



THE PRESTIGIOUS ROOFING TILE

ROMAN

INSTALLATION GUIDE

FOREWORD

Version: May 2012

The function of this installation guide developed by Lama Group is to enable designers, specifiers, quantity surveyors, purchasers, contractors and other users to further understand Lama's installation methods and specifications. This installation manual guide applies only to roofs in Malaysia, Singapore, Brunei, Vietnam, Cambodia and Laos under the normal tropical climate conditions. Lama Roof Tiles in this document refers to the Lama ROMAN Profile.

This Installation Manual is the minimum standards for the installation standards of the Lama roof tiles but is not part of local standards or governmental requirements. In all situations where local building authority requirements are enforceable, its precedence should take place. The information and illustration provided in the Installation Manual is intended to be used with the judgement and experience of competent installers who needs to evaluate the significance and limitations of the materials contained and who will accept responsibilities for its applications. It is the duty and the responsibility of all users of this installation manual to find and obtain the latest edition of the manual, if any and must be used in conjunction with other relevant reliable standards or publications on the installation and fixing of standard concrete roof tiles.

The durability and the long term performance of a tiled roof depends to a large extend on the standards of the installation workmanship which will lead to leakages or high breakages should insufficient standards are applied. All installations using higher quality materials with higher level of insurance such as additional head lap or fastenings are allowed. Lama strongly suggests the installation of all Lama roof tiles using Lama manufactured or supplied roof accessories and cappings as these products are designed for, tested and proven to be used with our tiles, otherwise, may result in the void of warranties.

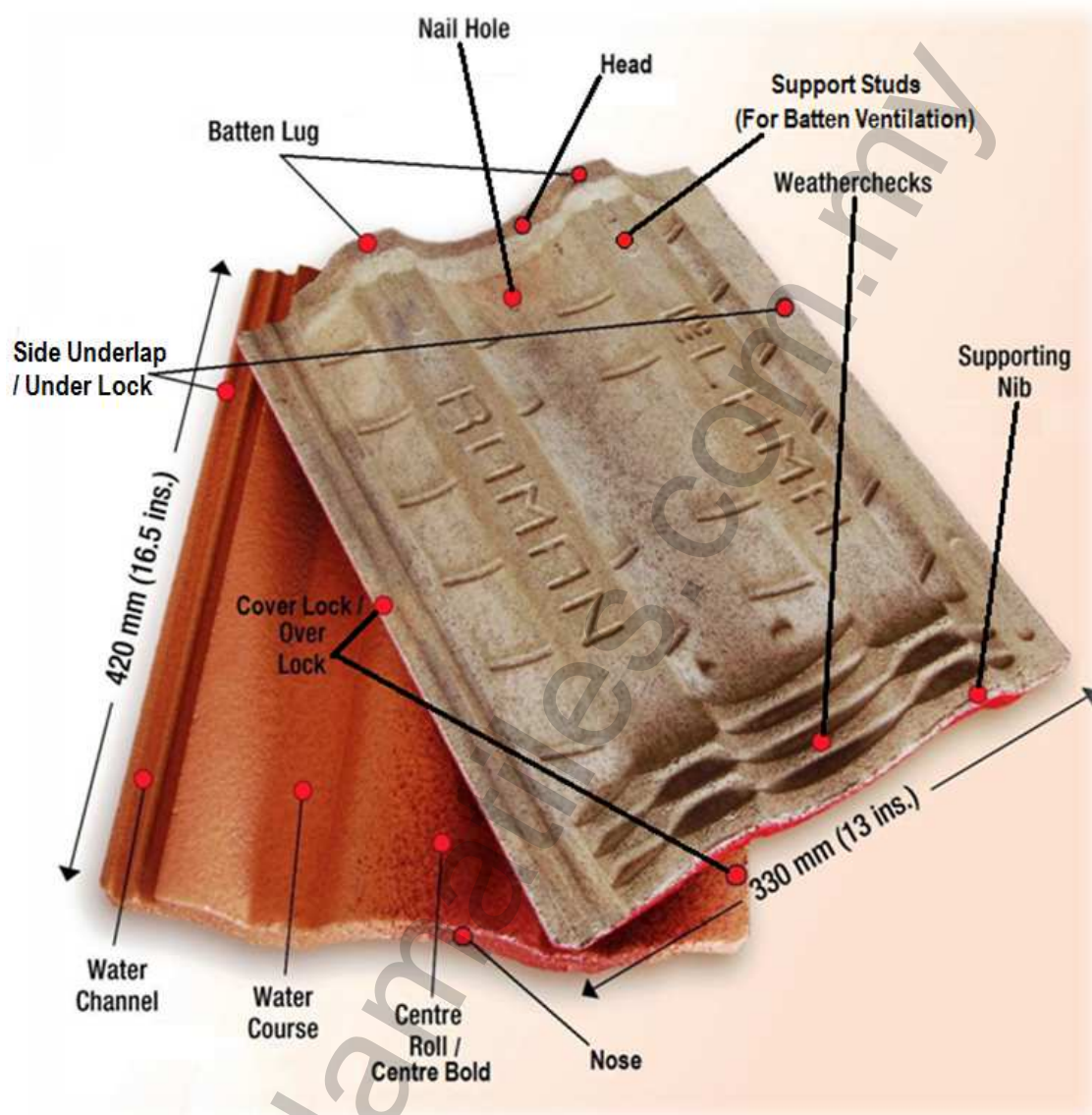
Should any unusual fixing situation arises and whereby this fixing is not illustrated in the installation manual, kindly please contact our staffs at any of our offices, branches or factories for further support.

Lama reserves the right to alter, remove or add to our product specifications as part of product or company operations improvements without prior notice. Specifications for products may differ between Malaysia and Vietnam, therefore, please obtain the correct version for your country. Lama Group disclaims any responsibility for the use of this document that directly or indirectly causes any injury towards any person or any damage in whatever manner, nor accepts any responsibility for any errors or omissions.

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1. TILE SPECIFICATION



PROFILE	Lama Concrete Interlocking Roofing Tiles With Triple Weather Checks - ROMAN Profile.
MATERIALS	Extruded Concrete Roofing Tile With Fused Pigmented Mono/Duotone Colour Coating
COMPOSITION	Portland Cement, Specially Selected Silicate Aggregates & Cement Based Colour Coating With Transparent Thermoplastic Finishing Coat
APPLICATION	Roof and Wall Covering Units
OVERALL SIZE	420mm (L) x 330mm (W) 16.5 inches (L) x 13 inches (W)
MINIMUM HEADLAP	76mm / 3 inches 100mm / 4 inches (Preferred)

COVERAGE	9.8 pcs / meter square Based on 76mm / 3 inches Headlap 91 pcs / 100 square feet
	10.6 pcs / meter square Based on 100mm / 4 inches Headlap 98 pcs / 100 square feet
TILE WEIGHT	Approximately 4.3 kgs / 9.5 lbs
FIRE RATING	Incombustible and Fully Fire Resistant
WATER ABSORPTION	Less Than 10%, Test MS797:PT1:1982
STANDARD TESTING	Transverse Breaking Strength In Saturated Conditions, Squareness Testing And Water Permeability Exceeding Requirements Of MS797:PT1 & PT2:1982, Specification & Aggregates Testing & Apparatus Calibration Methods Of MS29 & 30.
CERTIFICATION	SIRIM MS 797:PT.1:1982 & IKRAM Certification

2. LAMA ROMAN ROOF TILES

Lama ROMAN concrete roof tiles have interlocking profiles, ribbing, teeth, grooves etc. which allow linking together of tiles, securing, sealing and running off of surface water. They are used in residential construction of single and multiple houses, commercial buildings as well as schools etc. Lama ROMAN concrete roof tiles have the same physical characteristics as any other product constructed in concrete mix, such as:

- a) Impermeability (made possible by compression of the concrete mix)
- b) Durability
- c) Mechanical resistance to loads
- d) Resistance to physical and chemical aggression. As a consequence of mass and therefore of a compact and sealed surface, the tiles are resistant to aggressive atmospheric substances (eg: smog, salinity, industrial atmospheric pollutants, etc.)
- e) Dimensional stability. The system of pressure forming with aluminium pallets and the cold production process guarantees the tiles exactly repeatable dimensions and shapes even down to the more minuscule details, along with dimensional stability. This permits the tiles to be designed so that interlocking is achieved with maximum precision and without requiring large tolerances.
- f) Being concrete, raw materials qualities can be controlled much more easily due to its own chemical exothermic curing process as compared other materials that require heating or firing whereby shrinkage and warpage may occur if improperly controlled.

Lama's ROMAN Profile provides a larger water course compared to some of our competitors' for flowing a larger quantity of rain water during the frequent tropical storms, yet providing a centre bold high enough to prevent cross flow of rain water during strong cross winds. The triple weather checks also provides additional insurance against strong headwinds coupled with heavy rainfall.

The support required by Lama ROMAN concrete roof tiles is a small framing (parallel to the gutter line) of wooden battens placed at various distances from 310 to 343mm according to steepness of pitch. These batten strips in turn are directly supported by the rafters, if the rise permits, of by a more complex wooden frame for higher rises. Modern design metal roof trusses are widely acceptable as well, but pending to the recommendations of the manufacturer and the softwares used.

Lama ROMAN concrete roof tiles can also be combined with a variety of heat insulation, heat barrier as well as heat exhausting roof systems and accessories during its installation into a cool roof system.

3. ROOF DEFINITIONS /GLOSSARY

VERGE

The end edge (side of the exposed tile) of the roof surface at the gable or at its side ends.

EAVES

The lower or draining edge of a roof surface parallel to the ground.

VALLEY

The meeting area at the bottom of two inclined roof surfaces where the gutters and water channels are.

FASCIA BOARD

A board fixed to the end of the rafters, wall plate or the wall face that is immediately below the eaves.

GABLE

The part of the wall above the general level of the eaves at the end of a ridge roof or partially hip roof.

GABLE END TILE

Also known as the Vergé or Barge Tile, a tile that is used to cover the Vergé of the roof.

RIDGE

The meeting of two inclined roof panes at the peak apex of the roof and is horizontally / parallel to the ground.

RIDGE TILE END

The last Ridge Tile at the end of the ridge at where it meets the Gable.

HIP

The meeting line at the top of two inclined roof panes.

HIP STARTER

The starting tile of the hip.



HIP STARTER

The starting tile of the hip.

RIDGE

The meeting of two inclined roof panes at the peak apex of the roof and is horizontally / parallel to the ground.

HIP

The meeting line at the top of two inclined roof panes.

VERGE

The end edge (side of the exposed tile) of the roof surface at the gable or at the side ends.

VALLEY

The meeting area at the bottom of two inclined roof surfaces where the gutters and water channels are.

EAVES

The lower or draining edge of a roof surface parallel to the ground.

TOP ABUTMENT

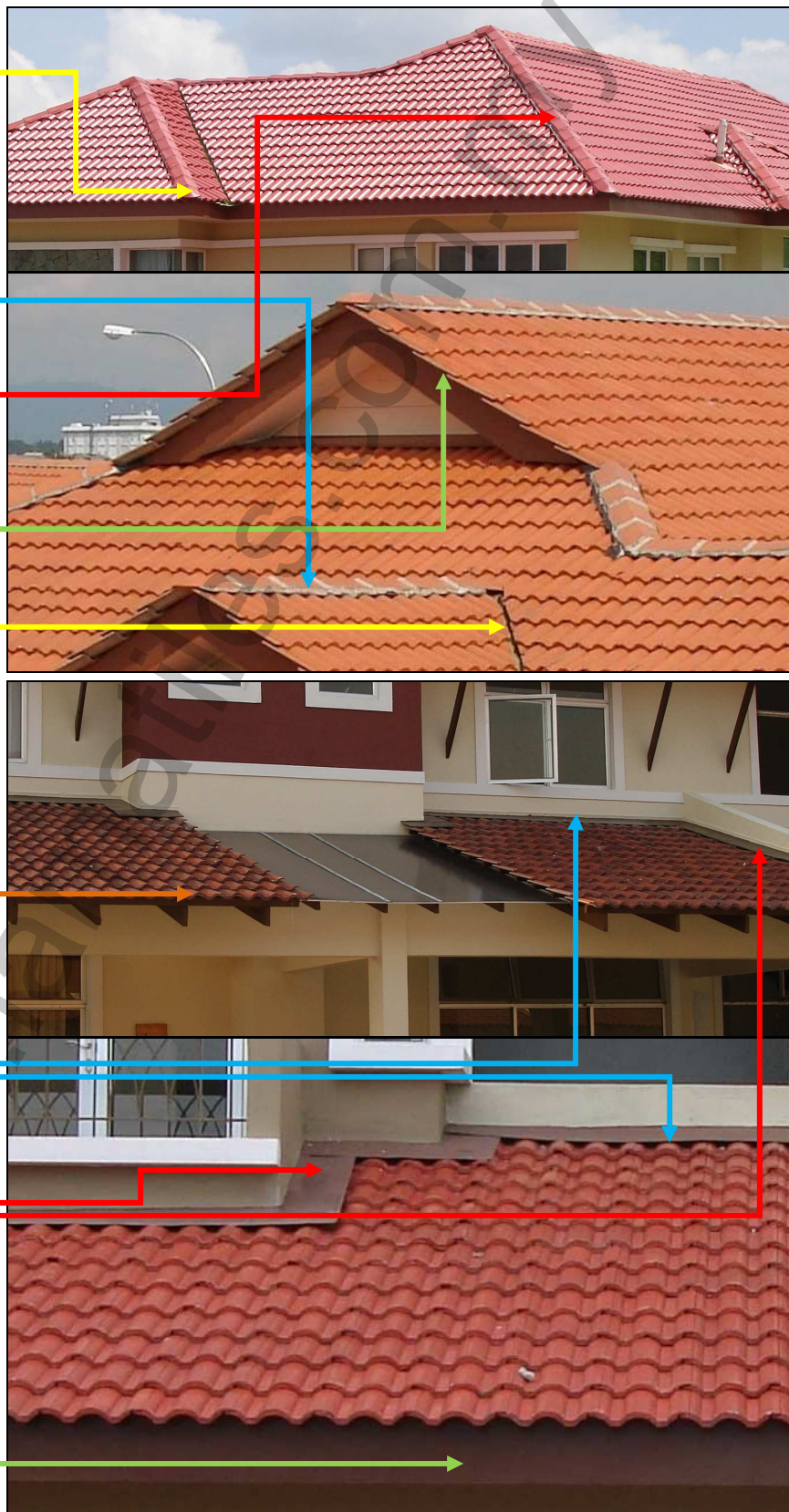
The intersection of a roof surface with the wall that rises above it.

SIDE ABUTMENT

The intersection of a roof surface with the wall that rises beside it

FASCIA BOARD

A board fixed to the end of the rafters, wall plate or the wall face that is immediately below the eaves.



4. TOOLS REQUIRED FOR INSTALLATION



- 1 Philips screwdriver
- 2 6cm screws
- 3 Lead Pencil
- 4 Tape measure
- 5 Measuring Line
- 6 Philips Wrench
- 7 Torqueable Drill
- 8 Angle Grinder With Diamond Cutting Wheel

INSTALLATION TIPS

✚ Foundations

- ❖ To have a safe, sustainable and beautiful roof , the structures and foundations of the building must meet the structural strength requirements.

✚ Roof Structure Design

- ❖ Lama ROMAN Tiles are designed for straight and flat surface roofs and therefore, any roof curvatures will result in the tiles being laid unevenly with possible skewed or protruded joints, leading to leakages.
- ❖ Wooden roof structures derived from good quality and matured wood are a tradition.
- ❖ High Quality lightweight roof systems which are designed by reputable and specialized softwares are also recommended, however, with the manufacturer's recommendations.

- ✚ The tile installation shall comply with the following order:
- ❖ Installation of the Main Tiles
 - ❖ Installation of other accessories such as:
 - Skylight Tiles, Vent –Pipe Tiles, Ventilation Tiles and other tiles directly related to the Main tiles
 - Gable End Tiles & Gable End Tile Ends
 - Ridge Tiles & Ridge related accessories such as Hip Starter, 2-Way Tiles, Round Ridge Vent Pipe or Antenna Tiles / Ridge.
 - 3-Way & 4-Way Apex Tiles.
 - Installation Using Lama ROMAN Colour Compound or Coloured Paint.



5. BATTENING & EAVES FIXING

Note: The below illustrations are based on the minimum Headlap / Head Overlap of 3 inches or 76mm and installation using conventional wooden battens and rafters. Should lightweight roofing structures are used, please refer to roof structure manufacturer for equivalent specifications.

Conventional Installation

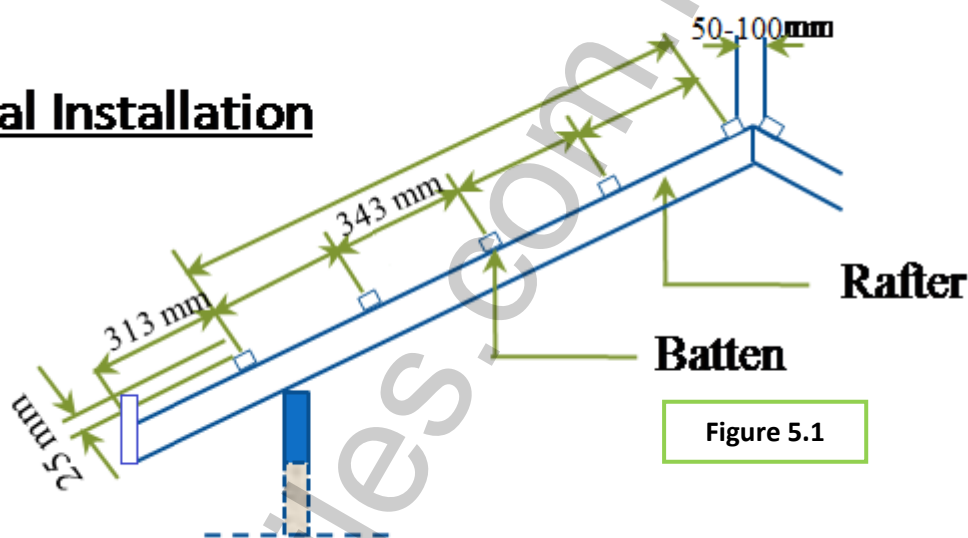


Figure 5.1

- ✚ The recommended minimum Batten Size is 50mm x 25mm (2 inches x 1 inches) with up to 600mm (24 inches) Rafter centres. Batten Spacings of 343mm (13.5 inches) should be the maximum.
- ✚ The type of wood used must be of good quality, straight and tandalised to prevent premature roof sagging through age. Steel (hollow section) battens and Metal Trusses are increasingly used for its straightness which facilitates good tiles installation and prevents roof sagging. For safety and durability reasons, metal trusses and hollow sections of equivalent structural loading calculated from internationally approved engineering softwares can also be used.
- ✚ The distance between two battens directly under the Standard ROMAN Ridge Tile shall be approximately 50mm – 100 mm maximum (depending on desired headlap). The first batten nearest to the Standard ROMAN Ridge Tile is placed such as to ensure that the top course of the Lama ROMAN roof tiles would be aesthetically covered by the ROMAN Ridge Tiles.

6. SETTING OUT

It is important that the tiler should set out the roof prior to fixing. Setting up requires planning and measuring as well as to ensure that the rafters are properly positioned and spaced. This will help to save time and avoid unequal overhangs at verges and costs in cutting tiles at the abutments (Fig 6.1).

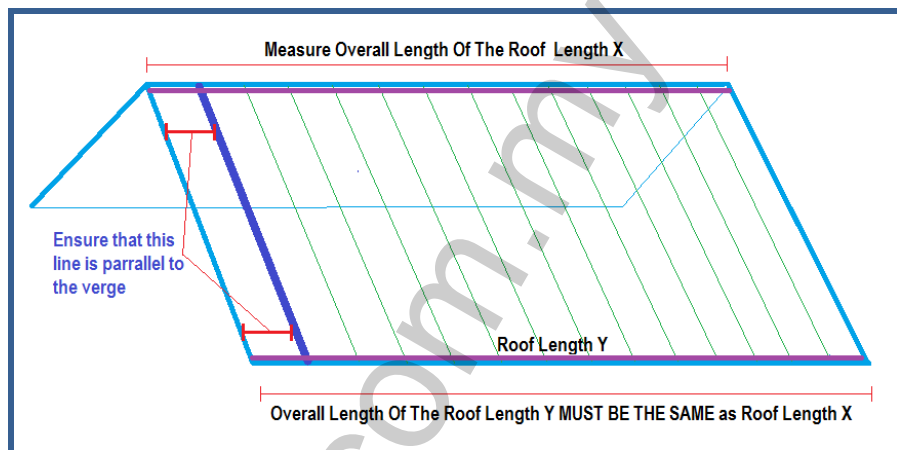


Figure 6.1

The last Batten at the Eave must be spaced up 25 mm higher than the previous batten. (Fig. 5.1 & Fig. 6.2).

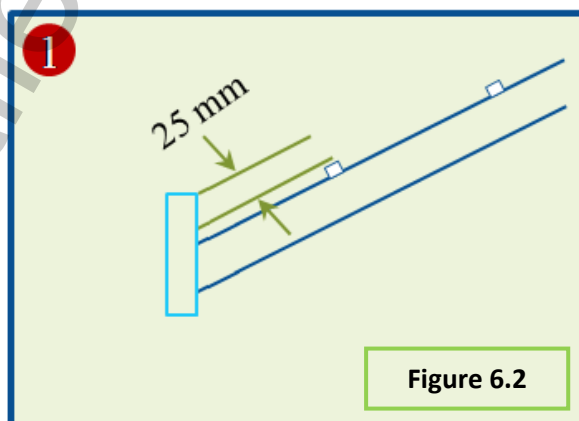


Figure 6.2

The spacing between the last Batten at the Eaves and the previous Batten is 313 mm. (Fig.5.1 & Fig. 6.3).

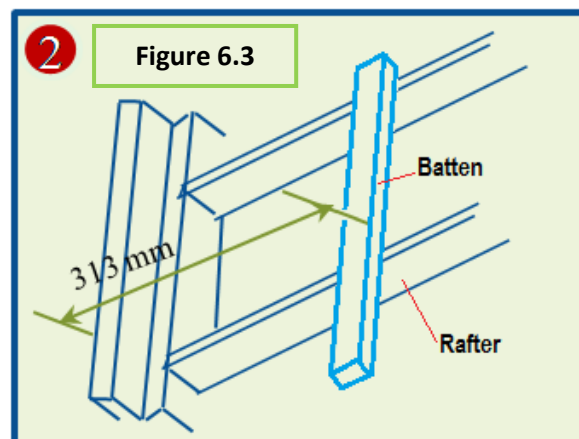


Figure 6.3

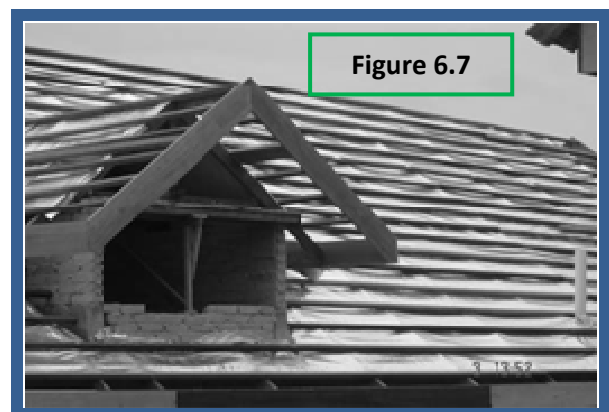
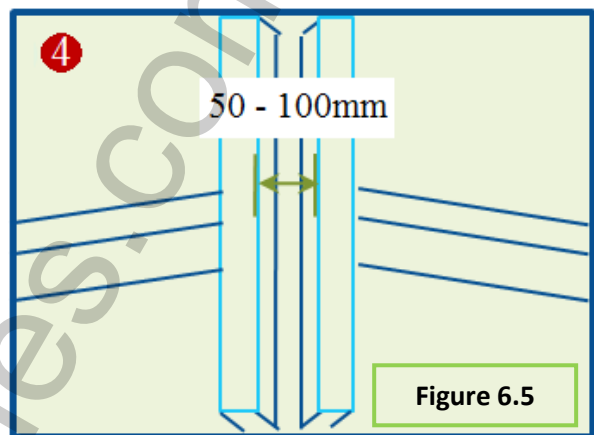
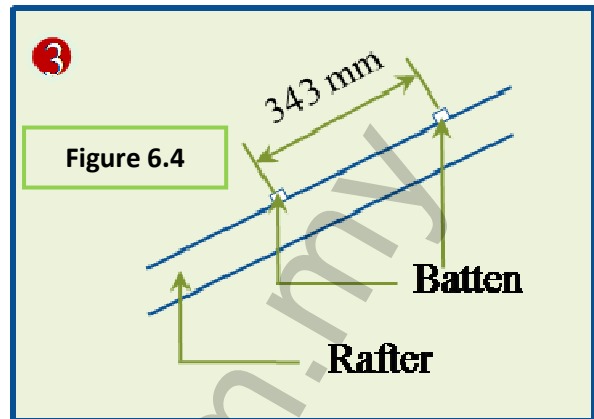
The spacing distance between the rest of the battens is 343mm based on a 76mm headlap / overlap. (Fig. 5.1, Fig. 6.4, Fig. 6.8 & Fig. 6.9).

The distance between 2 topmost Battens where the ridge of the roof sits should be as close as possible, or 50-100 mm gap in between, depending on the pitch of the roof. (Fig. 5.1 & Fig. 6.5).

Battens and Rafters are all planned, calculated, measured, set and built, almost ready for tile laying. Batten joints should be staggered over the roof so that consecutive battens are not all joint on the same rafter. (Fig. 6.6).

All Battens are to be mitre cut where they intersect with the hip board and valley battens and secured with a skew nails to provide firm support. (Fig. 6.6).

Heat Insulations and heat radiant barriers are installed prior to the installation of the battens. (Fig. 6.7).



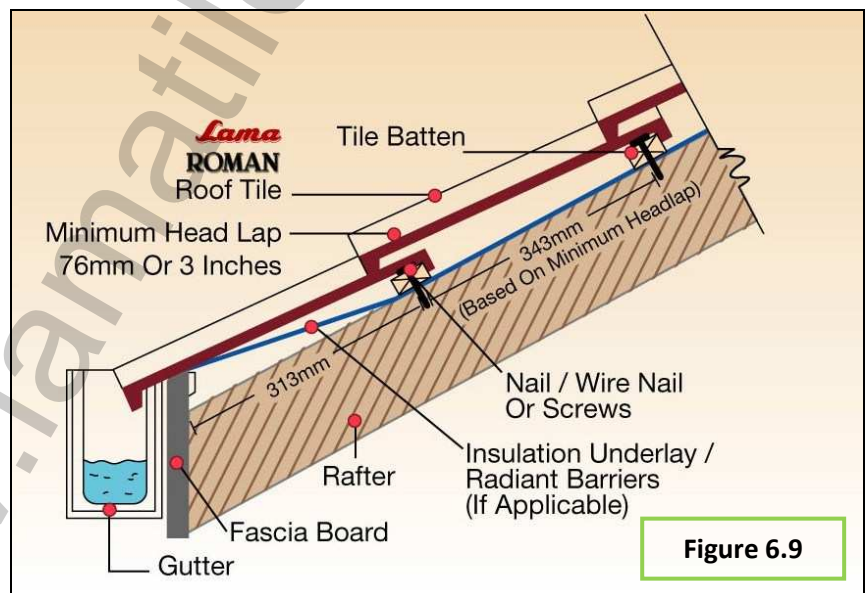
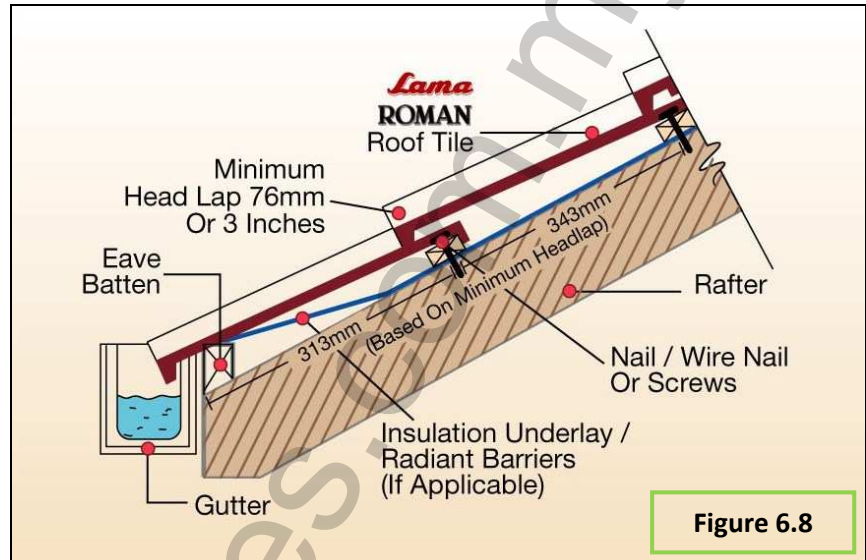
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Other battens are spaced according to the maximum of 343mm/13.5 inches (Fig.5.1, Fig. 6.8 & Fig. 6.9). The wooden battens or steel roof trusses used must be set strictly perpendicular to the rafters. Note that all eaves tiles should lie over the centre line of the gutter where water exits and must be nailed/screwed.

On the same row, the battens must be of the same height to facilitate good installation of tiles. For eaves tiles, the height of lowest batten or top edge of fascia board shall be 25 mm higher than other battens due to the absence of another tile below the last tile which overlaps upon. (Fig. 5.1 and Fig 6.2). Other layouts as per Figure 6.8 & 6.9.

Battens and Rafters mentioned above are based on durable heavy hardwoods or chemically treated medium hardwoods in accordance to **SIRIM Standards MS797**

6a. EAVES FIXING WITH GUTTER



- ✚ At the verge, hips and valleys, every full and half tile should be nailed or screwed.
- ✚ Make sure eaves course does not tilt backwards.

Refer Figure 6.8 & Figure 6.9

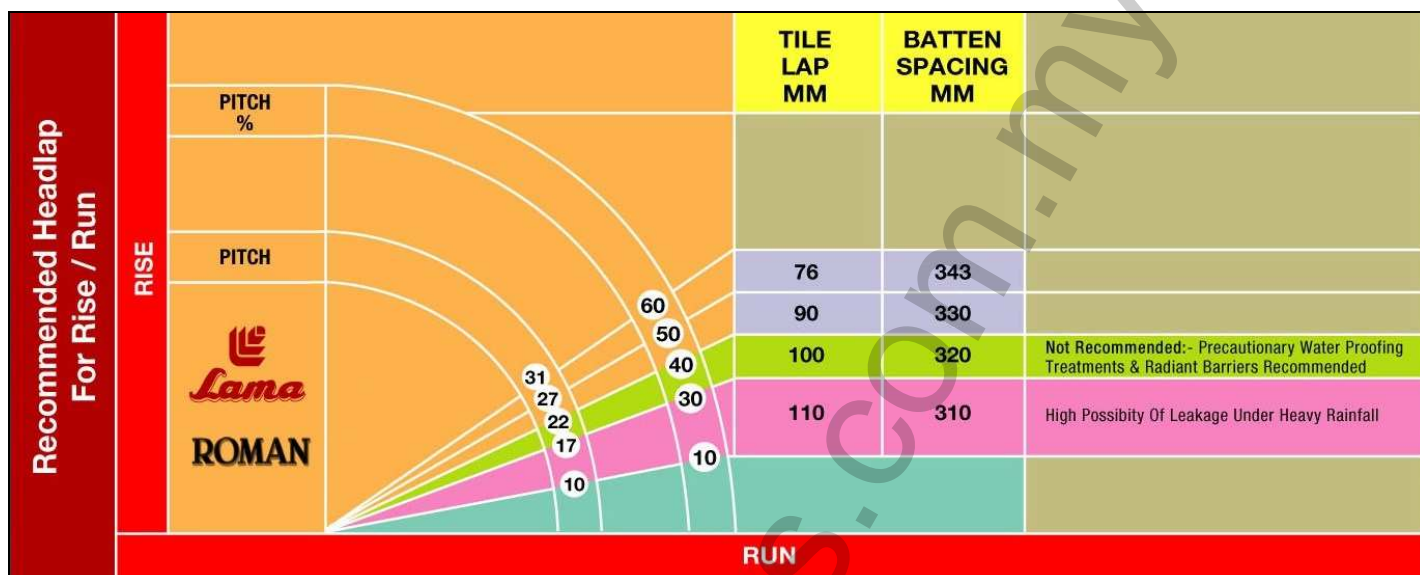
Figure 6.10

QUANTITY OF BATTENS / NO. OF COURSES

BATTEN SPACINGS / SPACING OF COURSES

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
310	0.31 (m)	0.62 (m)	0.93 (m)	1.24 (m)	1.55 (m)	1.86 (m)	2.17 (m)	2.48 (m)	2.79 (m)	3.10 (m)	3.41 (m)	3.72 (m)	4.03 (m)	4.34 (m)	4.65 (m)	4.96 (m)	5.27 (m)	5.58 (m)	5.89 (m)	6.20 (m)	6.51 (m)	6.82 (m)	7.13 (m)	7.44 (m)	7.75 (m)
320	0.32 (m)	0.64 (m)	0.96 (m)	1.28 (m)	1.60 (m)	1.92 (m)	2.24 (m)	2.56 (m)	2.88 (m)	3.20 (m)	3.52 (m)	3.84 (m)	4.16 (m)	4.48 (m)	4.80 (m)	5.12 (m)	5.44 (m)	5.76 (m)	6.08 (m)	6.40 (m)	6.72 (m)	7.04 (m)	7.36 (m)	7.68 (m)	8.00 (m)
330	0.33 (m)	0.66 (m)	0.99 (m)	1.32 (m)	1.65 (m)	1.98 (m)	2.31 (m)	2.64 (m)	2.97 (m)	3.30 (m)	3.63 (m)	3.96 (m)	4.29 (m)	4.62 (m)	4.95 (m)	5.28 (m)	5.61 (m)	5.94 (m)	6.27 (m)	6.60 (m)	6.93 (m)	7.26 (m)	7.59 (m)	7.92 (m)	8.25 (m)
343	0.35 (m)	0.69 (m)	1.04 (m)	1.38 (m)	1.72 (m)	2.07 (m)	2.41 (m)	2.75 (m)	3.09 (m)	3.44 (m)	3.78 (m)	4.12 (m)	4.47 (m)	4.81 (m)	5.15 (m)	5.50 (m)	5.84 (m)	6.18 (m)	6.52 (m)	6.87 (m)	7.21 (m)	7.55 (m)	7.90 (m)	8.24 (m)	8.58 (m)

7. ROOF PITCH & HEAD LAP



Technical Elaboration:

- When the slope of the roof is from 17° to 22° , the distance between battens is 320mm, and the head lap is 100mm
- When the slope of the roof is from 22° to 27° , the distance between battens is 330mm, and the head lap is 90mm
- When the slope of roof is from 27° to 31° , the distance between battens is 343mm, and the head leap is 76mm

Through years of experience in the application of Lama ROMAN roofing tiles, a generalization can be made that based on 17 degrees gradient, and base on a roof span of 6 metres / 20 feet, the approximate calculation of the correlation between roof span and roof pitch is that for every additional 305mm / 1 feet after 6 metres / 20 feet of roof span, there should be an additional 1 degree gradient increase in roof pitch to maintain the incremental water flow velocity, thus preventing water leakages despite that the ROMAN profile has been designed with a roofing pitch of 16 degrees gradient in mind.

The minimum roof pitch is determined by the roof span as well as many undeterminable and varying factors such as wind speed, wind angles as well as amount of rain. Therefore, there is no definite accurate calculation for the ideal roof pitch, maximum roof span or required headlap for a particular house in a particular location as too many varying variables are present. The above calculations are based on experience and a general rule of thumb. Lama suggests that additional allowed pitch as well as additional head lap be used for a larger margin of tolerance and will not be responsible for any damages or whatsoever.

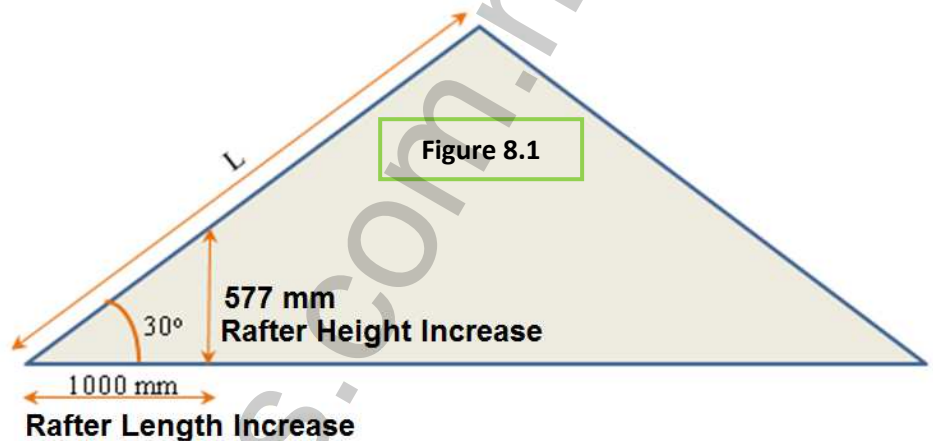
- ✚ Lama recommends a safe roof pitch of 22 degrees, which is important for windy locations for example, at a beach side, hilly or high wind areas to avoid any form of water seepage and/or leakages during heavy rainfall which is common in tropical climates. The minimum roof pitch is *17 degrees gradient* based on a roof span of *6 metres / 20 feet*.
- ✚ Under windy conditions, for example at the beach / hill side, high rise buildings and etc., Lama recommends the nailing or screwing of every other tile (alternate) manner for all roof pitches under *45 degrees gradient*.
- ✚ It is strongly recommended that all tiles are nailed or screwed on appropriately if the roof pitch is more than *45 degrees gradient* at windy areas.
- ✚ Lama recommends a minimum tile overlap of *76mm / 3 inches* . However, we strongly recommend an headlap / overlap of up to *100mm / 4 inches* for roofs with very low roofing pitch of approximately *15 to 17 degrees gradient* to prevent the possibilities of water seepages during heavy rainfall coupled with strong gusts of winds. If less than *76mm / 3 inches* headlap / overlap is used, the tile will not obtain the benefits of the triple weather checks and will be subceptible to leakages.



8. RAFTER LENGTH EFFECTS ON RAFTER HEIGHT

Presume that a 30° degree roof pitch is defined (Fig. 8.1), the following applies:

For every 1 meter horizontal length increment on a 30 degree radiant rafter of the roof, the height of the rafter is increased by 0.577 meters.



Lama ROMAN Roofing Tiles provides an area coverage of as follows:

9.8 pcs tiles – 1 metre square, based on a minimum headlap of 76mm / 3 inches or a batten spacing of 343mm.

10.6 pcs tiles – 1 metre square, based on a headlap of 100mm / 4 inches or a batten spacing of 320mm.

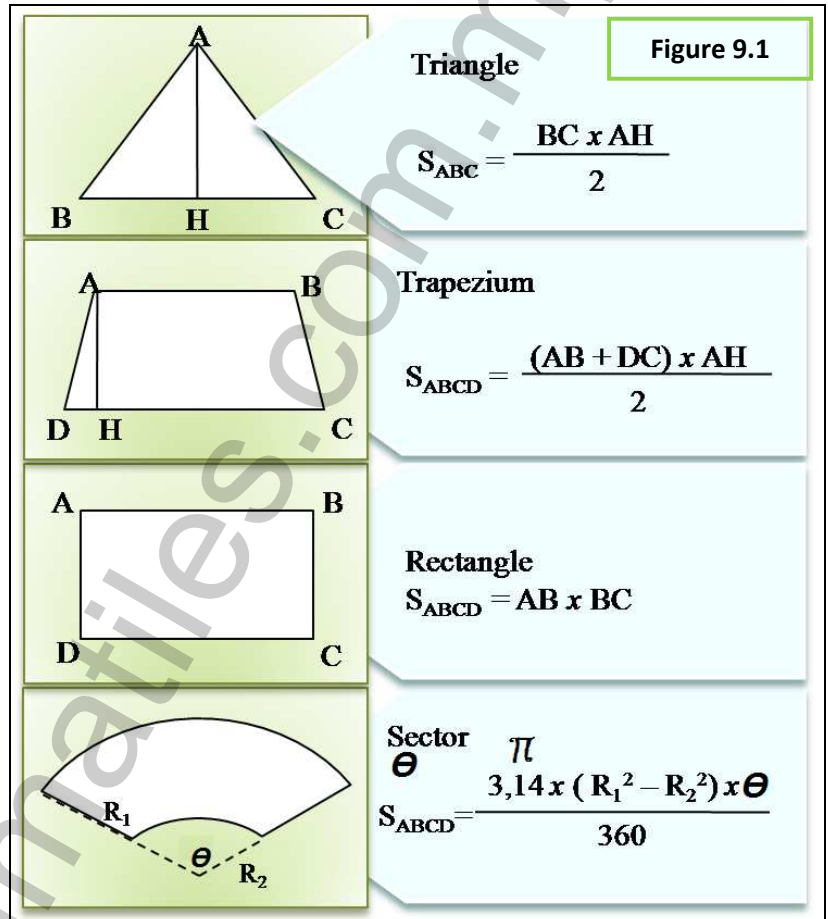
A roof can be associated with many roof shapes such as the illustration on the right. To calculate the number of roofing tiles, first calculate area “S” (Fig. 9.1), by its corresponding roof sections and multiplied by the number of roof tiles per metre square.

Experts recommend that a minimum of 5% more than the theoretical quantities should be allowed as wastages due to the cutting of tiles along the Hips and Valleys.

The more sophisticated the roof, the more hips and valleys the roof has, the higher the wastage percentage due to more cutting of tiles.

AREAS THAT NECESSITATES CUTTING OF TILES

9. MAIN ROOF TILE QUANTITIES ESTIMATIONS

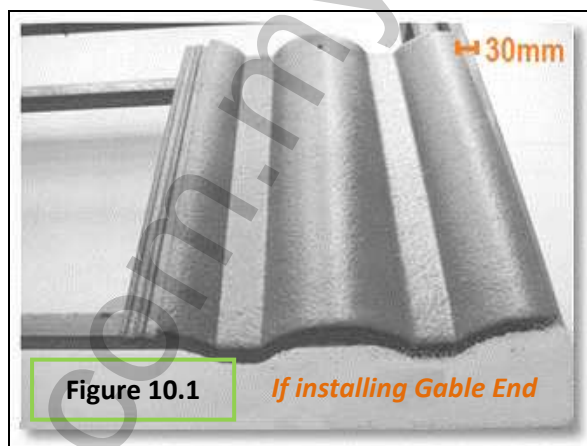


The above literatures and illustrations are only intended as a basic guide. Please consult your Architect or Quantity Surveyor for a higher and better calculation accuracy.

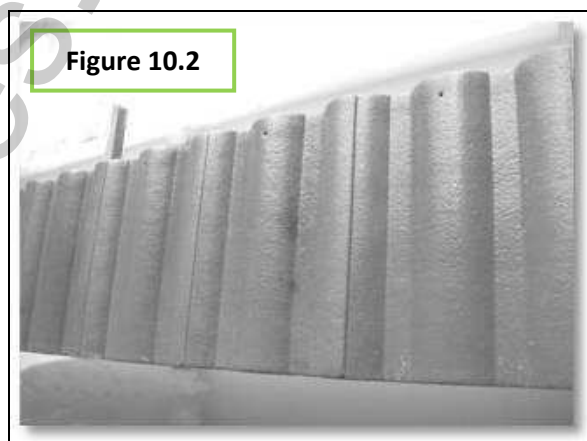
10. INSTALLATION OF LAMA ROMAN ROOF TILES

1) The tiles will have to be roofed respectively from the RIGHT to LEFT & BOTTOM to UP. Commencing from the bottom row first at the eaves, and at its farthest right (*Fig. 10.1*).

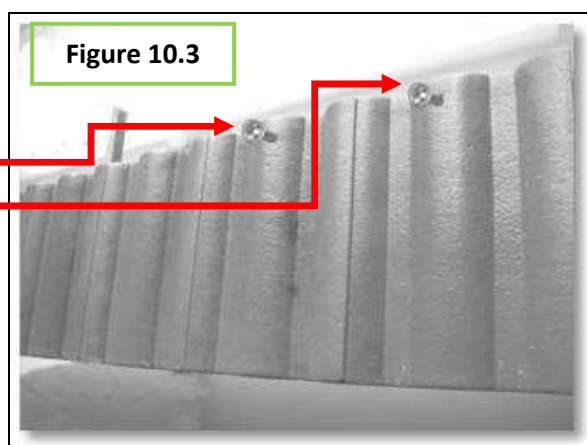
If Gable End Tiles are to be installed, please ensure that the tile is installed approximately, 30mm distance from the outer Fascia Board.



2) Hook the nibs over the wooden battens at their batten lugs, then laying the next tile along side so that it overlaps its neighbor. (*Fig. 10.2*). Complete laying the bottom row of the entire roof. Note that the end of each tile is to be raised by 25mm, as per *Fig. 5.1* and *Fig. 6.2* in Setting Out.



3) Using 60mm-65mm screws or equivalent Galvanised Steel Nails or Wire Nails, fasten/nail all tiles in the first row. (*Fig. 10.3*), (*Ref: Part 11, Nailing or Screwing of Tiles – Pg. 22*).



4) Laying RIGHT to LEFT & BOTTOM to UP as per mentioned in No. 1 above as Lama ROMAN Tiles have the underside of the overlap on the left (Fig. 10.4).

5) Tiles can be pre-placed on the roof with a crane for increased efficiency (Fig. 10.5).

6) Run a string from the peak of the roof at the ridge all the way down to the Fascia Board of the roof every 10 – 12 tiles to ensure that the tiles are laid straight (Fig. 10.6).

7) Should the overhang of the tile be inconsistent between rows or columns, set out roof along eaves starting with the correct overhang at the right hand verge. The overhang on the left hand verge can be corrected using the full tiles by opening or closing the side lap between the tiles. Lama ROMAN Tiles allow a total SHUNT tolerance of 2mm in side lock for adjustment (Fig. 10.7).

Note: There should be a recommended shunt tolerance of 0.7mm-1.2mm Shunt clearance at the coverlock and underlock interlocking. Insufficient Shunt clearance (Shunt In of less than 0.7mm) will result in tile breakages at the cover locks when accidentally stepped upon.



Figure 10.4



Figure 10.5



Figure 10.6

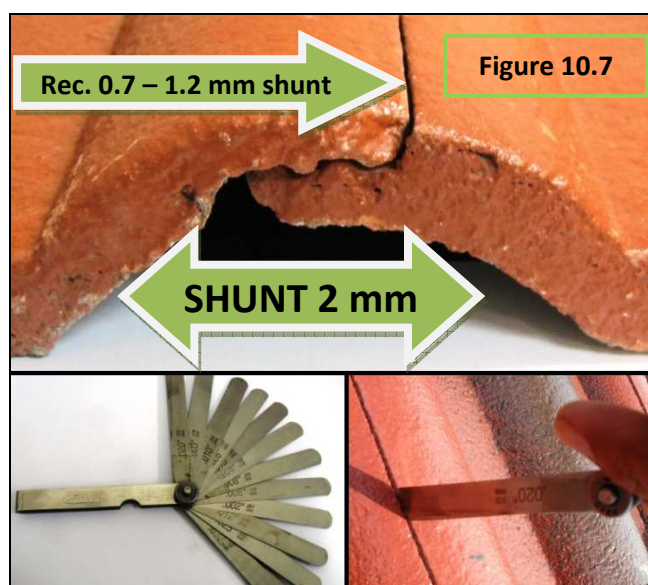
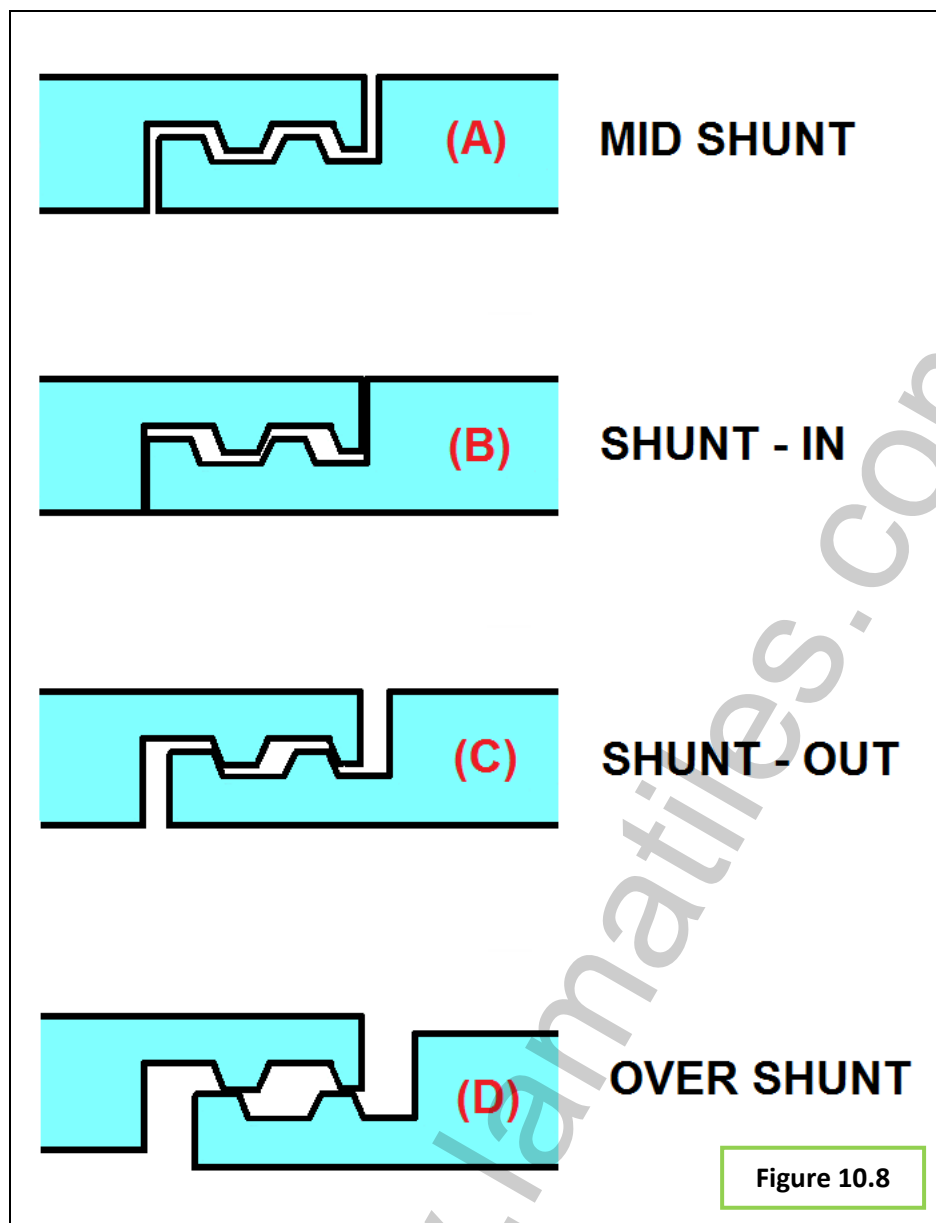


Figure 10.7



Why Do Corners Of The Tile Break At Their Interlock Edges After Installation?

The corners of the tile, especially at their cover lock areas, are the thinnest part of the tile and as such are the most prone to damages.

If the tiles are not aligned or laid properly on the roof, there is high potential for point loading that will put irregular pressure onto the corner of the tile, causing it to fracture or break.

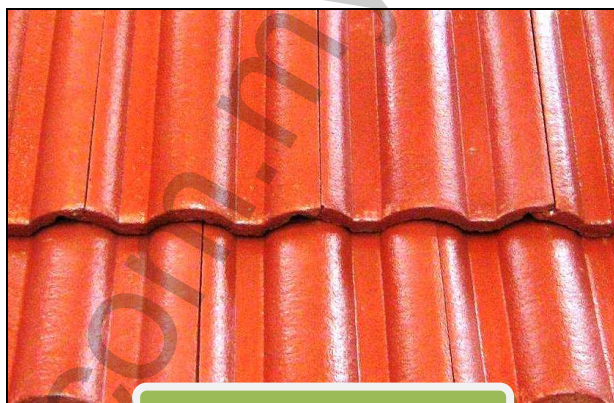
This happens most frequently when the tiles are laid too tightly together.

If this Shunt is not maintained, damage from foot traffic or the thermal expansion and contraction of the roof deck may result. Note that any debris left in the water channels during installation, creating a gap in between the interlocks could also result in point loading that may break the corners under foot traffic.

Lama ROMAN Interlocking Tiles should be laid as close to Mid Shunt (A), (Fig. 10.7) as possible but may be Shunted In or Shunted Out (B and C) to gain or deduct some tolerances. The tiles however, should never be Over Shunted (D) as it will lift the tiles and stress or crack at the interlocks.

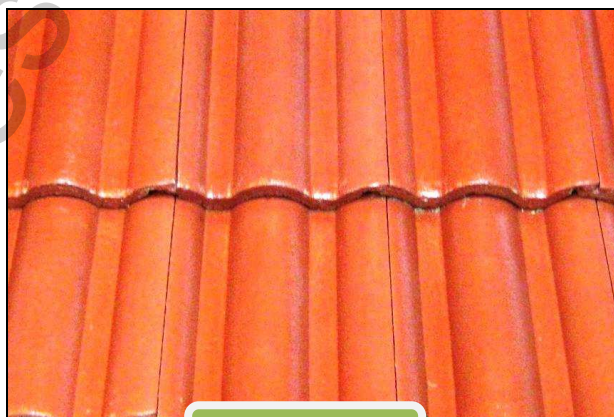
8) Lama ROMAN Roof Tiles can be laid in both CROSS BOND/ STAGGERRED LAYING METHOD or the STRAIGHT BOND LAYING METHOD

8a) The Cross Bond / Staggerred Laying Method

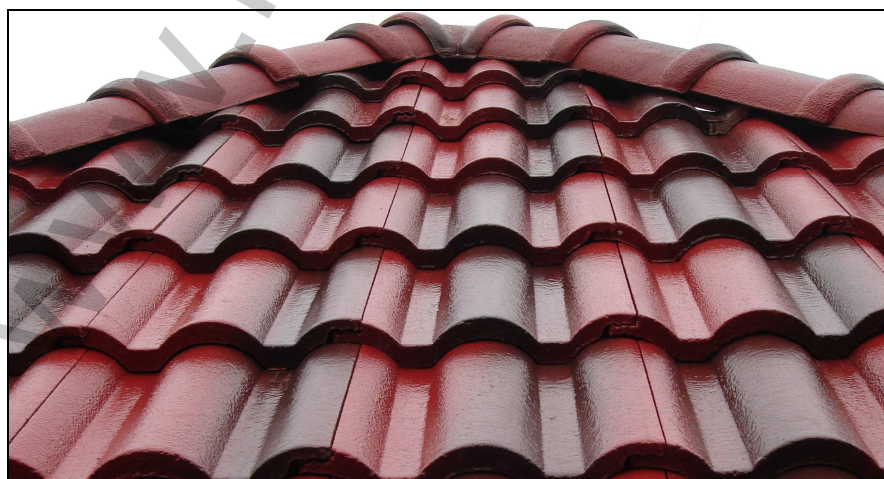


Cross Bond / Staggerred

8b) Straight Bond Laying Method



Straight Bond



Ensure straightness & uniformity during laying of Lama ROMAN roof tiles.

11. NAILING OR SCREWING OF ROOF TILES

- ✚ Tiles nailing or screwing is highly recommended to buildings in exposed surroundings frequented by strong gusts of wind, especially for buildings without a ceiling.
- ✚ During nailing or screwing on the tile, it is important to ensure that there is no direct impact on the tile or too big a screw used as hairline fractures may appear on the tile and may cause future leakages.
- ✚ Do not use nails or screws which are too large in diameter as it may easily fracture the nail holes and therefore the roof tile during installation.
- ✚ The First / Lowest Row of the tiles and the Side / Outer Most Column of the tiles have the highest tendency to be blown off during extremely strong gusts of winds. Please ensure that **ALL** tiles mentioned here are nailed or screwed in when being applied to any buildings with the presence of strong winds regardless of roof pitch.
- ✚ Do not overdrive the nails, there is not even any need for the nail head to come in contact with the tile - overdriving the nails risk damaging the tile (from the head of the hammer hitting the surface) - the tiles tend to be brittle and can easily be broken and may cause the nose of the tile to skew upwards thus causing breakages when being stepped on at the roof.
- ✚ Lama recommends nailing or screwing pattern of the following for the Alternate Tile or Every Other Tile Securement: **Horizontal – 1 Tile in 4. Vertical – 1 Tile in 3.** The alternate nailing or screwing pattern should be an approximately 1 nail or screw per square metre.

Due to the possibility of wind uplift, Lama ROMAN Roof Tiles and Accessories laid on the roof may need to be fastened by either nails or screws. The extent and the method by which the tiles and accessories are to be fastened will depend on the location of the tile and accessories on the roof, the pitch of the roof, the span of the roof, the presence or absence of ceilings etc.



All the above recommended procedures are based on normal tropical wind, rain and weather conditions. Lama is not liable for any loss, injury or damages due to flash storms or cyclones out of the claim of insufficient nailing advice.

12. LAYING & CUTTING OF LAMA ROMAN ROOF TILES

- ✚ Avoid cutting tiles whenever possible and never cut the bottom edge of the tile.
- ✚ On short eaves, tiles may require cutting. Cut at tile verges should be at least half width of a full tile. All vertical cuts should never be less than half a tile width.
- ✚ On each span of the roof, tiles should be laid from the bottom up of the roof and from the right side in. Any tiles towards the wall or the hip (if any), will require cutting.
- ✚ The use of a cutting tool with a diamond wheel cutting disk or any other disk which is specially designed for cutting masonry products, for the cutting separation of the tile is recommended. Terrazo tile cutters may also be used as long as the cutting does not result in impact which may lead to hairline fractures inside the tile's concrete structure.
- ✚ Nails or Screws should be used on all Cut Tiles

Step 1 - Mark the concrete roof tile along the line to be cut by scoring the tile with a screwdriver or utility knife.

Step 2 - Use a mechanical means (such as a disc cutter) for cutting concrete tiles, however, it can take a bit of practice to get a neat, clean cut using a disc cutter by freehand. If using a wet cutting system with a wet saw, connect the hose from your water source to the water feed kit of the wet saw.

Step 3 - Place the roof tile onto the platform of the diamond blade cutter. Align the blade edge with the scored line of the concrete roof tile. Slowly run the blade of the saw over the tile, following the rail on the saw table to guide the blade.

Step 4 - Run the blade over the surface of the tile, cutting it in several passes / repeated times to prevent breakage.



Wear safety goggles and gloves during the cutting process.

13. TILE ACCESSORIES



- | | | |
|---|--|--|
| <p>A. ROMAN STANDARD RIDGE TILE
Used for the Apex or the Peak Of The Roof Span
Internal Angle: 124 Degrees
Coverage: 2.5 Pieces Per Linear Metre</p> <p>B. ROMAN STEEP ANGLE RIDGE TILE
Used where the Pitch of the Roof is substantial
Internal Angle: 85 Degrees
Coverage: 2.5 Pieces Per Linear Metre</p> <p>C. ROMAN RIDGE TILE END
Substitutes the last Standard Ridge Tile on either ends & where 2 Gable End Tiles meet at the Apex / Peak.</p> <p>D. ROMAN HIP STARTER TILE
Used at the very start of the Standard Ridge Tile, at the lowest part of the roof corners.</p> <p>E. ROMAN 3-WAY APEX TILE
Used at the very peak of a 3 Span Roofline using Standard Ridge Tiles.</p> <p>F. ROMAN 4-WAY APEX TILE
The 4-Way Apex Tile is used at the very peak of a 4 Span Roofline using Standard Ridge Tiles.</p> <p>G. ROMAN SKYLIGHT TILE
Used in conjunction with ROMAN Roofing Tiles to allow daylight through the roof.</p> <p>H. ROMAN VENTILATION TILE
Used in conjunction with ROMAN Roofing Tiles for under roof Ventilation resulting in lower under roof temperatures.</p> | <p>I. ROMAN ROUND RIDGE TILE
Used at the Apex or the Peak Of The Roof Span
Coverage: 3.00 Pieces Per Linear Metre</p> <p>J. ROMAN ROUND HIP STARTER TILE
Used at the very start of the Round Ridge Tile at the lowest part of the roof corners.</p> <p>K. ROMAN ROUND RIDGE TILE END
Substitutes the last Round Ridge Tile on either ends & where 2 Gable End Tiles meet at the Apex / Peak.</p> <p>L. ROMAN ROUND 2-WAY TILE
Used to connect two non-collared, opposite sides of 2 Round Ridge Tiles on one common span of the roofline apex.</p> <p>M. ROMAN ROUND 3-WAY APEX TILE
Used at the very peak of a 3 Span Roofline using Round Ridge Tiles.</p> <p>N. ROMAN ROUND 4-WAY APEX TILE
Used at the very peak of a 4 Span Roofline using Round Ridge Tiles.</p> <p>O. ROMAN ROUND RIDGE VENT-PIPE / ANTENNA RIDGE
Used in conjunction with ROMAN Round Ridges for Lavatory / Toilet septic tank Ventilation or for the exit of an Antenna / Ariel.</p> <p>P. ROMAN VENT-PIPE TILE
Used in conjunction with ROMAN Roofing Tiles for Lavatory / Toilet septic tank Ventilation without the requirements of metal flashings.</p> | <p>Q. ROMAN GABLE END TILE
Designed for aesthetic purposes along the edges of the roof surrounds where the ROMAN Roofing Tiles end.
Coverage: 3.0 Pieces Per Linear Metre</p> <p>R. ROMAN GABLE END TILE END
Substitutes the very first (lowest end) of the Gable End Tile where the ends of the tiles are visually exposed.</p> <p>S. ROMAN HALF TILE CLIPS
Used to secure half cut tiles to the roofing batons by securing itself to the tile beside and below it.</p> <p>T. ROMAN MIXING COLOUR COMPOUND
(Per 5kg Bag)
A colour pigment based cement compound which is blended together with mortar for filling gaps on ridge tiles and accessories to obtain similar colours to the roof tile.
Coverage: Approx. 1.3 Sq. Metres / 60 Foot Run (Depending On Colour Strength)</p> <p>U. ROMAN COLOURED PAINTS
(Per 1 Litre Can)
These paints are brushed or rolled on to the non-coloured mortar which are used to fill up the gaps between the Blue and Sapphire Blue ridge tiles and other accessories.
Coverage: Approx. 4.8 Sq Metres Per Litre / 240 Foot Run (Depending On Colour Strength)</p> <p>V. ROMAN RADIANT BARRIERS / ROOFING FOILS
Used below the roofing tiles to reflect heat radiation from the roof, resulting lower under roof temperatures.</p> |
|---|--|--|

14. **Lama** ROMAN TILE ACCESSORIES SPECIFICATIONS

A. **ROMAN STANDARD RIDGE TILE**

Internal Angle:	124	Degrees
Coverage:	2.5	Pieces Per Linear Metre
Approximate Weight:	3.0	KGs

B. **ROMAN STEEP ANGLE RIDGE TILE**

Internal Angle:	85	Degrees
Coverage:	2.6	Pieces Per Linear Metre
Approximate Weight:	4.5	KGs

C. **ROMAN RIDGE TILE END**

Approximate Weight:	4.6	KGs
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D. **ROMAN HIP STARTER TILE**

Approximate Weight:	3.0	KGs
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E. **ROMAN 3-WAY APEX TILE**

Approximate Weight:	4.3	KGs
Pitch Angle:	25	Degrees
Fitment To Pitches Up To:	35	Degrees

F. **ROMAN 4-WAY APEX TILE**

Approximate Weight:	5.0	KGs
Pitch Angle:	25	Degrees
Fitment To Pitches Up To:	35	Degrees

G. **ROMAN SKYLIGHT TILE**

Weight:	0.9	KGs
Coverage:	Similar To Standard ROMAN Tile	
Pitch:	17 to 45 Degrees	

H. ROMAN VENTILATION TILE

Weight:	5.2	KGs
Coverage:	Similar To Standard ROMAN Tile	
Pitch:	17 to 45 Degrees	
Maximum Head Lap:	85	mm

I. ROMAN ROUND RIDGE TILE

Approximate Weight:	3.3	KGs
Coverage:	3.0	Pieces Per Linear Metre

J. ROMAN ROUND HIP STARTER TILE

Approximate Weight:	4.2	KGs
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K. ROMAN ROUND RIDGE TILE END

Approximate Weight:	5.5	KGs
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L. ROMAN ROUND 2-WAY TILE

Approximate Weight:	5.3	KGs
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M. ROMAN ROUND 3-WAY APEX TILE

Approximate Weight:	5.0	KGs
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N. ROMAN ROUND 4-WAY APEX TILE

Approximate Weight:	6.0	KGs
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O. ROMAN ROUND RIDGE VENT-PIPE / ANTENNA TILE

Weight:	4.6	KGs with Full Accessories
Coverage:	Similar To Standard ROMAN Round Ridges	

P. ROMAN VENT-PIPE TILE

Weight:	5.2	KGs with Full Accessories
Coverage:	Similar To Standard ROMAN Tile	
Pitch:	17 to 45 Degrees	

Q. ROMAN GABLE END TILE

Approximate Weight:	3.2	KGs
Internal Angle:	80	Degrees
Coverage:	3.00	Pieces Per Linear Metre

R. ROMAN GABLE END TILE END

Approximate Weight:	4.1	KGs
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T. ROMAN MIXING COLOUR COMPOUND (5kg Bag)

Mixing Ratio:	One : One	With Water
Approximate Coverage:	1.3	Square Metres Of Area / Per 60 Foot Run

U. ROMAN COLOURED PAINTS (1 Litre Can)

Coverage:	4.8	Square Metres of Area Per Litre
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V. ROMAN RADIANT BARRIERS / ROOFING FOILS

Single Sided:	80	GSM @ 100 Microns, ± 10%
Double Sided:	100	GSM @ 120 Microns, ± 10%
Reflectivity:	95	%
Coverage:	1.22	metres width X 50 metres length



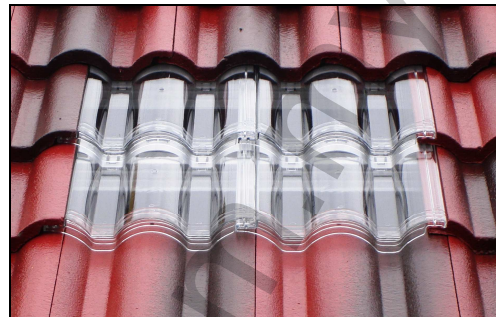
15. INSTALLATION OF SKYLIGHT TILE

Lama Skylight Tile is constructed out of Polymethyl Methacrylate, which is a choice for glass roof replacement suited to outdoor applications. It will provide a daylight transmission of up to 90%.

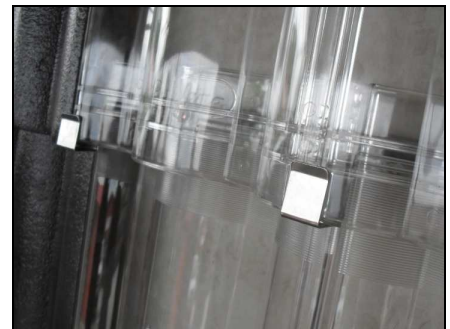
The Skylight Tile comes together with an anchoring hook, a clip bracket and a screw.

Due to the lightweight structure of the Skylight Tile, it is recommended that each Skylight Tile is properly fastened and secured.

The clip bracket is used for fastening the lower cover lock (lower right hand side) of the Skylight Tile to the lower water channel of the tile beside it (Fig. 15.1)



Clip Bracket



Mounting of the Clip Brackets for Skylight Tile installation using the Straight Bond tiles laying method.

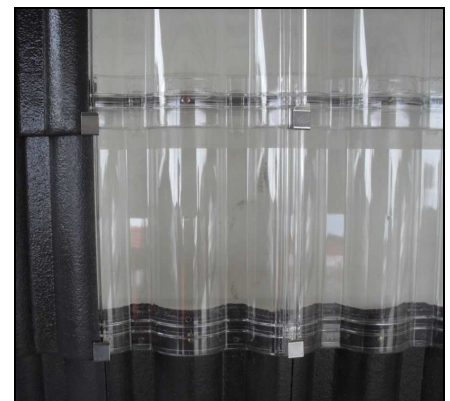


Figure 15.1

The Anchoring Hook is used for Cross Bond / Staggered tile laying and is fastened on the lower tile surface at its nail hole with a screw. The hook section of the anchoring hook is used to fasten against the lower water channel (at its lower left hand side) of the Skylight Tile (Fig. 15.2).

- ✚ Mount the Anchor Hook to the tile beneath and on the left of the Skylight Tile using a screw or nail (Fig. 15.3).
- ✚ Insert the Skylight Tile at the far left lower corner (water channel) into the Anchor Hook.
- ✚ Fasten the Skylight Tile at the nail hole with the screw provided.

Maintenance / Cleaning of Skylight Tiles:-

The Skylight Tile may have to be maintained / cleaned from time to time to remove accumulated dirt and debris on its surface. The Skylight Tile can be cleaned using warm and diluted soapy water with a soft cloth / sponge. Rinse only with clean water.



Figure 15.2

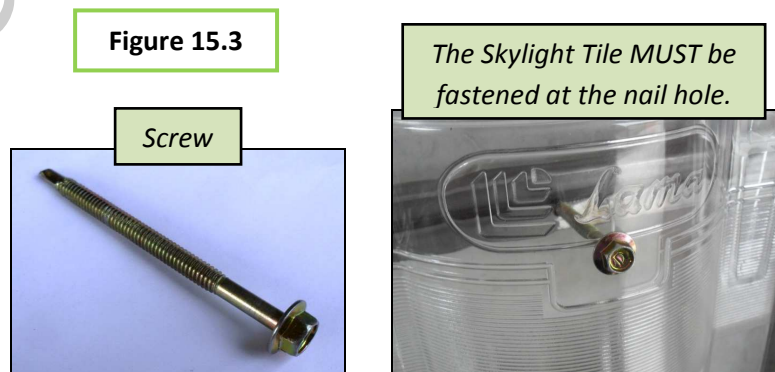


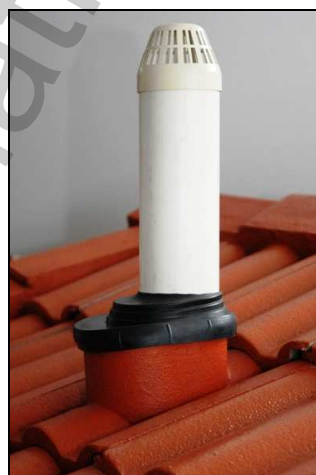
Figure 15.3

**DO NOT CLEAN WITH ANY FORM OF SOLVENTS,
SPIRITS OR HARSH DETERGENTS**

Lama ROMAN Vent-Pipe Tile & Round Ridge Vent-Pipe / Antenna Ridge can be installed as per the same method as our standard Roof Tile and standard Round Ridges (Fig. 16.1- Pg. 31).

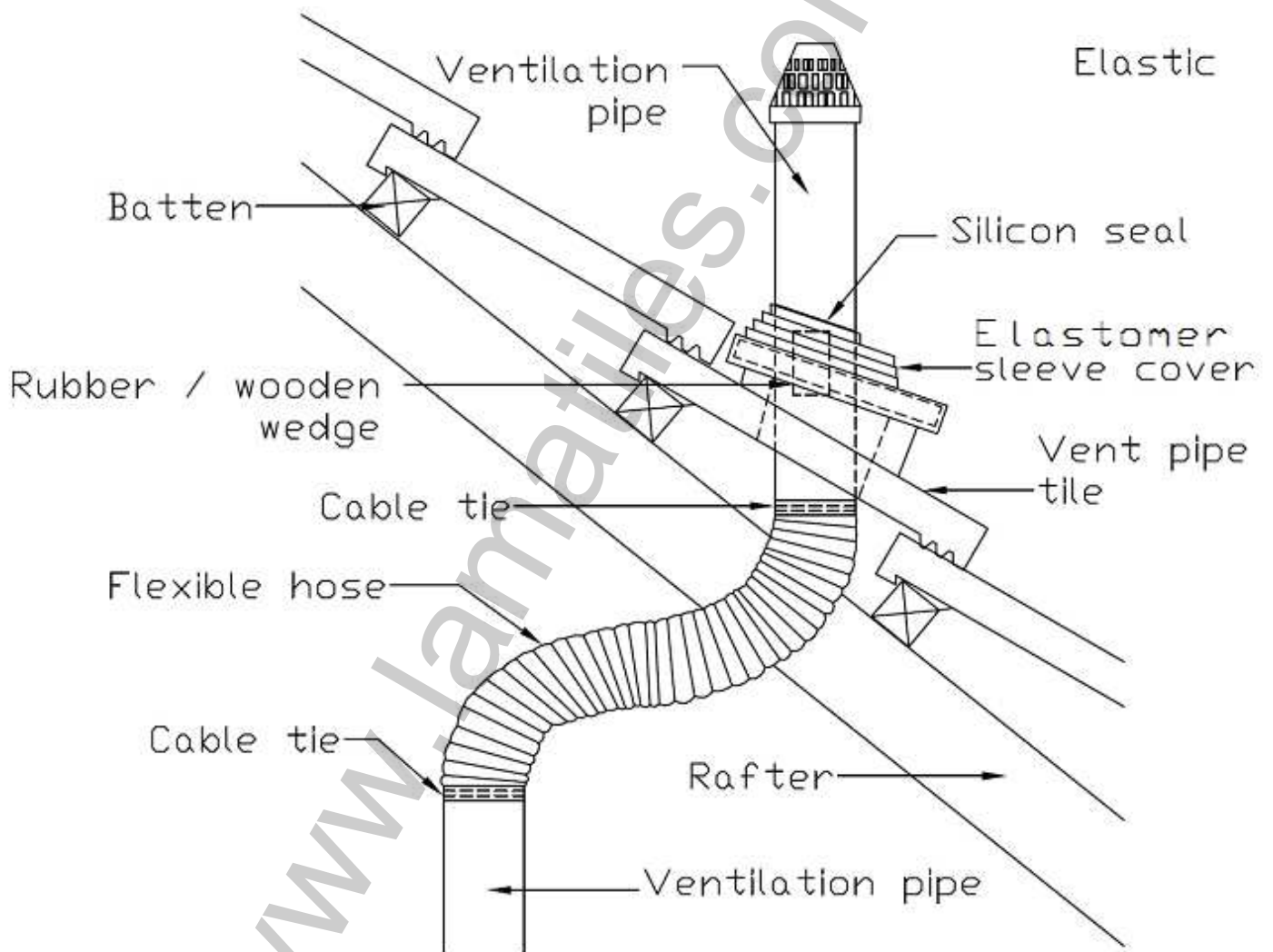
16. INSTALLATION OF VENT-PIPE TILE & ROUND RIDGE VENT-PIPE / ANTENNA RIDGE

- ✚ Install the Vent-Pipe Tile or Round Ridge Vent-Pipe/Antenna Ridge as per installation of a standard main tile or standard round ridge.
- ✚ Cut a correct sized hole at the top of the elastomer sleeve with a pair of scissors to suit the pipe/rod.
- ✚ The cut quality MUST be smooth and radiused. **Jaggedged cuts may result on the elastomer sleeve tearing upon insertion.**
- ✚ Insert the pipe/rod into the elastomer sleeve and through the tile/ridge. Insert the two rubber wedges and wedge the pipe firmly between the neck of the tile/ridge.
- ✚ Cover the elastomer sleeve over the neck of the tile/ridge.
- ✚ Secure the metalized flexible hose to the Pipe using the cable ties supplied. Connect the flexible hose to the septic tank ventilation pipes. For other applications, please use a suitable hose (not supplied).
- ✚ Clean the surface of the elastomer sleeve where the pipe/rod exits from the tile/ridge and apply the joint with a silicone based sealant to ensure waterproofing.



16a. VENT-PIPE TILE TECHNICAL ILLUSTRATION

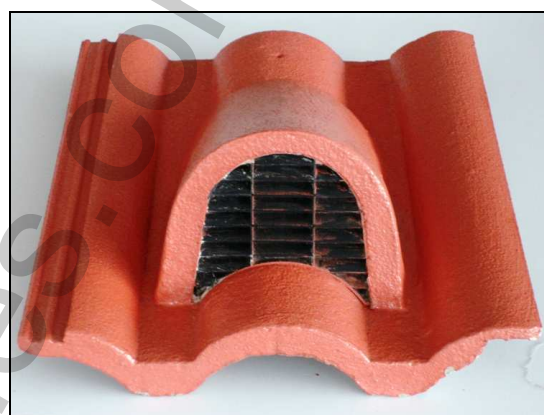
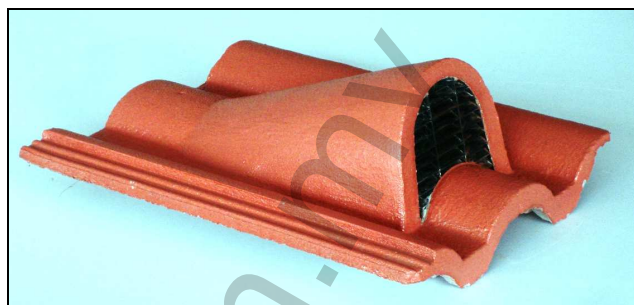
Figure 16.1



17. INSTALLATION OF VENTILATION TILE

The Ventilation Tile is compatible with all Lama ROMAN Roof Tiles.

- ✚ Installation of the Ventilation Tile should follow the installation of standard Lama ROMAN main tiles.
- ✚ Hot air rises, and the hottest part of the roof is at its highest point. The Ventilation Tiles should be installed above 50% of its roof's local area.
- ✚ The Ventilation Tile is not recommended to be used for roofs with tile headlap of more than 85mm.
- ✚ The Ventilation Tile will be effective to roofs pitches of up to 40 Degrees.



18. INSTALLATION OF VERGES & GABLE END TILE

PRIOR TO INSTALLING THE GABLE END TILES

- ✚ Fasten every verge tile regardless if it is a full or a half tile. Screws are however, preferred over nails. Specialised clips may be used.
- ✚ Interlocks of tiles can be removed to facilitate the fixing of external verge clips.
- ✚ Verge tiles at the eaves should over hang by same amount as the rest of the tiling.
- ✚ Cutting of tiles should be minimized by properly setting out prior. If the overhang section of the roof is too much and has to be cut, ensure that they are symmetrical at both verges. The cut verge tile should not exceed the outer edge of the fascia board.

GABLE END TILE INSTALLATION

- 1) Each Lama ROMAN Gable End tile is designed to cover 1 length of main tiles and starts off with the Gable End "TILE END", which starts on the roof eaves of the verge (Fig. 18.1).
- 2) Screws are preferred over nails for the installation of the Gable End tiles as the torque can be controlled with multiple tile adjustments without damaging the fascia board.

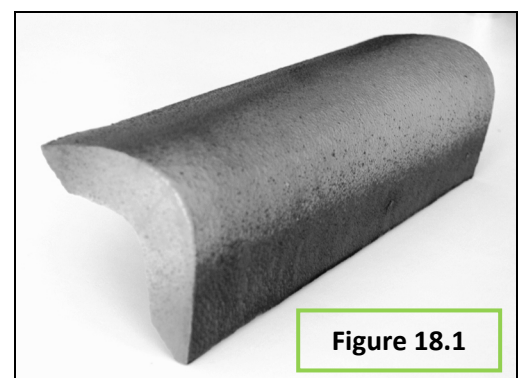


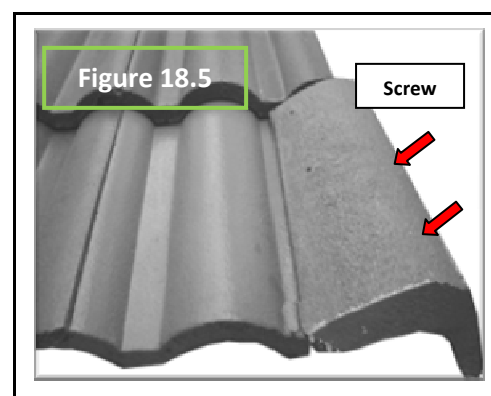
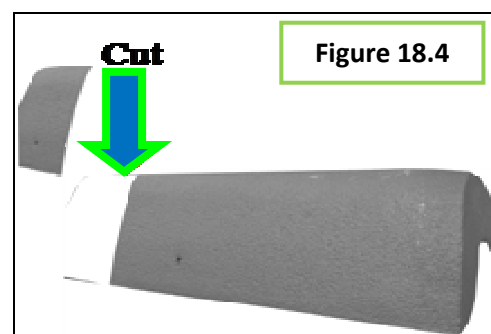
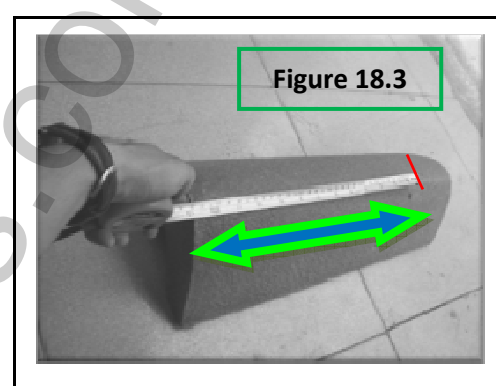
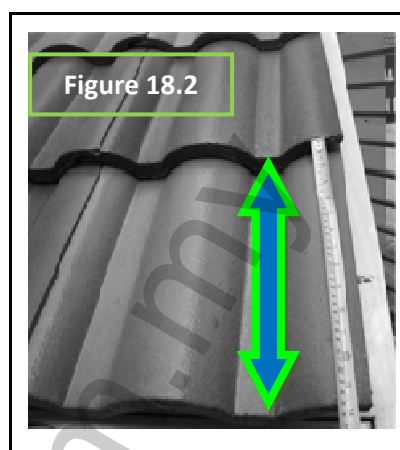
Figure 18.1

3) Measure the distance from the bottom of the first row eaves tile to the bottom of the second tile (*Fig. 18.2*).

4) Measure the length of the Gable End "Tile End". Cut off the excess of the Gable End "Tile End" at the smaller taper end (*Fig. 18.3 & Fig. 18.4*), to fit onto the first row of tile in *Fig. 18.2*.

5) Align the wider tapered end of ROMAN Gable End tile in line with bottom edge of standard ROMAN roof tile (*Fig. 18.5*).

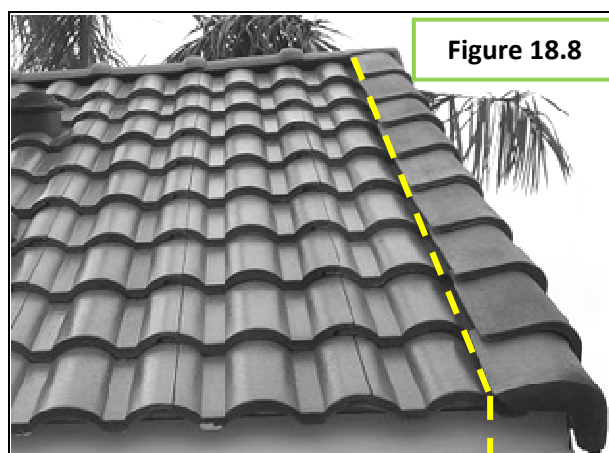
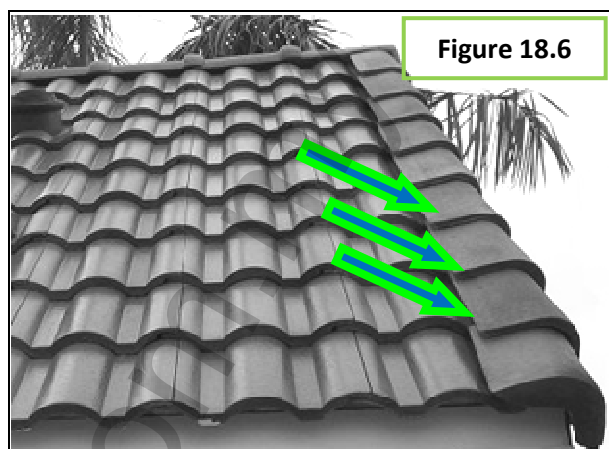
6) Install the Gable End "Tile End" first with fasteners. Screws are however, preferred over nails. (*Fig. 18.5*).



7) Ensure that each of the following Gable End tiles are wrapped around the verge and should be touching both the outer edge of the fascia board as well as the roof tile. Each of the larger taper openings of the Gable End overlaps the smaller taper ends (Fig. 18.6).

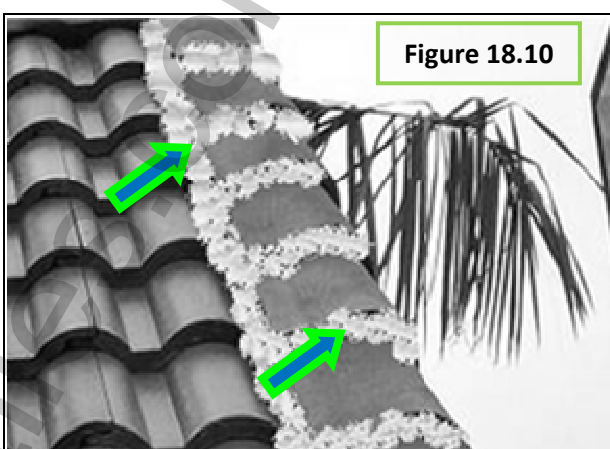
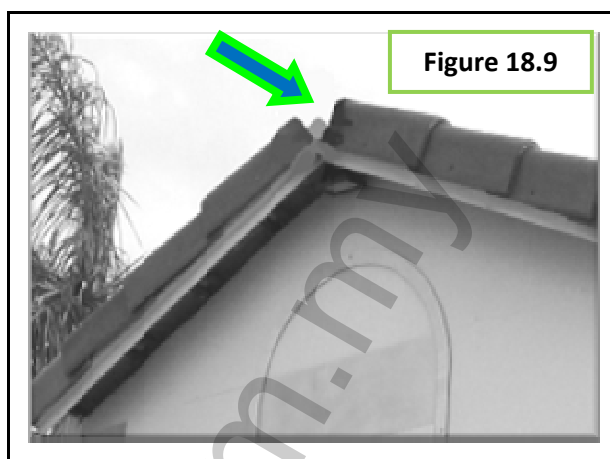
8) All Lama Gable End Tiles must be secured using screws on to the fascia board through the pre-punched hole markings provided. These nail hole markings are intentionally made not through, therefore, drilling the hole through will be required prior to fixing (Fig. 18.7).

9) Pull a string from the last ridge of the roof closest to the verge, and ensure that the Gable End Tiles are aligned properly and consistently (Fig. 18.8).

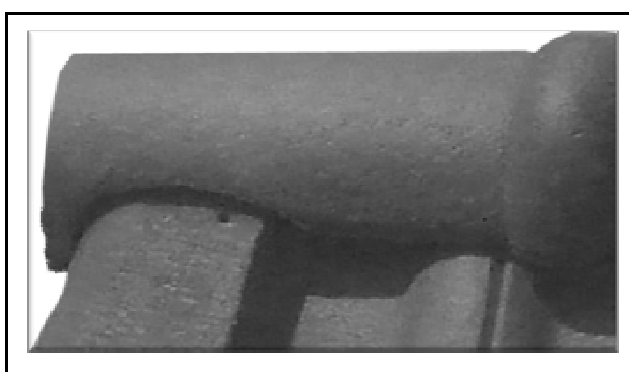
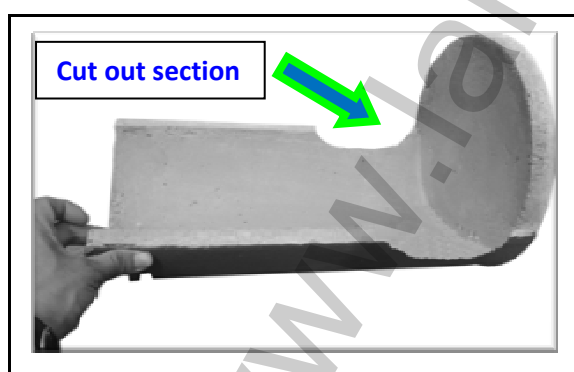


10) For Gable roofs, the last Gable End tiles from both verges should be spaced out as close as possible so that the intersection of the two edges are almost touching each other (Fig. 18.9).

11) Do not use cement mortar under the Gable End Tiles as they are prone to cracking (Fig 18.10).



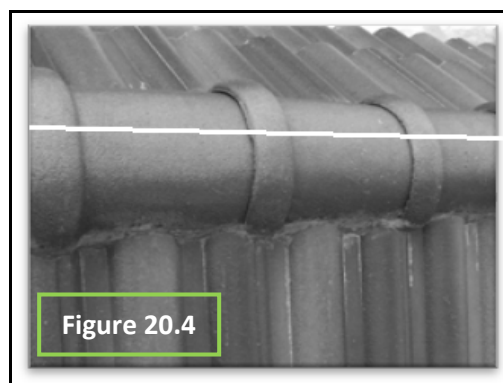
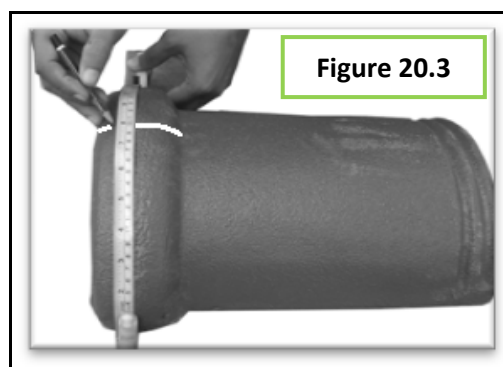
19. INSTALLATION OF RIDGE TILE END



For roofs with Gables installed with Gable End tiles, 2 radiuses should be cut at the sides of the Ridge Tile End. The amount and shape or area to be cut will depend on the pitch of the roof.

20. RIDGE & HIP PREPARATION & INSTALLATION

- ✚ At the ridge intersection of 2 verges, use the tile cutter to cut the tiles along the ridge with minimal gaps while ensuring that all the tiles are in place. Tiles should be cut in a straight line, keeping the cut centered on the hip board. Should the tiles be moveable, secure them with fastening clips or adhesive (*Fig. 20.1*).
- ✚ The ridge and hips are finished with ridge tiles, normally the same colour as the roofing tiles. Where ridges meet (such as where a hip ridge meets a main ridge), the ridge tiles should be trimmed so that the ends of the ridge tiles are parallel when fitted (*Fig. 20.2*).
- ✚ A centre line should be marked on the collar / head or centre of the ridge as a mid-point using a piece of chalk or a pencil on all Ridges and Hip Ridge with a measuring tape or a piece of string (*Fig. 20.3*).
- ✚ Fix the ridge or hip ridge to the ridge or hip using either the wet or dry fix installation method.
- ✚ Extend a string from one end of the ridge verge to the other if it is a gable roof or from the hip starter to the roof apex. Proceed to lay the rest of the ridges or hip ridge using the marked collar / head or the centre of the ridge as a reference to the extended string (*Fig. 20.4*).
- ✚ All ridge tiles should be laid to ensure the end laps face the same direction (if uncollared) with consideration given to the direction of prevailing winds.



21. INSTALLATION OF HIP STARTER

- ✚ The hip starter is the first to be installed at the hip and must be attached properly (*Fig. 21.1*)
- ✚ Install the next hip ridge after the hip starter. Making sure that the mid-points which are marked earlier meets up in a straight line (*Fig. 21.2*).
- ✚ If the Hip Ridge is uncollared, hip ridges should be laid so that the higher ridge overlap the lower ones.
- ✚ Extend a string from one end of the hip starter to the roof apex. Proceed to lay the rest of the hip ridge using the marked collar / head or the centre of the ridge as a reference to the extended string (*Fig. 21.2*).
- ✚ If the hip starter is on a high pitched roof, it is highly recommended to fasten or fix it using specialized clips or nail / screw (*Fig.21.3*).
- ✚ If a gutter exists in the roof, the hip starter should extend at least 50mm into the gutter.

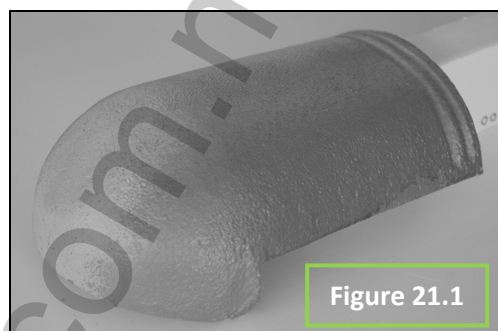


Figure 21.1

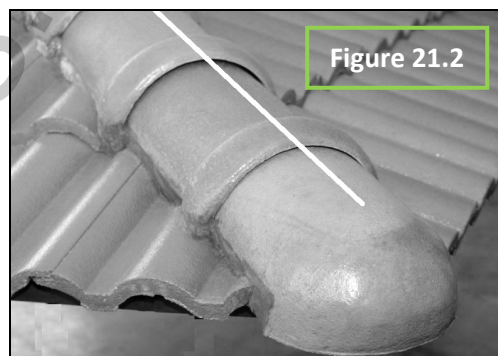


Figure 21.2

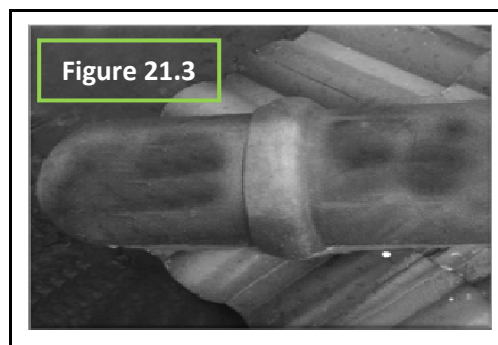


Figure 21.3

22. INSTALLATION OF 2-WAY TILE

A ROMAN 2-Way tile is mostly used on a Gable roof whereby both ends of the roof are the verges, therefore, necessitating the use of two Tile Ends. In order to facilitate two tile ends, one part of the ridge will face a back to back situation whereby a dual collared ROMAN 2-Way tile is required (Fig. 22.1).

The ROMAN 2-Way tile should be positioned at the centre of the ridge, in between the two Tile Ends at the verge.

If the ROMAN 2-Way tile does not fit because it is too long, use a tile cutter to trim down the rear of the both right and left ridge tile to suit, and make two grooves as a water channel (Fig. 22.2).

Install the 2-Way tile into the mid-point of the ridge (Fig. 22.3).

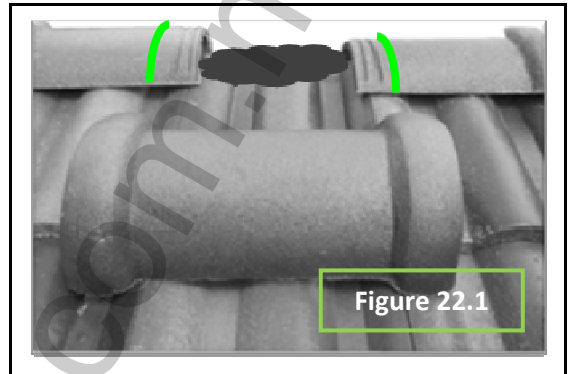


Figure 22.1

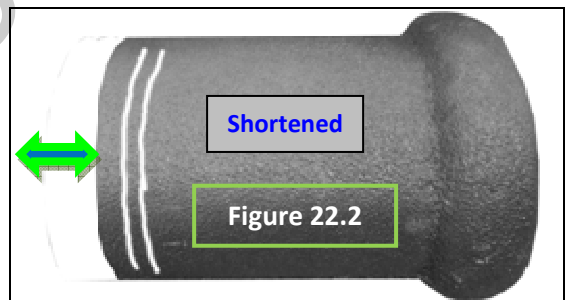


Figure 22.2

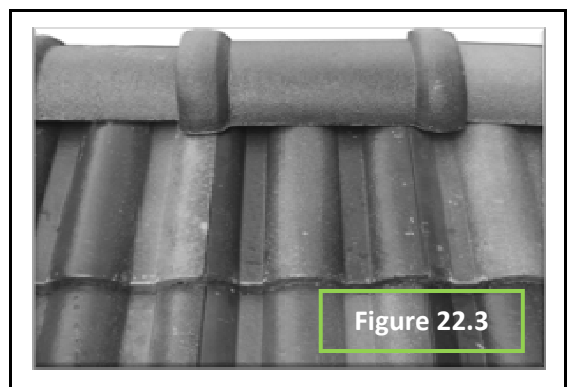


Figure 22.3

23. INSTALLATION OF 3-WAY & 4-WAY APEX TILE

- ✚ The ROMAN 3-WAY and 4-WAY Apex tile is used in conjunction at the very peak of a 3 or 4 pane ROMAN Hip roof.
- ✚ The ROMAN 3-Way and 4-Way Apex tile is installed using the wet fixing method, whereby cement mortar is used for a bedding, and pointing material made with Lama Coloured Compound is used to bed the tile to the peak of a hip apex.
- ✚ Spread and fill the bed and point mortar which are mixed following Lama's guidelines and mix ratios on all sides of the ridge saddle and the overlapping section of the ROMAN 3-WAY or 4-WAY Apex Tile at the ROMAN
- ✚ Ensure that surfaces are damped slightly during bedding installation for better adhesion.
- ✚ Clean all surroundings off any mortar dropping with a wet clean sponge.

3-WAY APEX TILE



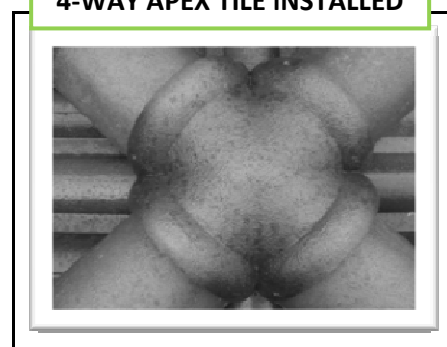
3-WAY APEX TILE INSTALLED



4-WAY APEX TILE

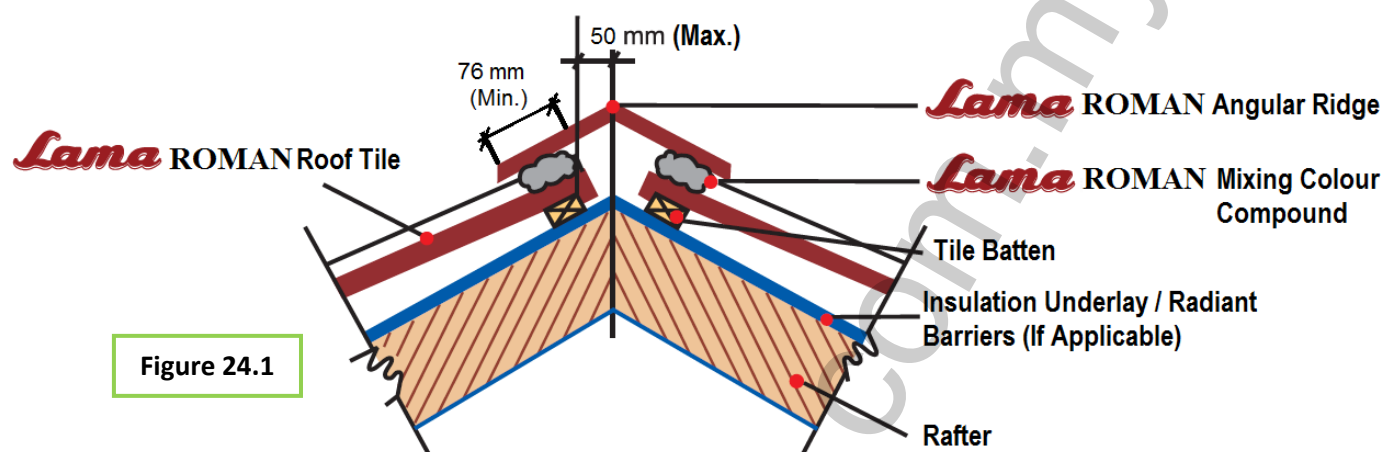


4-WAY APEX TILE INSTALLED



24. RIDGE & HIP FIXING

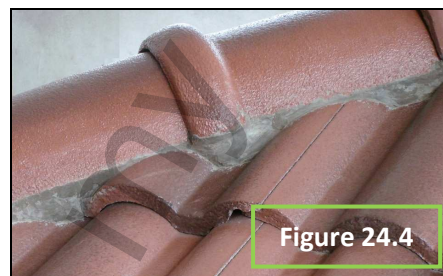
1 / Wet Ridge & Hip Fixing



- Lama ROMAN main roof tiles installation must be prepared for the ridge and hip fixing as per specifications and a minimum of 76mm cover should be provided over top course tiles (*Fig. 24.1*).
- The wet ridge and hip fixing involves bedding and pointing in a sand-cement mortar. The mortar bed supports and aligns the capping while the pointing provides the majority of adhesion and allows a neat finish (*Fig. 24.2*).
- Prior to application, all tiles adjacent to the ridge and hip should be lightly cleaned and brushed free of loose particles and ensure that areas that are to be bedded must be cleaned and freed of all traces of oil and grease and slightly dampened.
- Mix sand and cement to a mortar on a 3:1 ratio and create a bedding for fixing the ridges and hip starters to the hip or ridge.
- Support the mortar at the butt joints of the ridge tiles using pieces of tiles and edge bed ridge tiles onto the top course tiles with solid bedding at butt joints (*Fig. 24.3*).

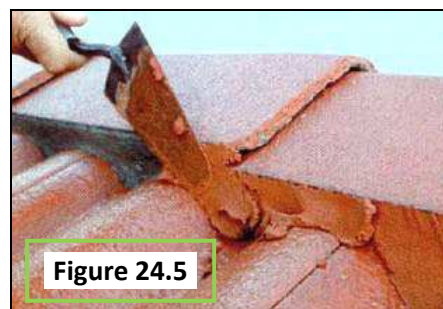


- ✚ After bedding is completed (Fig. 24.4), carry out pointing.
- ✚ Care should be taken to ensure that bedding and pointing is carried out in suitable weather conditions whereby if performed during hot conditions, the ridge should be made wet to ensure that the mortar compound does not dry too quickly for adhesion improvements.
- ✚ Standard conventional method of installing roof tile accessories with sand-cement mortar bedding and pointing may not be used in high wind areas - that is, above 33 metres per second - without additional mechanical fixing such as clips or other fasteners.

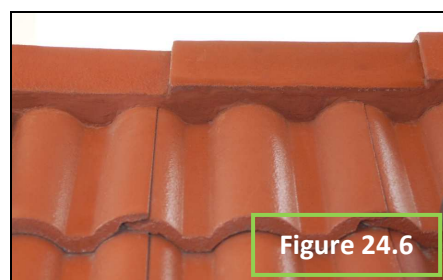


✚ BEDDING

- ✚ For further bedding instructions, see Wet Ridge and Hip Fixing above.



- ✚ A tiled roof has roof accessory cappings that covers the joints between the different sides of the roof. These accessories are called ridges and they are held down onto the cut roof tiles by cement mortar. The cement mortar is called **BEDDING** because it holds the ridges in a straight line. Once the bedding hardens and the ridge is supported, a layer of coloured material is applied over the exposed bedding to give the roof a cosmetic finish. This material is called the **POINTING** (Fig. 24.5).
- ✚ If the cement mortar to be used for bedding and pointing is not mixed properly with the correct amount of sand to cement ratios and if the wrong coarseness of sand is used, the mortar in conventional point may crack with the movement of the roof structure. This is unsightly and can lead to premature maintenance. Cracking may occur if pointing is disturbed by nearby work such as television antenna installation or areas where workers walk up and down the roof near the hips or ridges.
- ✚ Attention must be provided to the cleanliness during ridge and hip installation, avoiding mortar droppings. Mortar droppings can be cleaned using a wet sponge before they harden (Fig. 24.6).



POINTING

- ✚ The Lama ROMAN Colour Compound comes in a packaging of 5kg (Fig. 24.7). Do not encourage overly adulteration of the mortar with the substitution of other accelerators, composites, hardeners and/or other non-silicate. It is designed to be used as it is, though a small amount of mortar and fine aggregates can be added to it in order to obtain the colour strength required.
- ✚ The roof will look aesthetically very much better if the pointing material is made close to the colour of the ridge tile (Fig. 24.8 & Fig. 24.9). The Lama ROMAN Colour Compound is used to mix into the material for pointing. During mixing of Colour Compound, bonding agent additives may be added for adhesion improvements.
- ✚ When Lama ROMAN Colour Compound is used to prepare the pointing material, unlike a paint coating, the colour will not fade or wear out and is very long lasting.
- ✚ Pointing should be finished without visible trowel marks and finished at right angle to the roof tiles. Trowel the pointing material to a minimum thickness of 3-5mm, ensuring that the pointing is in full contact with the edge of the ridge and has a neat, clean finish with the bedding made damp for better adhesion. Weep holes should be provided through both the bedding and pointing to ensure any seepage is drained away.
- ✚ Tilers should take care to remove all debris from the roof and gutters on the completion of the job, particularly steel debris which may rust and cause staining of the tiles or gutters.
- ✚ Care should be taken to ensure that bedding and pointing is carried out in suitable weather conditions whereby if performed during hot conditions, the ridge should be made wet to ensure that the mortar compound does not dry too quickly for adhesion improvements.

**LAMA COLOURED
COMPOUND, 5KG BAG**



Figure 24.7

**WITHOUT LAMA
COLOURED COMPOUND**



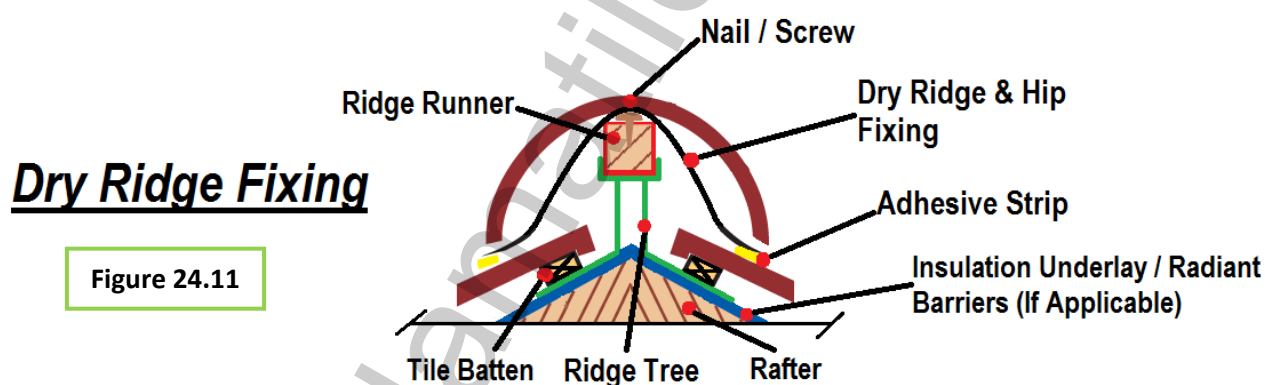
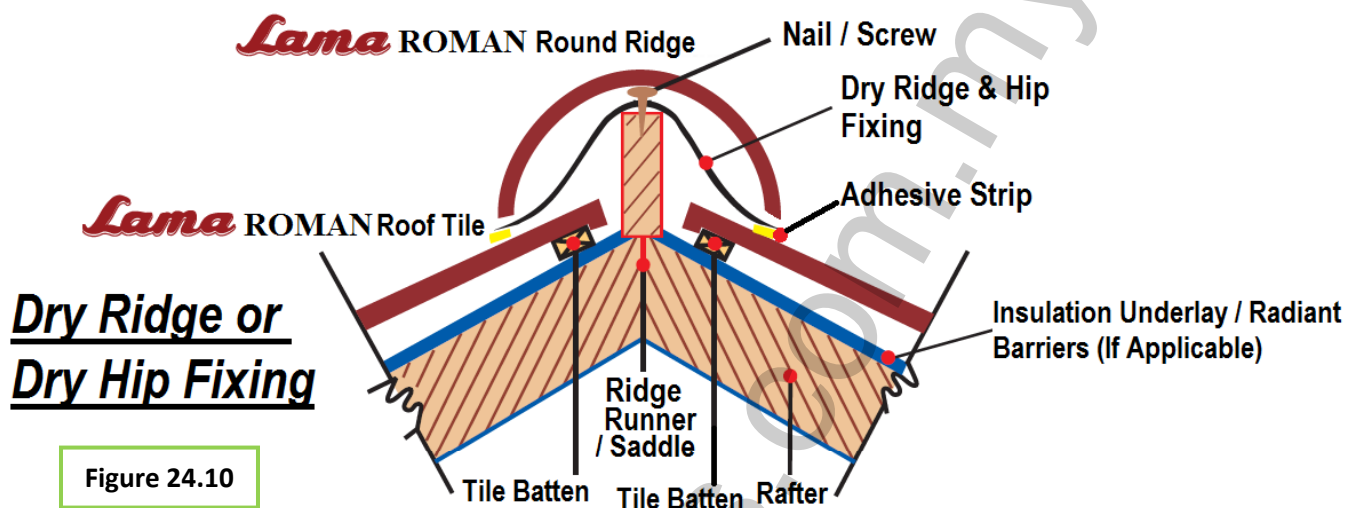
Figure 24.8

**WITH LAMA COLOURED
COMPOUND**



Figure 24.9

2/ Dry Ridge & Hip Fixing

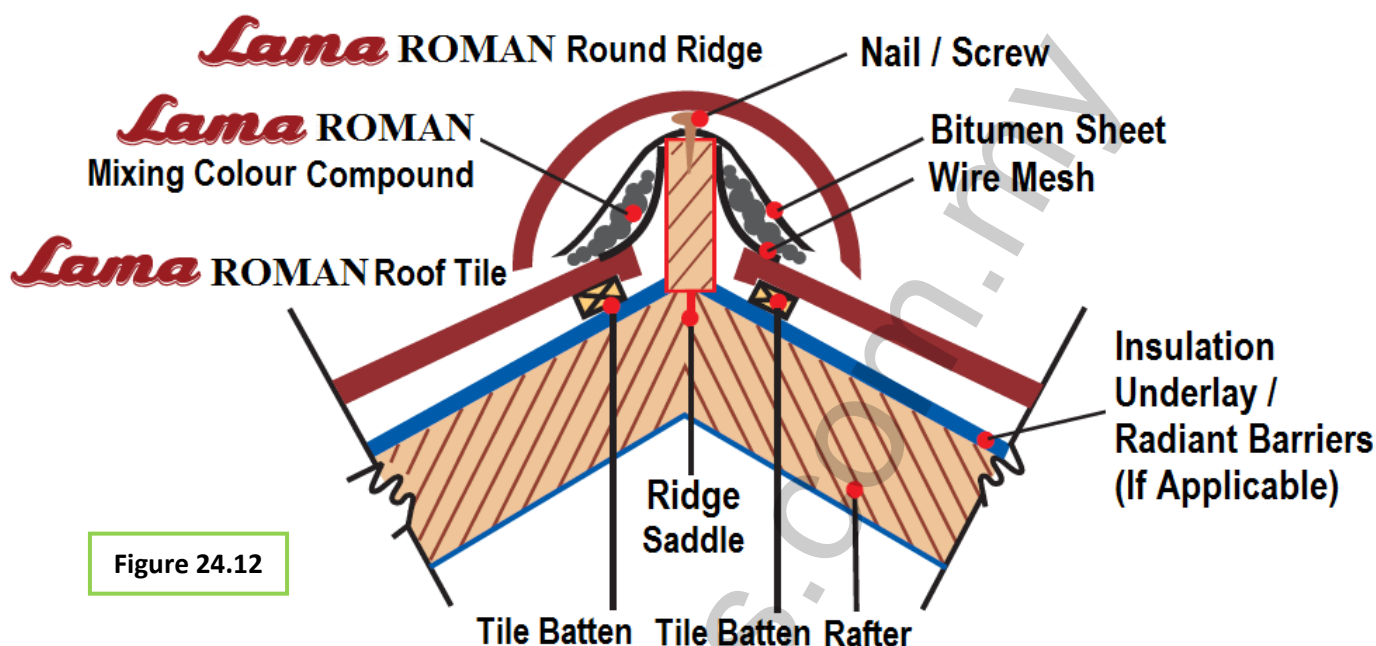


- ✚ No cement mortar or any bed and point compound is used for the dry ridge and hip fixing.
- ✚ Lama ROMAN Round Ridge tiles can be installed using the dry fix method using both the Ridge Tree with the Ridge Saddle / Ridge Runner (Fig. 24.10) method OR Ridge Runner method (Fig. 24.11), explained further below.

- ✚ Run a wooden ridge runner/saddle or ridge tree with ridge runner over intersection of two roofs for the support of the ROMAN Round Ridges.
- ✚ This ridge runner / saddle or ridge tree with ridge runner must be high enough so that the ridge would not contact / sit on the roof tiles at its sides but sitting on the ridge saddle or ridge tree with ridge runner instead. The height of the ridge saddle or ridge runner varies between roof pitches.
- ✚ The ridge tree bracketing can be mounted on the rafters – counter batten or between the battens and rafters and they can be adjusted to a suitable height for the ridge runner.
- ✚ Prior to application, at the very top course where all tiles are adjacent to the ridge and hip should be lightly cleaned and brushed free of loose particles and ensure that these areas that are clean and free of all traces of oil and grease and must be dry.
- ✚ Remove the adhesive tape backing on the underside of the Dry Ridge and Hip Roll and run them over by laying them over the ridge saddle / runner or ridge tree with ridge runner.
- ✚ Ensure that the sides of the Roll where the adhesive are, contacts well to the tile surface and not leaving any open gaps.
- ✚ Every Lama ROMAN Round Ridge tile should be mounted to the ridge tree with ridge runner, every hip tile should be mounted to the ridge saddle / runner mechanically, with a screw or nail (screws are recommended).
- ✚ Tilers should take care to remove all debris from the roof and gutters on the completion of the job, particularly steel debris which may rust and cause staining of the tiles or gutters.



3/ Ridge & Hip Fixing Using Bitumen Sheet

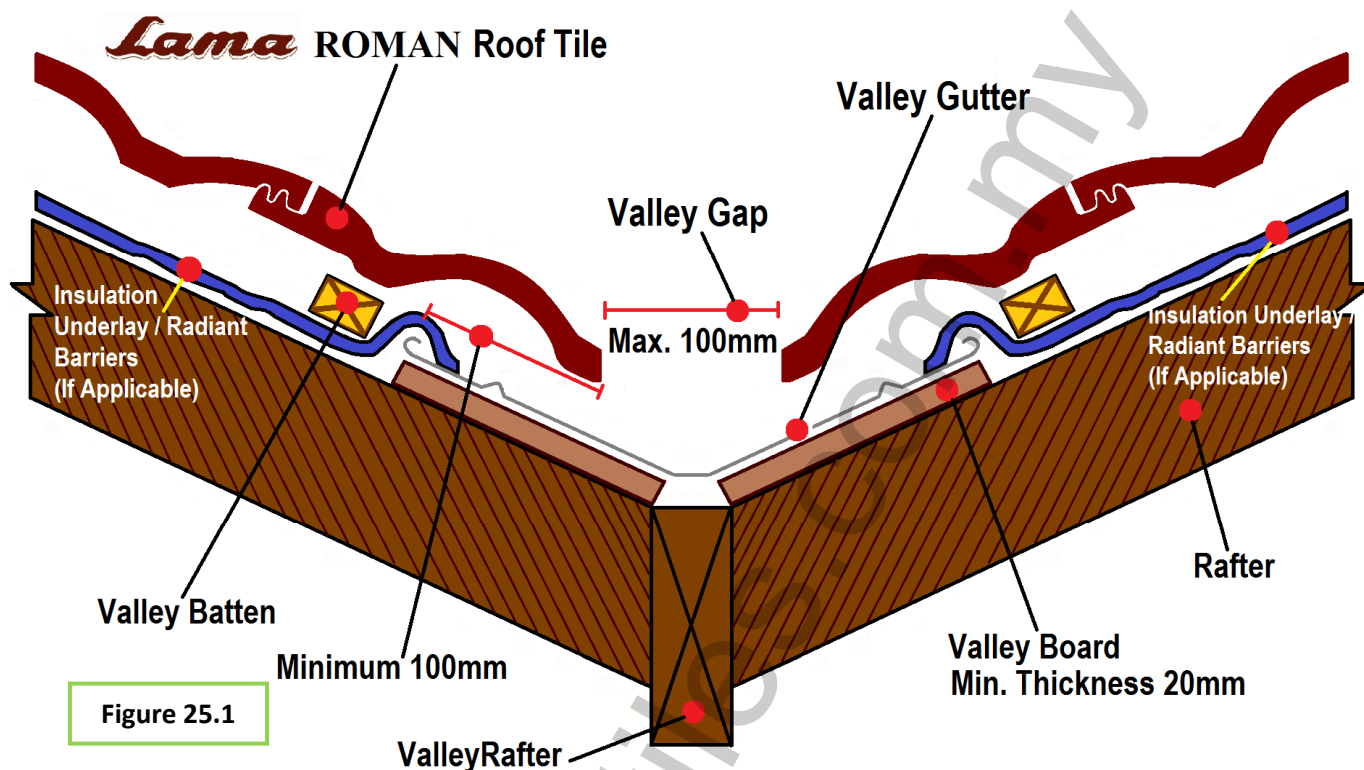


- Lama ROMAN Round Ridge tiles can also be installed using the fixing method (Fig. 24.12) using bitumen sheet, explained further below.
- Run a wooden ridge saddle or ridge runner of 25mm – 37 mm thickness over intersection of two roofs for the support of the ROMAN Round Ridges. Run a piece of string from one end to another to ensure that the ridge saddle or ridge runner is straight to achieve a well aligned ridge and hip tile installation.
- The height of the ridge saddle or ridge runner varies between roof pitches and therefore, should be measured and tested prior to determine the optimum height.
- Lay a construction wire mesh over the the head of the tile, overlapping about 30-40mm over the ridge saddle, or sufficient enough to prevent the mortar which is mixed with the Lama ROMAN Colour Compound from falling through the gaps between the tiles.
- Prior to application, at the very top course where all tiles adjacent to the ridge and hip should be lightly cleaned and brushed free of loose particles and ensure that these areas that are clean and free of all traces of oil and grease.

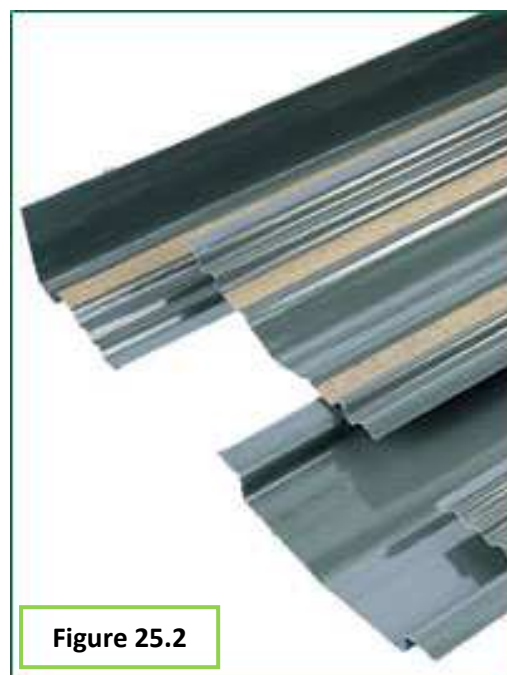
- ✚ Lama ROMAN Colour Compound can be used to be mixed into the cement mortar during its mixing in order to provide some colour to the mortar. Amount of Colour Compound to be used for this fixing will depend on the strength of colour required.
- ✚ Bed mortar over the construction wire mesh and on both sides of the ridge saddle or ridge runner, avoiding any cement mortar on the top face of the ridge saddle or ridge runner where the Lama ROMAN Round Ridge tile will be in contact with.
- ✚ Quantity of cement mortar applied must not protrude from the sides of the Lama ROMAN Round Ridge tile, therefore, excessive use with large quantities should be avoided.
- ✚ Run a bitumen sheet of a suitable width of approximately 250mm over and along the ridge saddle or ridge runner bedded with the coloured cement mortar. The width of the bitumen sheet will depend on the height of the ridge saddle or ridge runner.
- ✚ Run a piece of elevated string from one end of the ridge saddle or ridge runner to the other and marking the centre point of the round ridge collar as in (Fig. 20.3, Pg. 37), then start laying the Lama ROMAN Round Ridge tile over the bitumen sheet under the string and along the ridge saddle or ridge runner.
- ✚ Every ridge or hip tile should be mounted to the ridge saddle or ridge tree with ridge runner mechanically with a screw or nail (screws are recommended for adjustability).



25. INSTALLATION OF VALLEYS AND GUTTERS



- There are many different designs of valley gutters available in varying sizes (Fig. 25.2). Valley gutters are available in a variety of materials. The construction and design of the valley should follow the instructions of the valley gutter manufacturer whereby the flow of water should be as smooth as possible with minimal or no obstruction. Leakages leading to damages may occur should there be any overflow or backflow of rainwater.
- The eaves of the tiles should be cut in a straight line and must overlap the valley gutter by a minimum of 100mm (Fig. 25.1).



- ✚ The valley gap / open channel is the gap between the cut tiles at the valley should be approximately 76mm or 3 inches but must not be more than 100mm / 4 inches (Fig. 25.1).
- ✚ The gutter must be of smooth surface and must be supported along its entire length by the valley board, at least 20mm in thickness (Fig. 25.1).
- ✚ All valley battens should be mitre cut and skew nailed to the edge of the valley boards with the valley boards which are mounted to the counter battens leveled at the top surface. Valley batten spacings should be made to suit the valley gutter manufacturer's specifications.
- ✚ In any event, the valley gutters must not obstruct the interlocking of the roof tiles. Should the batten lugs of the tiles be in the way of the valley gutter, the batten lugs shall be removed by knocking with a hammer.
- ✚ The lower the roof pitch or the longer the valley, the wider or larger rain water flow capacity is required of a gutter. Most gutters with width of 125mm / 5 inches, is sufficient, however, for pitches below 35 degrees gradient or valley lengths of more than 5 metres / 16 feet, a wider gutter may be required. Valley gutters longer than 6 metres / 20 feet is not recommended.



The Gutter Is Installed In The Valley Of The Roof



The Main Tiles At The Valleys Must Be Cut To Allow The Correct Valley Gap

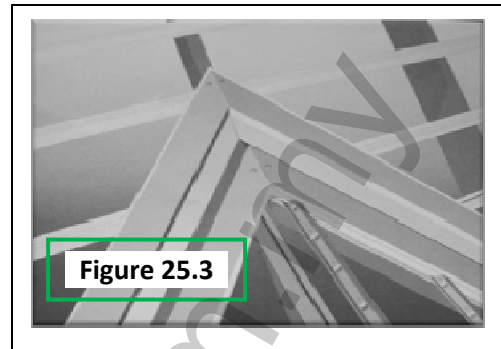


All Main Tiles At The Valleys Must Be Fastened, Nailed, Screwed Properly

Where Two Valleys Are To Join Into One, The Joining Must Be Correctly Done With Proper Sealing To Avoid Leakages (Fig. 25.3).

All tiles either side of the valley must be mechanically fixed by either screwing or nailing the tiles to the battens. If the tile nail hole is no longer present, they will have to be secured using specialized clip brackets or anchor hooks and even wire ties as a last resort. There should be no tiles missing from the valley sections (Fig. 25.4).

Do Not Use Mortar On The Valleys (Fig. 25.5).



Lama Coloured Paints (Fig. 26.1) is specially formulated to be painted on the mortar used for wet ridging and hip fixing to provide you a fully coloured throughout roof. Lama recommends the paint to be used straight out of the can and discourages adulteration or thinning with other solvents which may not be compatible with the paint. Lama Coloured Paints can also be used to touch up any chippings or cement droppings on the ROMAN roof tile and accessories. Being an Acrylic based paint, they are subjected to the normal wear and tear as well as the weathering properties of normal roofing and exterior paints. This product comes in 1 Litre Cans and a wide range of colours (only available in ROMAN Sapphire and Sky Blue in Malaysia).

When moving around on the roof, please ensure that safety is of concern and should be done with extreme caution. Tiles breakages may occur if the tiles are stepped on the wrong areas. These damages may extend to damages to the house or building via broken debris or infliction of personal injury. The stepping pressure point of the tile should only be applied to the Headlap / Head Overlap areas, near the nose of the tile. In any event, please avoid stepping on the Coverlock / Overlock as there are tendencies for this part of the tile to break if excessive load is applied to and please avoid stepping on the centre of the tile which is not supported by the roofing structures.

26. LAMA COLOURED PAINTS



Figure 26.1

27. WALKING ON THE ROOF

The weight of a person standing on the roof as well as the weight of the tile itself is supported by the battens of the roof just beneath the suggested stepping point. This point is where the load is distributed to near the bearing points of the tile. Stepping on other points may result in the tile breaking, cracking or developing a hairline fracture which may cause leakages further down the line (Fig. 27.3 - Pg. 52).

**STEPPING POINTS FOR
TILES LAID IN A
STRAIGHT BOND
METHOD**

(Fig. 27.1).

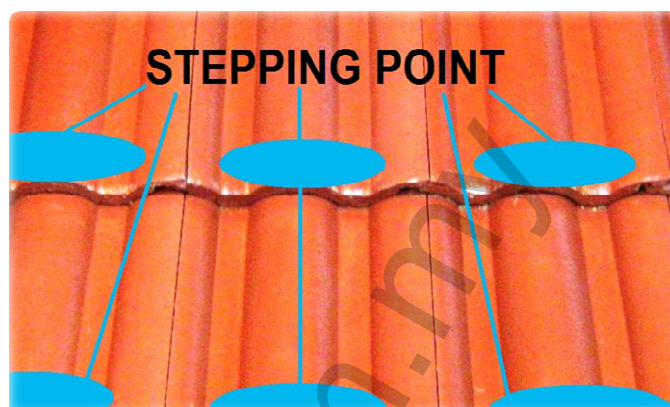


Figure 27.1

**STEPPING POINTS FOR
TILES LAID IN A CROSS
BOND OR STAGGERED
METHOD**

(Fig. 27.2).

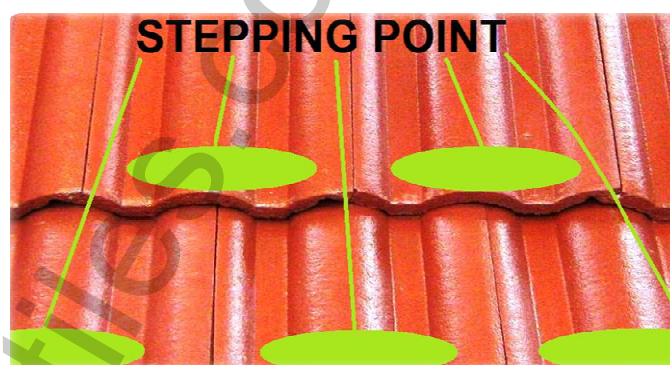


Figure 27.2

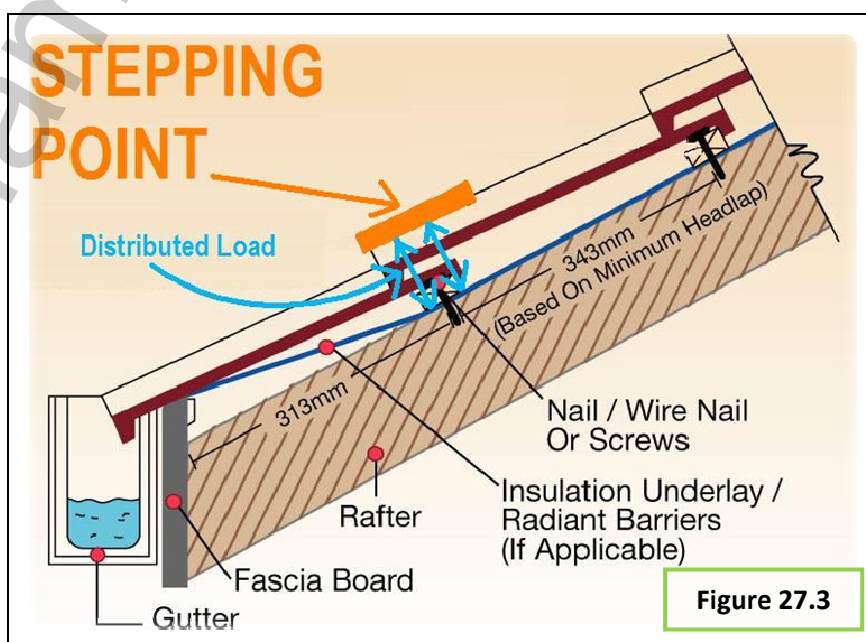


Figure 27.3

28. FUNGUS / ALGAE / MOSS GROWTH

In certain equatorial / tropical climatic regions as well as the warm and humid local environment of the roof, the development of Fungus, Algae and Moss can occur on any building material. Cement based products are naturally alkaline and therefore does not by itself encourage Fungus, Algae or Moss growth, however, the growth of Fungus, Algae and Moss thrives on the dirt and moisture on the surface of the tile and leaving a dark / black patch. Unlike other roofing materials, the formation of these items can easily be treated or rectified and does not deteriorate the structural integrity or the function of the roof tile.

29. EFFLORESCENCE

Efflorescence is a well-known phenomenon and is a very common sight on concrete structures and cementitious products as well as accepted by all international standards as an inevitable event. Efflorescence is a crystalline deposit of water-soluble salts on the surface of concrete and masonry products and depending on the severity of efflorescence, the presence of efflorescence, being white patches by its nature (CaCO_3 : Calcium Carbonat), may make the tile looks as if it has gone lighter and is generally more pronounced on dark coloured surfaces such as dark coloured concrete roofing tiles than on light coloured surfaces. Simply stated, these water-soluble mineral salts in solution are brought to the surface of the tile and deposited there by evaporation, but are trapped by the transparent gloss coatings of the tile. However, the colour is actually still there, but hidden behind this white mineral. Cement itself contain high levels of minerals in them as cement is made from properties of various minerals including Calcium and Limestone. Minerals found in sand, is also inevitable, thus making it no short of mineral salts inside cement products. The cycle of wetting and drying in the tropical environment is very conducive to these deposits coming to the surface.

Efflorescence however, has no detrimental effect on the performance of the product.

30. COLOUR SHADING

Lama ROMAN Roof Tiles are manufactured from natural materials such as sand, cement and etc. therefore, subtle variations in colour and surface finish due to the varying colours of raw material may occur. This slight variance is not detectable through standard quality control practices. To minimize colour patterning, tiles should be selected and spread over the entire roof pane when loading roof tiles on the roof prior to installation.

31. WEATHER EFFECTS OF ROOF TILES

Constant exposure to Ultra Violet rays from the sun, acidity of rain as well as other nature's elements causing oxidation may lighten the tile colours slightly. Through time of a few years, the gloss polymer coating applied to new tiles will eventually take on a matt appearance. The product functions however, will not be affected.

32. SCRATCHES ON TILE SURFACE

Due to the hot tropical climates and sudden downpours of rain, the protective gloss polymer coatings has to be made softer and more flexible to accommodate to this severe expansion and contraction movement of the product. Being slightly softer, tiles surfaces may be scratched if in contact with an abrasive surface.

In order for Lama to maintain providing competitive pricing of our ROMAN products, tiles are packaged in such a way that some coloured surfaces of the tiles are in contact with the batten lugs and supporting nibs of the tile beside or above it, which tends to move slightly during transportation based on traffic and road conditions thus creating some abrasion. Therefore, slight scratches to the tile surfaces are inevitable.

However, should special packaging to avoid the above are required, Lama will be able to arrange packaging of tiles with protective covering at an additional cost.

33. REPAIRING AND REPLACEMENT OF BROKEN TILES

Individual tiles or accessories that are damaged during or after installation should be replaced as soon as possible using matching units fixed in accordance with the screwing or nailing and/or clipping specification. Superficial coatings or repairs to damaged units using adhesives or other mechanical devices should not be used as their long term performance may be limited. If extensive repairs to the roof is required, sectional or complete re-tiling of that section should be considered as this may be the most practical and economic solution.

34. TRANSFER, STACKING & STORAGE OF ROOF TILES AT SITE

Caution and care against tile scratches and breakages should be taken during the transferring of tiles to the ground and/or to the roof while ensuring safety.

A proper unloading spot with flat, firm and clean grounds should be organized at site for the appropriate unloading of tiles. A soft and uneven ground may settle in causing the stacked tiles to fall over. The concrete tile has a small water absorption percentage therefore, damp or muddy locations with dirty water may cause a different shading of tile colour (Fig. 34.1 & 34.2).



Figure 34.1

Tiles are stacked properly on a prepared ground which is hard and flat, without any water catchment.



Figure 34.2

Tiles are stacked on soft, uneven ground with a lot of debris and poor conditions.

Stacking of tiles should be done correctly should the tiles be transferred to a different location from where the experienced transporter has initially unloaded. Sloped areas should be avoided (Fig. 34.3).

The lifting method to the roof that is used must not put strain on the product which may result in hairline fractures upon and after installation (Fig. 34.4).



Figure 34.3

Tiles should not be stacked too high especially on slopes. Stacking on steep slopes should be avoided.



Figure 34.4

When lifting the tiles to the roof using cranes, pallets must be strong and rigid and strappings must not impose any pressure to the tiles.

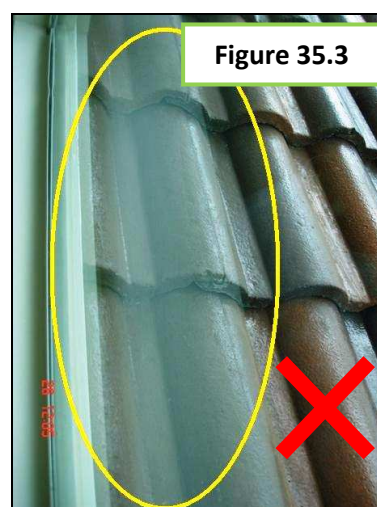
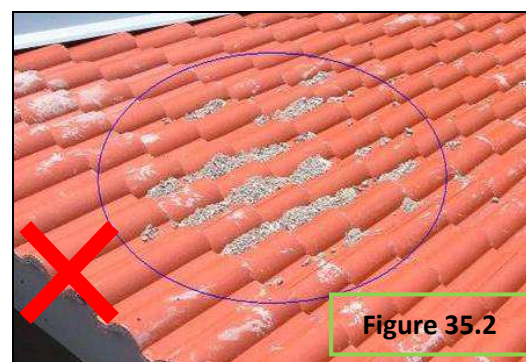
35. AVOIDANCES DURING INSTALLATION & COMMON INSTALLATION ERRORS

Attention must be provided to the cleanliness during ridge and hip installation, avoiding mortar droppings. Mortar droppings can be cleaned using a wet sponge before they harden (*Fig. 35.1*), (*Ref: Part 24, Ridge & Hip Fixing; Bedding – Pg.41*).

Tilers should take care to remove all debris from the roof and gutters on the completion of the job (*Fig. 35.2*), (*Ref: Part 24, Ridge & Hip Fixing; Pointing – Pg.42*).

Walking on a roof with debris may damage the gloss polymer coating by scratching, tearing, puncturing, resulting in colour variations due to the cause effects of efflorescence.

All Lama ROMAN roof tiles and accessories are coated with a gloss polymer coating. As in all painted products, they should only be cleaned using clean and warm soapy water with a soft sponge, then rinsed with clean water. Do not clean using any solvents, chemicals, harsh detergents, abrasive material or scrubbing (*Fig. 35.3*).



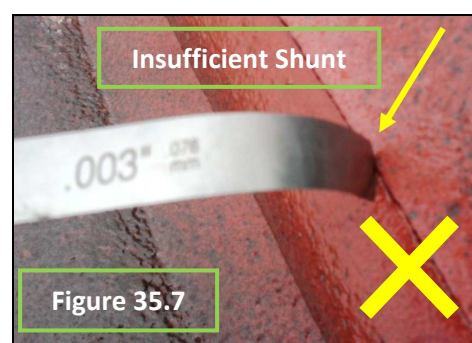
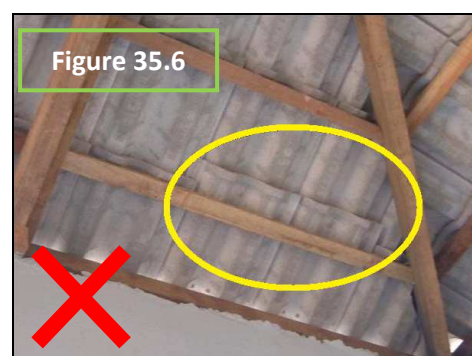
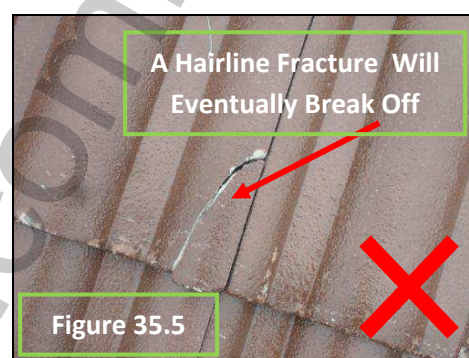
Avoid stepping on the Coverlock / Overlock of the tile as they are the thinnest part of the tile and have a tendency to break if excessive point loading is applied to. Do not step on the centre of the tile which is not supported by the roofing structures (Fig. 35.4), (Ref: Part 27, Walking On The Roof – Pg. 52).

&

Stepping on other points may result in the tile breaking, cracking or developing a hairline fracture which may cause leakages further down the line (Fig. 35.5), (Ref: Part 27, Walking On The Roof – Pg. 52).

Note that all eaves tiles should lie over the centre line of the gutter where water exits and must be nailed/screwed (Fig. 35.6), (Ref: Part 6a, Eaves Fixing With Gutter – Pg. 12).

There should be a minimum SHUNT tolerance of approximately 0.7mm at the coverlock and underlock interlocking. Insufficient clearance will result in tile breakages at the cover locks due to thermal expansion and when the interlock sections are point loaded or stepped upon (Fig. 35.7), (Ref: Part 10, Installing Lama Roof Tiles – Pg.18, Part 10.7, Shunt – Pg. 19-20).



Trowel the pointing material to a minimum thickness of 3-5mm (*Fig. 35.8*), (*Ref: Part 24, Ridge & Hip Fixing; Pointing – Pg.41*).

For Gable roofs, the last Gable End tiles from both verges should be spaced out as close as possible so that the intersection of the two edges are almost touching each other (*Fig. 35.9*), (*Ref: Installation of Verges & Gable End Tile, Part 18 – Pg. 36*).

Do not use cement mortar under the Gable End Tiles as they are prone to cracking, (*Fig. 35.10*), (*Ref: Installation of Verges & Gable End Tile, Part 18 – Pg. 36*).

Ensure that each of the following Gable End tiles are wrapped around the verge and should be touching both the outer edge of the fascia board as well as the roof tile. Each of the larger taper openings of the Gable End overlaps the smaller taper ends (*Fig. 35.11*), (*ref: Installation of Verges & Gable End Tile, Part 18 – Pg.35*).



Figure 35.8

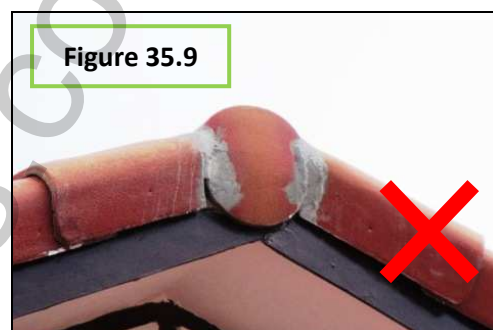


Figure 35.9

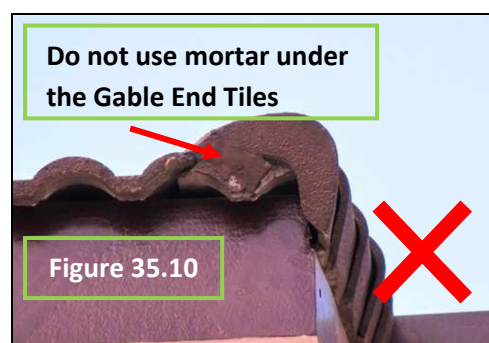


Figure 35.10



Figure 35.11

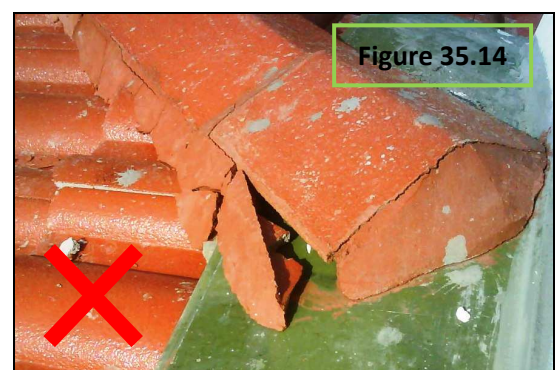
It is important that the tiler should set out the roof prior to fixing. Setting up requires planning and measuring as well as to ensure that the Rafters are properly positioned and spaced. This will help to save time and avoid unequal overhangs at verges (Fig. 35.12), (Ref: Part 6, Setting Out – Pg. 10).

Once the bedding hardens and the ridge is supported, a layer of coloured material is applied over the exposed bedding to give the roof a cosmetic finish. This material is called the **POINTING**. (Fig. 35.13 & Fig. 35.14).

If the cement mortar to be used for bedding and pointing is not mixed properly with the correct amount of sand to cement ratios and if the wrong coarseness of sand is used, the mortar in conventional point may crack with the movement of the roof structure (Fig. 35.13 & Fig. 35.14), (Ref: Part 24, Ridge & Hip Fixing; Bedding – Pg. 41).

Poor Bedding and Pointing Installation of roof tile accessories are a common cause of water leakages during rain fall.

**Eaves Should Have Minimal Overhang
If Gable End Tiles Are To Be Fitted**



Due to the fragile nature of concrete products, all Lama ROMAN roof tiles accessories should be handled with care. Any other forms of additional packaging should never be taken for granted. (Fig. 35.15 & Fig. 35.16).

