Roofing systems overview

Double lock standing seam

Index

Main characteristics

The double lock standing seam system provides a lightweight, sustainable and very durable roofing solution and is commonly used on many different building types including educational, healthcare, sports, comercial, religious and, of course, housing. The system is suitable for roofs pitched between 3° and 90°, barrel vaulted roofs, conical and domed roofs, and in general almost any type of roof that can be clad in elZinc®.

This is a proven traditional system that has been used to install zinc since the origins of zinc roofing itself and continues to be by far the most popular method today. The fine lines of the standing seams give the system its light, attractive appearance and contribute to its flexibility. Modern profiling and seaming technology makes quick work of large roofs, decreasing installation times and the associated direct and indirect costs.

It can be installed over a ventilated or non-ventilated roof construction, allowing the best solution to be chosen according to the characteristics of each project. The fixing is hidden and indirect. It needs a continuous support behind it and normally uses elZinc® sheet thicknesses of between 0.65 and 0.8mm. The covering withstands a certain amount of foot traffic.

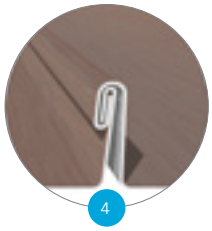


Diagram of standing seam

1 – Standing seam tray
2 – 25mm high standing seam
3 – Fixing clip (sliding)
4 – Expansion gap at base of seam

Principal joints

The longitudinal joint is a 25mm high double lock standing seam. The double lock welt of the seam is raised above the water drainage part of the tray.

The standing seam is formed by profiling or folding elZinc® strips and sheets into trays. An undercloak is formed along one edge (this is the edge that is fixed with clips) and an overcloak along the other. To make the joint, the latter is welted around the undercloak of the adjoining tray, covering the clips. The two trays are then seamed up using seaming irons or seaming machines. 70mm of material is used to form the seam.

The angle standing seam joint is limited to use on slopes pitched at least 25° or above.

The double lock standing seam is considered weather-tight above 7° without sealing, and at or above 3° when it is sealed. This is normally accomplished using closed cell self-expanding sealing strips.

Self-expanding sealing strip on undercloak

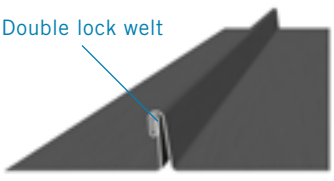
Seaming process

Standing seam tray

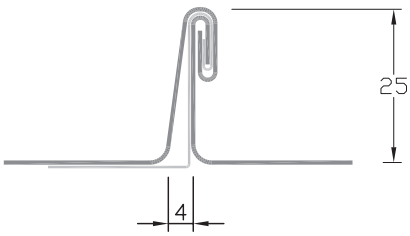
Clipped undercloak and overcloak

Small gap at base forms automatically and allows for lateral thermal expansion

Angle standing seam joint



Double lock standing seam joint

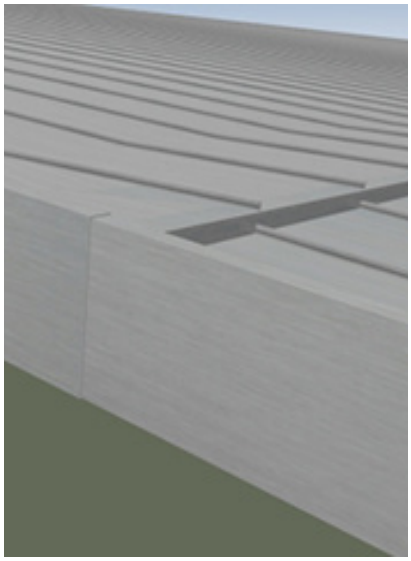


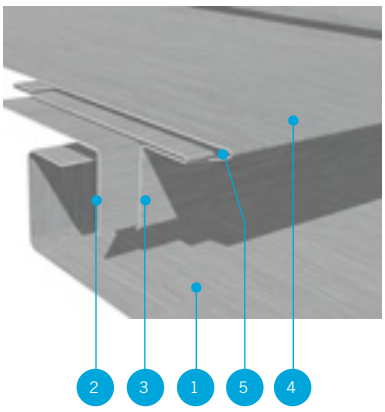
Double lock standing seam joint

Cross joints

It is sometimes necessary to join standing seam trays end to end. Without going into too much detail in this document, this may be to introduce an expansion joint on 'long' roofs (long eaves to ridge measurement), as part of the flashing work around a chimney or skylight, or to produce a change in tray width on a conical roof, for example. Generally speaking, the type of joint used will depend on the pitch of the roof slope, as shown here.

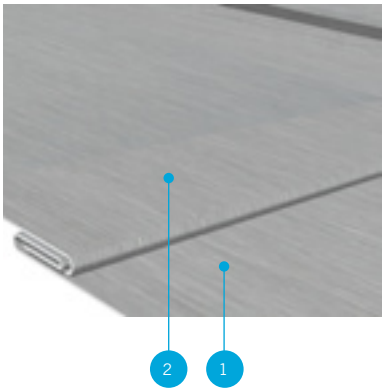
Save for the step, none of the joints require any changes in the substrate design or lateral verge/side abutment detailing. The stepped joint however requires a 60mm high jump to be created in the substrate, either by lifting the entire upper part of the roof or by creating a fillet in the top surface. Either way, the profile of the step can be hidden by creating a small parapet (h = 100mm) along the lateral edges of the roof to hide the step within the external verge profile.





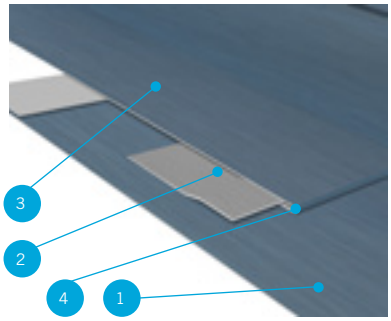
Step
Pitch: 3° and above
Height: 60mm
Often used as an expansion joint on long, low pitched roofs. The step in the substrate can be formed using a fillet.

1. Lower roofing tray
2. Continuous fixing strip
3. 'T' plate with folded back edge
4. Upper roofing tray
5. Expansion/contraction gap



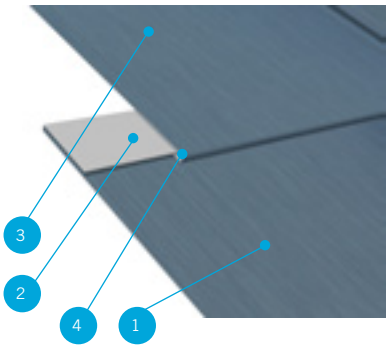
Double lock cross welt
Pitch: 7° and above
Width: Approx. 20mm
The preformed 'slide in' type (shown here) allows for perfect rainwater drainage (traditionally formed joints can retain rainwater at low pitches). Neither version works as an expansion joint.

1. Lower roofing tray
2. Upper tray



Lap lock
Pitch: 10° and above
Lap: Approx. 180mm
Often used as an expansion joint on long roofs.

1. Lower roofing tray
2. Soldered continuous cleat
3. Upper tray
4. Expansion/contraction gap



Single lock cross welt
Pitch: 25° and above
Width: 40mm fold on lower tray, 30mm on upper tray. Can be used as an expansion joint on long roofs

1. Lower roofing tray
2. 40mm fold
3. Upper tray
4. Expansion/contraction gap

Fixing

The hidden fixing is indirect, using clips that are hooked into the seam and (normally) screwed or nailed to the substrate below. If the length of the elZinc® trays is under 1,5m, fixed clips can be used throughout. Trays over 1,5m require a combination of fixed clips and sliding clips to allow for thermal movement of the trays, and also require provision for movement at eaves and ridge.

These clips should be sufficient in number to resist the design wind loading for each project. Normally 6 clips per sq. m prove to be enough for buildings not taller than 8m, whereas corners and edges of taller buildings will need more – please see our technical documentation for additional detailed information.

Sliding clip

Fixed clip

Standing seam tray dimensions

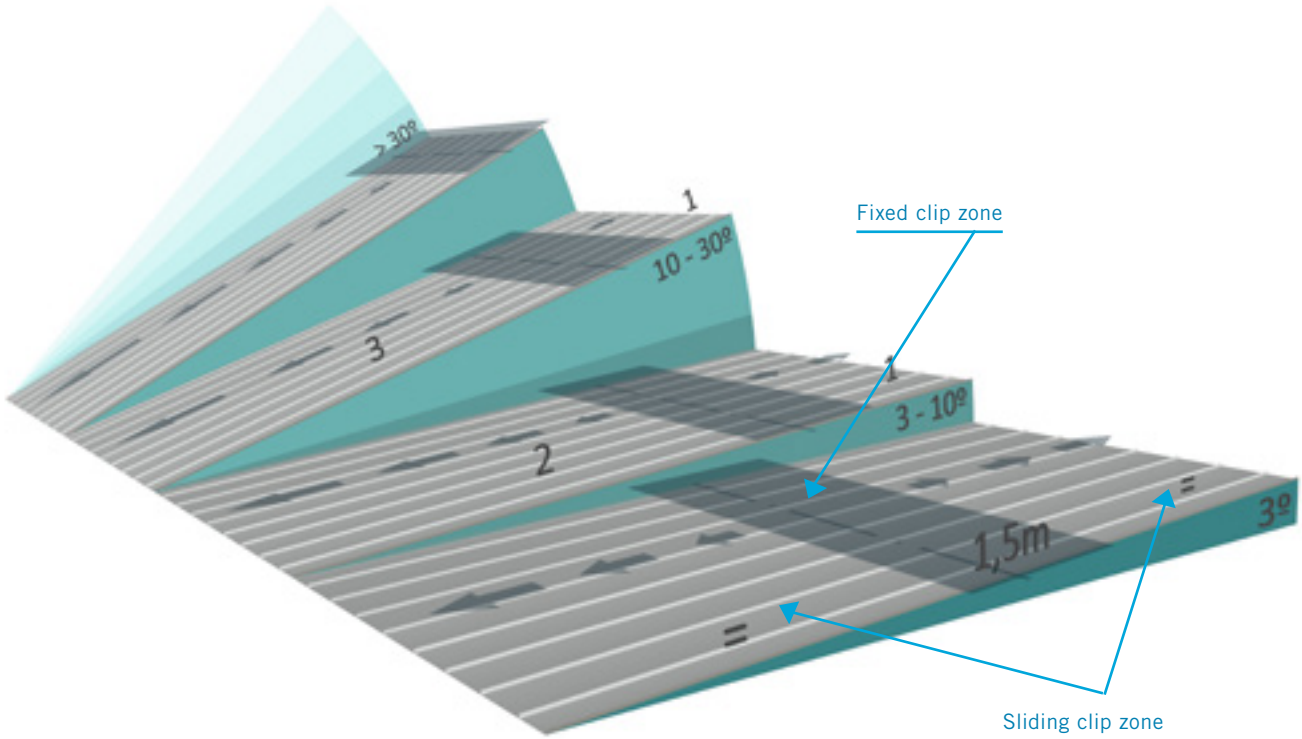
Since the trays are only fixed along their seams, the distance between them is determined according to expected wind loading, and tied in to commercially available coil widths.

Increasing wind loading	→		
Coil width (mm)	670	600	500
Tray width	600	530	430

The location, exposure, orientation and roof geometry all influence wind uplift. Advice should be sought from elZinc® or a reputable installer familiar with the area when deciding on seam centres. This is not just to ensure that the roof does not suffer during storms, it is also to avoid fluttering of the trays during constantly windy conditions.

These widths are used in combination with varying thicknesses from 0.65mm to 0.8mm to ensure the roof meets all performance criteria to which it is designed.

The maximum lengths of the trays is a nominal 10m, but this can be increased slightly on flatter roofs (with no additional measures required) or by using special clips, which allow for more movement, up to a maximum of 15m.



The distribution of the fixed clips depends on roof pitch – the steeper the pitch, the higher the band of fixed clips is positioned. This means that the lower the pitch of the roof, both the longer the trays can be before an expansion joint must be introduced or before special measures need to be taken, for example the use of special sliding clips.

Installation

The system is installed from left to right or right to left across the roof, or outwards from a centrally placed undercloak – undercloak tray that ensures trays of equal width (and therefore symmetry) at both sides of the roof. Detailed installation guidance is given in our publication 'elZinc® – Details, Processing and Installation', which can be downloaded from our web page.

The installation itself should be carried out by a reputable specialist, hard metal roofing contractor. elZinc® can offer contact information regarding suitable contractors on request.

Appearance

The standing seam should always follow the line of maximum pitch if possible. The seams themselves are fairly fine, but in sunny weather the shadows they cast are clearly visible on the surface of the roof.
A unique characteristic of light gauge metal roofs is the subtle quilting that can appear naturally under different light conditions, bringing a bit of visual 'vibration' and 'energy' to the building.

Many architects appreciate this. It is more noticeable on steeply pitches roofs and façades but even so, if desired for roofing, it can be reduced to a minimum. elZinc® material helps here by having excellent flatness and low residual tension leading to very flat trays anyway. Other typical measures that can be adopted are:

- Use 0.8mm thick elZinc®
- Limit the width of the trays to 430mm

Rainwater drainage

Rainwater is either drained by way of internal or parapet gutters or externally mounted eaves gutters. Both types are normally executed in zinc.

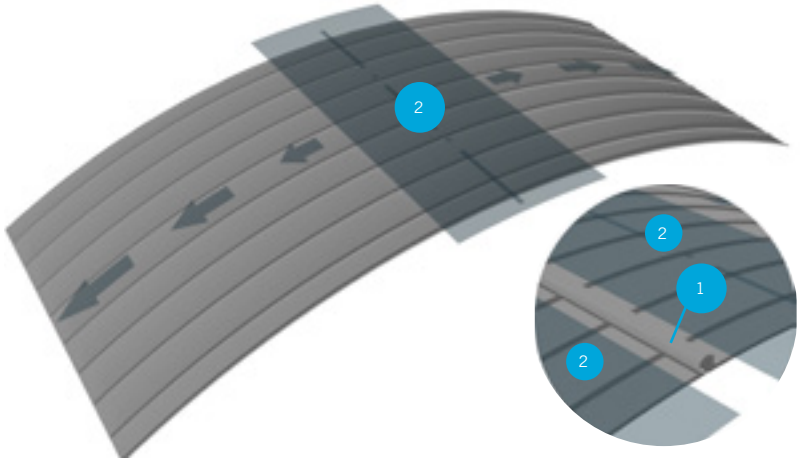
They can be laid horizontally but a fall of 1 in 200 is recommended as this promotes some self-cleaning and quickens drainage. The gutters are installed to allow for thermal movement, both between themselves and the adjacent roof covering and within the length of each gutter run itself, the latter being resolved by introducing expansion joints.

Gutters should be protected from snow slipping into them from the roofing sheets by fitting snow guards, and heated wires are advised in cold climates where ice build-up can occur. Further guidance on gutter dimensioning and design can be found in our technical literature.

Roof shapes

Barrel vaulted roof

Standing seam trays will naturally curve to a radius of about 20m. Tighter curves will require pre-curving (possible down to a minimum radius of ≈40cm). Trays are fixed at the apex of the roof on an unvented or cross-vented roof, and next or very near to both sides of the ridge on a ridge-vented roof. Here, the tops of the trays next to the ridge vent should be pitched to allow water to drain away freely - 3° over their first metre is advised. Seams should be sealed in areas of the roof pitched below 7°.

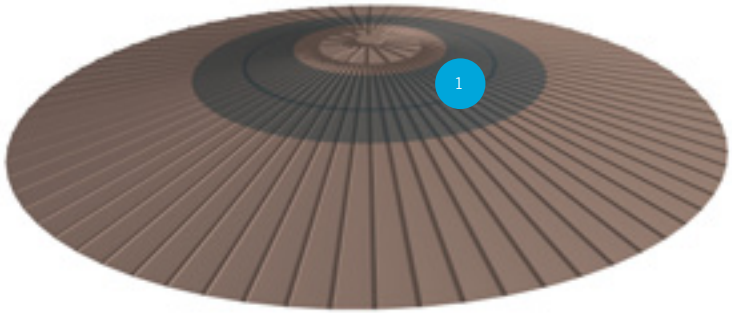


Parallel curved tray

1. Ridge vent
2. Fixed clip zone

Conical roof

Tapered standing seam trays are used to clad this roof form. The minimum seam centre to centre distance depends slightly on the profiling machine used, but is between 50 and 100mm. A capping piece is fitted at the top. If the roof is vented and a running outlet at the top is used, the minimum outlet section should be checked – see our technical literature. The band of fixed clips is positioned according to roof pitch.



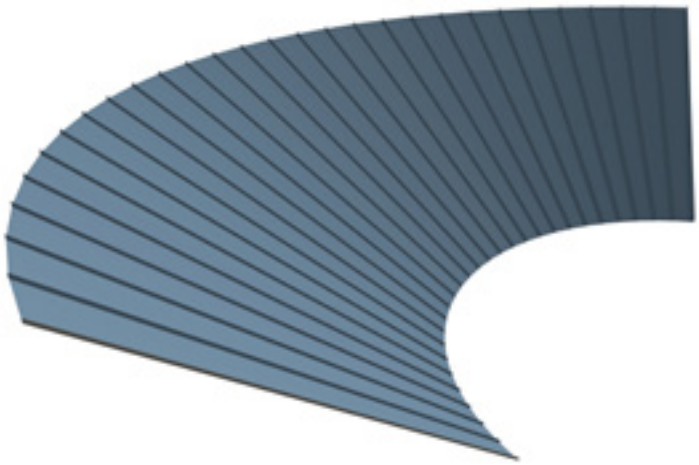
Conical roof

1. Straight tapered tray

Open conical roof

The same tray type and fixing method are used here as are with a regular conical roof. If the roof is vented and a running inlet at the bottom is used, the minimum inlet should be checked. The band of fixed clips (omitted in this diagram) is positioned according to roof pitch. These trays will concentrate rainwater which should be borne in mind when designing the gutter to prevent rainwater 'spouting' over its front edge.

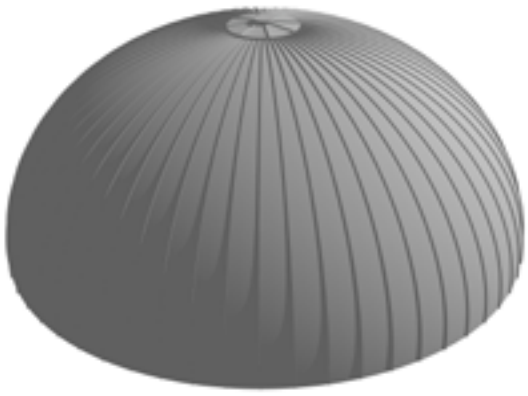
Straight tapered tray



Domes

The trays normally have to be formed after taking measurements on site to determine the exact shape of the trays (degree of bowing along the seams), as well as their overall dimensions. Smaller domes can be built and clad off the building and then lifted into position. Adequate ventilation outlet cross section at the top of the roof should be ensured – please see our technical literature.

Curved bowed tray

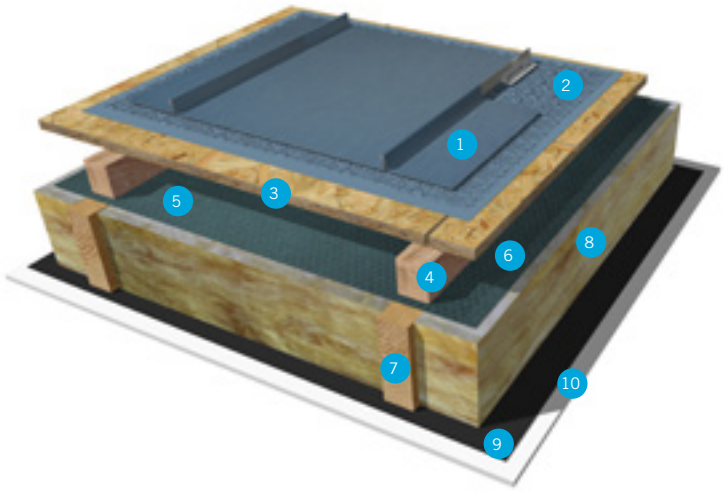


Substrates and roof construction

Standing seam trays are not self-supporting and require a fully or almost fully supporting substrate against which they rest and to which their clips are fixed. The substrate can be vented or unvented but it is essential that the roof build-up is correctly executed in either design to avoid the risk of interstitial condensation that could damage the roof. More guidance on this is given in our technical literature.

Wood is used for the substrate on ventilated roofs, in the form of soft-wood boarding, class 2 plywood sheathing or Class 3 OSB sheathing. The minimum thickness of the substrate is 22mm for the s/w boarding and 18mm for the plywood and OSB sheathing. These materials should be fixed perpendicular to the direction of the standing seams. If there are any doubts regarding the minimum clip pull-out values in the OSB sheathing, a test should be conducted to establish that the 560N minimum will be achieved with the proposed type of fastener.

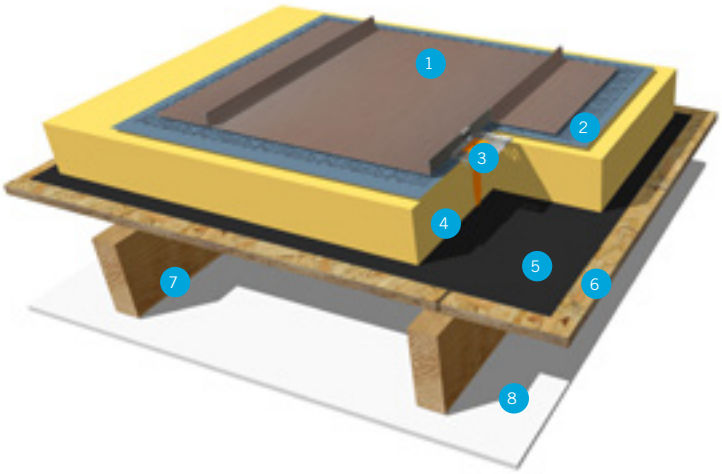
Warm roof construction can also use timber substrates, but the need to reduce cold bridging in many countries has led to the use of rigid insulation boards, composite insulation boards and sandwich panels as the direct substrate under the zinc. Rigid insulation is used in combination with special clips that enable the zinc to be fixed to the supporting decking below, and used in this way it must be able to withstand foot traffic and the like, and not deform during the life-time of the building. Composite insulating boards provide a timber decking that is factory-bonded to the insulation, so the installation of the zinc is executed using traditional clips and fixings. Three examples of the many possibilities that exist are shown here. For more detailed information on these, and on other types of supporting materials and roof construction, please consult our technical documentation or advisory service.



Ventilated roof

1. elZinc® standing seam
2. Structured separating membrane
3. Direct support
4. Timber battens
5. Ventilating air layer
6. Breather membrane (optional)
7. Wooden rafters
8. Insulation between rafters
9. Vapour control layer with sealed laps
10. Internal finish

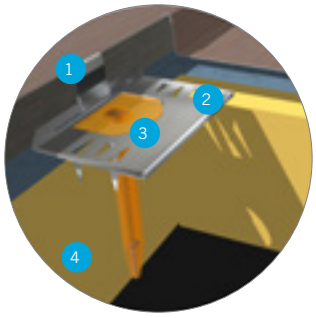
The height of the ventilating layer should be a minimum of 5cm, and in some cases (low pitch, long eaves to ridge measurement) should be increased to 10cm – see our technical literature. The direct support can be open gap softwood boarding, or plywood or OSB sheathing, all laid parallel to the gutter, and staggered. The optional breather membrane provides additional protection for the insulation against cold wind-driven drafts that enter the ventilation gap from the outside.



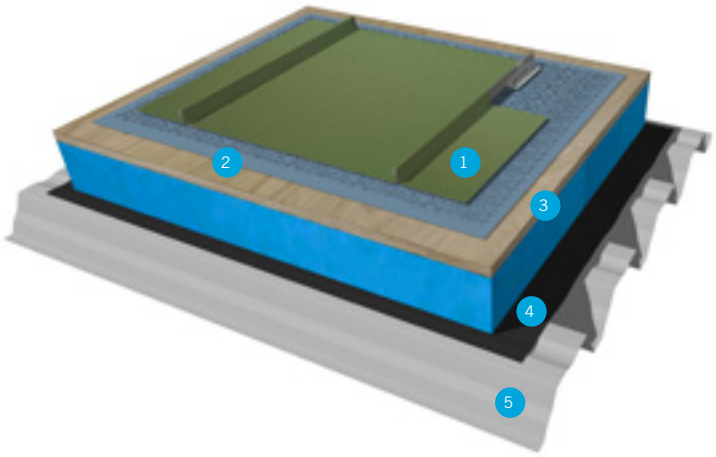
Warm roof – 'warm fast fixing'

1. elZinc® standing seam
2. Structured separating membrane
3. 'Warm fast' type fixing
4. Rigid insulation
5. High performance vapour barrier
6. Support decking
7. Rafters
8. Internal finish

The high performance vapour barrier, whose effective function is fundamental in this design, must self-seal against the warm fast type fixings, and all laps and roof penetrations taped and sealed. The support decking can be timber or steel. Standard clip centres apply, but the zinc is fixed using one screw only per clip, so a sufficient pull-out value for the screw in the supporting decking (560N) should be ensured.



1. Undercloak slider
2. Spiked base which grips insulation
3. Plastic peg (length varies acc. to insulation)
4. Screw fixing



Warm roof – timber insulating board

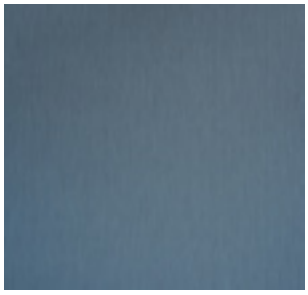
1. elZinc® standing seam
2. Structured separating membrane
3. Factory bonded insulating board
4. High performance vapour barrier
5. Profiled steel deck

The factory bonded insulating board is screw fixed through the vapour barrier into the decking below. The high performance vapour barrier must self-seal against these fixings, and all laps and roof penetrations taped and sealed. The exterior face of the insulating board should be exterior grade plywood or class 3 OSB, at least 18mm thick. The performance of the vapour barrier is fundamental in this design.

Summary

CHARACTERISTIC		OBSERVATIONS
Field of application	Roofs pitched between 3° and 90°. Barrel vaulted roofs, pagoda roofs, spires, domes and almost any type of amorphous 'free form' roof geometry	Minimum radius is 40cm using curving machines on convex (vaulted) curves. Concave trays can be curved straight out of the profiling machine to a 3m minimum radius.
Longitudinal joint	Double lock standing seam	25mm high. 70mm of material is used in the seam
Cross joints	Step, double lock cross welt, lap lock and single lock welts are used according to the pitch of the roof slope	———
Minimum thickness	0,65mm	0,7mm is the minimum advised in some countries
Maximum thickness	0,8mm	Profiling machines cannot work with thicker material
elZinc® finishes	Natural, Slate, Rainbow range of finishes	———
Weather tightness	Standing seams should be sealed on roofs pitched below 7°	———
Fixing method	Indirect and hidden using stainless steel clips nailed or screwed to the substrate (or riveted in the case of sheet metal support)	Fixed and sliding clips are used. Minimum pull-out values for the clips should be 560N
Layout designs	Long strip or traditional sheet designs	———
Tray width	Normally between 430 a 600mm	Trays wider than 600mm are not recommended due to wind uplift. In exposed areas or areas having long periods of windy conditions (Scotland for example) a width of 430mm is recommended.
Tray length	Nominally 10m.	Exceptionally up to 15m – consult elZinc® beforehand
Substrate	Continuous or semi continuous of soft wood boarding, plywood or OSB sheathing, rigid insulation or trapezoidal metal sheet	———
Roof construction	Vented (cold) or non-vented (warm) roof constructions are possible	———
System weight	From about 5 to 7kg/m² (zinc only)	Wooden support - 10 to 14kg/m²; trapezoidal sheet 7 to 12kg/m², both depending on types and thicknesses
Cost	Economical	———
Variations	Angle lock standing seam	For roofs pitched at or above 25°. For projects in UK + Ireland, please contact our technical advisory service.

Samples



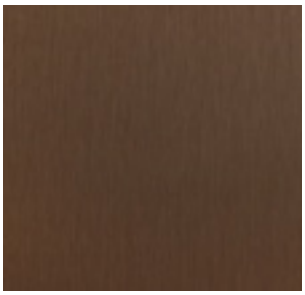
elZinc Rainbow® blu

elZinc Rainbow® red

elZinc Rainbow® green

elZinc® natural

elZinc Slate®



elZinc Rainbow® brown

elZinc Rainbow® gold

elZinc Rainbow® black

Note: The colours shown in this document are for illustrative purposes only and should not be taken as representative of the real finishes. Please request our sample card to see the real elZinc® finishes.

For more detailed technical information, please consult our technical literature or contact our technical advisory Service.

ASTURIANA DE LAMINADOS, S.A. has developed the instructions and recommendations herein with the aim of providing a better service for its customers. It is generic information for standard installation of elZinc® products in a European climate.

This information must not substitute the considerations and requirements that, in each project, architects, designers and consultants may offer.

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We remind readers that ASTURIANA DE LAMINADOS, S.A. provides an advisory service to assist in the interpretation and use of this information should any doubts arise in this regard.

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