

ENGLISH



Coelho da Silva

PORTUGUESE ROOF TILES INSTALLATION GUIDE

Thank you for choosing our products.
This booklet has been prepared to help you install CS
products. Understanding and complying with these
guidelines is essential for your roof to fulfil its function
effectively.

coelhodasilva.com



Tecno®



Sirius®



Global



F3+



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For us at CS, the quality of our products and services is of the utmost importance. To ensure this quality is not compromised, and because a product by itself cannot guarantee the function it is intended to perform, it is crucial to install it correctly according to the appropriate building standards. This guide provides essential information on how to correctly install Portuguese-style clay roofs.

GENERAL INSTALLATION RECOMMENDATIONS

1. Read this guide immediately after receiving the material on site.

2. **BEFORE** installation, carefully check if there are any manufacturing defects. If so, contact us immediately via the channels below, and send us a photo record of the occurrence.

- a. Whatsapp +351 964 171 140 / +351 912 987 364
- b. Email info@coelhodasilva.com
- c. Telephone +351 244 479 200

3. If in doubt regarding the information in this guide or the installation of our products, please contact CS' Technical Support Department using the details above.

4. For any installation matter not covered in this guide, the responsibility for the incorrect installation of the product should not be attributed to CS, in which case the recommendation of the previous point prevails.



REMEMBER

- In case of complaint, it's essential to present the label that accompanies and identifies the product on the pallet (or box in the case of some fittings). Do not proceed installing the product without first contacting CS' Technical Support Department.
- The measurements/figures presented in this guide should be considered indicative and confirmed with the products on site, when planning its installation.

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01 CHARACTERISTICS OF PORTUGUESE TILES



COLOURS

L34	Natural Glazed
M22	Red
M23	Titanium
M25	Brown
M26	Honey
M42	Rustic Red
E40	Natural Rustic
E41	Mediterranean Rustic

*Recommended

** If other guidelines exist in construction standards or manuals of the destination country, those prevail.

02 ROOF SUPPORTING STRUCTURE



2.1 TYPES OF SUPPORTING STRUCTURES

The roof tiles need an adequate structure to support them properly, to maintain their position and alignment, and to guarantee the ventilation of the roof.

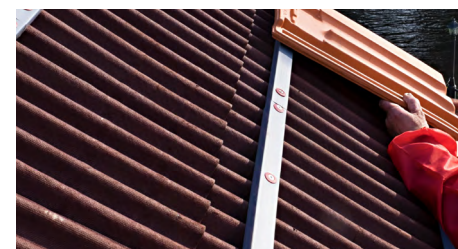
Below are the top recommended support structure solutions:



| Pre-stressed beam and rafter



| Wood batten and counter batten



| Batten over an underlayer



| Ventilated metallic batten

Whatever solution or materials you chose for the support structure, a minimum air gap of 3 cm (ventilated metal batten) to 5 cm (wood batten and counter batten) must be ensured between the underside of the tile and the material placed underneath, whether it is a membrane, slab, insulation or waterproofing material. The support structure must also provide vertical ventilation corridors from the eave to the ridge of the roof, allowing the air to circulate.

This is the best way to guarantee a uniform appearance of the roof and ensure the durability of the tiles, by promoting their quick drying and reducing the likelihood of condensation occurring. In addition to these aspects, a ventilated roof contributes to the thermal comfort of the building.

2.2 FIXING THE ROOF TILES TO THE SUPPORT STRUCTURE

On roofs with very steep slopes and/or exposed to winds, the roof tiles must be fixed to the support structure in order to prevent their displacement or lifting.

All Portuguese roof tile models come with pre-half-drilled holes that allow mechanical fixing to the batten, preferably using **self-tapping screws (for wood battens) or self-drilling screws (for metal battens)* and washers**. It is not recommended to use nails. However, if you choose this method, the tip must be rounded to avoid cracks or breaks during application.

The following are general criteria for fixing. These must be analysed on a case-by-case basis, by the person responsible for the work, depending on the height of the building, its geographic location and exposure to winds:

- a) Pitches up to 100%: In most situations, fixing is not necessary;
- b) Pitches between 100% and 150%: One in every five roof tiles must be fixed (regularly distributed).
The tiles on the perimeter of the roof may all be fixed;
- c) Pitches between 150% and 200%: It is recommended to fix all roof tiles;
- d) Pitches over 200%: The application of Portuguese roof tile models is not recommended.

* 4,8x38 mm self-drilling screws or 4,5x40 mm self-tapping screws for models F3+, GLOBAL and SIRIUS.
4,8x50 mm self-drilling screws or 4,5x60 mm self-tapping screws for the TECNO model.



4.5x40 mm self-tapping
Phillips flat head screws
For wood battens
For models F3+, GLOBAL
and SIRIUS



4.8x38 mm self-drilling
screws
For metal battens
For models F3+, GLOBAL
and SIRIUS



4.8x50 mm self-drilling
screws
For metal battens
For the TECNO model



4.5x60 mm self-tapping
Phillips flat head screws
For wood battens
For the TECNO model



Sealing washer in zinc.
Øint. 5mm Øext. 14mm

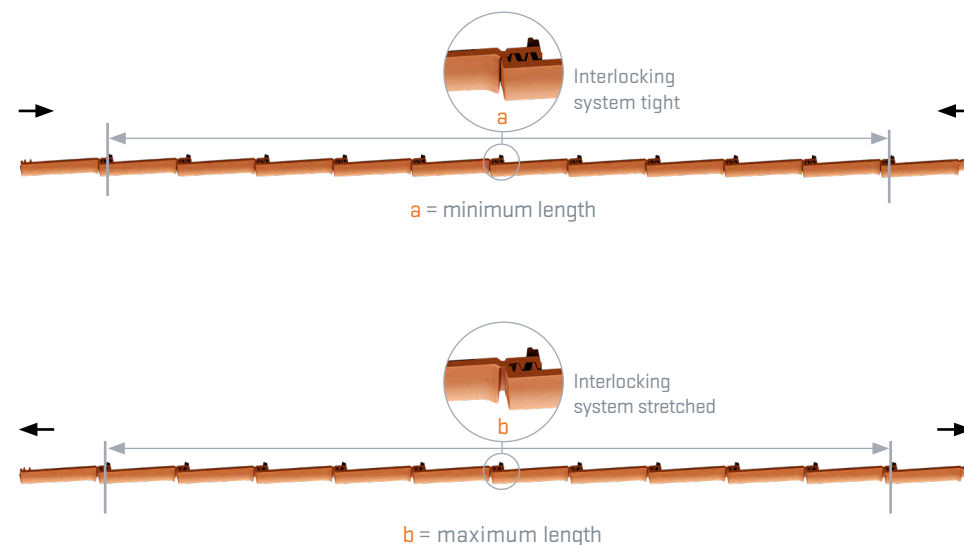
2.3 CALCULATING THE DISTANCE BETWEEN BATTENS

In order for the tiles to interlock together perfectly and fit the support structure correctly, the supporting battens must be distanced appropriately.

To calculate this distance:

- Place 12 interlocked roof tiles upside down on a flat surface (see schematic below).
- Measure length 'a' with the tiles set as closely together as the interlocking system allows.
- Measure length 'b' with the tiles set as far apart as the interlocking system allows.
- The average distance between the battens (from top to top of each batten) is then calculated as follows:

$$\text{Distance between battens} = (a + b) / 20$$



The calculation must be carried out on-site, with the material supplied, and mixing tiles from several pallets.

The recommended distance between battens (indicative measurement) can be found on page 02 - Characteristics of Portuguese tile.

DID YOU KNOW...?

A support structure that is well executed and correctly calculated speeds up the process of laying the tiles, saving in labour costs as a result. Furthermore, it ensures the correct interlocking and overlapping of the tiles contributing to an effective and aesthetically balanced roof.

03 MARKING THE ROOF AND INSTALLING THE ROOF TILES

In order to achieve a uniform and balanced distribution of the tiles on the roof, as well as minimize cuts and difficult adjustments, the roof must be marked both horizontally (rows) and vertically (columns). The planning and marking of the roof also makes it possible to identify situations where complementary fittings can be used, making the overall installation of the roof easier.

1 MARKING THE POSITION OF THE BATTENS (ROWS)

First, decide what the overhang of the tiles located at the eave will be (these can be standard tiles, Eave tiles or Curved finish eave tiles – see section 04). After, using a chalk line, mark lines parallel to the roof eave (starting at the bottom and moving upwards), distanced from each other by the measure previously calculated in section 2.3. Any necessary adjustment should be made on the last/top row of tiles, by the ridge. Then, install the battens according to the markings made.

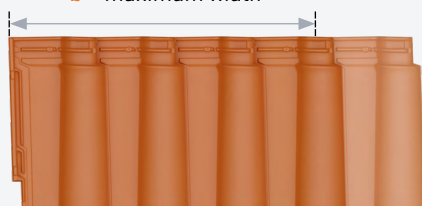
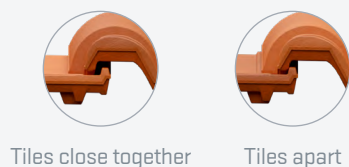
2 MARKING COLUMNS

Marking columns (each being equivalent to the width of 4 tiles) helps ensure all roof tiles are positioned in a uniform way. Calculating the columns width is done in a similar way to what was previously done to calculate the distance between battens, but now **interlocking the tiles laterally**.

- Place 5 roof tiles interlocked on a flat surface (see schematic below).
- Measure width 'a' with the tiles set as closely together as the interlocking system allows, and width 'b' with the tiles set as far apart as possible.
- The average width of the columns is then calculated as follows:

$$\text{Width of columns} = (a + b) / 2$$

a = minimum width
b = maximum width



Then, define the position of the 'base reference tile for marking' relative to the gable (see schematic on the next page). From there, use the width calculated above to mark the columns, in lines perpendicular to the battens, and from right to left.

This marking also helps predict where the last tile of each row will sit, at the left gable. By playing with the available lateral room provided by the interlocking system of the tiles, we can bring all tiles in a row slightly closer together or further apart to make sure each row ends with an entire tile without having to make any adjustment cuts.

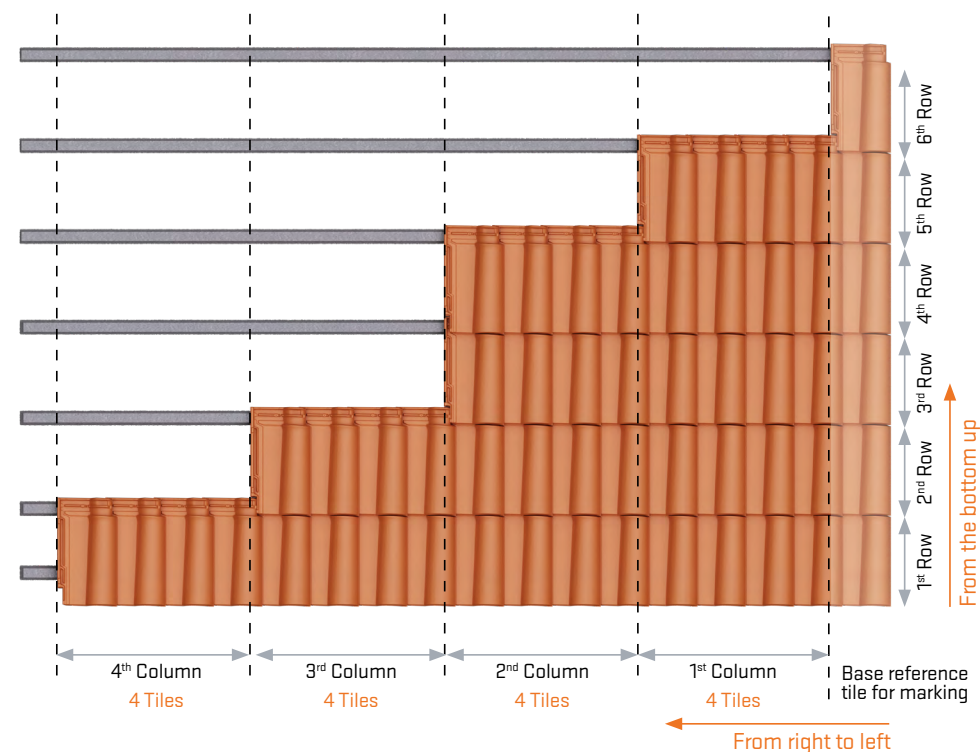
Indicative column width (average of 4 tiles) by roof tile model:

TECNO (natural red colour) = 83,8 cm	GLOBAL (natural red colour) = 85 cm
TECNO (natural white colour) = 84 cm	F3+ (natural red colour) = 83 cm
SIRIUS (natural red colour) = 83,6 cm	F3+ (natural brown colour) = 82 cm

3 LAYING THE ROOF TILES

Install the tiles starting on the right-end of the slope going left, and from the bottom going up, according to the column markings made (see schematic below).

When installing the tiles, we recommend randomly mixing tiles from several pallets in order to minimize slight variations in size and colour. These are considered normal due to the nature of the clay material and the tiles manufacturing process.



04 EAVES

The eaves of a Portuguese roof can be finished using either standard portuguese tiles, Eave tiles (available in the TECN0 range only), or using a Portuguese curved finish. These alternatives are explained below in sections 4.1 and 4.2.

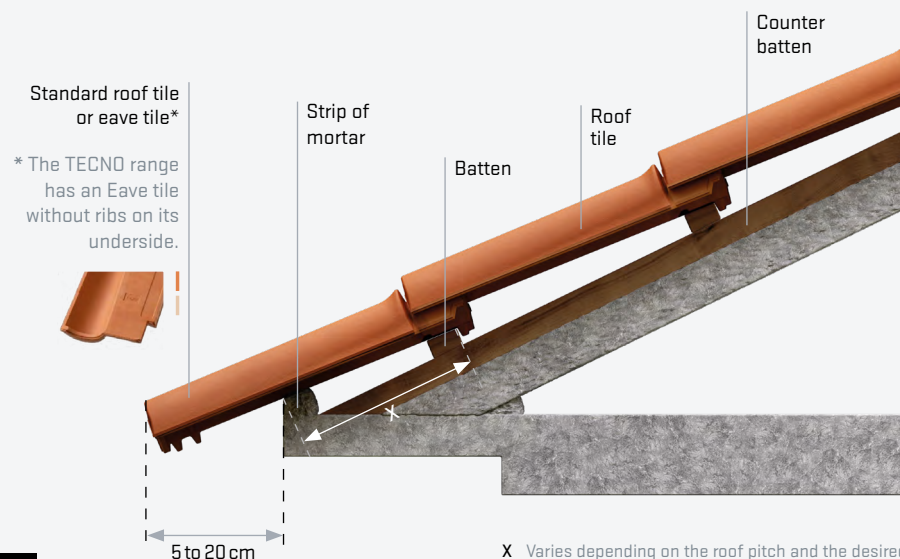
4.1 EAVE FINISHED WITH STANDARD ROOF TILES OR EAVE TILES*

Install the eave as follows:

1. Decide how much the tile will overhang, keeping in mind that the weight of the tile should be properly supported by the first batten. It's recommended a maximum overhang between 5 and 20 cm;
2. Mark and secure the first batten and, using the distance between battens calculated in section 2.3, mark and secure the other battens all the way from the eave to the ridge.
3. Support the front of the tile at the eave with a ventilated batten with a mechanically-fixed bird comb or, alternatively, with a strip of mortar suitable for securing clay materials (in which case small holes should be made on the strip of mortar to ensure air can enter the roof).



Bird comb at the eave



* The TECN0 range has an Eave tile without ribs on its underside.

X Varies depending on the roof pitch and the desired overhang of the tile at the eave in relation to the cornice.

If the roof has corners, use at its eave the fitting Eave corner (or a Valley end tile for inner corners).



Eave corner
(4 pieces, including a Double Tile)



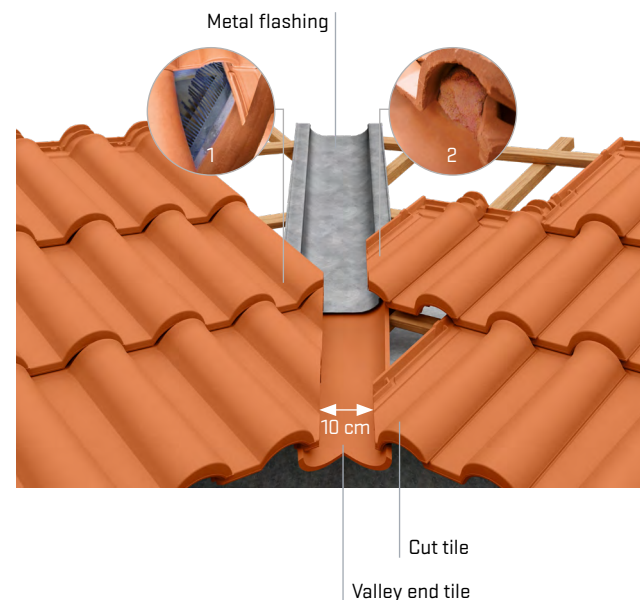
For more information, refer to the Eave corner installation sheet, available in the corner packaging or coelhodasilva.com.

The Valley end tile is the clay piece that finishes the eave at an inner corner. It is over this piece that a metal flashing or membrane is installed to receive the water that flows from the adjacent slopes (see image below).

When installing the Valley end tile and the valley gutter, the minimum recommended distance between the cut tiles on each side of the valley is 10 cm. This will allow effective drainage and avoid the accumulation of debris.



Valley end tile



The barrel of the tiles next to the valley must be closed with a bird comb (detail image 1) or mortar (detail image 2).

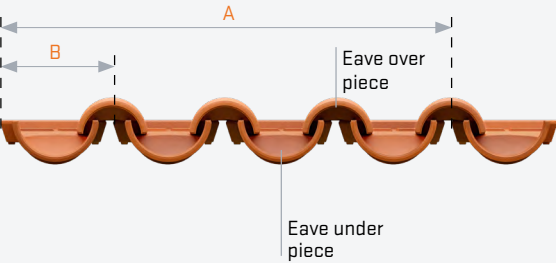
4.2 EAVE WITH PORTUGUESE CURVED FINISH

“Portuguese curved finish eave” is the designation of the eave finish done using fittings (eave under and eave over pieces) that simulate the look of the old barrel roof tiles. Eave Under Pieces are designed to support the Over Pieces, while the latter have an interlocking system to be appropriately overlapped by Portuguese roof tiles.

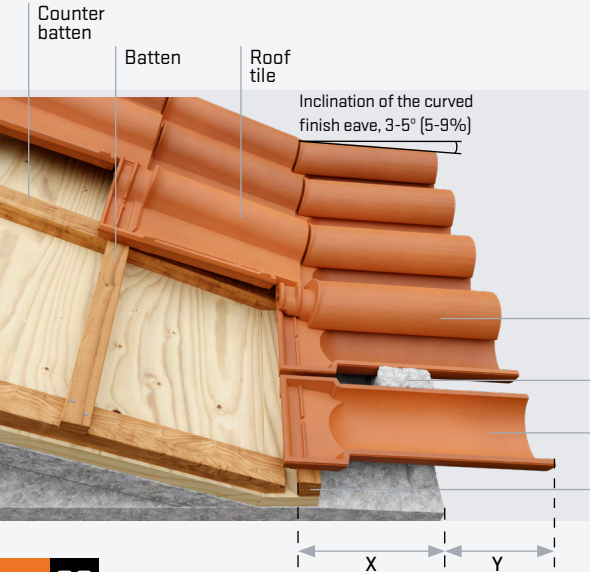


A Portuguese curved finish eave is installed as follows:

- 1. Depending on the size of curved finish eave chosen (40, 49 or 65), decide what the overhang of the eave will be, keeping in mind that the weight of the Eave under piece should be properly supported by the first batten (see recommended overhang measurements below, “Y”).
- 2. Once you have defined the overhang and location of the batten that will support the Eave under pieces, install the Eave under piece supported at its front by a strip of mortar suitable for securing clay materials. Then, install the Eave over piece, and then a Portuguese roof tile overlapping it, marking the position of the second batten, which will support the first row of roof tiles.



Width by model (in cm)	A	B
TECNO (natural red)	83,8	20,9
TECNO (natural white)	84	21
SIRIUS (natural red)	83,6	20,9
GLOBAL (natural red)	85	21,2
F3+ (natural red)	83	20,8
F3+ (natural brown)	82	20,5



Overhang	Y
Curved finish eave 40	Up to 20 cm
Curved finish eave 49	Up to 26 cm
Curved finish eave 65	Up to 36 cm

- Eave over piece
- Strip of mortar
- Eave under piece
- Adjustment batten

X Varies depending on the roof pitch and the desired overhang (Y) of the eave tile.

Note: The minimum roof pitch needed to install a curved finish eave is 20° (36%).



CURVED FINISH EAVE CORNER AND INNER CORNER



If the roof has corners, use the fittings Curved finish eave corner or Inner corner, respectively. Both these fittings are available in 40, 49 and 65 sizes.



Curver finish eave corner (11 pieces)
Available in sizes 40, 49 and 65*



Curver finish eave corner (8 pieces)
Available in size 40



Curved finish eave inner corner
Available in sizes 40, 49 e 65*



Eave under piece 40



Eave under piece 40 ^{*1}



Global eave over piece 40 ^{*2}



For more information, refer to the Curved finish eave corner installation sheet, available in the corner packaging or coelhodasilva.com.



Eave under piece ^{*1}



Eave over piece 49 ^{*1}



Eave under piece 65 ^{*1}



Eave over piece 65 ^{*1}

DID YOU KNOW...?

If the inclination of the curved finish eave is too low, the clay pieces will retain moisture for longer, preventing its drainage, evaporation, and easing infiltrations into the interior.

ALSO REFER TO: INTERNAL GUTTER FINISH ON PAGE 24.

* The 49 and 65 size are only available in Natural Red.

^{*1} Availabel in the Tecno, Sirius and F3+.

^{*2} Availabel in the Global.

4.3 PORTUGUESE CURVED FINISH AT THE GABLES

Finishing the gable using a curved finish maintains, along the gable, the same aesthetic of the curved finish eaves (see section 4.2).

The following images describe the main steps on how to install it with pieces size 40 (which is also valid for pieces size 65).



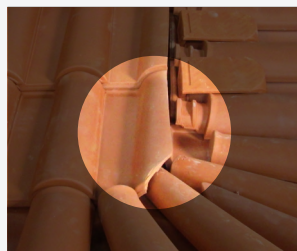
1.

To install a curved finish on the gable, it is crucial that the batten that supports the curved finish pieces (more specifically the Eave under pieces) is about 4 cm above the level of the battens that support the roof tiles. In the transition from the eave to the gable, use a Curved finish eave corner 40 (8 pieces), followed by Eave under pieces, Eave over pieces and Under-ridge wedges between the pieces.

The connection of the curved finish pieces and the corner needs to be checked depending on the inclination of the gable itself.

2.

On-site, adapt the roof tile (or Double tile if on the other side of the roof slope) with a longitudinal cut on the barrel as well as on the first roof tile to match the Curved finish eave corner.



3.

Installation of the Right or Left curved finish eave hip starter, followed by Ridge tiles, over the cut roof tiles and curved finish at the gable.

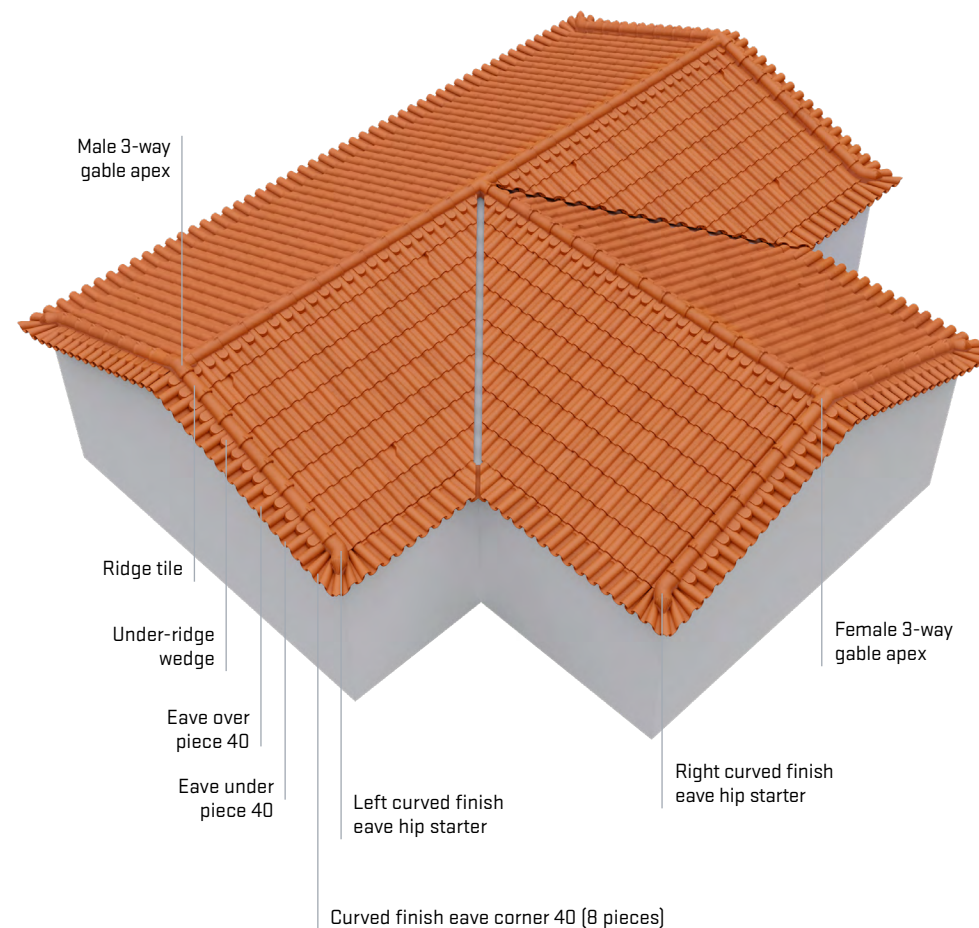
To fix the ridge tiles and Hip starter, use only 2 strips of mortar suitable for securing clay materials.



4.

Finally, at the ridge, use a Male or Female 3-way gable apex.

With the exception of step 2, the whole process is similar for both sides of the roof slope.



Male 3-way gable apex



Female 3-way gable apex



Left curved finish eave hip starter



Right curved finish eave hip starter

05 VENTILATION

Good air circulation on the underside of roof tiles is essential for the good performance and durability of a roof, promoting its quick drying, reducing the presence of moisture and preventing condensation and potential peeling.

Respecting the correct roof pitches and using an adequate batten support structure are necessary to ensure an efficient ventilation of the roof. However, **air inlets and outlets are also essential** to facilitate air circulation. This can be provided through the installation of ventilation tiles (with or without a safety step).

CALCULATING THE NUMBER AND DISTRIBUTION OF VENTILATION TILES

It is recommended a minimum of 1 Ventilation tile per 9m², distributed in a crossed way in 2 or 3 lines, providing **air inlets close to the roof eave (2nd row) and outlets close to the ridge** (penultimate row). This ratio must be checked on roofs of complex geometry, maintaining the same principle of ensuring air inlets and outlets, through ventilation tiles on all roof slopes.

- Roof slopes of up to 6 metres: – distribution in 2 lines;
- Roof slopes of over 6 metres: – distribution in 3 or more lines.

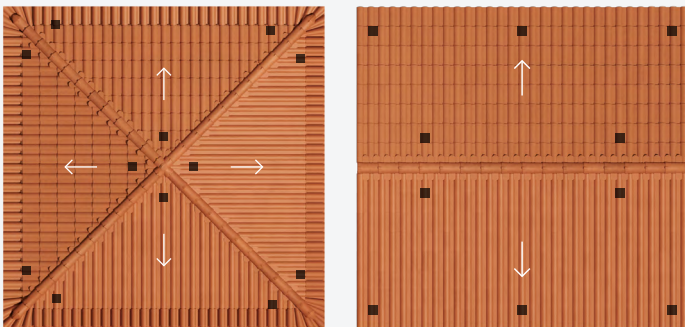


Ventilation tile

Note: Ventilation tiles are provided with metal meshes to prevent the entry of animals and dirt. Place them in the tiles opening, in the groove that exists for that purpose, secured with a suitable glue and seal product.



Safety step and ventilation tile



Example of ventilation tiles distributed over 2 lines.

■ Ventilation tile

DID YOU KNOW...?

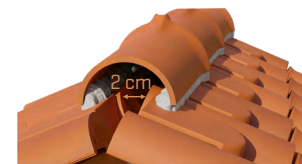
A well-ventilated roof preserves its original appearance for longer, prolongs the durability of the tiles and contributes to the health and thermal properties of the building.

06 RIDGES AND HIPs

On the ridges and hips, use under-ridge wedges and ridge tiles. There are two possible installation methods:

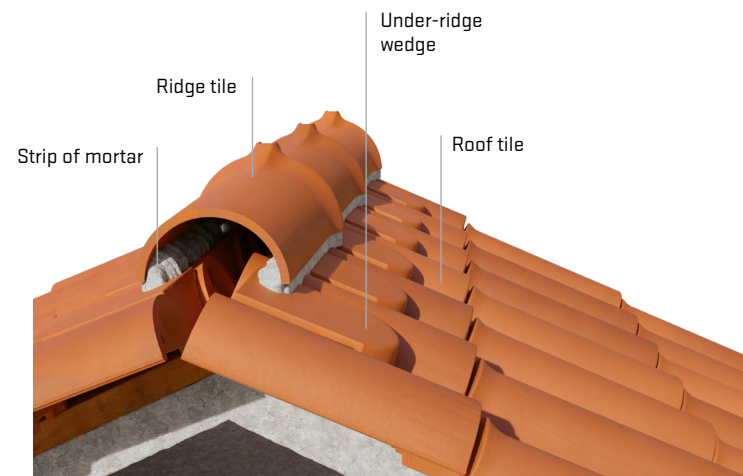
- Using mortar (section 6.1)
- Dry installation (section 6.2)

Whatever the method, it's crucial to ensure there is good ventilation along the ridge and hips. So make sure there is a space of about **2 cm** inside the ridge tiles, between the roof tiles that form the top row of each slope, to allow the air to circulate.



6.1 INSTALLATION USING MORTAR

1. Using mortars suitable for securing clay pieces, apply **two strips of mortar** (one on each roof slope) in the area where the Ridge tile will sit, as shown in the schematic below. To ensure air circulation through the roof as well as inside the ridge and hips, it's important to use only a moderate amount of mortar - **the inside of the ridge tiles must not be filled with mortar**.
2. Remove any excess of mortar outside of the ridge tiles and clean the area immediately before it dries, using clean water and a damp sponge.



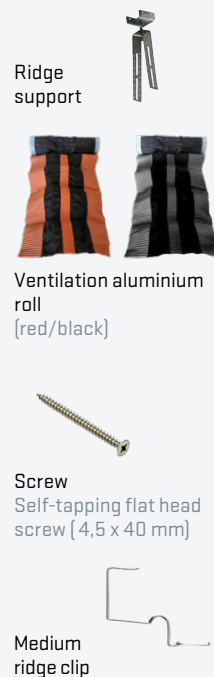
DID YOU KNOW...?

Some manufacturers supply ready-made mortars suitable to use on clay roofs without compromising the performance of the clay pieces. These are available in various tones for a better aesthetic finish depending on the colour of the roof tiles.

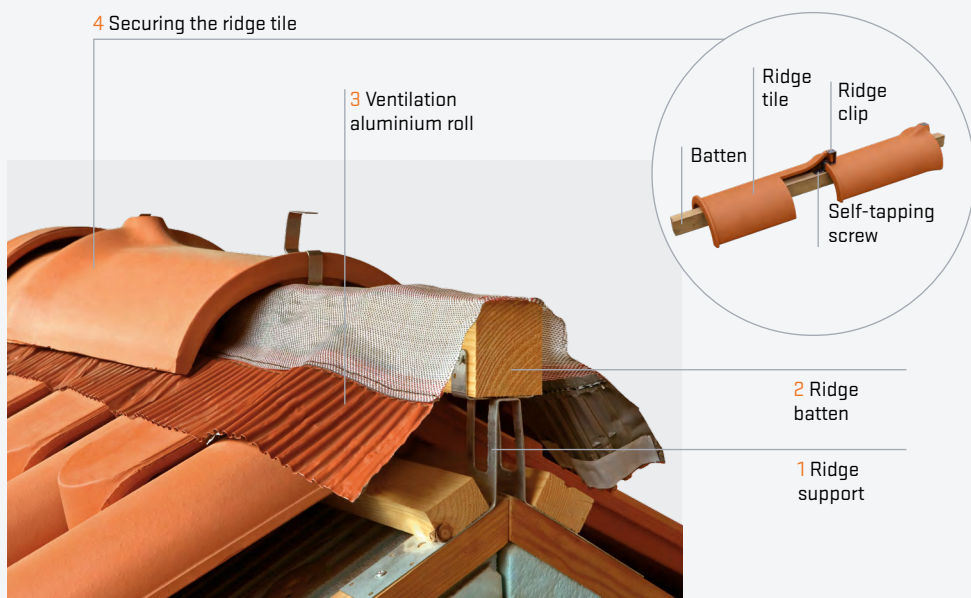
6.2 DRY INSTALLATION

Dry installation is an alternative to traditional mortar fixing methods of ridge and hip lines. It guarantees a very effective ventilation, using specific fittings for the purpose. This is a clean, quick and easy job, that can be summarized in 4 steps:

1. Adapt the Ridge support to the roof pitch and desired height, fixing it together with the adjustment batten that's near the ridge. Ridge supports should be distanced approximately 70cm from each other along the ridge line, with reinforcement in the areas where ridges intersect or transition to hips.
2. Place the ridge batten in the "U" shaped socket of the Ridge support and screw it through the lateral holes of the support.
3. Install the Ventilation aluminium roll. Align the central area of the roll with the ridge (or hip) batten and overlap the roof tiles on both sides with the adhesive flaps.
4. Install the Ridge tile using a Ridge clip screwed to the ridge batten at the "nose" end of the tile and.

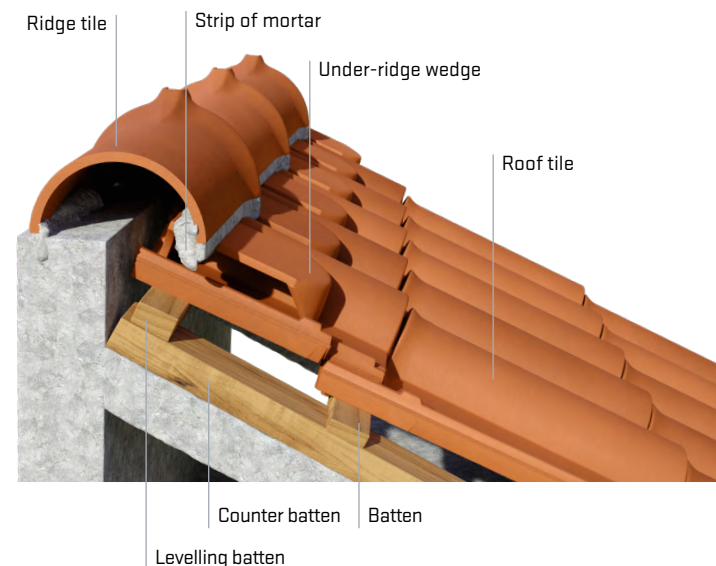


4 Securing the ridge tile



6.3 MONOPITCH - FINISH WITH RIDGE TILES

In situations where the roof has only one slope, the installation of the ridge follows the same principles as the two previous methods, as illustrated in the image below:



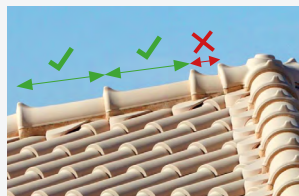
6.4 HIP

On the hips, because of the orientation of the line where the slopes meet, cut the Under-ridge wedges by one of the existing grooves on their back, and align that cut with the cut of the roof tiles. Then, secure the Hip starter approximately 20 to 30 cm from the edge of the Eave corner.



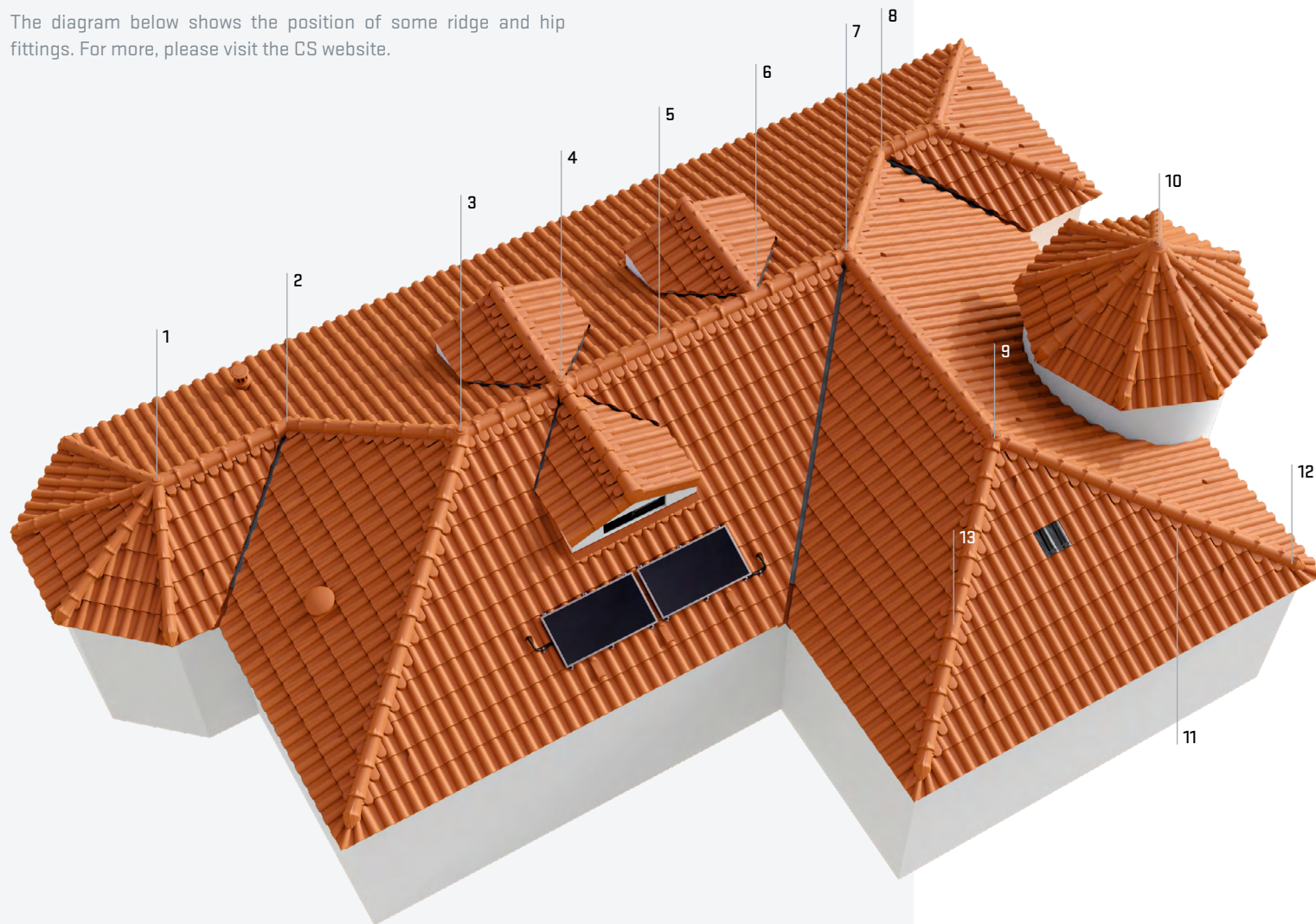
6.5 JOINING THE HIP WITH AN APEX

For a better aesthetic and functional finish, before securing any ridge tiles on a hip, distribute them sensibly along the hip, playing with their overlap, in order to avoid cutting the top ridge tile just before the apex (which sometimes results in a small and disproportionate piece).



6.6 MAPPING COMPLEMENTARY FITTINGS

The diagram below shows the position of some ridge and hip fittings. For more, please visit the CS website.



EXCLUSIVE CS



1 30° PG 5-way apex



2 Right ridge tile



3 Female 3-way apex



4 Flat 4-way apex



5 Female ridge tile



6 T-shaped 3-way apex



7 L-shaped 3-way apex



8 Left ridge tile



9 Male 3-way apex



10 Turret 8-way apex



11 Under-ridge wedge



12 Hip starter



13 Ridge tile

07 GABLES

Gables can be finished in 3 different ways, described below in sections 7.1 to 7.3.

7.1 GABLE RAKES AND RIDGE END CAP

Where the roof meets the gable, the best aesthetic and functional finish is achieved using gable rakes and a ridge end cap. It is an alternative to the usual use of firewalls or parapets.

Requiring **prior roof planning**, this solution uses left and right gable rakes (identified respectively with the letters 'E' and 'D'). Each piece has two pre-half-drilled holes on the side and one on the top to **secure the pieces to the structure** using screws and sealing washers **without the need to use mortar**.

A **Ridge end cap** is then installed at each extremity of the ridge, overlapping both top Gable rakes and **closing the opening at the first and last Ridge tiles**. It should be secured, if possible, using its two pre-half-drilled holes.

It may be necessary to cut the exposed male side of the last Ridge tile for the Ridge end cap on that end to fit properly.

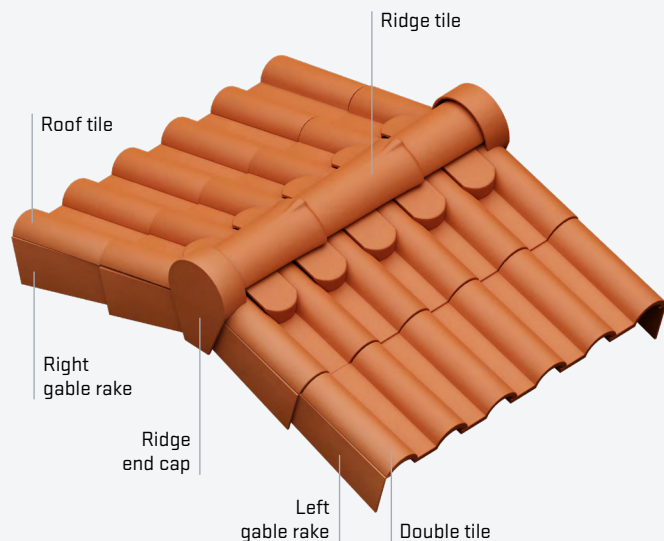
So the Ridge end cap can fit properly, it may be necessary to cut the male side of the last Ridge tile, on one of the ridge sides.



Left and Right gable rakes
Both gable rakes have three pre-half-drilled holes



Ridge end cap



7.2 BASIC GABLE FINISH

A basic gable finish is done using standard roof tiles along the right-end of the roof slope, and Double tiles or Half tiles along the left-end of the roof slope. The pieces along the gable are secured with a vertical strip of mortar (suitable for securing clay materials) applied (only) where the pieces sits.



3 to 3,5 cm

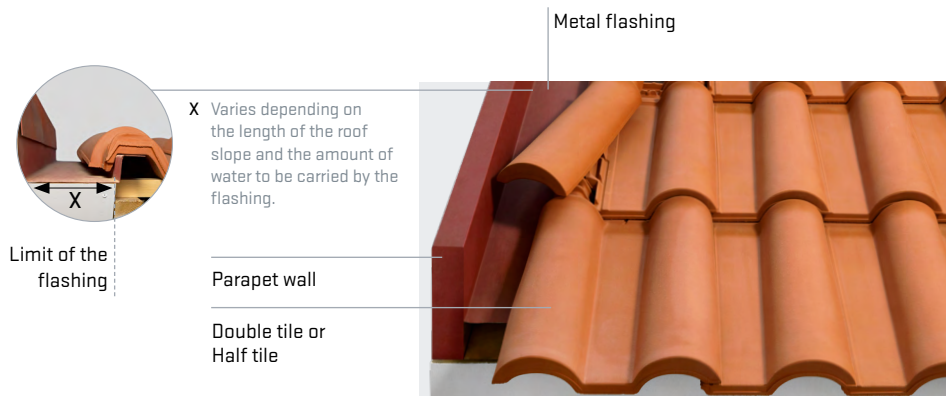
Double tile



To allow dripping, the pieces along the gables should **overhang about 3 to 3,5 cm beyond the wall** (as shown in the image), similarly to what happens on the eave.

7.3 GABLE WITH PARAPET WALL

This is done in the same way as in section 7.2 above, although now tiles are installed over a side metallic flashing or membrane that makes the transition between the tiles and the parapet or firewall along the gable.



X Varies depending on the length of the roof slope and the amount of water to be carried by the flashing.

Limit of the flashing

Parapet wall

Double tile or Half tile

DID YOU KNOW...?

When finishing the gable with a parapet or firewall, it is crucial to use side gutters as a transition between the tiles and the wall. Do not 'embed' tiles directly into the wall as this not only makes it difficult to replace them if they break, but also often results in serious infiltration issues.

08 OTHER INSTALLATION SCENARIOS

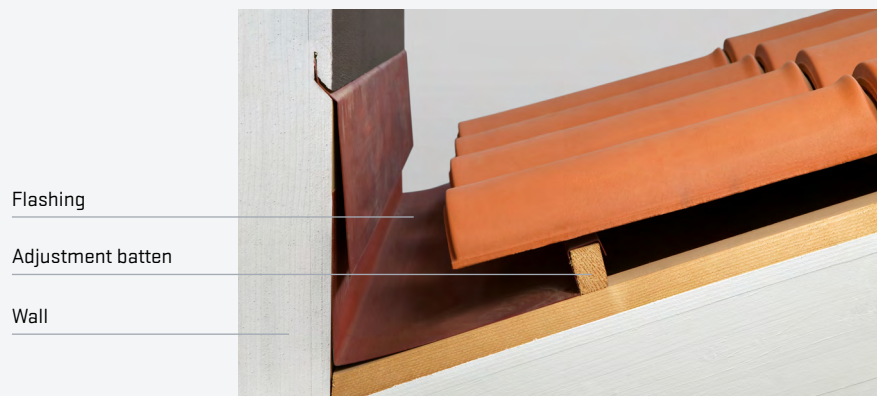
The following scenarios illustrate frequent finishing situations on roofs and the correct way to resolve them, using flashing or other transition materials.

8.1 INTERSECTION WITH VERTICAL WALLS

Finishing against a wall at the top of the slope



Finishing against a wall at the bottom of the slope

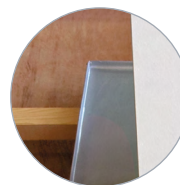


As an alternative to metal flashing, there are other viable transition solutions on the market, namely multi-purpose or specific adaptable membranes. Their installation instructions, durability and warranties must be supplied by the manufacturer.

8.2 INTERSECTION WITH A CHIMNEY



The areas where roof tiles and masonry chimneys meet must be done using custom-made or adaptable metallic flashing, and/or self-adhesive and waterproof multi-purpose membranes.



A rim with a minimum height of 2 cm must be created on the top and sides of the metal flashing to prevent water from entering the roof.



Double tile placed over the metal flashing

The metal flashing should coincide with the flat part of the roof tile

X Varies depending on the length of the roof slope (from the eave to the ridge) and the amount of water to be carried by the metal flashing.

DID YOU KNOW...?

The area surrounding the chimney is a critical part of the roof that must be monitored regularly to ensure it is clean and well maintained.

8.3 INTERNAL GUTTER FINISH

An internal gutter is located before the eave (or curved finish eave) in order to remain as discreet/hidden as possible. It collects and drains the water from a roof slope without going through the eave tiles (or eave under pieces in the case of a curved finish eave). The transition materials and installation methods follow the same principles explained in the previous sections.

When using the **TECNO model**, an internal gutter can be done using the **Internal gutter finish** piece. This clay fitting overlaps the metal gutter, providing a uniform and continuous clay finish.



Exemple of an internal gutter using flashing

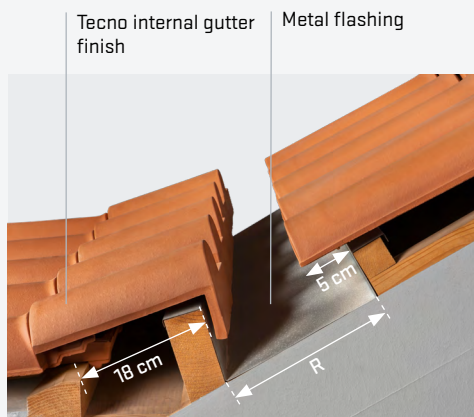
EXCLUSIVE CS



Tecno internal gutter finish



Example of the installation of the Tecno internal gutter finish piece with the Portuguese curved finish eave.



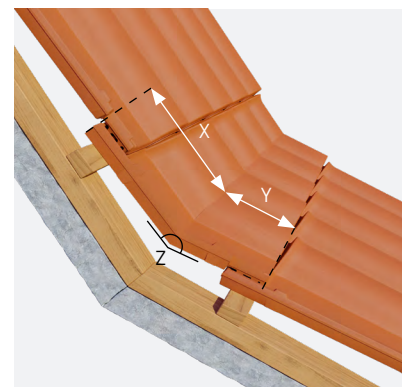
R Depending on the length of the roof slope and the amount of water to be carried by the metal flashing.

09 EXCLUSIVE CS FITTINGS

EXCLUSIVE CS

9.1 MANSARD ROOF

These fittings are “made to measure” to fit the measurements of each specific job - measurements “X” and “Y” vary depending on the desired angle “Z”.



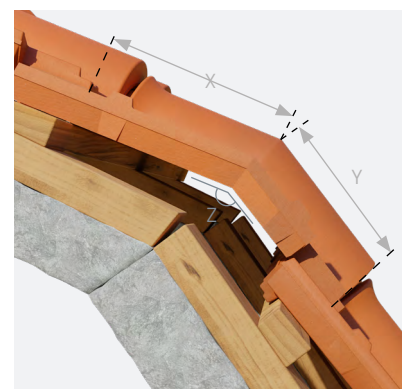
Concave mansard



Concave mansard tile



Concave mansard ridge tile



Convex mansard



Convex mansard tile



Convex mansard ridge tile

X / Y

Minimum: 15cm | Maximum: 35cm

Note: 'X' and 'Y' may either be the same or different measurements, but the sum of both must not exceed 500mm.

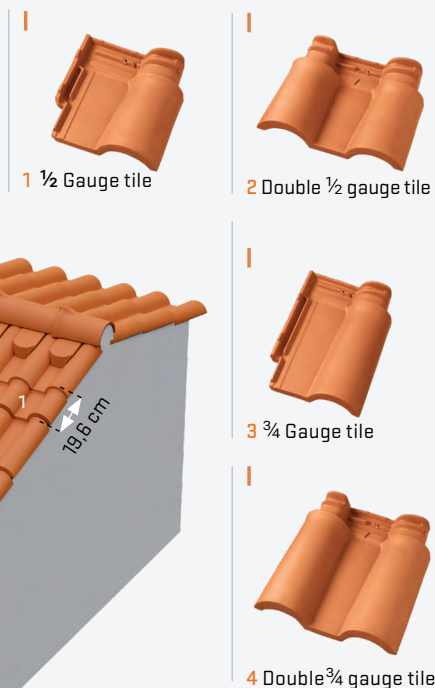
DID YOU KNOW...?

The use of internal gutter finishes allows a better clay finish at the eave, avoiding the need for highly visible external gutters.

9.2 TECNO ½ GAUGE AND ¾ GAUGE TILES

EXCLUSIVE CS

As the name implies, these fittings have ½ and ¾ of the gauge size of a TECNO roof tile. These pieces can be combined with their respective double tiles to adjust the roof slopes without the need for any tiles to be cut, for example, to keep the same overhang at the eave when the same roof slope varies in length (see diagram below).



9.3 GLASS TILE

The installation of Glass tiles must take place at the same time as that of the clay tiles in order to ensure their compatibility, which may be compromised if installed after the roof is completed. It is not recommended to apply more than 4 glass tiles together, in pairs.



Glass tile
Available in the Tecno and F3+ models



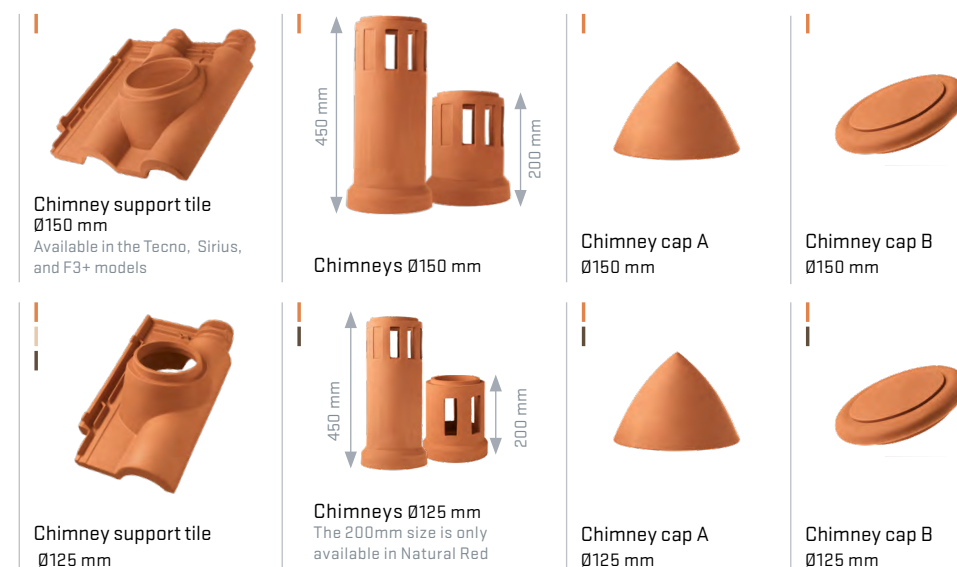
9.4 CHIMNEY SETS

CS EN

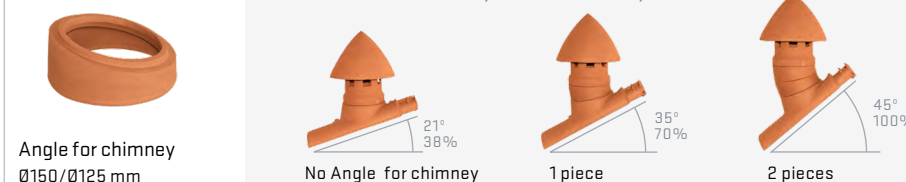
EXCLUSIVE CS

Clay chimney sets provide ventilation/exhaust outlets through the roof of sanitary facilities and kitchens. These sets consist of 3 parts: the chimney base (which design matches the model of the tile installed), the chimney and the chimney cap.

For most models, there are openings of 125 and 150mm, and chimney heights of 200 and 450mm available. The openings that exist in the chimneys must be oriented in the direction of the prevailing winds, so these go around the closed part, not affecting exhaust.



Depending on the roof pitch, the use of the Angle for chimney piece ensures the verticality of the chimney set.



9.5 JUNIOR RANGE

The Junior range features small-sized tiles in the perfect scale to cover chimneys, maintaining the traditional design of the roof, for a consistent overall aesthetic.

JUNIOR ROOF TILE

a: 270 x b: 150 mm

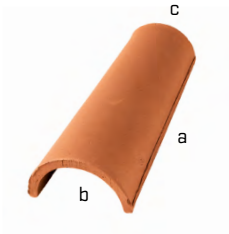


Tiles per linear metre	7,5
Tiles per m²	33
Overhang (recommended)	12 cm
Batten spacing (recommended)	23 cm



JUNIOR BARREL ROOF TILE

a: 235 x b: 90 x c: 65 mm



Tiles per linear meters	20
Tiles per m²	100
Overhang (recommended)	10 cm
Batten spacing (recommended)	19,5 cm



Junior portuguese ridge tile



Junior under-ridge wedge



Junior portuguese hip starter



Junior portuguese eave corner (3 pieces)



Junior portuguese male 3-way apex



Junior portuguese female 3-way apex



Junior portuguese 4-way apex



Junior eave under piece



Junior eave over piece



Junior curved finish eave corner (5 pieces)



Junior ball pyramid



Junior thin pyramid



Junior barrel hip starter



Junior barrel male 3-way apex



Junior barrel female 3-way apex



Junior barrel 4-way apex



Junior barrel eave corner (7 pieces)

9.6 UNIVERSAL RANGE

EXCLUSIVE CS

Due to its geometry and design, this range of fittings for the ridge and hips is compatible with all other roof tile models – Portuguese and Marseille.



Universal ridge tile



Universal hip starter



Universal ridge end cap



Universal 4-way apex



Universal 3-way apex
Male/female variants not required

10 ROOF MAINTENANCE

Like all other building materials exposed to the elements, the roof needs cleaning and preventive maintenance on a regular basis to ensure its functionality and good appearance. The following table summarizes the main maintenance actions and their recommended frequency.

MAINTENANCE ACTIONS	FREQUENCY	
	TWICE A YEAR	ONCE A YEAR
General inspection of the roof		■
Inspection of the water drainage system	■	
Inspection of transition areas like the perimeter of chimneys		■
Checking fixings of clay pieces		■
Clearing ventilation areas	■	
Elimination of moss/vegetation and other debris		■

REMOVAL OF MOSS/VEGETATION AND OTHER DEBRIS

It is recommended to remove moss/lichens, vegetation and other debris every year and whenever these compromise the efficient drainage of rainwater. **The roof should be washed with ONLY pressurized water and gentle brushing**, from the ridge downwards to the eaves. The use of water must be restricted to the minimum necessary for adequate washing, in order to prevent infiltrations during the process.

Alternatively, you can use the CS ANTIFUNGI product sold by CS. For more information on its features and application, please get in touch with CS Sales department.

ATTENTION

Maintenance work involving the application of sealants, paints, varnishes or other similar products on clay tiles is strongly discouraged, as they can cause their rapid and severe deterioration.

11 COMMON INSTALLATION ERRORS

The following table summarizes the most common installation errors, their consequences and the location in this manual where the correct installation is explained.

INSTALLATION ERROR	CONSEQUENCES	CORRECT INSTALLATION
Insufficient roof pitch	Each roof tile model must respect the minimum roof pitch indicated by its manufacturer, below which the tile can no longer perform its function correctly. An insufficient roof pitch compromises the efficient drainage of rainwater promoting the development of moss and favouring the accumulation of dirt, often causing infiltrations. It also contributes to the early deterioration of clay products (peeling) by keeping moisture on the tiles long after it has stopped raining.	01 Characteristics of portuguese tiles Page 02
Absence or inadequate support structure	Roof tiles installed directly onto the insulation material, on battens made of mortar, or without a counter batten, deteriorates quickly, particularly in areas where freeze-thaw cycles occur. The absence of ventilation space and/or vertical ventilation channels underneath the roof tiles keep moisture for longer periods, favouring the development of moss/lichens. This can result in undesirable aesthetic effects and lead to condensation.	2.1 Types of Supporting Structure Page 03
Incorrect calculation or installation of the batten structure	Roof tiles installed too tightly or too spaced out due to an incorrect calculation or installation of the batten structure lead to serious infiltrations and a lot of broken tiles during roof installation and maintenance/cleaning. And this often results in undesirable aesthetic effects.	2.3 Calculating the distance between battens Page 05
Insufficient inclination of the curved finish eave	Insufficient inclination of the curved finish eave prevents the correct drainage of rainwater, keeping moisture on the clay pieces for longer, resulting in infiltrations, accumulation of debris and a rapid deterioration of the tiles.	4.2 Eave with portuguese curved finish Page 10
Excessive use of mortars	Mortar is necessary to secure the tiles but, when used excessively, it can cause infiltrations and humidity inside the roof and on the tiles it is in contact with. This causes spalling/delamination of clay tiles, especially in climatic zones with freeze-thaw cycles. The moisture retained by the mortars makes it difficult for the roof to dry promoting the development of moss/ lichens. "Strong" mortars can also cause breakages and cracks in clay tiles.	04 Eaves Page 08 6.1 Installation using Mortar Page 15



INSTALLATION ERROR	CONSEQUENCES	CORRECT INSTALLATION
Insufficient ventilation	The lack of ventilation tiles, ventilation space and channels all the way from the eave to the ridge enhances the development of moss; increases the probability of condensation, spalling due to freeze-thaw cycles and the degradation of the roof support structure and other materials; and compromises the overall durability and appearance of the roof.	05 Ventilation Page 14
Not mixing tiles from different pallets before installing them on the roof	Mixing tiles from different pallets can reduce undesirable colour nuances in the roof. However, slight differences in shade between clay materials are normal, given the characteristics of clay as a natural resource and roof tiles manufacturing process.	03 Marking and Installing the Roof Tiles Page 06
Not using clay fittings	The performance and durability of the roof can be compromised when clay fittings are not used or are replaced by materials of a different nature (metallic, mortar, canvas, etc.). Clay fittings are the ones that resolve more perfectly, both functional and aesthetically, a number of roof situations.	04 Eaves Page 08 71 Gable rakes and ridge end cap Page 20 09 Exclusive CS Fittings Page 25
Lack of regular maintenance / cleaning	The lack of maintenance is responsible for most roof problems (infiltrations, moss, etc.), which would be easily avoided if the roof was checked before each winter and cleaned regularly (decide on the frequency depending on the characteristics of the surrounding area).	10-Roof Maintenance Page 30



12 ENVIRONMENTAL ASPECTS



ENVIRONMENTAL IMPACT OF EACH PHASE OF A ROOF LIFE CYCLE

Transport:

The construction of a building begins with the transport of materials to the construction site. In order to minimize the environmental impact of this phase, the associated logistics must be well-considered, namely the distances travelled and the use of vehicles with better energy and environmental performance.

Installation:

During this phase, mortar must be rationalized and never used in excess. This phase leads to material waste – packaging (plastics, straps, etc.), broken and cut tiles – as well as some noise and potential issues associated with cargo handling, and the emission of dust and exhaust gases. All waste must be sent to the appropriate licensed waste management operators.

Use:

There is no negative environmental impact of your roof while in use.

Maintenance:

Roof maintenance is a simple operation, consisting of cleaning vegetation debris (eg. moss, fungi), replacing any damaged tiles and washing the roof with water (keeping water usage to a minimum). Any waste resulting from this process must be discarded in the appropriate manner.

End-of-Life:

Once a roof reaches the end of its life, check if the roof tiles can be reused. If not possible, any waste resulting from the demolition or disassembling of the roof must be sent to a licensed operator (as mentioned, preferably to be reused).

ROOF TILE SEALANT, YES OR NO?

No. The use of waterproof sealants on clay roof tiles is a way of artificially decreasing the tiles water absorption capacity for a limited period of time. Its effect is actually quite short-lived (2 to 3 years) and eventually disappears.

Although sealants have been used for several years and interpreted by the market as the solution to prevent the appearance of moss, it is currently not recommended, especially not for more recent state-of-the-art roof tiles.

If the circumstances of installation and the surroundings of the building are favourable, the moss can set on both sealed and non-sealed tiles.

CS continues to supply sealed roof tiles in some ranges simply for commercial reasons, although warning of its inefficiency and risks, namely the occurrence of condensation.

CONDENSATION ON CLAY ROOF TILES. WHY IT HAPPENS AND HOW TO PREVENT IT?

Condensation is a common natural physical phenomenon that occurs when air saturated with water comes into contact with a cooler surface forming moisture, or droplets, on that surface. It happens in clay, glass, concrete, painted walls, aluminium, and other materials, and can occur with or without precipitation.

When condensation appears in clay tiles, it's a common misconception to think that there is a problem with the tiles or the roof. However, clay tiles are waterproof and an infiltration only happens if the roof is not well constructed.

To reduce the probability of condensation occurring, the roof must be well-ventilated and the minimum roof pitch recommended by the manufacturer respected, following the principles presented in this booklet. A breathable waterproof membrane can also be added to the roof to protect other materials.

Tiles to which a sealant has been applied are more prone to the phenomenon, that manifests itself on the underside of the tile.

PROXIMITY TO THE SEA AND THE EFFECT OF SALT. WHICH TILE SHOULD I CHOOSE?

Clay roof tiles, as most building materials installed in coastal areas, can be affected by salinity, resulting in its early degradation. This happens as the result of crystallization of soluble salts inside the tile, naturally absorbed when exposed to saline fog.

In order for the tiles to fulfil their role effectively in coastal areas and delay the effect of salinity, good installation practices must be followed (namely when it comes to the roof pitch, support structure and ventilation) and state-of-the-art roof tiles should be the go-to choice, given their low water absorption characteristics and high mechanical resistance.

Engobed tiles (coloured) are not recommended for coastal areas as their appearance can change in a short period of time due to the exposure to salt. When close to the sea, choose natural colours such as Natural Red, Natural Brown or Natural White, which are less affected by salinity. CS' product warranty does not cover the effect of salinity on clay tiles.

LOCATIONS WHERE FREEZE-THAW CYCLES OCCUR. WHICH TILE SHOULD I CHOOSE?

Despite being waterproof, clay tiles absorb some water when it rains. In areas of frequent freeze-thaw cycles, if there's a rapid drop in temperature, this absorbed water can freeze inside the tile. After many cycles, the tile may show spalling/delamination, which compromises its appearance and durability.

In order for roof tiles to efficiently fulfil their role in freeze-thaw climates, follow good installation practices (namely when it comes to the pitch and ventilation of the roof, so it can dry quickly) and choose state-of-the-art roof tiles, for their low water absorption characteristics and high mechanical resistance.

CS product warranty covers the spalling of clay tiles, provided that their installation instructions are duly complied with.

ARE COLOUR VARIATIONS A DEFECT?

Clay roof tiles and fittings have a natural raw material in their origin – clay. For this reason, their mineral composition can vary slightly which results in small (and expectable) colour/shade variations after the firing process, even when manufactured on the same date (and regardless of being in its natural colour or an engobe colour chosen from the marketing brochure). It's not possible to ensure absolute uniformity. These differences are acceptable, not considered a defect, and often welcomed as a nice visual effect in the overall natural aesthetic of the roof.

As a way to mitigate possible variations, we recommend mixing tiles at random from several pallets on site.

MOSS/LICHENS ON THE ROOF. HOW TO PREVENT AND REMOVE IT?

Moss and lichens are a common occurrence that, under the right light, temperature and humidity conditions, can develop on the surface of materials like clay, stone, paint, wood, concrete or even glass (which is not porous), affecting from floors to walls, façades or the roof.

The growth of moss on the roof is not possible to predict, but contributing factors are the proximity to vegetation and/or farmed land, the existence of shady areas, damp conditions, the orientation of the building and its exposure to sunlight, and atmospheric pollution. While it's impossible to control or avoid all these factors, a well-constructed roof is crucial in delaying and minimizing the growth of moss and lichens. Good ventilation throughout the roof is essential as well as all other factors that promote the fast drying of the roof materials such as an adequate support structure, air inlets and outlets, use of ventilation tiles, avoid excessive use of mortar, and respecting the minimum roof pitch recommended for your climate region.

Usually, just the aesthetics of the roof are impacted. However, the efficient drainage of rainwater can eventually be affected as well, and the stagnation of rainwater in certain areas can potentially lead to infiltrations.

To remove moss/lichens, wash the roof or apply a product of proven effectiveness, which must not harmful to the roof tile and other materials (see section 10–Roof Maintenance).





Coelho da Silva

PORTUGUESE
ROOF TILES
INSTALLATION
GUIDE

Tecno® Sirius® Global F3+

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