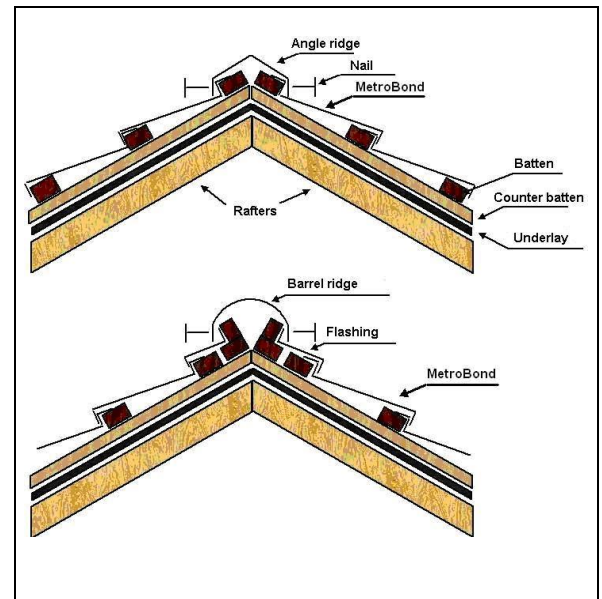


NAME OF PRODUCT

**METROBOND, METROSHAKE,
METROSHINGLE and METROROMAN
metal roofing tiles**

CERTIFICATE HOLDER

Metrotile Europe NV
Heersterveldweg 15
3700 Tongeren
BELGIUM



PRODUCT DESCRIPTION

The METROTILE roofing tile family consist of pressed metal roofing sheets which are coated on weather side by pigmented acrylic coating in which coloured stone granules are incorporated and on which a clear acrylic glaze coating is applied.

METROBOND, METROSHAKE, METROSHINGLE AND METROROMAN roofing sheets have different pressed shapes. Each sheet overlaps with adjacent sheets on top and bottom by means of an upstand and on the left and right by means of corrugation.

Steel thickness of the products is 0,45 mm. Alternative steel thickness of METROBOND and METROSHAKE roofing sheets is 0,9 mm (called METROBOND 900 or METROSHAKE 900).

METROBOND, METROROMAN AND METROSHAKE roofing tiles are applicable on roofs with a slope 1:6 (recommended 1:4) or more and METROSHINGLE on roofs with a slope 1:4 or more. Ventilation of the roofs below the roof tiles shall not be restricted.

Roof underlay shall be installed below the roof tiles so that ventilation take place. The quality of roof underlay depend on the type of the roof. In case of diffusion tight roof underlay the roof shall be ventilated also below the roof underlay. Diffusion open and water tight roof underlay can be installed directly on to the thermal insulation.

CERTIFICATION PROCEDURE

This certificate is based on an initial type assessment of the product, and an initial inspection of the factory and the factory production control. The general certification procedures are based on the certification system of VTT .

This certificate is valid for a maximum of three years from the date of issue. The conditions of validity are described in section 17.

To check the validity of this certificate, contact the VTT, Tel. +358 20 722 4911.

Using the VTT name in promotional material or reproducing and distributing any part of this certificate is allowed only by written permission of VTT.

TABLE OF CONTENTS

1. Product requirement standards	3
2. Other standards and instructions	3
3. Product description, marking and quality control	3
4. Delivery and storage on site	4
5. General	4
6. Installation	4
7. Structural performance	5
8. Sound insulation / Acoustical performance	6
9. Moisture behaviour	6
10. Thermal behaviour / insulation	6
11. Fire safety	6
12. Durability	7
13. Manufacturer's instructions	7
14. Testing and analysis for this certificate	7
15. Other materials	7
16. Validity period of the certificate	8
17. Conditions of validity	8
18. Other conditions	8

REGULATIONS, STANDARDS AND INSTRUCTIONS

1. Product requirement standards

In the opinion of VTT, METROBOND, METROSHAKE, METROSHINGLE and METROROMAN roofing sheets, if used in accordance with the provisions of this certificate, will contribute to meeting the relevant requirements of the Finnish building regulations as stated in the following:

B1	Structural safety and loads, Regulations 1998, in accordance with clause 7 of this certificate
C2	Moisture, Regulations and guidelines 1998, in accordance with clause 9 of this certificate
E1	Structural fire safety in buildings, Regulations and guidelines 2002, in accordance with clause 11 of this certificate
F2	Safety in use buildings, Regulations and guidelines in accordance with clause 6.6 of this certificate.
EN 14782	Self supporting metal sheet for roofing, external cladding and internal lining- Product specification and requirements.

2. Other standards and instructions

2.1 The certificate holder has declared, that the following general recommendations are followed:

RIL 107, 2000 Guidance for water and moisture insulation of constructions.

PRODUCT INFORMATION

3. Product description, marking and quality control

3.1 The Metrotile roofing sheets are manufactured of thermally galvanized steel DX52D. The steel sheets are coated with coloured stone granules and pigmented acrylic emulsion coating and clear top coat. The amount of coating vary depending on the size of granules and its thickness vary between 185 – 325 µm.

3.2 Also galvanized ribbed screw nails are delivered with the steel sheets for the fastening of steel sheets and repairing acrylic emulsion for finishing small damages.

3.3 The weights of the steel elements are according to the table 1.

Table 1. Dimensions and weights of the products

<i>Property</i>	<i>Unit</i>	<i>Metro-Bond</i>	<i>Metro-Bond 900</i>	<i>Metro-Roman</i>	<i>Metro-Shake</i>	<i>Metro-Shake 900</i>	<i>Metro-Shingle</i>
Nominal weight per element	kg	3,0	5,1	2,7	2,85	4,64	1,7
Nominal weight	kg/m ²	6,5	10,9	6,3	6,2	9,98	5,9
Nominal length	mm	1330	1330	1280	1330	1330	1330
Nominal width	mm	415	415	415	415	415	265
Roof coverage	elements/m ²	2,15	2,15	2,35	2,15	2,15	3,45

3.4 Internal quality control consists of control of incoming raw materials, process control, visual inspections and regular testing of finished products.

3.5 External quality controls are carried out by BCCA, Belgium according to a separate quality control contract.

4. Delivery and storage on site

4.1 The roofing sheets are delivered to the site on a pallet wrapped in plastics?. Each pallet is labelled with the product name, the name of the manufacturer, the name of the certificate holder and the quantity of the product. Each pallet contains general instructions for use.

4.2 The delivery pallets also contain information about the structure of the product, date of manufacture and the VTT certificate number.

4.3 The products must be stored in the delivery package and protected from direct sunlight and water.

DESIGN INFORMATION

5. General

5.1 The design data given in this certificate is based on the assumption that construction solutions, fastening methods and other details given in this certificate will be followed together with the mentioned requirements, guidelines, standards and instructions

6. Installation

6.1 Metrotile roofing sheets shall be installed and fixed according to the instructions of the certificate holder. Installation can be performed in ordinary installation conditions for roofing works.

6.2 Before the start of the installation it shall be confirmed that the sizes of trusses and battens and truss distances supporting the Metrotile roofing meet the wind and snow load requirements. The maximum distance between the battens is 368 mm for MetroBond, MetroRoman and MetroShake and 235 mm for MetroShingle. Possible alterations are always carried out at the top ridge of the roof.

6.3 The roofing sheets are laid onto the battens with the upper and lower edges interlocking and with side overlaps of the corrugation. The roofing sheets are fixed by nailing through the interlocking upstand edges. The accessories are cut, formed and installed as necessary to complete the installation.

6.4 Installation of MetroBond, MetroRoman and MetroShake roofing sheets on the roof surface take place from top to bottom. The starting row is the second row from the top ridge. The elements of this row are adjusted as necessary, with particular attention to the side overlaps, and are nailed to the top. Subsequently, the following rows are installed. After checking that side and top overlaps fit properly, the elements are nailed to the battens. Each element is nailed with four nails.

6.5 Installation of the MetroShingle roofing sheets take place from bottom to top and from right to left. Installation starts with starting profile and hidden gutter. On the starting profile, the first MetroShingle element is nailed on top of the profile. The elements of the starting row are adjusted with special attention to the side overlaps, and are nailed to the top of the profile. Subsequently, the following rows are installed. Each element is nailed with four nails. It is recommended that for roofing sheets with a thickness of 0,9 mm (MetroBond 900 and MetroShake 900), the nail holes are prepunched.

6.6 Walkways for maintenance traffic shall be installed on to the roofs. If the storey height of the building is over two stories there shall be access to the roof both from inside and outside. Ladders, steps and other walkways shall meet the requirements set in the Finnish Building Code F2 paragraph 5.3.

7. Structural performance

7.1 The loads applied on the building during its construction and use are set in the National building code of Finland, part B1, The safety and loads of structures, regulations 1998.

7.2 Metrotile roofing sheets are self supporting products but they have no structural role in the global or partial stability of the building structure.

7.3 Sizes of roof trusses and battens and distances of trusses shall be designed to meet the wind and snow load requirements of the Building Code B1.

7.4 Timber trusses and battens shall be at least class C24 timber, either spruce or pine (old class T 24).

7.5 The resistance to wind load of Metrotile roofings have been tested with under- and overpressure tests. All the roofing sheet types resisted, as installed according to the instructions of the manufacturer (shortly described in paragraph 6), at least 2500 Pa under-pressure and over 6500 Pa over-pressure without damage.

7.6 The point load resistance according to the EN 14782 have been tested. Point load resistance of the MetroShake 900 roofing sheets was 1,5 kN and the other products between 0,4 – 0,9 kN.

8. Sound insulation / Acoustical performance

8.1 Roofing sheets has only minor effect on sound insulation properties of the roof constructions.

9. Moisture behaviour

9.1 Insulation against water and moisture is made in accordance with part C2, Insulation against water and moisture, regulations 1998, of the National Building Code of Finland and Guidance for water and moisture insulation of constructions, RIL 107-2000.

9.2 The water tightness of Metrotile roofings has been tested. with combined rain-wind test. MetroBond roofing maintained watertight to the wind speed 15 m/sec when the slope of the roof was 1:6 or more and MetroShingle roofing to the wind speed 10 m/sec when the slope of the roof was 1:4 or more.

9.3 The performance of the steel sheet roofing provide that roof underlay is installed below the steel sheet roofing and there is ventilation gap both above and below the roof underlay. however in the cases roof underlay is diffusion open, it can be installed directly on to the thermal insulation.

9.4 performance of the roof provide that the penetrations through the roof underlay as well as through the steel sheet roofing shall be tightened and done in such a way that water or moisture movement to below locating structures is prevented.

10. Thermal behaviour / insulation

10.1 Steel sheet roofing has only minor effect on the thermal insulation properties of the construction. By protecting the underlay structure from wetting the roof prevents increase of heat losses.

11. Fire safety

11.1 The requirements for the fire resistance of the structures and the fire behaviour of the materials are set in the National building code of Finland, part E1, Fire safety of buildings, regulations and guidelines, 2002.

11.2 Metrotile roofing sheets fulfill the requirement of class B_{ROOF} (T2) according to the test results of the test ENV 1187.2002.

12. Durability

12.1 Installation of the roof structure shall be done according to the instructions of the manufacturer taking into account especially instructions given about cutting, fastening and protection of the roofing sheets.

12.2 Durability of roofing depends on the environment it is installed. Durability of the coating and steel is better on the countryside compared to the coast or industrial environment.

12.3 Resistance to the heat (75 °C/21 days), thermal shock (cycle -18 °C 8 h + 75 °C 16h, totally 42 cycles), salt spray (350 h NaCl), sulphur dioxide (30 cycles Kesternich) and UV-radiation (100 h QUV radiation) have been tested. No visible alterations took place.

12.4 Maintenance and reparation painting instructions is included in the manufacturers installation instructions.

INSTRUCTIONS FOR INSTALLATION AND USE

13. Manufacturer's instructions

13.1 Installation is performed according to the instructions of the manufacturer. The instructions shall be carefully followed in order to achieve the intended functional performance of the roof construction.

13.2 Guidance of maintenance and small repairs are given by the manufacturer in connection of the other instructions.

TECHNICAL ASSESSMENT

14. Testing and analysis for this certificate

14.1 UBAtc has performed tests concerning properties of Metrotile roofings. Test results are presented in the text above.

15. Other materials

Installation instructions

VALIDITY OF THE CERTIFICATE

16. Validity period of the certificate

This certificate is valid for a maximum of three years from the date of issue.

17. Conditions of validity

The certificate is valid assuming that no fundamental changes are made to the product, and that the manufacturer has a valid quality control contract. A list of valid certificates is available from VTT.

18. Other conditions

The references made in this certificate to standards and instructions are valid in the format used at the time the certificate was awarded.

The recommendations in this certificate concerning the safe use of this product are minimum requirements that shall be satisfied when using the product. The certificate does not override current or future requirements imposed by laws and statutes. In addition to the issues presented in this certificate, design, manufacturing and use shall follow appropriate construction methods.

The manufacturer is in charge of the product's quality and factory production control. In awarding this certificate, VTT does not bind itself to indemnification liability concerning personal injury or other damage that may directly or indirectly result from using the product described in this certificate.

VTT Technical Research Centre of Finland finds METROTILE roofing tile family to be suitable for use in construction as described in this certificate. This certificate No. VTT-C-594-06 has been awarded as described above to Metrotile Europe N.V.

On behalf of VTT on 23.5.2006



Liisa Rautiainen
Assessment Manager



Jarmo Ruohomäki
Senior Research Scientist

MetroBond

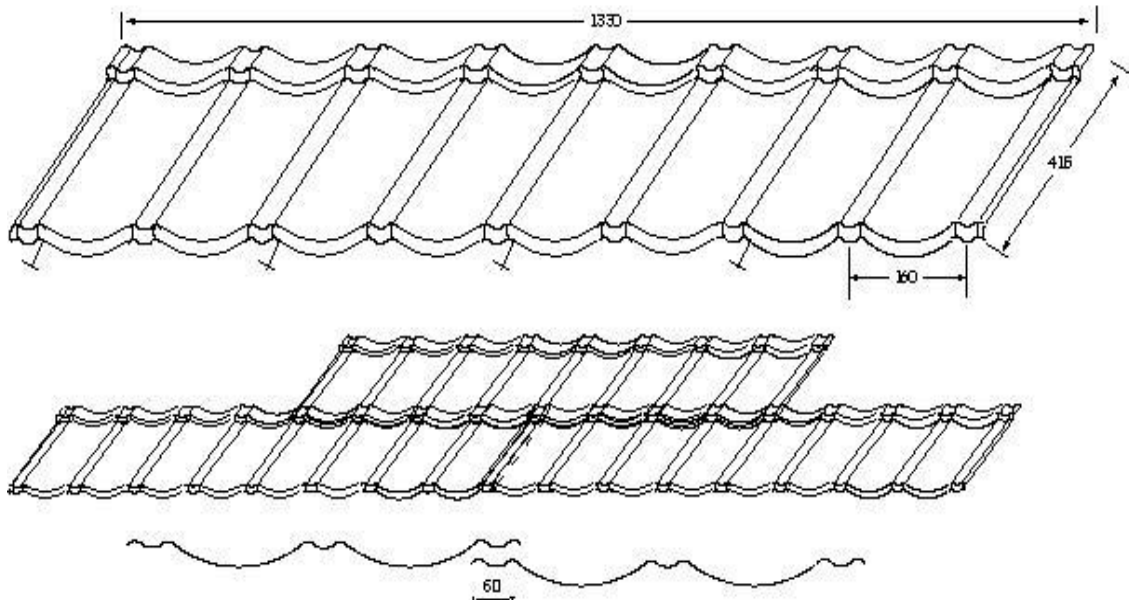


Figure 1 a, Metro Bond

MetroShake

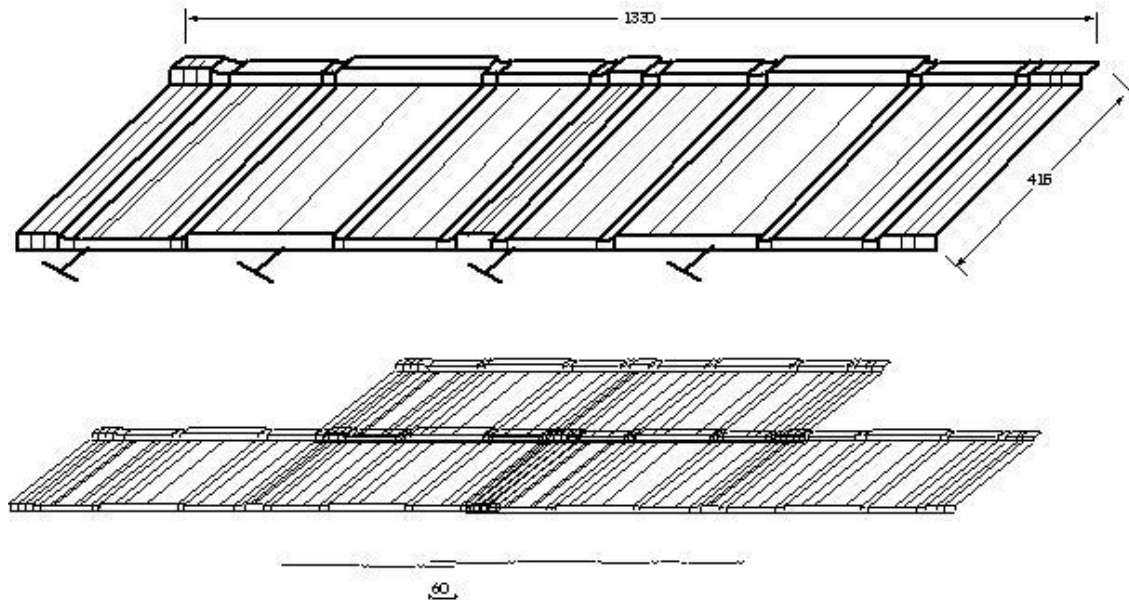


Figure 1 b. Metro Shake product

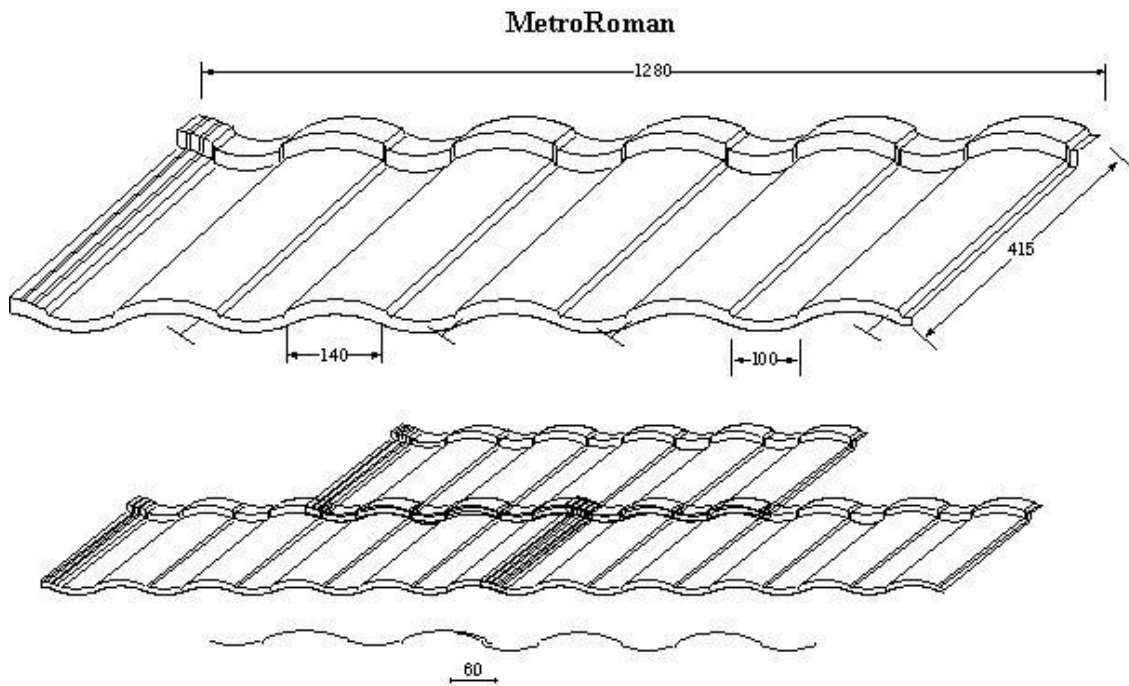


Figure 1 c Metro Roman product

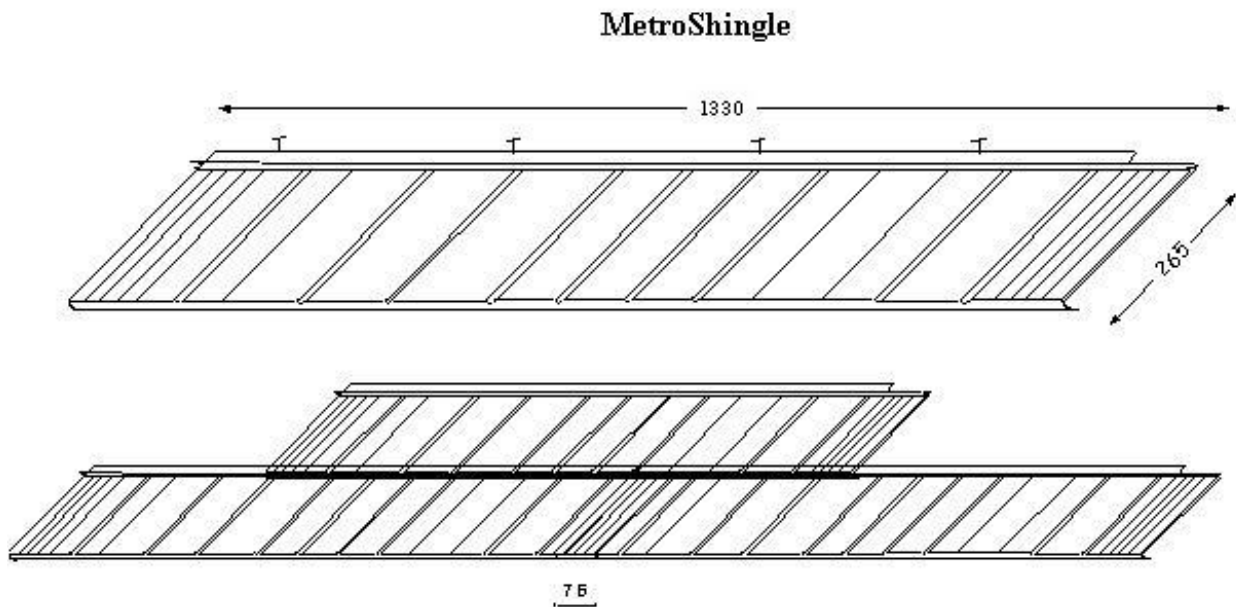


Figure 1 d Metro Shingle product

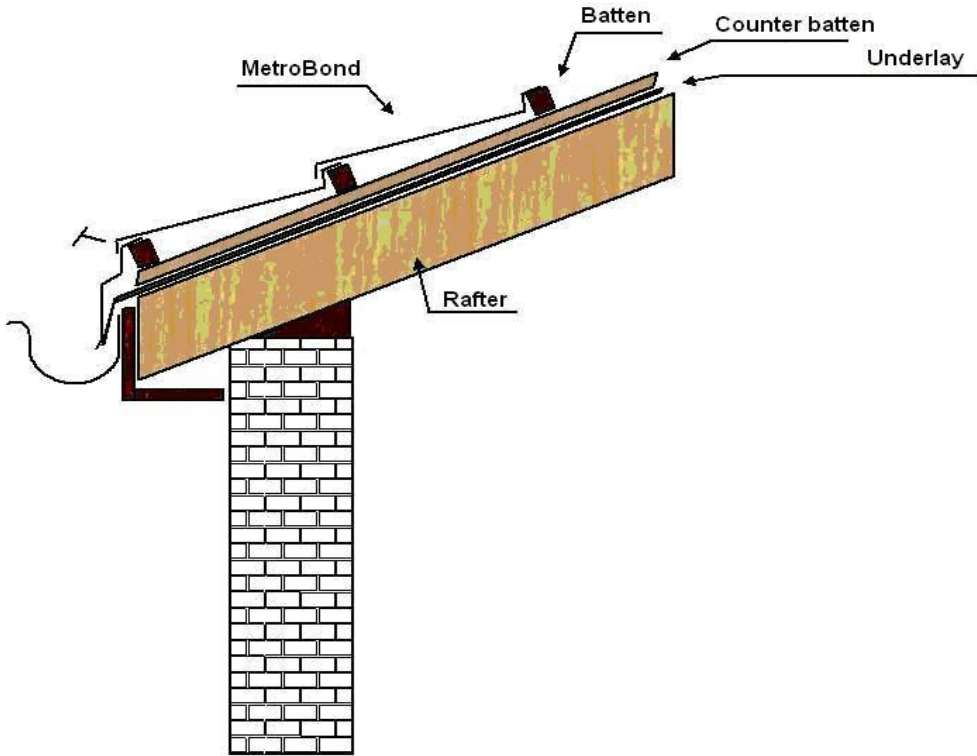


Figure 2a Foot of the roof

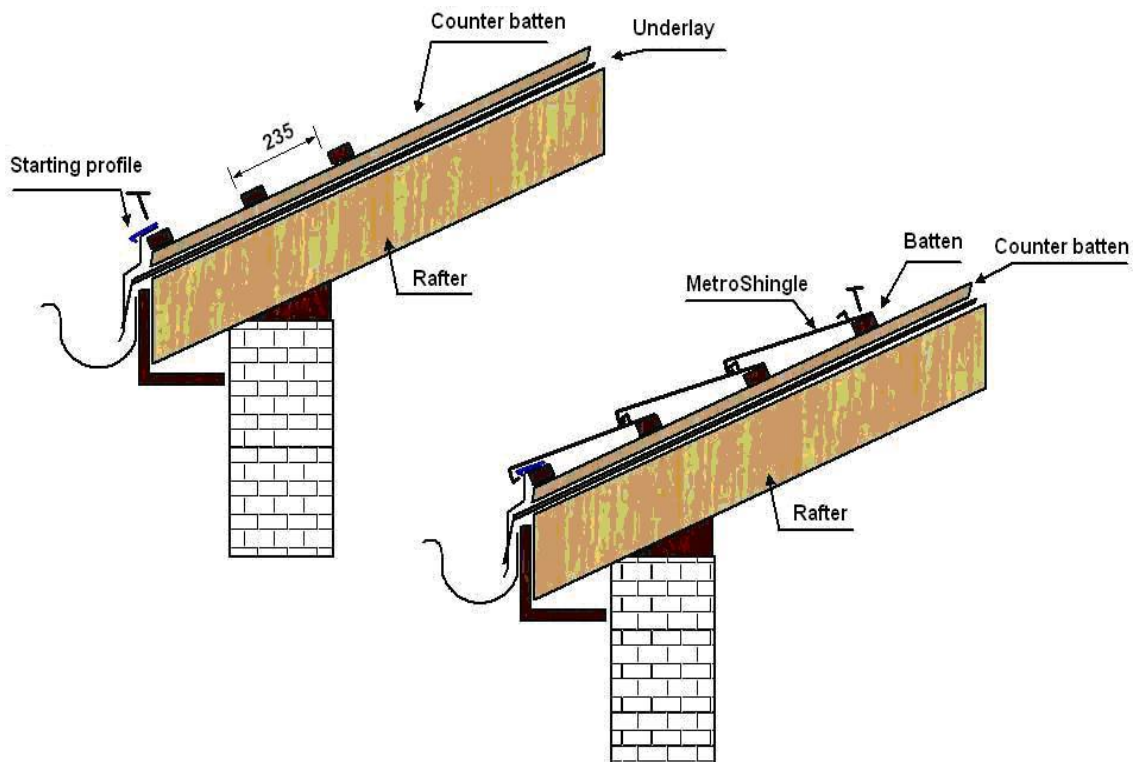


Figure 2b Foot of the roof and starting profile Metro Shingle

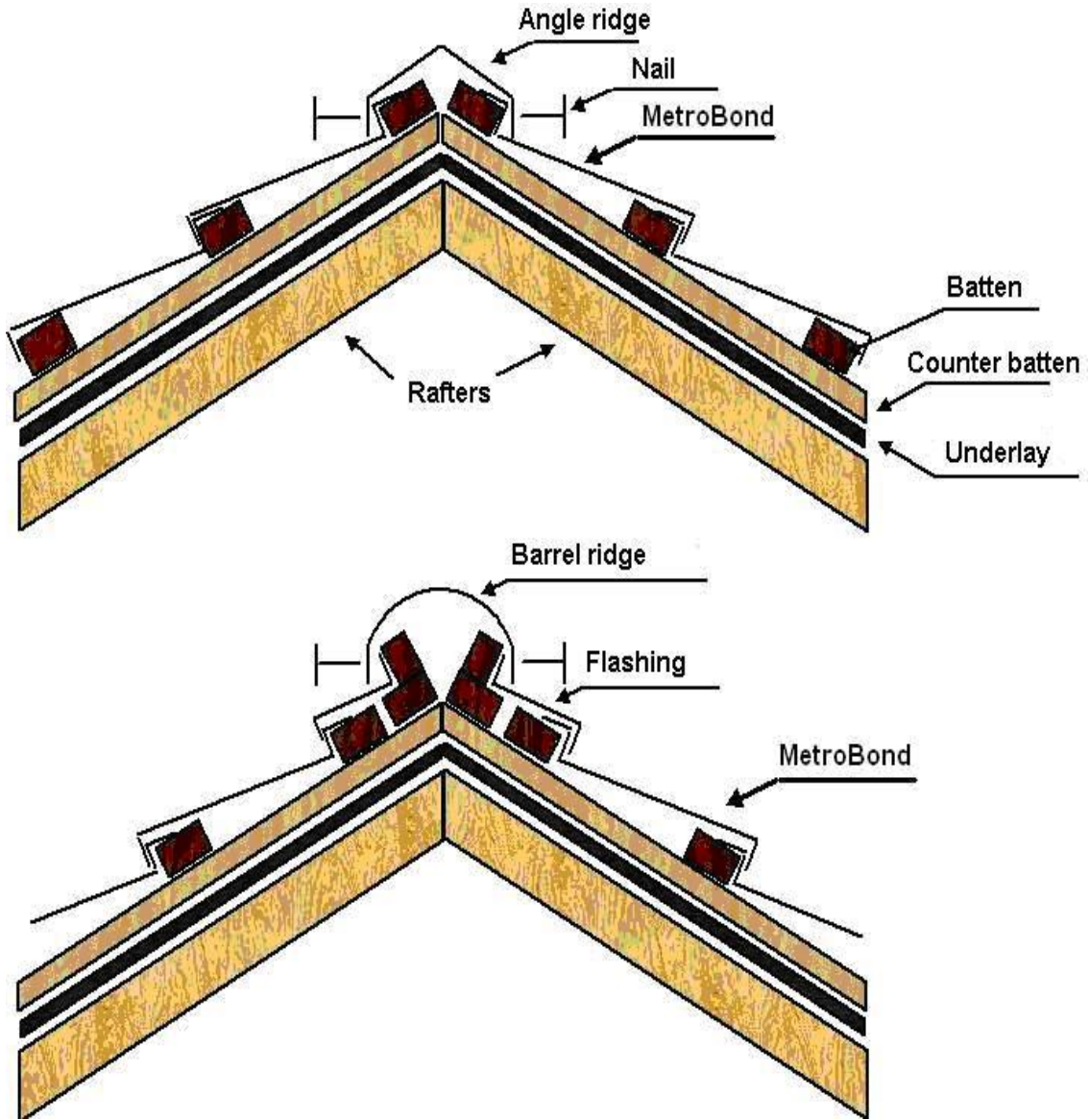


Figure 3 Roof ridge with angle ridge and barrel ridge



Figure 4a Roof edge Metro Shingle

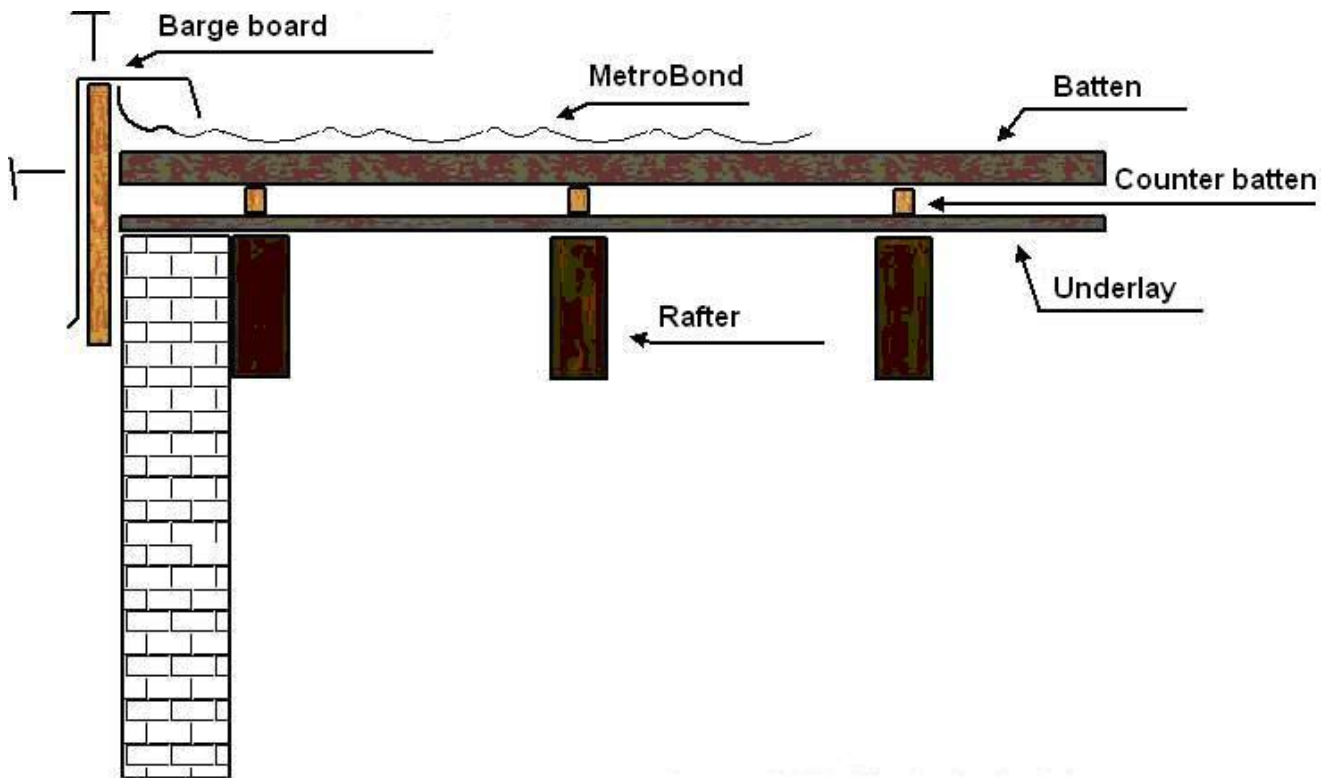


Figure 4b Roof edge Metro Bond

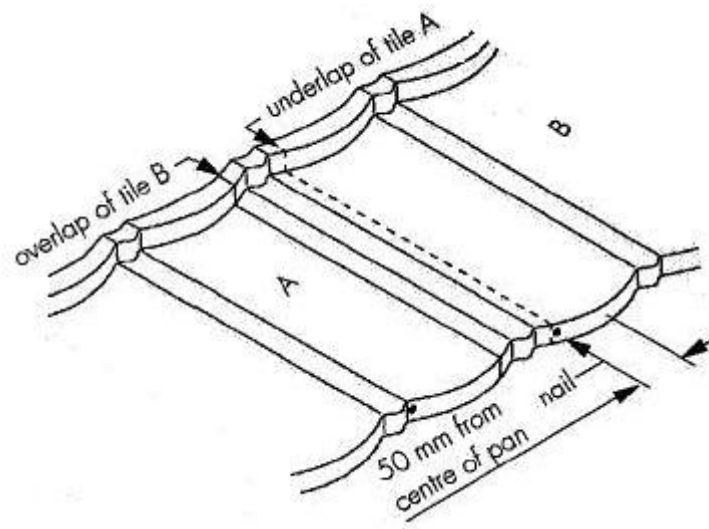


Figure 5a Overlapping of the adjacent sheets

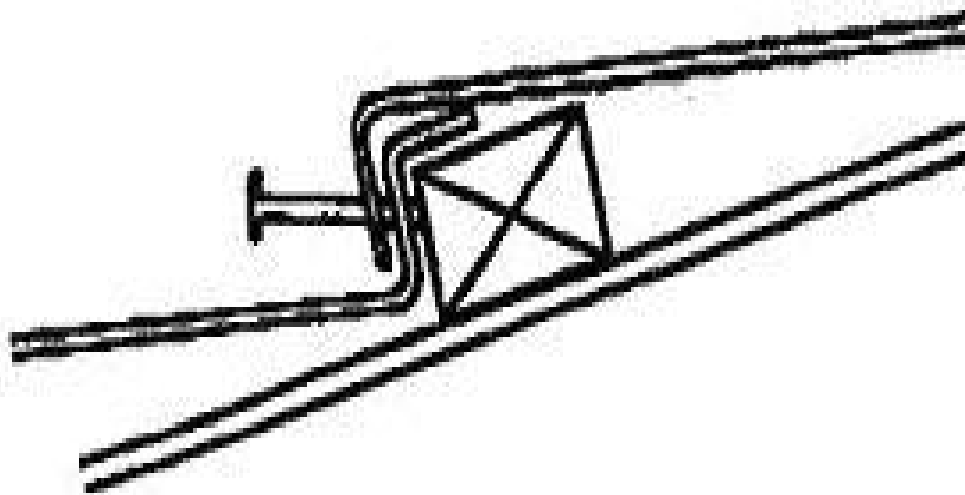


Figure 5b detail of the nailing