

# TOYO

**ROOF TILES**

**SPECIFICATIONS & TECHNICAL DETAILS**



TOYO ROOFING TILES INDUSTRY CO.,LTD.

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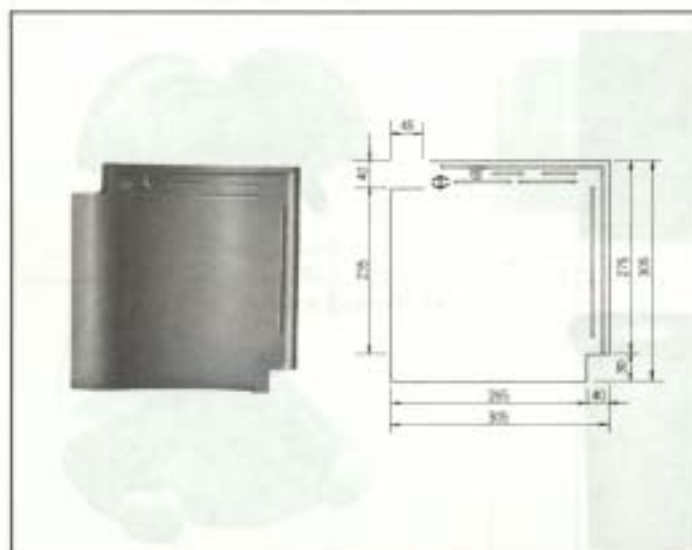
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Special shape of trim roof tiles are available on request.  
Please do not hesitate to write us for further information, if any.

Toyo Roofing Tile Industry Co., Ltd.  
Export Section

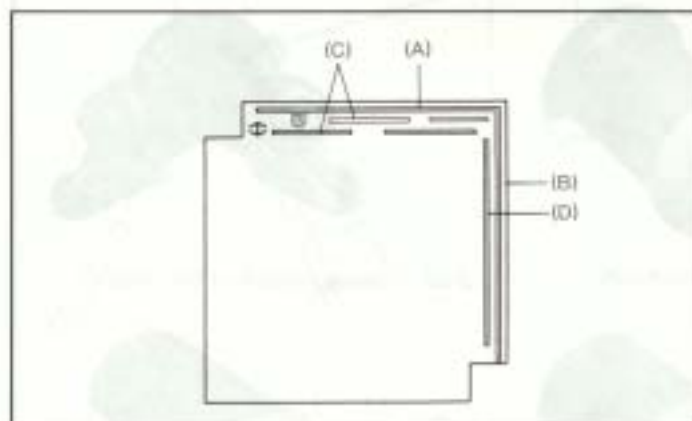
# 1 SPECIFICATIONS OF TOYO J-TYPE ROOFING TILES

## 1-1 FLAT TILE



Length	305 mm ( $\pm 4$ mm)
Width	305 mm ( $\pm 4$ mm)
Exposed length	236 mm ( $\pm 4$ mm)
Exposed width	267 mm ( $\pm 4$ mm)
Weight	2.7 kgs.
Quantity per m <sup>2</sup>	16 pcs./m <sup>2</sup>
Weight per m <sup>2</sup>	43.2 kgs./m <sup>2</sup>
Desirable roof pitch	Not less than 10 : 4 (21°48') pitch

## 1-2 TOYO'S LIGHT-WEIGHT ROOFING TILES

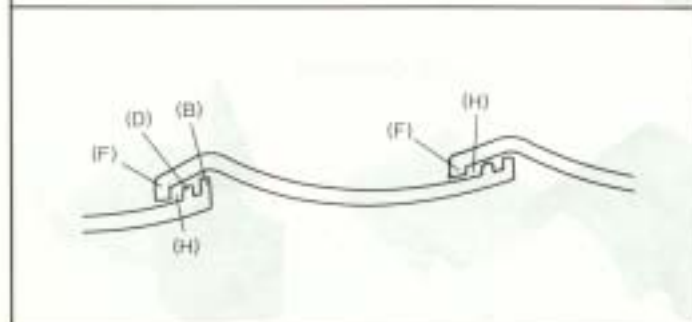
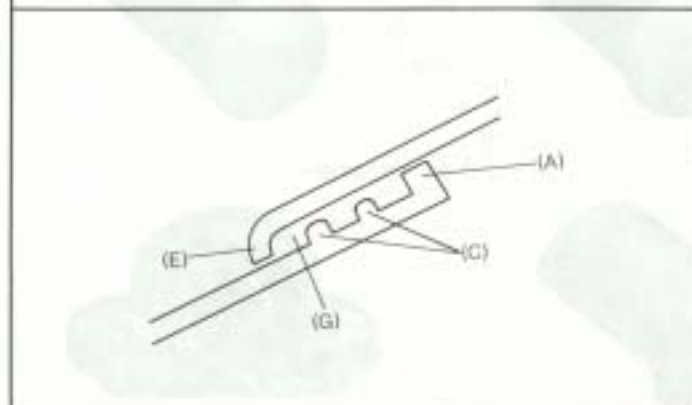


**"PERFECT WATER PROOFING!"** In any pitched roof, especially, best for low pitched roof.



















1. Upward water flowing by wind is intercepted perfectly by special water stoppers (A, B) and extra water stoppers (C, D) which are positioned by our scientific studies and long experiences to produce the best roofing tiles in the world.

2. The back-side end of the exposed parts of tile (E, F) are shaped with the best angle to flow off water travelling on the back of tiles. And, water on the back of tiles is perfectly intercepted by the spaces which are formed by the overlapping parts of tiles each other (G, H).

3. Moreover, in the case of J-type, the joint parts of A-E and B-F catch and control firmly each other, and will never be disordered after tile laying, accordingly.



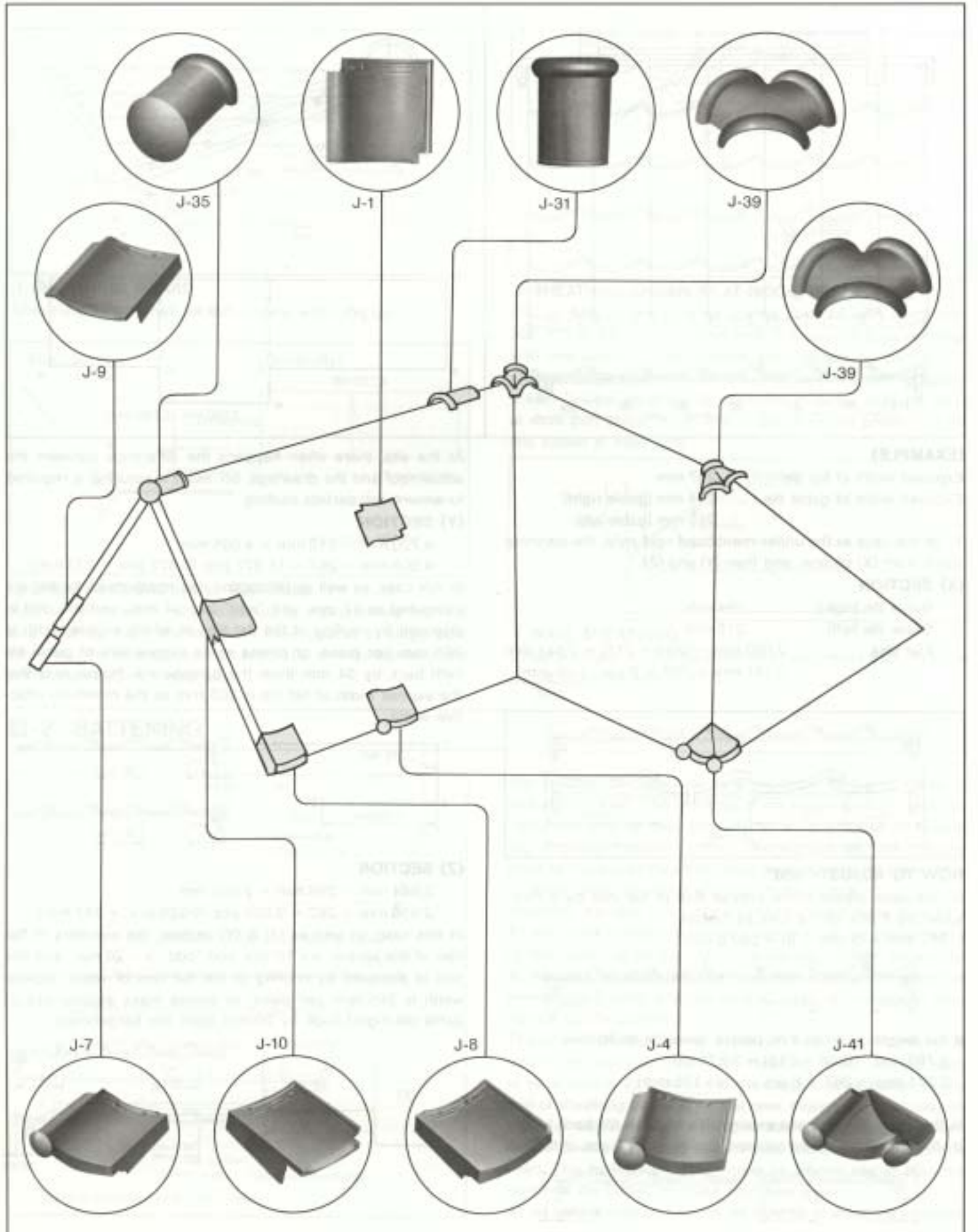
### 1-3 ROOFING TILES (REGULAR PRODUCTION)

<p>J-1 Flat tile</p> 	<p>J-28 Lapping</p> 	<p>J-39 Three forked ridge</p> 
<p>J-7 Gable corner (R)</p> 	<p>J-31 Ridge</p> 	<p>J-41 Forked eave</p> 
<p>J-8 Gable corner (L)</p> 	<p>J-35 (A) Ridge end with rim</p> 	<p>J-62 Ornament</p> 
<p>J-9 Gable (R)</p> 	<p>J-35 (B) Ridge end without rim</p> 	<p>J-32 Special ridge end for J-62</p> 
<p>J-10 Gable (L)</p> 	<p>J-36 Ridge down end</p> 	<p>J-63 Ornament</p> 
<p>J-4 Eave</p> 	<p>J-38 Two forked ridge</p> 	<p>J-70 Ornament</p> 



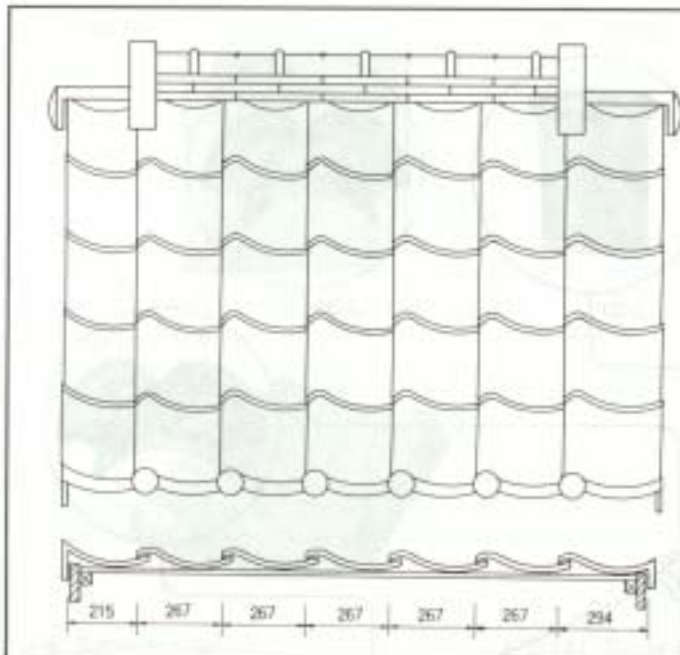
4 POSITION OF TILES

PLANNING



## 2 PLANNING OF ROOF LAYING

### 2-1 PLANNING



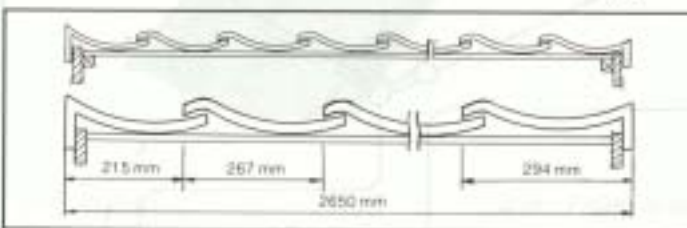
#### (EXAMPLE)

Exposed width of flat tile ..... 267 mm  
 Exposed width of gable tile ..... 294 mm (gable right)  
 215 mm (gable left)

1. In this case as the under-mentioned roof style, the planning starts from (X) section, and then (Y) and (Z).

#### (X) SECTION

Gable tile (right) ..... 294 mm  
 Gable tile (left) ..... 215 mm  
 Flat tiles  $2,650 \text{ mm} - (294 + 215) = 2,141 \text{ mm}$   
 $2,141 \text{ mm} \div 267 = 8 \text{ pcs. } (+5 \text{ mm})$   
 "odd"



#### HOW TO ADJUST "odd"

In this case, please make expose size of flat tiles by 5 mm wider by 8 pcs. of flat tiles as follows:

$$267 \text{ mm} + (5 \text{ mm} \div 8) = 267.6 \text{ mm}$$



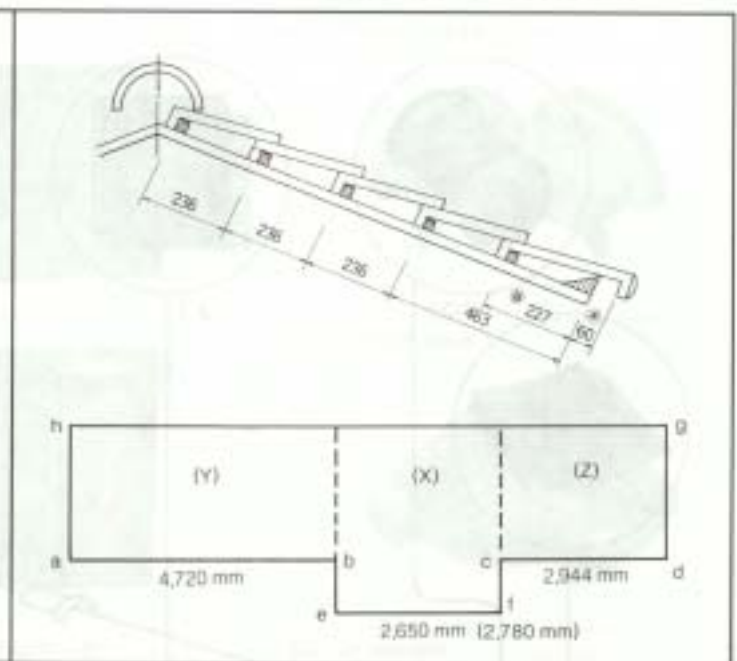
If the length is 2,780 mm, please compute as follows:

$$2,780 \text{ mm} - (294 + 215) = 2,271 \text{ mm}$$

$$2,271 \text{ mm} \div 267 = 8 \text{ pcs. } (+135 \text{ mm})$$

"odd"

In this case, please make expose size of gable tile back longer by 67.5 mm from the bargeboard, and cover by 9 pcs. of flat tiles.



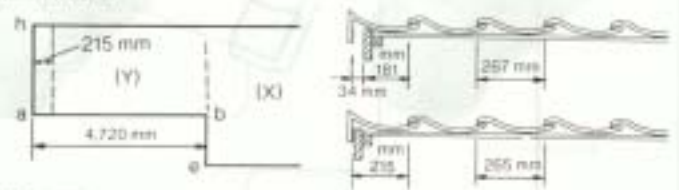
At the site, there often happens the difference between the actual roof and the drawings. So, exact measuring is required to ensure the perfect roofing.

#### (Y) SECTION

$$4,720 \text{ mm} - 215 \text{ mm} = 4,505 \text{ mm}$$

$$4,505 \text{ mm} \div 267 = 16.872 \text{ pcs. } (0.872 \text{ pcs.} = 233 \text{ mm})$$

In this case, as well as (X) section, the numbers of flat tile are computed as 17 pcs. and "odd" is -34 mm, and this odd is disposed by roofing of the flat tiles of which expose width is 265 mm per piece, or please make expose size of gable tile (left) back by 34 mm from the bargeboard. Please note that the expose width of flat tile is 265 mm as the minimum effective width.

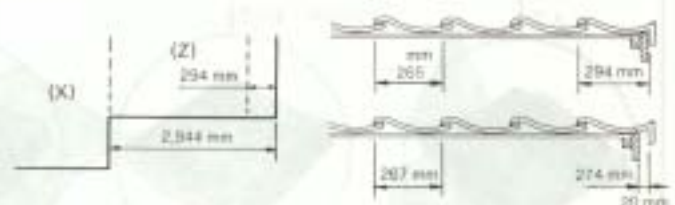


#### (Z) SECTION

$$2,944 \text{ mm} - 294 \text{ mm} = 2,650 \text{ mm}$$

$$2,650 \text{ mm} \div 267 = 9.925 \text{ pcs. } (0.925 \text{ pcs.} = 247 \text{ mm})$$

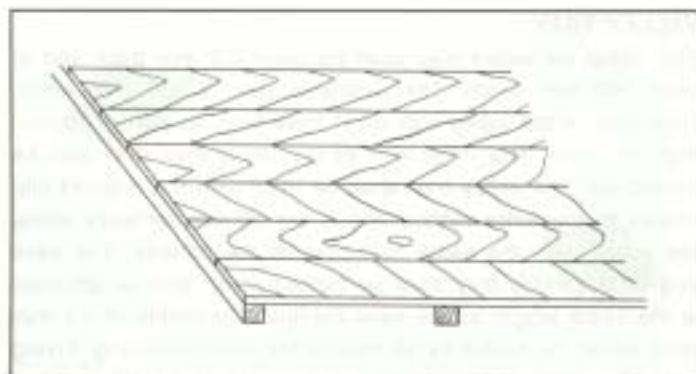
In this case, as well as (X) & (Y) section, the numbers of flat tiles of this section are 10 pcs. and "odd" is -20 mm, and this odd is disposed by roofing of the flat tiles of which expose width is 265 mm per piece, or please make expose size of gable tile (right) back by 20 mm from the bargeboard.





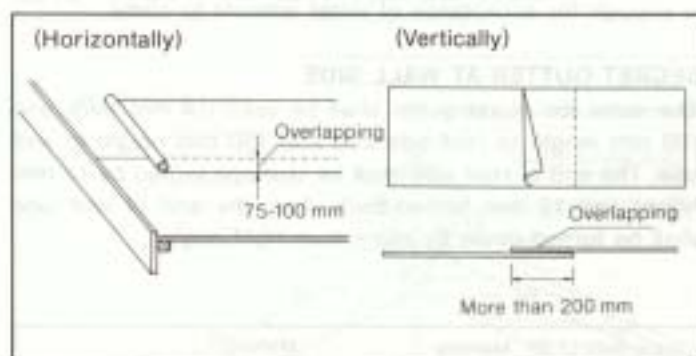
# 3 HOW TO LAY ROOFING TILES

## 3-1 SHEATHING



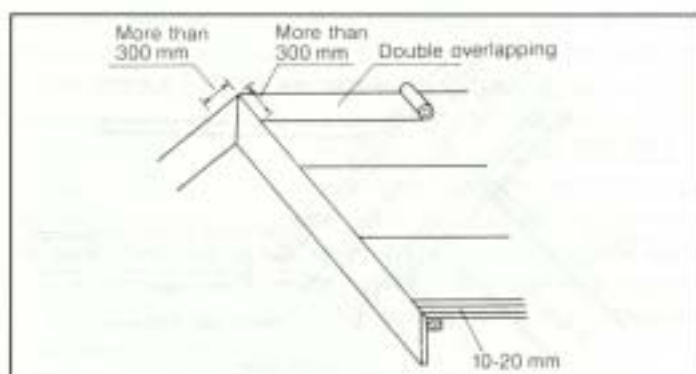
### ① SHEATHING BOARD

Sheathing board shall be laid closely without gaps.



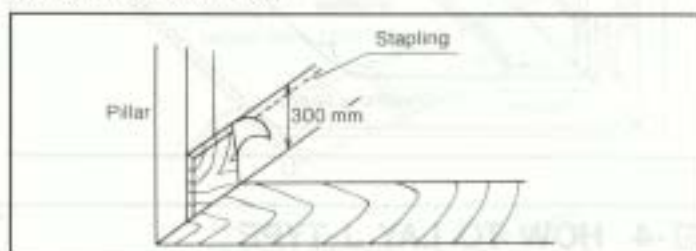
### ② SHEATHING UNDERLAY MATERIAL

Asphalt felt sheet is recommended as the underlay material and shall be fixed starting from eave course to ridge side. Normally, the overlapping part is 75-100 mm horizontally and more than 200 mm vertically.



### ③ SHEATHING UNDERLAY AT RIDGE, GABLE, EAVE

(Ridge) Asphalt felt shall be double-covered with more than 300 mm to each slope of the roof. It is desired to cover ridge with one piece of sheet without any overlapping part.  
(Gable) Verge part shall be covered upto the end of gable.  
(Eave) Double covering of underlay material shall be done at eave part about 10-20 mm longer than the position of the last batten at eave side.



### ④ WALL SHEATHING

Underlay material shall be covered at least more than 300 mm height from the end of roof.

## 3-2 BATTENING



The position of battens is very important to lay roof tiles of beautiful looking. The marking of the batten position must be calculated and decided carefully. When the colour of sheathing underlay material is black like asphalt felt, the marking must be made with the white colour marking material like powder of white chalk by string showed in the sketch.

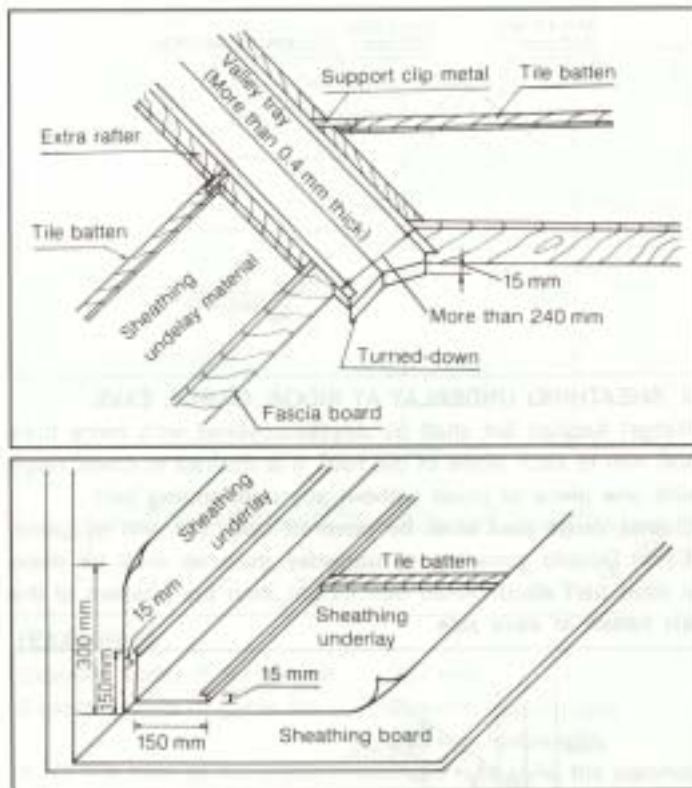
Normally, the size of tile batten shall be used more than 15 x 15 mm thick timbers and every batten must be nailed firmly to the rafters at all parts of crossing each other. Especially, in the case of steep pitched roof, two nails are required at every nailing point with the nails at least 30 mm longer than the tile batten thickness.

The span of the tile battens is 236 mm from ridge side to ridge side of the next batten, not from center to center. The last span at eave side is 227 mm from the ridge side of batten to the end of sheathing board in normal case, though this span may be used for adjustment according to the vertical length of roof. At the sheathing board end of eave side, the last batten is fixed. This batten's thickness must be 18 mm higher than the common tile batten to make roof face even.

All tile battens shall be fixed on the material of sheathing underlay.



### 3-3 VALLEY TRAY & SECRET GUTTER



#### VALLEY TRAY

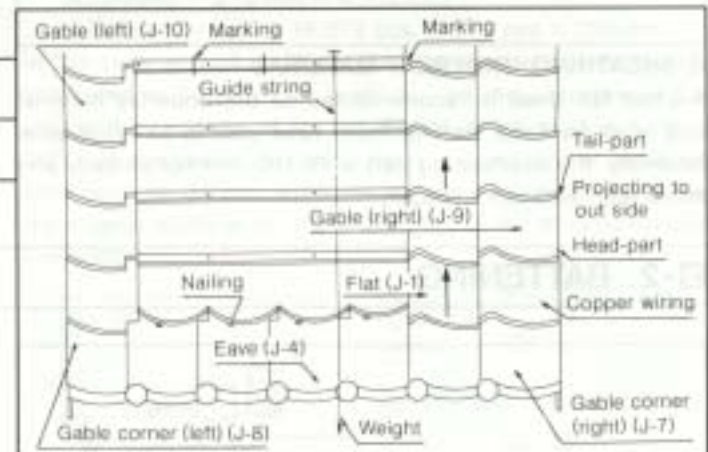
The metal for valley tray shall be used 0.4 mm thick and at least 240 mm width. The desirable size is 380 mm width. Both side of the valley tray must have turn-up part of 15 mm high or more. The ridge end of the valley tray shall also be turned-up. The valley tray shall be fixed with the support clip metals to the extra rafters which are affixed vertically along the valley with the same thickness of tile battens. The eave end of the valley tray shall be turned-down and be adjusted at the same length as the eave tile line. The inside of the tray shall never be nailed by all means for water-proofing. Fixing of the tray must be made at the top part only by the support clip metals. For the better looking, the visible part of the tray is the smaller the better, as far as the size of the valley tray is enough for acceptance of water amount to come.

#### SECRET GUTTER AT WALL SIDE

The metal for secret gutter shall be used 0.4 mm thick and 150 mm length to roof side and also 150 mm height to wall side. The end of roof side shall be U-shape turned by 15 mm height and 15 mm turned-back. And, the end of wall side shall be turned-down by more than right angle.

### 3-4 HOW TO LAY J-TYPE ROOFING TILES

1. Beautiful looking of roof starts from planning and the batten position must be marked carefully as this is the key point.
2. Firstly, the left and right gable corner tiles shall be fixed firmly. These must be laid at the exact position as planned because everything of roof is decided by these positions. It is recommended to lay gable tiles so that the tail-part may be projected about 3 mm from the head-part. This is considered the line of gable would be notched, but this makes the line more straight actually when it is looked up from the ground and also served for preventing the tiles from slip down.
3. The eave tiles, then, shall be laid at the planned position. The eave line should be straight by all means.
4. Following the eave tiles, the left and right gable tiles shall be fixed. Concerning to the laying way of the gable tiles, please refer to the detailed instruction page on this matter.
5. The fixing work of the above tiles must be done with stainless, copper, zinc-galvanized nails, and/or copper wires.
6. After finish of fixing gable corner, gable and eave tiles, then, the flat tiles laying shall be started from eave side to ridge and from right to left course along the guide string which is fixed on the ridge board and has the weight at the string end of eave side. The laying way of J-type shall be done by inserting the right side of flat tile in hand into under the tiles of the right course. One of the merits of J-type roof tile is the toughness against strong, violent wind, typhoon, hurricane or cyclone, because J-type tiles



engage each other with the neighbouring tiles like gears. Therefore, laying work by inserting method must be done tightly, never loosely. The roof laid tightly looks very strained and the beauty of roofs will never be tired of seeing by its symmetric and geometric patterns from every angle of view.

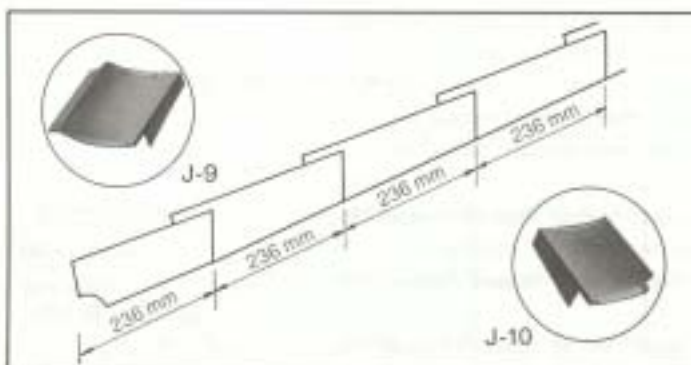
7. The last work is the ridge part laying. Firstly, the ridge end shall be set and the ornament shall be put when required. Then, the ridge tiles shall be laid. There is no problem to lay the ridge tiles from any side, left or right. But, it is desired not to be seen the back side of the ridge tiles when they are looked up from the ground where the main gate is positioned.

8. If the ridge tiles of small width are used, the lapping tiles are needed as the basement of ridge part and also clay or mortar is needed, too. The quantity of lapping tiles shall be decided according to the roof condition. The ridge tiles must be fixed tightly by copper wire of thicker than 1.2 mm (#18 or thicker wire) for wind proof purpose.



## 4 FINISHING OF TRIM TILES

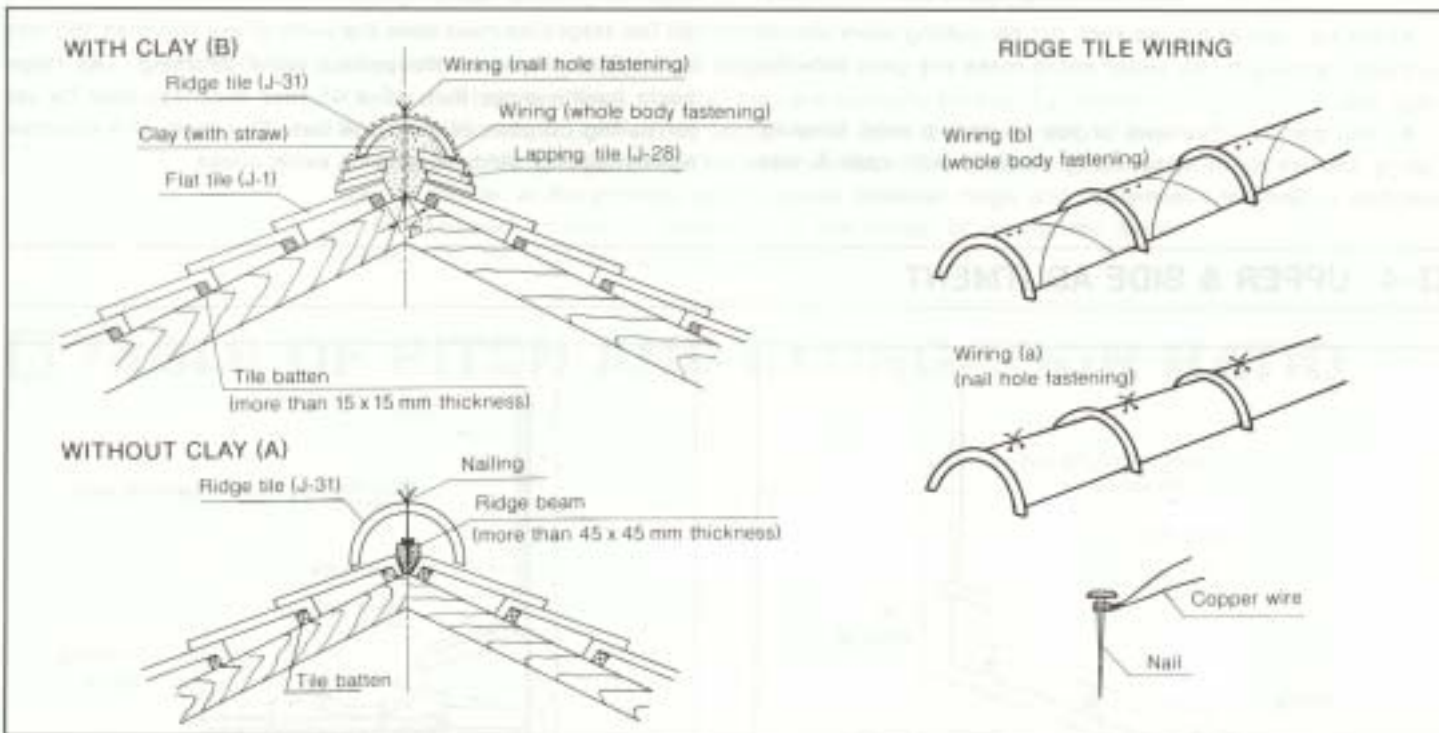
### 4-1 HOW TO FINISH GABLE TILE



Edge of sleeve part of gable tiles are made of about 10-15 mm thickness so that these parts can be cut easily by chisel or grindstone for roof tile not to make any gups at the joint part between gable tiles in any case of referent pitched roof.

Usually, it is enough to cut the edge parts of one or both side at every 3 or 4 pieces intervals for the adjustment of tile lines. By the expectation of better finish for beautiful appearance of gable part, the skilled roofing specialists cut every gable tiles sometimes. Such work, however, is not always required to every building because the cutting work is troublesome and needs much time.

### 4-2 HOW TO LAY RIDGE TILE



#### A. RIDGE WITHOUT CLAY METHOD

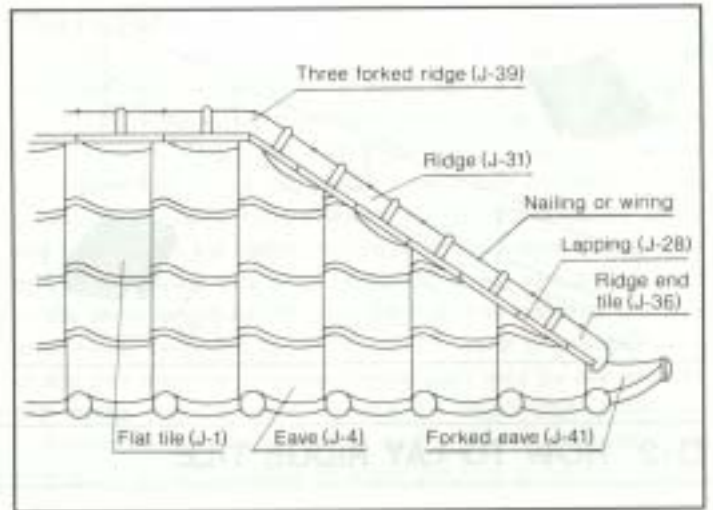
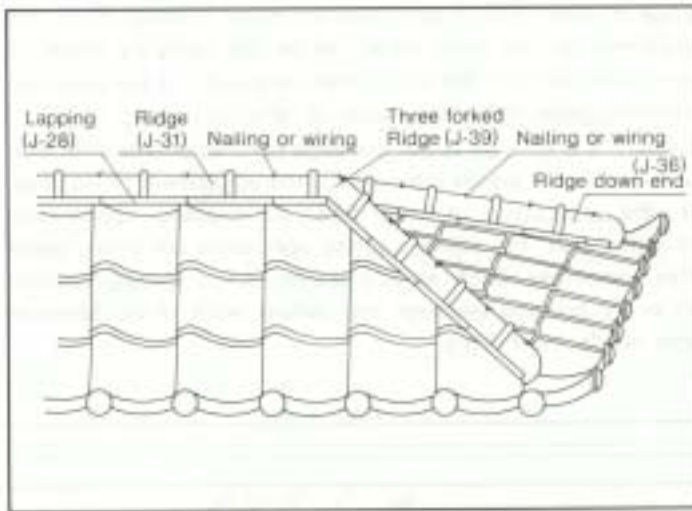
In this case, the ridge tiles must have the width more than 185 mm (J-31, S-5) to expect the perfect water proofing. The ridge beam having more than 45 x 45 mm thickness shall be set for nailing purpose of the ridge tiles. This method is effective against strong wind blowing or earth quake.

#### B. RIDGE AND RAPPING TILES WITH CLAY METHOD

1. When the small width of ridge tiles are used or the higher looking of roof is desired, lapping tiles are very useful. There are two kinds of lapping tile, one is just flat shape and another has rim. These tiles shall be used by cutting at the center, in another word, these tiles are used by pair usually. So, this tile is produced by one-piece body and cutting is made when it is going to be laid. Cutting into two pieces is very easy by hammer tapping.

2. Clay for bedding of ridge must be good in quality. If a certain material like straw is mixed in clay to prevent from crumbliness when dried, such clay should be kept at least for several days before use, because stickiness of clay will be increased and good result of firm laying can be expected.
3. Mortar for pointing (filling spaces between ridge and flat tiles) must be adhered to tiles closely. Visible part of mortaring shall be cleanly finished by trowel and surplus mortar shall be wiped off not to project outside. If colouring of mortar is required, colour must be tinted to match the main roof colour.
4. Ridge tiles must be fixed by copper wire and there are two ways of wiring, (a) one is fastening by the nail holes and (b) another is to fasten the whole body of ridge tile as the sketched.

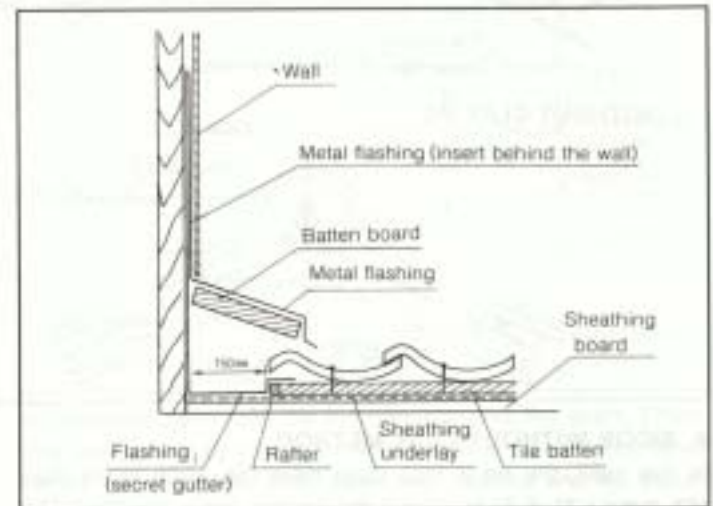
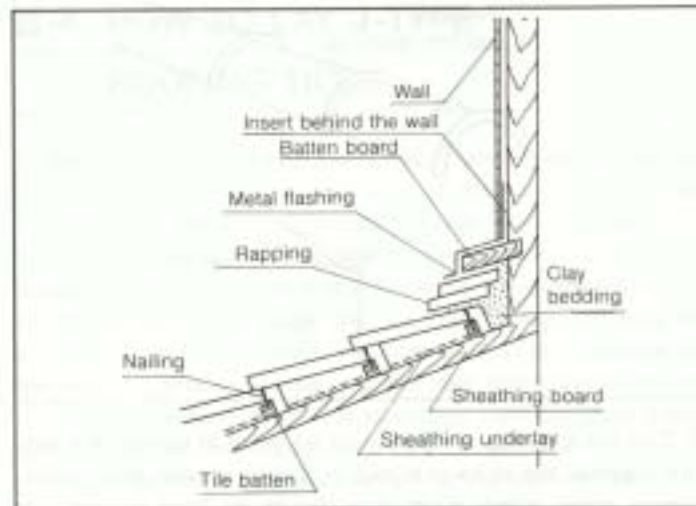
**4-3 CORNER OF HIPPED ROOF**



1. At the top part of hipped roof, flat tile cutting work should be made carefully by tile cutter not to make any gaps between ridge tiles.
2. As Hip part is influenced largely by strong wind blowing, nailing and wiring must be made carefully with nails & wire specified in General information.

3. The ridge tiles must have the width of not less than 185 mm (J-31, S-5) to expect the perfect water proofing. The ridge beam having more than 45 x 45 mm thickness shall be set for nailing purpose of the ridge tiles. This method is effective against strong wind blowing or earth quake.

**4-4 UPPER & SIDE ABUTMENT**



Secret gutter or metal flashing is needed for abutment part and metal for flashing must be copper or zinc-galvanized, and thickness is required more than 0.4 mm. The upper finish of flashing must be inserted behind the wall or weather-board.

It is impossible to specify the width of secret gutter, however, more than 150 mm width is required at least.



## 5 GENERAL INFORMATION

### A. NAIL & SCREW

Nails and screws which are used directly to the tiles must be made of copper, stainless, brass or zinc galvanized. And, the head of nail must be bigger than the common nails or screws. Please note the common iron nails must not be used to the tiles, because the swelled iron nails by rust lead to tile broken within one or two years since the holes of tiles are not big and usually don't be opened completely for the water-proof purpose after nailing. In case of stainless nail, it is recommended not to use perfect stainless nail like 18-8, because nails are fixed firmly to the wood when only the surface of nails get rust. It is needless to say that rusting of surface which makes tiles broken is out of discussion.

### B. WIRE

Wires to be used for tile fixing purpose must be made of copper of which gauge is  $\neq 18$  (1.2 mm dia.) or thicker. The wire must contain more than 95% copper, as the hard wire is not suitable for roofing work.

### C. KINSA NAIL (Special nail for roof tile)

This nail is usually used for roof tiles at eave course, made of brass and having rubber packing for water-proof purpose. The head part is the half-ball shape which serves as decoration of roof.

### D. S-MENDO (Special mask for mortaring part of ridge)

The spaces between ridge and roof tiles are normally finished by mortaring. For the better finish and saving labour time, special plastic mask is available for Spanish & S-type tiles. This mask serves to prevent from projecting clay or mortar at the pointing parts (spaces between ridge and roof tiles to be filled with mortar or plaster). It is the matter of course the better looking can be expected without exception.

## 6 TABLE OF PITCH AND ELONGATION RATIO

Pitch			Ratio of slope to horizontal length	Ratio of square hip length	
Fraction	Rise in m/m to 1000 m/m run	Degree		To slope	To horizontal line
12/10	1200 m/m	60° 11' 40"	1.562	1.188	1.855
11/10	1100	47 43 35	1.487	1.205	1.792
10/10	1000	45 0 0	1.414	1.225	1.732
9.5/10	950	43 31 52	1.379	1.235	1.704
9/10	900	41 59 14	1.345	1.246	1.676
8.5/10	850	40 21 52	1.313	1.257	1.650
8/10	800	38 39 35	1.281	1.269	1.625
7.5/10	750	36 52 12	1.250	1.281	1.601
7/10	700	34 59 31	1.221	1.292	1.578
6.5/10	650	33 01 26	1.192	1.305	1.556
6/10	600	30 57 49	1.166	1.317	1.536
5.5/10	550	28 48 39	1.141	1.330	1.517
5/10	500	26 33 54	1.118	1.342	1.500
4.5/10	450	24 13 40	1.097	1.353	1.484
4/10	400	21 48 05	1.077	1.365	1.470
●For the lower pitched roof listed hereunder, the further information is given on request.					
3.5/10	350 m/m	19° 17' 24"	1.060	1.375	1.457
3/10	300	16 41 57	1.044	1.385	1.446
2.5/10	250	14 02 11	1.031	1.393	1.436
2/10	200	11 18 36	1.020	1.400	1.428
1.5/10	150	8 31 51	1.011	1.408	1.423
1/10	100	5 42 38	1.005	1.411	1.418
0.5/10	50	2 51 45	1.0005	1.414	1.415





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