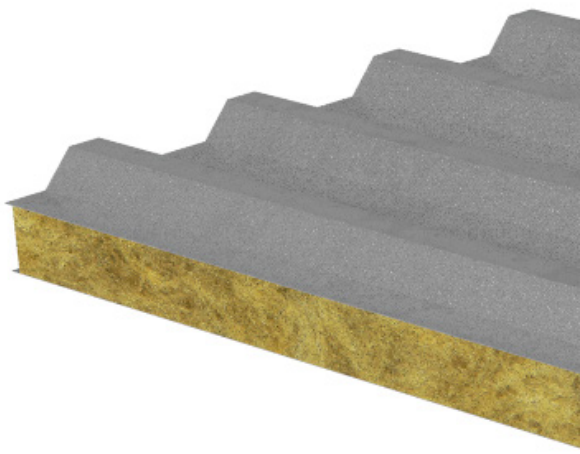
Horizontal Lifeline Application Guide

2023

Contents



Introduction

This guide has been compiled to ensure the correct installation of SOTER™ Horizontal Lifeline systems is adhered to at all times.

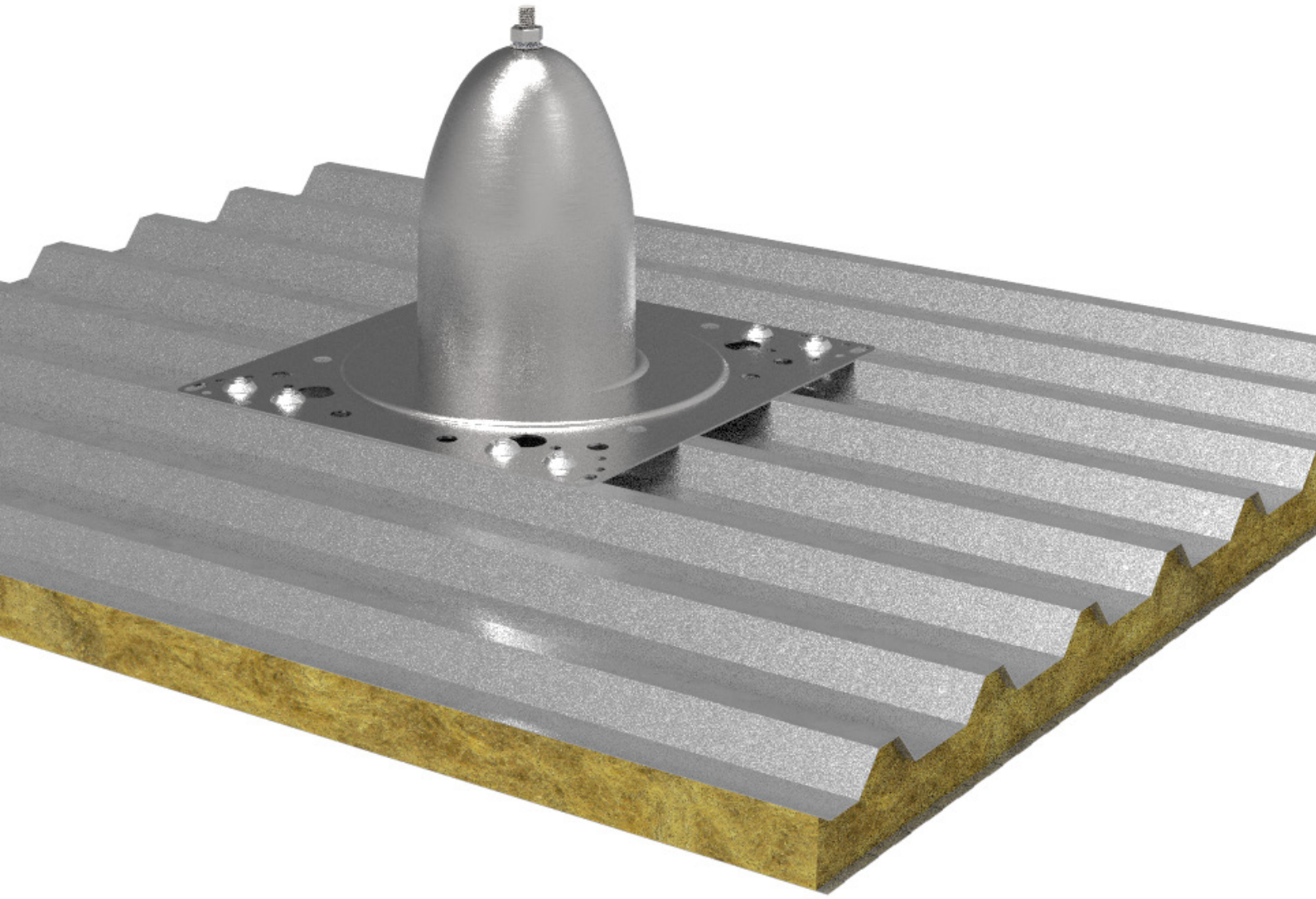
The installer should have previous Horizontal Lifeline system installation knowledge, design understanding and have taken part in SOTER™ training.

It is important that the installer fully understands this guide before commencement of installation on site.

SOTER™ Horizontal Lifeline systems are designed to act as a fall prevention method, or that of a means of minimising the consequences of a fall should it occur.

Only trained personnel should be involved in the design, correct installation, and recertification of horizontal lifeline systems. Failure to follow this guide could put lives at risk.

It is imperative that the correct components are used for the specific application, and any doubts should be resolved by seeking guidance from SFS fall protection.



Recognised Installers

Only competent installers trained by SFS are certified to carry out installation and re-certification of the SOTER™ Horizontal Lifeline system.

Recognised installers should ensure their personnel on site are competent and trained to the standards expected by SFS.

Conformity

The Horizontal Lifeline system is a series of top fixed shock absorbing posts anchored to the outer roof skin, joined through a series of components to create a system using a 7×7×8 mm wire cable. Tested by SATRA to EN795:2012, CEN TS16415:2013 multi-user and ACR Magenta guidelines.

The "system" refers to posts, components and wire, none of which should be substituted by non-approved components, modified or altered without the prior consent of SFS. Systems should not be dismantled or tampered with, as doing so could alter the performance of the system and invalidate its certification which could result in serious injury or death.

Design

Horizontal lifeline system design should only be carried out by competent persons.

When considering a safe system design, the designer must firstly understand the requirements of the user or need for roof access. This can be gathered from many sources, the safest method should be prioritised without the prejudice of a cost saving.

Full considerations to be understood:
- Reason for access/purpose of the system
- Access point and method
- No. of users required per system
- Full roof plans and elevations
- Roof substrate and condition
- Fixing method

The system designer should always follow the Hierarchy of Fall Protection. Restraint systems should be the preferred option and an arrest system should only be offered as a last resort. All systems must be capable of arresting a fall under EN795:2012 'foreseeable misuse', however it is best practice to keep a user in restraint to prevent any possibility of a fall occurring.

Restraint

Restraint systems are the safest method of horizontal lifeline system design. Keeping a user in restraint removes the possibility of fall occurring. The users path, and what they have access to can be dictated/controlled.

Keeping a user in restraint is dictated by the relationship of two key distances:

- Lanyard length (A)
- Position of the system and distance away from fall hazard (B), *see figure adjacent and on page 6

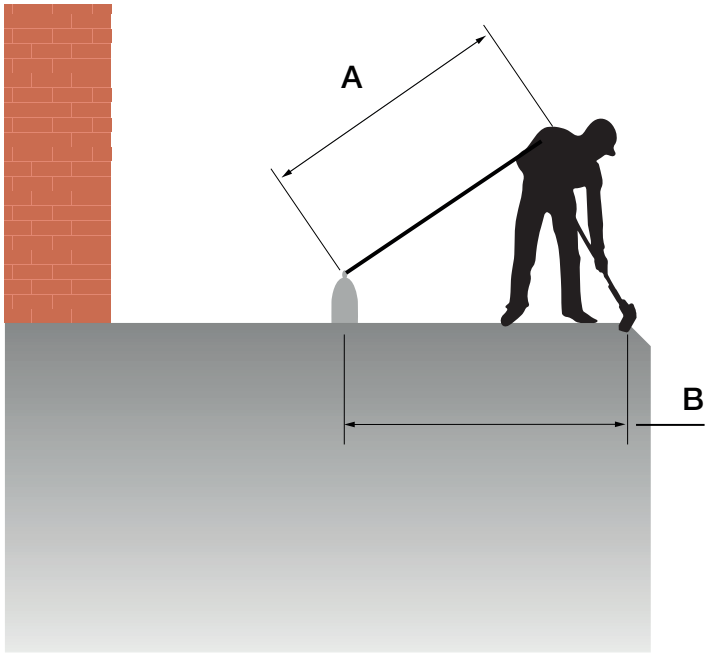
If the achievable distance between position of line and fall hazard varies on the system route, the lesser distance and therefore lanyard length should be preferred before any variable lanyard lengths/multiple lanyards are proposed.

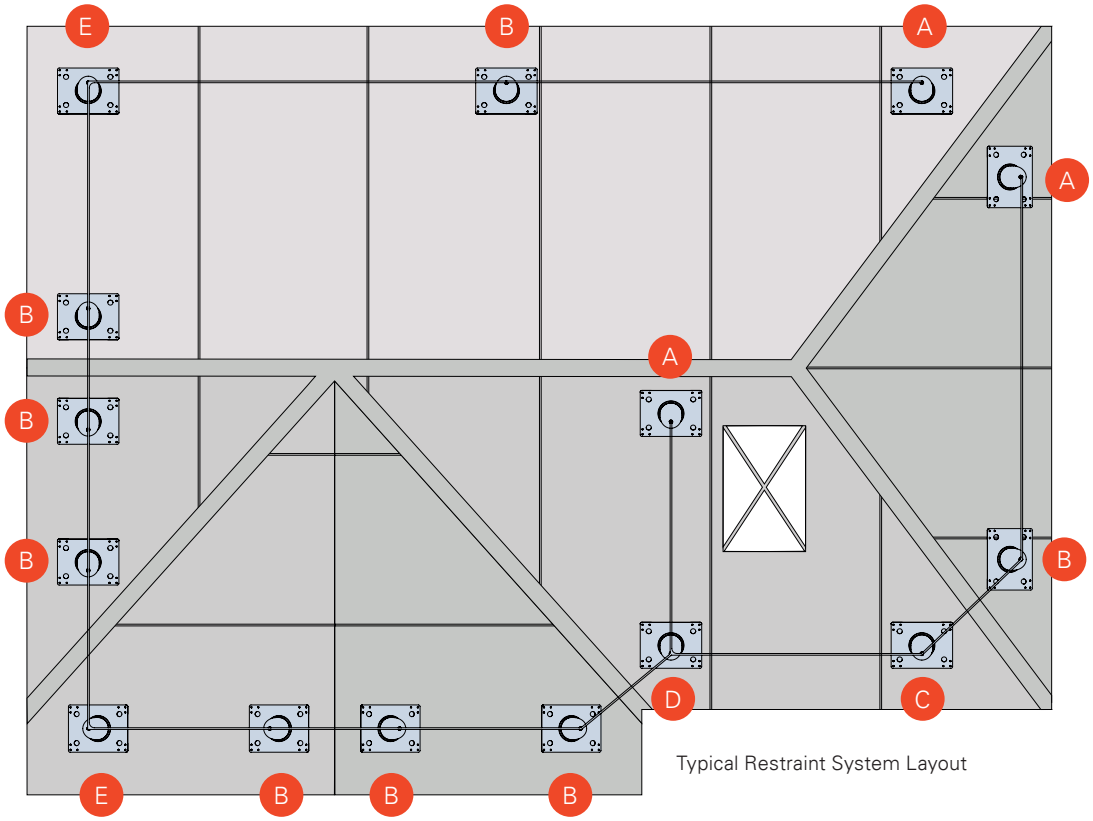
The general spacing from system to roof edge/fall hazard is 2.3m based on a typical lanyard length of 2m.

Fall hazards can be roof edges, roof lights or other fragile roof areas such as windows or glass.

Main advantages of work restraint systems:

- No possibility of a fall
- No need for any rescue plan
- Adjacent buildings/lower level roofs and fall clearances do not need to be factored
- Minimal system user training required





Typical Restraint System Layout

Key

A. High load start/end post with female M10/ universal
B. Intermediate post with intermediate bracket
C. High load with intermediate bracket
D. High load T-Off with 2 hole plate and intermediate bracket
E. High load corner with corner kit/solid corner

Fall Arrest

When a restraint system cannot feasibly be offered, a fall arrest system can then be considered.

Fall arrest systems are designed to 'limit the consequences of a fall should it occur'.

The SOTER™ horizontal lifeline system will arrest a users' fall, only if the required fall clearance has been allowed.

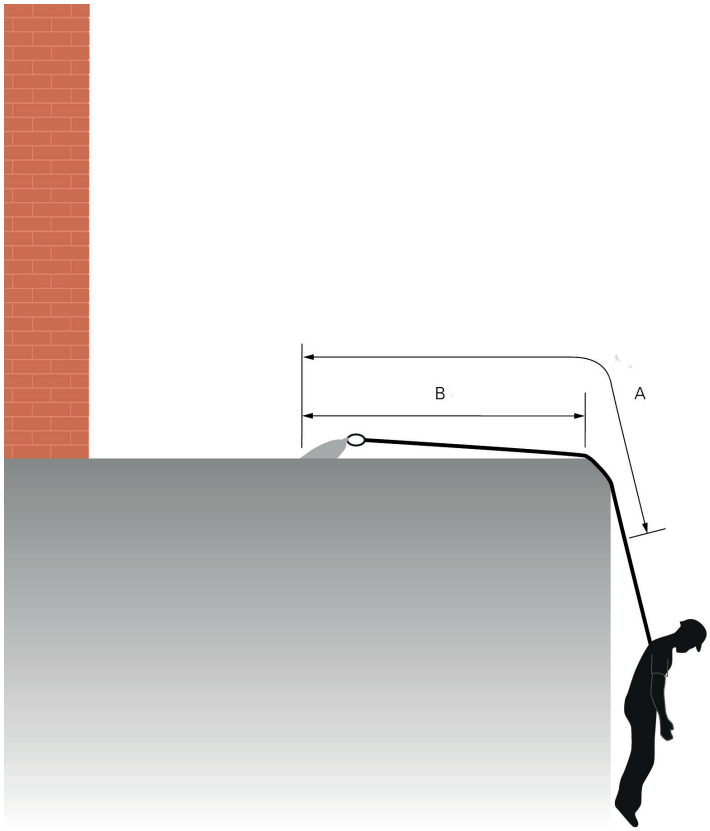
Fall clearances must be factored in when a fall arrest system is designed, considering the following factors:

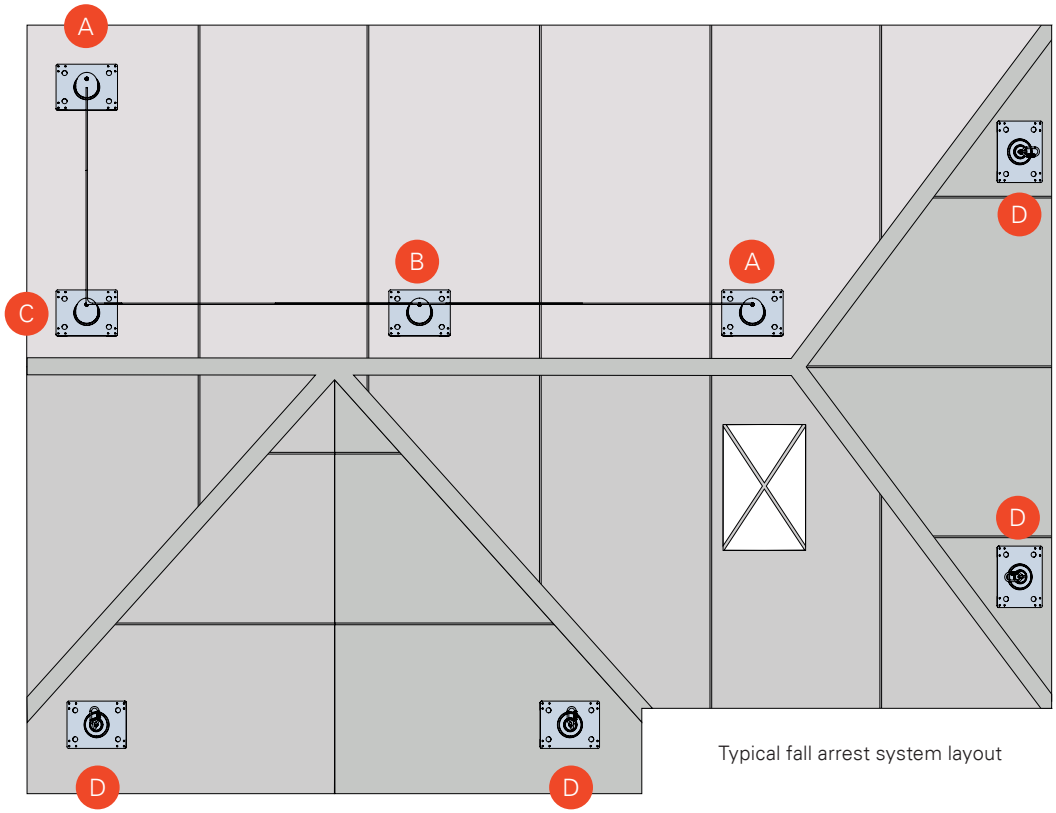
- Building height
- Free fall distance from roof edges
  - To the ground
  - Lower level roofs/adjacent buildings
- Free fall distance through fragile roof areas/roof lights/canopies etc.

Although fall arrest systems are often employed to give a user full roof access, they come with major disadvantages, such as:

- They do not stop a fall from height occurring as the user has flexibility of PPE lengths.
- They can only be used on buildings with the required free fall clearance from all fall hazards including through roof lights.
- A full rescue plan must be in place to return the user to safety, often this is overlooked.
- The users must be trained so they can use extra PPE equipment safely including extended rope and grab devices and anti-pendulum/swing posts.

*SFS systems should not be designed to arrest on standing seam roof sheets due to the weakness of the connection between clip and sheet which will not give required arrest figures.





Typical fall arrest system layout

Key

A High load start/end post with female M10/universal
B Intermediate post with intermediate bracket
C High load corner with corner kit/solid corner
D Anti-pendulum/ swing post

Free-Fall Clearances
Free fall clearances are often overlooked when a fall arrest system is designed.

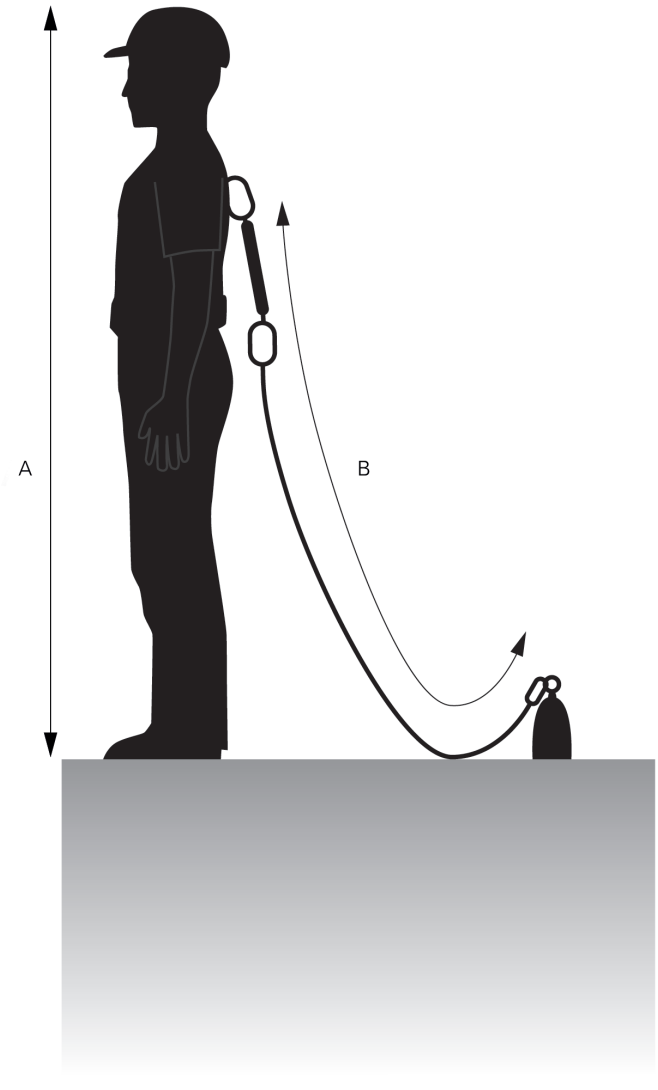
It is imperative they are calculated using a calculation programme by the manufacturer, to prove that if a fall was to occur, the distances required for the system to effectively arrest the users fall can be assured.

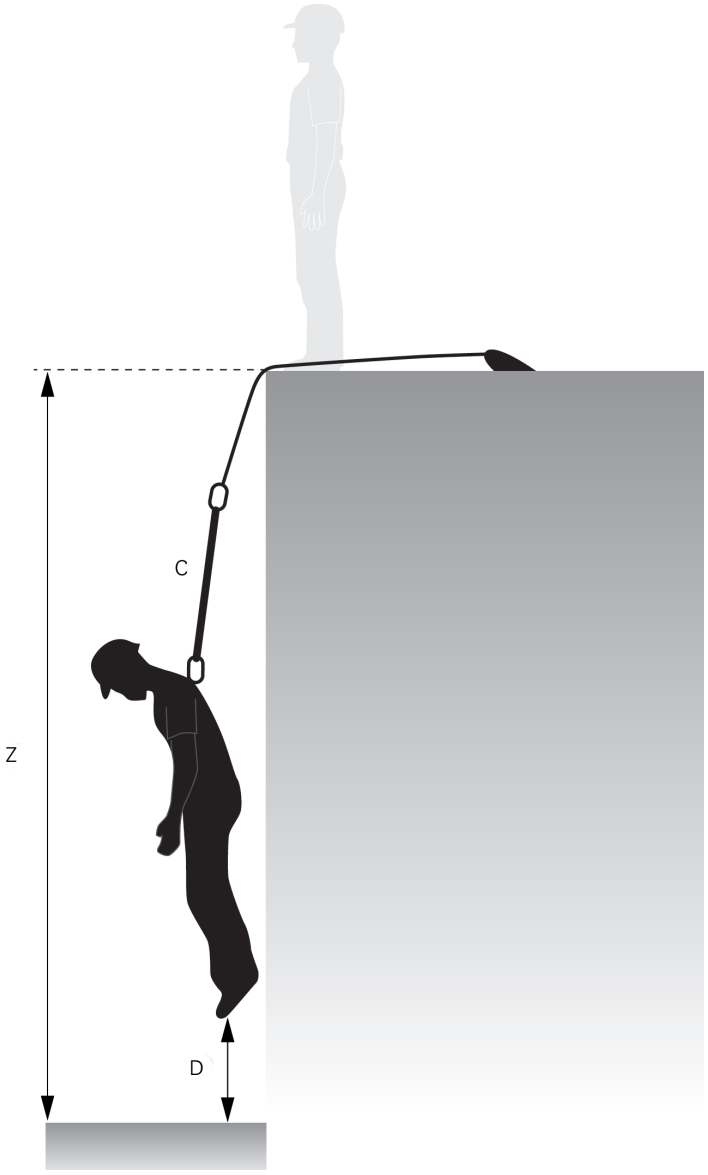
System deflection and wire elongation is calculated using our calculation package, taking into account system length, post spacing and maximum span length, and the number of users.

Once system deflection and wire elongation is known, this distance can be added to the following measurements to calculate a free fall clearance distance:

- Users height (A)
- Lanyard length (B)
- Deployed shock absorber length (C)
- Safety factor (D)

= Minimum free fall clearance required (Z)





Anti-Pendulum Posts/Swing Falls

Anti-pendulum/swing posts must be installed to protect exposed gable ends on roofs with fall arrest systems where the user is required to use an extended rope and grab.

Figure 1 below shows a user at the full extent of his rope at the eaves of the roof close to the exposed gable end. As the extended length of the rope is longer than the building height, should the user fall from the gable end, they would have inadequate free-fall clearance for the system to work effectively.

There is also another issue that the lanyard moving across the roof edge can generate a slicing effect.

Installing anti-pendulum posts reduces the possible 'swing' motion to a manageable length also ensuring the user can be fully arrested by the system.

Fig. 2 shows the potential swing fall and the inaccessible areas without the use of anti-pendulum posts.

Fig. 3 shows how the swing fall potential can be limited with the use of anti-pendulum posts.

Fig. 1

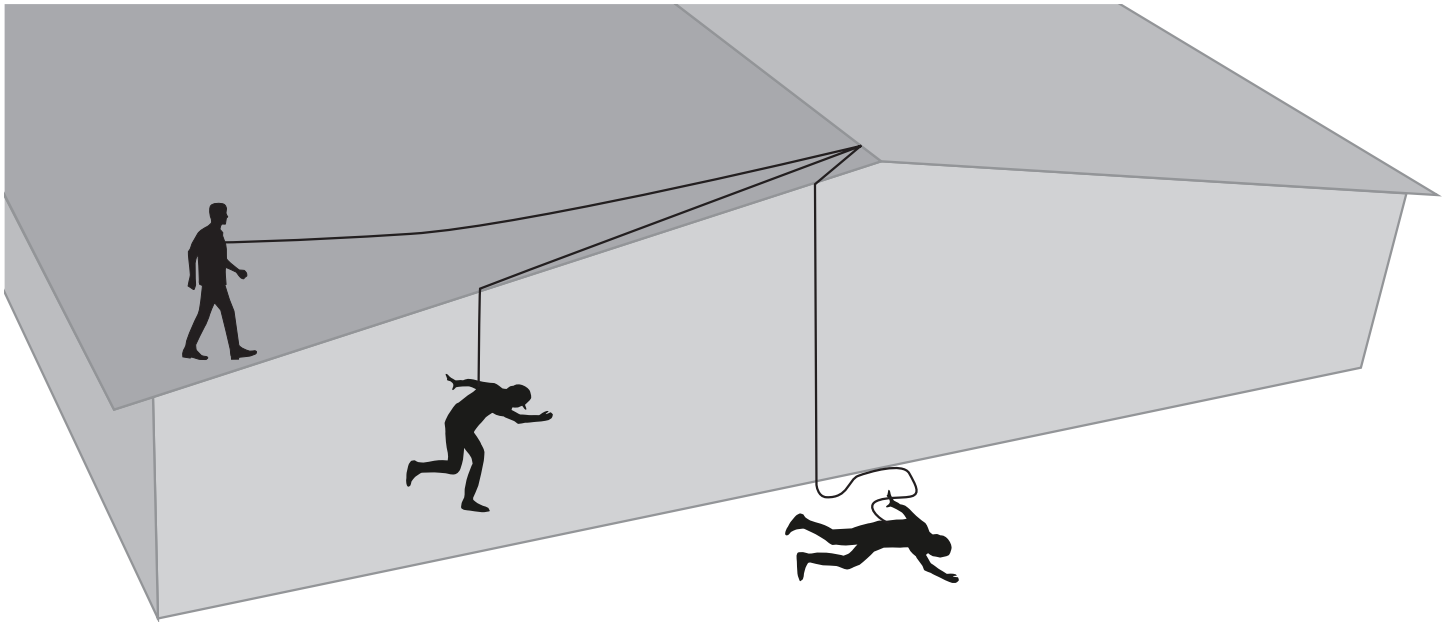


Fig. 2

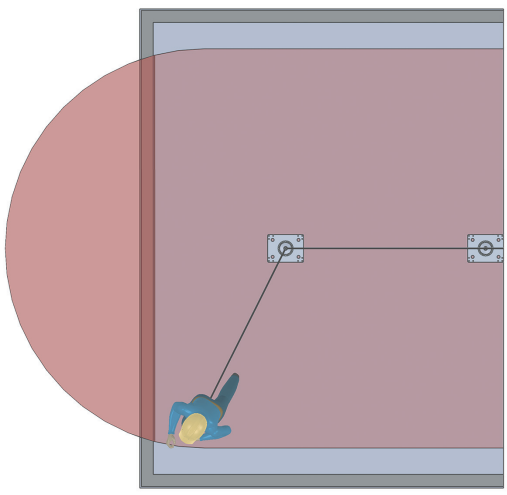
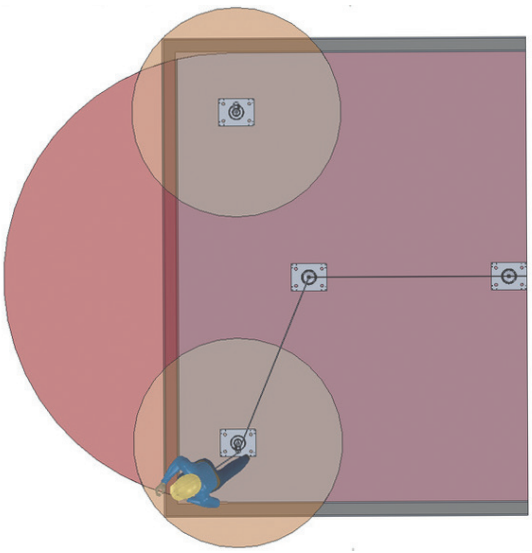
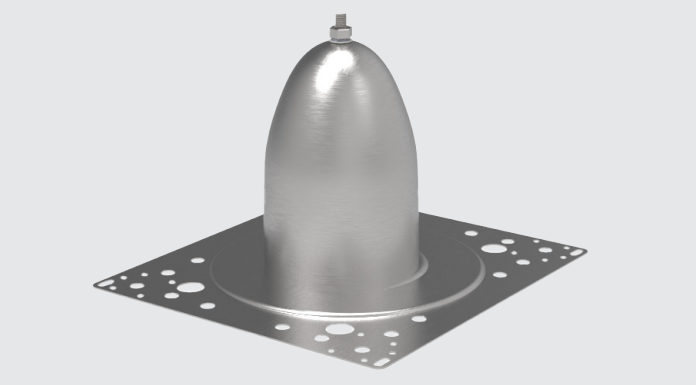


Fig. 3



Fixing Methods

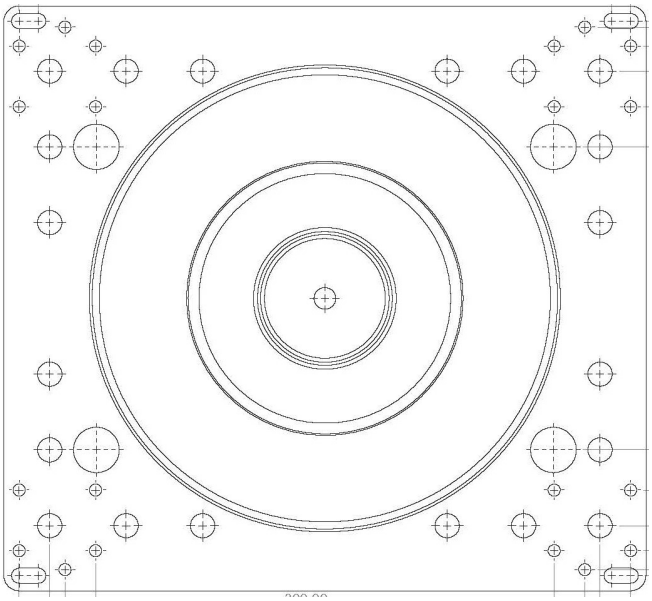
The SOTER™ horizontal lifeline system is fitted to roof structures using a baseplate and fixing method suitable for the roof type. Once the roof type is known, a base plate and fixing method can be selected. As the system is modular, posts, then components can be added.

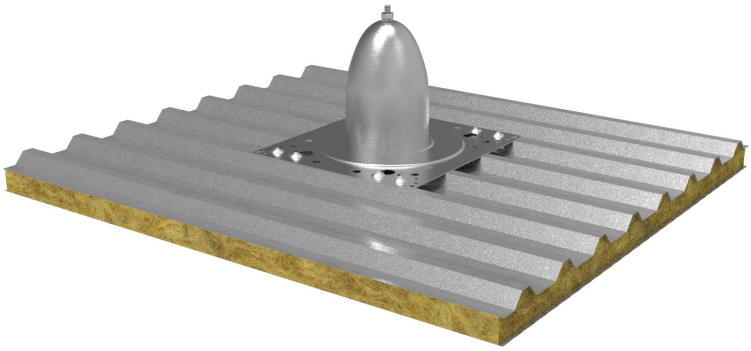


SOTER™ base plates have a central raised dome, complete with a welded M10 female boss, into which the relevant post can be securely turned. This weld is completely weather tight. Base plates to be used on metal roofing applications come complete with pads on the underside to seal the base plate to the roof sheet crown.

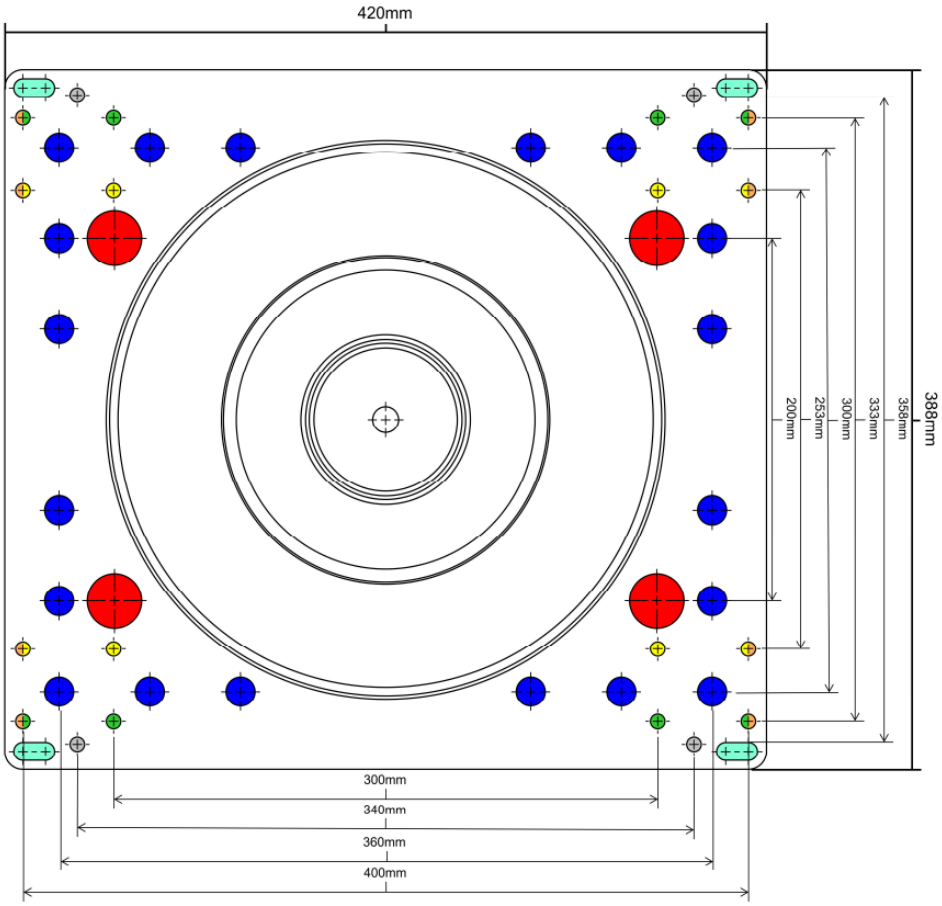
Each base plate, depending on application, will be fixed with either a specified number of rivets for Trapezoidal roof sheets, stainless steel gravity toggles, studding and resin, sleeves and fasteners and concrete screws for flat roofs, or a suitable non-penetrative seam clamp for standing seam roofs. Base plates are also available PVC coated to aid a direct weld of a suitable membrane roof covering if suitable.

Base Plate Example





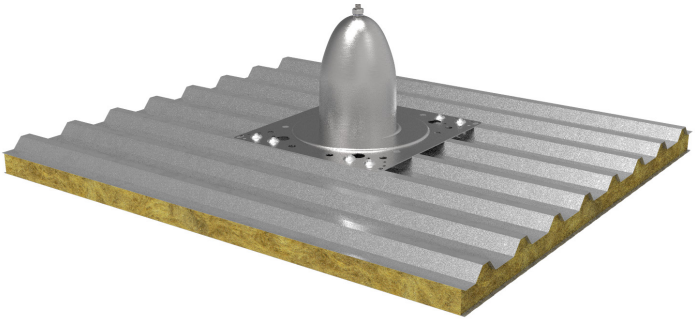
Multi-Use Base Plate

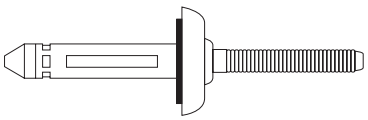


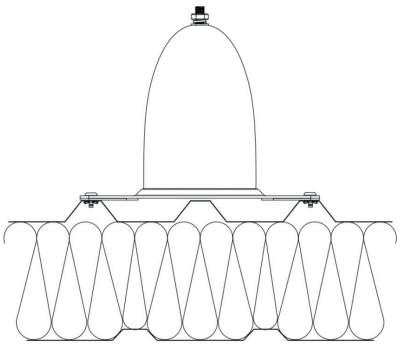
- **Red:** 4×30 mm (240×300 mm) holes for gravity toggles with toggle cups- 4 required into 0.7 mm metal and 18 mm ply & OSB decks.
- **Blue:** 10×16 mm holes for sleeve and stainless steel fastener into 0.7 mm metal, concrete, and timber decks. Please consult SFS for fixing numbers and details.
- **Green:** 8×8 mm rivet holes for 333 mm sheet crown centres
- **Orange:** 8×8 mm rivet holes for 400 mm sheet crown centres
- **Yellow:** 8×8 mm rivet holes for 300 mm sheet crown centres
- **Purple:** 8×8 mm rivet holes for 250 mm sheet crown centres.
- **Grey:** 4×8 mm rivet holes @ 358 mm centres for fixing SOTER™ seam clamp for 400 mm standing seam roofs.
- **Turquoise:** 4 × Elyptical holes @ 400 x 300 mm centres for fixing S5 clamp for 400 mm & 300 mm standing seam roofs.
- **Black:** 4×8 mm rivet holes @ 220 mm centres for fixing of leg straps for special applications e.g Rivertherm.

Trapezoidal Sheet Types

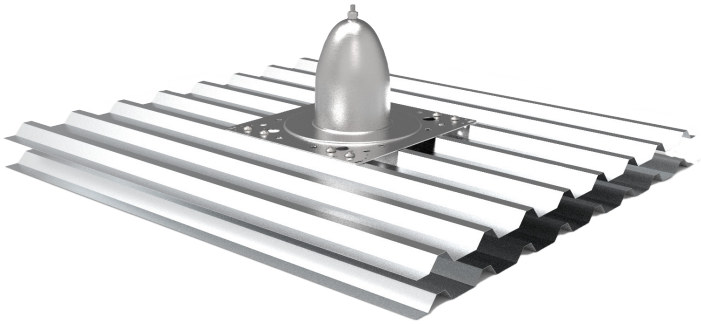
Composite Panel
> 0.5 mm outer sheet thickness
Fixed with 7.7 mm BULB-TITE® rivets

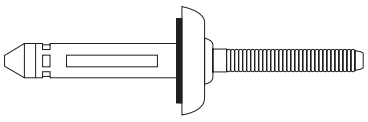


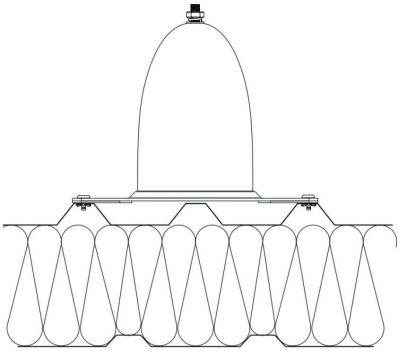




Twin Skin BUOS
> 0.7 mm sheet thickness
Fixed with 7.7 mm BULB-TITE® rivets

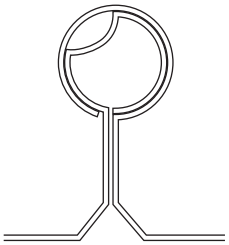


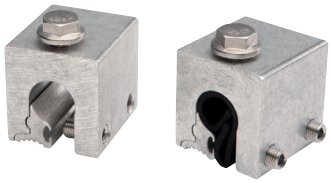


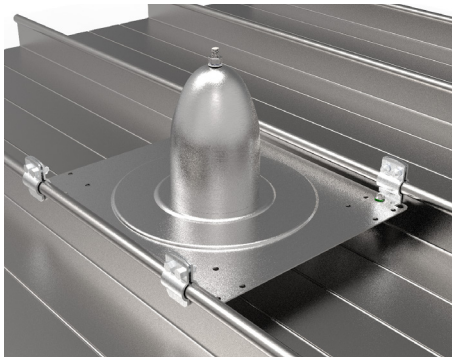


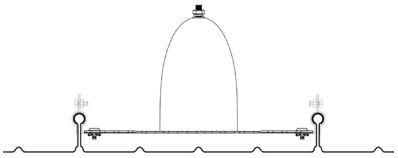
Standing Seam Sheet Types

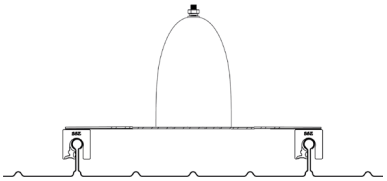
Rolled Type Standing Seam
Non-Penetrative SOTER™ Seam Clamp
or S5-Z Seam Clamp



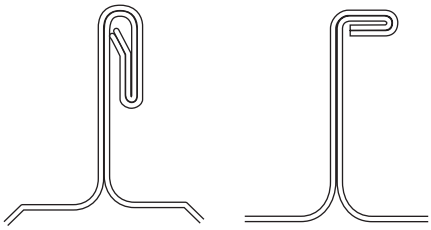


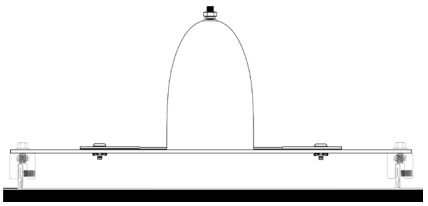




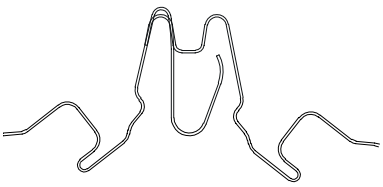


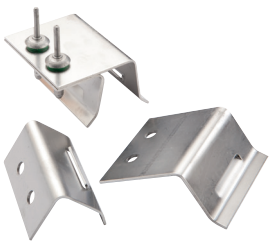
Traditional Folded Standing Seam
S5-U Seam Clamp

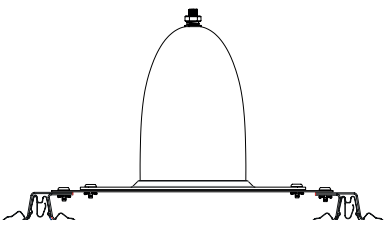




Rivertherm Standing Seam
Non-penetrative SOTER™ Rivertherm Seam Clamp







Flat Roof Types

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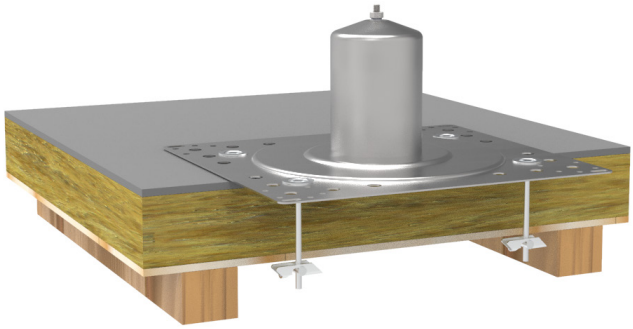
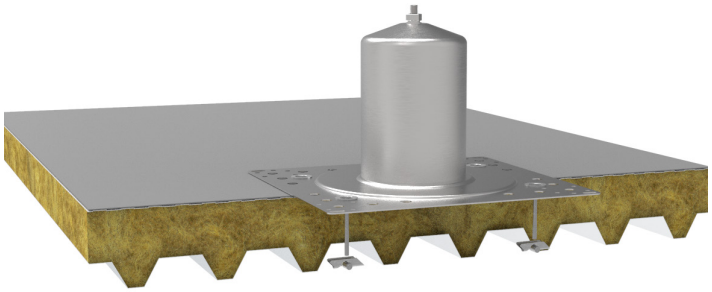
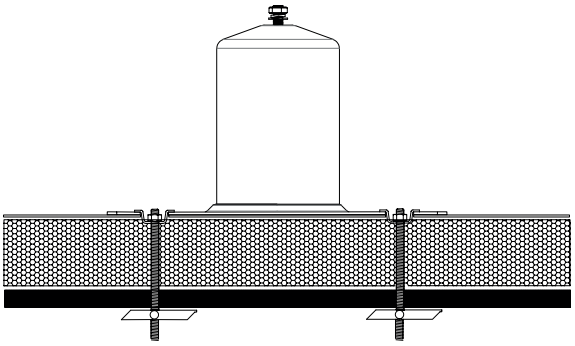
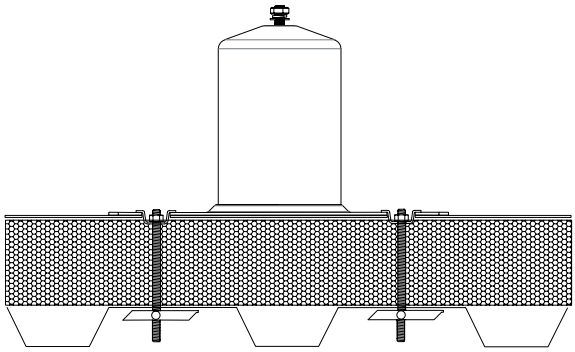
18 mm Ply/OSB Board & 0.7 mm Metal Deck

Gravity toggles









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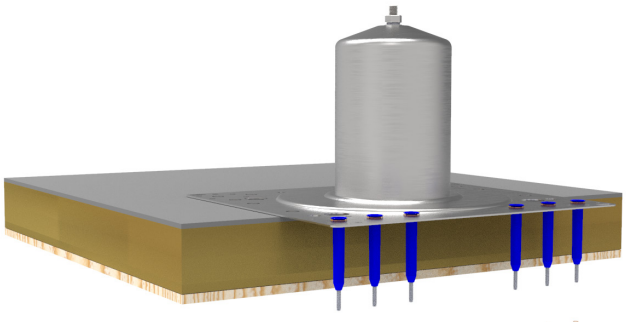
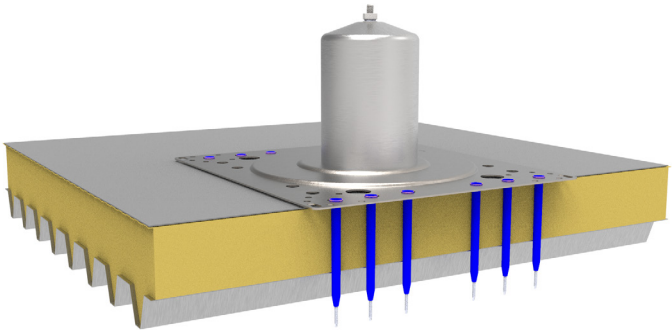
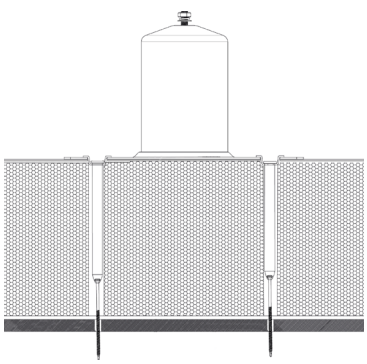
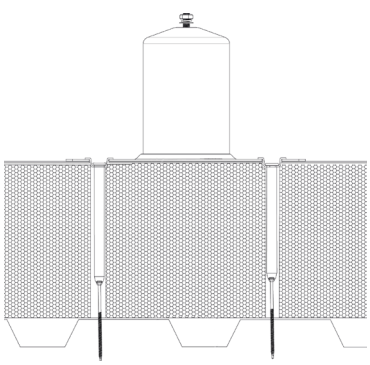
18 mm Ply & 0.7 mm Metal Deck

Typical sleeve and fastener installation. Please consult SFS for fixing numbers and details.



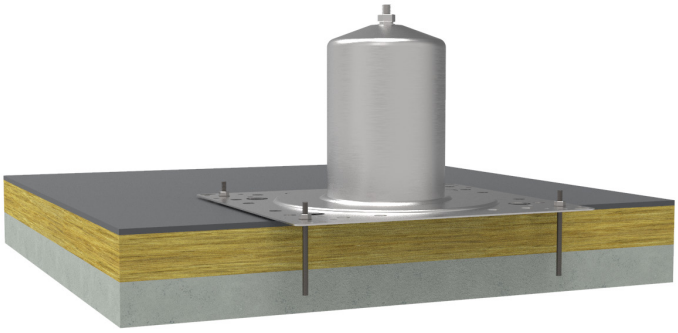


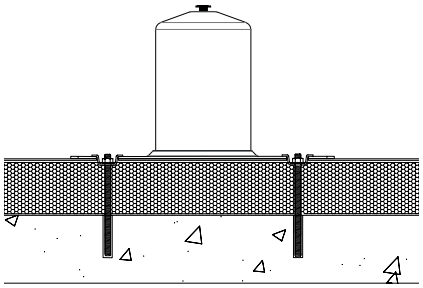




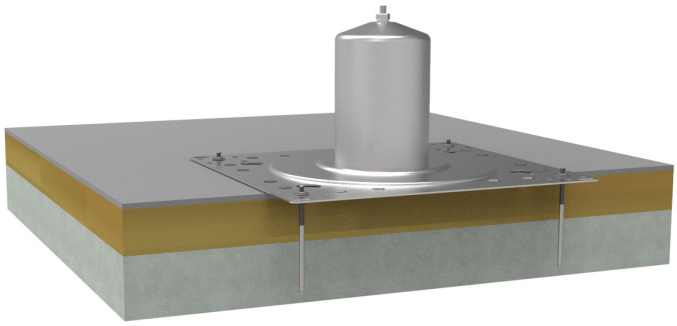
Flat Roof Types

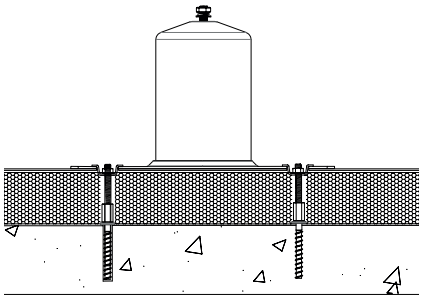
Concrete Deck
Typical stainless studs and resin



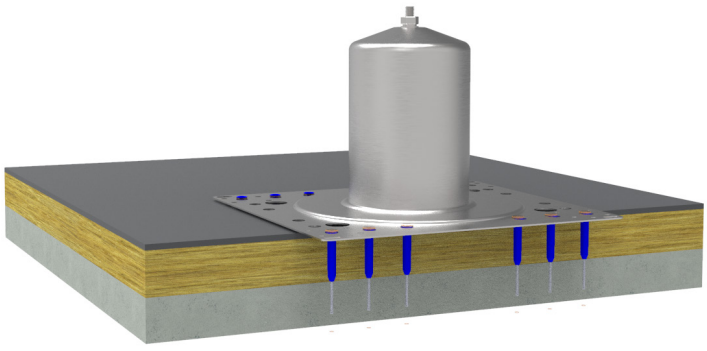


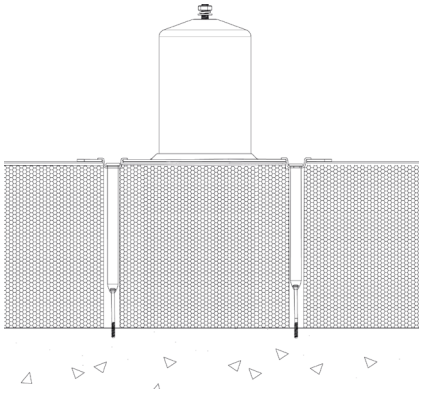
Concrete Deck
Concrete screws





Concrete Deck
Typical sleeve and fastener installation. Please consult SFS for fixing numbers and details.





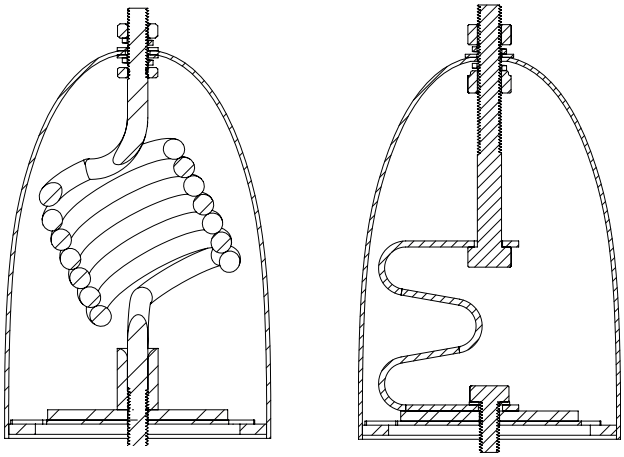
System Design Fundamentals & Limitations

High Load and Intermediate
The SOTER™ horizontal lifeline system is created using two post types.

The high load modules contains a shock absorbing element to reduce the load in the event of a fall that is sent back to the roof substrate. When falls occur, the majority of load generated is sent back to the ends of each straight run, these can be at the starts and ends of straight lines, or corners on systems which turn. For this reason, it is imperative that SOTER™ high load modules are fitted at the start, end, and corners of systems - therefore every straight run has a shock absorbing modules at start and end.

The intermediate modules has a smaller shock absorbing element inside, which is designed to tip over as quickly as possible, and overall reduce system deflection. As both posts at first look very similar, we have designed them so that the incorrect post cannot be fixed in the wrong location. The high load pmodule has a silver washer, and M10 stud.

The intermediate module has a red washer with a M12 stud. Combining this logic to our fittings, those components which are used at the starts, corners and ends of systems are drilled M10, so if an intermediate module was placed in the wrong location, the component would not fit onto it.



Calculation Package and Loadings
SF fall protection systems come complete with a calculation package allowing for calculations to be made to give end loadings, system deflections and other detailed information assisting the system designer to propose a system that is fit for purpose. This calculation package can be used on shock absorbing module, and components with in-line shock absorbers for systems fitted to rigid/fabricated module, walls, and rigid structures.

SFS Line System Configurator

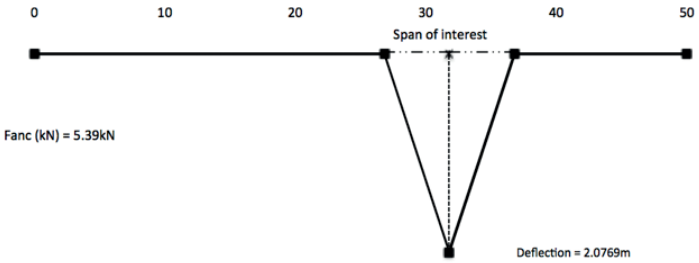
Input data		
Maxmimum span between anchors *(Sa)*	10	m
Total system length *(Ls)*	50	m
Initial tension in cable *(To)*	800	N
Mass of falling person *(m)*	100	kg
Wire construction CSA	B	
Solution		
Elongation of unloaded half span *(Eh)*	5.024651	m
Maximum tension at anchor *(Fa)*	5.39	kN
Maximum deflection at impact point *(D)*	2.0769	m

Notes

8mm 1x19 wire rope construction =	A
8mm 7x7 wire rope construction =	B
8mm 7x19 wire rope construction =	C

System Details (Enter your results below from the solutions given on the right. A typical example is given in grey)

Solution data	***Length (m)***	***Max Fa (kN)***	***Max Fm (kN)***	***Deflection D (mm)***
System total length	100	N/A	N/A	N/A
Systems shortest span	2	5.12	5.17	1.39
Systems longest span	10	5.39	4.00	2.71
Other spans of interest	8	5.30	4.74	2.67



Typical example of output provided to customer.

Maximum Spacings
To ensure both end loadings and system deflections are kept to a minimum, the horizontal lifeline system has been designed and tested to a maximum span of 12 m between 2 modules on all roof types.

Each straight run of a system should have a high load modules at the start and end with intermediate modules evenly spaced along its length, not exceeding the maximum 12 m stated spacing.

Maximum System Lengths
SOTER™ systems can support straight system lengths up to a maximum of 250 m, however this figure reduces once you add a corner, and further for every subsequent corner added. This is mainly down to the static loading that a corner modules is subjected to under system tensioning. The more corners, the more load each corner modules must support in two directions which can cause post lean.

Please refer to guidelines adjacent, however this should be assessed at the installers discretion on site.

Number of Corners	Max. System Length
Straight run	250 m
1	175 m
2–4	150 m
5+	125 m

*It is advised that systems of long lengths, or those that have multiple turns, have a tensioning termination at both ends of the system, so that the tension can be pulled into the line from both ends.

Starting and Stopping a System on a Single Post/Closed Loop
The SFS horizontal lifeline has been designed and tested to allow a system to be started and finished on the same post creating a closed loop on system lengths up to a maximum of 100 m. This can be created by using a Universal End Anchor with a Female M10 ring, or a 3-hole corner plate.

T-Off on a Single Post/Throw
You can also create a T-Off/Throw where one high load module can act as both the start/end of a system and the intermediate of another. This is created by using a 2-hole plate and intermediate bracket.

Only the stated number of users can be on the system as a whole, not per line.

45 Degree Turns and Hip Details
Due to the unique way both our Traveller attachment device and intermediate bracket are designed, a 45-degree turn can be created by using an intermediate bracket located on an intermediate module. If however, a system needs to turn 45 degrees twice in a line between 2 posts, therefore creating a 90 degree turn, which is often seen on trapezoidal roof sheets in hip details, one of these posts must be a high load.

Crossing Ridges, Valleys and Distance from End of Sheets
When a system is required to cross over either a ridge or valley detail it is important that the wire itself does not come in to contact with the capping at the ridge, and doesn't rise above knee height when meeting two slopes at a valley once tensioned. Variable intermediate brackets can help in this application.

At both ridges and eaves locations, and at the end of any sheet next to a roof edge/fall hazard, the module must be fitted inside a fixing line/purlin on metal sheet constructions.

Systems to Standing Seam Roofs
Due to the construction methods of standing seam roofs, arrest systems using top fixed shock absorbing module, are not suitable. This includes all forms of standing seam where the sheet is not 'fixed' and the lap detail is rolled or folded.

Installation

All SOTER™ horizontal lifeline installations should be carried out by trained personnel, competent in not only SOTER™ systems, but general roof and site safety.

Tool List
Detailed below are generic tools required for all SOTER™ orizontal lifeline roof system installation, followed by specific tools per roof type/application.

General
- Cordless drill
- 17 mm spanner/wrench
- 19 mm spanner/wrench
- 19 mm extended socket with wrench
- 2 x pairs of mole/vice grips
- Marker pen
- Tape measure
- Knife
- Cembre 130kN Hydraulic swager/crimper
- Cembre Hydraulic wire cutters
- Strap wrench with 130 mm diameter capability

Trapezoidal Roof Sheet Installation
- 8 mm HSS drill bits
- Gesipa PowerBird battery riveter/HN-2 long arm riveter c/w small jaws and nosepiece

Standing Seam Roof Sheet
- Gesipa PowerBird battery riveter/HN-2 long arm riveter c/w small jaws and nosepiece
- 13 mm spanner/wrench
- 13 mm hex socket driver for drill
- Allen keys and spanners (for S5 clamps)

Flat Roof Toggle Installation to Metal/Ply Decks
- 25 mm auger bit
- 25 mm bi-metal hole saws
- Arbour
- Arbour extension bar long enough to penetrate roof build up and deck
- 13 mm hex socket driver for drill

Flat Roof Stud and Resin Installation to Concrete Decks
- SDS Hammer drill to suit build-up depth
- 25 mm auger bit
- SDS masonry drill bit long enough to penetrate roof build up, screed, and embedment in deck.
- Wire brush
- Blow pump
- Resin applicator gun
- Hack saw/cutting disc/grinder
- File
- Hydrajaws pull test meter and plywood board/spreader plate for distributing load

Flat Roof Stainless Steel Fastener and Sleeve to Metal and Ply Decks
- Tx extended drive bar

Flat Roof Fastener and Sleeve to Concrete Decks
- SDS Hammer drill
- ZVK-STOP drill bit
- ZAK extension bar
- Tx extended drive bar

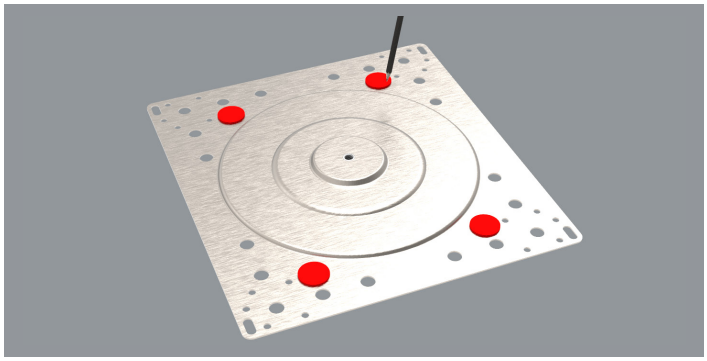
Flat Roof Concrete Screw to Concrete Decks
- SDS Hammer drill
- 25 mm auger bit
- SDS masonry drill bit long enough to penetrate roof build up, screed, and embedment in deck.
- ZA1/4 M6 300/750 Drive Bar
- T25 M6 Drive Bit
- Hack saw/cutting disc/grinder
- File
- Hydrajaws pull test meter and plywood board/spreader plate for distributing load

Post Installation

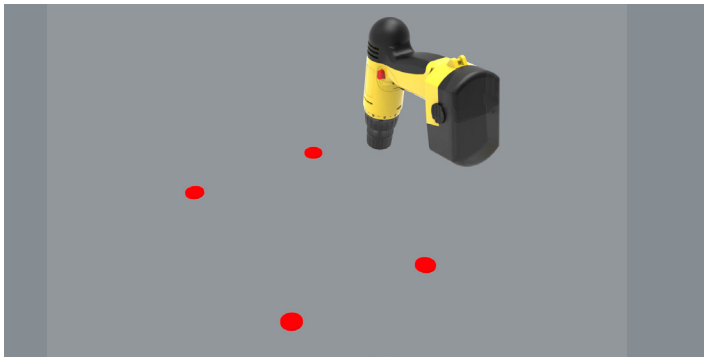
Flat Roof Gravity Toggle to Metal and Ply/OSB Decks

Note: For unknown substrate material & thickness, test the substrate with Pull-Test Device.

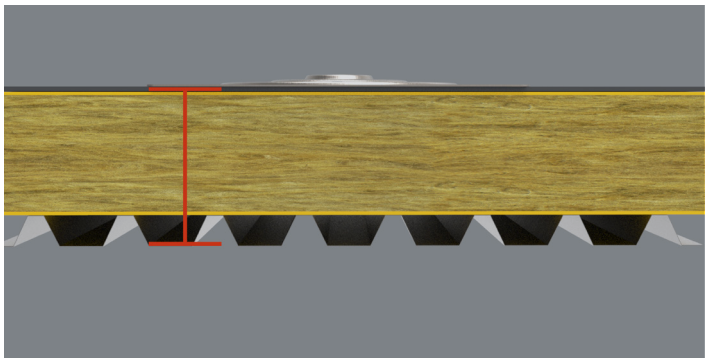
1. Ascertain location of base plate on membrane and mark 4 no. toggle fixing positions.



2. Using a 25 mm diameter hole saw suitable for the deck construction, drill through the insulation and deck in all four locations. Ensure all four fixing holes have been drilled through the total roof build up and are clear, clearing any debris away.

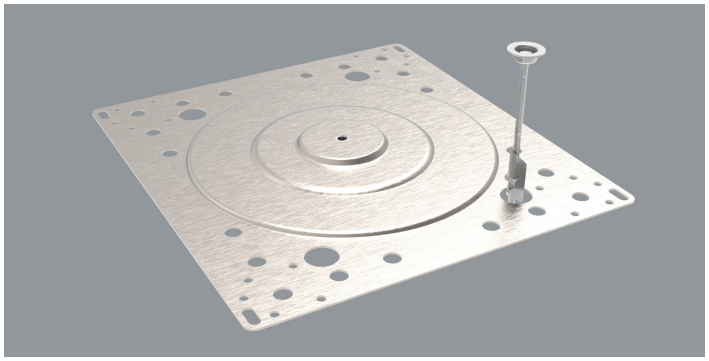


3. Measure the depth of the roof build up and ensure you have the correct toggle length. Toggles require an additional **80 mm** in length to deploy fully.



4. Wind enough thread through the toggle barrel so that the toggle catches when deployed, re-set the toggle parallel to the toggle stud.

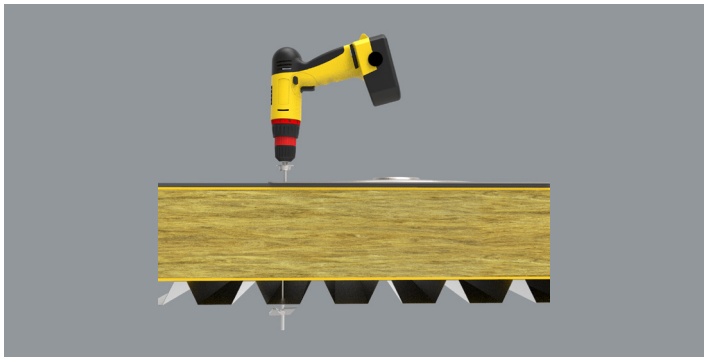
5. Insert toggle with care through base plate and drilled hole in roof, ensuring the toggle doesn't deploy until it has cleared the deck. Using toggle tubes prevents early deployment within the roof build up.



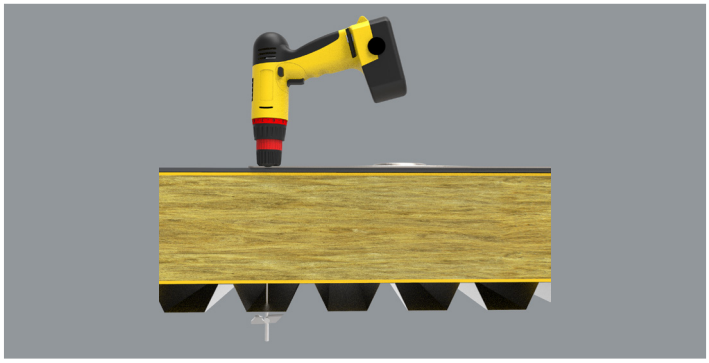
6. Once the toggle has dropped through the roof construction the toggle will deploy, this can be aided by shaking the post and stud slightly. When fully deployed, pull the toggle upwards so that it is tight against the deck, this will confirm the toggle is deployed or not. Repeating steps from 4 to 6 for the remaining toggles.

*Please consult SFS for fixing performance.

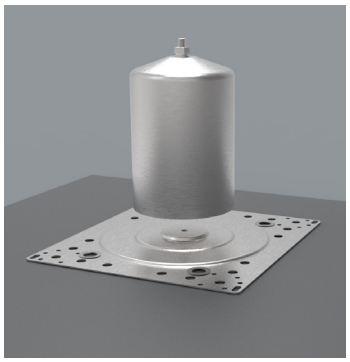
10. Once all four toggles have been deployed, pull, and hold the toggle whilst driving the nut with a battery powered drill and 13 mm hex driver until the plate is pulled tightly to the membrane.

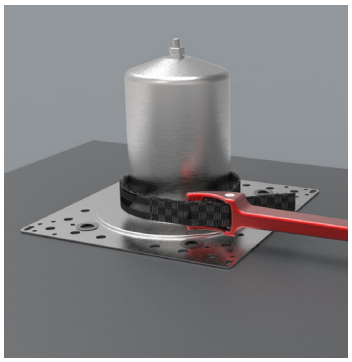


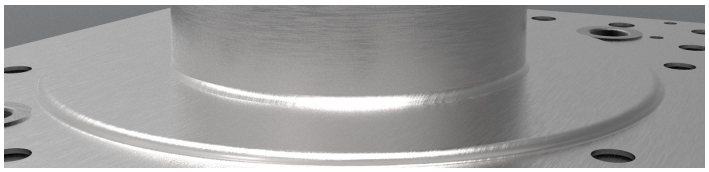
11. This will lock the toggle fully as shown. Repeat until all four toggles are tightened down slightly depressing the base plate into the membrane.



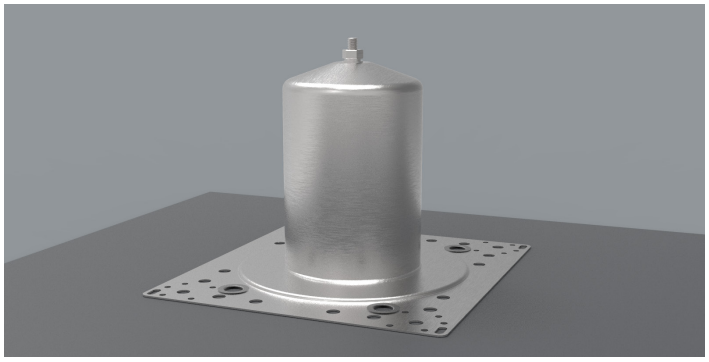
12. Turn can onto female boss in base plate by hand firstly then to the desired tightness with the strap wrench tool until module is seated correctly.







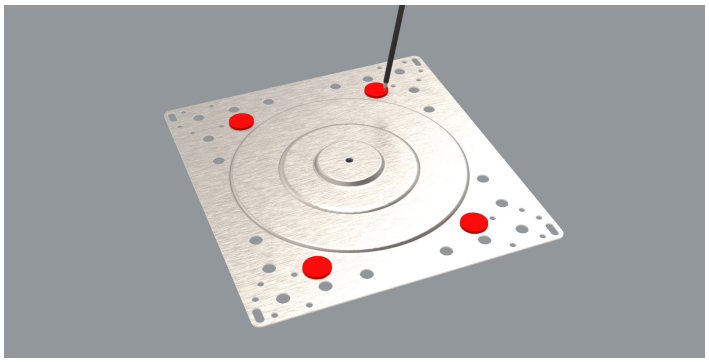
13. Anchor installation is complete and is ready for SOTER™ components to be secured.



Flat Roof Stud and Resin to Concrete Decks

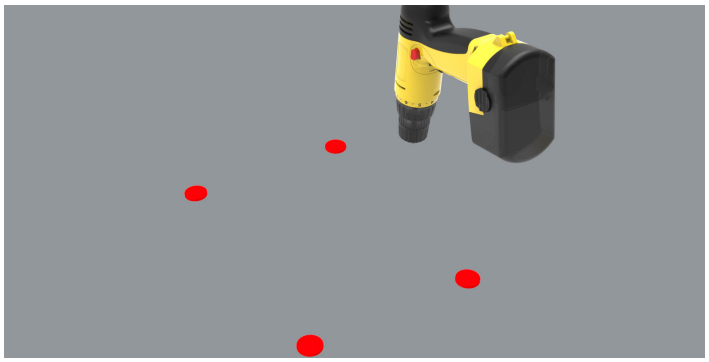
Note: For unknown substrate material & thickness, test the substrate with pull-test device.

1. Ascertain location of base plate on membrane and mark 4 no. fixing positions.

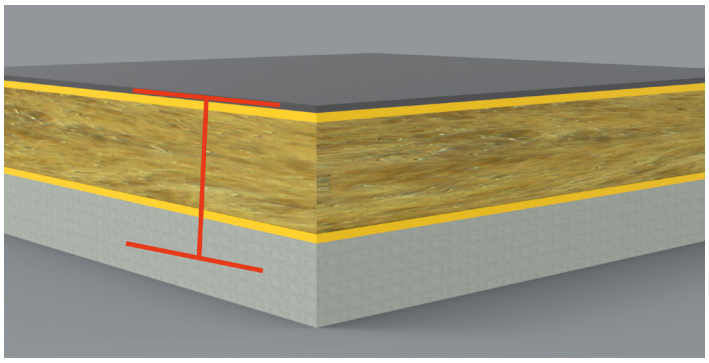


2. Using a hole saw or auger bit, drill through the insulation in all four locations.

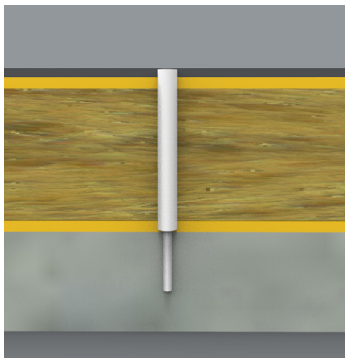
3. Ensure all four fixing holes have been drilled through the insulation and are clear, clearing any debris away.



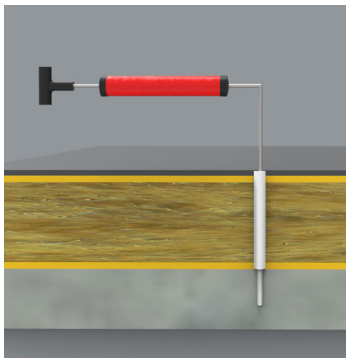
4. Ensure you have the correct stud length for the total build up depth, embedment into the substrate and enough protruding from the opening to fit a nut and washer.

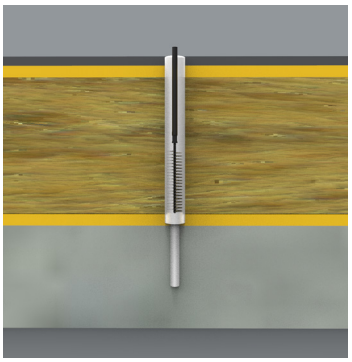


5. Using a SDS Masonry Drill and specified diameter drill bit, drill 4 no. holes into the concrete deck to give the required fixing embedment. If screed is present above concrete deck, remove this first using a larger drill diameter ensuring correct fixing embedment is in concrete substrate ONLY.



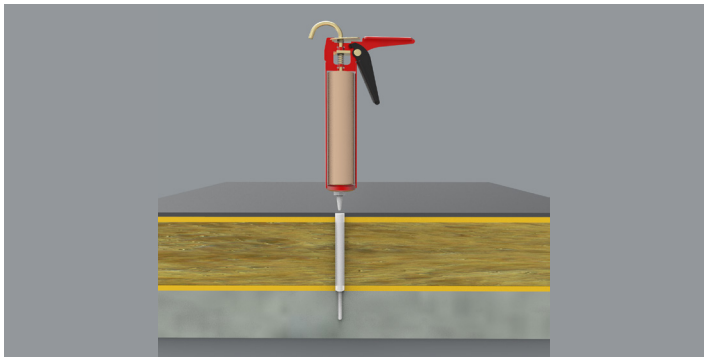
6. Using a wire brush and blow pump remove all debris remaining in each of the four holes.





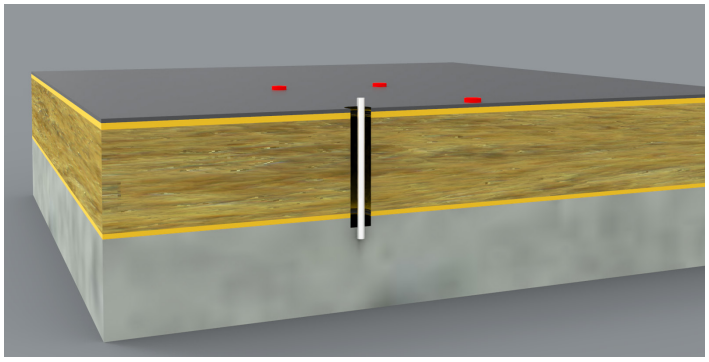
7. Prepare Fischer Vinylester resin tube, nozzle, and gun ready for application. Extrude enough resin through the tube on a test area ensuring the 2 chemical parts are correctly mixed.

8. Once the resin is prepared squeeze resin through hole into substrate, slowly retracting the nozzle as the hole fills until 2/3 full. Do this for all four fixing locations.



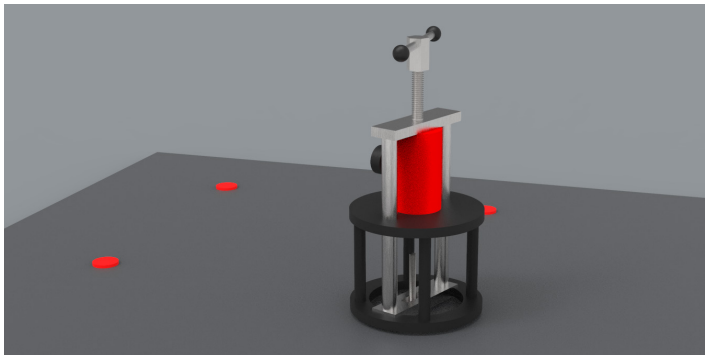
*Please consult SFS for fixing performance.

9. Before resin begins to cure insert studding gently into the hole turning the stud as you push it into the resin until the stud is fully inserted. Do this for all four fixings.

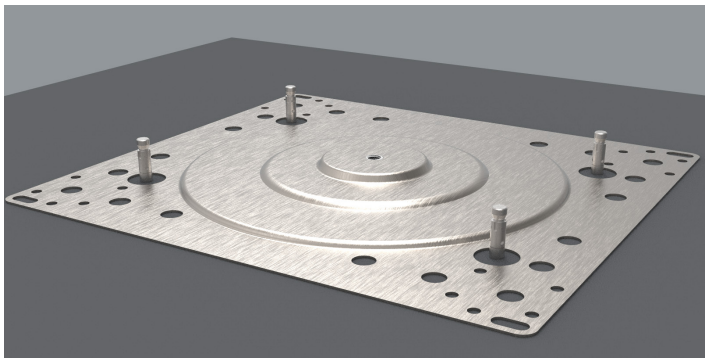


10. Allow for resin to cure based on temperature/conditions on site. See tube for indicative curing and setting times.

11. Once cured test a minimum of one in four fixings with a pull test metre to 6kN using a spreader plate if required.

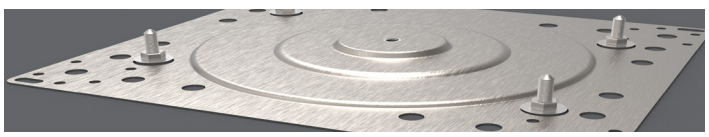


12. Drop base plate into position over protruding studs.

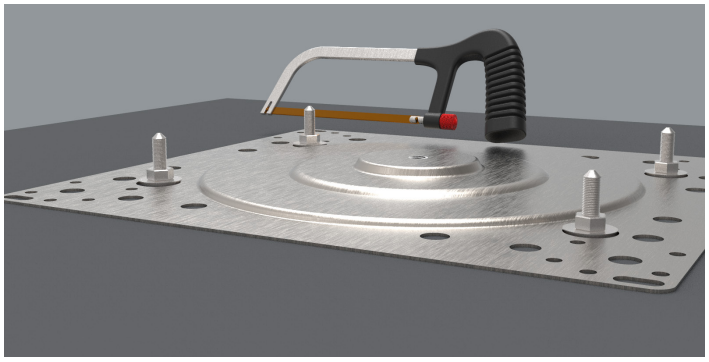


13. Place toggle cups over protruding studs above base plate for each of the four studs per post.

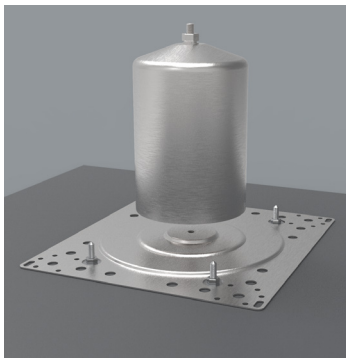
14. Add the nut to each fixing and tighten until base plate depresses into the membrane slightly.

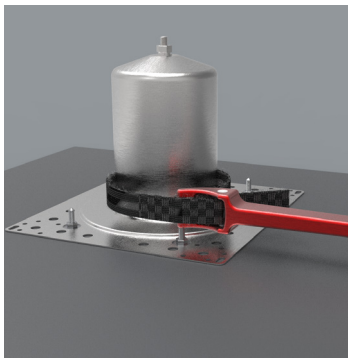


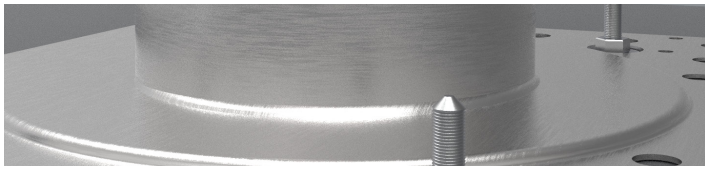
15. Cut off any excess studding and file down until smooth to avoid penetration through roof membrane, once laid.



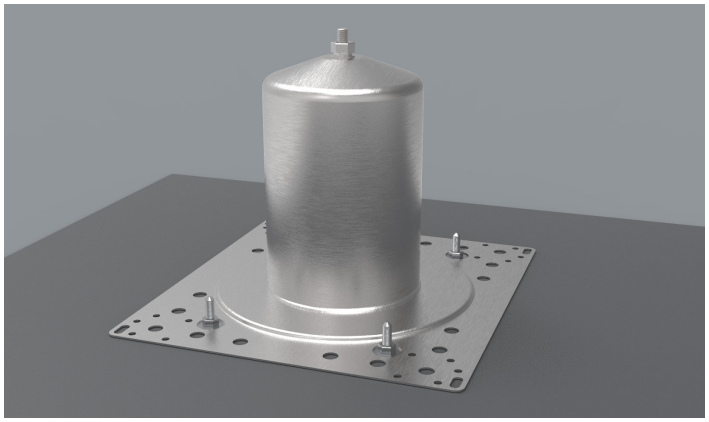
16. Turn can onto female boss in base plate by hand first, then to the desired tightness with the strap wrench tool until module is seated correctly.







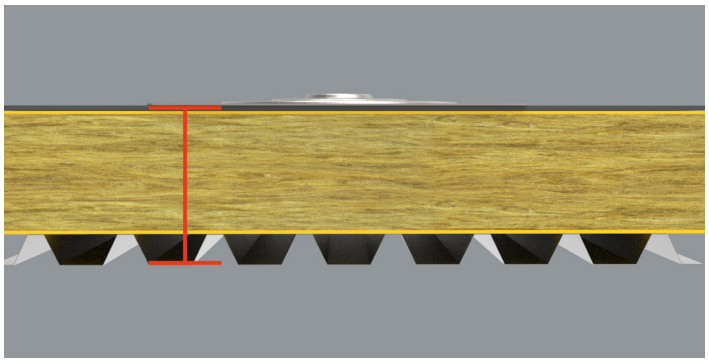
17. Anchor installation is complete and is ready for SOTER™ components to be secured.



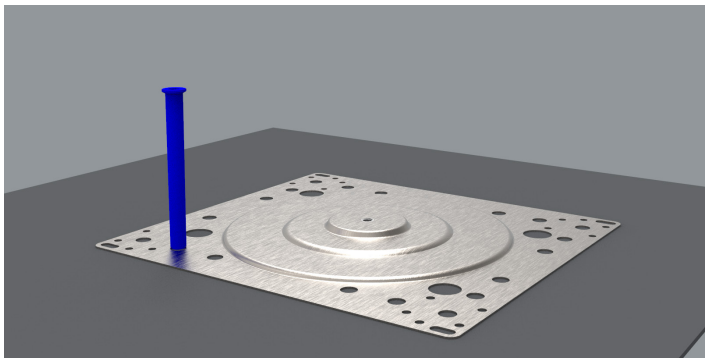
Flat Roof Sleeve and Stainless Steel Fastener to Metal and Ply 18 mm Decks

Note: For unknown substrate material & thickness, test the substrate with Pull-Test Device.

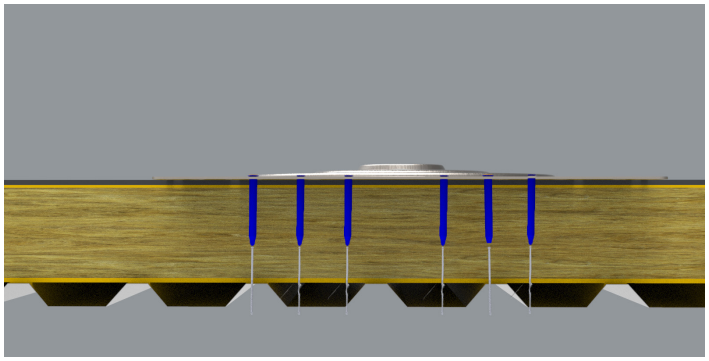
1. Ascertain location of base plate picking up the crown or trough of the deck based on the fixing length supplied.



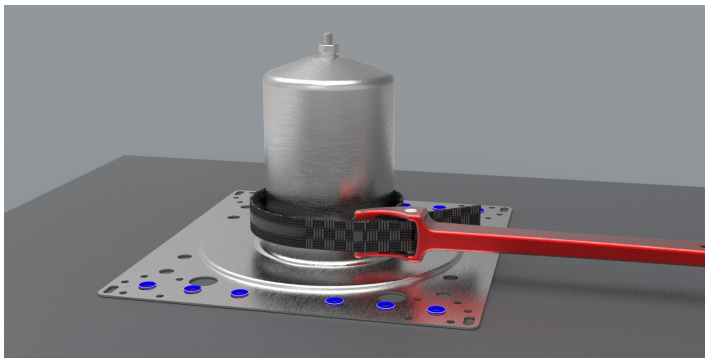
2. Push screws fully into Sleeves, through the plate and into the insulation.



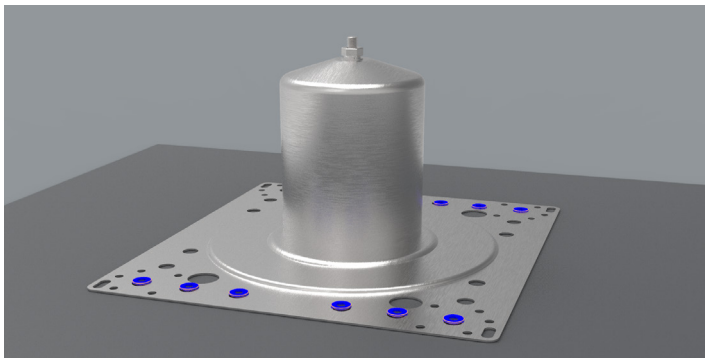
3. Take drill fitted with extended drive bar and T25 bit and fix all required number of fasteners through insulation build up and deck, securing firmly. **Do not overdrive.**



4. With all required number of fixings installed turn can onto female boss in base plate by hand firstly then to the desired tightness with the strap wrench tool until post is seated correctly.



5. Anchor installation is complete and is ready for SOTER™ components to be secured.



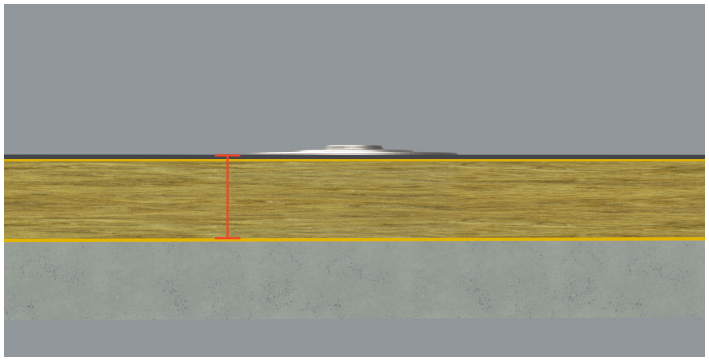
*Please consult SFS for fixing performance.

Flat Roof Sleeve and Stainless Steel Fastener to Concrete Decks

Note: For unknown substrate material & thickness, test the substrate with pull-test device.

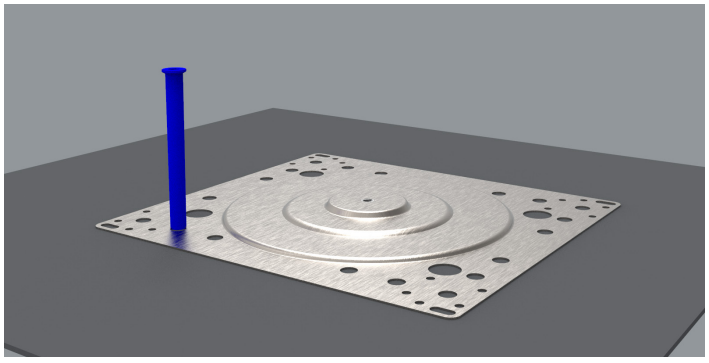
1. Ascertain location of base plate in accordance with installation layout provided.

2. Ensure the correct sleeve and fastener combination is used for the build up present. Mark each fixing location to be drilled.

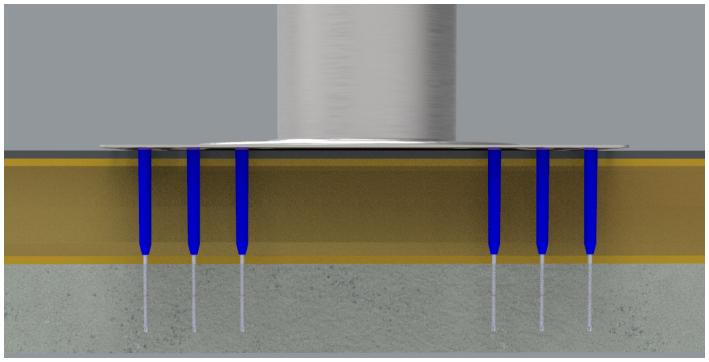


3. Using a hammer drill, ZAK drill extension bar and ZVK-STOP drill bit, drill the marked holes through build up and into the concrete deck.

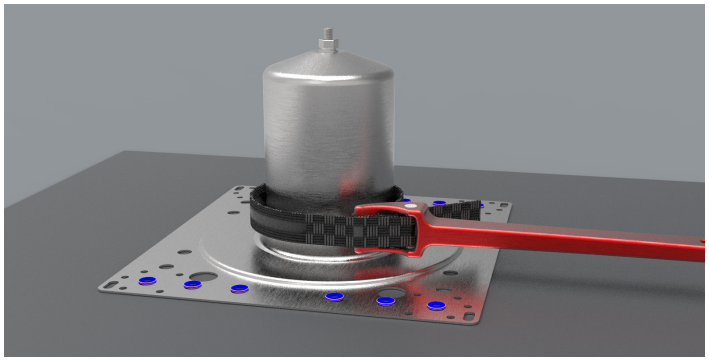
4. Once drilled out wind fasteners fully into Sleeves, then push through the plate and into the insulation in all locations.

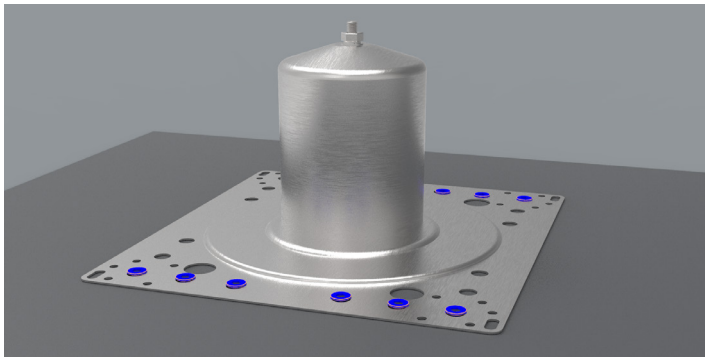


5. Take battery powered screwdriver, ZA ¼-M6- 300/750 extended drive bar and T25-32-M6 bit and fully wind each fastener into the deck until the baseplate slightly depresses the roof covering.



6. With all fasteners installed turn S2 can onto female boss in plate firstly by hand, then to the desired tightness with the SOTER™ strap wrench tool until the module is seated correctly against the plate with no visible gap.



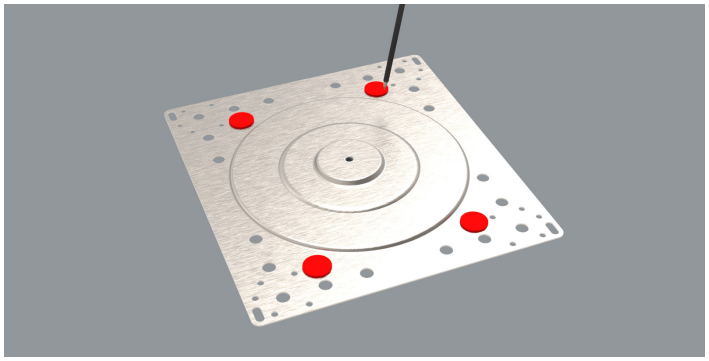


*Please consult SFS for fixing performance.

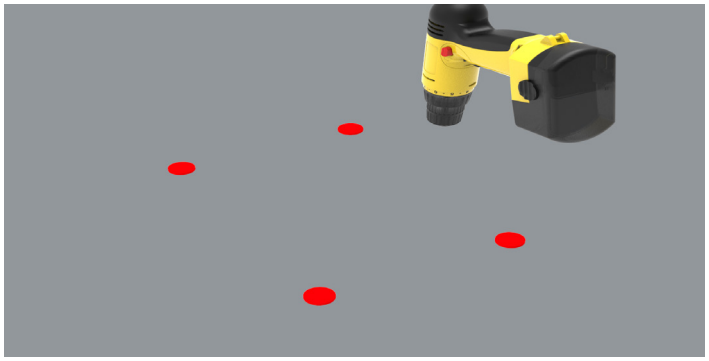
Concrete Screw to Concrete Decks

Note: For unknown substrate material & thickness, test the substrate with Pull-Test Device.

1. Ascertain location of base plate on membrane and mark 4 no. fixing positions.

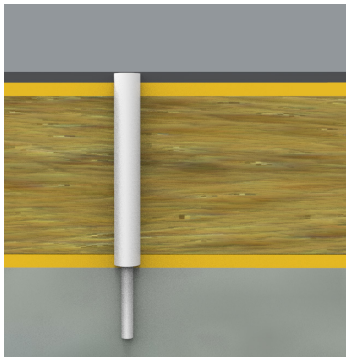


2. Using a 14 mm diameter hole saw or auger bit, drill through the insulation in 4 locations.

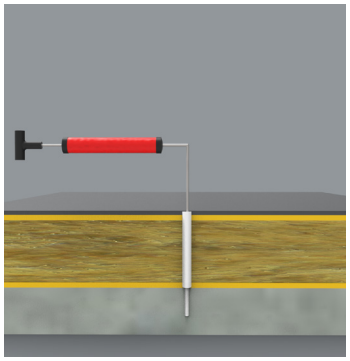


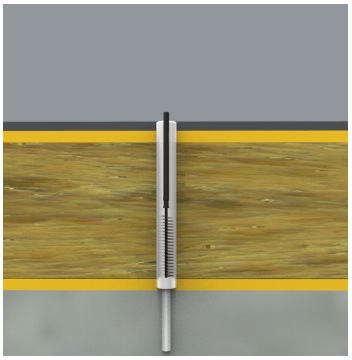
3. After removing insulation in all fixing holes clear any remaining debris away.

4. Using a SDS Masonry Drill of specified diameter, drill 4 no. holes into the concrete deck to give the required fixing embedment. If screed is present above concrete deck, remove this first using a larger drill diameter ensuring correct fixing embedment is in concrete substrate **only**.

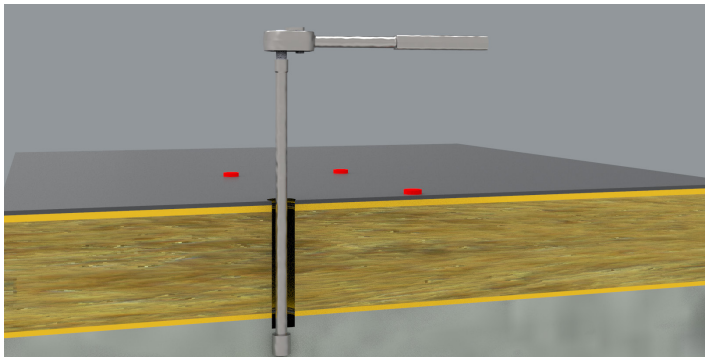


5. Using a wire brush and blow pump remove all debris remaining in each of the 4 holes.

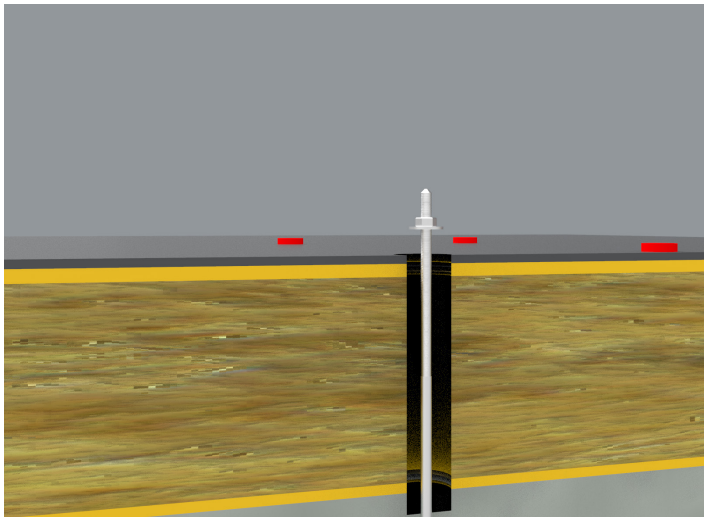




6. Using socket and extended drive bar fasten each of the screws into the concrete deck.

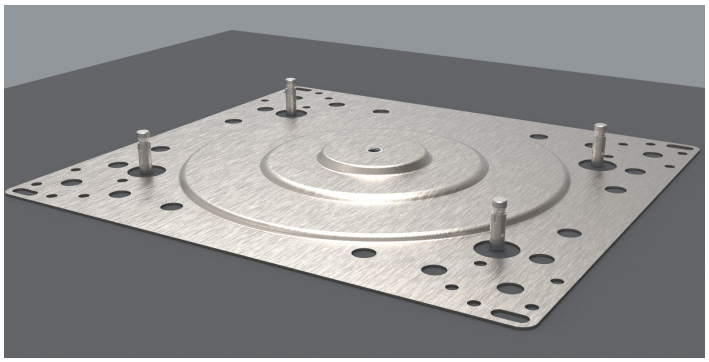


7. Turn studding into screw head of each fixing ensuring the correct stud length is used to allow enough to protrude from the opening to fit a nut and washer.



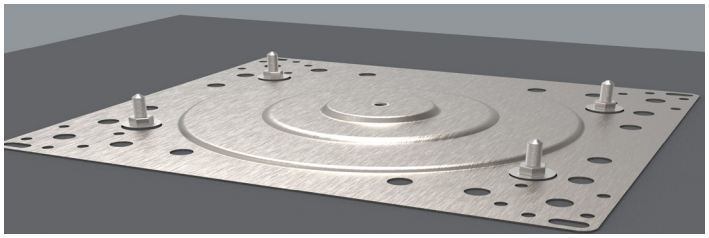
*Please consult SFS for fixing performance.

8. Drop base plate into position over protruding studs.

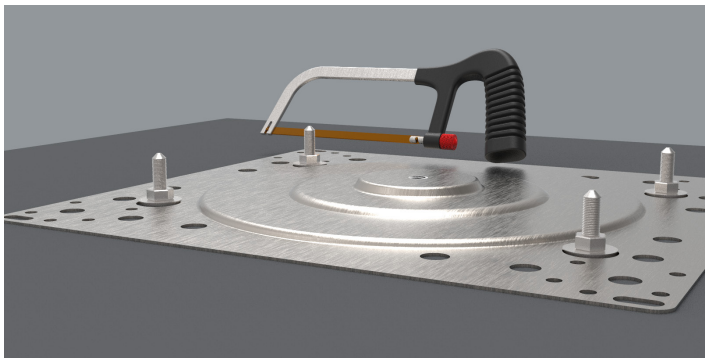


9. Place toggle cups over protruding studs above base plate for each of the 4 studs per module.

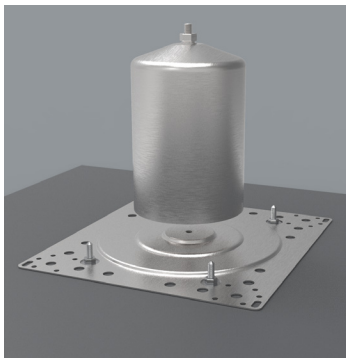
10. Add the nut to each fixing and tighten until base plate depresses into the membrane slightly.

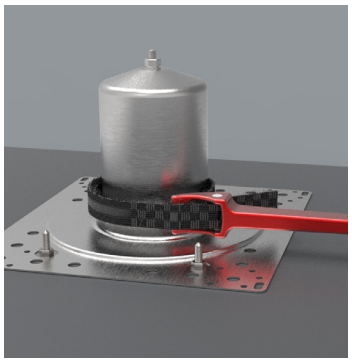


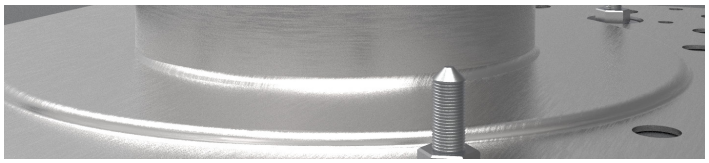
11. Cut off any excess studding and file down until smooth to avoid penetration through roof membrane.



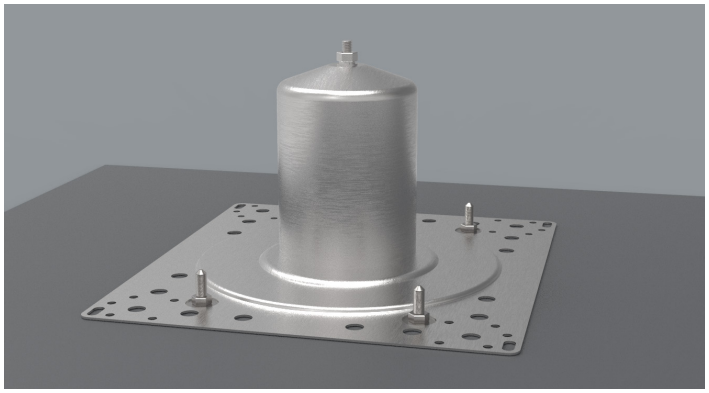
12. Turn can onto female boss in base plate by hand firstly then to the desired tightness with the strap wrench tool until module is seated correctly.





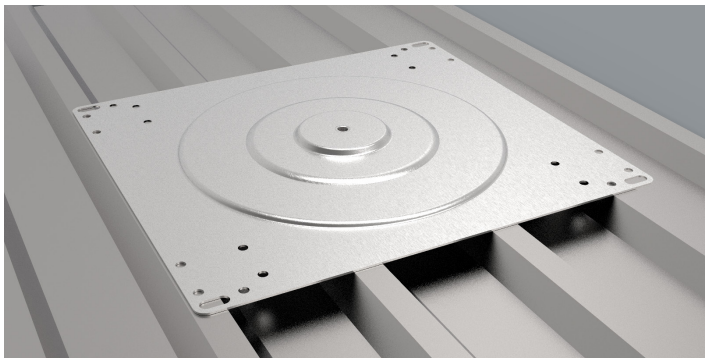


13. Anchor installation is complete and is ready for SOTER™ components to be secured.



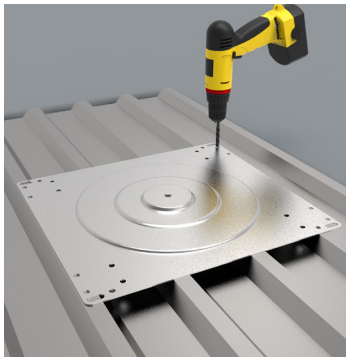
Trapezoidal Roof Sheets

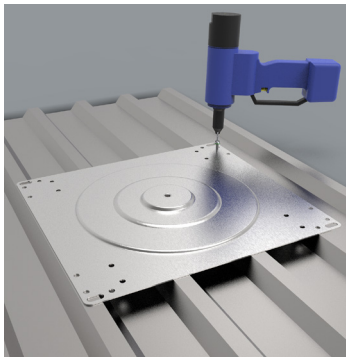
1. Ascertain location of base plate, ensuring the plate is positioned so that the correct fixing holes sit centrally to the crown centres of the sheet. Ensure roof sheet is properly cleaned prior to installation.



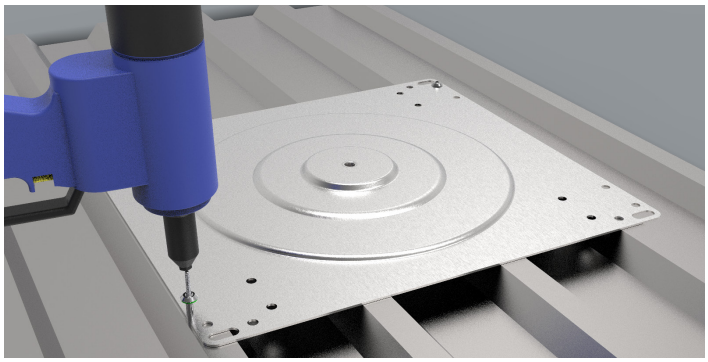
2. Once positioned drill first hole in corner of base plate using a 8mm drill bit.

3. Insert rivet into drilled hole and using a PowerBird riveter pull the rivet fully ensuring the rivet mandrel is fully removed.

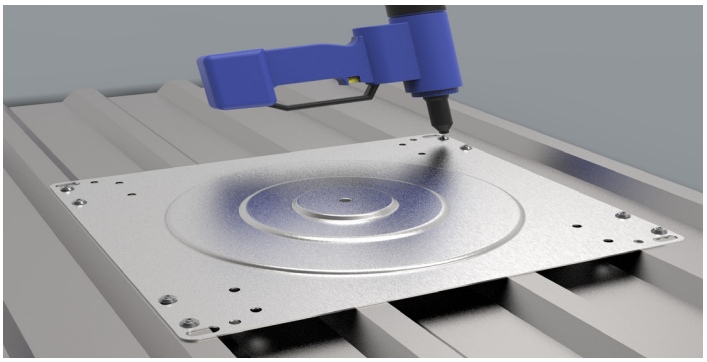




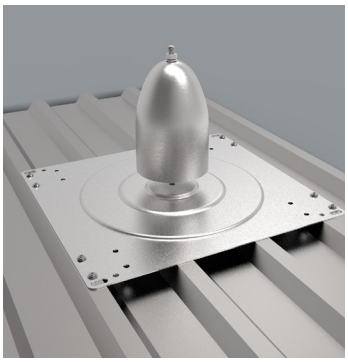
4. Drill and rivet the opposite corner.

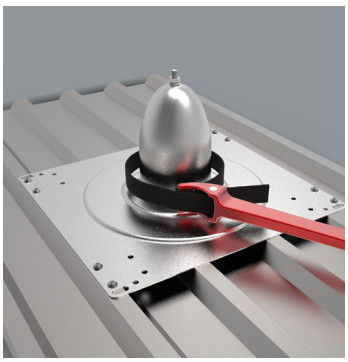


5. Repeat steps 2–4 on remaining fixing holes as per roof sheet specification and fixing number.

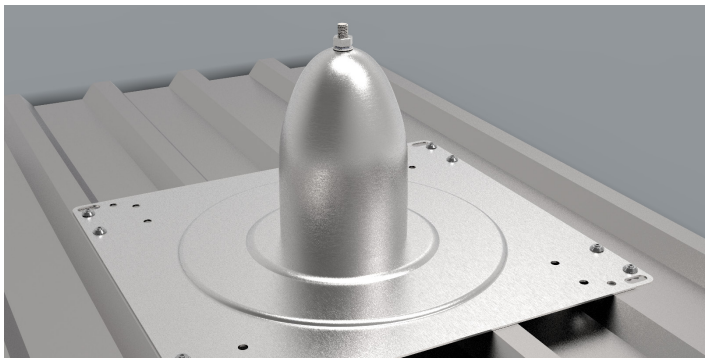


6. Turn can onto female boss in base plate by hand firstly then to the desired tightness with the strap wrench tool until post is seated correctly.





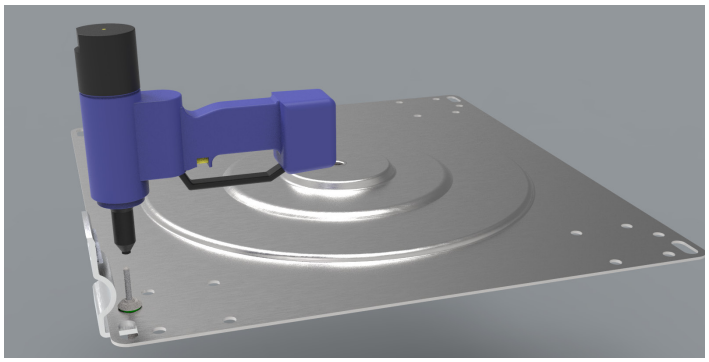
7. Anchor installation is complete and is ready for SOTER™ components to be secured. Clean area fully removing any drill/ rivet swarf.



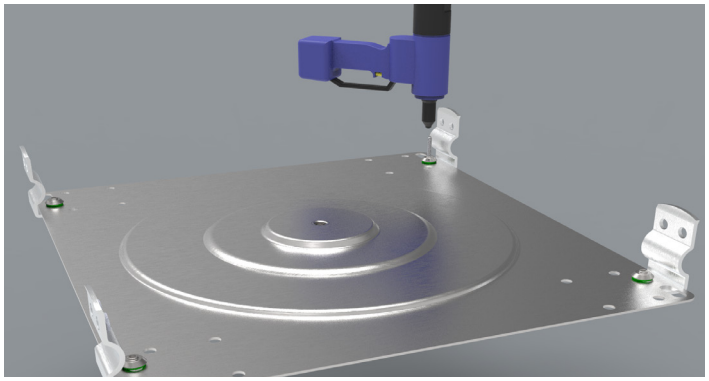
*Please consult SFS for fixing performance.

Standing Seam Roof Sheets

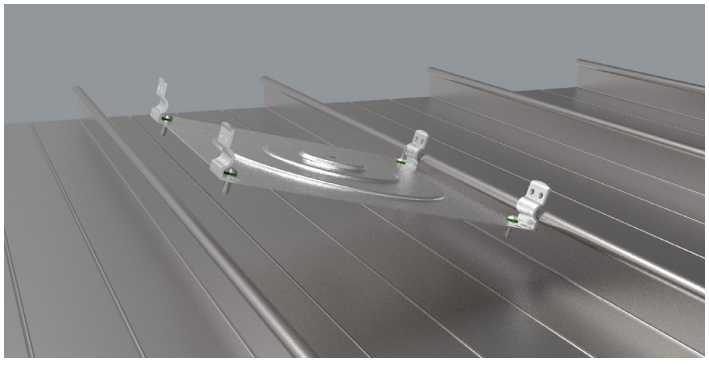
1. Ensure location of base plate is a minimum of 150 mm from halter clips, and the seam is correctly zipped/formed and not damaged, and cleaned prior to installation.



2. Rivet flanged part of SOTER™ 2-part clamp to 4 corners of SOTER base plate.

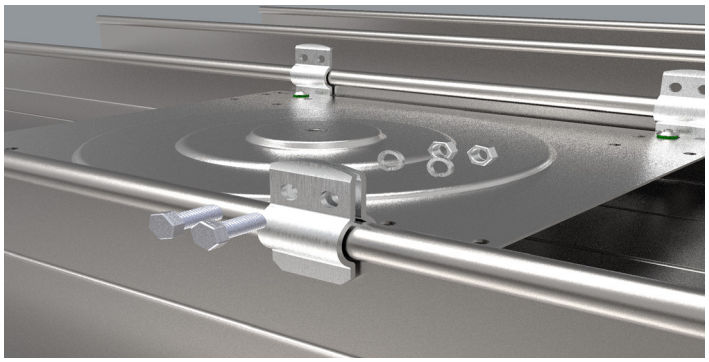


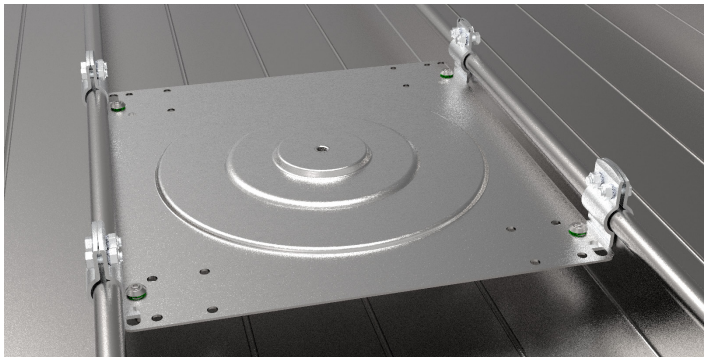
3. Once first part of SOTER™ clamp is installed in all four corners, locate one side against the bulb seam and gently push the other side down to fit securely between the bulb-forms without damaging the sheet. By standing in each sheet pan to either side of the post will widen sheet pitch and aid installation.



4. Once post sits between bulbs of sheet the second part of the SOTER™ clamp can be fitted using nut bolt and washer sets. Torque each nbw set to 14 Nm.

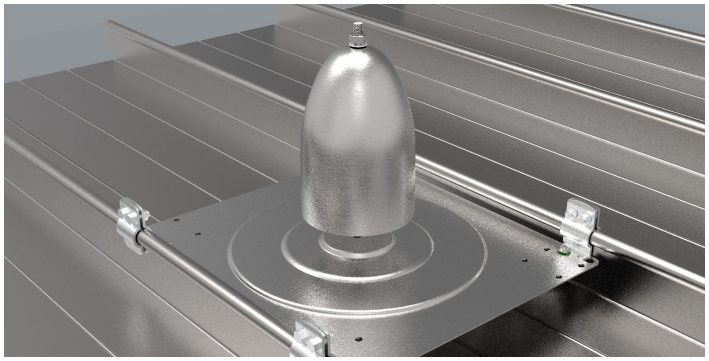
5. Repeat for remaining clamps.

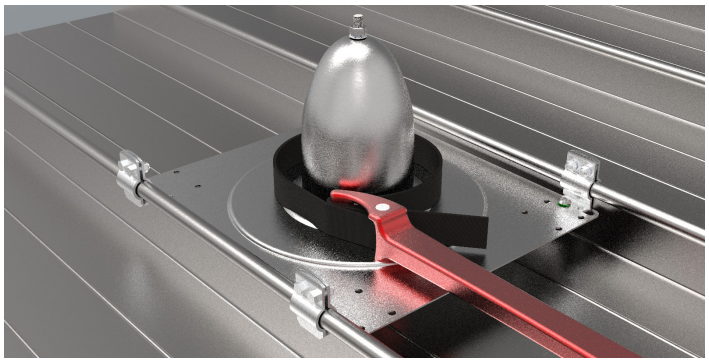




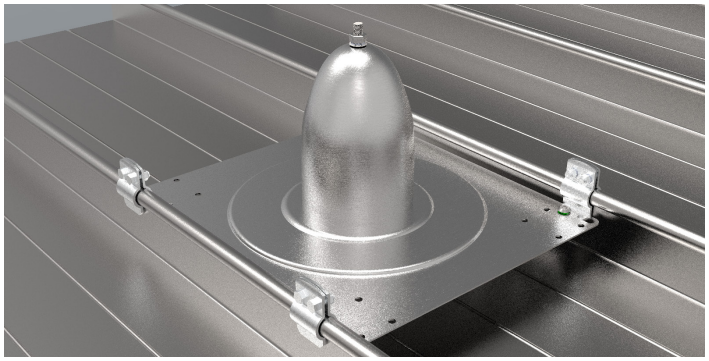
*Please consult SFS for fixing performance.

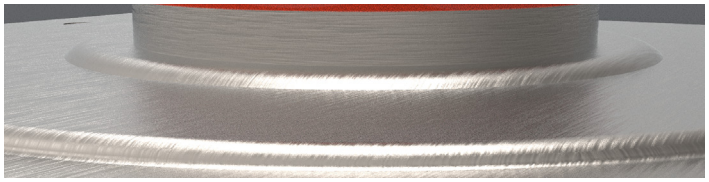
6. Turn can onto female boss in base plate by hand firstly then to the desired tightness with the strap wrench tool until post is seated correctly.



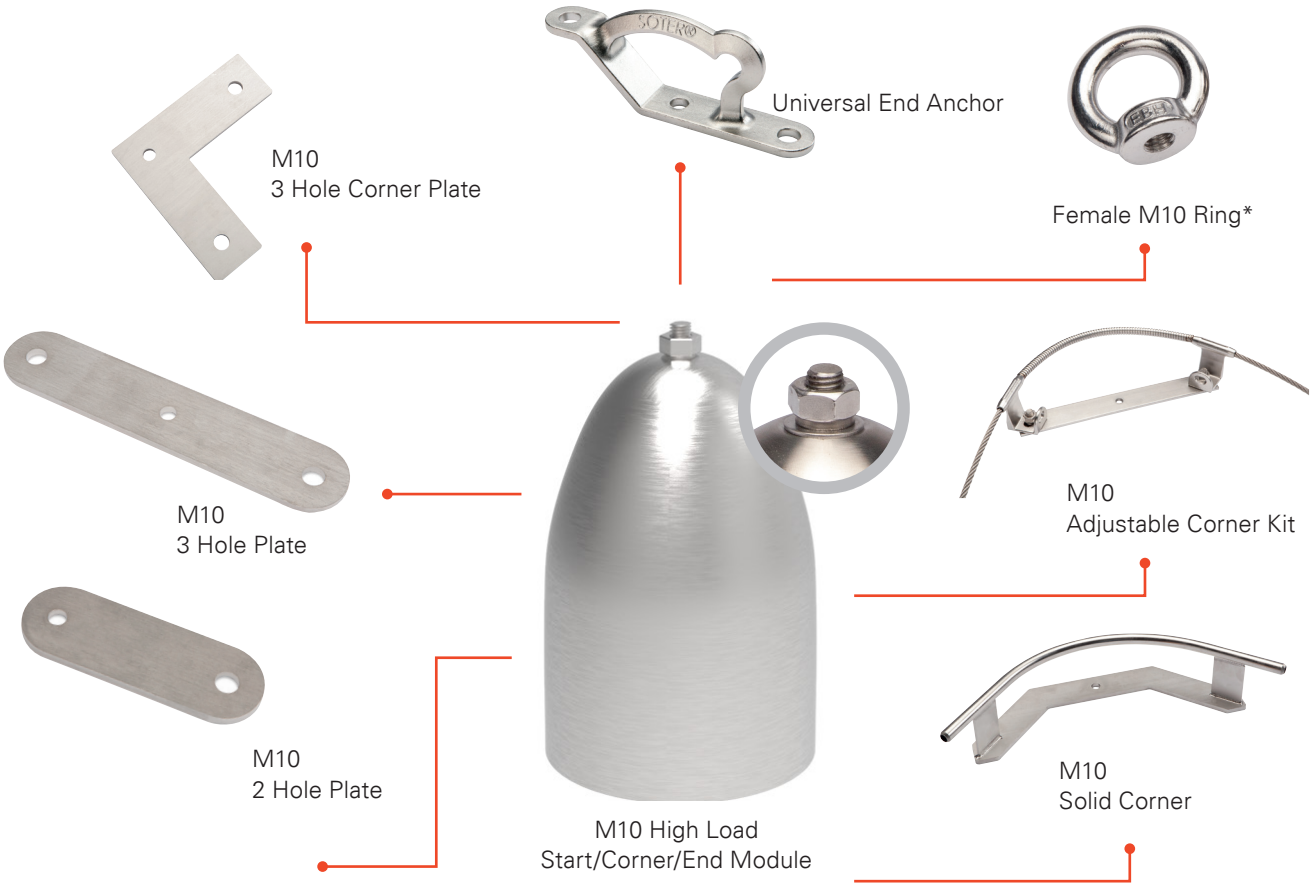


7. Anchor installation is complete and is ready for SOTER™ components to be secured. Clean area fully removing any rivet swarf.





Component Installation
Due to the unique way the SOTER™ cans have been designed M10 & M12, the required component can only fit on the correct post type.



*Nut not required for female ring

Wire Measure and Cutting

1. Before any accurate measurement can be made, the wire must first be loosely pulled from the start of the system, through every component fitted to posts to the end point.

2. To gain the most accurate measurement it is advised to swage/crimp the end termination and fix to the end module component. If the end termination is a line tensioner, ensure the tensioner is fully wound out prior to crimping. See section on swaging/crimping.

3. Working back from the end of the line, and after every 3 or so posts on a straight run, or more frequently if the system turns, take a pair of mole/vice grips and manually pull the line (without overloading the end/corner module) and clamp the vice grips behind an intermediate bracket or corner kit.

4. As you reach the start of the line, you will have manually pulled the wire enough so that it doesn't touch the roof surface, and has reasonable tension in it. Doing this minimises the amount of tension you require the line tensioner to take up.

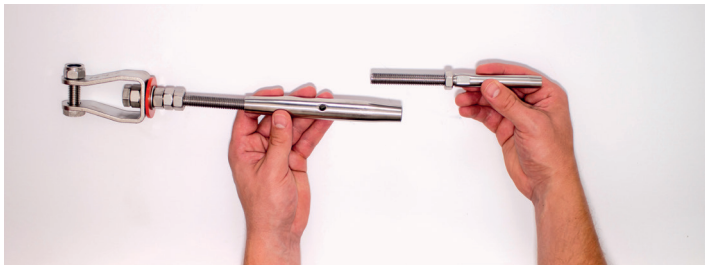
Specialist Tools Required

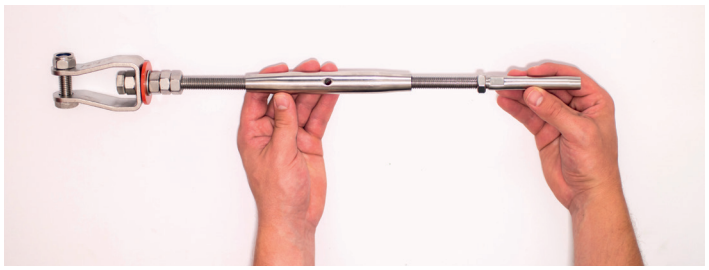
Hydraulic wire cutter for 8mm stainless wire

130kN hydraulic swager and die set for 8mm stainless wire

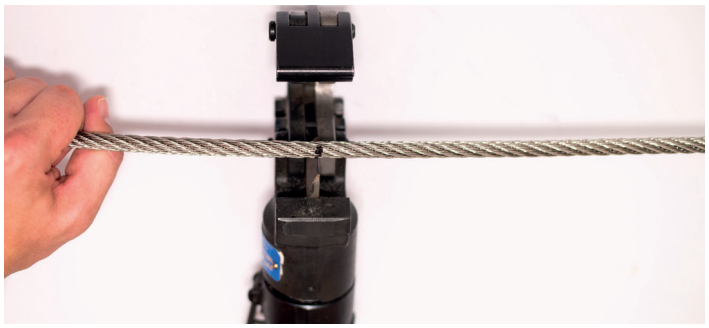
Termination Swaging/Crimping

1. Take the combined tensioner/line tensioner and fully unwind both ends from the central barrel first. Then wind both back in, two full turns. This maximises the amount of tension it can take up.





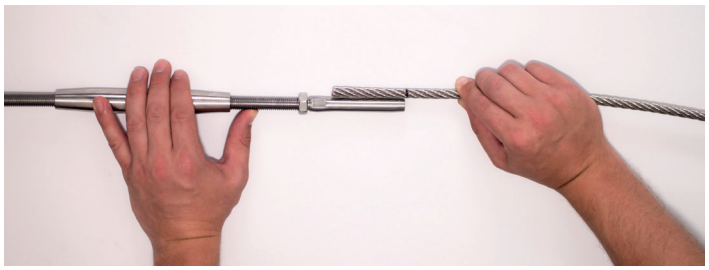
2. Fit the tensioner to the start component loosely, and whilst pulling the wire taught, mark the wire with a marker pen against the pressing on the tensioner. You can now cut the wire on the marking with the Cembre HT-TC026 hydraulic cutter. This will ensure the wire is cut correctly.



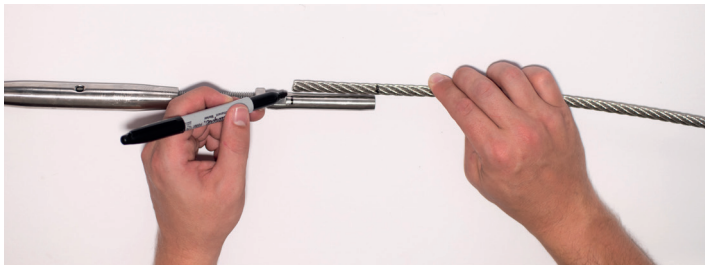
3. As the wire is now cut to the correct length, the tensioner can be removed from the start component ready for crimping/ swaging.

4. Insert the wire into the termination fully, and mark the wire at the end of the termination.

5. Remove the wire and place alongside the termination up to the point just marked.



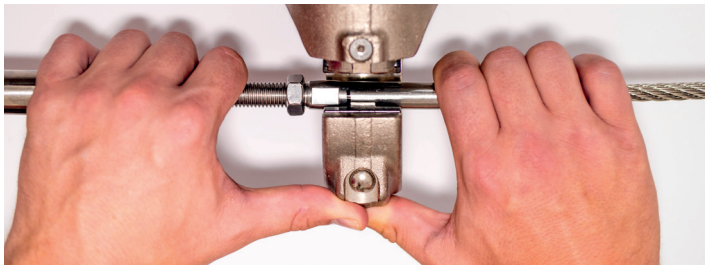
6. Now mark on the termination where the wire ends. This shows where the hollow part of the termination ends, and where the first crimp will be located. This needs to be done on all terminations- tensioners and toggle fork ends.



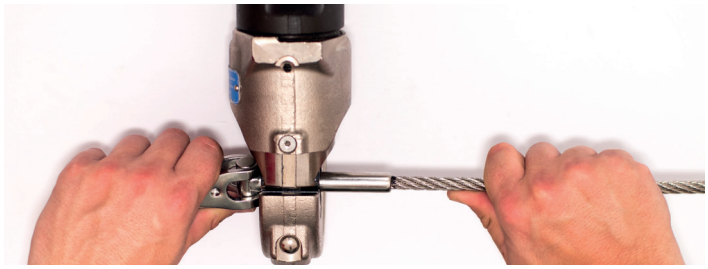
7. Re-insert the wire fully ensuring the wire is fully engaged in the termination up to the point marked.

8. Take the Cembre HT-131-C crimping tool and set the barrel to ‘close’.

9. Position the central section of the die so that the first crimp is made next to the line marked on the termination itself.



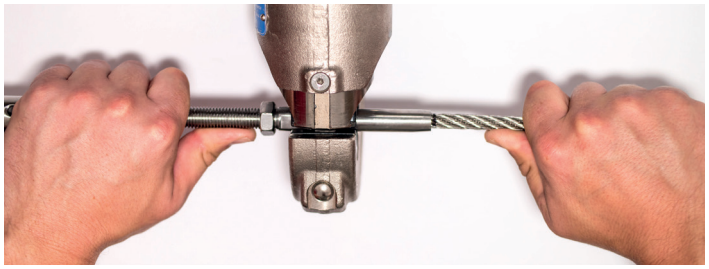
10. During the first crimp ensure that the wire is held into position so that it doesn’t slip. Pump the handle on the crimper until a distinctive ‘click’ is heard and pressure is released from the Crimper.



11. Turn the crimper barrel to ‘open’, pump the handle once to release the jaws.

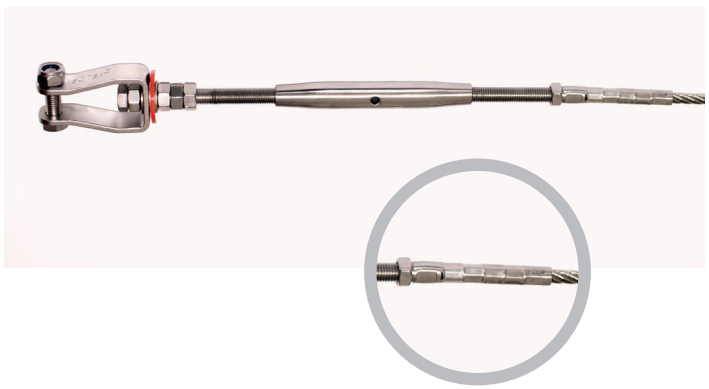
12. Remove the termination and check that the crimp has been fully pressed and is stamped A10. This shows that the crimp has been properly performed and the die itself is not worn.

13. Moving down the termination, 4 more crimps need to be performed, ensuring there is a 1mm gap between each. It is also advised to turn the termination after each crimp so that they are not pressed in the same plane which will prevent the termination from slightly bending.



14. All five crimps must be completed on the straight shank hollow section of the termination, and before the chamfered end. Each crimp should show the A10 stamp clearly and not overlap.

15. The termination has now been fully crimped and can be connected to the post by removing the pin/bolt and securing to the start/end post.



Tensioning

1. Once the start termination has been fully crimped it can be properly secured onto the start component and the nut and bolt fully tightened.

2. By holding the crimped barrel and line in one hand the turnbuckle/central barrel of the tensioner can be turned tensioning the line with the other hand.

3. Once the required amount of tension has been achieved the red tension indicating disc will loosen and spin. Although this indicates the required amount of tension (0.8kN) has been achieved, it is the installer's responsibility to check each straight-line span has enough tension in it and the tension is evenly distributed throughout the system.

4. The nuts on the tensioner can now be tightened against the turnbuckle, locking it in place.

5. Finally, all system components should be fully tightened down to each module, and a final walk of the system should be performed ensuring everything is secure and nothing has been missed.

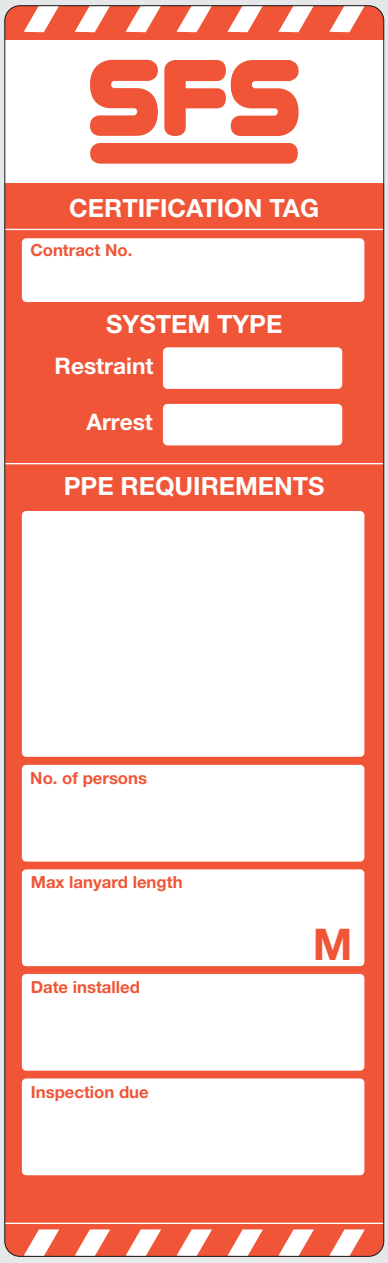
System Tagging
It is important that all installed systems are fitted with a certification tag at the point of access, similar to the tag shown opposite. Conforming to BS EN 365:2004

The certification tag should include the following information to support the more detailed O&M Manual:

- Contract number/name so that the system can be identified
- System type - Restraint/Arrest
- PPE Requirements for the user to use the system safely & correctly
- No. of persons the system is designed for
- Maximum lanyard length - imperative in work restraint systems
- Installation date
- Recertification/inspection due by date

If the recertification date has lapsed, the system **should not be used** until a recognised SOTER™ installer has recertified the system as fit for use.

Systems are required under EN795 to be recertified annually.



Annual Maintenance and Recertification

General Notes
Safety line systems must be inspected and re-certified at intervals not exceeding twelve months.

Horizontal lifeline systems are affected by changes of temperature; this will result in expansion/contraction of the wire. Where systems are subject to significant seasonal temperature variations, these will require re-tensioning for summer and winter operation.

Only those components manufactured and supplied by SFS are permitted for use. The exceptions to this are bespoke fittings required to attach the system to particular structures. Wherever possible such bespoke fittings should be designed and manufactured by SFS, or their design approved. Where such bespoke fittings are provided from another source, it is the installer company's responsibility to ensure they are fit for the purpose intended and carry the necessary approvals.

Under no circumstances must a standard SOTER™ component be modified or replaced by components from another source.

It is important that all SOTER™ devices will align themselves correctly through all componentry; and that there are no obstructions or structures that interfere with the traveller device, or deflect the wires path.

The structure to which systems are to be installed should be sufficiently strong to withstand the fall arrest/restraint loadings for which the system is designed. These loadings can be calculated by the installer or provided by SFS. If there is any doubt as to the structure's ability to withstand such loadings, then the system should not be installed without appropriate testing on the substrate.

Inspection Procedure
Visual Inspection of Complete System

- Check for obvious damage
- Chemical contamination
- Loose fittings
- Building modifications that have resulted in reduced free fall distance/clearance
- Post stability/lean
- Cable damage, paying particular attention to wire passing th-rough any bracketry
- Excessively loose cable

Checking of individual components
High Load & Intermediate Module

Check for Visible Damage

- If the inspector has any doubts as to the integrity of the post due to visible damage take the system out of use and consult SFS

Module Lean

- It is possible that the lean is the result of overtightening at installation or from contraction of the wire due to temperature change module installation.
- Slacken the system and gently assist the post to return to its correct attitude, if successful re-tension the system.
- If post does not return to the perpendicular and there is no other evidence of system abuse the post may remain in situ
- It is acceptable for a post to lean up to 5° from the vertical providing the can is still secure.
- Where any doubt exists consult SFS

Rivets

- Visually seated correctly
- No mandrel is protruding from the rivet head
- The mandrel should however be visible within the body of the rivet

Standing Seam Clamps

- SOTER™ seam clamp torque setting 14 Nm
- S 5 clamps base plate attachment bolt 20 Nm, grub screws 15 Nm

Components Fitted to Post Secured with M10 or M12 Nuts

- Components should be secure & tightened to 30 Nm
- Damaged components should be replaced and a careful inspection of any wire passing through the damaged parts is required.

Toggle Bolts

- If underside of the deck/roof is visible check toggles are firmly secured with no movement and correctly engaged with the deck
- Toggles should not be tightened beyond 15 Nm
- Non-exposed fixings, where the bolts are weathered in and inaccessible a tensile proof test is recommended to a sample 10% of the systems posts.
- The 10% should consist of ends, corners & intermediate modules.
- Due to the internal mechanics of the modules, test loads must not exceed 1.5 kN (150 Kg).
- Hold the load for 1 minute. Insulation and other roof build-ups can and do affect this process, so care must be taken to spread the load around the post to the roof surface using a spreader board/plate.

Structural Anchorages

- Modules secured to steel work/structures, M12 high tensile stainless steel bolts to 50 Nm.
- Where Lindapter type clamps are used, follow the manufactures guide for torque settings
- Modules installed on concrete decks with resin or through fix anchor bolts must have each fixing point proof load tested to 6 kN for 15 seconds at original installation.
- For recertification, it's recommended to test a sample 10% of the systems posts.
- The 10% should consist of ends, corners and intermediate modules.

Wire

- 7×7×8 mm stainless steel cable (minimum breaking load 38 kN).
- SFS recommends that maximum in-line loads of 15 kN should be targeted, this figure allows for a factor of safety of 2, based on the breaking strength of the cable.
- Visually examine cable, intermediate and end anchorages. The cable must be replaced if there are any signs of damage (kinks, fretting, etc.).
- All systems to be properly tensioned and as such must incorporate a SFS supplied line tensioner and tension disc indicator.
- Correct pretension is achieved when the line-tensioner disc spins freely. **Never over tension a system.**

Swaging

- Cable swaging should be accomplished by use of 6 mm hexagonal form dies using 5 continuous 'bites'
- **Note:** the 6 mm dimension refers to the width of each face. The across flat dimension, after swaging, is typically 11 mm
- Testing swage joints is possible with specialist equipment.
- Fittings should be tested to 15 kN for 7×7×8 mm stainless wire.
- Maintain the applied load for 1 minute and the release
- Thoroughly examine the following:
  - All swaged connections for 'slip'
  - All components for damage
  - End & Intermediate anchorages for damage/slip
  - The cable for damage
- Test all system terminations and in-line swaged joint
- Care must be taken when using cable grip devices, that damage to the cable does not occur and that there are no loads transmitted to the intermediate anchorages

Operation and Maintenance/ User Instructions

It is imperative that any safety line system, once installed, is accompanied by a full O&M, and user instruction manual. This manual should be given to the building owner.

Any operative who is to use the system should have access to this document, allowing them to understand how it can be used safely, but also kept in good condition, and re-certified at correct intervals.

O&M Manual should detail the following:

- Site location, building name, and roof reference/location of line.
- Installation certificate including installation date and re-certification due date.
- Contact details of approved company who installed the line.
- System layouts.
- The purpose or areas in which the system will allow access to.
- Recommended PPE to be worn.
- User equipment detailed ensuring safe use – most importantly lanyard lengths.
- System type – restraint/arrest.
- Rescue plan in event of a fall.
- Number of persons the system is designed for.
- Access point.
- Usage/record card.
- General safe use and good practice.
- Connection of travelling device.
- Inspection and maintenance records.

Warranty

All fall protection products sold within the SFS group carry a standard 12 month 'fit for purpose' product warranty*

In cases where customers seek additional comfort, an extended warranty can be applied for.* This should be done by the system installer within the first 3 months of installation.

Warranty terms may be 1–24 years, or even longer than this, subject to conditions and project specification.

A pre-contract questionnaire, covering building use and proximity to chemicals or coastal environments will be required.

All warranties are subject to the frequency of inspections and system re-certification by a recognised SOTER™ system installer.

The SOTER™ SFS Warranty* covers all systems installed on trapezoidal roof profiles, standing seam, and flat roofs.

The fall protection range is made from non-ferrous and stainless-steel components, it carries a design life which goes beyond that of the actual building.

Standard terms and conditions covered by our insurers is available on request.

*Terms and conditions apply

Testing Standards

All SFS Fall Protection products are tested to, and pass, all the relevant and recognised industry standards for each type. The SOTER™ Horizontal Lifeline system passes EN795:2012 Type A and Type C and CEN/TS 16415:2013 Type C for up to 4 users. The traveller travelling device also carries a CE mark.

All tests have been witnessed and certified by independent testing body SATRA. These tests have been carried out both at SFS's testing facility, and at SATRA's own facility.

We can also test to ACR[M] 002:2009–(part2) testing of roof anchors on roof systems known as the Magenta test methods.

As we also recognise the up and coming BS8610 standard which requires all systems to be tested to the substrate it will be installed on, we are actively including the new standard in all our testing and development work.

References

EN 795:2012 Type A	Anchor device with one or more stationary anchor points while in use, and with the need for a structural anchor(s) or fixing element(s) to fix to the structure
EN 795:2012 Type C	Protection against falls from height Single User (anchor devices employing a flexible anchor line which deviates from the horizontal by not more than 15°)
CEN/TS 16415:2013 Type C	Protection against falls from height Multi user HLL (anchor devices employing a flexible anchor line which deviates from the horizontal by not more than 15°)
UNI 11578:2015	Anchor Devices intended for permanent installation – requirements and test methods.
BS 7883: 2005	Code of practice for the design, selection, installation, use and maintenance of anchor devices conforming to BS EN 795
BS 8610:2016	Personal Fall Protection equipment anchor systems
ACR[M]002:2009-(Part2)	Magenta guidelines for roof anchors fitted to roofing systems
CE 0321 EN 795:1996 Class B	Travelling device CE marking
EN ISO 9227	Salt Spray Corrosion Test for CE
EN 361:2002	Full Body Safety Harness
EN 362:2002	Karabiners/connectors
EN 355:2002	Lanyard Shock Absorbers
BS EN 358	Personal protective equipment for work positioning and prevention of falls from a height - Belts and lanyards for work positioning or restraint
EN 354:2002	Fall Arrest Lanyards
BS EN 567	Aluminium rope grab device
BS EN 365:2004	Instructions for marking products with user instructions, inspection periods and re-testing.
ISO 9001	International standard that specifies requirements for a quality management system (QMS).

SFS Group Fastening Technology Ltd.
Division Construction
153 Kirkstall Road
Leeds, LS4 2AT
ukenquiries@sfs.com
www.uk.sfs.com