an improvement to their esthetical look it prevents the intrusion of contaminants, birds and animals through the ridge

\* The company manufactures concrete tiles in other colors, too, as well as in blue and green (different from the standards) upon agreement with the customer.

### Technical feature:

Product Type: Uncoordinated complementary element /NC/  
 Element Type: flat roof ridge tile /F/  
 Length: 420 mm  
 Width: 225 mm  
 Weight: 4,500 kg.  
 Dimensional variation: complies  
 Mechanical resistance: complies  
 External fire performance: complies  
 Reaction to fire: complies  
 Water impermeability: complies  
 Durability (freeze-thaw): complies

### Information on the packaging:

pallet's size: 100 x 120 cm  
 quantity of product in a pallet: 100 units  
 weight of a pallet: 450 kg.



### Technical feature:

Product Type: Uncoordinated complementary element /NC/  
 Element Type: flat ending and starting ridge tile /F/  
 Length: 420 mm  
 Width: 225 mm  
 Height: 140 mm  
 Weight: 5,150 kg.  
 Dimensional variation: complies  
 Mechanical resistance: complies  
 External fire performance: complies  
 Reaction to fire: complies  
 Water impermeability: complies  
 Durability (freeze-thaw): complies

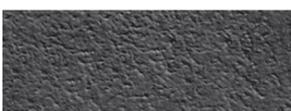
### Information on the packaging:

SOLD PER ITEM



# ONDA

Onda gives to every type of building, regardless whether it is a residential, public or production one, a very typical harmonious look. The wave-form of the surface of the roof gives to it an esthetic and classic lay as the effect is significant with the combination of profile with the traditional roof red color. This is a good solution for traditionalists.



Anthracite  
K001



Tile red  
K002



Red  
K003



Brown  
K004



Vintage  
K005

\* The company manufactures concrete tiles in other colors, too, as well as in blue and green (different from the standards) upon agreement with the customer.



## Technical feature:

Product Type: Interlocking tile with straight front edge  
 Length: 420 mm  
 Width: 330 mm  
 Hanging length: 398 mm  
 Cover width: > 300 mm  
 Profile depth: 35 mm  
 Weight: 4,400 kg.  
 Dimensional variation: complies  
 Mechanical resistance: > 2000 H  
 External fire performance: complies  
 Reaction to fire: complies  
 Water impermeability: complies  
 Durability (freeze-thaw): complies

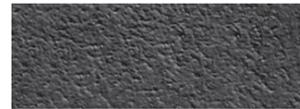
## Information on the packaging:

pallet's size: 100 x 120 cm  
 quantity of product in a pallet: 240 units sq. m.  
 product in a pallet: 24 m<sup>2</sup>  
 weight of a pallet: 1056 kg.



# ONDA

## MIDDLE WAVE HALF TILE



Anthracite  
K001



Tile red  
K002



Red  
K003



Brown  
K004



Vintage  
K005



The half tile ONDA spares the redundant cutting of the whole tiles when laying the sloped roofs with the minimum slope of 18°.

# ONDA

## MIDDLE WAVE LEFT- AND RIGHT-END ROOF TILES



The end tiles are a very good and esthetical solution for forming the front-end edges and covering the front beams with the two-layer roofs.

\* The company manufactures concrete tiles in other colors, too, as well as in blue and green (different from the standards) upon agreement with the customer.

### Technical feature:

Product Type: Coordinated complementary element /CO/  
Element Type: half roof tile  
Length: 420 mm  
Width: 180 mm  
Weight: 2,250 kg.  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

### Information on the packaging:

pallet's size: 100 x 120 cm  
quantity of product in a pallet: 100 units  
weight of a pallet: 225 kg.



### Technical feature:

Product Type: Coordinated complementary element /CO/  
Element Type: left-end roof tile, (right-end roof tile)  
Length: 420 mm  
Width: 300 mm  
Weight: 5,800 kg., (right-end roof tile - 6,350 kg.)  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

### Information on the packaging:

pallet's size: 100 x 120 cm  
quantity of product in a pallet left/right: 48 items  
weight of a pallet: left – 278,4 kg., right – 304,8 kg.



# BREEZE

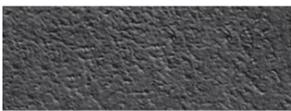
Breeze is the tile with an established role of a classic tile within the years. Its universal profile, combined with the various types of colors, makes it applicable for every type of buildings and different types of architectural styles. It is suitable for both reconstruction of roofs of old buildings and construction of new ones. Its shape allows the perfect drainage of water even with small slopes of the roof.

## Technical feature:

Product Type: Interlocking tile with straight front edge  
 Length: 420 mm  
 Width: 330 mm  
 Hanging length: 402 mm  
 Cover width: > 300 mm  
 Profile depth: 25 mm  
 Weight: 4,400 kg.  
 Dimensional variation: complies  
 Mechanical resistance: > 2000 H  
 External fire performance: complies  
 Reaction to fire: complies  
 Water impermeability: complies  
 Durability (freeze-thaw): complies

## Information on the packaging:

pallet's size: 100 x 120 cm  
 quantity of product in a pallet: 240 units sq.m.  
 product in a pallet: 24 m<sup>2</sup>  
 weight of a pallet: 1056 kg.



Anthracite  
K001



Tile red  
K002



Red  
K003



Brown  
K004



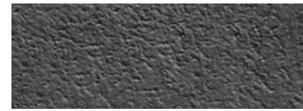
Vintage  
K005

\* The company manufactures concrete tiles in other colors, too, as well as in blue and green (different from the standards) upon agreement with the customer.



# BREEZE

## LOW WAVE HALF TILE



Anthracite  
K001



Tile red  
K002



Red  
K003



Brown  
K004



Vintage  
K005



The half tile BREEZE spares the redundant cutting of the whole tiles when laying the sloped roofs with the minimum slope of 18°.

# BREEZE

## LOW WAVE LEFT- AND RIGHT-END ROOF TILES



The end tiles are a very good and esthetical solution for forming the front-end edges and covering the front beams with the two-layer roofs.

\* The company manufactures concrete tiles in other colors, too, as well as in blue and green (different from the standards) upon agreement with the customer.

### Technical feature:

Product Type: Coordinated complementary element /CO/  
Element Type: half roof tile  
Length: 420 mm  
Width: 180 mm  
Weight: 2,350 kg.  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

### Information on the packaging:

pallet's size: 100 x 120 cm  
Quantity of product in a pallet: 100 units  
weight of a pallet: 235 kg.



### Technical feature:

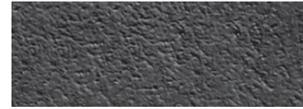
Product Type: Coordinated complementary element /CO/  
Element Type: left-end roof tile, (right-end roof tile)  
Length: 420 mm  
Width: 300 mm  
Weight: 6,450 kg., (right-end roof tile - 6,800 kg.)  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

### Information on the packaging:

pallet's size: 100 x 120 cm  
quantity of product in a pallet left/right: 48 items  
weight of a pallet: left – 309,6 kg., right – 326,4 kg.

# ONDA / BREEZE

## ROOF RIDGE-TILE



Anthracite  
K001



Tile red  
K002



Red  
K003



Brown  
K004



Vintage  
K005



The roof ridge-tile is an important part of the roof, which gives the final visual and practical finished look and creates protection from the intruding water and the different atmosphere influences. It is laid on the ridge, with a minimum slope from 18°.

### Technical feature:

Product Type: Uncoordinated complementary element /NC/  
Element Type: roof ridge tile /F/  
Length: 420 mm  
Width: 230 mm  
Weight: 4,600 kg.  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

### Information on the packaging:

pallet's size: 100 x 120 cm  
quantity of product in a pallet: 100 units  
weight of a pallet: 460 kg.

# ONDA / BREEZE

## STARTING HIP ROOF RIDGE-TILE



The starting hip roof ridge-tile is suitable for completing a ridge with a layered roof and besides improving its esthetical look it prevents the entrance of contaminants, birds and animals through the ridge.



### Technical feature:

Product Type: Uncoordinated complementary element /NC/  
Element Type: flat ending and starting ridge tile /F/  
Length: 380 mm  
Width: 230 mm  
Weight: 3,650 kg.  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

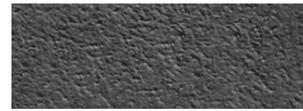
### Information on the packaging:

SOLD PER ITEM

\* The company manufactures concrete tiles in other colors, too, as well as in blue and green (different from the standards) upon agreement with the customer.

# ONDA / BREEZE

ENDING HIP ROOF RIDGE-TILE  
WITH LARGE BOTTOM



Anthracite  
K001



Tile red  
K002



Red  
K003



Brown  
K004



Vintage  
K005



The ending hip roof ridge-tile is suitable for completing a ridge with a two-layered roof and besides improving its esthetical look it prevents the entrance of contaminants, birds and animals through the ridge.

## Technical feature:

Product Type: Uncoordinated complementary element /NC/  
Element Type: ending hip roof ridge tile with large bottom /F/  
Length: 420 mm  
Width: 225 mm  
Height: 175 mm  
Weight: 6,200 kg.  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

## Information on the packaging:

SOLD PER ITEM

# ONDA / BREEZE

ENDING HIP ROOF RIDGE-TILE WITH  
SMALL BOTTOM



The ending hip roof ridge-tile is suitable for starting a ridge with a two-layered roof and besides improving its esthetical look it prevents the entrance of contaminants, birds and animals through the ridge.



## Technical feature:

Product Type: Uncoordinated complementary element /NC/  
Element Type: ending hip roof ridge tile with small bottom /F/  
Length: 420 mm  
Width: 225 mm  
Height: 150 mm  
Weight: 5,800 kg.  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

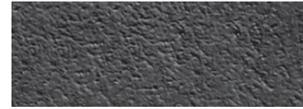
## Information on the packaging:

SOLD PER ITEM

\* The company manufactures concrete tiles in other colors, too, as well as in blue and green (different from the standards) upon agreement with the customer.

# ONDA / BREEZE

3-WAY APEX TILE



Anthracite  
K001



Tile red  
K002



Red  
K003



Brown  
K004



Vintage  
K005



Product suitable for covering the top of a ridge with a three-layered roof with minimum slope of 18°.

# ONDA / BREEZE

4-WAY APEX TILE



Product suitable for covering the top of a ridge with a four-layered roof with minimum slope of 18°.

\* The company manufactures concrete tiles in other colors, too, as well as in blue and green (different from the standards) upon agreement with the customer.

## Technical feature:

Product Type: Uncoordinated complementary element /NC/  
Element Type: 3-way apex tile /VT/  
Length: 350 mm  
Width: 290 mm  
Height: 260 mm  
Weight: 7,400 kg.  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

## Information on the packaging:

SOLD PER ITEM



## Technical feature:

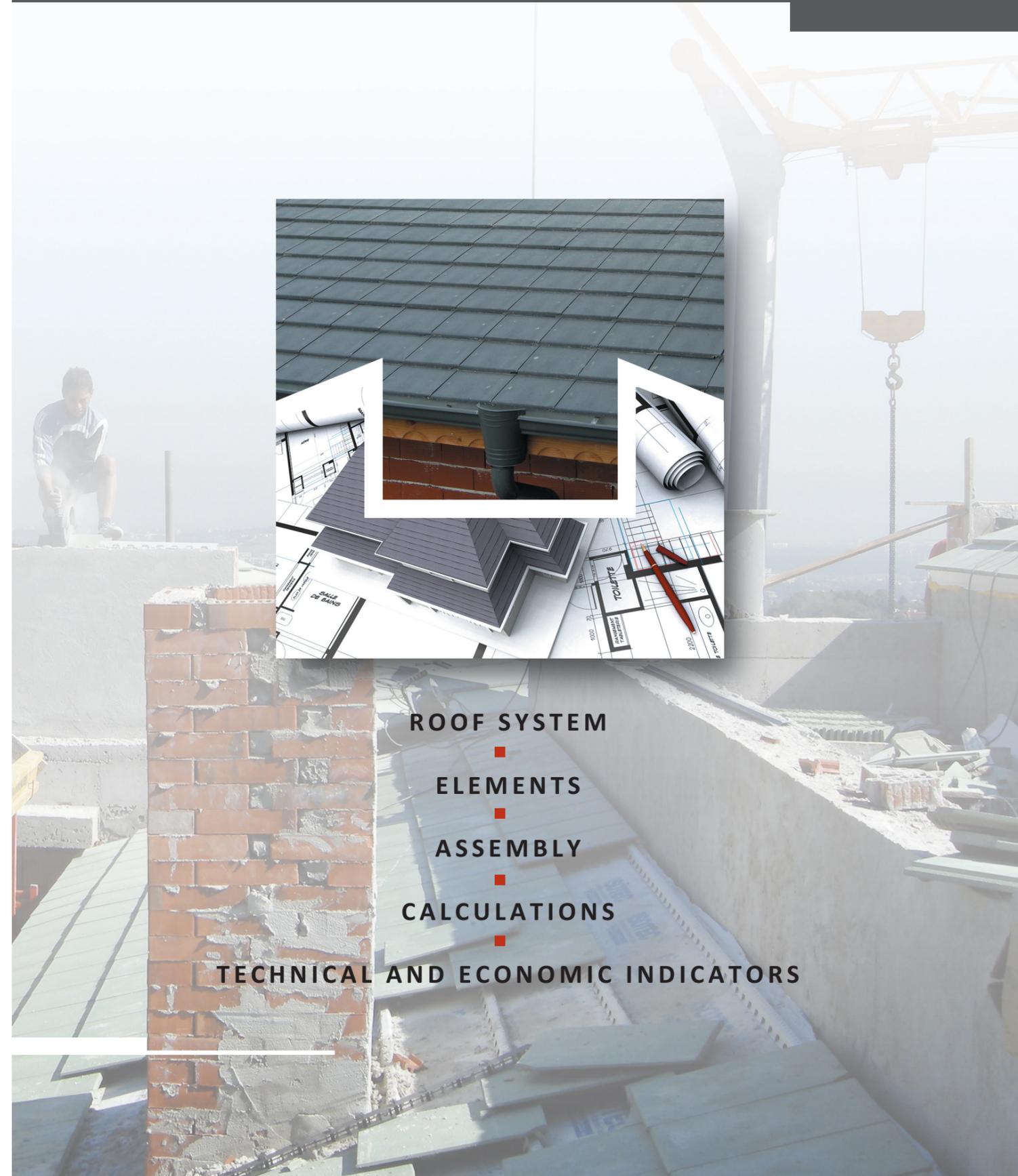
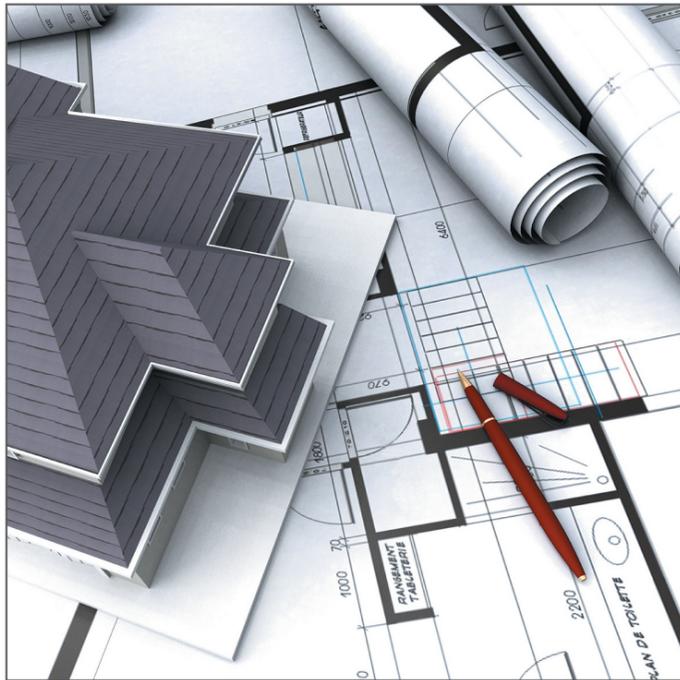
Product Type: Uncoordinated complementary element /NC/  
Element Type: 4-way apex tile /VT/  
Length: 380 mm  
Width: 380 mm  
Height: 250 mm  
Weight: 6,300 kg.  
Dimensional variation: complies  
Mechanical resistance: complies  
External fire performance: complies  
Reaction to fire: complies  
Water impermeability: complies  
Durability (freeze-thaw): complies

## Information on the packaging:

SOLD PER ITEM



# USEFUL INFORMATION



ROOF SYSTEM

ELEMENTS

ASSEMBLY

CALCULATIONS

TECHNICAL AND ECONOMIC INDICATORS

# TECHNOCIM ROOF SYSTEM

Because of their specific role the roof covers should meet several basic requirements. They are not only the finishing element of every building, attributing to it an individual outer look, but they serve also for hydro-, steam and heat insulation. In order to improve the qualities of every single roof, it is necessary to use an equipped and complete roof system. Technocim EAD offers a full roof system, completed with all necessary basic materials, accessories, belongings and aiding materials – under-roof folio, heat insulating sheets, air ducts, supporting and venting elements, snow breaking hooks, aluminum self-sticking bands and rails etc. These accessories and belonging have a positive esthetical influence on the layered roof and give it a finished look.

Their basic intention is to:

- ensure the absolute water resistance;
- ventilation of the under-roof room;
- protection of the roof from intrusion of birds and animals;
- good air circulation in the under-roof room;
- ventilation of the sewerage of the building;
- assembly and support of the equipments - mounted at the roof – solar systems, lightning conductor installations and other;
- facilities for drainage of the building and their protection from the falling snow etc.

The use of the roof system ensures high quality and durability of the roof. From significant importance is the creation of under-roof rooms with very good functionality including an improved micro climate. The achievement of reliable energy efficient results with the roof system Technocim creates conditions for improvement of the heat comfort in the resided under-roof rooms.

The number of accessories and elements of the roof system is not a small one, therefore we group them into the following categories:

## BASIC MATERIALS

This category includes all types of concrete items: tiles, roof ridge-tiles, half tiles, ending/side/left and right tiles, starting and ending hip roof ridge-tiles, 3-way apexes, 4-way apexes etc.

## ROOF INSULATION

Here all types of roof folio/membranes/ designed to protect the under-roof room from unfavourable atmosphere influences are included to protect the heat insulation and the supporting construction of the roof from humidity, to ensure the necessary ventilation of the entire roof as well as to protect the heating comfort of the entire building.

## ELEMENTS FOR VENTILATION

Within this category, all accessories are included which are suitable for channeling the water steams and the humidity from the under-roof space and the roof, preventing the processes of overheating the roof and the intrusion of heat in the building through the roof.

## SUPPORTING ELEMENTS

The elements for assembling tiles, roof ridge-tiles and other basic materials to the roof lining - the purling, the ribs, the counter beams, the ridge beams and the supporting beams for the tiles. With these elements stability of the roof during heavy and stormy winds is ensured.

## ELEMENTS FOR CONGESTION

This category comprises all elements ensuring the special insulation of the conflict attaching parts between the roof surface and the chimneys, ventilation ducts, roof windows, sun collector panels, ridges and other walls and front sides of other neighboring buildings. These elements additionally protect the under-roof space from intrusion of water.

## DRAINAGE ELEMENTS

These are one of the most important and obligatory elements from the roof system, which should drain in the fastest and shortest way the water from the roof into the street sewerage network. Meanwhile with the drainage of the roof both the under-roof space and the entire front side of the building are protected from the harmful influence of all types of precipitations. The drainage elements protect the entire building, the entire construction of the building - surface and ground water should not be allowed intruding the fundamentals of the buildings. The drainage elements are a part of an entire completed system from gutters, drainpipes, grates, elbows, drainage basins, sleeves, consoles and many other details.



# ELEMENTS FROM THE SYSTEM

## ROOF INSULATION

The roofs are among the parts of the buildings which are subjected to the influence of many severe atmosphere conditions, and through them one loses most heating energy. The heating losses through the roof of a building are calculated at about 40% from all losses /through the enclosing walls, joineries and floors/. Meanwhile, the trends in the architecture and the construction show a significant advance in the use of the under-roof rooms, proving once again the advantages of the layered roofs compared to the flat ones. All this leads to the necessity of even higher requirements for safety and reliability with the construction or the reconstruction of layered roofs.

The efficient use of the under-roof space today is achieved by means of the use of the modern steam letting membranes /folio/ and the heating insulation materials – mineral wadding /glass or stone/, XPS and EPS.

### HEATING INSULATION

Concerning the heating insulation, here we should not discuss many details, since their application in the construction is mandatory and it is a question of independent project on the part: General Water pipe and Sewerage - Heating Technical Efficiency. Their being mentioned in this section is because our possibilities to furnish the roof system with everything which is necessary. The Technocim roof system is developed on the grounds of the use of mineral wadding GEOLAN, which has the following technical features:

- name – GEOLAN B-040
- density – 40 kg/m<sup>3</sup>
- rate of stability to diffusion –  $\mu=1$
- temperature of melting – 1000°C
- rate of heating conductivity –  $\lambda=0,0327$  W/mK
- fire resistance – class A1 – not burning material

The combination of three extremely important qualities of the mineral wadding GEOLAN, in particular its excellent heating insulation, reliable sound insulation and perfect and safe fire protection, have predetermined the application of it in the system Technocim.

For every particular case our experts could offer a solution for the type, qualities and thickness of the heating insulation. This is valid especially when using the system for reconstruction of existing roofs, for which surely there is no design for heating insulation.

The calculations and the specification of the parameters of the heat insulation are a routine work and are done in compliance with the Standards for designing of heating insulations of buildings valid in this country.

### STEAM DIFFUSION MEMBRANES/FOLIO/

The roof membranes /folio/ should have 4 basic functions:

1. Second drainage layer – which allows the snow brought by the wind rain and snow and which had found leaks through the tiles or the places of overlapping, to fall down in a safe way on the under tile folio to the gutters and from there out of the roof.
2. Temporary hydraulic insulation – during the construction or in case of breaking the tiles, under-roof membrane /folio/ protects the heating insulation and the layers under it /resp. the supporting construction/.
3. Control of condensation – hot humid air which rises from the internal part of the building to the under-roof space could freely get through the steam letting membrane /folio/. When there is condense on the lower surface of the tiles, the water drops should fall on the under-roof folio to the gutters and from there out of the roof.
4. Wind – the under-roof folio should ensure protection against intrusion of cold air from outside, as well as against intrusion of dust or snow in the under-roof space when there is stormy wind.

Within the roof system there are two types of folio:

#### A. SILVER roof foil- Steam barrier and controlling layer

The goal and the task of this layer is to limit to a minimum the transition of water steam from the internal part of the building through the heat insulation towards the under-roof space. This problem occurs most often during the winter according to the Second Law of the Thermodynamics. The humidity harms both the wooden construction and the heating insulation layer. It is well known that the water is the biggest enemy of the heat insulations i.e. worsens significantly the heat comfort of the entire building! From everything said until now it is clear, that the place of the steam barrier is under the heat insulation.

For steam barrier one could use two-layered and three layered steam letting membranes /folio/ with the following technical characteristics:

- weight – up to 100 gr/m<sup>2</sup>
- stability to longitudinal tearing – up to 200 N/50 mm
- stability to transverse tearing – up to 100 N/50 mm
- steam transition – from 1,0 gr/m<sup>2</sup>/24 h to 50 gr/m<sup>2</sup>/24 h
- diffusion equiv. thickness – Sd=from 30 m to 1 m
- water insulation -  $\geq 1$  m water pillar



SILVER



CLASSIC

MAXI

STRONG

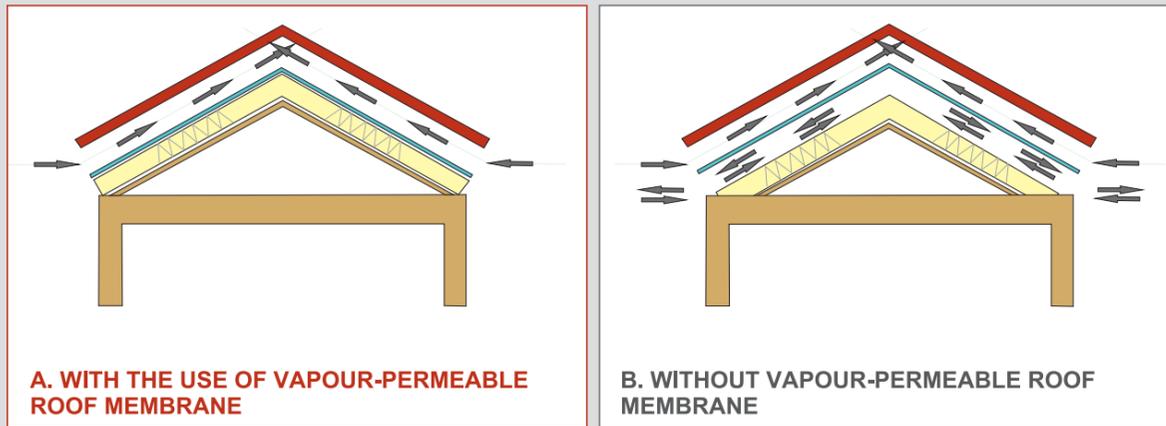
#### B. CLASSIC, MAXI, STRONG roof membranes- highly vapour-permeable layered roof membranes

When laying the big part of the roof membranes, which have been used until recently, a ventilated room between the membrane and the base under it should be allowed – most often – heating insulation, since when counterattacked at any point, one had the “effect of the tent” – the membrane allows water entering at the points of touching the base. This leads to a more complicate constructive detail, limitation of the under-roof space, there are preconditions for heavy air drafts and at the end there is a low energy efficiency. Solution to these problems is offered by the modern roof steam letting membranes. Today they are an important component of the modern roof constructions.

For such under-roof membrane/folio/ one uses three-layered vapour-permeable roof membranes with the following features:

- weight – from 100 gr/m<sup>2</sup> to 175 gr/m<sup>2</sup>
- stability to longitudinal tearing – from 200 N/50 mm to 300 N/50 mm
- stability to transverse tearing – from 100 N/50 mm to 200 N/50 mm
- stability to longitudinal tearing with a nail – 70 N/20 mm
- stability to transverse tearing with a nail – 80 N/20 mm
- steam transition – from 1250 to 5000 gr/m<sup>2</sup>/24
- diffusion equiv. thickness – Sd=from 0.015 to 0.030m
- class of burning ability under DIN 4102 – B2
- UV – stabilization – min. 4 months
- stability to temperature influences - from -80° to + 120 °C

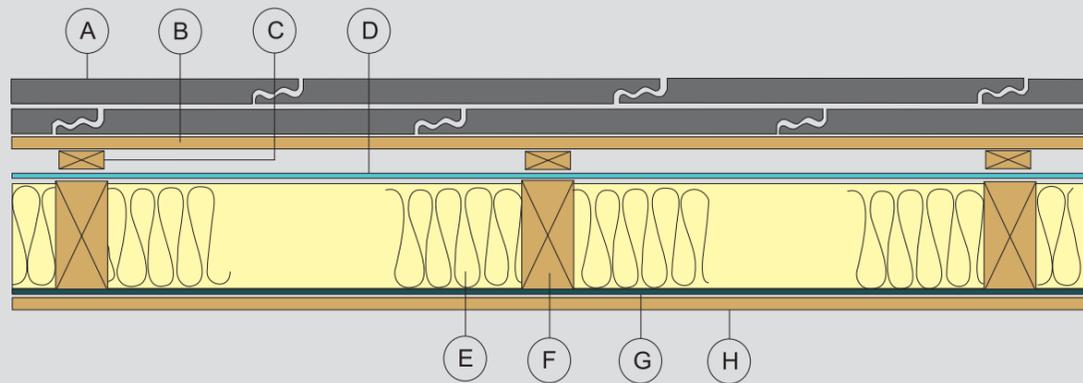
These membranes could be laid immediately on the heating insulation or the plank covering, without any danger from occurrence of the “effect of the tent”. They could be located in the immediate contact with the end roof cover /tiles, plates, sheet iron/.



**A. WITH THE USE OF VAPOUR-PERMEABLE ROOF MEMBRANE**

**B. WITHOUT VAPOUR-PERMEABLE ROOF MEMBRANE**

**REMARK:** When using modern vapour-permeable roof membrane the volume of the under-roof area is increased by approx. 20-25%



- A. FLAT CONCRETE PLANO TILES
- B. BEAMS 3/5 CM
- C. COUNTER BEAMS 5/5 CM
- D. STEAM DIFFUSION FOLIO
- E. HEAT INSULATION – MINERAL WADDING
- F. RIBS 10/12 CM
- G. CONTROLLING LAYER – STEAM BARRIER
- H. CEILING OF THE UNDER-ROOF AREA

Within this category there are included all elements and accessories whose basic designation is to lead the water steams and humidity from the under-roof space and the roof as well as the prevention of the processes of over-heating these volumes and areas. To this group we have included also the elements with the help of which we fight against the intrusion of birds and animals in the under-roof space and from there into the building, too. Most of the elements perform combined functions – ensure the ventilation of the roof and protect the under-roof space from the access of birds and animals. The ventilation of the roof is performed in a natural way, guided only by the basic laws of the heating technology – entry of fresh air through the eaves and the leading of the „processed“ humid air through the ridge.

Because of this reason we shall divide the types of ventilation materials, elements and accessories to:

- elements for ventilation on the eaves
- elements for ventilation on the ridge
- elements for ventilation of the sewerage network – venting chimneys

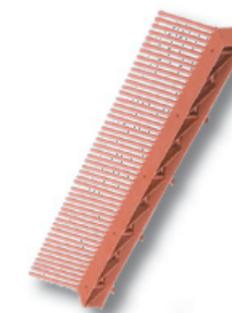


**1. EAVES COMB- VENTING ELEMENT**

This grate has a combined action. It protects the under-roof area around the eave, under the first row of tiles from the access of birds and animals. It is similar to a barrier against the entry of leaves and small branches in the under-roof area, it ensures the ventilation of the roof. It protects the heating insulation from mechanical damages.

**TECHNICAL FEATURES:**

Materials	PP or PVC
Sizes	60 mm x 1 m
Stability	UV, freeze, heating, rain and snow
Cost / Packaging	100 items/carton
Colors	Just as the tiles



**2. EAVES COMB WITH GRATE- COMBINED ELEMENT**

This grate has a combined action. It protects the under-roof area around the eave, under the first row of tiles from the access of birds and animals. It is similar to a barrier against the entry of leaves and small branches in the under-roof area, it ensures the ventilation of the roof. It protects the heating insulation from mechanical damages. The difference between this grate and the one from point 1 is that the latter one has an additional /ventilating/ profile, which substitutes the starting beam, which makes assembly significantly easier. Typical is the longer durability of the item.

**TECHNICAL FEATURES:**

Materials	PP or PVC
Sizes	85 mm x 1 m
Stability	UV, freeze, heating, rain and snow
Cost / Packaging	50 items/carton
Colors	Just as the tiles



### 3. VENTING ELEMENT

With its small constructive height, this profile is very convenient for ventilation of roofs performed with the flat Plano tiles, since the clearance between the first row tiles and the eaves is very small. It ensures the perfect protection against birds and animals, front side ventilation of the roof and is very convenient for assembly.

#### TECHNICAL FEATURES:

Materials	PP or PVC
Sizes	32 mm x 1 m
Stability	UV, freeze, heating, rain and snow
Cost / Packaging	100 items/carton
Colors	Just as the tiles

## ELEMENTS FOR VENTILATION ON THE RIDGES



### 1. RIDGE BATTEN SUPPORT

This is a supporting element for mounting the ridge beam which supports the roof ridge-tiles and the ventilation folio. It is characterized with high strength and stability to atmospheric conditions. Made by high-quality zinc coated steel and designed for strengthening and leveling the ridge beam and indirectly for reliable operation of the ridge ventilation since the ventilation /ridge/ folio lays on and anchors to the ridge beam.

#### TECHNICAL FEATURES:

Materials	Zinc coated steel
Sizes	40 mm; 50 mm; 180 mm; 210 mm;
Stability	Corrosion, UV, freeze, heating, rain and snow
Consumption/Packaging	1,5 item/m.l. 100 items/carton
Color	Grey zinc coated



### 2. ROLL STANDARD- RIDGE TAPE

The ventilation folio represents a one-layer universal self-adhesive band, which is used for ventilation through the roof ridges. This is a basic element from the roof ventilation. The designation is to let the humidity from the under-roof space through the ridge. The folio has been prepared by profiled aluminum sheet material, polypropylene sheet with end stripes from self-adhesive butylenes band. The band clays very good to the cleaned from dust and fats rough and smooth surfaces.

#### TECHNICAL FEATURES:

Materials	PP and aluminum
Sizes	310 mm x 5 m.
Stability	UV, freeze, heating, rain and snow
Cost / Packaging	4 rolls/carton
Colors	Just as the tiles



### 3. ROLL METAL ALU- RIDGE TAPE

The ventilation folio represents a one-layer universal self-adhesive band, which is used for ventilation through the roof ridges. This is a basic element from the roof ventilation. The designation is to let the humidity from the under-roof space through the ridge. The folio is prepared by a profiled aluminum sheet material in which one has made special ventilation ducts and end stripes from self adhesive butylenes band. The band clays very good to the cleaned from dust and fats rough and smooth surfaces. With this folio one works very neatly and achieves great durability.

#### TECHNICAL FEATURES:

Materials	Sheet aluminum
Sizes	300 mm x 5 m.
Stability	UV, freeze, heating, rain and snow
Cost / Packaging	4 rolls/carton
Colors	Just as the tiles



### 4. EAVES GRATE

This net is suitable accessory for protection of all ducts on the roof and the front side of the building against birds, animals, insects as in the meantime it ensures good circulation of the air in the points where it has been used.

#### TECHNICAL FEATURES:

Materials	PVC
Sizes	50 mm x 5 m'; 80 mm x 5 m'; 100 mm x 5 m'; 120 mm x 5 m'
Stability	UV, freeze, heating, rain and snow
Cost / Packaging	24 rolls/carton
Colors	red, brown, anthracite

## VENTILATING CHIMNEYS



### VENTING CHIMNEY TILES

This tile is with a foundation identical with the profile of every one of the tiles of Technocim – Plano, Breeze and Onda. It is supplied together with a bracelet for sealing, flexible connection Ø 100 mm and reducing element Ø 100/70 mm. The intention of this item is to ventilate the sewerage system of the building.

#### TECHNICAL FEATURES:

Materials	PVC
Sizes	33 x 42 cm
Stability	UV, freeze, heating, rain and snow
Consumption / Package	according to the project
Colors	Just as the tiles



## SNOW RETAINING ELEMENTS



### SNOW STOP- SNOW BARRIER

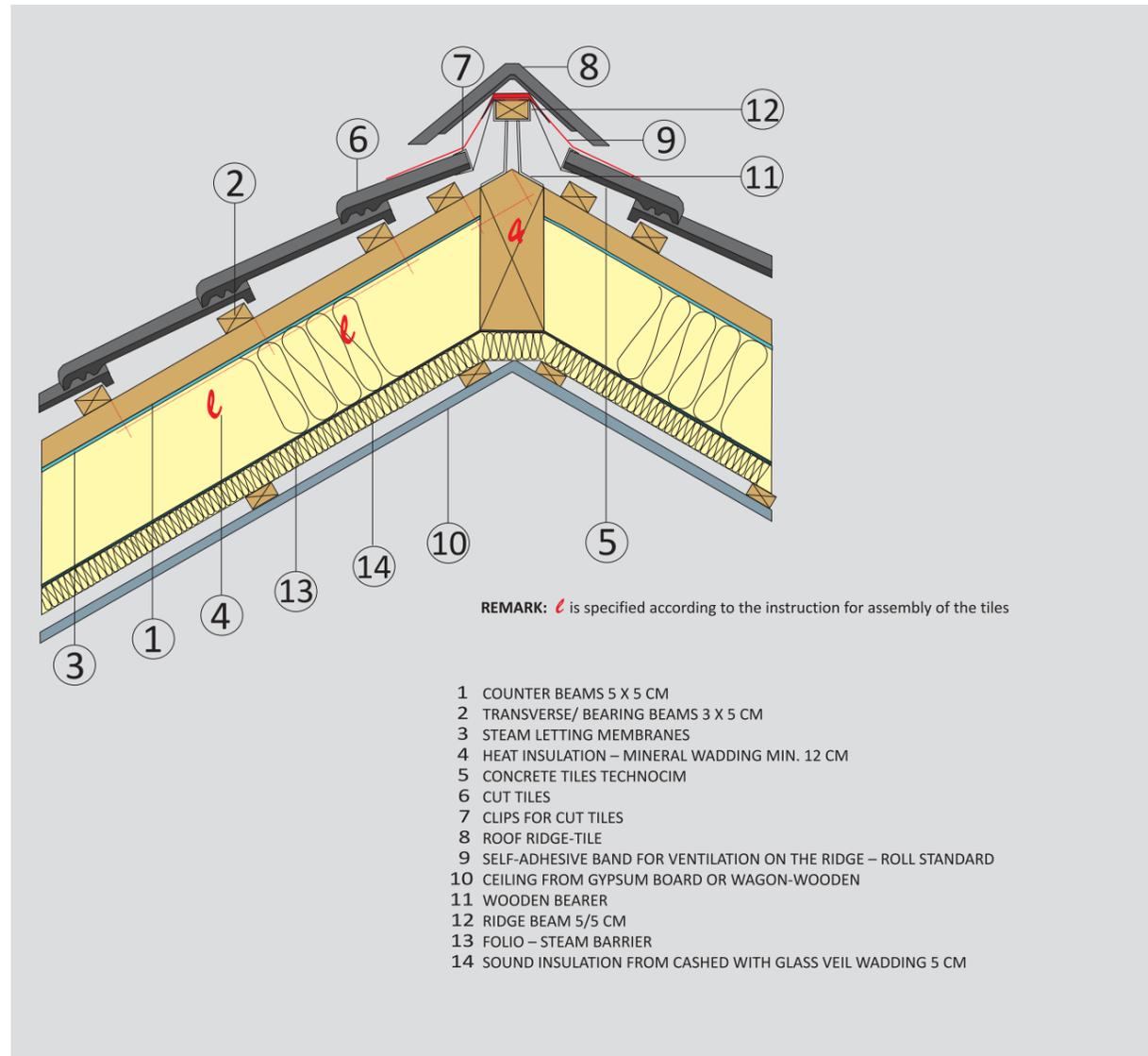
These are elements manufactured by galvanized steel or aluminum, covered with polyester paint in a color according to the laid tiles. They serve for protecting the drainage system and the passengers from falling snow and icy masses from the roof.

#### TECHNICAL FEATURES:

Materials	metal
Sizes	380 mm
Stability	UV, freeze, heating, rain and snow, corrosion
Consumption / Package	according to the scheme
Colors	Just as the tiles



## RIDGE



## SUPPORTING ELEMENTS

The name itself shows that here we shall talk about supporting elements, without which no single roof system could be made and therefore it is necessary that they should be specified equally with all other materials, belongings and accessories. With their assistance, the roofs are ensured against heavy and stormy winds. In order to keep the acquired way of presenting the materials in this section, too, we shall group them according to their place of use.

## SUPPORTING ELEMENTS FOR RIDGE

### 1. CLIPS FOR RIDGE FIXING

They serve for fixing the roof ridge-tile to the ridge beam. They are used with dry assembly of the roof ridge-tiles, which is more preferable than the wet one /sticking the roof ridge-tiles with lime and cement solution/. With the dry assembly the ventilation of the roof is without any troubles.

#### TECHNICAL FEATURES:

Materials	Aluminum, st. iron sheet
Sizes	140 x 20 mm.
Stability	UV, freeze, heating, rain and snow, corrosion
Cost / Packaging	2.25 items/ lin. m
Colors	Just as the tiles



### 2. NAIL WITH HAT

They serve for fixing all peripheral roof elements – end tiles, 3-way apexes, 4-way apexes, starting and ending hip roof ridge-tiles. Under the hat of the nail there is assembled a sealing from special rubber material, which doesn't age under the influence of the atmosphere conditions. This rubber disc ensures the water density of the roof elements which are nailed.

#### TECHNICAL FEATURES:

Materials	Steel with anticorrosive cover
Size	3,8 x 105 mm; 3,8 x 150 mm
Stability	UV, freeze, heating, rain and snow, corrosion
Cost / Packaging	3 items/ lin. m
Colors	Just as the tiles



## SUPPORTING ELEMENTS FOR ROOF VALLEY

### 1. CLIPS FOR ROOF VALLEY FIXING

They serve for fixing the roof valley to the slope.

#### TECHNICAL FEATURES:

Materials	Zinc coated iron sheet
Sizes	G-shaped with L=250 mm
Stability	UV, freeze, heating, rain and snow, corrosion
Cost / Packaging	5-8 items/m <sup>2</sup>
Colors	zinc





## 2. CLIPS FOR TILES FIXING

They serve as additional strengthening of the tiles in the places where one expects the extreme values of the wind.

### TECHNICAL FEATURES:

Materials	Zinc coated iron sheet
Sizes	G-shaped with L=250 mm
Stability	UV, freeze, heating, rain and snow, corrosion
Cost / Packaging	5-8 items/m2
Colors	zinc



## 3. CLIPS FOR CUTTED TILES FIXING

They serve as additional strengthening of the tiles in the places where one expects the extreme values of the wind.

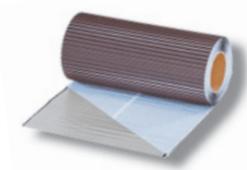
### TECHNICAL FEATURES:

Materials	Zinc coated iron sheet
Sizes	80 x 20 mm with spikes and wire /zinc coated/ with L=300 mm
Stability	UV, freeze, heating, rain and snow, corrosion
Cost / Packaging	2-3 items/m2
Colors	zinc

## ELEMENTS FOR CONGESTION

This category includes all elements securing the special insulation of the neighboring areas, which are meeting usually in two different planes. For example the connection between chimney and roof, roof valley, turbot and roof, roof windows and ridge, solar elements and ridge, tobacco boxes, hitches etc. At these places there are always some "sores" and one should take special and serious measures for ensuring the necessary water density.

## ELEMENTS FOR CONGESTION



## 1. FLEX STANDARD ALU- SELF-ADHESIVE ALUMINUM CHIMNEY TAPE

This very elastic material represents a band from high quality profiled aluminum, applied with adhesive butylenes layer. The front surface of the band is wavy. The self-adhesive band serves as sealant and for performance of water dense linings around chimneys, arches and roof /mansard/ windows.

### TECHNICAL FEATURES:

Materials	aluminum
Sizes	300 mm x 5 m
Stability	UV, freeze, heating, rain and snow, ageing
Cost / Packaging	1 roll/carton
Colors	Just as the tiles



## 2. FLEX 3D ALU- SELF-ADHESIVE ALUMINUM CHIMNEY TAPE

This type of self-adhesive sealing band is different from the previous one only by the front surface – made of 3D /three dimensional stamped ribs/ thanks to which the assembly is easier even at hard accessible places on the roof. Sealing and ensuring of water dense connections around chimneys, arches, garret windows, sun collectors etc. hatches and holes on the roof.

### TECHNICAL FEATURES:

Materials	aluminum
Sizes	300 mm x 5 m
Stability	UV, freeze, heating, rain and snow, ageing
Cost / Packaging	1 roll/carton
Colors	Just as the tiles



## 3. FLEX LINE- CHIMNEY STRIP

The rail is manufactured by high quality sheet aluminum, profiled in specialized form with the purpose of making the assembly around the chimneys easier. It is mounted when forming the upper edge of the sealing self-adhesive bands around chimneys and arches. The rails guarantee water density of the connection and give finished and esthetic look to the roof.

### TECHNICAL FEATURES:

Materials	aluminum
Sizes	60 x 2 000 mm
Stability	UV, freeze, heating, rain and snow, ageing
Cost / Packaging	20 items /carton
Colors	Just as the tiles



## 4. AIR FLEX- ROOF RIDGE VENTILATOR

This is an element, which performs the role of ridge deflector /ventilation/ and ridge sealant. It protects the roof from snow, rain, humidity and dust entering through the ridge.

### TECHNICAL FEATURES:

Materials	PP; PVC
Sizes	75 mm x 1,000 mm
Stability	UV, freeze, heating, rain and snow
Cost / Packaging	20 items /carton
Colors	Just as the tiles



## 5. ROOF VALLEY PROFILE

It performs and seals the connection /the lowest part/ between two slopes. The roof valley could be stamped vertically and horizontally. When one uses horizontally stamped/ribbed/ roof valley, which has big strength, one may not perform dense beam lining under it. For roof valley one could use also zinc coated sheet iron.

### TECHNICAL FEATURES:

Materials	Aluminum – sheet; zinc coated sheet iron
Size	500 x 2,000 mm; 600 x 2,000 mm
Stability	UV, freeze, heating, rain and snow, corrosion
Consumption / Package	according to the project
Colors	Just as the tiles



## 6. BAND FOR SEALING THE ROOF VALLEY

It seals the connections of the roof valley with the roof slopes. It protects from intrusion of dust, leaves, humidity or water under the tiles in case of overflowing the roof valley.

### TECHNICAL FEATURES:

Materials	Polyurethane foam with self-adhesive band
Sizes	1,000 mm
Stability	UV, freeze, heating, rain and snow
Cost / Packaging	4 - 5 items/roof valley
Colors	Just as the tiles



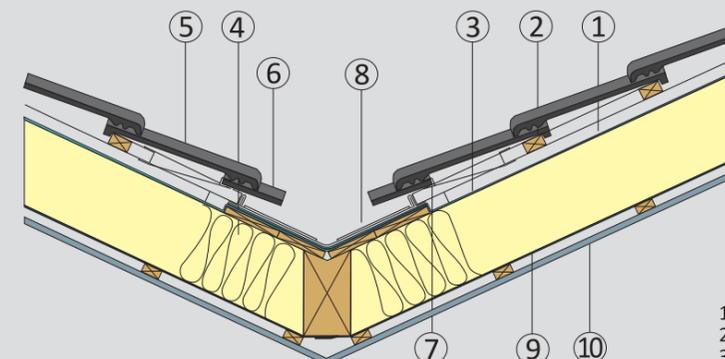
## 7. GUTTER FLASHING

The gutter flashing is used in order to protect the eaves from entry of rain and snow in the under-roof space and also in order to guide the water, reached the first row of tiles, directly to the gutter, respectively to the drainage system.

### TECHNICAL FEATURES:

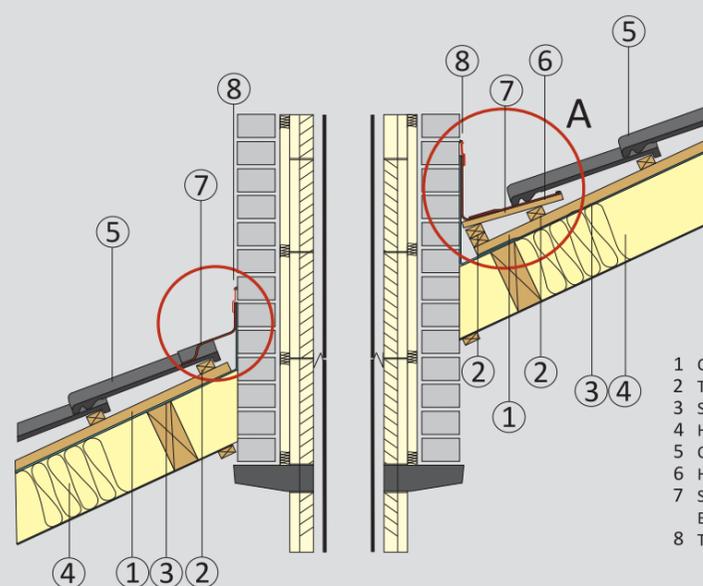
Materials	Aluminum, st. iron sheet
Sizes	175 x 2,000 mm
Stability	UV, freeze, heating, rain and snow, corrosion
Consumption / Package	according to the project
Colors	Just as the tiles

## ROOF VALLEY



- 1 COUNTER BEAMS 5 x 5 cm
- 2 TRANSVERSE /BEARING BEAMS 3 x 5 cm
- 3 STEAM LETTING MEMBRANE
- 4 HEAT INSULATION – MINERAL WADDING MIN. 12 cm
- 5 CONCRETE TILES TECHNOCIM
- 6 CUT TILES
- 7 CLIPS FOR CUT TILES
- 8 PROFILE ROOF VALLEY
- 9 STEAM BARRIER – FOLIO
- 10 CEILING OF GYPSUM BOARD OR WAGON-WOODEN

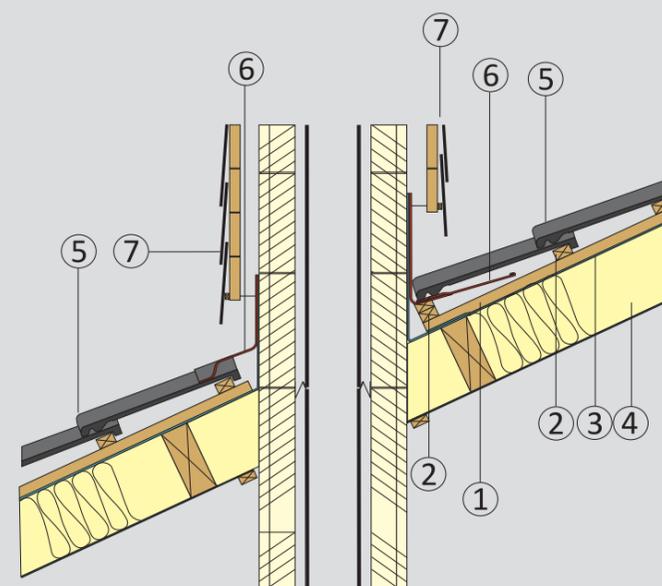
## LINING AROUND A CHIMNEY



- 1 COUNTER BEAMS 5 x 5 cm
- 2 TRANSVERSE /BEARING BEAMS
- 3 STEAM LETTING MEMBRANE
- 4 HEAT INSULATION
- 5 CONCRETE TILES TECHNOCIM
- 6 HYDROPHOBIC PLYWOOD OR ALUMINUM SHEET IRON
- 7 SELF-ADHESIVE ALUMINUM WAVY RELIEF BAND **FLEX STANDARD ALURAIL** FROM SHEET IRON FOR ENDING
- 8 THE LINING

**A REMARK:**  
DETAIL **A** COULD BE FORMED AS SHOWN "AS ROOF VALLEY", BUT IT COULD BE FORMED WHEN THE TILE CONTACTS THE WALL AND THE SELF-ADHESIVE BAND LAYS UNDER THE SECOND TO LAST TILE.

## LINING AROUND WALLS



- 1 COUNTER BEAMS 5 x 5 cm
- 2 TRANSVERSE /BEARING BEAMS
- 3 STEAM LETTING MEMBRANE
- 4 HEAT INSULATION
- 5 CONCRETE TILES TECHNOCIM
- 6 SELF-ADHESIVE ALUMINUM WAVY RELIEF BAND **FLEX STANDARD ALU**
- 7 SUSPENDED FRONT SIDE OR VERTICAL WALL – ROOF MADE OF FLAT TILES **PLANO**

## DRAINAGE ELEMENTS

The drainage elements for single slope roof are too many and too various. Also various are the functions of every single element, and in the meantime one would like to achieve one basic purpose – the quick and safe drainage of the water from the roof to the street gutter system.

From the other part the assembly of these elements requires labor force with more different qualification than the purely construction one. Therefore, in this section we should talk about drainage system, which suggests performance of specialized and good qualified assembly group.

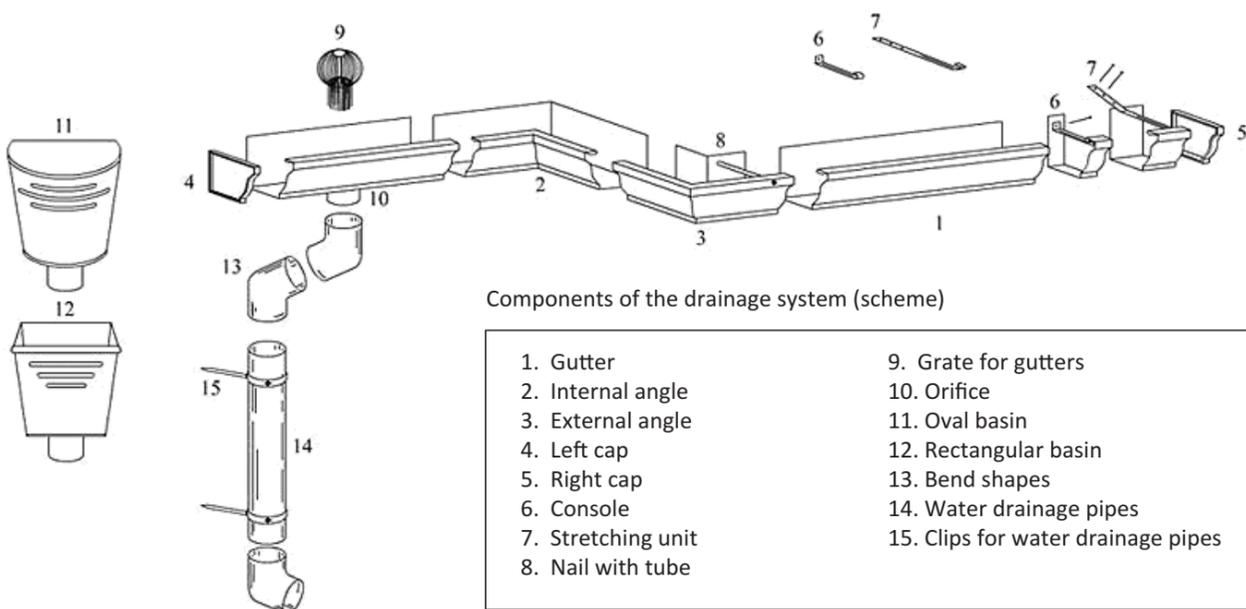
**Technocim**, offering a complete solution for the roofs, examines as eminent and mandatory precondition the performance of the drainage system for every single sloped roof.

In this section we should not stop in details at all types of drainage systems, since we offer one, proven with its qualities system - a system with seamless gutters.

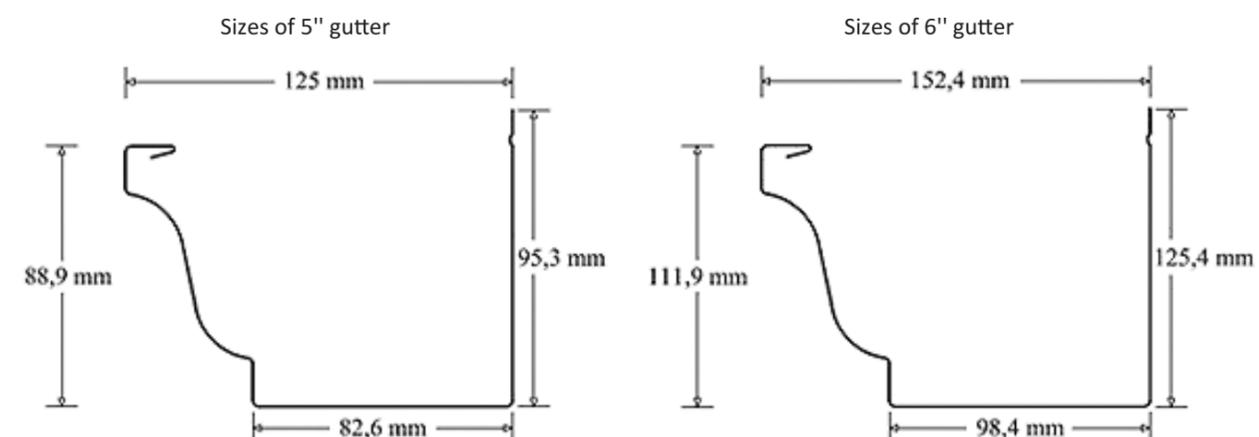
### Advantages:

- unlimited length of the various sections of the gutters
- unique system of hanging/ with internal hidden clips/ of the gutters
- very safe and reliable connection gutter-gutter flashing
- the gutters are made of entire units /without connections/, which allows placing them with a minimum admissible slopes (0,5 %). The water drains with a normal speed and without any obstacles. The risk of corrosion with the presence of links is a minimal one.
- trapezium shaped gutters, which ensures perfect drainage and good self-cleaning speed of the water. This untraditional shape of the gutters gives to the building stylish and finished look
- quick and easy assembly
- rich scope of materials and colors:
  - zinc coated sheet iron
  - sheet iron with colorful polyester cover
  - zinc coated iron sheet
  - copper iron sheet

The drainage system, which is worked out with various types of iron sheets, has a longer life than the PVC systems that have emerged on our market. Regardless of the different additives and plasticizers, the plastic drainage systems still cannot fight the ageing.

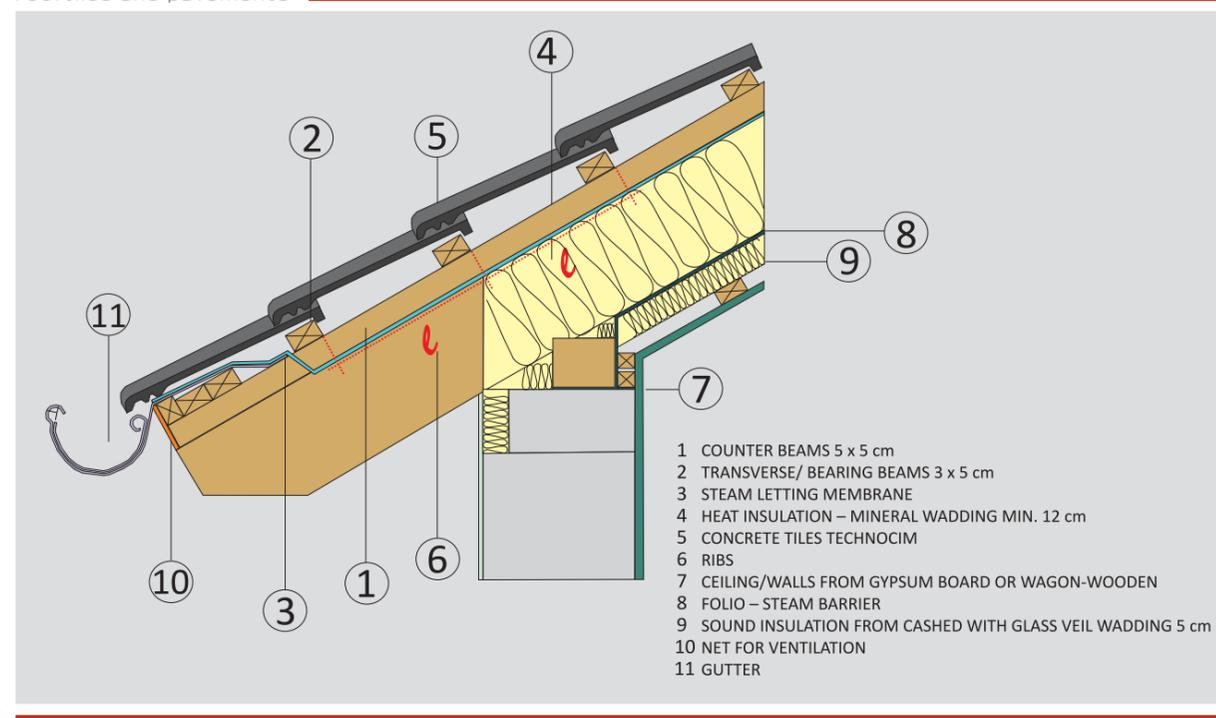


Profile, section and dimensions of the gutter



## TECHNOCIM GUTTER

rooftiles and pavements



# INSTRUCTIONS FOR INSTALLATION

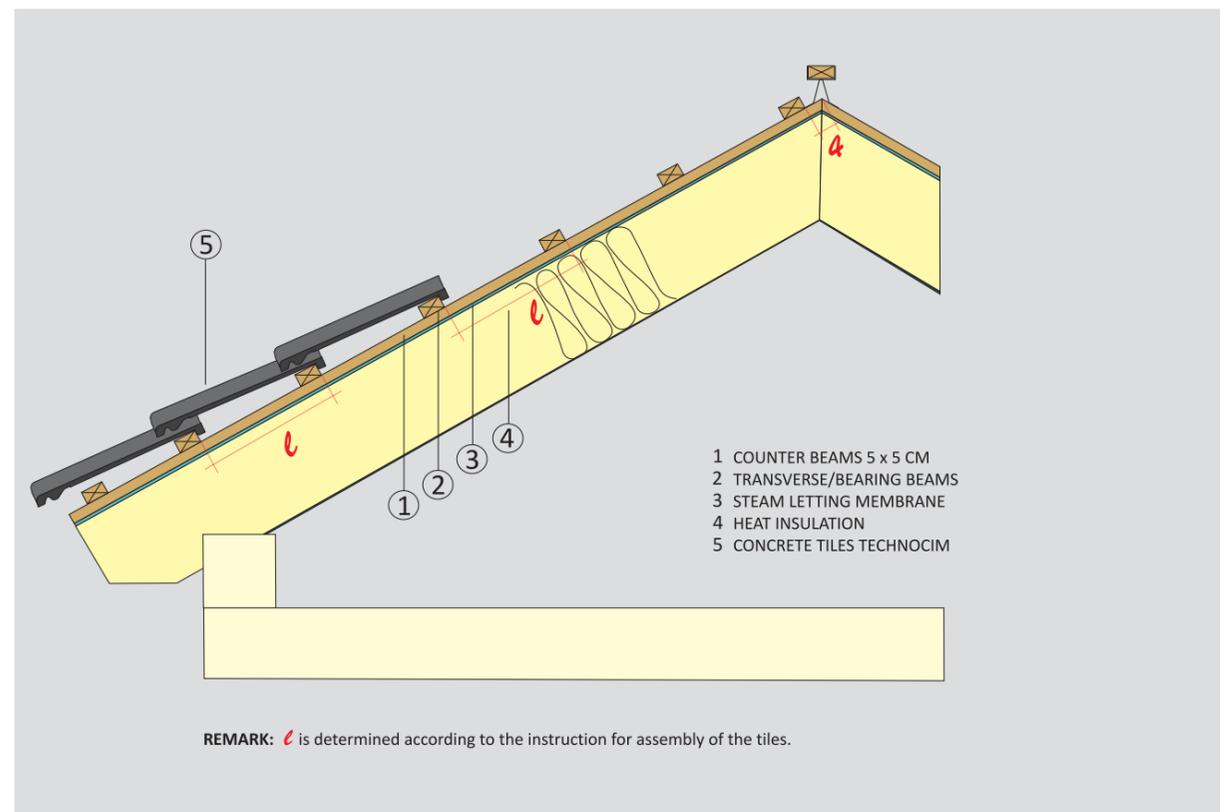
## INSTRUCTION FOR ASSEMBLY OF THE TECHNOCIM TILES

The **Technocim** tiles and in particular the models: **PLANO**, **BREEZE** and **ONDA** are laid depending on the construction and details of the roof on a beam lining or on a grate from counter beams and beams. The cross section of the counter beams is 5 x 5 cm and of the beams is 3 x 5 cm. With the variant with plank lining one should nail on it the grate from the counter beams and the beams, which carry the tiles and when there is no plank lining – the counter beams lay directly on the ribs, whose size is 10 x 12 cm.

The modern slope roofs are obligatory made with steam letting three layered folio, which protects the heating insulation /if any/ and the entire under-roof space from the harmful influence of the humidity. It could enter both from the internal part of the building to the roof and through the roof to the rooms, located in the under-roof room. The steam letting folio is clamped to the ribs by means of counter beams which are nailed along the ribs. The nails, with which one nails the counter beams and the steam letting folio, doesn't break its surface, since the modern steam letting folio have the capacity to "vulcanize" themselves around the nail hole, going through them. Transversely to the counter beams and parallel to the ridge at varying distances the beams, which support the tiles, are nailed.

The beams are nailed at distances from 28,5 to 31,5 cm. /measured from the upper edge to the lower edge of the beams/ depending on the slope of the roof.

### TECHNOCIM DISTRIBUTION OF THE BEAMS



### ASSEMBLY OF BREEZE AND ONDA TILES

For a slope of the roof up to 30° and with the use of end left and end right tiles / with a two-layered roof/ the distance is 30,5 – 31,5 cm and the overlapping of the tiles is maximum 10 cm. In this case one should foresee 11 tiles per m<sup>2</sup>. With this slope and without use of end tiles, the distance between the planks could be also 31,5-33 cm and the consumption is 10 items/m<sup>2</sup>.

For slopes of roofs bigger than 30° the distance between the planks is 33-34 cm. In these cases 10 items tiles per m<sup>2</sup> are foreseen. When using end left and right tiles and with slopes of more than 30° the distance could be 30,5 – 31,5 cm as the overlapping is maximum 10 cm.

### ASSEMBLY OF PLANO FLAT TILES

With four layered roof with slope of up to 30° /when there are no necessary end tiles/, the distance between the planks should be 28,5 cm, so that the tiles could lay on their feet. In this case the overlapping is 10 cm and the consumption is 11 items/m<sup>2</sup>. For a slope of the roof up to 30° and with the use of end left and end right tiles / with a two-layered roof/ the distance is 30,5 – 31,5 cm. In this case one should foresee 11 tiles per m<sup>2</sup>.

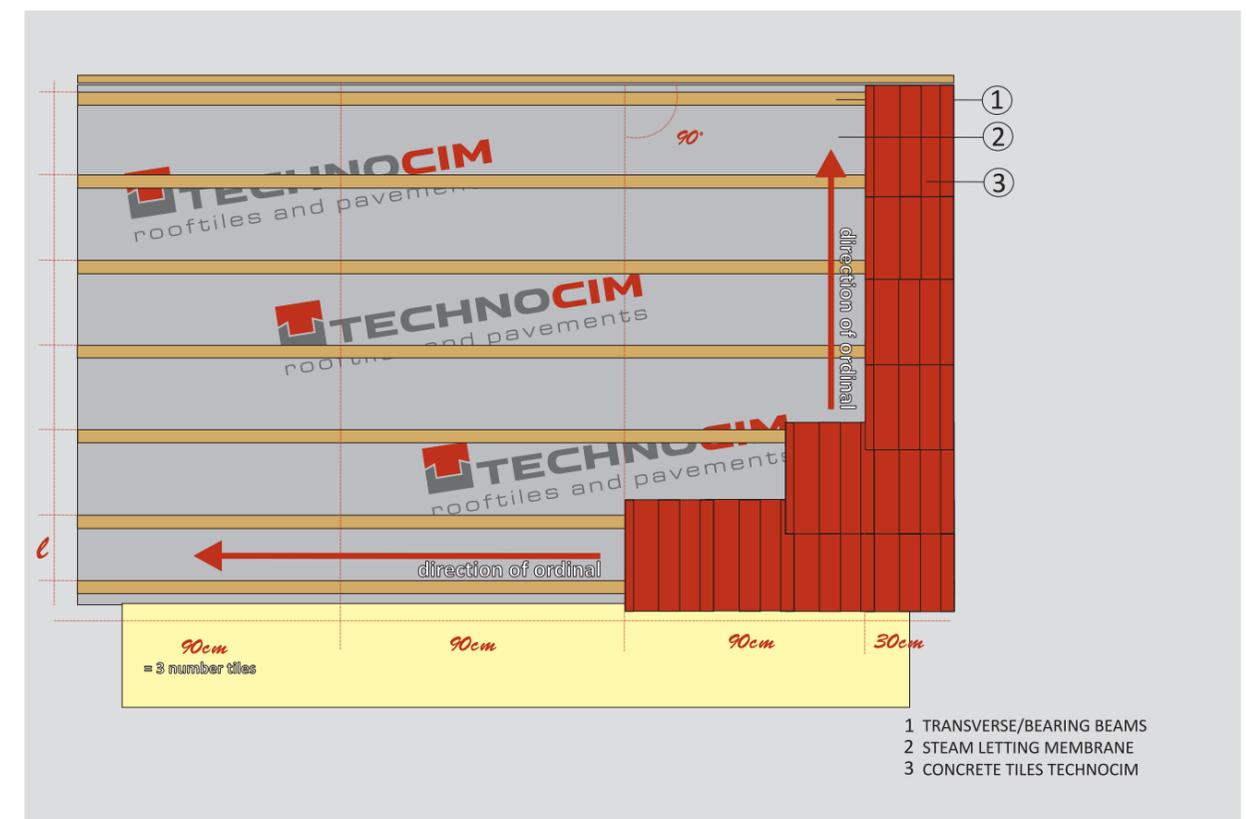
When using ending left and right tiles and with a slope of the roof more than 30°, the distance could be 30,5 - 31,5 cm. /the overlapping is maximum 10 cm/, but in this case the flat tiles doesn't lay on their feet. The consumption is 11 items/m<sup>2</sup>.

**Without using end tiles the recommended distance between the beams is 28,5 cm. The consumption is 11 item/m<sup>2</sup> and the tiles lay on their feet. Thanks to the feet for hanging the tiles are placed very safe and easy to the bearing beams.**

The right distribution of the beams is a very important operation and it should be done precisely on site immediately prior to starting the assembly of the tiles! When distributing the beams on the area of the roof it is mandatory to mark the right 90° angle against the eaves, so that one could have correctly placed and esthetic tiles.

The placement of tiles is done from right to left and from the eaves to the ridge!

### TECHNOCIM DISTRIBUTION OF THE BEAMS AND DIRECTION OF ROWS



# INSTRUCTIONS FOR CALCULATION

One should pay attention - the channels for overlapping the tiles should pass with each other!  
The tiles and the complex genuine accessories participating in the system are combined in order to achieve a precise, safe and quick mounting.

**Don't forget:** The peripheral areas /sides, eaves and ridges/ should always mandatorily be secured against storms with special nails, screws and clips at the provided for such purposes sites.

## ASSEMBLY OF DRAINAGE SYSTEM

The assembly of the drainage system runs through several continuous stages.

### 1. Assembly of water collecting basins

The places of the basins are predetermined in the design. Their places are marked. After cutting the sides of the water collecting basins according to pattern they are mounted with nails or screws at 2-3 cm lower than the upper edge of the frond beam. So one ensures the necessary longitudinal slope of the gutter.

### 2. Ensuring longitudinal slopes and fixation of the gutters

The assembly of the gutters starts from the water collection basins. Mandatorily one should ensure minimum 5 cm free flowing of the gutter into the basin. In this way, we have decided the issue with the linear temperature extensions. The gutter is fixed with nails after taking care for a slope from 0,5 to 1,0%. Where it is necessary that one should perform plugging /in the beginning of the gutter/ one mounts plugs, as the inner part of the assembly is sealed with silicon.

### 3. Assembly of the gutter flashing

The assembly of the flashing starts from the basin to the highest point of the gutter as preliminary one has made cuts for the edges of the basin. The fixing of the flashing is done with nails in the upper part at distances of 40—50 cm as one follows the maximum dense passing to the front beam in its lower part. A mandatory condition is that the flashing should enter at least at 3 cm in the gutter. One should ensure overlapping from 4 – 5 cm between the different parts of the flashing. If the flashing is bordering a wall, one makes 2 cm vertical bending to the upper side.

### 4. Assembly of the gutter clips /spanners and consoles/

The distance between the clips should be no more than 60 cm. When one assembles the clips it is necessary to place a spanner and a console. In this way one ensures maximum stability of the gutter in horizontally and vertically position.

### 5. Forming of internal and external angles

For forming the angles the most easy way is to work on pattern. On it one should cut two meeting each other sections of the gutter. The fixing of the two parts is done with pop nits and all edges are insulated with silicone. The overlapping of two neighboring parts should be in the direction of the drainage of the water.

### 6. Water drainage pipes

The assembly starts from the water collection basins, as the plug of the basin enters into the water drainage pipe or in a bending unit, if there is need of such an element. The water drainage pipes are mounted vertically with mandatorily use of plummet. The plummet is hanged for the first clip which is usually at 10 cm from the lower bending unit in the beginning of the water drainage pipe. After stretching the plummet at distances of 1,5 m one mounts the other clips, which shall bear the pipes.

The overlapping /muffs/ between the separate pipes should be at about 5 cm. The fixing between the separate elements /plugs, bending units, pipes etc/ is done with pop nits or rapids at three places /side and front/. The edges of the water drainage pipes are placed to the wall and if necessary a horizontal section – the edges are upwards.

## INSTRUCTIONS FOR SPECIFICATION OF THE NECESSARY MATERIALS, ACCESSORIES, BELONGINGS AND ELEMENTS WHEN PERFORMING A ROOF SYSTEM

### 1. STARTING DATA

For starting the work on preparing the quantitative account for a particular site, the first and mandatory condition is that we receive technical or working plans including: situation, plan of the roof, cuttings of transverse and longitudinal sections and front sides. When one shall make only overlapping of an existing roof, often there are no drawings. In this case, it is necessary to make snap shots of this roof as well as all necessary measures should be put on sketches.

To the necessary output data one should include the specific requirements of the project or the customer regarding: the type of the tiles, the way of placement, their color, the presence of heating insulation and type of materials from which it is made.

### 2. SPECIFICATION OF THE NUMBER OF THE NECESSARY TILES

The first and most important operation is to determine the reducing ration for horizontal projection of the sloped part of the roof /slope/. Usually in the architectural designs of the plan of the roof it is specified what is the slope of the roof 1:2, 1:1 etc or 18°, 45° etc. With the help of trigonometric functions tg and cos we determine the reducing ratio.

**Example 1:** The slope of the roof is 18°. This means that the angle with the eaves is 18°.

On the drawings mandatorily there are shown the length of the horizontal projection of the slope and the height of the roof with the ridge, one must know the length of the slope. We know the angle  $\beta=18^\circ$  according to the formula:

$$X = \text{horizontal projection: } \cos 18^\circ,$$

i.e. the length of the slope is equal to the result of the division of the horizontal projection to  $\cos 18^\circ$  / in this case – 0,9511/. We have reduced the length of the horizontal projection, in order to receive the actual length of the slope, which shall be necessary for the following pure geometrical calculations.

**Example 2:** One has the slope of the roof 1:2. This means that the angle with the eave shall be found by the tg function  $\text{tg } \beta = 0.500$ , which from the tables of the trigonometric functions is equal to an angle  $\beta$  with the eaves =  $26^\circ 40'$ , so we could accept  $27^\circ$ .

After determining the angle according to the known formula we could calculate the length of the sloped part of the roof /slope/ as we know that  $\cos 27^\circ = 0.8910$  :

$$X = \text{horizontal projection: } \cos 27^\circ$$

When there are no architectural drawings as result of the shooting the existing roof with the help of trigonometric functions one should calculate the slope of the roof so that one could perform all above cited operations.

The next operation is to divide the plan of the roof to possible lowest number and possibly simplest geometrical figures, which areas we should search for. Of course the number of the figures depends on the complexity of the roof /roof lines/. In order to prevent errors when calculating the areas it is recommended when dividing the roof at geometrical figures, the latter to be numbered. In this way one prevents errors or dubbing the areas.

For the more complex roofs the calculations could be a quantity document, since the calculation shall be made with deduction of some holes /windows, chimneys, ventilation collectors etc./.

$$F \text{ total} = \sum f_1 + f_2 + f_3 + \dots + f_n \quad \{m^2\}$$

Calculated in this way the area of the roof gives us the possibility immediately to determine the necessary number of tiles, as it is recommended to consider the number of the tiles in a pallet. All these calculations are made with the precondition that we have specified together with the customer preliminary what type and color should be the tiles. Our experience shows that the rounding of the number of tiles to a whole pallet is always the best possible solution. It is better for the customer and for us that on site there should be some tiles remaining than to have a shortage of tiles.

- **Necessary number of tiles = F total x 11 items/m<sup>2</sup> {items} for tiles PLANO.**
- **Necessary number of tiles = F total x 10/11 items/m<sup>2</sup> {items} for tiles BREEZE or ONDA depending on type of the roof /two-layered or four-layered/.**

### 3. SPECIFICATION OF THE NUMBER OF ACCESSORIES FOR THE RIDGE

#### 3.1. Roof ridge-tiles

On every single plan of roof there are marked the roof lines which show the places and the lengths of the ridges and the roof valleys. They specify the type of the roof – two-layered, four layered or combined.

From the plan of the roof we deduct the lengths of the ridges which are specified, when not coted, according to the known geometrical formulas. We must underpin that when the ridges are sloped one should take into consideration the reducing ratio. The number of roof ridge-tiles is specified from the consumption 2,7 items/ m´ according to the formula:

$$\text{Necessary number of roof ridge-tiles} = L / \text{length of ridge in m} / \times 2,7 \text{ items} / \text{m} \{ \text{items} \}$$

#### 3.2. Starting /ending/ hip roof ridge-tiles

From the plan of the roof where there are shown the ridges and from the cuttings one determines the necessary numbers of starting and ending hip roof ridge-tiles. Depending on the type and complexity of the roofs one could have no need of ending hip roof ridge-tiles. Therefore it is very important to take a look at the sections. Principally every ridge should start with a starting hip roof ridge-tile and should end with an ending hip roof ridge-tile.

The roof system is made with three types of tiles. For these types of tiles one manufactures the corresponding types of roof ridge-tiles, in accordance with the sizes and the peculiarities of the tiles. For the **PLANO** flat tiles one has made and manufactures only one type **PLANO ending/starting hip roof ridge-tiles**. For the **BREEZE** and **ONDA** tiles one manufactures the following types of roof ridge-tiles:

- **Ending hip roof ridge-tile with small bottom** – one uses it with the two-layered roofs
- **Ending hip roof ridge-tile with large bottom** – one uses it with the two-layered roofs
- **Starting hip roof ridge-tile** – one uses it with the four-layered roofs

#### 3.3. Roof ridge-tiles for 3-way apexes and 4-way apexes

Parallel with the specification of the starting and ending hip roof ridge-tiles one determines also the need of roof ridge-tiles for 3-way apexes and 4-way apexes. Judging from their names, one could conclude that they are mounted where there are connected three or four ridges. 3-way apexes and 4-way apexes are made in the factory only for the Breeze and Onda tiles. For the flat tiles Plano the 3-way apexes and 4-way apexes are designed and cut on site, as the sticking of the separate components is done with teracol.

Therefore when we need such elements, we should foresee for every 3-way apex roof ridge-tile three single roof ridge-tile and for every 4-way apex four roof ridge-tiles in addition with regard to the specified in item 3.2, which is reflect in the offer, too.

### 4. DETERMINATION OF THE NUMBER OF THE HALF TILES

Depending on the project for placement of the tiles or the wish of the customer it is necessary to use half tiles. The purpose of manufacturing these elements is to reduce to minimum the waste of entire tiles and to achieve an esthetic effect when placement them. When one knows from the project or from the customer, that the tiles should be placed in a checkmate order, e.g. with displaced joints, it is then clear that mandatorily one should foresee a specific quantity of half tiles. The necessary quantity is determined in the following way:

- One calculates the number of rows for every slope.
- According to the complexity of the roof one specifies the consumption ratio – usually one foresees 2 to 3 numbers of half tiles per row.
- The total amount is calculated according to the formula:

$$\text{Necessary number of half tiles} = \text{number of rows} \times 2-3 \text{ items/row} \{ \text{items} \}$$

### 5. SPECIFICATION OF THE NUMBER OF ENDING /SIDE/ ACCESSORIES

The placement of tiles is done from right to left and from the eaves to the ridge. The rows start and end with the side tiles or with other words – the rows start with right ending and end with left ending tiles.

The necessary number of tiles is determined with a consumption ratio of 3 items / lin. m. From the design of the roof one deducts the lengths of the slopes, reduces them according to the slope /item 2/ and the quantity of the side tiles is:

$$\text{Necessary number of ending right/left} = L / \text{length of slope in m} / \times 3 \text{ items/m} \{ \text{items} \}$$

## 6. SPECIFICATION OF THE QUANTITIES OF THE NECESSARY ACCESSORIES AND ELEMENTS

### 6.1. Ventilation of the roof

One performs this by means of several and various types of elements:

- **A safety grate against birds – 60 x 1000 mm**
- **Ventilating safety grate against birds – combined element – 85 x 1000 mm**
- **Ventilating profile – 32 x 1000 mm**

The common between these elements is that they ensure good front side ventilation of the roof construction and protect from the intrusion of birds and animals through the eaves. When using Plano flat tiles the best way is to apply the ventilating profile 32 x 1000 mm and with the presence of Breeze or Onda tiles one could use the three types of elements but the best is the combined element.

The necessary quantity is calculated on grounds of the total length of the roof eaves. Naturally the length of the eaves is calculated on grounds of the "Plan of the roof". The formula is:

$$\text{Necessary number of ventilating element} = L / \text{length of eaves in m} / \times 1 \text{ items} / \text{m} \{ \text{items} \}$$

- **Net for ventilation with sizes: 50; 80; 100 and 120 x 5000 mm**

The net could be used in combination with several of the upper elements and could be used independently for protection of all ventilation ducts of the roof from birds and animals. The necessary amount is calculated according to the formula:

$$\text{Necessary numbers of ventilating net} = L / \text{length of the eaves in m} / : 5 \text{ m} \{ \text{items} \}$$

- **Venting tile**

With this item one leads the gasses from the ventilation of the building sewerage system, wet rooms, kitchens and bathrooms. The necessary amount is specified from the presence of ventilation pipes and collectors going through the roof, which is determined straight from the plans.

### 6.2. Accessories and elements for ridge

On grounds of the calculations we have made for the lengths of the ridges /horizontal and sloped/, we determine the necessary amount of elements for ridge, as follows:

- **Roll Standard**  
Universal self-adhesive band with aluminum cover and textile ground for ventilation on ridges with sizes 310 x 5000 mm
- **Roll Metal**  
Universal self adhesive band with aluminum cover and metal ground with ventilation ducts for ventilation on ridges with sizes 310 x 5000 mm

$$\text{Necessary numbers of band} = L / \text{length of the ridge in m} / : 5 \text{ m} \{ \text{items} \}$$

- **Air Flex**

Plastic element for dry assembly of roof ridge-tiles with sizes 75 x 1000 mm

$$\text{Necessary numbers of element} = L / \text{length of the ridge in m} / : 1 \text{ m} \{ \text{items} \}$$

- **Beam holders**

The necessary number of the beam holders is determined with a consumption ratio of 1.5 items / lin. m. The formula is:

$$\text{Necessary number of beam holders} = L / \text{length of ridge in m} / \times 1.5 \text{ items/m} \{ \text{items} \}$$

### 6.3. Accessories and elements for safety and strengthening the roof

- **Snow retaining elements**

In Bulgaria there are two clearly distinctive areas of snow loading:

- Area I – up to 90 kg/m<sup>2</sup>
- Area II – up to 150 kg/m<sup>2</sup>

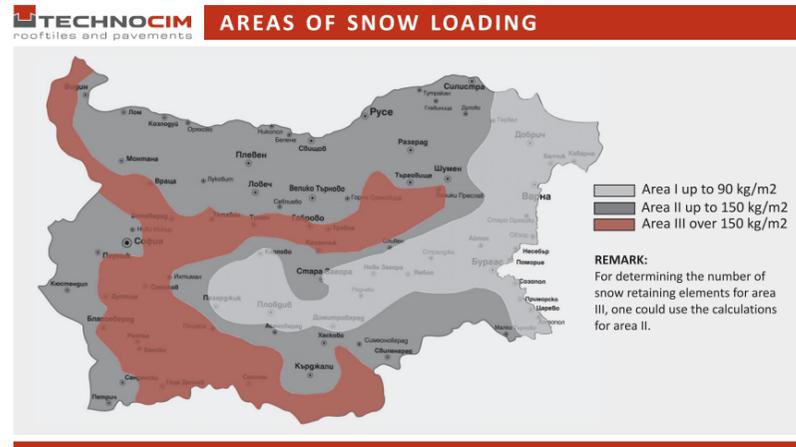
Specification of the necessary numbers of snow retaining elements is made depending on the normative area of snow loading and from the slope of the roof

The first step is specifying the number of rows, on which according to the scheme one shall mount the snow retaining elements.

This is done on grounds of the plan of the roof as the length of the slope is reduced in the well known way /item 2/. The counting of rows starts from the lower one /with eaves/ row. This is row number 1.

**As a rule on the first row tiles there are no snow retaining elements are not mounted!**

There are possible several cases of placement of elements, which are function of the areas of loading from snow and the grade of slope.

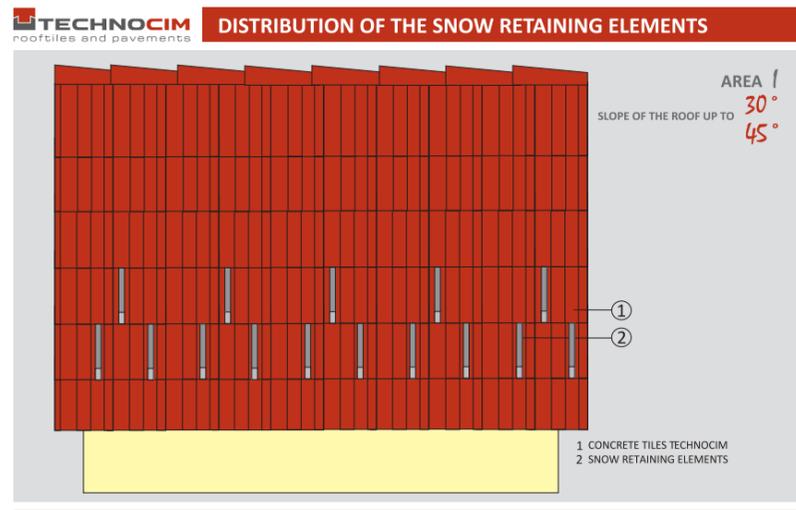


**Case number 1 – Area I and the grade of the slope of roof is up to 30°**

On the second row the direction of the ridge, one mounts one element for every tile.  
On the third row there are mounted – through a tile, i.e. their total number for this row is with 1/3 less than the calculated for the second row.

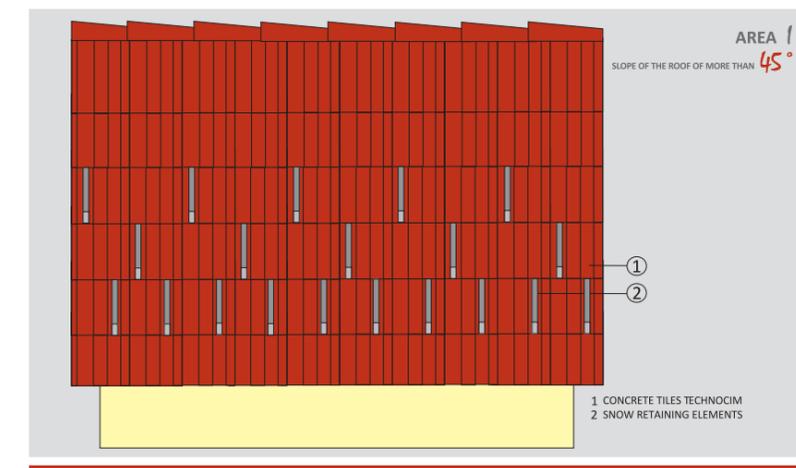
**Case number 2 – Area I and the grade of the slope of roof is up to 45°**

On the second row the direction of the ridge, one mounts one element for every tile.  
On the third row there are mounted – through a tile, i.e. their total number for this row is with 1/3 less than the calculated for the second row.



**Case number 3 – Area I and the grade of the slope of roof is more than 45°**

On the second row the direction of the ridge, one mounts one element for every tile.  
On the third row they are mounted through a tile, i.e. their total number for this row is with 1/3 less than the calculated for the second row.  
On the fourth row one mounts through tile according to the third row /in order to have a checkmate position/.

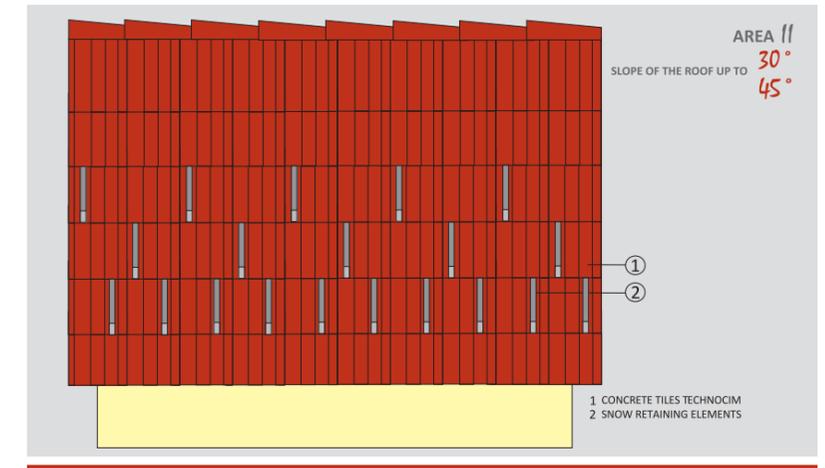


**Case number 4 – Area II and the grade of the slope of roof is up to 30°**

On the second row the direction of the ridge, one mounts one element for every tile.  
On the third row they are mounted – through a tile, i.e. their total number for this row is with 1/3 less than the calculated for the second row.  
On the fourth row one mounts through tile according to the third row /in order to have a checkmate position/.

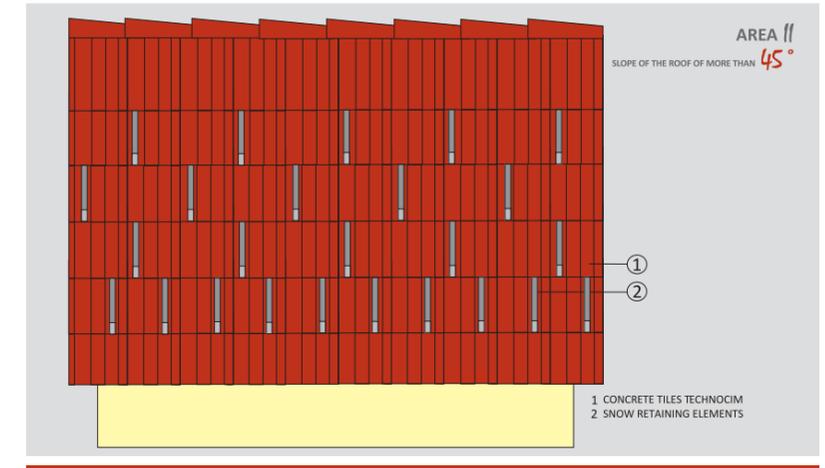
**Case number 5 – Area II and the grade of the slope of roof is up to 45°**

On the second row the direction of the ridge, one mounts one element for every tile.  
On the third row they are mounted – through a tile, i.e. their total number for this row is with 1/3 less than the calculated for the second row.  
On the fourth row one mounts through tile according to the third row /in order to have a checkmate position/.



**Case number 6 – Area II and the grade of the slope of roof is more than 45°**

On the second row the direction of the ridge, one mounts one element for every tile.  
On the third row they are mounted – through a tile, i.e. their total number for this row is with 1/3 less than the calculated for the second row.  
On the fourth row one mounts through tile according to the third row /in order to have a checkmate position/.  
On the fifth row they are mounted through a tile /again checkmate style/, according to the fourth row.



After we have determined the number of rows, on which we are going to mount snow retaining elements, we determine in an easy way the number of these elements as we know that in one linear meter are mounted 3 tiles. Every row has a specified length and it is made from the drawings of the plan and the sections of the roof. The necessary number snow retaining elements for the second row are specified on the formula:

$$\text{Necessary number of snow retaining elements} = L / \text{length of row in m} / \times 3 \text{ items/m} \{ \text{items} \}$$

The necessary number snow retaining elements for every next row are specified on the formula:

$$\text{Necessary number of snow retaining elements} = L / \text{length of row in m} / \times 2 \text{ items/m} \{ \text{items} \}$$

**Remark:** In the mountain and the highly mounting areas in Bulgaria is possible to have snow falls, which could lead to snow loads bigger than 150 kg/m². In these case the number of the snow retaining elements is determined according to the formula:

$$\text{Necessary number of snow retaining elements} = F / \text{area of the roof in m}^2 / \times \{ 1,3 - 1,8 \text{ items/m}^2 \}$$

This means that on every 8th or 6th tile one should mount a snow retaining element according to the known checkmate scheme.

#### ■ Roof ridge-tiles clips

From the name it is clear that the design is strengthening of the ridge against extreme winds and storms. Quantity is specified according to the formula:

$$\text{Necessary number of roof ridge-tiles clips} = L / \text{length of ridge in m} / \times 2.25 \text{ items/m} \{ \text{items} \}$$

#### ■ Clips for fixing the tiles

They serve for strengthening the roof against extreme winds and storms. The quantity is specified according to the formula:

$$\text{Necessary number of clips for tiles} = F / \text{area of the roof in m}^2 / \times 5-8 \text{ items/m}^2 \{ \text{items} \}$$

#### ■ Clips for fixing the cut tiles

They serve for strengthening the roof against extreme winds and storms. The quantity is specified according to the formula:

$$\text{Necessary number of clips for cut tiles} = F / \text{area of the roof in m}^2 / \times 2-3 \text{ items/m}^2 \{ \text{items} \}$$

### 6.4. Roof valleys

#### ■ Profile for roof valleys

Thin sheet profile which protects the roof from intrusion of water through the roof valley. The profiles are with length of 2000 mm and width of 600 mm. They are colored in the color of the corresponding tiles – red, brown or anthracite. The lengths of the roof valleys are calculated from the design with the plan of the roof.

$$\text{Necessary numbers of roof valleys} = L / \text{length of the roof valley in m} / : 2 \text{ m} / \text{unit} \{ \text{items} \}$$

### 6.5. Roof linings

#### ■ Self-adhesive bands for linings

Through the roof usually there are ventilation and smoke directing chimneys going. The areas around these crossings are “sores”, which could lead to intrusion of water in the under-roof area. On these places and on “endings” of tiles to walls and front sides there are made special linings from self-adhesive bands covered with aluminum. The quantities of these linings are taken from the drawings for the roof.

We offer two types of bands **Flex Standard Alu** and **Flex 3D Alu**. They have width of 300 mm and length of 5000mm. The necessary amounts are calculated according to the formula:

$$\text{Necessary numbers of self-adhesive band} = L / \text{length of the element in m} / : 5 \text{ m} / \text{unit} \{ \text{items} \}$$

#### ■ Ending profiles

The linings are ended and shaped esthetically with the help of the ending profile of thin sheet colored in accordance with the color of the tiles.

We offer ending profile – rail **Flex Alu**, which is length 2000 mm and width 60 mm

$$\text{Necessary numbers of ending profile} = L / \text{length of the element in m} / : 2 \text{ m} / \text{unit} \{ \text{items} \}$$

## 7. UNDER-ROOF FOLIA AND MEMBRANES

When performing a roof system there are two main types of roofs with regard to the requirements to the under-roof rooms – warm sloped roof and cold sloped roof. With the warm roof it is mandatory to place the heat insulation under the tiles, which differs it from the cold one, which is without heat insulation and usually the under-roof space is not used for household needs. Such roofs are performed recently exclusively and only for agricultural buildings or for storehouse rooms, for which the requirements for energy efficiency are not mandatory. We shall look in details the performance of a warm sloped roof. It is according to the type of material from which the construction is made, either wooden, steel concrete or metal one. In the specified example we shall look in details at the warm sloped roof made from wooden construction.

### 7.1. Under-roof folio and membranes. Areas of placement

All types of roofs and in particular the sloped ones are subjected to serious atmosphere influences - rain, snow, wind etc. which could intrude through the displaced or broken tiles and could damage the correct functioning of the construction. This leads most often to:

**Problem nr. 1 – Worsening of the comfort in the entire building**

**Problem nr. 2 – Damaging the protection of the heat insulation from humidity**  
/water steam from the internal part of the buildings/

*During the winter the water steam from the internal part of the building, resp. the under-roof area go through the heat insulation layer and reach the cold surface of the roof /tiles/ - Second Law of the Thermodynamics. When they meet an objection – bitumen paper or other steam not letting membranes /folio/, there is a danger of condensation. The humidity harms both the wooden construction and the heating insulation. In this way the humidity durably and irreversibly lessens the heat insulation qualities of the materials.*

#### **Problem Nr. 3 – Lack of mandatory ventilated area between the under-roof folio and the base**

*This problem until recently has led to complex details related to the limitation of the under-roof space and diminished energy efficiency.*

A solution to the above mentioned problems is made with the steam letting folio and membranes. They are very important element of the modern roof constructions. Roof system Technocim includes two different types of steam letting under-roof folio and membranes.

#### A. Steam barrier / controlling layer/

This layer is placed at the bottom of the lining, under the heat insulation, in order to control the letting of water steams to the heat insulation which could worsen its qualities. These folio types should have the following characteristics:

- steam letting capacity – maximum one = 40 g/m<sup>2</sup>/ 24h
- diffusive – equivalent thickness - Sd=1,00 m
- density – maximum one = 110 g/m<sup>2</sup>

**Remark:** *When performing a cold roof /without heat insulation/ this layer is not placed.*

#### B. The under tile membrane – steam letting layer

With this membrane one solves all issues on the protection of the heat insulation and the under-roof area against the harmful influence of humidity and also the maximum rational and functional use of the under-roof volume. The hot and humid air which rises from the internal part of the building towards the under-roof area could transit freely and without objections through the steam letting membrane.

When on the internal surface of the tiles there forms condense or through them in a way intrudes rain water, the water drops should fall onto the upper surface of the steam letting membrane to the gutters, without wetting the heat insulation. This layer is mounted immediately over the heat insulation or under the tiles. The under tile membrane should have the following characteristics:

- steam letting capacity – from 1500 to 5000 g/m<sup>2</sup>/24h
- diffusion equiv. thickness – Sd=from 0.015 to 0.030m
- density – from 110 to 175 g/m<sup>2</sup>

**Remark:** *From particular significance is to know which side of the steam letting membrane is front one so that one could assemble them correctly. In other case the effect shall be a reverse one. This is valid for all types of folio and membranes. Usually there are instructions on the packaging for the direction of letting the water steams.*

### 7.3. Specification of the necessary amounts of under-roof membranes

For specifying the necessary quantities steam diffusion folio /membranes/ we again should consider all drafts and details, which we have described in the beginning /starting data item 1/. After we have determined the square area of the roof, which we shall cover with tiles, we could easily calculated the necessary square area of the under-roof folio /membranes/ according to the following formula:

$$\text{Necessary area of the under tile membrane} = F / \text{area of the roof in m}^2 / \times 1,07 \{ \text{m}^2 \}$$

**Remark:** *1,07 – ratio taking into consideration the overlapping of the membrane at the places of connection*

One should take into consideration that the steam letting membranes, which we offer, have sizes 1,5m x 50 m, e.g. in such a roll there are 75m<sup>2</sup>. As we know this it shall be easy to specify the necessary quantity of rolls. We perform the system with the following types of folio and membranes:

- Under tile folio Silver for steam barrier / see item A/
- Under tile membranes Classic, Maxi and Strong – three and four layered heavily steam letting membranes for under tile assembly /see item B/

# TECHNICAL AND ECONOMIC INDICATORS FOR SLOPED ROOFS

Every building receives some type of roof, which like an “umbrella” protects it from rain, snow, wind and in general from all kinds of unfavorable atmosphere conditions. From the quality of the roof there depend very heavily the stability, the longevity and the esthetical look of the building. It is not unusual the old Bulgarian tradition – when starting the performance of the roof of a particular building one should raise the Bulgarian flag and the masters should receive as gift shirts and towels. This important role of the roof is reflected in the Law on the Territory Arrangement art. 152, par. 2 – one does not acknowledge for finished the type of “raw construction” of the building, if the **roof** is not finished. All normative regulations for design and performance of the roof pay particular attention, which proves what huge importance has the **roof** for every building and what attention should be paid to it from all participants in the investment process. The first step towards realization of a safe and durable roof is selecting the type of material which shall cover the building. For this purpose it is necessary to get acknowledged with the advantages and disadvantages of the offered at the market materials for covering of sloped roofs.

When selecting material for water protection of the roof one should mainly take into consideration the efficiency under the particular circumstances of a particular project. Even a material with excellent insulation, exploitation and esthetical qualities could be inappropriate if the weight is too big and the roof construction is enlightened. From the other part with a too small weight of the cover even with the longest durability of the material it is possible that the unfavorable “sucking” action of the wind should shorten significantly the exploitation life of the roof. These and many more factors make the selection of the most appropriate material for the roof a complex engineering task, which correct solution guarantees minimum maintenance, longevity and safety. The diversification of roof materials at the market could hamper every single user, who has no experience in such type of selection.

## 1. TYPES OF MATERIALS. ADVANTAGES AND DISADVANTAGES

It is not an easy task to select the best for your roof, since at the market there is a variety of most different roof materials offered – traditional ceramic tiles, modern concrete tiles, different types of shingles /wooden, bitumen, metal ones/ and roll-on bitumen materials. All of them offer excellent hydro insulation qualities, good protection against strike and safe protection from the UV rays. But one could say immediately that not all are appropriate for every single type of roof.

The first thing, which should be considered, when selecting the material, is the level of deformation capability. The construction of the sloped roof is such, that requires the possibility for development of big deformations in the roof without compromising the cover, which leads to damaging the water protection. Considering this we reach the conclusion that the most appropriate are the covers, which are composed of many in number but small in size elements. This could be the ceramic and the concrete tiles and the bitumen shingles.

### Ceramic tiles

This is one traditional and proven in time material for sloped roofs. It is very good known by the builders and the non-experts.

**Advantages:** They have long exploitation life of up to 100 years, they are used many times, low toxic, with good durability under severe atmosphere conditions, stable to fire and chemical aggression.

**Disadvantages:** They do not stand against heavy hailstorms. Some tiles are broken directly by the icy pieces and other become cracked and with the time they are damaged as a result of the small cracks on them. The other great disadvantage is from ecological nature – the big quantity of energy, necessary for their production. When compared to the concrete tiles with regard to the exploitation costs the ceramic tiles are in not so favorable position – the annual exploitation costs for roof made of ceramic tiles are with approx. 0,30 Eur/m<sup>2</sup> per year higher. Another great disadvantage of the ceramic tiles are the higher initial capital costs. There is a decrease of the resources of quality clay in worldwide aspect, which is necessary for the production of this type of tiles.

### Concrete tiles

These tiles are recently to be found on the market, and they are more and more popular. The user knows very fast about their advantages and they are now sold better than the ceramic tiles. It is a well known fact, that Europe has been restored with the use of concrete tiles after the damages of the World War II.

**Advantages:** Their main and biggest advantage against the ceramic tiles is the quality-high density and low pore capacity, which leads to very good hydro insulation parameters and high durability of the cycles “freezing-melting”. The initial capital costs are less than the costs for ceramic tiles, i.e. very appropriate for low budget sites.

### Other benefits of the concrete roof items of TECHNOCIM

1. The accumulation of the strength of the concrete goes on as the years pass by! When compared with the ceramic tiles - the concrete ones become harder and harder with the course of time, i.e. the longevity of the roof is guaranteed. They have exploitation life of more than 50 years.
2. Technocim’s tiles are resistant to **frost-thaw** cycles. They have high density and that is why they absorb less humidity from rain and snow. The risk level for absorbing humidity and freeze is equal to zero. Technocim tiles are much more frost resistant and durable in comparison to alternative roof materials.
3. Concrete tiles are not susceptible to strong winds, storms and torrent rains no matter what the roof construction might be. They absorb 25% less humidity in comparison to the ceramic tiles and the special fixing brackets add extra stability to the roof. Their own body mass contributes to the better stability of the roof as well when compared to alternative roof products.
4. Technocim’s concrete tiles do not increase the pressure of the roof construction per square meter because the norm is 10 tiles per square meter while with the ceramic ones the norm is 15 tiles per square meter.
5. The tiles of Technocim are manufactured fully automated with quality mixtures and technological lines of the leading manufacturers in Europe ABECE AB- Sweden. That is why the shapes and sizes of the tiles have the minimal possible diversion levels which is a condition for ideal and quick fitting during installation.
6. Technocim’s tiles are highly resistant to hail. Their high density and the excellent quality of the **additional second covering** makes them exceptionally resistant to hails which are a common phenomenon in our country. The ceramic materials with varnished and glazed upper surfaces do form micro cracks during hails. With the lapse of time these cracks tend to enlarge and become a reason for the increasing of water absorption which in turn leads to destruction of the **frost-thaw** cycles.
7. Technocim concrete tiles do not burn and successfully protect the basic wooden constructions from inflammation.

**Disadvantages:** Bigger own weight than the ceramic tiles and therefore the users refrain from buying them, when there are needed repairs of existing roofs. But here we must explain: the loading per sq.m. by the ceramic and the concrete tiles is one and the same, since the concrete tiles are with bigger sizes than the ceramic ones and their consumption is 10 items/m<sup>2</sup>, and the consumption of the ceramic ones is 15 items/m<sup>2</sup>.

### Bitumen tiles (shingles and roll-on bitumen membranes)

**Advantages:** When the funds are limited, i.e. the budget is limited and the strive towards economy is a leading one, the bitumen tiles are a perfect choice. The use of bitumen tiles made of distilled bitumen modified with APP or with SBS, but not made of oxidized bitumen, is recommended. The latter ones are not qualitative, therefore they are cheaper. The same is valid for the use of roll-on bitumen membranes. The bitumen tiles – shingles are stable and nice, they are assembled easy and quick and with a good assembly they have a maximum exploitation life of 15 years. They have low own weight and offer performances even with the most complex configurations of the roof lines.

**Disadvantages:** They require qualified experts for the assembly. Their exploitation life is a considerably short one. They have higher exploitation costs than the tiles – with approx. 0,67 Eur/m<sup>2</sup> per year, compared to the ceramic tiles. Although they have protection layers from slates or different quartz sands they are not stable against the UV rays. They burn faster, especially when the layer is not performed during the production in a correct way and after approx. 10 years they start to break and fall from the roof. The performance of a roof with roll-on bitumen membranes is not esthetically good one.

## Metal tiles

**Advantages:** Their low own weight makes them ideal product for areas with high seismic activity. There are manufacturers, who give long exploitation life – up to 50 years. They are covered with various anti-corrosive layers colored in nice colors. They could be recycled.

**Disadvantages:** Big initial capital costs – expensive solution for a roof. Very high exploitation costs. Although the technologies for covering with anticorrosive products become even better, the corrosion remains the greatest problem.

At the market there are also wooden shingles, shingles and sheet iron /mixture from lead and zinc/ or only zinc, covering plates from natural stone. But these are coverings for buildings, which are cultural monuments, old restored buildings of historical significance etc.

The criteria when selecting a covering for sloped roofs could be both technical and esthetical, technological and economic ones. Even more and more the choice shall be influenced by the environmental factors. Most companies, offering roof materials, have professional experts at their disposal, who could help you in the process of selecting the most appropriate roof cover. Technocim is no exclusion to this rule and our experts could advise you even for the choice of the entire roof system, including all necessary roof materials /concrete tiles, roof ridge-tiles, ending tiles, 3-way apex and 4-way apex tiles etc./ as well as for the modern elements and accessories with the help of which one gets solutions to the issues with the ventilation of the roof, the snow retaining problems, the drainage, the hydro insulation steam letting membranes, the supporting and sealing details.

## 2. VALUE INDICATORS

Before making your final choice on the type of roof cover, you must mandatorily make a price research, too. The issue with the price of the roof has no categorically and single solution. The price depends on many various factors.

**The rule is that the higher price reflects the better quality.**

As a base for the price formation is the issue with the quantitative account. When performing new construction and even when repairing old one, usually there is no such account. With the assistance of an expert, you could solve this problem and if you use the services of Technocim this expert shall prepare the quantitative account for free. So you should be assured, that in the price for m<sup>2</sup> there should be included all necessary elements and accessories, needed for a contemporary modern solution for the roof.

For the ease of our customers we offer some orientation prices for the various roof covers which are offered at our market at the moment.

### Prices for roll-on hydro insulation made of modified bitumen

- First layer with thickness from 3 to 4 mm – from 2 BGN/m<sup>2</sup> to 7 BGN/m<sup>2</sup>
- Second layer with thickness from 4 kg/m<sup>2</sup> to 5 kg/m<sup>2</sup> - from 3,50BGN/m<sup>2</sup> to 9 BGN/m<sup>2</sup>

### Prices for ceramic tiles

- Steam letting membrane – from 1,10 BGN/m<sup>2</sup> to 7,80 BGN/m<sup>2</sup>
- Ceramic tiles – from 7 BGN/m<sup>2</sup> to 16 BGN/m<sup>2</sup>

### Prices for concrete tiles

- Steam letting membrane – from 1.30 BGN/m<sup>2</sup> to 3.20 BGN/m<sup>2</sup>
- Concrete tiles – from 12 BGN/m<sup>2</sup> to 19.80 BGN/m<sup>2</sup>

### Prices for concrete tiles of Technocim

- Steam letting membrane – from 1.10 BGN/m<sup>2</sup> to 2.60 BGN/m<sup>2</sup>
- Concrete tiles Breeze and Onda – from 13 BGN/m<sup>2</sup> and from 14 BGN/m<sup>2</sup>
- Concrete tiles Plano/flat tile/- 18 BGN/m<sup>2</sup>

### Prices for bitumen tiles-shingles

- Lower /under tile/ membrane – from 1.00 BGN/m<sup>2</sup> to 6.60 BGN/m<sup>2</sup>
- Bitumen tiles - shingles – from 7.7 BGN/m<sup>2</sup> to 25 BGN/m<sup>2</sup>
- Bitumen tiles with copper coverage – from 55 BGN/m<sup>2</sup> to 80 BGN/m<sup>2</sup>

**Remark:** All prices are without labor costs and without VAT and are on grounds of a marketing research of the commercial division of Technocim for 2010.

In order to finish and to add more clarity into your idea about the values of the different types roof covers we shall offer a technical economic comparison, made in Germany – country with far more experience in the building of contemporary sloped roofs.

## 3. COMPARISON BETWEEN THE DIFFERENT TYPES OF COVERS FROM THE POINT OF VIEW OF THE CAPITAL COSTS AND EXPLOITATION COSTS

According to some data of the Polytechnic University in Stuttgart, Germany, published in the magazine for “Architecture and construction” in 2008, made on grounds of long year observations and researches, the technical life of the various roof covers is as follows:

1. Covers from bitumen tiles and membranes from modified bitumen – 25 years with average value of 50 EUR/m<sup>2</sup>
2. Covers from concrete tiles – 45 years with average value of 70 EUR/m<sup>2</sup>
3. Covers from ceramic tiles – 100 years with average value of 90 EUR/m<sup>2</sup>

After one takes into consideration the capital costs, the amortization write-offs /ageing/ and the necessary small repair works, which are needed during the exploitation, one has the following values for annual exploitation costs:

1. Covers from bitumen membranes made of modified bitumen – 11,25 EUR/m<sup>2</sup> per year
2. Covers from concrete tiles – 10,58 EUR/m<sup>2</sup> per year
3. Covers from ceramic tiles – 10.875 EUR/m<sup>2</sup> per year

### From the made calculations we could draw the following conclusions:

1. Initially, the capital costs when using ceramic tiles are bigger. Here the advantage of the concrete tiles is clear and undoubted!
2. The roofs performed with ceramic tiles, regardless of the fact, that have a longer technical life than the roofs with concrete tiles, are eventually more expensive and more unprofitable than the concrete ones because of the higher exploitation costs.

# CERTIFICATES DOCUMENTS



## WARRANTY CARD №

(Keep until the expiration of the warranty term)

### GENERAL WARRANTY CONDITIONS

1. TECHNOCIM EAD gives 30 (thirty) years of warranty for the concrete tiles and roof elements, manufactured at the own production base in the city of Sofia, district of Vrazdebnia, Str. 45 with invoice /of the vendor/ nr. \_\_\_\_\_ from date \_\_\_\_\_ 2009. Through the company \_\_\_\_\_, received from \_\_\_\_\_ /name of buyer/.
2. For the term of the warranty free one shall replace all concrete roof tiles, produced by TECHNOCIM EAD under the condition that they do not comply with the corresponding quality indicators according to norm EN 490.
3. For the same period TECHNOCIM EAD gives additional warranty for frost resistant.

For the necessary replacements when changing the frost-damaged concrete products the material is supplied free on site.

### 4. TERMS FOR PERFORMANCE OF THE WARRANTY

- Coordinating a term for inspection of the damages by our experts as well as for removing the accepted by us damages;
- The roof construction should be in compliance with the general static requirements;
- The construction of the roof and the covering should be done in compliance with the rules for placement of roofs with concrete items for roofs and in accordance to our technical prescriptions;
- The damage from frost should be due to bad quality of the material, therefore every possible damage because of frost should be immediately notified with specification of the type and date of the supply of concrete items;
- The replaced material should not be used for roof purposes, the transport to the waste collection site is at costs of the customer.

### 5. WARRANTY SERVICING COULD BE REFUSED IN CASE WHEN:

- There are inconpliance between the data in the documents and some tampering on the warranty card;
- The instructions for assembly, specified in the instruction manual have not been met;
- There are damages and defects, caused by negligence, misuse or in compliance with the designation of the product use;
- In case of damages as a result of not using the original accessories from the roof system TECHNOCIM EAD shall not take any warranty neither for the concrete items nor for the damages occurred from these damages;
- Breaking as a result of the pressure from snow piled is not regarded as damage by frost and is not within the frames of the warranty terms;
- Claims for damages of property caused as a result of bad quality of the material which are in surplus of the usually determined by the legislation, are excluded by the warranty;
- Damages because of mechanical load over the specified norms, respectively change in the surface because of meteorological conditioned influences are not included in the warranty terms;
- Non-significant deviations in the coloring are no lack of quality and correspondingly are excluded from the warranty conditions.

6. The warranty is acknowledged only against submitting a document for purchase and warranty card, filled in a proper way and including the name of the buyers, the name of the vendor and the date of purchase and in case of lack of obligations on the particular bargain.
7. The legal warranty terms are valid only when observing the described conditions in this card.
8. This warranty card could not be issued again.
9. The warranty card, filled in with a distributor of ours, is valid only if within 10ten/ day time limit it is certified or one sends a copy to the administrative base of Technocim EAD.

BUYER	AUTHORIZED DEALER /STAMP/
ADDRESS AND PHONE NUMBER	PRODUCT /TYPE/

BUYER	AUTHORIZED DEALER /STAMP/
ADDRESS AND PHONE NUMBER	PRODUCT /TYPE/



BUYER	AUTHORIZED DEALER /STAMP/
ADDRESS AND PHONE NUMBER	PRODUCT /TYPE/



## DECLARATION FOR COMPLIANCE Nr.

I, the undersigned eng. Teodor Iliev – Production Manager of

Technocim EAD, with headquarters: Sofia 1606, Dospat 2 Str.

declare on my own responsibility that the product:

Concrete tiles, flat, Plano with size: 420 x 330 mm, designed for building roof.

manufactured in:

the production base of Technocim EAD with address: Sofia 1839, Vrazdebnia district, Str. 45 for which this declaration refers, is in compliance with the following standards or European technical approval (ETA) or Bulgarian technical approval (BTA) and/ or other normative deeds:

BDS EN 490:2006 – Tiles and additional elements made of concrete for roofs and wall linings

and the compliance is estimated according to the Ordinance on the significant requirements towards the constructions and estimation of the compliance of the construction products. The declaration is issued on grounds of (certificate of product or certificate of system for production control or report from initial testing of the type):

nr. 193-08 from 6<sup>th</sup> January 2009

issued by:

University for Architecture, Construction and Geodesy, Centre for scientific researches and design, direction: "Assessment of the compliance of construction products and issue of BTO" with address: Sofia 1046, 1 Hristo Smirnovski Blvd.

are in compliance with:

Nomenclature for the types of products from Appendix Nr. 1 to art. 1 par. 2 "Groups of construction products" from the Ordinance on the significant requirements and assessment of the compliance of construction products.

I declare that I am aware of the responsibility I have in accordance with art. 313 of the Criminal Code.

Sofia, 19<sup>th</sup> April 2010

Production manager:



Storage: At an open place, on drained and leveled ground or under shelter.  
Use: For covering the roofs of buildings and for wall linings.  
Safety: Do not contain harmful for the environment and the people components. During the assembly one should follow the rules for safety of the labor.

# CERTIFICATE

Nr..... date.....

Technocim EAD  
Bulgarian producer of concrete items for roof and concrete pavements,

issues a certificate for successfully graduated course of education on topic:

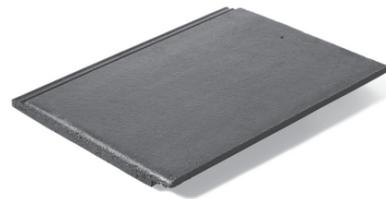
## "Placement of roofs and roof systems with the brand Technocim"

The certificate is issued to company: .....

\* An integral part of the certificate is the report from the training done with employees of the company.

Lecturer ..... Managing director .....

**TECHNOCIM**  
rooftiles and pavements



### 1. NAME OF THE PRODUCT AND COMPANY MANUFACTURER

PRODUCT: FLAT CONCRETE ROOF TILE PLANO  
TRADE NAME: FLAT CONCRETE ROOF TILE PLANO  
MANUFACTURER: TECHNOCIM EAD  
ADDRESS: SOFIA 1839, DISTRICT VRAZDEBNA, 45 STR.  
PHONE: +359 2 434 19 31, FAX +359 2 434 19 36

### 2. DESCRIPTION OF THE PRODUCT

COMPOSITION: THE PRODUCT IS FLAT CONCRETE TILE, PRODUCED BY EARTH MOISTURE CONCRETE, COMPOSED BY PORTLAND CEMENT /CLASS CEM I 42,5 R/, SAND, WATER, ACRYLIC PAINTS THE PRODUCT IS READY TO USE.

### 3. APPLICATION OF THE PRODUCT

THE PRODUCT IS APPROPRIATE FOR COVERING SLOPED ROOFS WITH MINIMUM SLOPE 14 DEGREES.

### 4. IMPORTANT FEATURES OF THE PRODUCT

PRODUCT TYPE: INTERLOCKING TILE WITH STRAIGHT FRONT EDGE  
LENGTH: 420 MM  
WIDTH: 330 MM  
HANGING LENGTH: 398 MM  
COVER WIDTH: 300 MM  
PROFILE DEPTH: NO  
WEIGHT: 4,900 KG.  
DIMENSIONAL VARIATION: COMPLIES  
MECHANICAL RESISTANCE: > 1200 H  
EXTERNAL FIRE PERFORMANCE: COMPLIES  
REACTION TO FIRE: COMPLIES  
WATER IMPERMEABILITY: COMPLIES  
DURABILITY (FREEZE-THAW): COMPLIES

### 5. CONSUMPTION OF THE PRODUCT PER SQ. M.

CONSUMPTION OF MATERIAL WITH COVERAGE OF SQ.M.: 11 ITEMS/M2

### 6. COLORS OF THE PRODUCT

GREY, RED, RED-TILE, BROWN, ANTHRACITE, VINTAGE OR OTHER UPON REQUEST

### 7. RAW MATERIALS / TECHNICAL DATA

EARTH MOISTURE CONCRETE  
HIGH QUALIFIED CEMENT /CLASS CEM I 42,5 R/  
CALIBRATED SAND: NORMAL  
WATER

### 8. PACKAGING

DIMENSIONS PALETTE: 100 X 120 MM  
QUANTITY OF A PRODUCT IN A PALLETTE: 190 ITEMS  
SQ. M. PRODUCTS IN A PALLETTE: 16 SQ.M.  
WEIGHT OF A PALLETTE: 882 KG

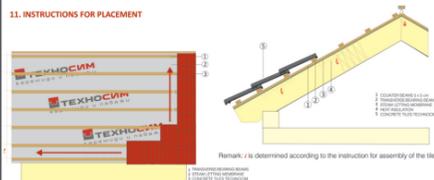
### 9. STORAGE

NO REQUIREMENTS

### 10. GENERAL INSTRUCTIONS

NOT TO BE PLACED WITH SUBZERO TEMPERATURES.

### 11. INSTRUCTIONS FOR PLACEMENT



GENERAL INFORMATION:  
PLANO IS PLACED DEPENDING ON THE CONSTRUCTION AND THE DETAIL OF THE ROOF ON A WOODEN LINING OR ON A GRATE OF COUNTER BEAMS /90x9 CM/ AND BEAMS /90x12 CM/.

WITH THE VARIANT WITH WOODEN LINING ON IT ONE NAILS THE GRATE FROM THE COUNTER BEAMS AND THE BEAMS WHICH CARRY THE TILES.

WHEN THERE IS NO WOODEN LINING THE COUNTER BEAMS LAY DIRECTLY ON THE RIBS /10x12 CM/

THE BEAMS ARE NAILED AT DISTANCES FROM 28,5 CM /FROM UPPER EDGE TO LOWER EDGE OF THE BEAMS/ DEPENDING ON THE SLOPE OF THE ROOF.

THE MODERN SLOPED ROOFS ARE MANDATORILY DONE WITH STEAM LETTING THREE-LAYERED FOLIO, WHICH PROTECTS THE HEAT INSULATION /IF ANY/ AND THE ENTIRE UNDER-ROOF AREA FROM THE HARMFUL INFLUENCE OF THE HUMIDITY.  
THE STEAM LETTING FOLIO IS FIXED TO THE RIBS WITH THE HELP OF THE COUNTER BEAMS WHICH ARE NAILED ON THE LENGTH OF THE RIBS.

MOUNTING OF PLANO FLAT TILES:  
WITH FOUR-LAYERED ROOF AND SLOPES UP TO 30 DEGREES /WHEN THERE ARE NO END TILES NECESSARY/ THE DISTANCE BETWEEN THE BEAMS SHOULD BE 28,5 CM, SO THAT THEY COULD LAY ON THE FEET. IN THIS CASE THE OVERLAPPING IS 10 CM AND THE CONSUMPTION IS 11 ITEMS/M2.  
FOR SLOPE OF THE ROOF UP TO 30 DEGREES AND WITH THE USE OF END LEFT AND RIGHT TILES /WITH TWO-LAYERED ROOF/ THE DISTANCE IS 30,5 31,5 CM. IN THIS CASE 11 ITEMS/M2 SHOULD BE FORESEEN.  
WHEN USING THE END LEFT AND RIGHT TILES AND WITH SLOPES OF THE ROOF OF MORE THAN 30 DEGREES THE DISTANCE COULD BE 30,5-31,5 CM /OVERLAPPING IS MAXIMUM 10 CM/ BUT IN THIS CASE THE FLAT TILES DO NOT LAY ON THEIR FEET. THE CONSUMPTION IS 11 ITEMS/M2.

IN ALL CASES WITHOUT USE OF END TILES, THE RECOMMENDED DISTANCE BETWEEN THE BEAMS IS 28,5 CM. THE CONSUMPTION IS 11 ITEMS/M2 AS THE TILES LAY ON THE FEET.

THE RIGHT DISTRIBUTION OF THE BEAMS IS A VERY IMPORTANT OPERATION AND IT SHOULD BE DONE PRECISELY ON SITE, IMMEDIATELY PRIOR TO STARTING THE ASSEMBLY OF THE TILES! WHEN DISTRIBUTING THE BEAMS ALONG THE AREA OF THE ROOF IT IS OBLIGATORY TO MARK THE RIGHT 90 DEGREES ANGLE AGAINST THE EAVES SO THAT CORRECT AND ESTHETICAL PLACED TILES ARE ACHIEVED.

THE PLACEMENT OF THE TILES IS MADE FROM RIGHT TO LEFT AND FROM THE EAVES TO THE RIDGE!

THE CHANNELS FOR OVERLAPPING THE TILES SHOULD PASS EXACTLY TO EACH OTHER!

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### 1. NAME OF THE PRODUCT AND COMPANY MANUFACTURER

PRODUCT: FLAT CONCRETE ROOF TILE  
TRADE NAME: FLAT CONCRETE ROOF TILE PLANO  
MANUFACTURER: TECHNOCIM EAD  
ADDRESS: SOFIA 1839, DISTRICT VRAZDEBNA, 45 STR.  
PHONE: +359 2 434 19 31, FAX +359 2 434 19 36

### 2. DESCRIPTION OF THE PRODUCT

COMPOSITION: THE PRODUCT IS FLAT CONCRETE TILE, PRODUCED BY EARTH MOISTURE CONCRETE, COMPOSED BY PORTLAND CEMENT /CLASS CEM I 42,5 R/, SAND, WATER, ACRYLIC PAINTS  
THE CONTENT OF SOLUBLE CHROME CR (VI) IS LOWER THAN 0,0002% OF THE TOTAL DRY WEIGHT OF THE CEMENT.

### 3. DESCRIPTION OF THE DANGERS

NONE

### 4. MEASURES FOR FIGHTING A FIRE

THE PRODUCT IS NOT FLAMMABLE.  
THE FIRE FIGHTING MEASURES ARE IN COMPLIANCE WITH THE FIRE IN THE ENVIRONMENT.

### 5. WORK WITH THE PRODUCT AND STORAGE

THE PRODUCT IS PLACED AT LEAST BY TWO PEOPLE WITH A VIEW TO DECREASE THE RISK OF LOADING THE MOTOR SYSTEM OR ANOTHER INJURY.

### 6. PERSONAL PROTECTIVE EQUIPMENT

GENERAL PROTECTIVE AND HYGIENE MEASURES: CLEAN THE HANDS BEFORE PAUSES AND AFTER FINISHING THE WORK.

PROTECTION OF THE HANDS: USE SAFETY GLOVES.

PROTECTION OF THE BODY: USE WORKING CLOTHES. AVOID SKIN CONTACT.

### 7. PHYSICAL AND CHEMICAL FEATURES

APPEARANCE: SOLID BODY  
COLOR: GREY OR COLORED WITH ACRYLIC PAINTS IN THE FOLLOWING COLORS:  
ANTHRACITE, RED, YELLOW, BROWN, WHITE OR ANOTHER UPON REQUEST OF THE CUSTOMER  
ODOR: NONE  
FLAMING TEMPERATURE: NOT SPECIFIED  
TEMPERATURE OF SELF-IGNITION: NOT SPECIFIED  
SOLUBILITY: NONE  
PH VALUE: NOT SPECIFIED  
LOWER/UPPER LIMIT OF EXPLOSION: NOT SPECIFIED

### 8. STABILITY AND REACTIVITY

STABLE UNDER NORMAL CONDITIONS OF WORK AND STORAGE.  
CONDITIONS WHICH SHOULD BE AVOIDED ARE STRIKE OR SCRATCHING WITH ANOTHER SHARP OBJECT.  
SUBSTANCES WHICH SHOULD BE AVOIDED ARE ACIDS, SALTS AND OTHER REACTIVE AGENTS  
DANGEROUS PRODUCTS OF DECOMPOSITION: NONE UNDER THE CONDITION OF PROPER PLACEMENT.

### 9. TOXICOLOGICAL INFORMATION

NO DATA AVAILABLE ON HARMFUL INFLUENCES  
IRRITATING ACTIVITY: NONE  
SENSIBILITY: NO SENSIBILITY ACTIVITY

### 10. INFORMATION ON THE ENVIRONMENT

ECOTOXIC: NONE  
MOVABILITY: NONE  
OTHER INSTRUCTIONS: NONE

### 11. WASTE TREATMENT

THE PRODUCT IS TREATED AS MIXED CONSTRUCTION WASTE ACCORDING TO THE EUROPEAN CATALOGUE OF WASTES: MIXED CONSTRUCTION WASTE WITHOUT CONTAMINATION FOR THE ENVIRONMENT, CODE 17 09 04  
THE PACKAGES ARE TREATED ACCORDING TO THE LEGAL PROVISIONS E.G. ACCORDING TO THE LAW ON MANAGEMENT OF THE WASTES.

### 12. INFORMATION ON TRANSPORTATION

GENERAL INFORMATION: NOT DANGEROUS WHEN TRANSPORTING IN THE SENSE OF THE NATIONAL AND INTERNATIONAL TRANSPORT RECOMMENDATIONS  
THE PRODUCT IS NOT SUBJECTED TO THE PROVISIONS OF ADR/RID.

### 13. INFORMATION ACCORDING TO THE VALID NORMATIVE DOCUMENTS

### 14. OTHER INFORMATION

THE PRESENTED DATA ARE GROUNDED ON THE ACTUAL STATUS, KNOWLEDGE, EXPERIENCE AND LONG-YEAR PRACTICE WHEN WORKING WITH THESE MATERIALS. THE INFORMATION IS IN ACCORDANCE WITH THE VALID LEGISLATION IN THE REPUBLIC OF BULGARIA, THE EU DIRECTIVES AND IN COMPLIANCE WITH THE INTERNATIONAL AGREEMENTS WITH REGARD TO THE MANUFACTURED PRODUCT. THIS INFORMATION IS CONCERNING ONLY THE SPECIFIED PRODUCT AND ITS SAFE APPLICATION.



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## **PRODUCTION BASE AND ADMINISTRATION**

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