

TECHNICAL MANUAL

USER INTRODUCTION

LockClad S³ is a derivation of LockClad described on Data Sheet 4 of the LockClad Technical Manual, but utilising a lighter horizontal rail to provide an economic solution where medium to short spans would suffice. It maintains the unique benefits of LockClad utilising common components such as the LockTiles, LockClips and LockSpacer. With the choice of both LockClad and LockClad S³, economic solutions are available to cover most building structures and span requirements. The fixing methods for the two types differ.

For easy reading, the LockClad S³ Data Sheets that follow repeat some of the common information previously provided in the LockClad Technical Manual. For full reference to the components common to both LockClad and LockClad S³ both Technical Manuals should be consulted.

Each Section is given a Data Sheet Number from S³-1 to S³-11

Product and Design Detail drawings are combined in section S³-9

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LockAdjuster	<i>Lever tool to adjust LockRail.</i>
LockClad	<i>Small Panel terracotta rainscreen supported on a box section horizontal LockRail, as described in the LockClad Technical Manual</i>
LockClad S³	<i>Small Panel terracotta rainscreen supported on a “C” section horizontal LockRail, as described in the LockClad S³ Technical Manual</i>
LockClip	<i>Plastic clip used to lock LockTiles onto LockRail.</i>
LockClip 1	<i>Version of LockClip that can only be positioned under the joint of two LockTiles.</i>
LockClip 2	<i>Version of LockClip that can be located in any position on the LockRail and used to assist the removal of tiles.</i>
LockJig	<i>Tool used to set the vertical spacing of LockRail during installation.</i>
LockSlider	<i>Tool used to adjust the position of LockClip 2 after the tiles have been installed.</i>
LockSpacer 2	<i>2mm spacer fitted at the head of the LockTile to prevent tiles touching when LockSpacer 8 is not used.</i>
LockSpacer 8	<i>8mm spacer fitted between the LockTiles to give an enhanced shadow gap.</i>
LockRail	<i>Aluminium box section horizontal rail used to support the LockTiles on LockClad rainscreen cladding.</i>
LockRail S3	<i>Aluminium “C” section horizontal rail used to support the LockTiles on LockClad S³ rainscreen cladding.</i>
LockRail S3 Bottom	<i>Aluminium horizontal rail used only to support LockTiles at the bottom row of LockClad S³ rainscreen cladding panels when the bottom LockTile needs to be cut to a different vertical height than the standard sizes offered.</i>
LockRail S3 Top	<i>Aluminium horizontal rail used to support LockTiles at the top row of LockClad S³ rainscreen cladding panels</i>
LockTile	<i>Clay cladding tile designed to fit onto LockRail and form an outer rainscreen on building structures.</i>
Rainscreen	<i>The outer skin of a building that protects an otherwise sealed structure or building from many of the elements within changing weather patterns. IT DOES NOT PROVIDE A SEAL TO THE BUILDING.</i>

3 Overview of LockClad S³

LockClad S³ is a derivation of LockClad described on Data Sheet 4 of the LockClad Technical Manual, but utilising a lighter horizontal rail to provide an economic solution where medium to short spans would suffice. It maintains the unique benefits of LockClad utilising common components such as the LockTiles, LockClips and LockSpacer. With the choice of both LockClad and LockClad S³, economic solutions are available to cover most background and spans. The fixing methods for the two types differ.

For easy reading, the LockClad S³ Data Sheets that follow repeat some of the common information previously provided for LockClad.

3.1 Advantages of LockClad S³

The beauty of terracotta available at affordable prices.

Tiles are simply attached back to lightweight aluminium S³ rails, which are fixed to a vertical sub frame, with short to medium spacing.

This provides a long lasting decorative rainscreen cladding that may be fixed by any competent cladding contractor to a sealed building or structure.

3.2 Tiles

The rectangular tiles are in common with LockClad and are provided in a range of sizes that are manufactured to order and supplied complete with LockClips ready to attach to the aluminium S³ rails.

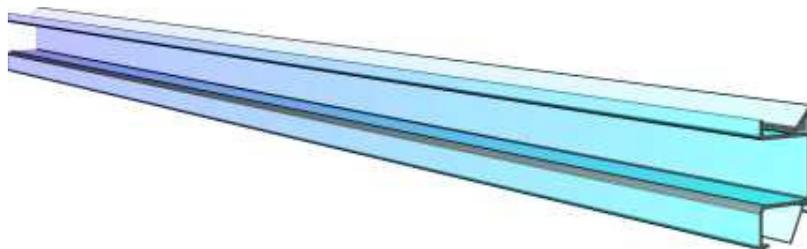
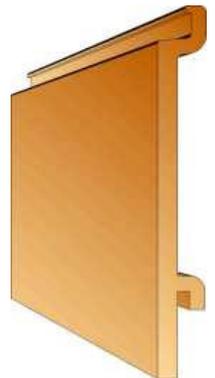
Nominal sizes are 400mm maximum to 210mm minimum width and grid heights of 185mm, 200mm, 210mm, 220mm, 235mm, and 250mm.

The vertical size is overall and includes an allowance for the nominal 10mm vertical joints.

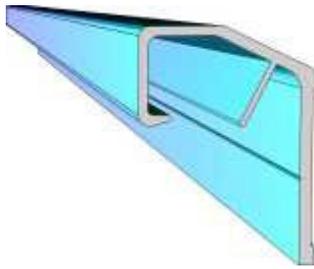
Colours - See brochure.

3.3 Fixing Rails

Tiles are individually retained on lightweight aluminium S³ rails with LockClips. The individual tiles are held top and bottom by the S³ rails and every tile is independent of all other tiles. This allows rapid fixing in any order, including from the top downwards and allows individual tiles to be removed and/or fitted at any time to suit other trades.



3.4 Top and Bottom Rails

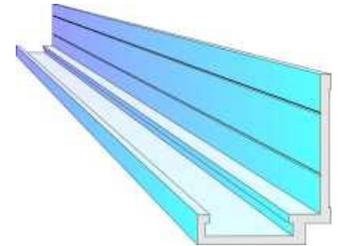


To maintain a concealed fixing at the uppermost and lowest LockTile in a panel, special top and bottom S³ rails are available.

The S³ top rails are used where the vertical tile heights exactly fit the panel sizes without cutting the top tile.

The standard S³ rail may be used at the bottom where there is no requirement to cut the bottom of the lowest tile.

The special S³ bottom rail allows up to 45mm to be trimmed off the lowest tile.



3.5 Contractor Supplied Trims

To fit other grids, standard tiles may be cut and then restrained by an edge trim supplied by the fixing contractor.

At the head the critical dimensions for this edge trim are an opening 18mm wide to receive the tile with provision for a 5mm clearance over the tile when fitted. This enables the tile to be clipped in and restrained by the LockClip preventing the tile from being lifted out.

The lower trim only requires a 5mm deep recess to retain the cut bottom edge.

As there will be no LockClip in this instance, tiles should be secured against unauthorised removal by use of suitable mastic adhesive.

Top and bottom trims must be designed to take the appropriate wind and dead loads.

Side trims, if required, only require sufficient cover to mask any irregularities in cut tile edges.

With the aid of a special tool, any individual tile may be released to facilitate removal and replacement without damage. The LockClips raise the tiles above the horizontal S³ rails to provide a horizontal cavity drainage tray at every course redirecting water that may enter the cladding zone back to the front face.

3.6 LockClips

LockClips are in common with LockClad and are supplied with the tiles. They lock and attach each individual tile to the S³ rails to provide a secure fixing.



3.7 LockSpacers

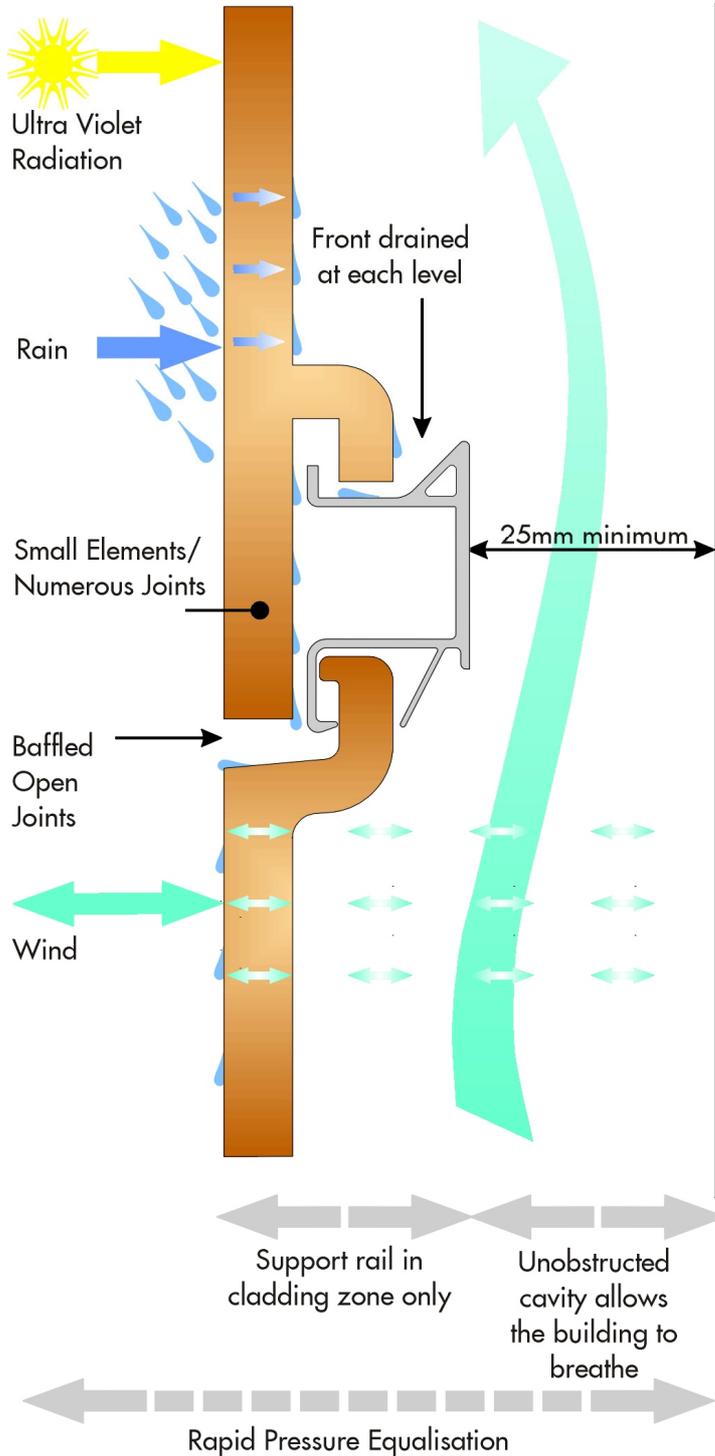
LockSpacers should be used to set the vertical joints for all normal external applications. Its primary purpose is to ensure the accuracy of the vertical joints between adjacent LockTiles

Nominal vertical joints shall be either 2mm or 8mm and it is essential that LockSpacers are used for all joints to minimize water ingress.

Each LockSpacer locks into the LockRail between LockTiles, and its profile follows the profile of the top nib of the LockTiles.



Outside Cladding Ventilation



4.1 LockTiles

The outer leaf of LockTiles comprises natural clay fired into Terracotta, a material with one of the longest lifespans of any building product.

LockTiles have natural warmth and the size of units provide human scale whilst facilitating simple installation, handling and easy accommodation of building movements.

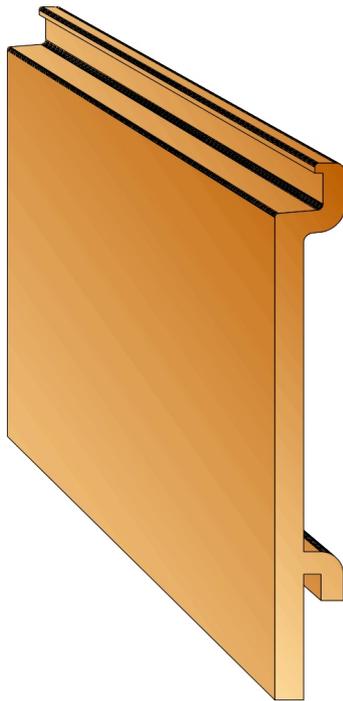
LockTiles are fired to a high temperature; this achieves exceptionally low water absorption of around 5% and high transverse strength of around 3000N. (See test certificates)

The even distribution of water over the facade reduces the likelihood of pattern staining.

The LockTiles provide great flexibility as they may be cut to fit actual building sizes and can be cut to as small as 75mm vertical face size for the top tile.

The actual joint pattern to be achieved is the choice of the specifier.

If used in areas exposed to the risk of hard impact loads, protection commensurate with the use of terracotta tiles must be provided.



All LockClad S³ Components are supplied in accordance with the appropriate Technical Specification.

4.1.1 The LockTile Specification

The LockTile Specification is as set out in Data Sheet S³ 10.

4.1.2 Cutting and Drilling LockTiles.

LockTiles are readily cut to width and height using a diamond tile-cutting disk with a continuous rim. It is essential that the saw operator cut the tiles square and to accurate dimensions.

Occasionally it will be necessary to carry out site work to drill holes through LockTile, cut corners off, or slots into the tile to allow services to pass through to the surface.

To cut irregular shapes into the edges of tiles etc., a diamond-cutting disk can be used. These should have a continuous diamond rim and are readily available to fit angle grinders using 115mm diameter. disks or larger.

A specialist water jet cutting service can be arranged.

Drilling the tiles should be carried out using a glass / tile drill at slow speeds without impact.

The operatives must always use appropriate Safety Clothing/Equipment when carrying out this type of work.

NOTE. Impact must never be used on LockTiles. This includes Percussion/Hammer drills, Hammers and Chisels.

4.1.3 Cleaning LockTiles

Most dust and dirt contamination that may be experienced on LockTiles during installation can normally be cleaned off by brushing gently with a soft brush whilst washing the tiles down with copious amounts of clean water.

This is made easier by using a car wash brush with an attached hosepipe feed.

The tiles must not be scrubbed with a hard bristled brush as this can mark the surface.

LockClad walls are self-cleaning and require minimum maintenance.

To remove any dust and pollutants that may have collected on the facades, clean down with a brush and water.

Graffiti can either be removed in situ or LockTiles can be quickly replaced for cleaning in a workshop.

More persistent staining may require the services of a specialised cleaning contractor.

If this is the case a small sample area should be cleaned to assess the effect on the LockTiles and if any chemical cleaning is necessary the LockTiles should normally be removed from the wall prior to cleaning.

To prevent contamination of the S³ rails, the LockTiles must be washed with copious amounts of water before being refitted.

In case of accidental damage any tile can be readily replaced.

The ability to remove LockTiles allows simple attachment of external accessories to the building structure.

LockClad tiles can be totally removed to facilitate simple or major alterations to the building. Cleaning of masonry walls can be carried out using the methods described in BDA Building Note 2, September 1982.

Removal of graffiti may require a combination of methods used by specialist cleaning contractors, depending on the type of marker used to deface the surface.

Please see Data Sheet S³ 6 regarding maintenance and periodic inspection.

4.2 LockClips



LockClips are inserted under each LockClad tile to prevent its removal from the S³ rail. The two versions of LockClip are in common with LockClad.

LockClip 1 has a spacer that ensures that it is always locked centrally under each vertical joint,

LockClip 2 does not have the spacer upstand and can be slid sideways with the LockSlider tool; in order to facilitate the fitting of the last tile and the removal of tiles in the future.



Once installed, the semicircular recess on the centreline of the bottom edge identifies LockClip 2.

This can be used to check that the LockClip is centrally placed between two tiles.

The spacer on the LockClip 1 ensures a minimum vertical joint of 2mm.

LockClip 1 should be used whenever possible as it cannot move from the central position and helps maintain the 2mm vertical gap.

Technical Specification

BS 2782 ; 1992 & BS 476 pt 12 – LockClips are manufactured from polypropylene grade 94ULV-2 and comply with the relevant parts of the standard.

Their content is not considered as forming a significant part of the total combustible materials represented by the average building and its contents.

4.3 LockSpacer

LockSpacers must be used for all normal external applications. Nominal vertical joints shall be either 2mm or 8mm and it is essential that LockSpacers be used for all joints to minimize water ingress.

LockSpacers lock under the LockRail between LockTiles and are aligned with the profile of the top nib of the LockTiles.



The primary purpose is to ensure the accuracy of the vertical joints between adjacent LockTiles.

LockSpacer 2 provides a 2mm vertical joint in conjunction with the 2mm spacer provided on the LockClip at the bottom of the LockTile.

Where LockClip 2 is used, LockSpacer 2 ensures that a gap between adjacent tiles is maintained. If LockSpacer 2 is omitted then fitting tolerances and building movements may result in tile edges touching.

With LockSpacer 2, broken bond may be adopted.

LockSpacer 8 is not applicable to applications where broken bond is used

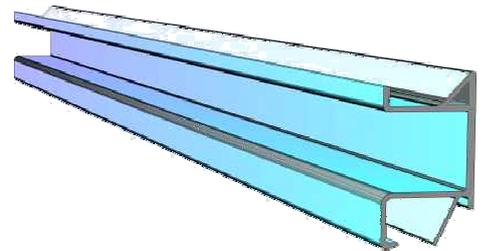
LockSpacer 8 not only provides for an accurate 8mm vertical joint width, but because the vertical element is joined into a continuous strip, accurate vertical alignment of the LockTiles up the building is assured.

LockSpacer 8 together with its vertical element also fills the wide gap between the LockTiles minimizing direct ingress of rain into the cavity.

The majority of any minor leakage through the small joints is directed back into the LockRail that normally diverts the water to the face of the building towards the centre of each tile.

By manufacturing LockSpacer 8 as two components, the 4mm x 8mm strip element can be fitted to the LockSpacer in the adjoining horizontal course, whether above or below, so facilitating tiling either up or down the building, or in any combination.

There is a special “T” Bar Spacer used for either cut LockTiles or for the bottom course where there is only one LockSpacer 8 fitting.



4.4 Aluminium S³ Rails

S³ Rails are manufactured to BS 1474 : Grade 6063 T6

The coefficient of linear expansion is:- $24 \times 10^{-6} / ^\circ \text{C}$.

S³ rails should be fixed back at regular intervals to any suitable firm and true back wall structure or sub frame system.

Fixings must incorporate suitable means of adjustment to position all S³ rails in a true vertical plane.

S³ Rails should be spaced at the required grid height. It is recommended a suitable jig be used to ensure accurate fixing centres, and that rails are fixed horizontal and level.

Adjacent rails should be jiggged to aid alignment, as this will minimise the risk of accumulated errors along the face of the building.

Deflection of rails should not be greater than 1/600 of the span in the vertical plane to maintain joint width accuracy and 1/200 of the span in the horizontal plane. Tighter tolerances may be required where appropriate for the design.

S³ Rails must be joined on independent vertical rails to minimise the effects of thermal expansion and should be installed at practical lengths taking into account the effects of thermal movement along the rail.

Movement joints should not occur adjacent to a vertical LockTile joint where LockSpacers are installed.

In all cases, the rail fixings should be in a state of pre-tension and loads must be spread using a washer no less than 19mm diameter.

S³ rails are supplied in 6 metre lengths as standard. Special lengths to reduce cutting wastage are available for large batches to special order.

The detail design of their installation and fixing is the responsibility of the Purchaser / Installer. To aid calculation, load span tables are included. These are based on tests carried out by BRE and indicate the actual loads that can be carried before the maximum permitted horizontal and vertical deflections are exceeded.

Span between fixings is dependent upon the wind exposure factor and the detail design precautions to reduce the wind pressure on the tile face by achieving pressure equalisation within the cavity.

When considering the structural spans of the S³ rails it is a decision for the Purchaser and their advisers as to the degree of pressure equalisation to be adopted for a particular application.

Fixing economy can be enhanced where the high ventilation rates that is achievable through the tile joints leads to rapid pressure equalisation.

Account should be taken as to potential for rapid pressure change at the corners of buildings (both vertically and horizontally) and for the first 1.8 metres no pressure equalisation should be assumed without the provision of effective and secure cavity corner baffles (both vertically and horizontally).

By installing effective and secure cavity baffles at locations of rapid external pressure differences (e.g. vertical & horizontal corners) and ensuring that the inner skin is largely airtight, significant pressure equalisation is achieved. In addition to maximising the permitted spans, this also minimises any water that may cross the cavity and wet the inner wall. Where rapid pressure equalisation is achieved, the face tiles do not carry the full wind load so the load on the LockRail S³ is reduced, consequently increasing their span capability for the same wind exposure factor.

The span limitations of the S³ rail, where pressure equalisation applies, is limited by the aesthetic requirement of restricting vertical deflection to 1/600 of the span and horizontal deflection to 1/200 of the span.

Some users may prefer to introduce a tighter tolerance in certain situations.

Care must be taken to avoid different spans for vertically adjacent rails where varying deflections would be apparent by virtue of a varying joint width, and the permitted tolerance between S³ rails would be exceeded.

The precise vertical dimensional accuracy of the LockClad tiles ($\pm 1.5\text{mm}$), makes gauging unnecessary and the S³ rails can be independently jiggged to predetermined positions using the LockJig. This close dimensional tolerance ensures even tile abutting and even horizontal joints.

MAXIMUM SPANS (mm) for LockRail S³

CLEAR SPAN FOR S³ Rail	<i>MAXIMUM WIND PRESURE</i> Negative or Positive With No Pressure Equalisation Rails at 250mm c/c	WITH ALLOWANCE FOR 2/3 Reduction Because of pressure Equalisation
Rails at 250mm c/c		Rails at 250mm c/c
(mm)	KNm²	KNm²
800	5.4	
900	4.2	
1000	3.3	
1100	2.7	
1200	2.3	6.8
1300	1.9	5.7
1400	1.6	4.8

At 250mm centres Vertical deflection limits the maximum span to 1400mm for LockRail S³

MAXIMUM SPANS (mm) for LockRail S³ Top

CLEAR SPAN FOR S³ Top Rail	<i>MAXIMUM WIND PRESURE</i> Negative or Positive With No Pressure Equalisation Rails at 250mm c/c	WITH ALLOWANCE FOR 2/3 Reduction Because of pressure Equalisation
Rails at 250mm c/c		Rails at 250mm c/c
(mm)	KNm²	KNm²
800	1.8	5.4
900	1.5	4.4
1000	1.2	3.7
1100	1.0	3.1
1200	0.9	2.6

MAXIMUM SPANS (mm) for LockRail S³ Bottom

CLEAR SPAN FOR S³ Bottom Rail Rails at 250mm c/c (mm)	<i>MAXIMUM WIND PRESURE</i> Negative or Positive With No Pressure Equalisation Rails at 250mm c/c KNm ²	WITH ALLOWANCE FOR 2/3 Reduction Because of pressure Equalisation Rails at 250mm c/c KNm ²
800	2.6	7.8
900	1.9	5.8

At 250mm centres Vertical deflection limits the maximum span to 1000mm for LockRail S³ Bottom

For S³ rails at the other standard VERTICAL CENTRES, the wind pressure or maximum span can be increased by the following Factors :-

235mm x 1.06 220mm x 1.13 210mm x 1.19 200mm x 1.25 185mm x 1.35

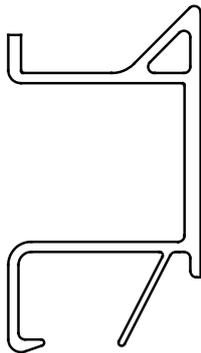
Rail spans for all rails should be sized in accordance with the LockRail S³ Top from the tables above if this rail is used on the façade. Alternatively an intermediate support can be fitted to the top and bottom LockRails to allow LockRail S³ to be used at its maximum centres.

All rail fixings must be in a state of pre-tension. To avoid rail deformation at the fixings the load must be spread onto the face with a washer of minimum 19mm diameter or equivalent. In all cases the actual fixings selected must be justified by calculation.

The structure behind **MUST** be adequate to carry the **FULL WIND LOAD**. Pressure equalisation is on the basis of design in accordance with recommendations to achieve one third wind force on the tile face in line with the test results carried out by BRE in relation to LockClad.

THE LOAD SPAN TABLES above have been formulated from STATIC LOAD TESTS carried out by BRE on 27th July 2001, report no 205-370 using load/span graphs based on L/200 and L/600 maximum deflection limits for wind load and dead load respectively.

4.4.1 LockRail S³



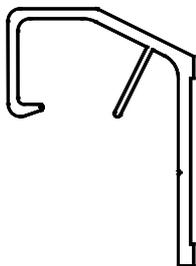
SECTION PROPERTIES

Assuming fixings with a 19mm washer, with the fixing 2mm above the centreline, torqued into place so that the interface between the rail and the fixing is in a state of pre-compression, then: -

Second moment of area (I)	
about major axis (for assessment of self weight)	55,700mm ⁴
about minor axis (for assessment of wind)	28,270mm ⁴
Elastic section modulus (Z)	
about major axis	1,960mm ³
about minor axis	1,510mm ³

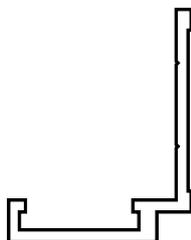
As a guide, when fixed as above, and where the wind load on the tiles, after any allowance for pressure equalisation, does not exceed 2.50KN/m², fixings would be **at about 1.2M centres**.

4.4.2 LockRail S³ Top



To be bolted back with a 19mm washer, with the fixing centred on the score line provided and torqued into place so that the interface between the rail and the fixing is in a state of pre-compression.

4.4.3 LockRail S³ Bottom



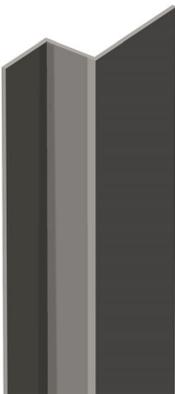
To be bolted back with two fixings centred on the score lines provided and torqued into place so that the interface between the rail and the fixing is in a state of pre-compression.

5.1 Rainscreen Principles

For a full description of the mechanism of Rainscreen Cladding see LockClad Technical Manual Data Sheets 2 and 10. It is important to note that a Rainscreen protects a sealed structure or building from many of the elements within changing weather patterns. **IT DOES NOT PROVIDE A SEAL TO THE BUILDING.**

5.2 Primary Support Structure

Thermal movement of the S³ rails must be considered when designing the primary support structure. Unlike the LockClad rails, the fixings to the S³ rails must be in a state of pre-tension, so thermal movement **MUST** be accommodated in the primary support structure.



Where there is a continuous backing wall, for instance a concrete block wall, vertical support rails should be installed. These can be 'Z', 'Omega', or Box sections shimmed off the wall. Alternatively an angle bracket bolted to the wall supporting a vertical angle section could be employed. The attachment brackets or shims should allow sufficient adjustment to correct any tolerance errors in the building structure.



The background system employed must be selected to provide the required offset to suit the chosen insulation and the cavity width and the load to be carried.

Any appropriate insulation can now be installed, care being taken to ensure that the required minimum cavity width is maintained.

Box Section with clearance hole in front face to allow secure fixing of back face to structure.

Fixings of S³ rails or any non LockClad S³ Components that interface directly with the background supporting structure, including all flashings, trims and ventilation slots are **INDICATIVE ONLY** where shown or mentioned in this Technical Manual or on any drawings supplied by the Manufacturer or the Supplier.

There must be continuous unobstructed back ventilation to protect the integrity of the LockClad S³ Components. All fixing details **MUST** be checked and approved by a Structural Engineer



6.1 Fixing S³ rails to Primary Support Structure

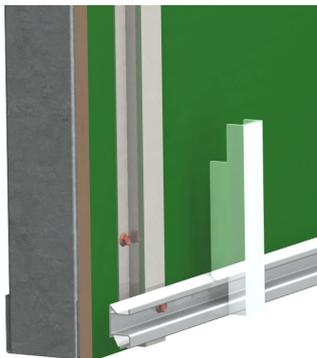
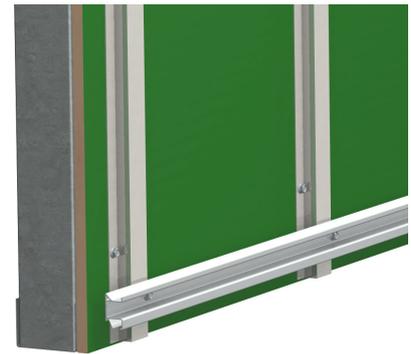


Fix Primary Support Vertical Rails to structure

The first S³ rail is accurately positioned and levelled at the bottom of the wall, then attached by fixing to the uprights or other true and aligned structure; through the back of the S³ rail, ensuring the minimum 19mm diameter washer is used between the fixing and S³ rail.

S³ rails must be accurately cut to length, taking due account of building and thermal movements and the maximum and minimum gaps and joining details between rails.

The accuracy of the LockClad tiles are such that the S³ rail locations can be accurately predetermined and jiggged with the assistance of LockJig. Thus ensuring the S³ rails are not closer than the grid dimension.

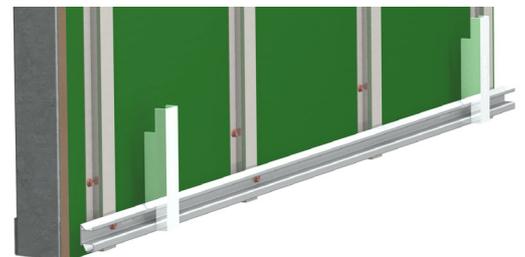


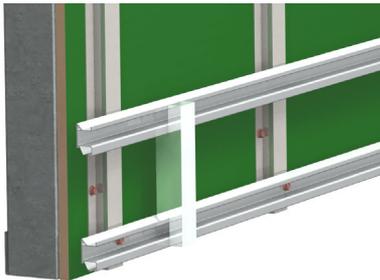
Subsequent S³ rails are fixed back in a similar way using a LockJig to provide an accurate way using a LockJig to provide an accurate distance from the previously fixed rail. LockJigs are placed at each end of the lower rail after it is fixed and used to hold up the next S³ Rail at the correct distance apart. Each subsequent rail is spaced in a similar manner. It is easier to start from the bottom and work up. It is recommended that pairs of Jigs are alternated and that a running check is made at 1M intervals to minimise accumulative errors.

Where S³ rails are cantilevered at their ends, the rail must be continuous over the next span and the cantilever distance must not exceed ONE FIFTH OF THAT SPAN. Ideally the channel should be continuous over two spans.

S³ rails must always be installed to maintain accurate alignment, whilst allowing for differential thermal movement.

Wherever possible rail joins should be staggered vertically between adjacent S³ rails.





To minimise water draining down through S³ rail joints, the joint between S³ rails should be sealed with black tape.

The tape must be selected and fitted for long life and flexibility to accommodate the anticipated thermal movements between adjacent rails.



Due allowance must be made for thermal expansion and contraction of the rails from the ambient temperature at the time of fixing and in selecting the type of fixing. In accordance with the coefficient of expansion of aluminium (1mm/m/40degree C), one metre length of rail will move 0.024mm per degree C of temperature change. For example at 12 degree C, a 6.0m length of rail will expand by 3.45mm when heated to 36 degree C.



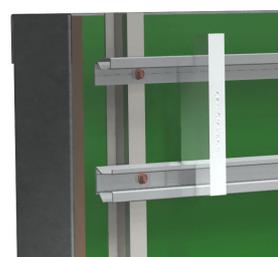
Rails joined on separate verticals to limit thermal expansion

Where thermal movement does not need to be accommodated at a rail join, they may both be bolted to a vertical rail. Where thermal movement is to be accommodated, LockRail S³ should not be joined on the same vertical rail; extra vertical rails will be required to limit the vertical movement to each LockRail S³. Gaps between the ends of adjacent rails should be designed so that at the nominal maximum anticipated temperature the rails never quite abut (after allowing for building and other tolerances) and are located to be away from LockSpacer locations. At the nominal minimum anticipated temperature, the gap should be no greater than 15mm with any one rail moving no more than 10mm. The designer must decide where movement of the rails is to be accommodated. This may preclude adjoining rails being fixed to the same vertical support. Care must be taken to see that the vertical grid dimension is not exceeded by more than 2mm to ensure the structural integrity of the fixing of the LockClad tiles. S³ rails MUST be fitted to a tolerance of + 2mm - 0mm between adjacent vertical S³ rails to ensure the integrity of the fixing of the LockClad tiles. The maximum accumulative error with + 2mm - 0mm between rails at 250 centres will be + 8mm per m or approximately 20mm per storey height. Care needs to be exercised to see that the horizontal gaps between tiles are reasonably consistent having allowed for the rail tolerances in COMBINATION with the dimensional tolerances of the LockClad tiles. Note that the aim should be not to exceed ± 3mm. LockClips should not bridge any gap in the rails where both the LockClip is being relied upon to support the tile and there is significant anticipated movement.

It is important that thermal movement of S³ rails is not accommodated close to side abutments where LockSpacer 8 requires to be supported by the end of the rails at the extremities of panels. Any edge trims must not present an obstruction to LockSpacers.

S³ RAILS MUST BE CUT ACCURATELY TO LENGTH ON SITE TO ACCOMMODATE ALL THE ABOVE REQUIREMENTS

The S³ rails are fixed independently to the fitting of the LockClad tiles



S3 Top Rail is also fitted with the aid of LockJig

6.1.1 Mitred Corners

S³ rails may be mitred at external and internal corners and joined with an angle fitted to the end of each rail.

It is important that S³ rails are accurately aligned and mitred at corners. Because the S³ rail encloses the head of the tile, the mitred rail secures each corner tile from sliding sideways and maintains its security independent of the other corner tile.

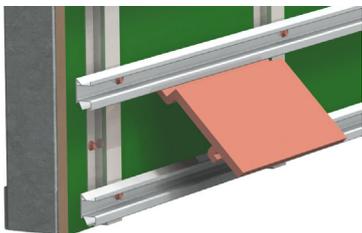
6.2 Installing LockTiles

Note:- Much of this information is common with LockClad except for the S³ top and bottom rails.

It is recommended that LockTiles be installed as late in the building program as possible to reduce possible marking or damage from other trades. The first task is to ensure that the S³ rails are swept clear of any dirt or debris. The first tile can be fitted on any support channel in any location. To fit a tile, a LockClip is first snapped onto the channel. The LockAdjuster MUST be used to adjust the thin restraining section at the bottom rear of the support channel to suit the batch of LockTiles so as to minimise tile movement.

LockTiles must not be "forced" into the channel. At the time of fitting each LockTile, it is essential operatives check the suitability in terms of colour, tolerance & condition and pay regard to site handling and selection of tiles from at least 3 different pallets.

If any tile is considered unsuitable for a particular location, it should be put on one side and considered for use in another location.

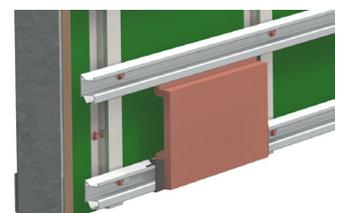


The LockTile is held in both hands and top tilted so the front face faces upwards at 45 degrees. The top nib is slid into the bottom channel of the upper support channel and the LockTile lifted up into this channel and rotated into a vertical plane.

The LockTile will then be high enough for the lower rear nib to clear the front upstand of the lower S³ rail. When the LockTile is fully vertical and at its highest possible position, it can be slid sideways over a previously fitted LockClip and pushed against the previously fitted neighbouring LockClad tile or into the required position as appropriate.

A further LockClip may now be fitted over the lower rail and slid sideways until its vertical upstand comes hard against the tile.

Another LockTile follows being lowered down to sit on the two LockClips. The second LockClip will project enough to receive the next LockTile and so on.



As part of this process, the rear profile of the support channel holding the head of the LockTile can be adjusted with the LockAdjuster to ensure a tight fit for each tile to prevent tile movement.



On installing each LockClip, either LockSpacer 2 is then inserted for 2mm wide vertical joints or LockSpacer 8 for 8mm wide joints. LockSpacers are fixed into the bottom of the rail and rotated to lock into the rail, then pushed hard against the last tile fitted. Subsequent LockTiles are fitted along the LockRail.



For 2mm vertical joints, precision is provided by the spacer which is an integral part of LockClip 1 working in conjunction with LockSpacer 2 to provide the accuracy at the top of the LockTile. LockSpacer 2 must be used where LockClip 2 is used otherwise there is no means of maintaining the correct joint width.

For 8mm vertical joints, the same applies except LockSpacer 8 is used together with the 8mm vertical strip.

Both spacing and vertical alignment with the courses above and below is achieved with LockSpacer 8 which is made in two parts to facilitate fitting LockTiles either up or down the building.



LockSpacers can be pushed hard against the last tile fitted and subsequent LockClad tiles are fitted along the Support channel. The use of LockSpacers also helps protect the ends of tiles from damage.



The last tile in a row is inserted in the normal way, using LockClip no 2 at either side. LockClip 2 does not have the central upstand and so they can be first positioned entirely under adjacent LockClad tiles. It is recommended that every 6th LockTile be retained using LockClip 2 to allow easy removal of any tile.



After the last LockClad tile is in the vertical position, the two LockClip 2s are slid half under each side of the last LockClad tile using the LockSlider to lock it into position and the tile is then seated down. This tile can be readily removed using the LockSlider procedure in reverse and the adjoining tiles removed in a reverse fitting procedure. Where it is anticipated that particular LockClad tiles are to be regularly removed, e.g. for service access, then LockClip 2 would be used for this LockClad tile.



LockClip 2 has a distinctive visible lower profile to aid its identification and check that it is centrally locked between two LockClad tiles. To remove a specific LockClad tile, one needs to find the nearest LockClip 2s in that row and slide the LockClips to the sides of the associated LockTile so it can be removed.

Adjacent tiles are then slid along until the specific tile is reached which can then be slid clear of its LockClips and removed. The reverse procedure is used to reinstall the tiles.

The LockSlider is supplied to facilitate easy sliding of the LockClips. Standard LockTiles may be installed onto the S³ rails by either starting at the bottom and working up, or by starting at the top and working down.

The structure behind and not the LockTiles should carry fixings for external signs and equipment etc. Where LockTiles are cut to facilitate fixings for signs etc. care must be taken to provide adequate weatherproofing to keep water within the cladding zone.

LockTiles with a minimum nominal width of 250mm are used where LockClips cannot be slid beyond the sides of the LockClad tile, e.g. a single tile location. The contractor needs to remove the central 120mm of the lower rear nib down-stand on the tile to allow the LockClips to be slid to the centre to facilitate fitting and removal.

6.3 Vertical Strips, Trims and Edge Trims

An 8mm LockSpacer and its vertical strip should fill the wide gap between the LockTiles and any vertical edge trims minimising direct ingress of rain into the cavity. Any edge trims must not present an obstruction to LockSpacer 8.

Any minor leakage through the remaining small joins is directed back into the S³ rails, which diverts the water to the face of the building towards the centre of each tile.

The 8mm strip element can be fitted to the LockSpacer in the adjoining horizontal course, whether above or below, thus facilitating tiling either up or down the building, or in any combination.

The fixing of the strips to the LockSpacers must be removable in order not to compromise the facility to remove or replace any individual tile.

In using LockSpacers, it is important that the tiles either side are closely abutted to minimise water ingress, whilst at the same time also allowing the alignment of the vertical joints up the building.

Where a LockSpacer is used at the extremities of a panel, care must be taken to ensure that the LockSpacer and S³ rail are locked to provide adequate support for the LockSpacer and is so fitted that natural thermal and building movements will not displace it.

There must also be a smooth side abutment to receive and retain the LockSpacer to prevent excessive ingress of water.

When using LockSpacer 8, a policy needs to be set for locating the last tile to be locked into position.

One option is to make the penultimate tile or the end tile in each bay the last tile.

Another is to make an identifying mark on the strip element of the spacer by drilling a 1.5mm hole.

Ensure that horizontal rails are aligned vertically using the LockJig supplied by the manufacturer and horizontal joints are checked for width and consistency.

NOTE: If rails are not correctly aligned or spaced, this will result in irregular or incorrect horizontal joints. LockClad S³ rails must be cleared of any debris or swarf before LockTiles or LockClips are installed.

It is essential to ensure that all Fixings are checked for structural integrity and ability to accommodate thermal movements and to ensure that no other hole is drilled in a support channel for any other purpose whatsoever.

LockClips can be seen within the horizontal joints in order to check on their correct positioning. LockClip 2 should also be checked to ensure they are centrally located under the vertical joint separating the two tiles, as appropriate.

At completion, ensure that all LockTiles are left in a clean condition, free from handling marks and ensure that all the recommendations of this Technical Sheet are complied with.

During the monitoring of construction work on site, INSPECTIONS should be carried out by removing appropriate LockClad tiles. The inspection should include, inter alia, a check upon :

Continuity, location and fixing of any insulation.

All aspects of the supporting structure.

The location, security and adequacy of all fixings

The continuity and omission of obstructions or debris in the vertical cavity.

General cleanliness and in particular the top of the S³ rails.

Absence of any obstruction to the top and bottom ventilation slots servicing the cavity.

Correct location of fixings and that all fixings/bolts are installed and correctly tightened to the design specification.

S³ rails are correctly joined and taped.

S³ rails are correctly restrained and that thermal movements are accommodated within the primary support structure.

The system enables periodic inspection of the LockClad components and the support structure during the life of the building by removal of appropriate tiles and this should be carried out periodically by building occupiers/owners.

It is the responsibility of those undertaking the supervisory checks to carry out such work in a competent professional manner and to arrange for the rectification of any damage, defects, errors or omissions expeditiously.

Responsibility does not accrue to either the Manufacturer or the Supplier for any aspect of any defect, which could or should have been easily identified, whether by inspection (either during construction or on periodic maintenance inspections) or otherwise.

The opportunity is presented to Purchasers and Installers to attend training seminars to assist the understanding of the Guidance Notes.

Training will be offered periodically to groups of architects, fixing contractors and their staff and other interested parties at the Manufacturer's premises in Measham.

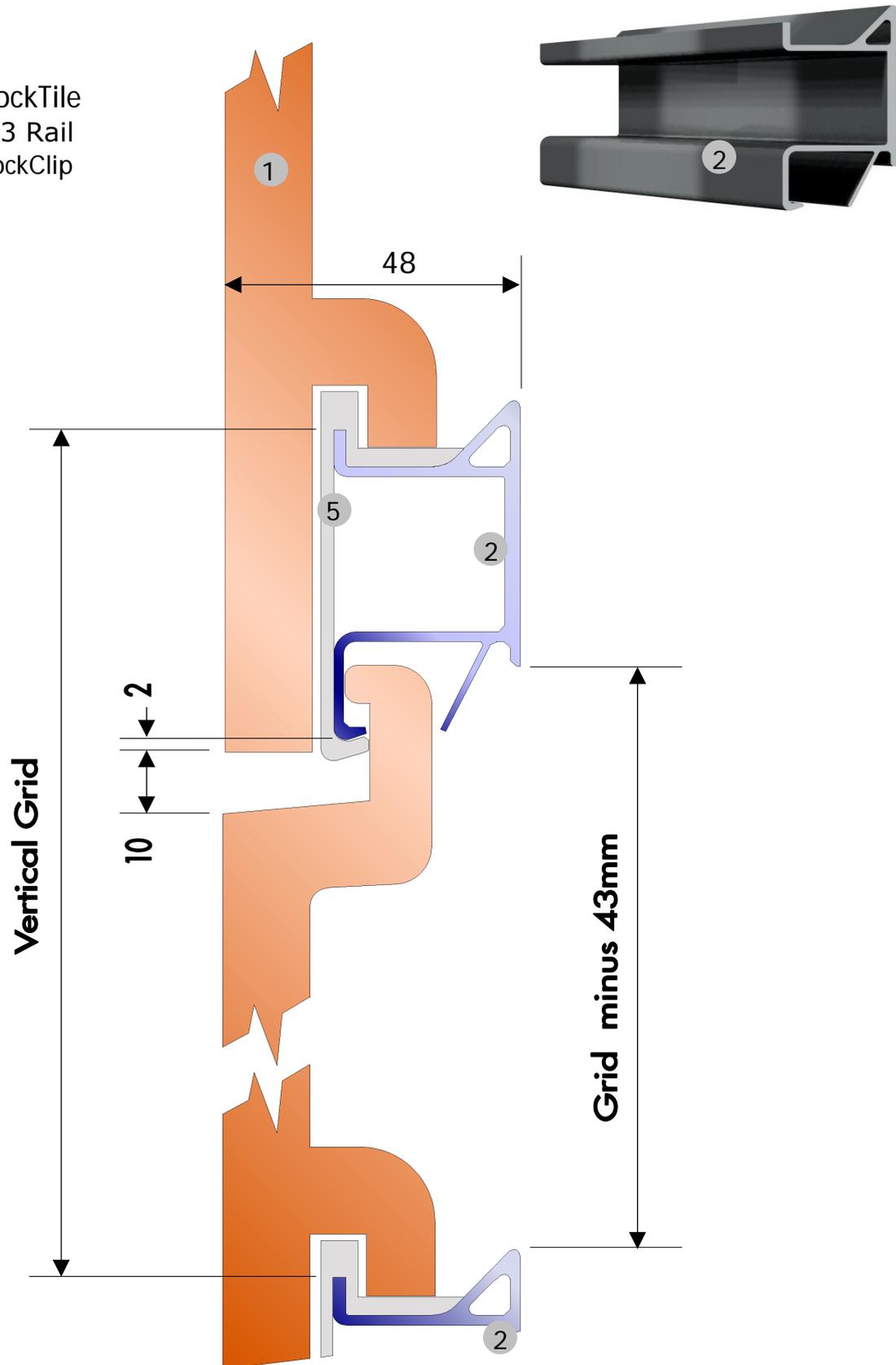
Courses will normally be of one day's duration. There is no charge for attending courses for those who purchase LockClad S³ components but participants are expected to meet their own travelling and subsistence costs.

It is particularly important that the people detailing the installation and those working on site responsible for the installation of the LockClad S³ components are offered the facility to attend training courses.

Training days are not design seminars but arranged only to assist those responsible for design, installation and maintenance to consider the relevant issues.

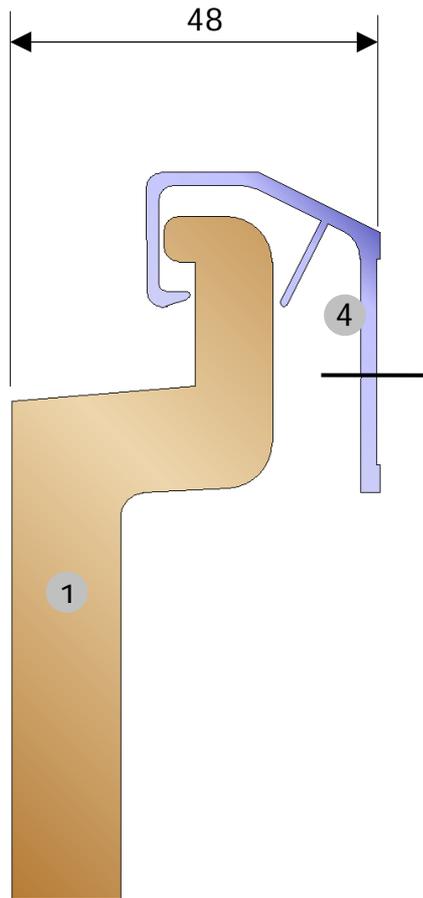
Any assistance given at training days or at any other time by either the Manufacturer or the Supplier (their staffs or agents) should not be construed as going beyond the information contained in these LockClad S³ Technical Guidance Notes.

- 1 LockTile
- 2 S3 Rail
- 5 LockClip

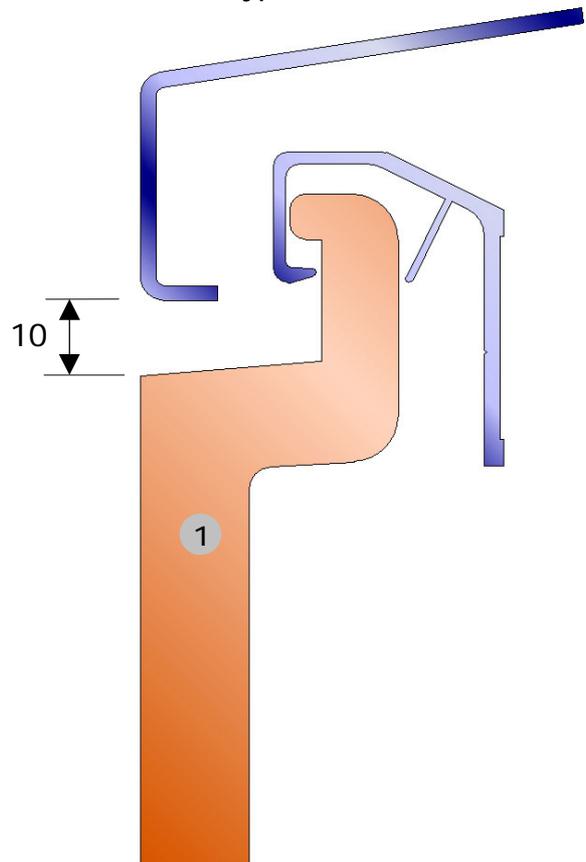


Scale 1:1

- 1 LockTile
- 4 S3 Top Rail

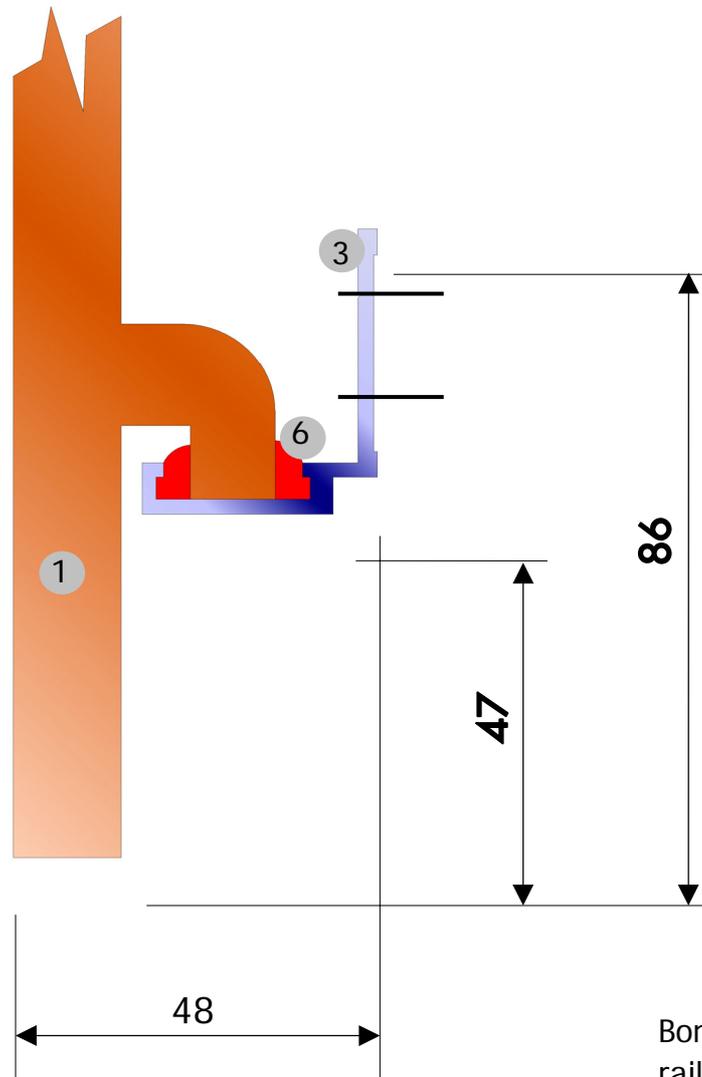


Typical Cill Detail



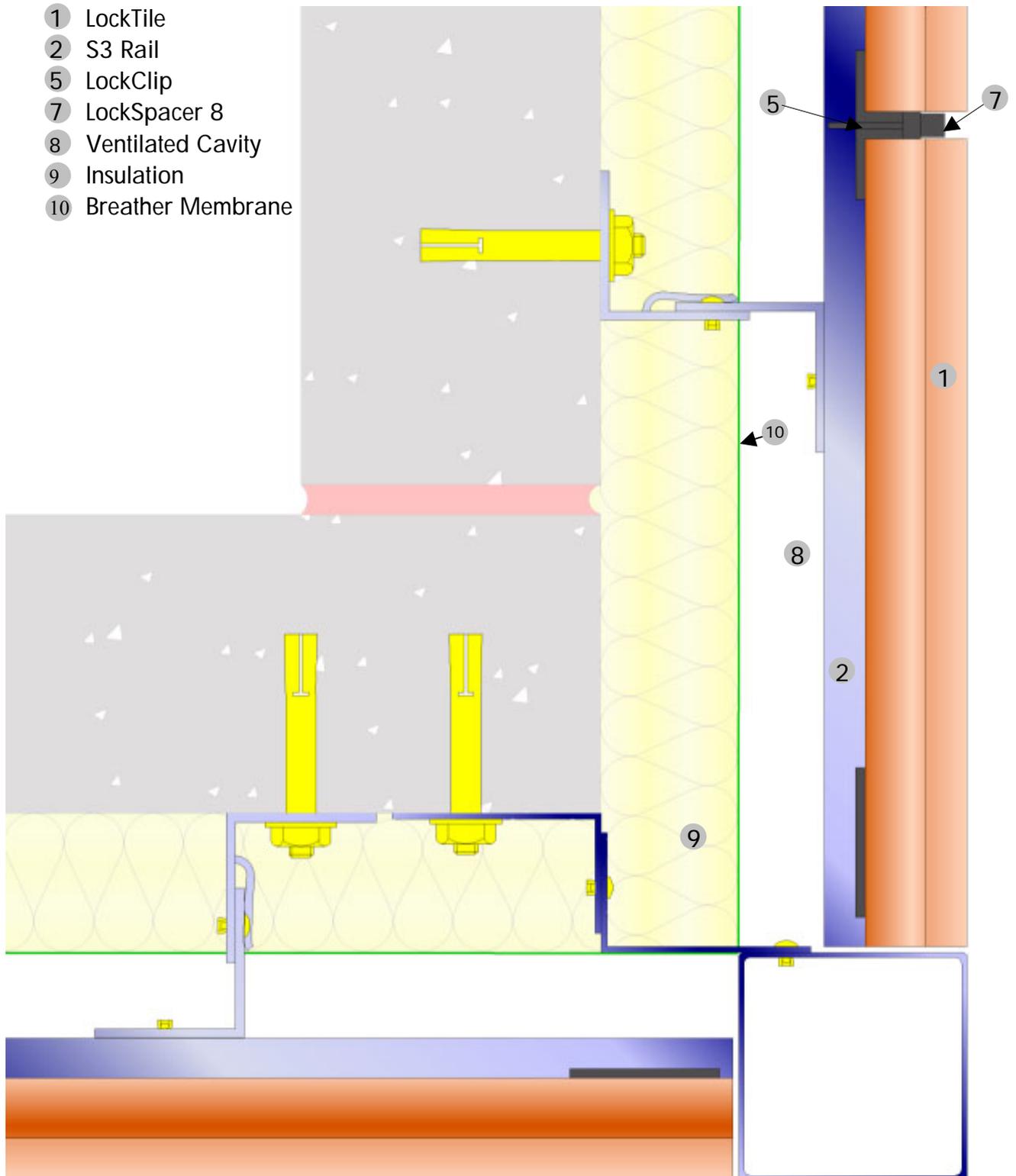
Scale 1:1

- 3 LockTile
- 3 S³ Bottom Rail
- 6 Silicon Adhesive



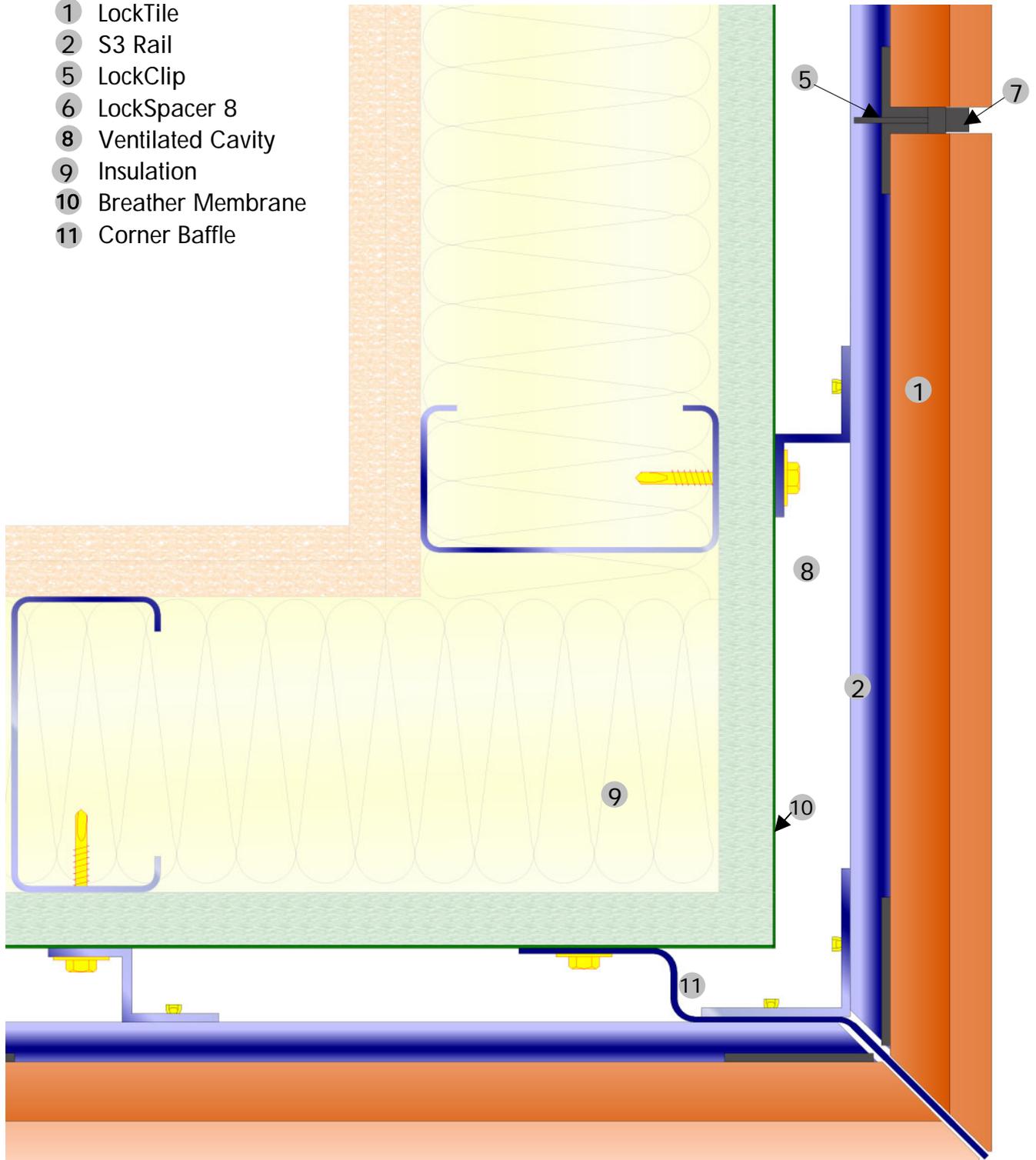
Bond each end of tile to rail with high modulus silicon adhesive

Scale 1:1



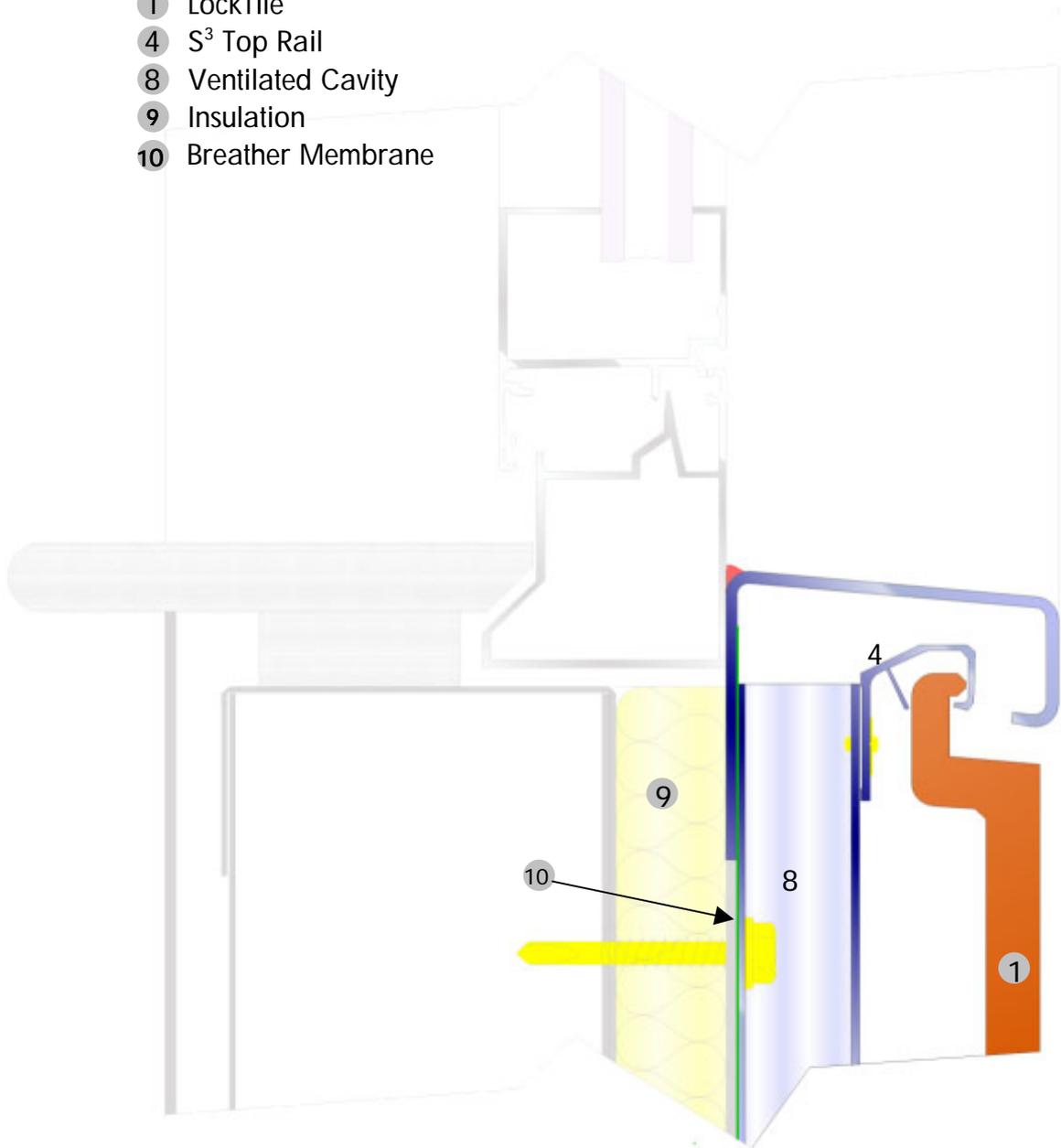
Not To Scale

- 1 LockTile
- 2 S3 Rail
- 5 LockClip
- 6 LockSpacer 8
- 8 Ventilated Cavity
- 9 Insulation
- 10 Breather Membrane
- 11 Corner Baffle



Not To Scale

- 1 LockTile
- 4 S³ Top Rail
- 8 Ventilated Cavity
- 9 Insulation
- 10 Breather Membrane

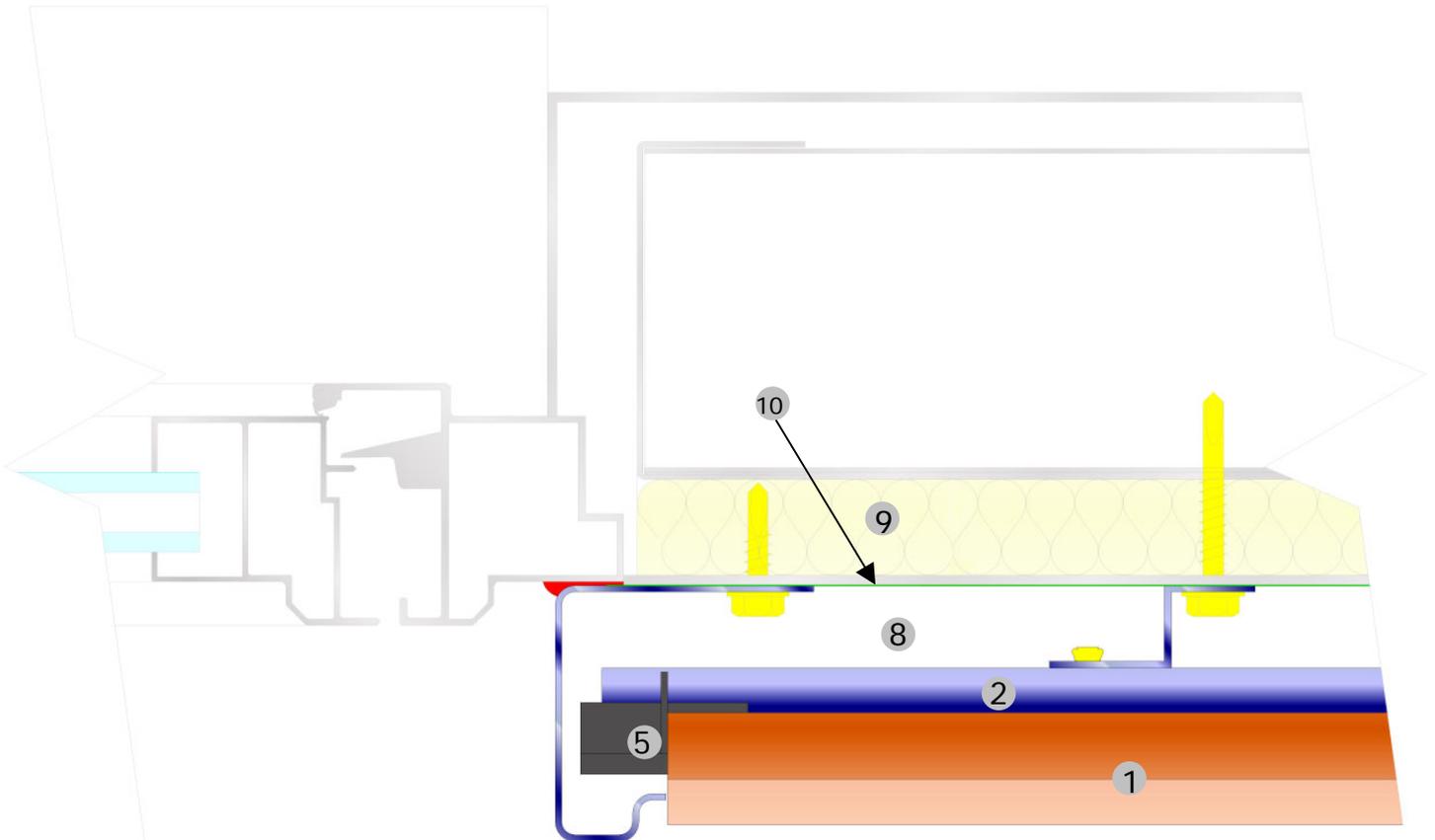


Note

Window must be fully sealed to main structure and the building envelope watertight before the Rainscreen is installed

Not To Scale

- 1 LockTile
- 2 S³ Rail
- 5 LockClip 1
- 8 Ventilated Cavity
- 9 Insulation
- 10 Breather Membrane



Note

Window must be fully sealed to main structure and the building envelope watertight before the Rainscreen is installed

Not To Scale

10.1 TERRACOTTA LOCKTILES

Colour - Terracotta, Slate, Buff, Antique, and other colours by arrangement

Finish - Natural Terracotta

Composition - Natural Terracotta (Fired Earth) and Slate Body manufactured from Etruria Marl Clay. Buff manufactured from Buff Fireclay.

Terracotta LockTiles made from:

Etruria Marl - Typical constituents - 3 parts clay : 1 part Course Grog

which contain -SiO₂ 56.96%, Al₂ O₃ 22.25%, TiO₂ 1.16%, Fe₂ O₃ 9.37%,
CaO 0.64%, MgO 0.77%, Na₂O 18%, K₂O 1.07%.

The red colour associated with terracotta products comes from the high iron content of these clays.

Slate Body uses the above clay with the addition of Manganese to produce the darker body. A surface colour is added before firing to improve the uniformity and depth of this product. Etruria Marls are normally fired to 1045 °C to give the required level of vitrification, frost resistance and low water absorption properties.

Buff LockTiles made from:

Buff Fireclay - Typical constituents - 5 parts clay : 2 parts Course Grog

which contain -SiO₂ 59.54%, Al₂ O₃ 22.05%, TiO₂ 1.14%, Fe₂ O₃ 3.35%,
CaO 0.29%, MgO 0.73%, Na₂O 0.23%, K₂O 1.97%.

The reduction in iron content gives this clay a natural cream colour. Normal firing temperatures would be 1100 °C.

For the general nature of terracotta, its appropriateness and characteristics - see section 3.4.

Dimensions Tiles are made and cut to FACE SIZES.

It is ABSOLUTELY ESSENTIAL that the difference between the nominal grid dimension and the physical face size of the tile is fully understood when ordering as the tiles are cut to the face size. Data sheet 4.11 shows that for a nominal grid height of 250mm and a horizontal joint width of nominally 10mm, the tile FACE height is 240mm.

STANDARD HEIGHTS FOR TILES ARE (ALL DIMENSIONS NOMINAL):

Grid height of: 250mm with horizontal joint width of 10mm giving a FACE height of 240mm.
235mm with horizontal joint width of 10mm giving a FACE height of 225mm.
220mm with horizontal joint width of 10mm giving a FACE height of 210mm.
210mm with horizontal joint width of 10mm giving a FACE height of 200mm.
200mm with horizontal joint width of 10mm giving a FACE height of 190mm.
185mm with horizontal joint width of 10mm giving a FACE height of 175mm.

10.1 Terracotta LockTiles - continued

LockTiles are cut to FACE width to order.

The face width will depend on the choice of vertical joint width and any allowance for constructional tolerances.

For a nominal grid width of 250mm and LockSpacer 2 the Face width would be 248mm, assuming no allowance for tolerances. The tolerance of the cut width for LockTiles less than 300mm nominal width is ± 1 mm and there are building tolerances to consider in addition. It is for the Purchaser to specify the face width but in using the LockSpacers it is important that the tiles either side are closely abutted to minimise water ingress whilst at the same time also allowing the alignment of the vertical joint up the building.

For a nominal grid width of 250mm and LockSpacer 8 the face width would be 242mm, assuming no allowance for tolerances.

The nominal vertical grid is measured to the centre line of the vertical joints, i.e. to set the grid, deduct the width of one Lockspacer from the overall clear width to determine the overall panel width.

Thickness	14mm. Dry Weight, up to 46.5 kg/m ² exclusive of LockRail.
Dry Weight	LockTiles Maximum Dry Weight /m ² 240 Face 44.0 kg/m ² - 225 Face 44.5 kg/m ² - 210 Face 45.0 kg/m ² 200 Face 45.5 kg/m ² - 190 Face 46.0 kg/m ² - 175 Face 46.5 kg/m ²
Unit tolerances	Tile Width ± 1 mm for nominal widths upto and including 300mm cut widths and ± 1.5 mm for nominal width upto 400mm. Tile Height ± 1 mm. Thickness +2mm –1mm. Twist (any corner relative to any other 3) ± 3 mm for nominal width up to 300mm and ± 4 mm for nominal width up to 400mm.
Accuracy	All units are mechanically cut after firing to provide nominally parallel and square outer edges and bearing surfaces to ± 1 mm (widths of ± 1.5 mm for LockTiles larger than 300mm) to reduce level differences between adjacent tiles to 2mm maximum, at the exposed bottom edge.
Sawn Edges	LockTiles are supplied free from any significant edge/aris damage or chipping on exposed faces of depth greater than 2.5mm or flaws not consistent with a natural clay product.
Quality	Low in soluble salts and free from significant cracks, fissures, discoloration, or other defects which may significantly affect strength, durability or overall appearance.
Colour Variation	Terracotta is a natural material and there will be colour variation between individual LockTiles. Terracotta mellows with age and weathers naturally. Prior to placing a firm order Purchasers MUST acquaint themselves with the colour variation to be generally expected.

Colour Variation - continued

LockTiles are cut to a particular size from a single batch. It is probable that different size LockTiles will come from different batches, as will special LockTiles. Whist each batch will contain variations in colour, the variation may vary between batches, therefore care must be taken when combining LockTiles from different batches by selecting to avoid colour banding. Site cutting of standard LockTiles from the same batch will avoid this selection task.

Bonding

Each tile may be fixed independently of all other tiles.

For Stacked bond the standard nominal vertical joint widths are 2mm and 8mm using LockSpacer 2 and 8 respectively.

For Broken bond the standard nominal vertical joint width is 2mm using LockSpacer 2

Ordering

LockTiles are generally manufactured to order and no changes to dimensions, quantities or colour can be accommodated once the order has been accepted and acknowledged by the Manufacturer, unless agreed in writing by the Manufacturer,(clause 2.2 of the supply agreement).

BRITISH STANDARDS

BS 5534 pt 1 : 1990 and pt 2 : 1986 for clay tiles where relevant.

- All tiles comply.

BS 3921 : 1995 as for Clay Bricks.

- Satisfies 100 freeze thaw cycles as required.

BS 402 : Pt 1 : 1990 Appendix E for Water absorption

- Generally around 5% by mass when tested in accordance with standard.

BS 8200 : 1985 clause 7.3 for Impact Loads

- Complies with the requirements for clay tiles likely to be subject to hard impact loads to be easily replaceable.

BS 476 and B4 Building Regulations for Fire Safety : 1991

- In accordance with Class O

Note - The inner leaf alone shall possess the requisite standard of fire resistance. This shall also extend around openings crossing the cavity, and all insulation within the cavity shall be non-combustible.

10.2 LOCKCLIPS AND LOCKSPACERS

BS 2782 ; 1992 & BS 476 pt 12

- LockClips and LockSpacers are manufactured from polypropolene grade 94ULV-2 and comply with the relevant parts of the standard.

Their content is not considered as forming a significant part of the total combustible materials represented by the average building and its contents.

10.3 LockRail S³

LockRail S³ are Aluminium and are manufactured to BS: 1474 for extrusions..

Aluminium accords with this standard with International Designation 6063 T6 .

Coefficient of linear expansion $24 \times 10^{-6}/oc$.

See data sheet S³-3-5 for table for spans and wind loadings.

Deflection of LockRail S³ is less than ... $1/600$ of the span ... in the vertical plane to maintain joint width accuracy and ... $1/200$ of the span ... in the horizontal plane.

LockRail S³ can be delivered at a batch length to suit lengths required up to a maximum of 6.0m. (subject to availability). Lengths must be selected with thought to the effects of thermal expansion.

Allowable end cantilever for LockRail S³ is maximum $1/5$ span where LockRail is continuous over at least one full span between fixings.

Due allowance must be made for the thermal expansion and contraction of the rails from the ambient

For projects that require the LockClad components to be delivred in separate batches - each batch constitutes a separate order. All details for all orders to be recorded on the order form in section 17.

An order becomes binding on the Manufacturer once a section 17 form covering that order has been signed off by the nominated Red Bank Technical Manager.

As the order progresses through the production process the physical ability to modify the order

diminishes. It is therefore of paramount importance for the Purchaser to define the quantities, colours and dimensions of LockTiles and details of all other LockClad components accurately at the time of placing the order.

The Supply Contract gives discretion to the Manufacturer to agree in writing to a modification/extension/reduction to an order. This does not confer any automatic rights on the Purchaser. Where a modification can be agreed by the Manufacturer it will normally involve additional costs.

NBS SPECIFICATION CLAUSES

H92 RAINSCREEN CLADDING
To be read with Preliminaries/General Conditions



120 RAINSCREEN CLADDING _____

- Drawing reference(s): _____
- Primary support structure: _____
- Rainscreen cladding system:
Manufacturer and reference: **Taylor Maxwell & Company Limited, LockClad Division, c/c Red Bank Manufacturing Company Limited, Atherstone Road, Measham, Swadlincote, Derbyshire DE12 7EL. Tel: 01530 274854, Fax: 01530 274853. Email: lockclad@taylor.maxwell.co.uk Web: www.taylor.maxwell.co.uk**
Type: **LockClad Terracotta Rainscreen**
- Material: **Terracotta**
Thickness: **14mm**
Finish/colour: **Natural Terracotta/Natural Buff/Dark Terracotta/Ivory/Slate**
Fasteners: **LockClip - secret fixing**
Number and location of fasteners: **2 per tile**
Joint type: **Butt joints vertically; lapped horizontally**
Joint width: **2mm and 8mm vertical; 10mm horizontal**
- Air gap: **25mm.**
-

Secondary support/framing system: **LockClad S³ - Horizontal aluminum rails**
Manufacturer and reference: **Taylor Maxwell & Company Limited, LockClad Division, c/c Red Bank Manufacturing Company Limited, Atherstone Road, Measham, Swadlincote, Derbyshire DE12 7EL. Tel: 01530 274854, Fax: 01530 274853. Email: lockclad@taylor.maxwell.co.uk Web: www.taylor.maxwell.co.uk**
Material: **Aluminum**
Fasteners: **Direct to backing wall or primary support structure**
Number and location of fasteners: **Consult Taylor Maxwell for details** -
Backing wall: **Masonry/ concrete/timber frame/steel frame/board**
Breather membrane: **Optional - Consult Taylor Maxwell for details**
Thermal insulation: **As clause 776.**