SAFLOK 410
concealed fix roofing

INSTALLATION GUIDE

Safintra is part of the Safal Group, the largest steel roofing company in Africa

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PRODUCT DESCRIPTION & FEATURES
Concealed-fixing, also referred to as secret fix, is a roofing system designed for very low pitched roofs using fasteners which do not pass through the sheet. Clips pre-fixed into the purlins hold the roof sheets in place. The alternative is pierced-fixing, a system not suited for roof pitches lower than 5°, and restricted in sheet length.

MATERIAL SPECIFICATIONS
SAFLOK 410 can be produced from:
- Pre-painted or unpainted steel base with aluminium-zinc alloy-coating.
- Pre-painted or unpainted aluminium base.

TOLERANCES FOR THE MATERIAL
Length: +0 mm / -15 mm
Width: +2 mm / -2 mm
Make allowance for thermal expansion or contraction for long length roofs at sheeting ends. The equation \( \Delta L = \alpha \Delta T \times L \) gives an indication of the sheeting extent or contraction (\( \Delta L \)).
\[ \alpha = 12 \times 10^{-6} \] (coefficient of linear expansion for steel)
\[ \Delta T = \text{temperature change in } ^\circ\text{C} \]
\[ L = \text{sheet length in mm} \]

LENGTHS
Mobile roll formed sheets are custom cut on-site. With the aid of the mobile rolling mills, custom lengths in excess of 18m can be rolled on-site. To date the longest continuous sheets in South Africa have been in the region of 130m long. Off-site rolled sheets are cut to transportable lengths (approximately 12m).

ROOF PITCH
SAFLOK 410 was designed for roof pitches from as low as 2° (1 in 50) however 3° is preferred. It can also be used on walls. When applying to very steep roof pitches you should pierce-fix through each sheet under the flashing or capping, along the top of the sheet to prevent the concealed-fixed sheeting from sliding downward in the fixing clips. Clip-in marks might be visible on

high pitched roofs. This visual effect might not be aesthetically pleasing in a residential application.

SEVERE CORROSIVE CONDITIONS
If this product is to be used in marine, severe industrial, or unusually corrosive environments, consult the technical staff at your nearest Santra branch.

METAL & TIMBER COMPATIBILITY
Lead, copper, free carbon and bare steel are not compatible with AZ coated or Aluminium material. Don’t allow any contact with those materials, nor discharge of rainwater from them onto the material. Supporting members should be coated to avoid problems with underside condensation. If there are doubts about the compatibility of other products being used, consult the technical staff at your nearest Santra branch.

MAXIMUM PURLIN SUPPORT SPACINGS
The maximum recommended purlin spacings are based on testing in accordance with SABS 0237: 1991. Roof spans consider both resistance to wind pressure and light foot traffic (traffic arising from incidental maintenance).

It is important to note that the design criteria for Industrial and Residential buildings are different. Aesthetics play a much bigger role in residential buildings than in industrial type buildings, hence the purlin spacings on residential buildings need to be reduced for a more pleasing appearance. It is strongly recommended not to design to the limits. Allow for the unexpected, for example installing a very heavy air-conditioning unit long after the building has been commissioned, strong gusts of wind from time to time or an area renowned for snow or hail. Safintra recommends being a little conservative with your purlin spacings, this can prevent potential problems at a later date. Please consult the technical staff at your nearest Safintra branch.
# SAFLOK 410

**World Class Roofing Systems**

**Concealed Fix Roofing**

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## DRAINAGE TABLE

<table>
<thead>
<tr>
<th>Rainfall Intensity (mm/hour)</th>
<th>Roof Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>2°</td>
<td>3°</td>
</tr>
<tr>
<td>250</td>
<td>75</td>
</tr>
<tr>
<td>300</td>
<td>65</td>
</tr>
<tr>
<td>400</td>
<td>50</td>
</tr>
<tr>
<td>500</td>
<td>40</td>
</tr>
</tbody>
</table>

Maximum roof run for roof slopes and rainfall intensities shown.

### Saof 410 Clips are Calculated at 140g per clip - require approximately 2 clips per m².

### Gauget Note:

It is important to reduce purlin spacings by 20% when spring curving a roof.

### Purlin Spacings

<table>
<thead>
<tr>
<th>Gauge</th>
<th>0.5mm</th>
<th>0.55mm</th>
<th>0.8mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Aluminium-Zinc</td>
<td>Aluminium-Zinc</td>
<td>Aluminium</td>
</tr>
<tr>
<td>Roofs</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>Single Span</td>
<td>1,400</td>
<td>1,700</td>
<td>1,900</td>
</tr>
<tr>
<td>End Span</td>
<td>1,600</td>
<td>1,900</td>
<td>2,000</td>
</tr>
<tr>
<td>Internal/Double Span</td>
<td>1,800</td>
<td>2,100</td>
<td>2,700</td>
</tr>
<tr>
<td>Cantilever (Unstiffened)</td>
<td>150</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>Cantilever (Stiffened)</td>
<td>300</td>
<td>300</td>
<td>200</td>
</tr>
</tbody>
</table>

### Side Cladding

<table>
<thead>
<tr>
<th>Rainfall Intensity (mm/hour)</th>
<th>Roof Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>2°</td>
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</tr>
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</tr>
<tr>
<td>Internal Span</td>
<td>2,100</td>
</tr>
<tr>
<td>Cantilever</td>
<td>300</td>
</tr>
</tbody>
</table>

Approximate Mass/m²

- 5.4 kg
- 6.2 kg
- 2.9 kg

Span tables are for SAFLOK 410 with light foot traffic only.

Span tables are based on 1.5kPa downward pressure, 1.6kPa upward pressure and 0.75kPa for the side cladding, inward or outward. The span tables are maximum recommended spans based on buildings up to 10m high in Region B, Terrain Category 3. For further clarity on terrain categories, and wind speeds, please refer to the Safintra Design and Installation Manual (specifically pages 5,6 and 10,11).

### Roof Spacing for Sheetings

ROOFS:

Cpi=+0.20, Cpe=–0.90, Ki=2.0 for single and end spans, Ki=1.5 for internal spans

WALLS:

Cpi=0.20, Cpe=–0.65, Ki=2.0 for single and end spans, Ki=1.5 for internal spans. These spacings may vary by serviceability and strength limit stated for particular projects.

### Limit Stated Wind Pressures

Our Span table for light foot traffic was tested with the latest methods for modelling wind pressures. The wind pressure capacity table was tested by the CSIR, using the direct pressure-testing rig. The pressure capacities for serviceability are based on a deflection limit of [span/120] + (maximum fastener pitch/30). The pressure capacities for strength has been determined by testing the cladding to failure (ultimate capacity). These pressures are applicable when the cladding is fixed to a minimum of 2.0 mm, G550 steel.

### Wind Speed Table

<table>
<thead>
<tr>
<th>Wind Zone</th>
<th>Purlin Spacing for Sheetings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low [32 m/s]</td>
<td>As per the profile span tables</td>
</tr>
<tr>
<td>115km/h</td>
<td></td>
</tr>
<tr>
<td>Medium [37 m/s]</td>
<td>As per the profile span tables - 5%</td>
</tr>
<tr>
<td>133km/h</td>
<td></td>
</tr>
<tr>
<td>High [44 m/s]</td>
<td>As per the profile span tables - 25%, all roof perimeters secured, consult your local Safintra branch.</td>
</tr>
<tr>
<td>158km/h</td>
<td></td>
</tr>
<tr>
<td>Severe [50 m/s]</td>
<td>As per the profile span tables - 25%. Consult your local Safintra branch</td>
</tr>
<tr>
<td>179km/h</td>
<td></td>
</tr>
</tbody>
</table>

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INSTALLATION

Before starting work ensure that:

- The purlins for your sheeting are truly in the same plane;
- the minimum roof slopes conform to our recommendations;
- the overhangs of sheets from the top and bottom purlins don’t exceed our recommendations; and
- the first and last purlins and clips should be at least 75mm from each end of the sheet to keep maximum holding power.

Make any necessary adjustments before you start laying sheets, they will be difficult to rectify later.

ORIENTATE SHEETS BEFORE LIFTING

Consider which end of the building is best to start from. For maximum weather-tightness, start laying sheets from the end of the building that will be downwind of the worst-anticipated or prevailing weather.

It is much easier and safer to turn sheets on the ground than up on the roof. Before lifting sheets on to the roof, check that they are the correct way up and the overlapping side is towards the edge of the roof from which installation will begin.

Place bundles of sheets over or near firm purlins, not at mid span of roof members.

Step 1

When lifting sheet lengths onto the roof structure ready for installation, make sure all sheets have the overlapping ribs facing towards the side where fastening is to commence.

The first run of clips must be located and fastened, onto each support, so that they will correctly engage in the overlapping and centre rib of the first sheet when it is located and locked over them.

To do this, fasten clips to the purlins at each end of the sheet, having positioned them so that the first sheet will be in correct relation to other building elements.

Align and fasten the remainder of the first run of clips using a builders line (string line or gut line) or the first sheet as a straightedge.

Note: Most “failures” occur during erection. To secure work in progress, the last sheet for the day must be positively fixed. This sheet must be lifted and re-used at the end of each day’s work, and finally discarded at the end of the project. Positive fix through the pans or the ribs, as long as the sheet is extremely well secured!
Step 2
Position the first sheet perpendicular to the purlins and locate it over the fastened run of clips, positioning the centre rib first, and engage the centre and overlapping ribs onto all clips by foot pressure.

Step 3
Position and fasten the next run of clips, one to each purlin, with the “goose neck” of the clip over the male rib of the installed sheet. Take care to roll the clip in by engaging the inside spur first and then roll to engage top section. [For a video demonstration go to http://www.safintra.co.za/concealed-fix-roofing.html]

Step 4
Place the second sheet over the second run of clips, again positioning the centre rib first. A builders line stretched across the bottom alignment of the sheets can be used to check that the ends of the sheets are in line.

Fully engage the interlocking ribs and the centre rib over each clip. This can be achieved by walking along the full length of the sheet being installed with one foot in the tray next to the overlapping rib and the other foot applying pressure to the top of the interlocking ribs at regular intervals.
Also apply foot pressure to the top of the centre rib over each clip. For complete interlocking, which is essential, the spurs of SAFINTRA SAFLOK 410 along the under-lapping rib must be fully engaged in the shoulder of the overlapping rib. See illustration above.

A distinct and loud “click” will be heard as the interlocking ribs fully engage.

When engaging SAFINTRA SAFLOK 410 interlocking ribs, stand only on the sheet being installed, that is the overlapping sheet, and not on the preceding sheet.

Install subsequent sheets by following Steps 3 and 4 and make periodic checks that the installed sheets are aligned with the roof perimeter.

On side cladding or walling applications a rubber hammer must be used to fully engage the interlocking ribs and engage the centre ribs over the clips.

**Step 5**

If the space left between the last full sheet and the fascia or parapet is more than a half sheet width, a sheet can be cut longitudinally, leaving the centre rib complete. This partial sheet can be fully clipped onto a row of clips as for a full sheet, before installing the capping or flashing. If the space left between the last full sheet and the fascia or parapet is less than a half sheet width, it can be covered by the capping or flashing. In this case, the last sheet should be secured by cutting the sheet in half and fastening the under-lapping rib at each purlin with a half sheet.

Similarly, a half clip may also be used if required. In this case, where a partial sheet of less than two ribs is used, it is necessary to turn up the lip along the edge of the cut sheet. This can then be covered by the capping or flashing.

(Last rib fastened with half sheet and covered by capping or flashing).

**Step 6**

Turn up the SAFLOK pans at the ridge line. On lower pitches the pans should be turned down at the gutter line.

**Step 7**

Clean the roof daily by removing all swarf, pop rivets and fasteners.
CHECK ALIGNMENT OCCASIONALLY

Occasionally check that the sheets are still parallel with the first sheet, by taking two measurements across the width of the fixed sheeting.

At about half way through the job, perform a similar check but take the measurements from the finishing line to aim that the final sheet be parallel with the end of the roof. If the measurements are not close enough, lay subsequent sheets very slightly out of parallel to gradually correct the error. To allow this to happen, flatten the tabs on the base of subsequent clips—the slot in the clip will allow the clips to be fixed out of standard pitch.

FIX THE LAST SHEET

If the final space is less than the full width of a sheet, you can cut a sheet along its length and shorten the clips appropriately. It is desirable to fix the sheet at one end.

INSTALLING SAFLOK 410 SIDE CLADDING

It is important to note that SAFLOK 410 was never designed for side cladding. When used as side cladding it does not appear aesthetically pleasing. The clip engaging a sheet often leaves a small mark or indentation. This is normal and unavoidable. Although the marks do not influence the performance of the sheets, aesthetically it is not pleasing in certain light conditions.

The installation procedure for walls is similar to that described for roofs.

To prevent SAFLOK 410 from sliding downward in the fixing clips, one should pierce-fix through each sheet under the flashing or capping, along the top of the sheets. A wooden mallet or rubber hammer should be used to engage the clip and preferably do not kick the sheet into place, as the latter (although easiest!) will potentially pose a greater risk of leaving marks on the sheets.

TOLERANCES FOR INSTALLATION

The clips will only perform if aligned correctly. Viewed from the side, a clip will only engage into the sheet if the purlin is not rotated more than 3° from the roof angle/slope. Similarly seen from above, the clip or the purlin onto which it has been fixed cannot be more than 3° misaligned. Therefore a sturdy substructure is essential. If the purlin has deflected or rotated too much under traffic loads, the installed sheets will disengage.

When considering tolerances, the roof slope or roof angle would obviously be the main factor, depending on drainage tables and sheet length, 3° slope on a wooden substructure or 2° for a steel substructure. Anything lower than the prescribed roof slope will cause pooling and will accelerate corrosion and leakage. It is important to ensure that the roof structure complies with SABS 0237:1991 which states that deviations under self weight conditions do not exceed 5 mm out of parallel per metre of spacing between adjacent purlins/girts and the angle between accepted contract surfaces do not exceed 3°. Purlins or girts must not exceed 3° from the perpendicular to the direction of the sheet.

END-LAPPING

Because it is a concealed-fixed system, SAFLOK 410 should not be end lapped. Instead, a step lap joint must be used. Long length sheets from a mobile roll former should be used where possible as this eliminates the need for joining. Alternatively, pre-cut sheet lengths can be supplied up to the limits of transport regulations which are often long enough to cover roofs without endlapping the sheets.

If you contemplating using sheets that are shorter than the full span, with the intention to overlap them, you need to consider:

- the roof slope, because it affects the length of the lap; and
- the method of fixing of the cladding to its purlins, because it affects the maximum length of one sheet.

Note: For video clips on installation, visit http://www.safintra.co.za/concealed-fix-roofing.html
Where insulation is to be installed, you may need to increase the length of the fasteners given below, depending on the density and thickness of the insulation. When the fastener is properly tightened:
- into metal: there should be at least three threads protruding past the purlin you are fixing to, but the shankguard must not reach that purlin.
- into timber: the fastener must penetrate the timber by the same amount that the recommended fastener would do if there were no insulation.
- Never re-use a MT410 clip.

Natural springing occurs at 36m radius in the convex and 60m radius in the concave.

For sealed joints use fasteners or rivets and neutral-cure silicone sealant branded as suitable for use with AZ steel.

It is possible to rollform straight onto a roof using a scaffold ramp. The limitations are the building height and space needed to roll. A departure angle of 10° is the maximum allowed at any time. A greater angle would damage the sheet when leaving the mill, again when bending to settle onto the roof and put enormous stress on the drive motor. The sheeting cannot be roll formed onto a building higher than 10m.

During installation, clean the roof daily by removing all swarf, pop rivets and unused fasteners or any other debris.
**CUTTING**

For cutting thin metal on site, we recommend a circular saw with a metal-cutting blade. These produce fewer damaging hot metal particles and leaves less resultant burr than a grinder. The cutting of sheeting should be done on the ground and not on top of other materials. Sweep all metallic swarf and other debris from roof areas and gutters at the end of each day and at the completion of the installation. Failure to do so can lead to surface staining when the metal particles rust.

**NOTCHING**

**USING NOTCHING TOOLS**

After the cladding is fixed and the turn-ups finished, proceed as follows:

- Place a flashing with the notch-edge resting on the ribs.
- Place or position your notching tool over a rib with the notching head against the flashing.

**VERTICAL TOOL:** Locates the body along the rib. **HORIZONTAL TOOL:** uses the lugs on the underside to locate on top of the rib.

- Raise the handle to open the tools. For the VERTICAL TOOL: lift the flashing into the mouth of the tool. For the HORIZONTAL TOOL: slide the mouth of the tool over the edge of the flashing as far as it will go.
- Push down on the handle to perform the notching.
- Repeat for all ribs, checking in each case that the flashing is correctly positioned.
- If you are using a horizontal tool, bend down the tongues between the notches over a suitable straight edge (such as a piece of timber).

**USING TINSNIPS.**

If notching tools are not available, flashings can be notched to the rib profile with tinsnips. After the sheeting is fixed and the turn-ups finished, proceed as follows:

- Place the flashing with the turned-down edge resting on the ribs.
- Mark out the notching using a template positioned over each rib.
- Cut the notches with tinsnips.

**TURN UP-DOWN (LIPPING) TOOLS**

On all roofs with pitches of less than 15°, the high end of all sheets must be turned up to stop water from being driven under the flashing and into the building. Similarly, the pans at the gutter end must be turned down to stop water running back along the underside of the sheets. Tools are available for both applications.

In normal turning-up of SAFLOK 410, the tops of the ribs protrude past the turned up tray. Consequently the turn-ups cannot be positioned hard against a fascia or wall, or the ends of the sheets on either side of the ridge cannot be butted together. This is usually of no consequence because the turn-up is completely covered by a flashing or capping. However, if you want the ribs not to protrude past the turn-up, you can make a flush turn-up. You need an extra 40 mm in sheet length for flush turn-ups.

1. Cut the top of each rib before turning-up the pans, and turn-up the pans as described previously.
2. Position the backing tool in the tray and hold it hard against the turn-up with your foot.
3. With a rubber mallet, fold the protruding ‘ears’ flush against the backing tool.

**NOTCHING TOOL**

A tool is available for on-site notching of sideways flashings and cappings [headwall, apex, over-under flashings]. Alternatively, make use of serrated metal broad flute closures. There is no tool or serrated metal broad flute closures for hips!
**POLYCARBONATE SHEETS**

Polycarbonate sheets do not have the mechanical grip required to keep the sheet fixed or adhered to the clip. A pierced fix method is the only way and we do not recommend using polycarbonate sheets on a SAFLOK 410 roof. Due to its greater thermal expansion, Polycarbonate sheeting should be fixed using oversized holes and sealing washers recommended by the manufacturer.

*Note: Do not exceed the maximum purlin spacing specified by the Polycarbonate sheeting manufacturer. Use of Polycarbonate sheeting may result in lower limit state capacities.*

1. Fix the base plate of the POLY-SLIDER BRACKET down with 10x16mm Wafer Head Teks, Class 3 fastener. Align as per the steps for installation.

2. Place the sheet on top of the POLY-SLIDER BRACKET.

3. Place a saddle washer over every rib above the slider section of the POLY-SLIDER BRACKET. Align and fasten the first 3 ribs using 10 x 16mm Hex Flange metal Teks with seal class 3 fastener. (It is possible to leave out the saddle washer, but this would weaken the system)

4. Now place the next sheet, engaging the female rib firmly over the male rib of the previous sheet.

5. Repeat step 3.

   **NOTE:** The bonded washer can be fixed from the top or from the side. A very low roof pitch would require side fixing.

**MAINTENANCE**

Optimum product life will be achieved if all external surfaces are washed regularly. Areas not cleaned by natural rainfall (such as the tops of walls sheltered by eaves) should be washed down every six months. Regular maintenance and inspections, especially after severe storms, are essential.

**STORAGE AND HANDLING**

Keep the product dry and clear of the ground. If stacked or bundled product becomes wet, separate it, wipe it with a clean cloth to dry thoroughly. Handle materials carefully to avoid damage, don’t drag materials over rough surfaces or each other, don’t drag tools over material and protect from swarf.
CONCEALED FIX PROFILES
The Saflok™ concealed fix profile is available in Saflok 700 (ideal for inland conditions) and the new Saflok 410 for challenging wind load conditions on the coast. Mobile mills enable Saflok® to be rolled on site in continuous lengths of up to 120 metres, enabling architects and engineers to create rooflines which are both practical and supremely modern. Safintra is also the sole manufacturer of SafZip™, a standing seam, zip-secured concealed fix profile for maximum wind-load performance, which can also accommodate tapered, domed and concave rooflines.

PIERCED FIX PROFILES
Exclusive pierced fix profiles include Widedek™ and Trimflute™ for extra coverage, Industrial 7, and the respected Versatile™ profile, which provides the structural benefits of a continuous steel sheet with the aesthetic appeal of tile. Safintra also produces the ever-appealing Corrugated and IBR profiles, and a full range of flashings, cold formed sections, louvres, ventilators and more.

TECHNICAL SUPPORT
Our vast experience in the building industry is backed up with local roll forming operations and full technical support services in 6 centres in South Africa,

Safintra South Africa: Polokwane, Nelspruit, Johannesburg, Cape Town, Durban, Port Elizabeth. www.safintra.co.za
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Safintra is part of the Safal Group, the largest steel roofing company in Africa. Perhaps more importantly, we are also the longest established group in our field - speaking volumes about the depth of our commitment to our clients, and our pride in what we do.

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