IMAGINATION SOLAR LTD

Installation Guide A3

Over Roof Mounting Frame

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A3.1 Over roof mounting

Collectors can also be over roof mounted using an aluminium frame that is fixed on top of the tiles or slates which eliminates the necessity to remove them for installation. Generally the frame will be coach screwed to noggings fitted between the rafters but in some instances the frame may be screwed directly to the rafters.

Before making a decision on whether to use noggings or screw directly to the rafters please consider the following and fully read the installation instructions for both options:

- Is the roof profiled (e.g. interlocking clay tiles) or non profiled (e.g. slates)
- It is always recommended to use noggings for a profiled roof tile since the alignment of the rafters is unlikely to correspond with the peaks of the roof tiles.
- Modern prefabricated trussed roofs often use narrow rafters
- Rafters may not run true
- Is the loft space accessible?
- A loft or attic conversion might not allow noggings to be fitted in which case 100mmx25mm battens may be fitted under the tiles from above.
- Is a stud/metal detector available that can be reliably used with confidence?
- Can tiles be easily lifted to see where the rafters are?

A3.2 Horizontal mounting for traditional roofs

Each kit for a single collector includes the following items:

2 off 2.43m long 75mm x 25mm horizontal aluminium box section rails
2 off 1.2m long 75mm x 25mm vertical aluminium angle side rails
1 off 1.2m long 25mm flat aluminium rail
4 off M10 x 200mm turbo coach screws
8 off Joist hangers (for 50mm wide noggings)
32 off stainless steel Tek screws
1 off 2m length of 19mm thick x 83mm wide Armaflex sheet

Extra items which may be required:
1.6 m length of 100mm x 50mm structural grade timber to be cut into four noggings.
1 off flashing for non-profiled roofs
Clear silicone sealant for profiled roofs

Option 1. Coach screwing the frame to noggings.

The two main advantages of using this method are that a good fixing can be guaranteed and the flexiblity of being able to move the frame to the best location on the roof rather than fixing to where the rafters are. These normally outweigh the only disadvantage which is the extra time and effort to fit the noggings.

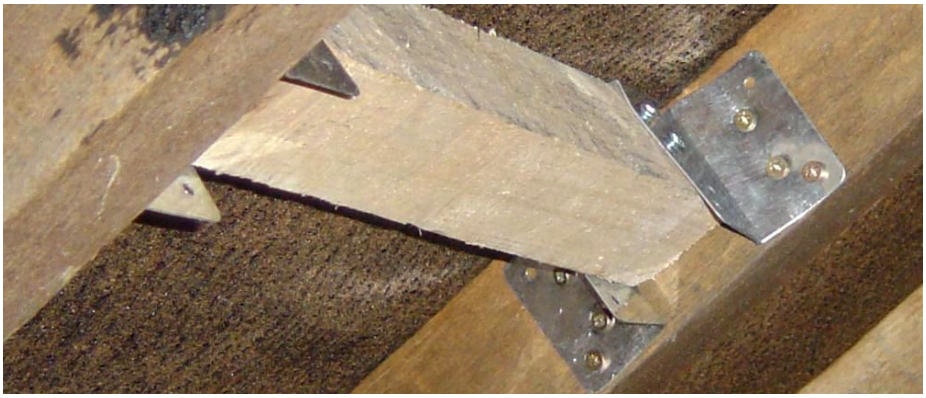
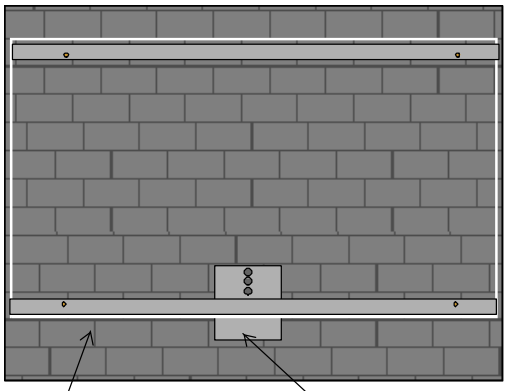


Photo of noggings in roof space to fix frame to

STEP 1: Drill holes for flow/return pipework and control sensor

The first step is to locate the position on the roof where the flow/return pipes and sensor cable will go through the slates/tiles into the back of the collector using the cardboard template. For a non-profiled roof there is more flexibility of location, but a flashing is required as per figures 1 to 4. For a profiled roof this will be at the ridge point of the tiles, without a flashing as per figures 5 and 6. Select a position for both rails which avoids the step between courses, especially on thicker tiles.



1. Firstly you will need to make three holes for the flow/return pipework and light sensor through the tiles or slates, felt and any roof insulation.

2. (a) For non-profiled roofs the holes should be approximately in the centre of the visible tile/slate.

2. (b) On a profiled roof these holes will be at the peak (ridge) of a tile, approximately midway between courses.

3. The three holes are in a line spaced at 30mm centres. The lowest hole centre being located centrally 95mm from the bottom edge of the collector.

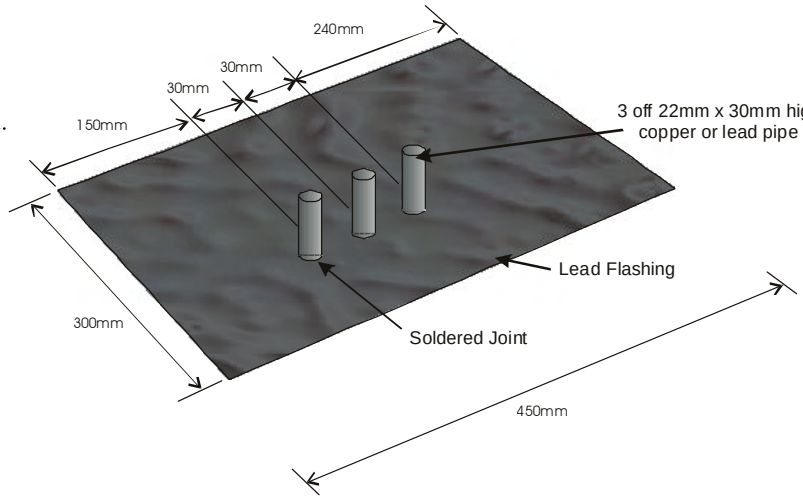
4. The holes should be drilled from the outside into the loft space to ensure the correct location of the holes in the tile. Initially a small pilot hole should be drilled once the collector location has been established using the cardboard template on the packaging.

5. If the pilot hole is in the wrong position seal it with a roofing screw and high quality roofing sealant and use it as a reference point to identify the correct position.

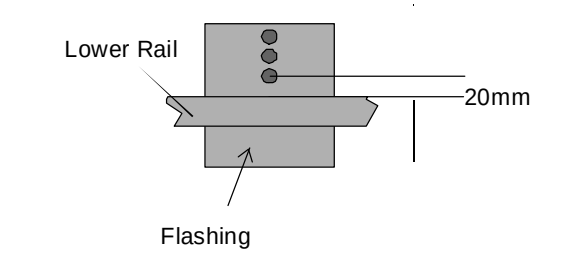
6. Assuming the location is deemed acceptable once the location of the pilot hole has been checked inside; enlarge this hole to 20mm and then make another two holes at 30mm centres to the first. If a flashing is to be used a slot can be cut, instead using an angle grider.

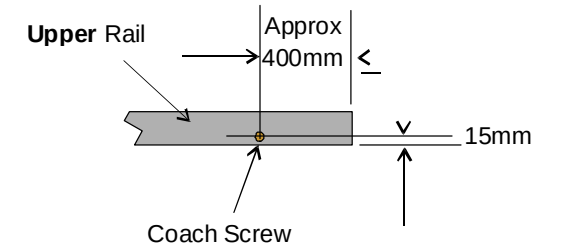
7. Carefully ease the flashing under the upper slates or tile as in the photograph.

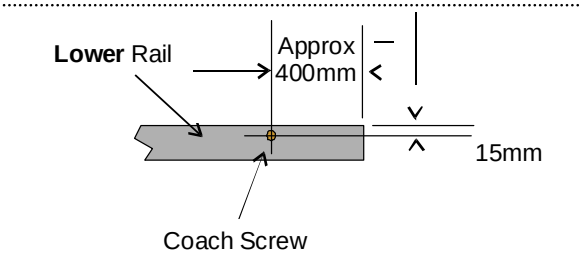
A3 Figure 1: Photo of optional aluminium flashing supplied by ISL

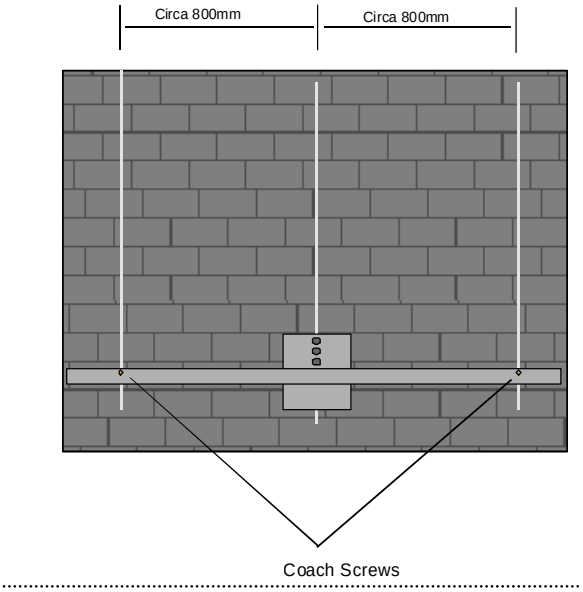


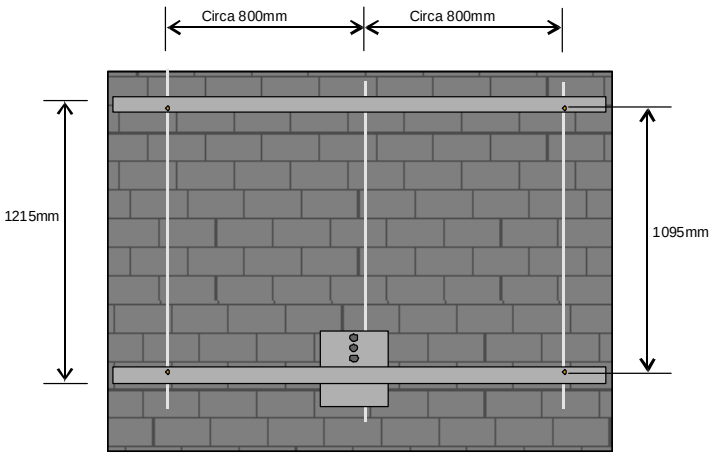
A3 Figure 2: Installer made lead flashing (use either way up as appropriate and trim to final length)











STEP 2: Drill holes for frame rails

The second step is to locate the horizontal frame rails.

1. Bring the rail up to the flashing/holes so the top edge is 20mm from the centre of the lower hole and centralise the rail on the line of holes.

2. (a) ▬▬ Drill two 12mm holes, 15mm from the top edge and 400mm in from either end of both rails.

2. (b) ∿∿ Drill two 12mm holes, 15mm from the top edge approximately 400mm in from either end of both rails to coincide with the peaks of the tiles as per figure 5.

3. Drill through the rail, slates/tiles, felt and any insulation to the loft space below.

4. The holes for the upper rail can now be measured and then drilled from this reference point at 1095mm centre to centre directly above the lower frame rail coach screws.

5. Drop the coach screws through the holes so that both rails are held loosely in place.

6. As a check make sure that the top edge of the upper rail is 1215mm from the bottom edge of the lower rail. The 75mm x 25mm aluminium side rails can be used to ensure that the rails are in line and correctly spaced.

STEP 3: Fit noggings

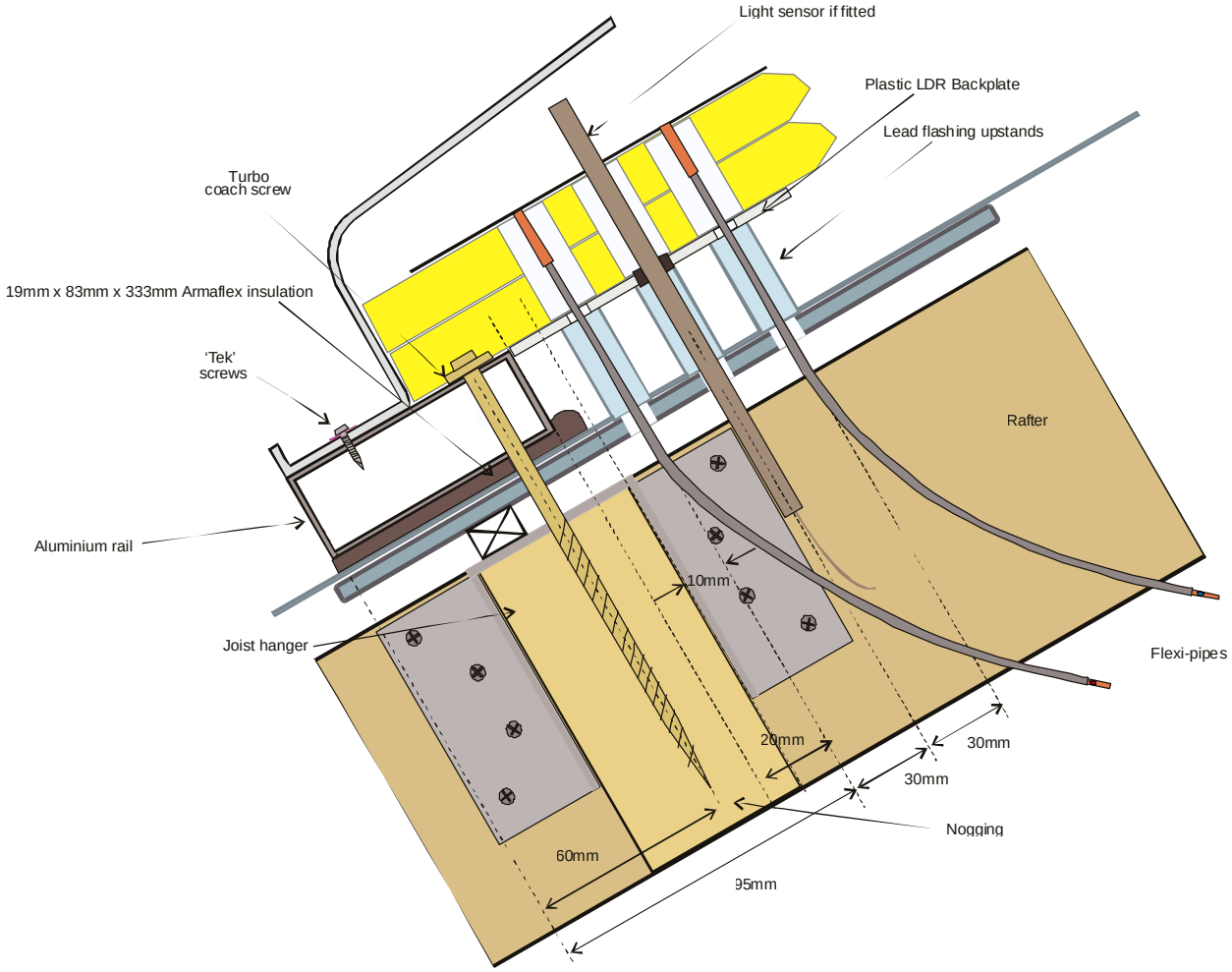
The third step is to fit noggings between the rafters to screw the coach screws into.

1. With the rails held loosely in place by the coach screws each nogging position can be determined from inside the loft with reference to the screw locations.

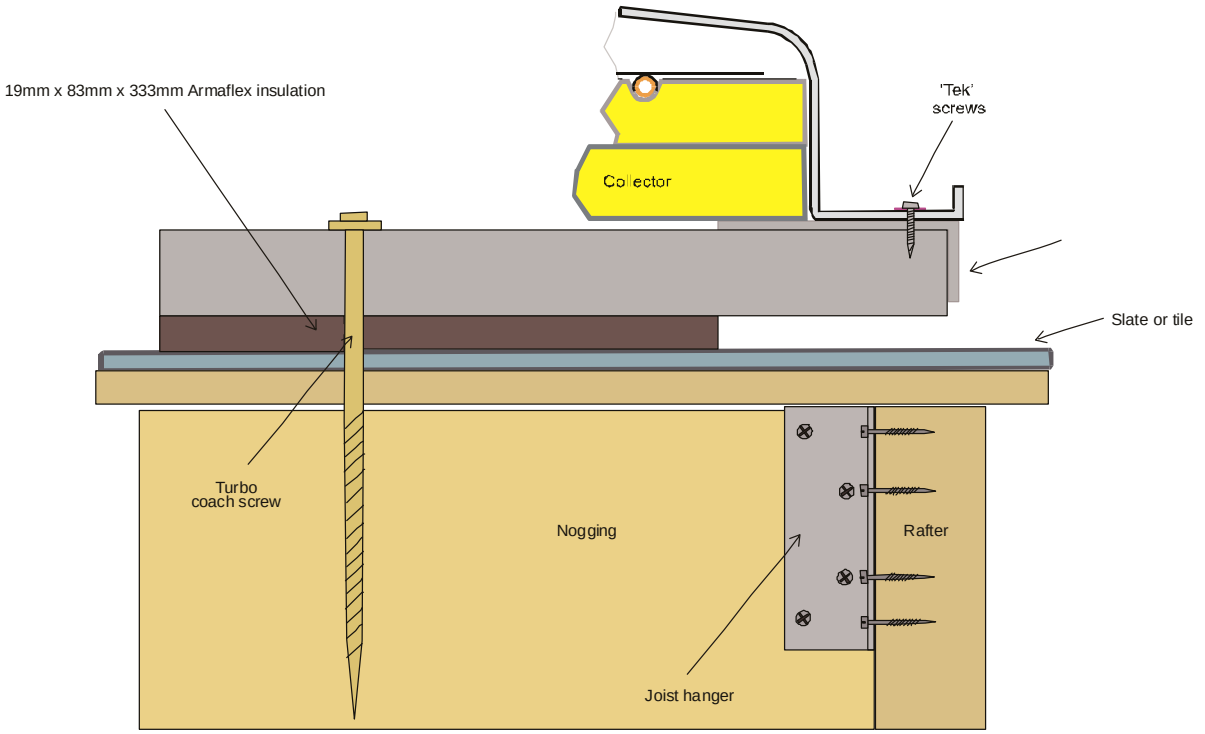
2. Carefully measure between the rafters and then cut each nogging from a piece of structural grade 50mm x 100mm timber.

3. With reference to figures 3 – 6 use 50mm galvanised screws to fit the joist hangers provided, in line with the holes in the roof, so that the coach screws will be fixed to the centre line of the noggings. Note these are installed “upside down” so when the coach screws are tightened the nogging will be pulled into the seat of each hanger.

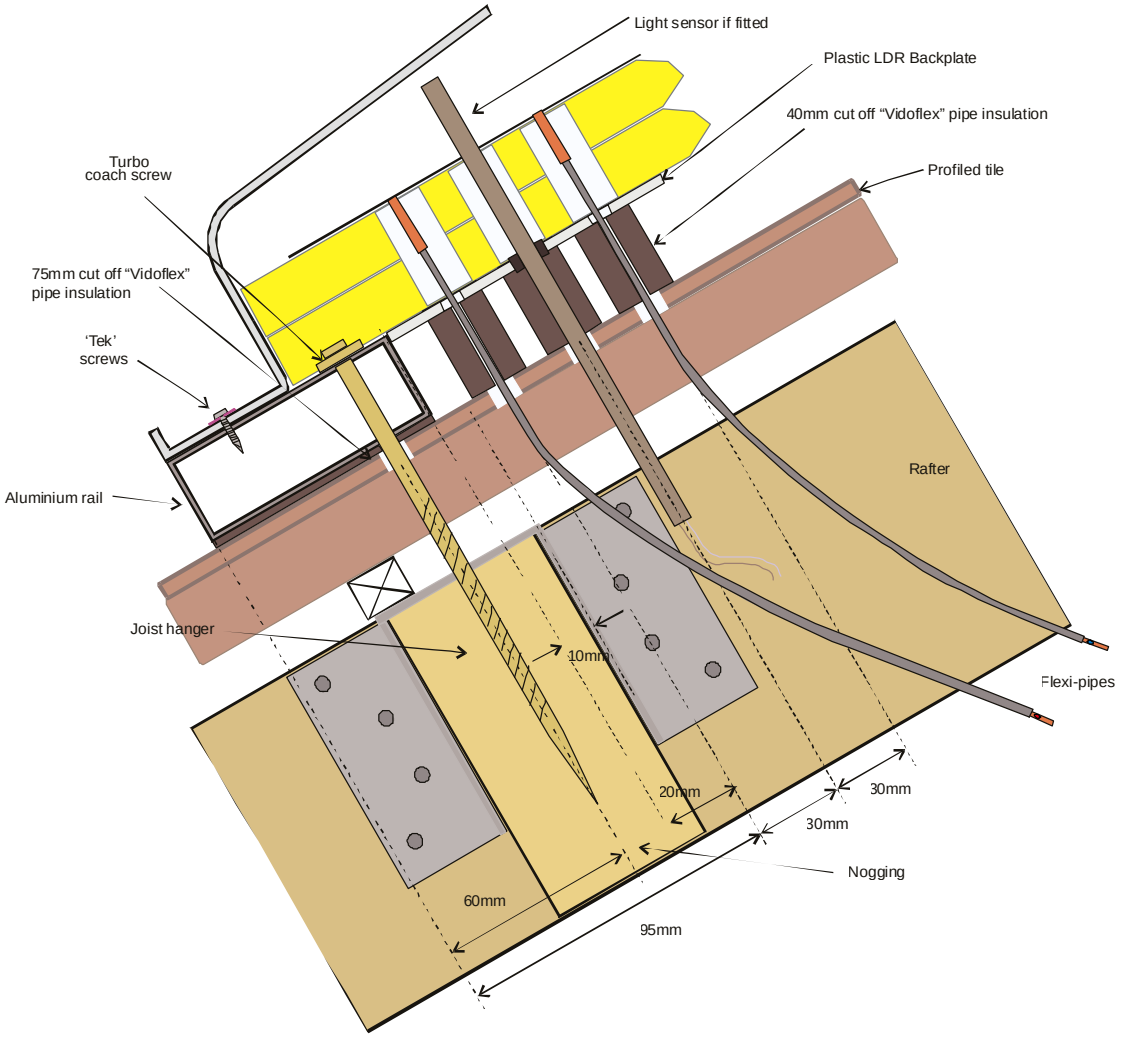
4. With the hangers in place the noggings can then be screwed into postion.



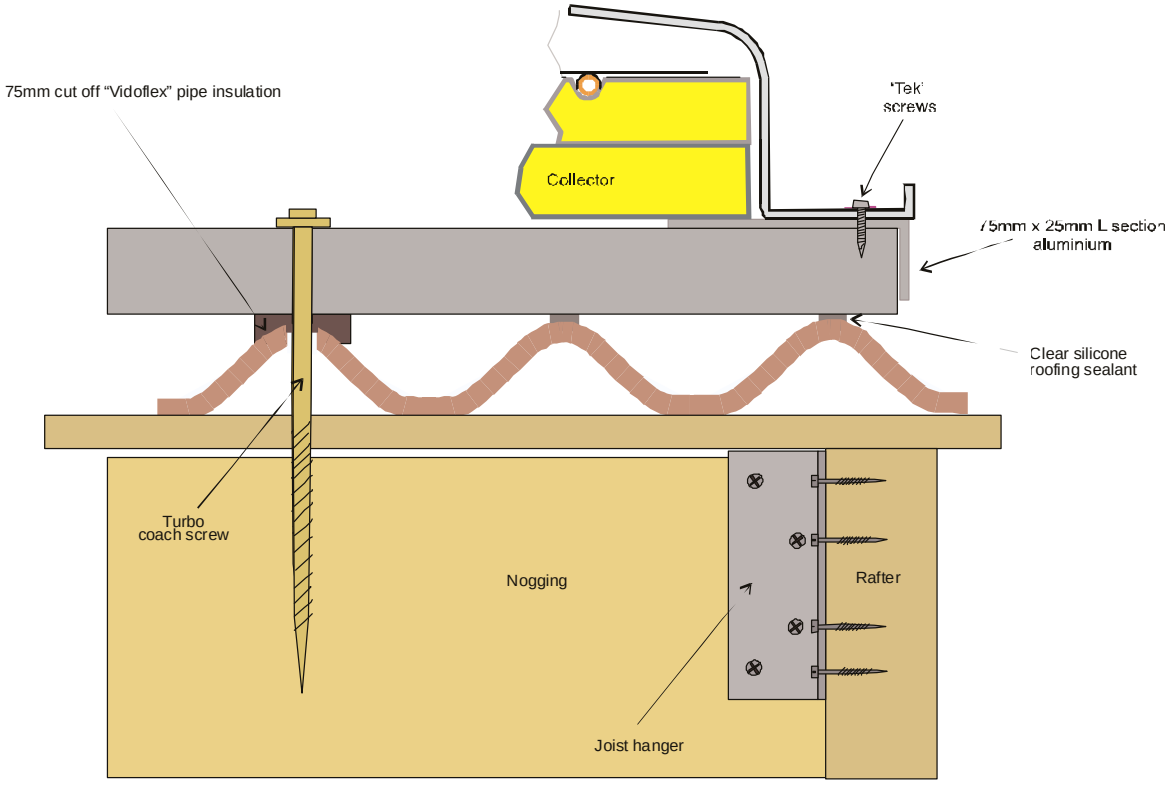
A3 Figure 3: Vertical section through a non-profiled roof with nogging



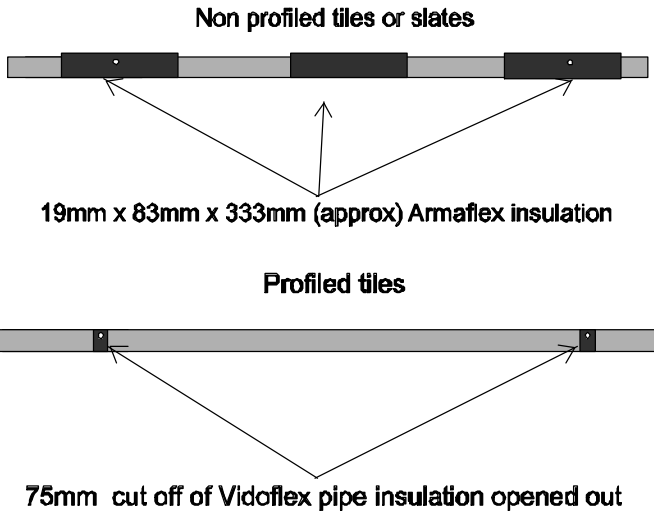
A3 Figure 4: Horizontal section through a non-profiled roof with nogging

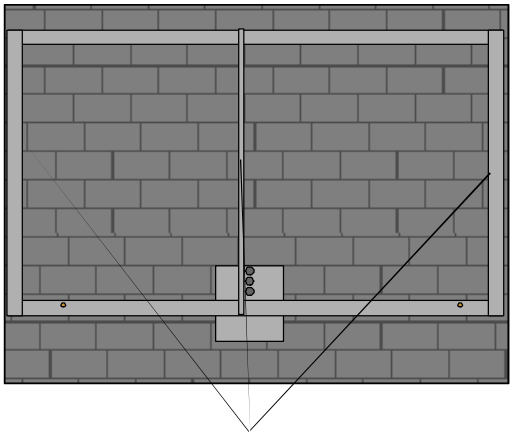


A3 Figure 5: Vertical section through a profiled roof with nogging

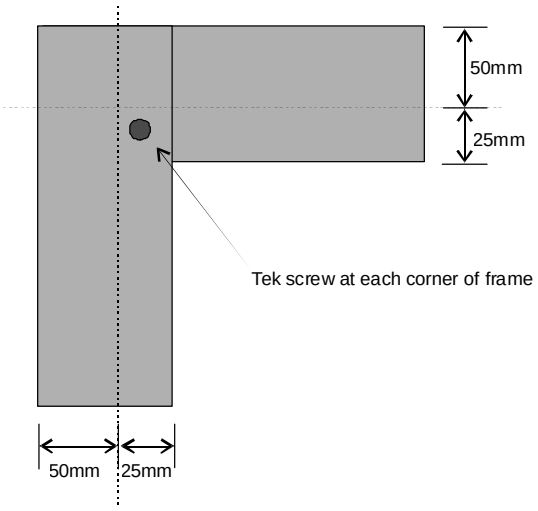


A3 Figure 6: Horizontal section through a profiled roof with nogging





Lay vertical side sections and "centre" rail on horizontal rails



STEP 4: Fit frame to roof.

The fourth step is to coach screw the frame to the noggings.

1. Armaflex closed cell insulation pads are placed between the rail and roof before the rail is coach screwed to the nogging. This is to waterproof the holes, allow for any unevenness in the roof whilst leaving gaps to allow for drainage.

2. (a) ▬ Cut the 2m long 19mm thick x 83mm wide Armaflex insulation supplied into six equal pieces (approximately 333mm long). Take out the coach screws and lift the frame rail from the roof to allow three pieces per rail to be slipped under in the position shown by the diagram. The insulation should be positioned to protrude 8mm up from each rail.

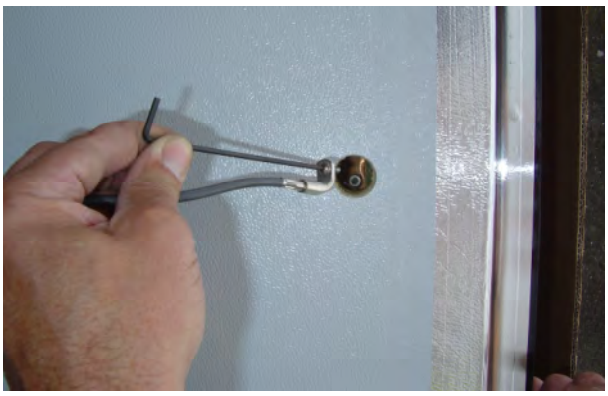
2. (b) ∿ Cut four 75mm long pieces of Vidoflex pipe insulation. Slice each piece length ways and open it out. Placing it against the rail over the holes, as per the diagram, make a small hole in each piece to allow the coach screw to pass through it. Slip each piece under the rail, aligning the holes, over the ridge of the tile length ways.

3. ∿ A generous quantity of clear silicone sealant should then be spread along the ridge of each tile under the rails. (see figure 6)

4. With the insulation held in place by the rail fix the turbo coach screws into the centre line of the noggings using a cordless driver and hex fitting. At this stage loosely fit screws so that rails can still move.

5. Place the side sections and centre rail in position. Fix each corner with a tek screw as per the diagram. Note that the "centre" rail must be fitted off centre to avoid the flow and return connections and tek screw in place. It is important that no tek screws are fitted within 50mm from the outer edge of the frame and the frame is square.

6. With the vertical sections fitted carefully tighten the coach screws to squeeze the armaflex insulation and bed in the frame, but do not over tighten since this may cause the slates or tiles to crack.



STEP 5: Fit controller sensor, pipes and collector

1. Fit the Resol PT1000 sensor or light sensor to the collector. The light sensor is held in place using the white plastic plate and screws provided. The plate may require trimming to miss the frame. We would recommend that mastic is smeared onto the back of the plate before it is screwed into the collectors' insulation to glue it place providing additional strength.

2. The collector can now be carefully moved into position on the roof frame. Check that the side gutters are flush with the frame and make adjustments if necessary.

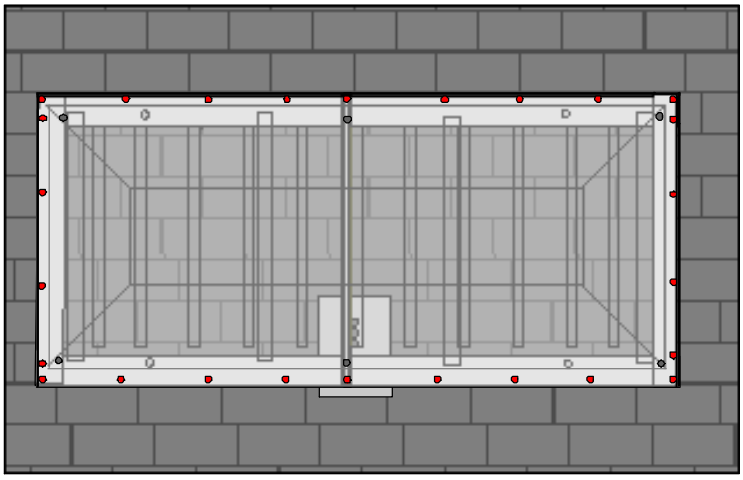
3. Press the collector down onto frame so that all the hex heads push into the back of the insulation board. Use a drill to make small indents if required.

4. If the system is powered using a PV collector which is to one side of the collector then the cable for this can be fed through the same hole as the light sensor (middle hole), resting the cable on the bottom rail (see guide A5).

5. If the pipes are passing through layers of felt and insulation which might cause an obstruction to the flow and return pipes then fit three 22mm copper pipes to act as sleeves.

6. Cut three 45mm long pieces of vidoflex pipe insulation and place them over the flow/return pipes and light sensor to waterproof and insulate them as per figure 5 & 6.

7. Carefully drop the collector into place feeding the pipes and sensor cables through the holes/flashing.

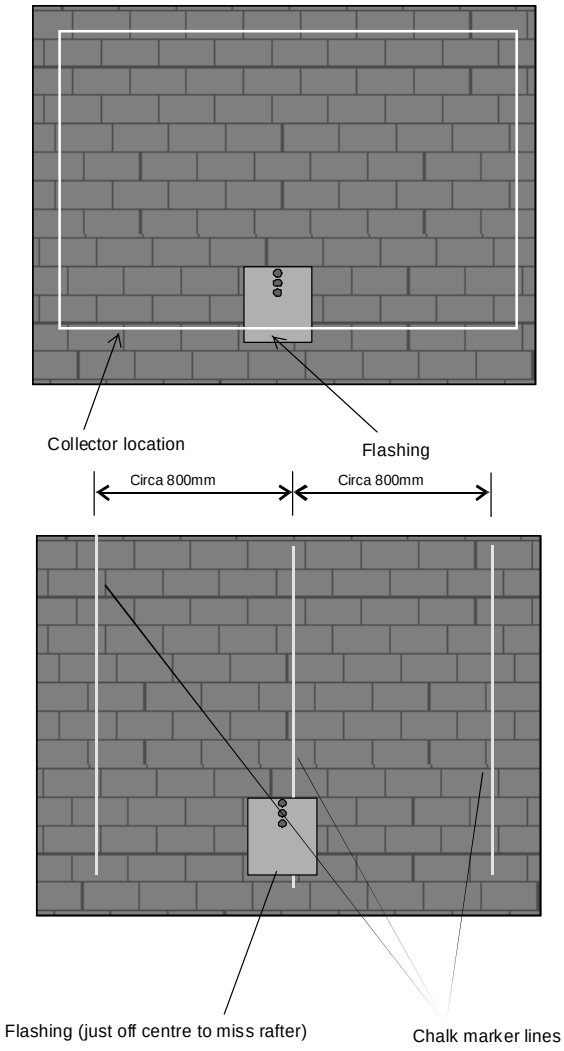


8. Screw the perimeter of the collector to the roof-mounting frame using the 26 Tek screws supplied (as per figure 7).

A3 Figure 7: Section through a standing seam roof.

Option 2. Coach screwing the frame directly to rafters.

Essentially this option uses the same fitting sequence as option 1.



1. Using the cardboard template provided establish the approximate collector location on the roof.

2. Establish with the aid of a stud detector, or by lifting the tiles/slates, two rafters approximately 1600mm apart and around 400mm in from the edge of the template. Mark the centre line and positions of the rafters on the tiles/slates with chalk. With a profiled tile choose rafters that coincide with the highest points of the tiles.

3. If the roof is profiled and no rafters coincide with the ridges of the tiles then it is advisable to use noggings.

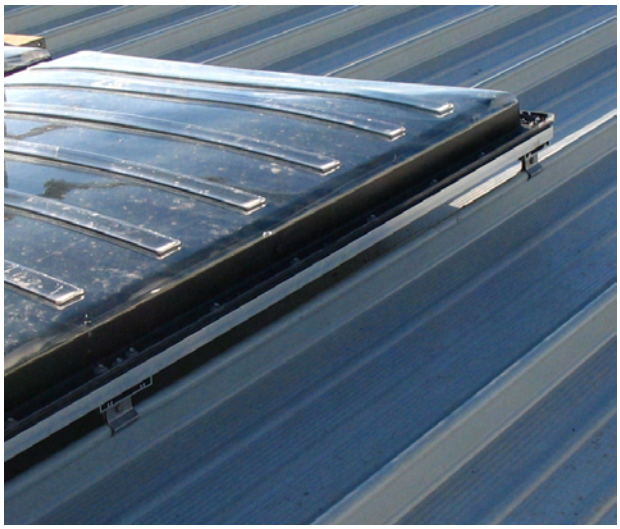
4. Once the rafter positions have been clearly marked then proceed as per steps 1, 2, 4 & 5 of option 1.

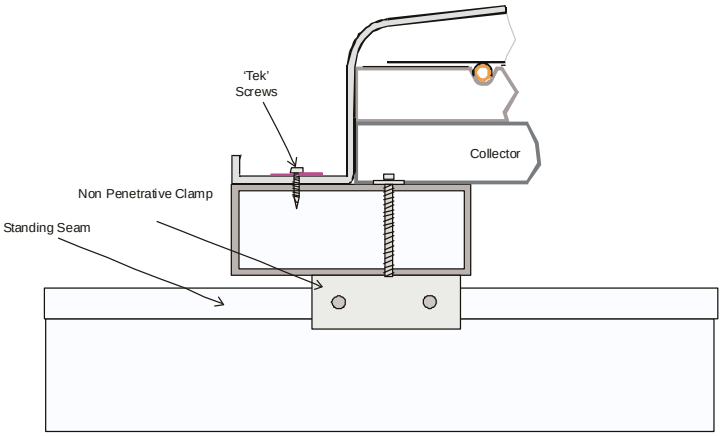
A3.3 Multiple horizontal collectors.

If more than one horizontal collector is installed then it is normally recommended to use one kit per collector. Rails 4.86m long can be supplied if preferred but these are difficult to install easily on a conventional roof. They could be considered for a steel/aluminium profiled though if non-penetrative roof fasteners are used.

A3.4 Steel/Aluminium/Copper standing seam profiled roofs

This type of roof is uncommon for domestic property but is commonly seen on commercial buildings such as industrial units. The photograph shows an installation that comprises two vertical collectors on a school roof. The frame is exactly the same as for a traditional roof but uses non-penetrative roof fasteners that are attached to each standing seam. The frame is then bolted to the fastener. Non-penetrative fasteners are available from either the roofing suppliers or specialists such as Roof-Pro Tel. 01234 843790 who stock the S-5 range of fasteners.





A3 Figure 8: Section through a standing seam roof.

STEP 1: Fit Sleeves for pipework

1. Select collector position on roof and work out where on a standing seam the flow/return pipework and sensor cable will be fitted through.

2. Once this position has been established carefully measure inside and outside to ascertain that there are no steel joists or beams that might interfere with the pipe runs.

3. Carefully prise apart the selected standing seam and fit 22mm copper guide sleeves through any insulation to allow the flow/return pipework and sensor cable to be fitted later. Check that the pipework will fit and make any adjustments required before fitting the rails.

STEP 2: Fit Frame

1. Slide the fasteners/clamps onto the seams. Seven will normally be required for each horizontal collector rail (fourteen in total).

2. Place lower rail in position and mark the positions where the bolts are required. Please note that the bolts should be 15mm from the top edge of the rail. If they are lower than this the bolt heads will foul the collector.

3. Drill the holes and attach the rail to the fasteners/clamps.

4. Slide the rail so that top is 20mm from the centre of the hot flow connection into the collector and tighten clamps.

5. Now fit the upper rail so the top edge is 1215mm from the bottom edge.

6. Fit the “centre” rail, ensuring it is just off centre to avoid the collector connections, and then fit the side sections.

7. Carefully drop the collector into place feeding the pipes and sensor cable through the guide sleeves and Tek screw to frame (as per figure 7).

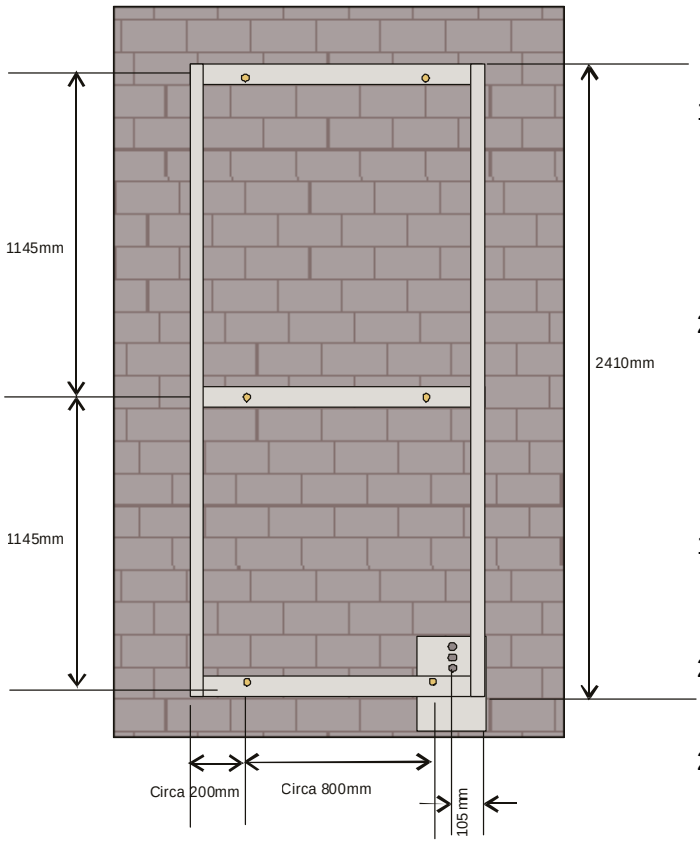
A3.5 Vertical Collectors.

Each kit for a single collector includes the following items:

3 off 1.22m long 75mm x 25mm horizontal aluminium box section rails
2 off 2.41m long 75mm x 25mm vertical aluminium angle side rails
6 off M10 x 160mm turbo coach screws
32 off stainless steel Tek screws
12 off Joist hangers (for 50mm wide noggings)
1 off 2m length of 19mm thick x 83mm wide Armaflex sheet

Extra items which may be required:
2.4 m length of 100mm x 50mm structural grade timber to be cut into six noggings.
1 off flashing for non-profiled roofs
Clear silicone sealant may be required for profiled roofs

Vertical collectors are installed in a similar way to horizontal collectors but use an additional horizontal rail to support the middle section of the collector and have a different position for the flow/return pipework and light sensor if fitted. Follow the instructions for the horizontal collectors with the following exceptions.



STEP 1. Drill holes for flow/return pipework and light sensor.

1. Use the template to help establish the best position for the flow/return pipework (and light sensor if fitted). The diagram shows a right-handed collector but this can also be supplied with left-handed connections if preferred. Select a position that allows the rails to be positioned between courses avoiding the junctions.

2. The three holes are in a line spaced at 30mm centres. The lowest hole centre being located 95mm from the bottom edge of the collector and 105mm in from the edge.

STEP 2. Drill holes for frame rails

1. Bring the rail up to the flashing/holes so the top edge is 20mm from the centre of the lower hole and the line of holes is 105mm in from the edge of the rail.

2. (a) Drill two 12mm holes, 15mm from the top edge and 200mm in from either end of both rails.

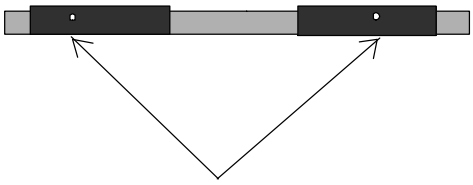
2. (b) Drill two 12mm holes, 15mm from the top edge approximately 200mm in from either end of both rails to coincide with the peaks of the tiles as per figure 5.

3. The holes for the upper rail can be be measured and then drilled from this reference point at 2295mm centre to centre directly above the lower frame rail coach screws.

4. Drop the coach screws through the holes so that both rails are held loosely in place.

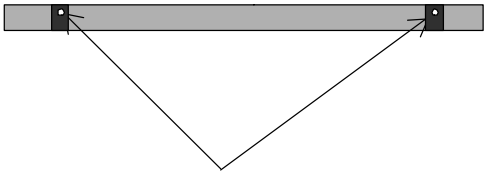
5. As a check make sure that the top edge of the upper rail is 2415mm from the bottom edge of the lower rail. The 75mm x 25mm aluminium side rails can be used to ensure that the rails are in line and correctly spaced.

Non profiled tiles or slates



19mm x 83mm x 333mm (approx) Armaflex insulation

Profiled tiles



75mm cut off of Vidoflex pipe insulation opened out

STEP 4: Fit frame to roof

1. (a) Cut the 2m long 19mm thick x 83mm wide Armaflex insulation supplied into six equal pieces (approximately 333mm long). Take out the coach screws and lift the frame rail from the roof to allow two pieces per rail to be slipped under in the position shown by the diagram. The insulation should be positioned to protrude 8mm up from each rail (level with bottom edge).

1. (b) Cut six 75mm long pieces of Vidoflex pipe insulation. Slice each piece length ways and open it out. Placing it against the rail over the holes, as per the diagram, make a small hole in each piece to allow the coach screw to pass through it. Slip each piece under the rail, aligning the holes, over the ridge of the tile length ways.

A3.6 Multiple vertical collectors.

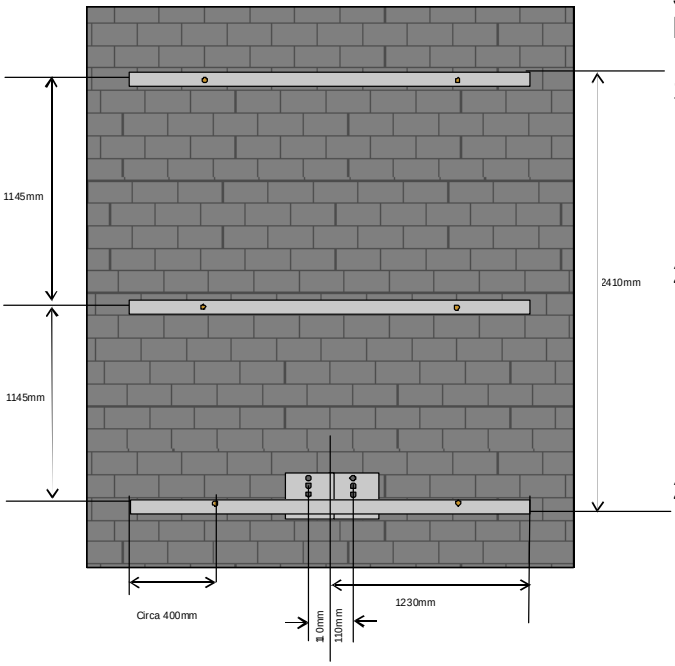
If more than one vertical collector is installed individual kits can be used but for a two collector system a single kit with three 2.46m long rails can be used.

This kit for two vertical collectors includes the following items:

3 off 2.46m long 75mm x 25mm horizontal aluminium box section rails
4 off 2.41m long 75mm x 25mm vertical aluminium angle side rails
6 off M10 x 160mm turbo coach screws
64 off stainless steel Tek screws
12 off Joist hangers (for 50mm wide noggings)
2 off 2m lengths of 19mm thick x 83mm wide Armaflex sheet

Extra items that may be required:
2.4m length of 100mm x 50mm structural grade timber to be cut into six noggings.
2 off flashing for non-profiled roofs
Clear silicone sealant for profiled roofs.

This kit is installed in a similar way to vertical collectors but uses double width horizontal rails. Follow the instructions for the horizontal collectors with the following exceptions.



STEP 1. Drill holes for flow/return pipework (and light sensor if fitted).

1. Use the templates to help establish the best position for the flow/return pipework (and light sensor if fitted). The diagram shows twin flashings for a non-profiled roof. Select a position that allows the rails to be positioned between courses avoiding the junctions.

2. (a) ▬ Two flashings are required. Each collector requires three holes in a line spaced at 30mm centres. The lowest hole centre being located 95mm from the bottom edge of the collector and 110mm in from the centre line. Figure 9 shows a cross section.

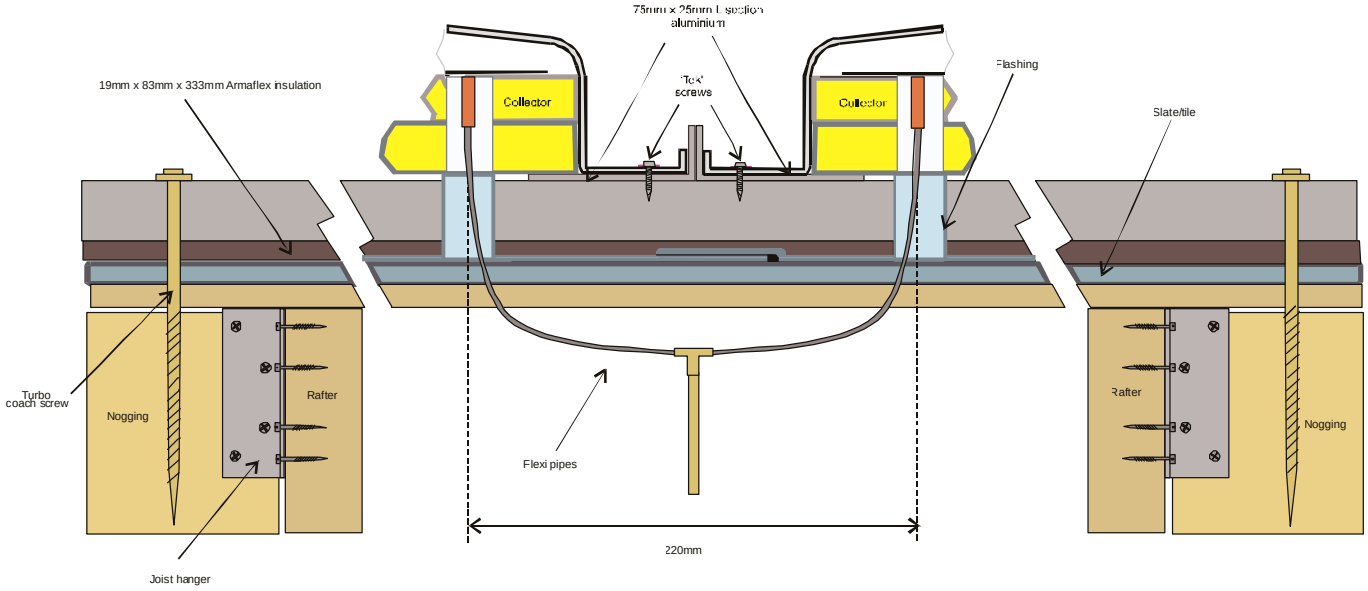
2. (b) ∿ On a profiled roof these holes will be at the peak (ridge) of a tile, approximately midway between courses. The three holes are in a line spaced at 30mm centres. The lowest hole centre being located on the centre line of the rail 95mm from the bottom edge of the collectors.

STEP 2. Drill holes for frame rails

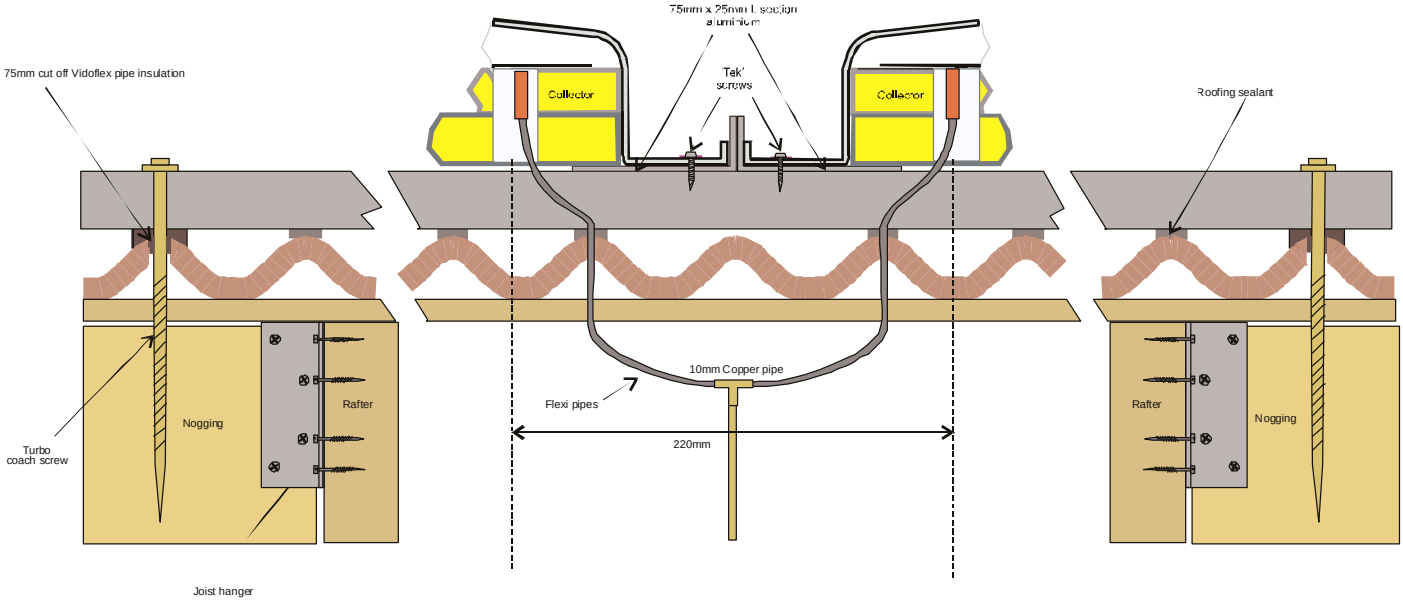
1. The holes for the middle and upper rail can now be measured and then drilled from this reference point at 1145mm centre to centre directly above the lower frame rail coach screws.

2. Drop the coach screws through the holes so that both rails are held loosely in place.

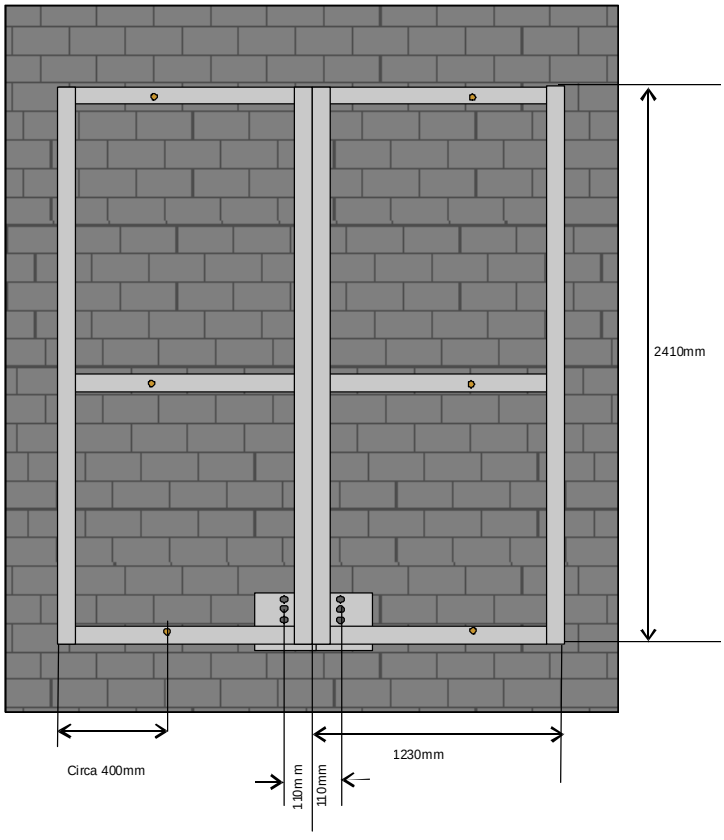
3. As a check make sure that the top edge of the upper rail is 2410mm from the bottom edge of the lower rail. The 75mm x 25mm aluminium side rails can be used to ensure that the rails are in line and correctly spaced.



A3 Figure 9: Horizontal section through two vertical collectors on non-profiled roof



A3 Figure 10: Horizontal section through two vertical collectors on a profiled roof



STEP 4: Fit frame to roof.

1. Place the side sections and centre rails in position. Fix each corner with a tek screw. It is important that no tek screws are fitted within 50mm from the outer edge of the sections and the frame is square (by measuring both diagonals).

STEP 5: Fit light sensor, pipes and collectors.

1. Insulate the flexi pipes with vidoflex before passing pipe through roof.
2. Gently lower each solar collector down whilst passing flexi pipes and sensor cable through holes.
3. Tek screw the perimeter of collector in a similar pattern to figure 6.