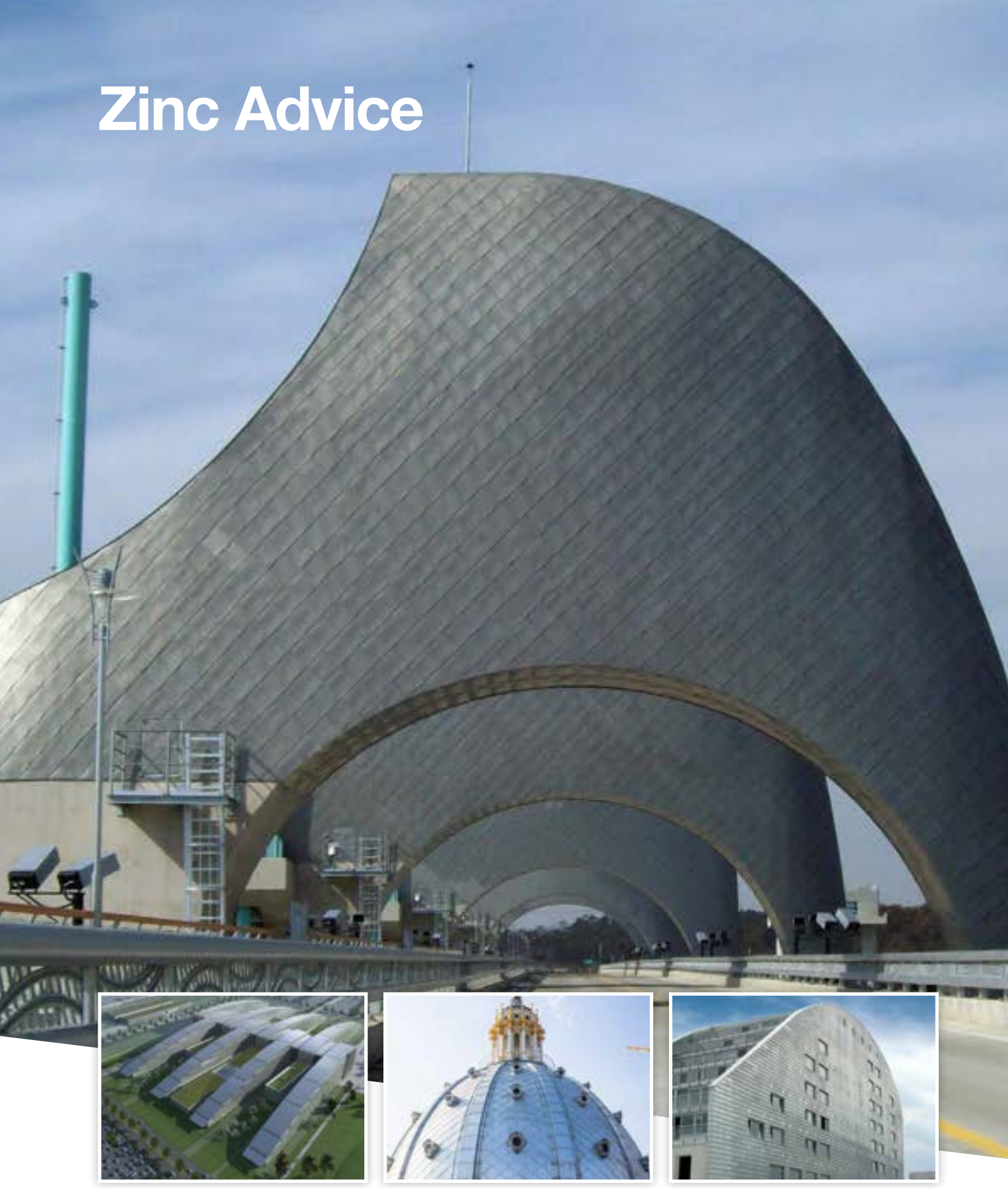
Zinc Advice



Technical instruction handbook

NedZink

THINK ZINK

Foreword

A useful reference offering inspiration aplenty

NedZink has been manufacturing high quality zinc products for over a hundred years. After all, zinc is a natural and durable material that possesses striking aesthetic properties. This makes the material versatile and easy to apply as a roof, façade and wall cladding.

The world in which architects, installers and zinc workers operate is constantly evolving. New building insights and fresh combinations with other natural materials such as glass, wood and brick require innovative zinc products and applications. We laid strong foundations with NedZink NATUREL, NedZink NOVA, NedZink NEO and NedZink NOIR and continued to build on these foundations by developing new zinc products such as NedZink Pro-Tec and NedZink NUANCE.

Thus our extensive and flexible product range developed over the years, requiring specific processing methods. Justifiably proud, we present you with the new, expanded NedZink technical instruction manual. Not only does it contain the very latest zinc applications, this user-friendly technical instruction manual also includes overviews of diverse roof and façade systems, surprising zinc applications and clear construction drawings.

In a nutshell, it's a handy reference offering inspiration aplenty that will provide you with years of pleasure.

NedZink B.V.
Technical Support Team

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Sports hall in Stuttgart

1 Build on NedZink

NedZink has been manufacturing the highest quality zinc products used in both large and small-scale projects worldwide for over 130 years. This ranks NedZink among the top four zinc producers in the world. Rolled titanium zinc is produced at the ultramodern plant in Budel-Dorplein (NL) and subsequently processed for applications in façade cladding, roofing, gutters and rainwater drainage systems.

Future-oriented management and investments in the very latest production techniques boost our market position and provide scope for new developments.

NedZink contributes to a social economy and the future by producing natural zinc products sustainably and processing them for the building industry. What's more, zinc looks highly appealing and symbolises NedZink's mission: **Together shaping the future with sustainable beauty.**

Site Budel-Dorplein Netherlands

2 Materials

NedZink has already been producing high quality zinc products for applications in the construction sector for more than a hundred years. Titanium zinc is sold under the brand names NedZink NATURAL, NedZink NOVA, NedZink NEO, NedZink NOIR, NedZink NUANCE and NedZink Pro-Tec, and has an excellent reputation on the European market. The basic material NedZink NATUREL is titanium zinc with a smooth rolled surface for applications in roof and façade cladding, roof gutters and rainwater drainage systems.

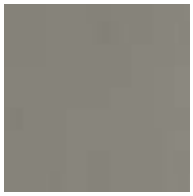
2.1 Material types

NedZink NATUREL

NedZink NATUREL is a durable, aesthetic and maintenance-free building material that becomes increasingly attractive over the years under the influence of weather conditions. This is due to the formation of a natural zinc patina layer on the surface. This property means NedZink NATUREL is mainly used where a natural and vibrant appearance, high cost-effectiveness and a long life are required.

NedZink NOVA

In order to achieve the natural grey tint from the start, NedZink has developed a highly advanced prepatination process. The uniform medium-grey of NedZink NOVA is achieved following a chemical surface treatment after the rolling process. Color fast and approaching the most natural patina tint. Roofing, façade cladding and rainwater drainage systems are the right color from day one.



NedZink NEO

Complementing the medium grey NedZink NOVA, the slightly darker grey surface of NedZink NEO has the same advantages and the right color from day one. This uniform matte, mineral grey alternative of NedZink NEO offers an additional option when choosing pre-weathered zinc.

NedZink NOIR

In addition to the patina grey NedZink NOVA and the mineral grey NedZink NEO, NedZink has a third variant of prepatinated titanium zinc called NedZink NOIR. This variant has a virtually black surface. It can be used to give projects a distinct and unique look.

NedZink NUANCE

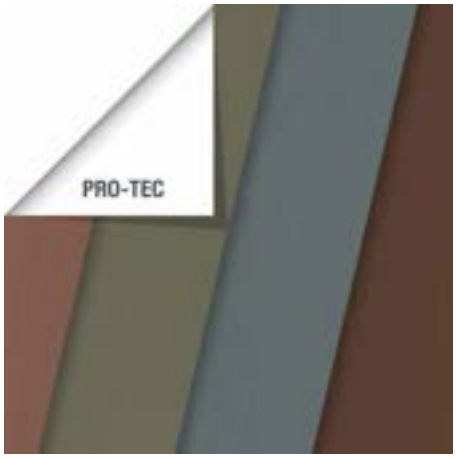
NedZink NUANCE is pre-weathered titanium zinc with pigments. This results, depending on the selected pigment, in a pre-weathered zinc variant with a blue, red, green or brown colour nuance.

The natural properties of titanium zinc: high durability, maintenance-free and good deformation properties are fully retained. The pigments also provide extra protection for the pre-weathered titanium zinc. NedZink NUANCE is mainly used for high-quality aesthetic building applications: externally for roofs and façades or internally for various design applications.

NedZink NATUREL, NOVA, NEO and NOIR Pro-Tec

NedZink Pro-Tec

NedZink Pro-Tec is process-produced titanium zinc with a protective coating on the backside for application on either cold or damp-proof constructions. The protective layer protects the zinc against the effects of water vapor and other substances. The effective processing properties offered by zinc are retained.



NedZink NUANCE Red, Green, Blue and Brown Pro-Tec

© DEFENSIE – Michael Moors

2.2 Technical Specifications

NedZink produces titanium zinc in accordance with EN 988, an alloy based on electrolytically refined zinc with a purity of min. 99.995% Zn (Z1 in accordance with EN 1179) with small additions of the alloy elements copper, titanium and aluminum.
The chemical composition, the mechanical and physical properties and measurement tolerances are determined in the KOMO product certificate and the product certificate from Lloyd's Register, Industrial Quality Scheme for Product Certification by Surveillance of Quality Systems (approval No. QIS 122).
Compliance with the established material properties is checked at regular intervals (several times a year) by an independent and neutral inspection body, Lloyd's Register.

The materials are provided with a continuous stamp featuring a mark in accordance with the provisions of NEN-EN 988, mentioning the producer, the product description in German, Dutch, English and French, the EN 988 standard, the nominal thickness, the batch number, the year of production and the logos of the Lloyd's Register and KOMO inspection bodies.
The product certificate and the ISO 9001 certificate for the quality management system at NedZink ensure consistent and uniform high quality.
NedZink titanium zinc is characterized by high durability and excellent deformation properties, and is extremely weather-resistant, durable and maintenance-free.

Chemical composition

Product requirements	NedZink Titanium zinc
Zinc	Zn 99,995%
Copper	Cu 0,08 - 0,17%
Titanium	Ti 0,07 - 0,12%
Aluminium	Al < 0,015%

Size tolerances for standard products

Product requirements	NedZink Titanium zinc
Sheet and coil thickness	± 0,025 mm
Sheet and coil width	+ 2/-0 mm
Sheet length	+ 2/-0 mm

Mechanical & technological properties

Product requirements	NedZink Titanium zinc
Yield strength elasticity (Rp 0,2)	min. 110 N/mm^2
Tensile strength (Rm)	min. 150 N/mm^2
Elongation (A50)	min. 40%
Vickers hardness (HV3)	min. 40
Folding test	no fractures on the fold
	no cracks
	relative tensile strength D > 0,7 x original tensile strength
Permanent stretch in creep test	max. 0,1%
Edgewise bow	max. 1,5 mm/m
Flatness-corrugation	max. 2 mm
Independent product control	several times a year
Guarantee	10 years
Quality management system	DIN-EN-ISO 9001

Physical properties

Product requirements	NedZink Titanium zinc
Density	7,2 g/cm^3
Melting point	420 °C
Recrystallisation temperature	> 300 °C
Lineair expansion coefficient	0,022 mm/(mK)

2.3 Material Characteristics

Every rolled metal, NedZink material included, will show tension in a certain way. This is a consequence of the rolling process. With modern techniques, these tensions are reduced to a minimum. Nevertheless, it may be that these tensions occur, to a lesser degree, after the NedZink material is processed by third parties.

NedZink NATUREL has a bright, rolled surface. Exposure to the outside air and moisture results in a protective layer of zinc carbonate, which is called the patina. This process begins immediately after installation and will continue until a uniform patina is obtained. In the beginning, the appearance of the patina layer may be slightly mottled. This is visible particularly on vertical surfaces such as façades. Other factors that play a role in this patina process are: the orientation / geometry of the building, weather conditions during assembly, and the storage of the titanium zinc prior to assembly.

NedZink NOVA, NedZink NEO, NedZink NOIR and NedZink NUANCE are natural products and consequently minor color nuances will occur. A unique production process results in an extremely consistent color, but there is always a possibility of color variations (production batch related). Use material from the same production batch for each particular project to avoid color variations. The production batch number is stated on the back of the material.

Always assemble NedZink NOVA, NedZink NEO, NedZink NOIR and NedZink NUANCE in the same rolling direction in order to avoid color variations. The rolling direction is indicated by arrows on the back of the material. This rolling direction must be checked before installing the material.

After many years the pigments of NedZink NUANCE will gradually fade and the colour of the pre-weathered NedZink NOVA will appear on the surface. The durability of the pigments is highly dependent on environmental factors such as the location of the building, temperature, UV exposure and air quality. Damage, perforation and adverse environmental factors can significantly shorten the lifetime of the pigments.

2.4 Protective Film

Anti-Fingerprint
An Anti-Fingerprint coating is applied on the pre-weathered zinc types to prevent fingerprints during installation and to optimize machine processing. This AFP gives the material a slightly shiny surface, which will disappear over time.

PE self-adhesive foil
NedZink NOVA, NedZink NEO, NedZink NOIR and NedZink NUANCE can be delivered with a temporary self-adhesive PE-foil for additional protection of the surface during the application. This film protects the surface from damage and contamination during assembly or subsequent work.

The protection is only functional when the film is not damaged. The adhesion of the film can be stronger in colder periods of the year. This protective film should be removed as soon as possible after installation. The temperature of the zinc should be at least 7 °C. Lower temperatures lead to unevenness of the patina and water trapped between the zinc and the film can cause the formation of zinc hydroxide stains. These stains are very difficult to remove.

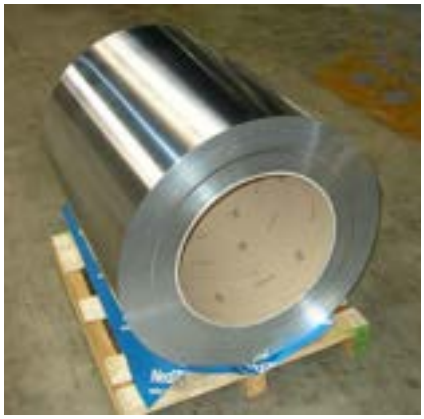
The foil is not durable UV resistant and intended only for temporary protection. Particularly at high solar radiation and high metal temperatures there is a risk of damage. The foil should not be used in fabrication techniques such as a standing seam.

3 Products

NedZink material is supplied in the form of coils, sheets, strips, gutters and pipes. NedZink offers a wide range of dimensions and thicknesses not only in NedZink NATUREL, but also in NedZink NOVA, NedZink NOIR, NedZink NEO and NedZink NUANCE.

3.1 Coils

Productdetails coils	
Available widths	150 – 1000 mm
Material thickness	0,65 – 0,70 – 0,80 – 1,00 mm
Weight coils of 1000 mm	max. 2800 kg – min. 930 kg
Coil internal dimension	standard coils: 508 mm
	small coils = 250 kg: 500 mm
	small coils < 250 kg: 300 mm
Length small coils < 250 kg	in coil widths < 500 mm: 42 m
	in coil widths ≥ 500 mm: 30 m
Packaging	ID 300 mm: 6 per pallet
	ID 500 mm: 4 per pallet
	ID 508 mm: as agreed



Other sizes and thicknesses are available on request.

3.2 Sheets

Productdetails sheets	
Standerd sizes	1000 x 2000 mm
	1000 x 2250 mm
	1000 x 3000 mm
Material thickness	0,65 – 0,70 – 0,80 – 1,00 mm
Packaging	on pallets of approx. 1.000 kg

Other sizes and thicknesses are available on request.

3.3 Gutters

The NedZink standard gutter (box gutter and suspended gutter) has been a reliable Dutch, quality product for many years. With a NedZink standard gutter not only the material is KOMO certified, the dimensions are also KOMO/KIWA certified. All NedZink standard gutters feature a unique NedZink embossed stamp on the front of the gutter, directly under the bead. This brand label guarantees it is a genuine top quality, NedZink product.

Standard gutters: Suspended gutter M30, M37 and M44 in NATUREL, NOVA, NEO and NOIR
Box gutter B30, B37, B44 and B55 in NATUREL, NOVA, NEO and NOIR

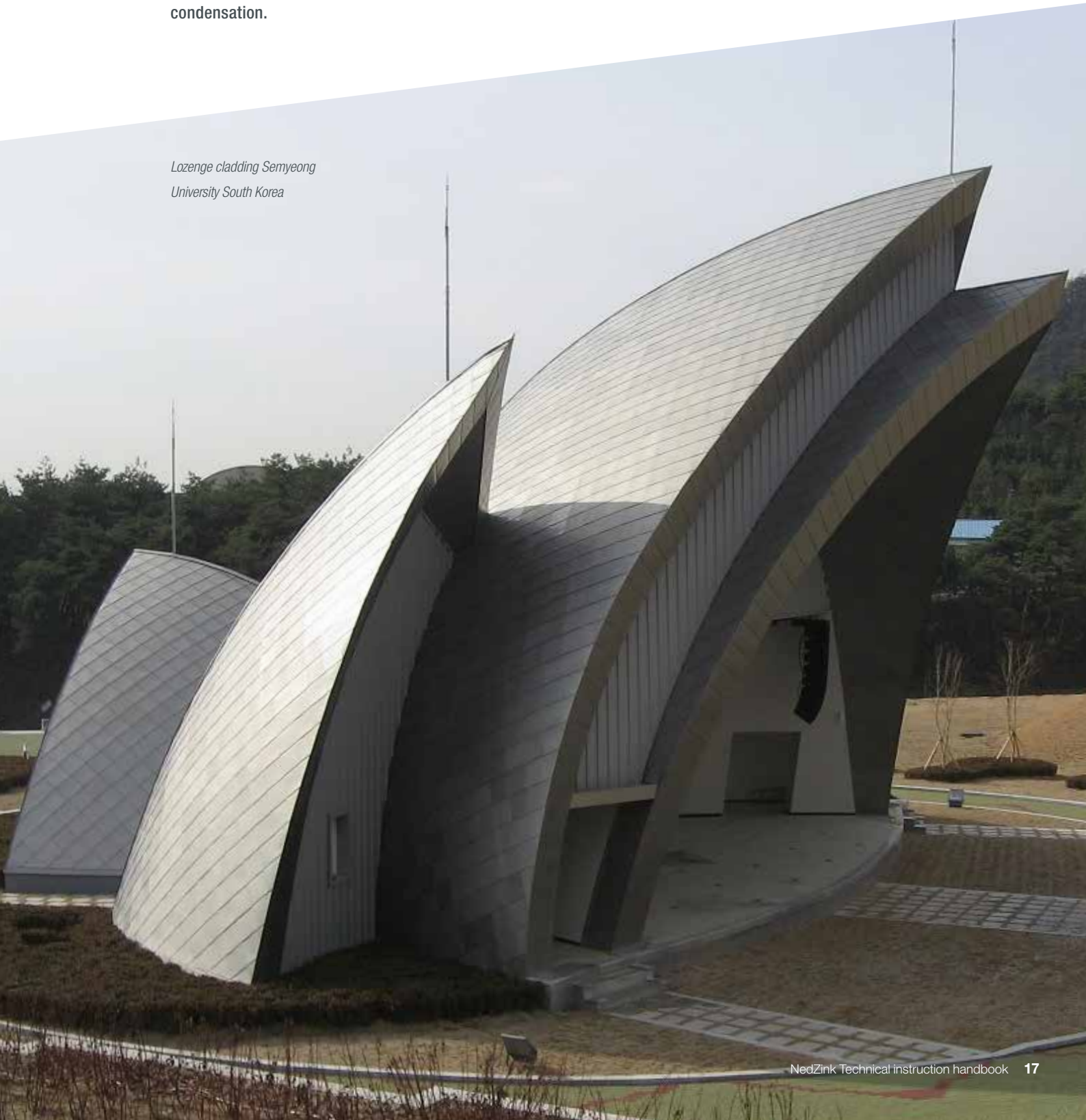
3.4 Downpipes

The NedZink rainwater downpipe has been a reliable Dutch, quality product for many years. At NedZink the material as well as the dimensions, including the fit, are KOMO guaranteed. The NedZink rainwater downpipe is guaranteed to be dimensionally stable, quick and easy to mount and also has an extremely long lifespan. All NedZink rainwater downpipes feature a stamp on the exterior showing the KOMO quality label and certificate number.

4 Building physics

A lifespan of between 75 and 100 years is no exception for titanium zinc on a façade or roof, provided it has been properly fitted. However, building physics plays a major role in this lifespan.

Condensation of vapour against the backside of a titanium zinc construction can cause serious corrosion if certain conditions are not met. Thus it must be ensured that there is sufficient ventilation on the backside of the zinc surface if no other measurements are taken to prevent condensation.



Lozenge cladding Semyeong University South Korea

For *non-insulated* roofs it is enough to support the zinc with a wooden roof deck consisting of rafters and timber boarding. The boarding is placed with a 5 mm gap between the boards. To decrease the capillary action due to contact with the board, the boards should be unplaned. If, however, plywood decking is used to support the zinc covering for example, it is advised that a vapour-permeable layer be placed between the plywood and the zinc to prevent corrosion. Although nails are commonly used because of their fast assembly, the fastening with screws is preferred, because their pull-out resistance is greater.

For *insulated, ventilated* roofs and façades the risk of internal condensation is bigger than for those that are insulated, non-ventilated because the difference between the internal and external temperature is on average larger than for non-insulated constructions. To prevent condensation in these cases, a vapour barrier in combination with a ventilated cavity is necessary.

For an *insulated* construction without ventilated cavity, a so called 100% vapour-tight system is essential to prevent condensation problems.

In general the substrate must meet the following requirements:
- to have an excellent dimensional stability
- to be designed in such way that it can also serve as a work floor for the roofer
- to allow a firm and durable anchoring for the fastening clips of zinc roofing and cladding
- to be chemically inert to the roof covering or cladding when it comes into contact
- to have a regular sloping and flat surface that is sufficiently rigid and not dented

4.1 Vapour Transmission

Formation of condensation water: how condensation water is formed structures are stressed not only by mechanical forces but also by the physical aspects of a building, such as fluctuating temperatures, which may vary between - 20 °C and + 80 °C, and differences in air humidity on the inside and outside.

Temperature curve and water vapor pressure in a ventilated façade

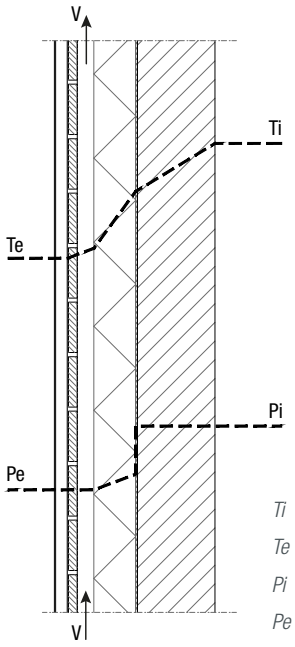


Figure 4.1

Temperature curve and water vapor pressure in a ventilated roof

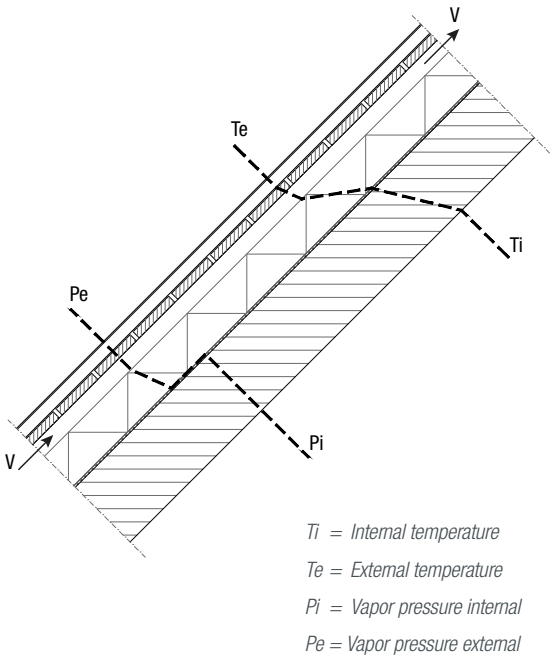


Figure 4.2

In the most common, where the internal temperature (Ti) is higher than the external temperature (Te), it is generally also found that the air humidity is greater on the inside than the outside.

The difference in vapour pressure (Pi - Pe) causes vapour to be transported through the roof structure from the inside to the outside. If the roof is not constructed properly, condensation or frost will form on the inside of the relatively cold titanium zinc.

Damage and prevention

Excessive condensation can be harmful in a number of ways. For example, it can damage the titanium zinc on the backside as the result of corrosion, or lead to moisture damage on parts of the supporting structure (corrosion, wood rot or mold). Totally sealing the roof on the inside is not the answer: this cannot be done in practice, and in terms of moisture regulation in a building it is generally not desirable. In order to achieve the desired movement of vapour and to avoid the risk of damage, two main steps must be taken:

A. Fit a damp control course on the inside of the thermal insulation.
B. Include a gap on the external side of the thermal insulation to permit ventilation by external air.

A. Diffusion layer

This layer is necessary:

1. To let through just enough vapour, but not too much, to remove excess vapour from the building (e.g. vapour produced by the occupants). We recommend the selection of a material which prevents the transmission of vapour, having a minimum µ.d (or Sd) value of 10.
2. To make the structure draught-proof and prevent air from the interior from flowing directly into the ventilation cavity. The cavity is in direct contact with the external air, meaning an unpleasant current of air could flow into or out of the structure through any cracks or gaps.

The diffusion layer is not needed in all cases, e.g. where the structure beneath the ventilation cavity already has a vapour resistance value greater than 10. In such cases, however, the ventilation gap and the air apertures must correspond to the values given in the table, and protection must be provided to seal any cracks between the ventilation gap and the interior air space.

B. Ventilation cavity

The ventilation cavity must be open to the external air via ventilation apertures at the lowest and highest points of the façade or roof. The air must be able to flow between apertures without major obstacles. The required dimensions for the gap and the apertures are detailed in the following table.

Pitch	Minimum width of ventilation	Minimum cross-section of ventilation apertures top and bottom per m² of roof surface area
3° tot 20° *	80 mm	40 cm²
> 20°	50 mm	30 cm²
90°	20 mm	20 cm²

* The exact height of the ventilating cavity is considered per situation.

Table 4.1

4.2 Ventilated Construction

The quality and service life of a roof or façade covering made of titanium zinc depends firstly on the design and execution of the roof. If the roof or façade is not constructed properly, condensation or frost will be formed on the backside of the titanium zinc. In principle, the construction of a roof with a titanium zinc covering is, in building physics terms, the same as that of a façade.

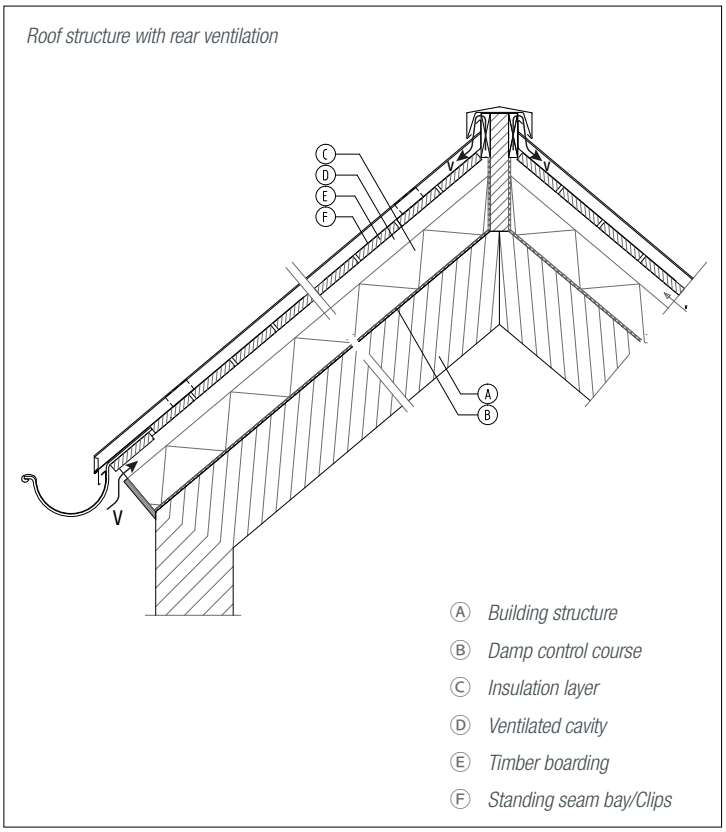


Figure 4.3

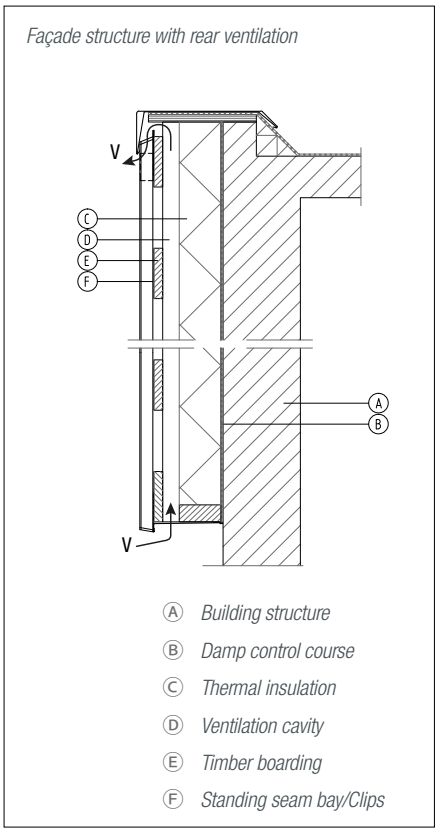


Figure 4.4

Therefore, this chapter exclusively concerns roof constructions with a slope of between 3° and 90°. Flat or almost flat roofs with a pitch of less than 3° should, if possible, not be covered with titanium zinc unless the surface area is smaller than 15 m², for example over dormer windows and canopy roofs.

The components are identified from inside to outside:

1. Ceiling - any type, although it must be able to support the insulating material, or have the insulation attached to it.
2. Damp control course made of metal or plastic film.
3. Supporting rafters - generally made of wood.
4. Insulation slabs, matting or foam between the rafters. It is even better if they can be made to run across under the rafters, although a different construction is required for this. The thickness of the insulating layer depends on the material used and the degree of insulation required.
5. Ventilated cavity: thickness depends on pitch of roof (see table 4.1).
6. Timber boarding: If titanium zinc is to be used, the preferred type of timber is unplaned, untreated boards no less than 22 mm thick. The boards should be arranged horizontally without tongue and groove, and there should be a 5 mm gap between the boards.

Pitch	Minimum space	Maximum space
3° tot 20°	5 mm	10 mm
21° tot 45°	5 mm	22 mm
46° tot 75°	5 mm	44 mm
76° tot 90°	5 mm	100 mm

Table 4.2

Assemble the wooden parts in such a way that the clips can be arranged at the desired location. The nail heads must be well sunk to prevent contact with the zinc. Use thermally galvanised nails with a zinc layer thickness of at least 20 microns or stainless steel.

7. NedZink titanium zinc in the form of the chosen roofing type. The principal options are:
   - the standing seam system
   - the roll cap system
   - the lozenge system

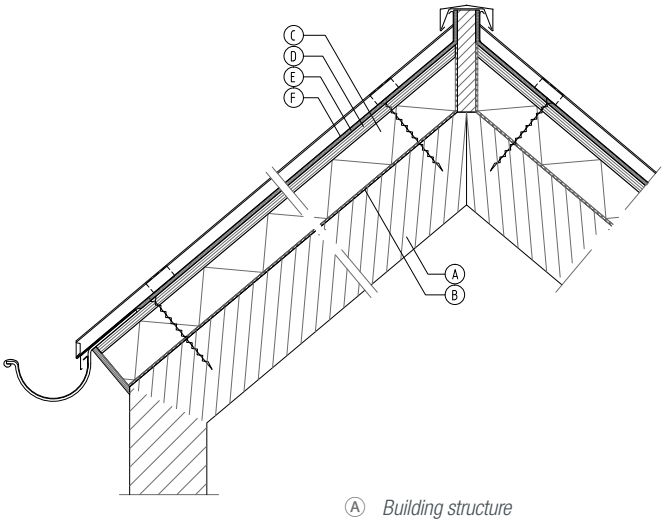
4.3 Non-ventilated Construction

Increasingly, the designer wants to achieve a slim roof package, making it different from the traditional structure with a relatively high ventilated cavity. Also, with the renovation of roofs, the thickness of the total package can be a problem. The choice is on a non-ventilated, vapour-tight system with the advantage of a slimmer design.

What is a non-ventilated structure?

A non-ventilated structure is a roof and façade construction with no ventilation or air cavity. Thermal insulation followed by a roof covering system is fitted to the support structure. This produces a single-layer, non-ventilated structure. This concept is highly suited to sloping roofs and façades with zinc. To avoid the formation of condensation the structure must be 100 % damp proofed! Internal condensation or condensation resulting from nocturnal temperature drops, do not form in this construction either. This represents a major difference with a traditional cold roof system. When building this structure the preference is for a damp-proof system with a μ.d (or Sd) value of at least 150 meters.

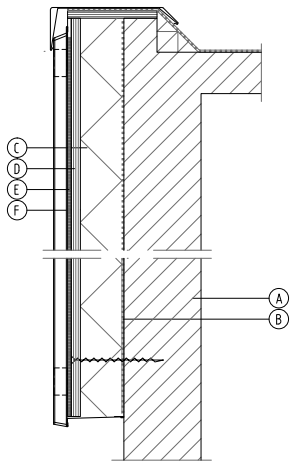
Non-ventilated roof structure build-up



Ⓐ *Building structure*
Ⓑ *Damp control course μd ≥ 150*
Ⓒ *Insulation layer*
Ⓓ *Plywood panel, thickness 22 mm*
Ⓔ *Separating layer*
Ⓕ *Standing seam bay/Clips*

Figure 4.5

Non-ventilated façade structure build-up



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Ⓑ *Damp control course μd ≥ 150*
Ⓒ *Insulation layer*
Ⓓ *Plywood panel, thickness 22 mm*
Ⓔ *Separating layer*
Ⓕ *Standing seam bay/Clips*

Figure 4.6

Risks of a vapour-tight construction

In the application of vapour-proof systems, risks are present that may affect the functionality and longevity:

- Mutual seams that are not properly taped
- No rigid substructures
- Making penetrations at a later time, which can cause leaks
- Leaks that may occur through careless installation and detail mistakes

4.4 Products for non-ventilated constructions

NedZink Pro-Tec

To reduce the risks involved in non-ventilated systems we recommend using NedZink Pro-Tec. NedZink Pro-Tec is process-based compiled titanium zinc, available as NOVA, NEO, NOIR and bright-rolled zinc with a protective layer on the rear for applications especially in damp-proof systems. The protective layer is a two-layer polymer lacquer system that lowers the risk from damage to the zinc caused by water vapour and other substances.

Please note: if condensation issues occur during construction the zinc will not be affected, but the condensation could have drastic consequences for the construction and the insulation values to be achieved.

Breather membrane

A breather membrane is used underneath zinc roofing and is vapour-permeable, water-resistant and airtight. It allows condensation beneath the zinc layer to drain away and minimises material stress by permitting a degree of movement between the roofing and the timber structure.

Separating layer/-foil

- *Structured separating layer*
  When a separating layer is part of the construction, a structured separating layer can be used. The resulting airspace is used for gradual drying small amounts of moisture still present directly under the zinc surface. It also decreases the possibility of rear side corrosion of the zinc material. The cavity is not comparable with the ventilation space used in a ventilated construction and cannot replace its function! For sound-insulating and sound-reducing properties of the separating layer contact the manufacturer.

- *Structured separating layer with foil*
  This is a vapour permeable waterproofing barrier that can be installed as a separating layer between zinc roofing or cladding and the supporting substructure. The material has an outer layer of polypropylene mesh bonded to a vapour permeable membrane fleece foil.

  For small coverings with wooden-based panels the layer can be used only for separation, not as a fully functioning ventilation cavity. This cavity is not comparable with the ventilation space used in a ventilated construction and cannot replace it! For more information contact the manufacturer.

Insulation

There is a large variety of insulation systems and materials. Depending on the requirements of the project, application, construction and physical aspects of the building, various materials can be chosen, such as mineral fibers, hard foam, FOAMGLAS®, etc.

Damp control

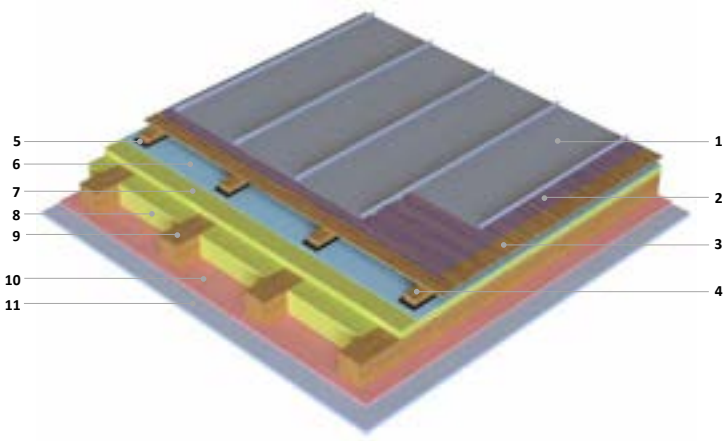
A damp control course must be fitted under the thermal insulation. This screen is designed to make the roof construction airtight and seal it off from the damp produced in the underlying rooms. The damp control course is fitted so that all the seams between the various parts of the damp course, as well as between the damp course and other parts of the building, are airtight. To do so a seal is needed. This can be achieved using a sealant or tape, which may or may not be supplemented by mechanical fixation. If possible, it is desirable to always fit the damp control course on top of the support structure or the battening and on a continuous surface. This can significantly simplify the installation. A damp control course with an Sd value > 150 meters is required.

4.5 Roof substructures

The substructures mentioned in this chapter are examples of used constructions underneath the zinc roofs. The recommendations are guidelines and entirely without obligations, as mentioned in our disclaimer. The construction engineer is responsible for the built up of the substructure and choice of the materials used. As shown in our drawings we recommend NedZink Pro-Tec for non-ventilated substructures to lower the risk of damage to the zinc surface caused by water vapour and other substances.

4.5.1 ROOF VENTILATED SUBSTRUCTURES

4.5.1.1 Substructure with concealed beams

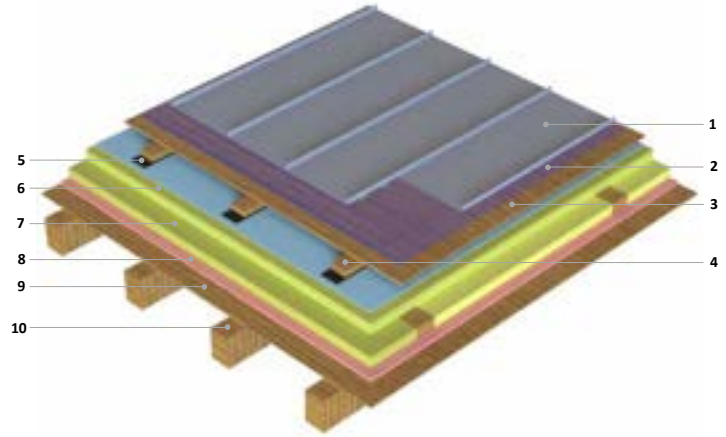


1. *NedZink® Standing Seam Roof System*
2. *Separation Layer thickness 8 mm*
3. *Untreated timber boarding with 5 mm gap*
4. *Ventilated cavity - timber battens on sealant*
5. *Continuous seal*
6. *Breather membrane underlay waterproof*

7/8. Thermal insulation

9. *Structural beams*
10. *Damp control course*
11. *Board decking*

4.5.1.2 Substructure with exposed beams



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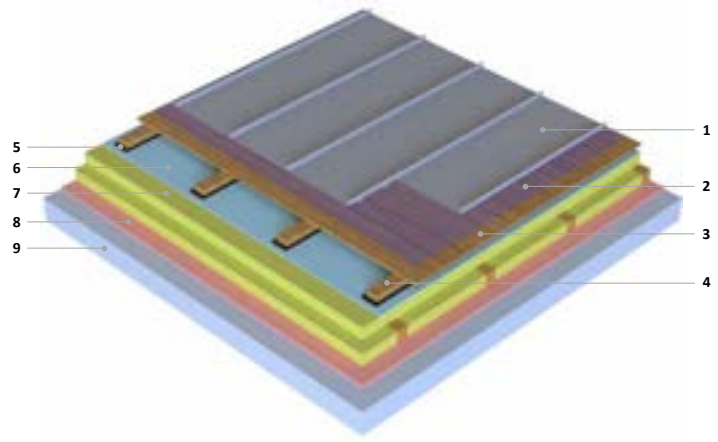
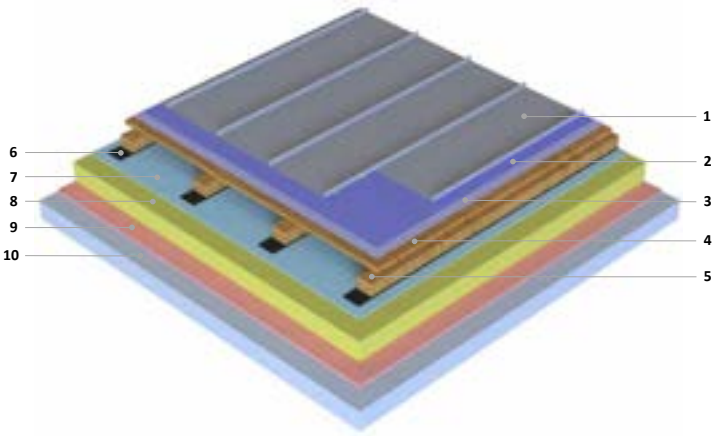
5. *Continuous seal*
6. *Breather membrane underlay waterproof*
7. *Thermal insulation (variable thickness)*
8. *Damp Control Course*
9. *Finishing ceiling*
10. *Structural beams*

4.5.1.3 Substructure with concrete cover slab



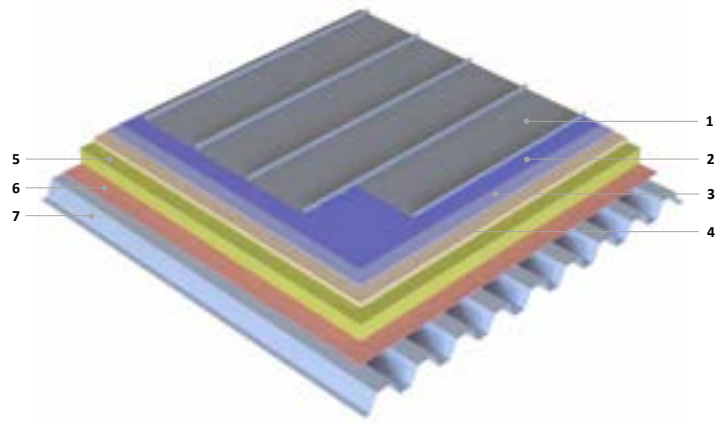
1. *NedZink® Standing Seam Roof System*
2. *Separation Layer thickness 8 mm*
3. *Untreated timber boarding with 5 mm gap*
4. *Ventilated cavity - timber battens*
5. *Continuous seal*
6. *Breather membrane underlay waterproof*
7. *Thermal insulation (variable thickness)*
8. *Damp Control Course*
9. *Concrete Covering*

4.5.1.4 Substructure with wooden panels and battens



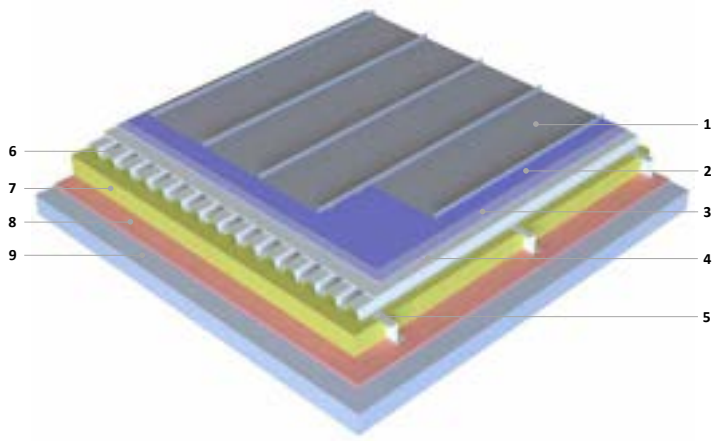
1. *NedZink® Standing Seam Roof System*
2. *Separation Layer thickness 14 mm*
3. *Waterproof membrane underlay*
4. *Wooden panels (f.e. 3-layer wood panel)*
5. *Ventilated cavity - timber battens*
6. *Continuous seal*
7. *Breather membrane underlay waterproof*
8. *Thermal insulation*
9. *Damp Control Course*
10. *Load-Bearing structure*

4.5.1.5 Substructure with wooden cement panels and corrugated sheets



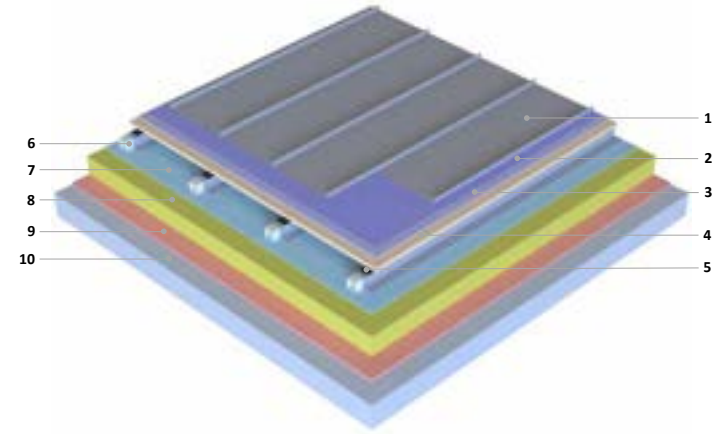
1. *NedZink Pro-Tec® Standing Seam Roof System*
2. *Separation Layer minimum thickness 14 mm*
3. *Waterproof membrane bitumen with aluminum film*
4. *Wood-cement boarding*
5. *Thermal insulation*
6. *Damp Control Course (100% dampproof)*
7. *Corrugated sheet structure and steel*

4.5.1.6 Substructure with metal support with medium/low/high density



1. *NedZink Pro-Tec® Standing Seam Roof System*
2. *Separation Layer thickness 14 mm*
3. *Waterproofing membrane of bitumen with aluminum film*
4. *Metal plate as continuous support*
5. *Support brackets – metal profiles*
6. *Corrugated metal sheet as ventilated cavity*
7. *Thermal insulation with medium/low density*
8. *Damp Control Course*
9. *Load-bearing structure*

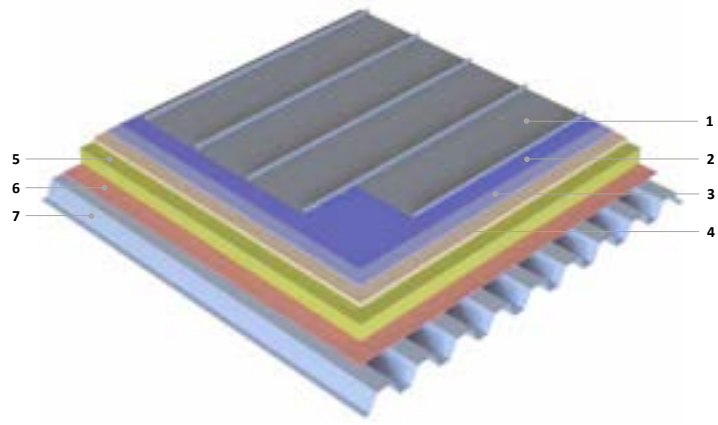
4.5.1.7 Substructure with wood cement panels and profiles



1. *NedZink® Standing Seam Roof System*
2. *Separation Layer thickness 14 mm*
3. *Waterproofing membrane of bitumen with aluminum film*
4. *Wood-cement panel*
5. *Sealant*
6. *Tubulars – metal*
7. *Breather membrane underlay waterproof - fireproof*
8. *Thermal insulation*
9. *Damp Control Course*
10. *Load-Bearing structure*

4.5.2 ROOF NON-VENTILATED SUBSTRUCTURE

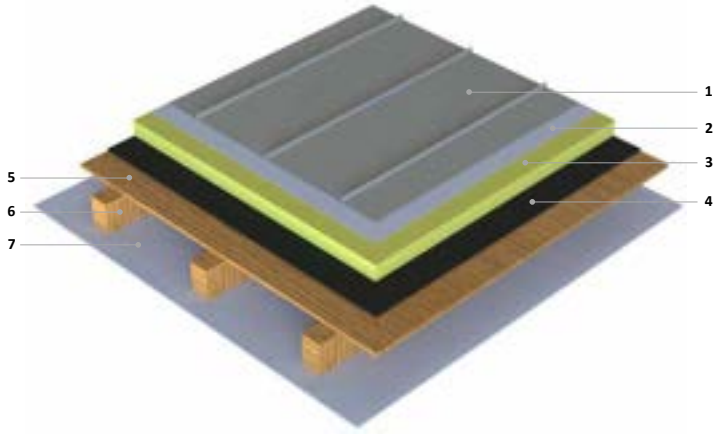
4.5.2.1 Substructure with wood-cement panels



1. *NedZink Pro-Tec® Standing Seam Roof System*
2. *Separation Layer thickness 14 mm*
3. *Waterproof membrane bitumen with aluminum film*
4. *Wood-cement boarding*
5. *thermal Insulation*
6. *Damp Control Course (100% dampproof)*
7. *Corrugated sheet structure and steel*

100% dampproof system required

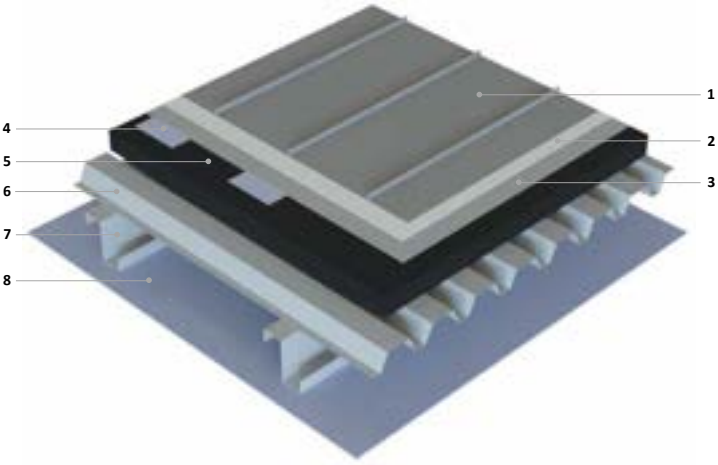
4.5.2.2 Substructure with rigid insulation



1. *NedZink Pro-Tec® Standing Seam Roof System*
2. *Separation Layer thickness 8 mm with waterproof membrane*
3. *Thermal insulation*
4. *Damp control course (Sd-value> 150 mtr) with bitumen and aluminum*
5. *Plywood or steel deck support*
6. *Rafters*
7. *Interior finishing*

100% dampproof system required

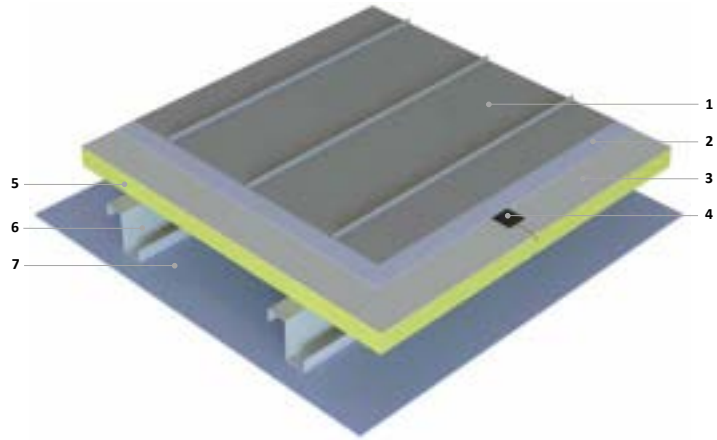
4.5.2.3 Substructure with cellular glass insulation



1. *NedZink Pro-Tec® Standing Seam Roof System*
2. *Separation Layer - polyethylene*
3. *Bituminous membrane*
4. *Galvanised steel plate*
5. *Cellular glass insulation (e.g. FOAMGLAS)*
6. *Steeldeck support*
7. *Metal purlins*
8. *Interior finishing*

100% dampproof system required

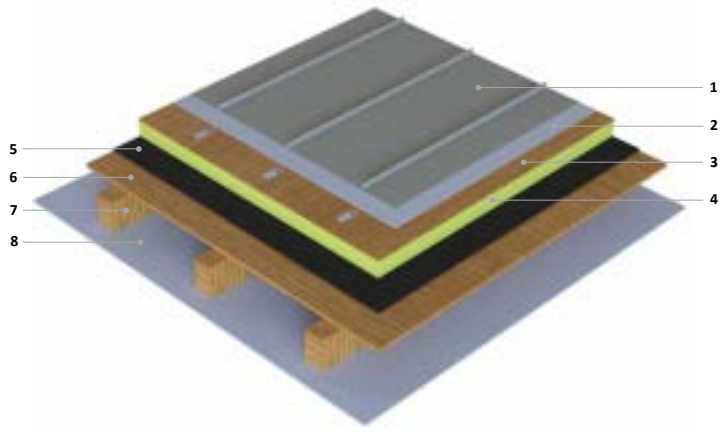
4.5.2.4 Substructure with insulated metal-faced panels



1. *NedZink Pro-Tec® Standing Seam Roof System*
2. *Separation Layer thickness 8 mm with waterproof membrane*
3. *Metal faced 0.7 mm thick layer on insulation panel*
4. *Tape aluminum-faced*
5. *Insulation panel*
6. *Steel purlins*
7. *Interior finishing*

100% dampproof system required

4.5.2.5 Substructure with bonded plywood



1. *NedZink Pro-Tec® Standing Seam Roof System*
2. *Separation Layer thickness 8 mm with waterproof membrane*
3. *18 mm plywood bonded to phenolic insulation*
4. *Insulation panel*
5. *Damp control course (Sd-value> 150 mtr) with bitumen and aluminum*
6. *Plywood or steel deck support*
7. *Rafters*
8. *Interior finishing*

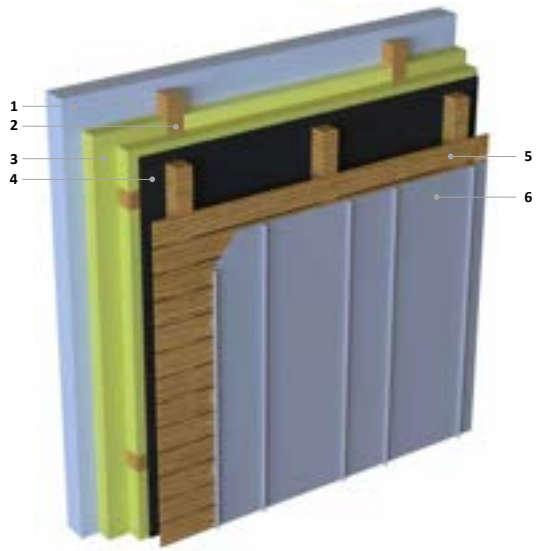
100% dampproof system required

4.6 Façade substructures

The substructures mentioned in this chapter are examples of used constructions behind the zinc claddings. The recommendations are guidelines and entirely without obligations, as mentioned in our disclaimer. The construction engineer is responsible for the built up of the substructure and choice of the materials used. As shown in our drawings we recommend NedZink Pro-Tec for non-ventilated substructures to lower the risk of damage to the zinc surface caused by water vapour and other substances.

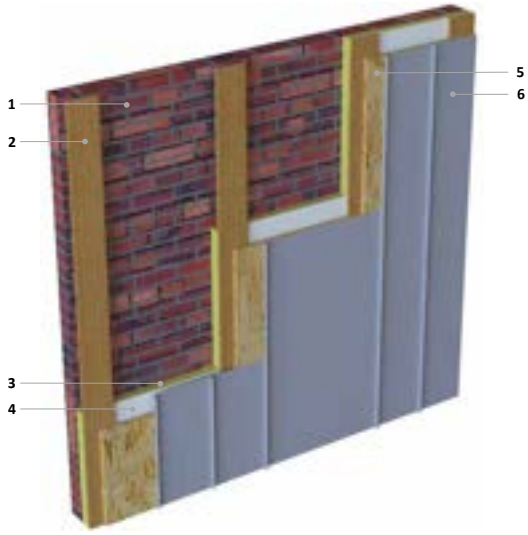
4.6.1 FAÇADE VENTILATED SUBSTRUCTURES

4.6.1.1 Substructure with wooden board and battens



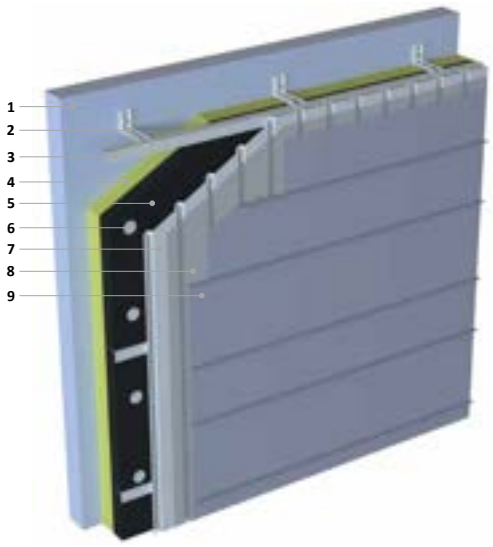
1. *Supporting structure*
2. *Thermal insulation*
3. *Breather membrane waterproof*
4. *Ventilated cavity - timber battens*
5. *Untreated timber boarding with 5 mm gap*
6. *NedZink ® Standing Seam Cladding System*

4.6.1.2 Substructure with bonded plywood



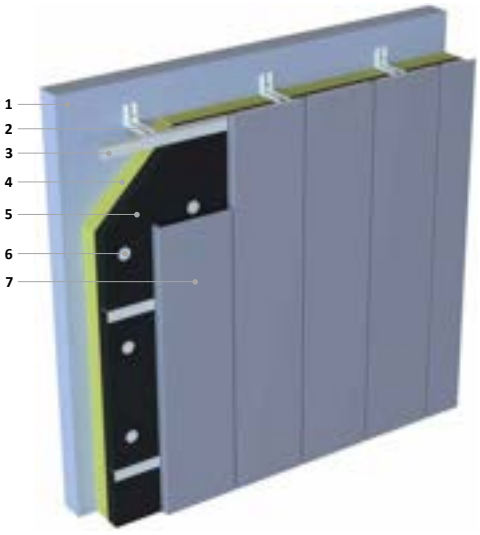
1. *Supporting structure*
2. *Ventilated cavity 38 mm - timber battens*
3. *Insulation panel*
4. *Breather membrane waterproof on insulation*
5. *18 mm plywood (or steel deck)*
6. *NedZink Pro-Tec® Standing Seam Cladding System*

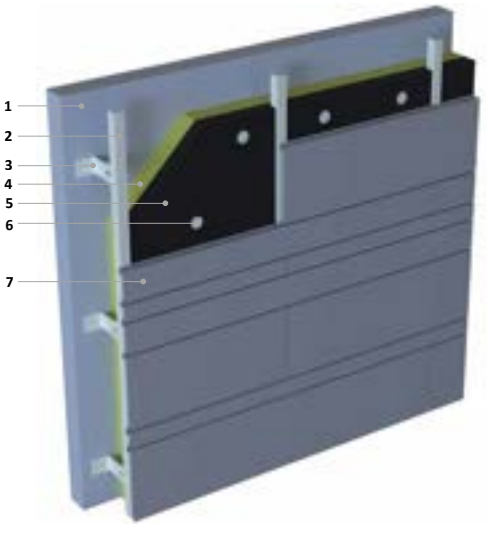
4.6.1.3 Substructure with steel deck



1. *Supporting structure*
2. *Brackets*
3. *Horizontal profiles*
4. *Insulation panel (high density)*
5. *Mineral film on insulation panel*
6. *Fixing system insulation panel*
7. *Corrugated metal sheet*
8. *Separation Layer - waterproof membrane*
9. *NedZink® Standing Seam Cladding System*

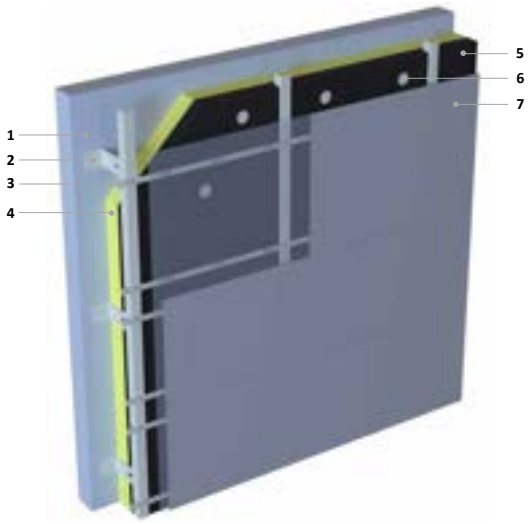
4.6.1.4 Substructure with vertical/horizontal profiles and metal brackets





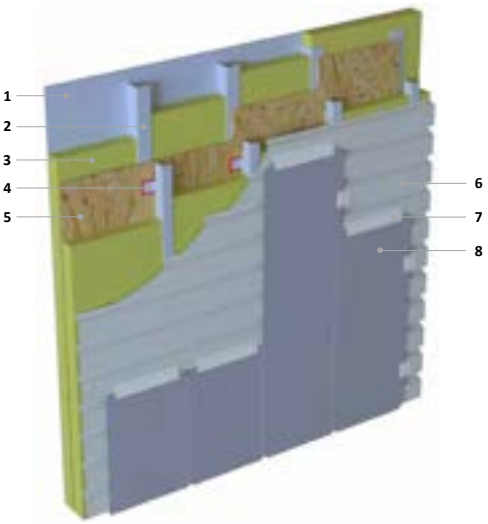
1. *Supporting structure*
2. *Brackets*
3. *Horizontal or vertical profiles*
4. *Insulation panel (high density)*
5. *Mineral film on insulation panel*
6. *Fixing system insulation panel*
7. *NedZink® hor/vert Panel Cladding System*

4.6.1.5 Substructure with vertical + horizontal profiles and metal brackets



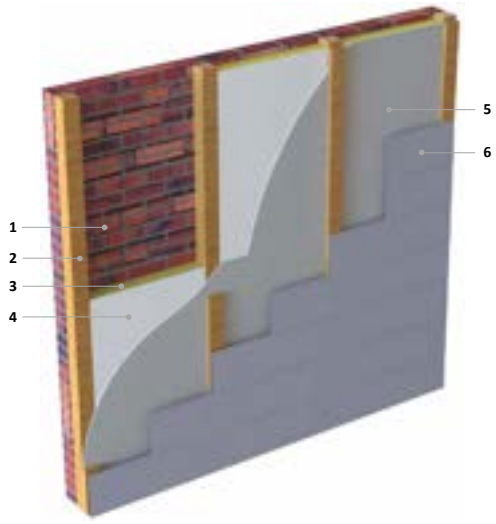
1. *Supporting structure*
2. *Brackets*
3. *Support system with vertical profiles*
4. *Horizontal profiles*
4. *Insulation panel (high density)*
5. *Mineral film on insulation panel*
6. *Fixing system with thermal cut screws with wide head*
7. *NedZink® Cassette Cladding System*

4.6.1.6 Substructure with corrugated steel deck



1. *Backside structure*
2. *Supporting structure*
3. *Insulation panels (high density)*
4. *Sealant fixed supporting profiles*
5. *Plywood panel*
6. *Corrugated metal sheet 38 mm cavity*
7. *Fixed system clips*
8. *NedZink® Flat Lock Cladding System*

4.6.1.7 Substructure with vertical timber

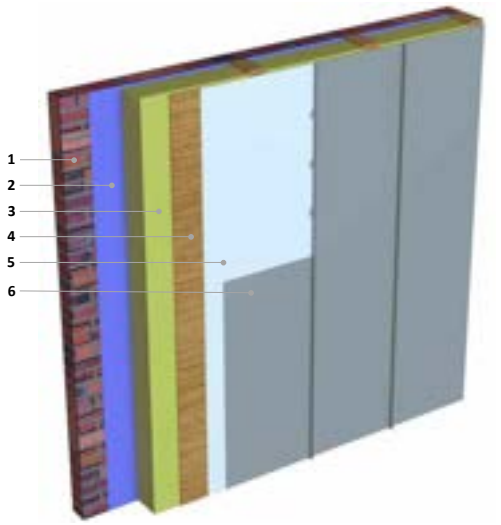


1. *Supporting structure*
2. *Timber Battens - ventilated cavity 38 mm*
3. *Insulation panel*
4/5 *Breather membrane waterproof*
6. *NedZink Pro-Tec® Overlapping System*

4.6.2 FAÇADE NON-VENTILATED SUBSTRUCTURES

As shown in our drawings we recommend NedZink Pro-Tec for non-ventilated substructures to lower the risk of damage to the zinc surface caused by water vapour and other substances.

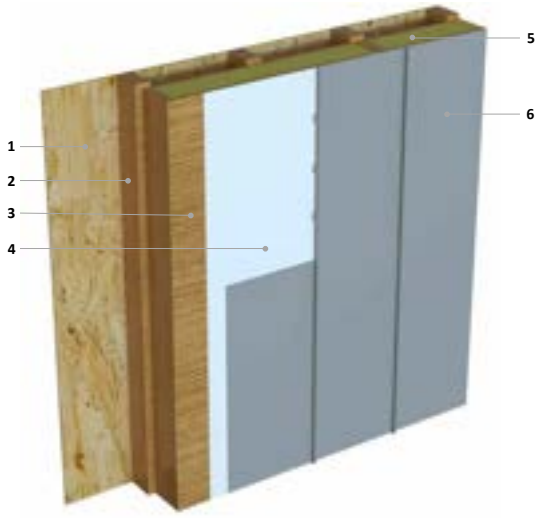
4.6.2.1 Substructure with insulation and bonded plywood



1. *Supporting substructure*
2. *Damp Control Course*
3. *Insulation panel*
4. *Plywood or OSB panel*
5. *Breather membrane waterproof*
6. *NedZink Pro-Tec® Standing Seam Cladding System*

100% dampproof system required

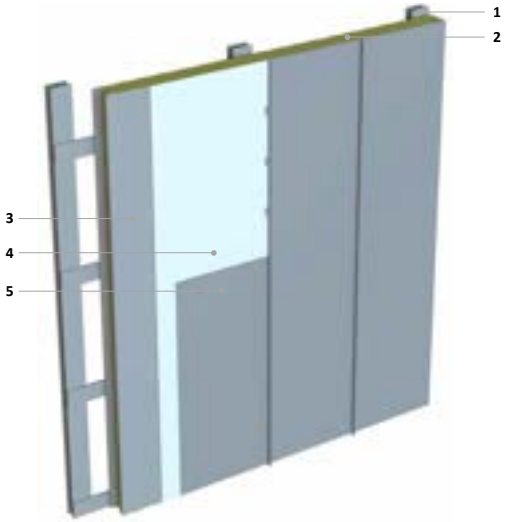
4.6.2.2 Substructure with wooden sandwich panel



1. *Supporting structure*
2. *Timber battens*
3. *Wooden sandwich panel*
4. *Plywood or OSB finish on panel*
5. *Breather membrane waterproof*
6. *NedZink® Standing Seam Cladding System*

100% dampproof system required

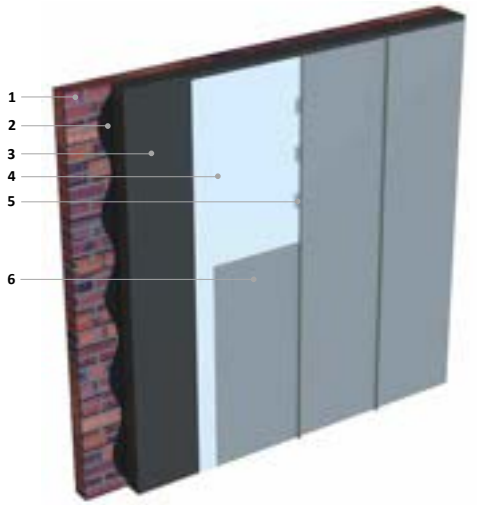
4.6.2.3 Substructure with insulation with metal top sheet



1. *Metal substructure*
2. *Sandwich insulation panel*
3. *Metal top layer on panel*
4. *Breather membrane waterproof*
5. *NedZink® Pro-Tec Standing Seam Cladding System*

100% dampproof system required

4.6.2.4 Substructure with cellular glass insulation



1. *Supporting substructure*
2. *Bonding film layer*
3. *Cellular glass insulation (e.g. FOAMGLAS)*
4. *Breather membrane waterproof*
5. *Foamglass cramps and standings seam clips*
6. *NedZink Pro-Tec® Standing Seam Cladding System*

100% dampproof system required

4.7 Patina layer zinc

NedZink NATUREL is a durable and aesthetic material that in the course of time develops a unique charm by the progressive patination of roof and façade cladding. The patina layer originates by the formation of a zinc carbonate base, which forms an oxide skin that is also a natural protective coating. This process starts under the influence of the weather conditions. It has a natural course, so the full grey shade is obtained after one to four years.

$Zn + O_2$	→	$ZnO + H_2O$	→	$Zn(OH)_2 + CO_2$	→	$ZnCo_3$
Zinc + Oxide	→	Zinc oxide + Water	→	Zinchydroxide + Carbonoxide	→	Zinc carbonate

The surfaces of the bright rolled zinc reacts with the oxygen in the air to form a zinc oxide layer. In the next step the zin oxide reacts with water from the humid air or rain to form zinc hydroxide. This then reacts with CO^2 from the air to form the stable compound zinc hydroxyl carbonate.

Back side corrosion

Insufficient ventilation capacity or leakage in a damp proof built up will cause corrosion on the zinc surface. NedZink Pro-Tec with a backside coating is resistant to condensation.

A risk remains where the water permanently remains standing. The drainage of condensation water is necessary and correct application of the vapour barrier is decisive for the expected properties of NedZink Pro-Tec.

The effect of back side corrosion on zinc.

White rust corrosion

White rust corrosion is an attack on the zinc surface on the outside of the material, for example on cover strips, roofs and gutters. White rust corrosion occurs in particular with new zinc that has not yet formed a dense patina layer. The chemical process that creates the protective patina layer does not proceed completely. The effect of carbon dioxide on the air from outside is not possible. This can happens because, for example, a considerable amount of water has remained on the zinc or if stored zinc has become wet (moisture between plates or profiles). As a result, the patina formation remains in the zinc hydroxide stage. The result is a white deposit on the zinc, or white rust corrosion.

Remove the white deposits by means of a brush, stainless steel sponge or with a sander. Please note that the patina layer will also disappear, causing a difference in appearance with the surrounding material. White rust corrosion can be prevented by protecting the zinc against rain and/or moisture during transport and storage and by applying it with a gradient of at least 3°.

Salt deposition

In a maritime climate, the salt in the air and/or water can react with zinc and form zinc chloride on surfaces that do not get rinsed off by rainwater. This appears as permanent white patches. These white patches do not have any impact on the functionality of the zinc and do not cause corrosion.
In the absence of rain or on surfaces sheltered from rain, it is necessary to clean these areas regularly with (warm) water.
NedZink is not responsible for the effects of salt deposition.

4.8 Zinc in different Environments

Zinc is used all over the world, in all types of climate conditions. In hot, cold and wet areas as well as near the sea and inland. Because of the material properties zinc almost needs no maintenance especially when the rinsing effect of rainwater performs its task naturally.

For a protected façade or soffit stains may occur when not rinsed with (rain) water. Therefore the dark types of zinc on a non-rinsed surface should be taken in consideration during design. In coastal areas near the sea (1 km) the risk of staining in these areas increases. These stains will have no effect on the functionality of the zinc material.

Project Hermanus coastal area South Africa

4.9 Noise and wind Load

Metal roofing can produce excessive noise in the event of extreme hail or heavy rain. Applying a separation layer for sound insulation can diminish these effects. The separation layer ensures a reduction of 8 dB and can be supplied in different widths.

The requirements for the wind loads that a Dutch building construction must meet are described in the NEN standards of the Dutch Standardization Institute (NEN). The research organization, TNO has derived calculation rules from these norms for zinc roof systems. They concern rules for establishing the wind load as well as methods for deducing the strength.

For a fully supported structure, such as the traditional standing seam, roll cap or shingle roof, one mainly has to counter any wind suction that occurs. For self-supporting constructions, wind pressure, the structure's own weight and consequently the deflection of the material play a role. In addition, the fixation method as well as the profiling (system option) of the material are

important. The wind suction affecting a façade or roof section depends on the shape and dimensions of the building, the slope of the roof and the location of the roof covering.

Zinc roof coverings and wall claddings are attached to the substructure by means of clips. The clips of the standing seam and roll cap system are located on the longitudinal seam between the bays. The clips of the lozenge system are locked in the folded edges of each lozenge. For flat roofs with soldered sheet coverings the clips are placed underneath the soldered joint. The clips are often made of titanium zinc, but can also be made from stainless steel, galvanized steel or aluminum. Roof and wall coverings that consist of bays mainly are attached with fixed and sliding clips.

4.10 Fire safety

Protection against fire spread differs from country to country. Therefore the text below is only informational. The assessment with regards to fire safety for zinc roof coverings and façade claddings must always be carried out by an expert.

In most cases fire regulations are drafted for residential buildings above 6 storeys, which will affect fully supported traditional cladding systems where plywood and timber boarding are not acceptable.

Protection against fire spread

In general there are three specific fire spreading scenarios for the building façade system:

- due to a nearby fire source from the outside by direct exposure to flames or radiation;
- due to radiation from the outside f.e. flying embers from an adjacent building;
- due to fire inside the building expanding through the openings in the façade

The fire-fighting designer defines the technical requirements of the façade according to the type of building, the intended use, the expected fire loads and the distribution of the compartments.

It is preferable to use non-combustible materials on the façade. If there are combustible materials, it is possible to limit the spread of fire on the façade by inserting strips of non-combustible material, in compliance with current regulations.

In case of a fire, temperatures of 900 °C can be reached at the windows and, without sufficient protection, the flames could penetrate the ventilated cavity. The use of fire barriers lowers the risk of fire spread.

Zinc Properties

In general NedZink titanium zinc is classified as Euroclass A1 building material of EN 13501-1. Euroclass A1 is the 'non-combustible' class. Keep in mind that if soldered zinc is used, the connections separate at temperatures of 180 °C and higher. Zinc sheet material deform and melt at 420 °C.

General information built up façade

A façade construction is built from diverse building materials, and each has a particular fire class. The construction must comply with a fire class according to EN-13501-1. When determining the fire class of the façade construction as a whole, the different materials, the structure of the construction, fire compartments, etc. must be taken into account. Therefore the assessment to determine if the façade construction complies has to be done by an expert on the basis of standards f.e. EN 13501-1.

A zinc façade built up frequently has a ventilated cavity, the materials used are directly exposed to fire via this cavity. All individual materials, which usually have different fire classes, must at least comply with fire class D. In the event that a façade has to comply with fire class B, only the wooden structure (f.e. timber boarding) does not meet these requirements. As an alternative to these timber boardings, a galvanized steel panel with coating (or an aluminium trapezoid panel) with an aluminium supporting structure can be applied.

Limitation of fire spread

In Europe the building code sets requirements for the limitation of fire penetration and fire spread (Resistance to fire for 30 or 20 minutes) between spaces, determined according to standards. When using zinc cladding the fire spread is mainly caused the so called 'chimney effect' by the ventilated cavity.

Provisions are needed to make the façade fire-safe according to the standards.
There are several options the safety expert can choose from:

- Fire barriers dividing the cavity into compartments to prevent rapid fire spread.
  These fire barriers foam up at high temperatures and blocked the ventilated cavity.
- Fire barrier insulating panels made of high density fireproof insulating materials
- Metal fire barriers made of galvanized steel or stainless steel, blocking the fire spread in the cavity.

Disclaimer

This NedZink editorial is strictly informative. Claims of all kinds referring to this information are excluded. Liability remains unaffected. The assessment with regard to fire safety of a façade must always be carried out by a Fire Safety Expert at all time.

Royal Theatre Carré in Amsterdam

4.11 Solar applications on a zinc roof

Assessment required.

When solar panels are installed on roof cladding, it is necessary to check and document the existing types of fixing. Verify if these are compatible with the overload brought by the solar panels and their substructure. Not only the static load is important, but also the dynamic forces such as wind uplift. An assessment is needed to determine the actual consequences of the extra installed solar panels and the load-bearing capacity of the roof.

Mounting systems.

Screwing or drilling into the zinc roofing is not recommended. The penetrations can cause water leakage and corrosion problems. For the standing seam system normally standing seam clamps are used that directly attach to the double locked seam, without perforations in the roof built up.

In all cases contact the supplier of the solar panels to install these clamps in the appropriate way. NedZink is not responsible for the use of solar panels and its assembly on a zinc roof.

Thermal expansion in relation to the solar panels.
The zinc material expands and contracts significantly due to temperatures changes. When using clamps that are directly mounted on the standing seam the movement the zinc system underneath must be taken into account. Rigid mounted solar panels without any thermal compensation will cause problems to the PV system and the zinc roofing. This will cause to leading long-term damage.

Conclusion solar application
Zinc roofs can be combined with solar panels successfully with the right technical approach. It is essential to work with experienced installers familiar with metal roofs and to select materials and methods that protect the zinc roof and the solar panels. Normally zinc roofs are low-maintenance, but adding a solar system introduces new components that require occasional inspection. Protection against lightning and fire protection should also be taken into consideration.

5 Recommendations

To maintain the durability and appearance of zinc sheets and coils, it is essential to follow the recommended guidelines for handling and storage.

5.1 Handling and storage

Handling

NedZink bright-rolled and pre-weathered material must be transported under dry and ventilated conditions. Avoid contact between the zinc surface and moisture during handling and transportation. Provide abrasion protection when transporting, avoid tight stacking and transport covered material on dry pallets.
Due to the acidity of perspiration, fingerprints may become permanent blemishes if not removed quickly. When handling the NedZink material during transportation, fabrication and installation it is advised to wear gloves.

Storage

The zinc must be adequately packed to avoid damage during transportation. NedZink products must always be transported in dry and ventilated conditions. The coils and sheets must be protected against transportation damage (scratching, denting). NedZink material must be stored in a dry and ventilated area and protected against damage and especially against excessively high air humidity. Outdoor storage is not recommended.

5.2 Maintenance

Standard maintenance

NedZink material requires very little maintenance. The rinsing effect of rainwater is often sufficient enough to the surface in normal condition. Precautions can be followed such as regular inspection of the material surface and soldering. Deposits and foreign matters like leaves should be removed, especially in gutters to allow the rain water to flow freely. Prevent standing water in flat gutters and ensure a regular dry gutter surface. The maintenance is normally done by the owner at a regular base after the installation work has been completed. For gutter a frequency of two times per years is recommended.

Surface cleaning

Most of the zinc surfaces will be rinsed by rainwater, so extra cleaning will not be necessary. However, it is possible to wash the zinc with warm water and a mild detergent. The surface of the material must always be cleaned in the direction of the grain of the metal. Pressure washers are not recommended. Rinsing with clean water afterwards is advised. It is always advisable that a small test area is cleaned and left for 24 hours prior to proceeding to a larger area.

Foot traffic

Reduce walking on zinc surfaces to a minimum. For maintenance use ladders, scaffolding and other equipment to prevent traffic on zinc. It will cause footprint, punctures or deformation of the joints and soldering. If frequent inspections are necessary for installation on roofs, consider adaptive arrangements.

Scratches

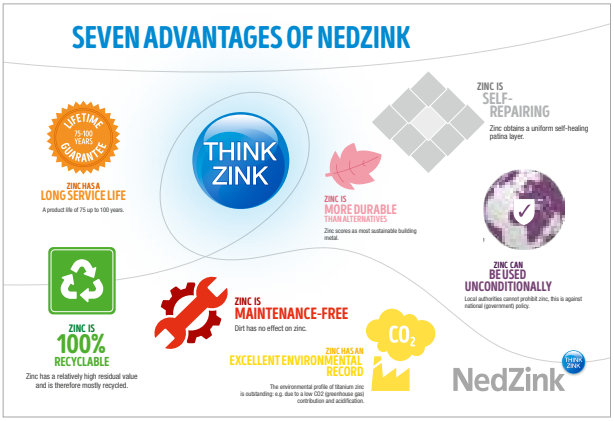
Zinc has a self-healing nature. We recommend that small scratches be left to heal on their own.
A natural patina layer will be formed when the surface is in contact with humid air. Paint is not recommended because this will always stay visible.

Fingerprints

By wearing work gloves during processing and installing fingerprints on the zinc surface can be prevented. If fingerprints appear during installation, know that the prints will disappear due to the formation of the patina. Removing the fingerprints on natural zinc can be done with cleaning oil.

On the pre-weathered NedZink NOVA, NedZink NEO and NedZink NOIR an Anti-Fingerprint coating is applied to prevent fingerprints during installation and to optimize machine processing. This AFP gives the material a slightly shiny surface, which will disappear over time.

The NedZink coils can also be delivered with a temporary self-adhesive PE-foil for additional protection of the surface during the application. This film protects the surface from damage and contamination during assembly or subsequent work. The protection is only functional when the film is not damaged. The adhesion of the film can be stronger in colder periods of the year. This protective film should be removed as soon as possible after installation. The temperature of the zinc should be at least 7 °C.



5.3 Titanium zinc and other materials

Titanium zinc is a material that can be easily combined with other materials. Yet there are a number of materials that require extra attention.

Roofing materials
Bitumen-based roofing materials are based on petroleum with modifications, known as APP and SBS modified bitumen. These will partially break down (SBS to a lesser extent) into soluble substances under the influence of sunlight (UV rays). These substances are carbolic acids, which increase the acidity of the rainwater. When this water then runs off over the zinc, the zinc will severely corrode.

For most plastic roofing materials there are no problems with zinc and the substances discharged. However, PVC roofing materials can have problems with chlorine binding discharges (softeners) that damage the zinc. Corrosion only occurs if the roofing is applied on top of the zinc and rainwater runs over the zinc.

Copper
Copper is more precious (great difference in potential) than zinc. The electrochemical potential between zinc and copper means that copper cannot be used above zinc. If it is, the zinc will quickly degrade (electrochemical corrosion). Corrosion also takes place if the two substances come into direct contact. If water flows from copper to zinc, the zinc (the weakest metal) will be damaged. Rain water flowing from a metal with a high electrolytic potential to a metal with a lower electrolytic potential must be avoided.

Lead
The potential difference between zinc and lead is small and therefore there should be no difficulties in using those metals together. Partly because of the patination of zinc and lead, a transition zone is created, making the potential difference almost equal. We do recommend treating lead with patination oil immediately after assembly. This will prevent the lead from leaving marks on the zinc. To prevent damage when using lead flashing in a zinc gutter, use of a plastic separation layer, such as EPDM rubber, is recommended.

Thatched roofs
Zinc cannot be used under a thatched roof because it will be corroded by the humus acids that leach out of the reed. The zinc literally dissolves. Zinc is used for ridges, chimneys (above the thatch) and roof penetrations so water does not run off the thatch on to the zinc.

Wood types
It is prohibited to use woods with incompatible tannins above zinc elements (eg façade in incompatible planks or panels placed above zinc). The leaching of the wood and tannic acids and / or wood treatment products can cause damage of the zinc, spots on the patina or discoloration. Your timber supplier will inform you if the impregnated wood you have chosen, compatible with zinc. Incompatible woods are larch, oak, chestnut, white and red cedar, Douglass fir and all woods with a pH value <5.

Preferably do not use the following in direct contact with zinc:

- **Plywood**: build-up of veneer layers that have been glued together (water-tight). If condensation were to form between the plywood and the zinc, the moisture would damage the zinc after long-term exposure.
- **Preserved wood**: check which preserver has been used on the wood with the applier. Wood preservatives can also give run-off marks.
- **Western Red Cedar** used in an untreated form leaches over time. It contains corrosive substances that can damage the zinc. This only causes problems if the wood is applied above the zinc and water runs off over the zinc.

Compatible woods are pine, spruce, scot pine and poplar.

Types of glue
A precondition for gluing zinc is to use an elastic non-silicone-based glue, which does not contain any acidic substances. The glue must be elastic to deal with expansion and contraction. Types of glue that are not recommended are: acidic silicones and epoxies, urea/melamine glues and phenol formaldehyde glues.

Mineral building materials
Mineral construction materials are used in great quantities in construction, such as fresh concrete, calcium, lime, plaster, gypsum, cement and mortar. They can damage zinc in combination with moisture. We recommend applying the zinc as late as possible in the building process to reduce the chance of contamination and minimize any damage.

Construction materials and (Fiber cement) slate
Avoid any direct or indirect (run-off water) contact with fresh concrete, lime, bitumen, mortar and all construction materials that may contain substances harmful to zinc. Inform yourself the producer always checks for compatibility with zinc.
It is recommended when (fiber cement) slates are placed above the zinc to contact the supplier of the slates. When possible, negative effects are ruled out, guaranteeing the zinc's lifetime.

Galvanized steel, aluminium and stainless steel
Direct contact is permitted between titanium zinc and galvanized steel, aluminium (anodized or enamelled) and stainless steel. Please note: if galvanized steel wears, rust can occur that will leave marks on the zinc.

Chimneys and plumbing pipes
Smoke deposits from a poorly adjusted heating boiler or a zinc chimney that is not installed according to the standard can cause irreparable damage. Special attention should be paid are added to the fuels heating oil and some woods. Precipitation from a fireplace, stove on wood or coal or other fuels that burn incompatible wood types produce precipitation. The use of a "cap" on chimneys can cause deposits of smoke that is aggressive to zinc. Deposits from sanitary ventilation are usually acidic and can cause aesthetic damage. The most common toilet maintenance products can stain zinc.

Maintenance products
Always use PH-neutral products to prevent damage to the zinc, originating from run-off water from, for example, washing windows or other higher-lying elements. All elements with a PH value <5 will attack zinc.

6 Roofs

Titanium zinc is ideal for roofing both small and large areas. The various systems, such as the standing seam system and roll cap system, can be applied to roofs with a pitch of at least 3° (preferably > 7°). The lozenge system is suitable from a minimum roof pitch of 25°, or 18° when the vertex of the lozenge is soldered.

6.1 Standing Seam Double Lock System

The standing seam system provides a rain-tight roof and façade covering where the pitch is in excess of 3°, preferably > 7°. The single standing seam is used for roofs with a pitch steeper than 25° and for façades. For roofs with a pitch angle lower than 25° the double standing folded seam is used.

The standing seam system makes it possible for a roof or façade to be covered with titanium zinc quickly and at reasonable cost. This is because preformed bays are used, and the seams are folded mechanically, reducing manual folding to a minimum. The preformed bays are supplied in custom-made sizes and are locked together on site with a single or double fold, by machine or by hand. Aside from straight bays, curved (convex and concave) and tapering bays can be made easily. The bays are secured to the substructure by means of fixed and sliding clips (see figure 6.1.1).

With a standing seam roof, the zinc bays are connected in the longitudinal direction with so-called (double) standing seam. The material thickness is 0.80 mm. The allowable bay width is determined by the wind load and the height of the roof. The advised bay width varies from 330 mm to 530 mm. The advised maximum bay length is 10 meters (thermal movement: 20 mm). When making a selection, think about handling the bays.

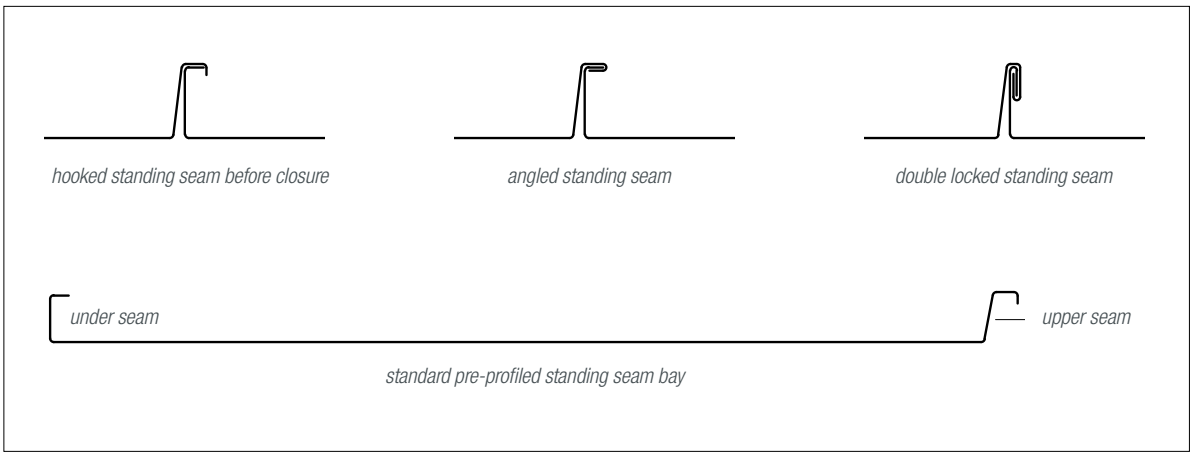


Figure 6.1.1

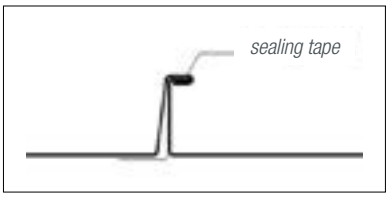
The standing seam can consist of a single or double connection. A single connection forms a less effective water seal and may therefore only be used on roofs with a pitch angle larger than 25°. With fixed clips the cladding is fixed over a one-meter length. Sliding clips are used for the remaining length of the roof bay. The location of the fixed clips depends on the pitch angle of the roof. The relationship between the location of the fixed clip and the pitch angle is shown in figure 6.1.5. Fixed clips ensure that the standing seam bays don't slip. Bays up to 3 meters long can be fully secured with fixed clips. For lengths greater than 3 meters the bay is secured with fixed clips over a length of one meter, and the rest with sliding clips.

Standing seam

The standard height of a standing seam for a profiled seam is 25 mm. A seam height of 38 mm is sometimes used to accentuate shadow formation. The higher seam also offers improved rain proofing in the case of windy conditions.

Figure 6.1.2 Dimensions standing seam bay

To promote the rain proofing aspect of a standing seam roof, sealing tape can be affixed between the seams. This is also recommended for unventilated systems that pose a risk of leakage.



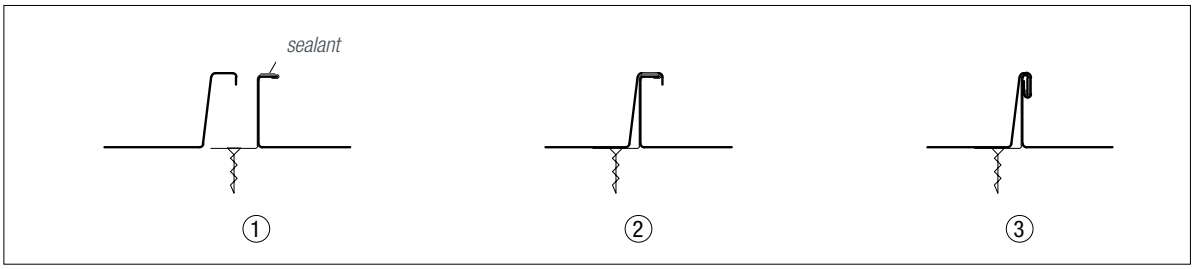


Figure 6.1.3

Fastening the clips

The bays are secured to the substructure by means of fixed and sliding clips (see figure 6.1.4, fixed and sliding clip). The fixed clips secure the standing seam bay and the sliding clips make longitudinal expansion possible. The clip is secured over the lowest standing seam bay and on the sub-construction. Then the top standing seam bay is placed over this and folded shut.

Figure 6.1.4

Support

The standing seam system must be fully supported by unplaned, untreated wooden boards at least 23 mm thick, not tongue and grooved, with gaps of at least 5 mm.

The space between the boards can be larger depending on the pitch of the roof, i.e.

roof pitch up to 45º	5 – 10 mm
roof pitch from 45º - 70º	5 – 50 mm
roof pitch from 70º - 90º	5 – 100 mm

The construction requirements are also important in this. Use galvanised nails with a zinc-layer thickness of at least 20 microns or AISI 304 stainless steel for fastening.

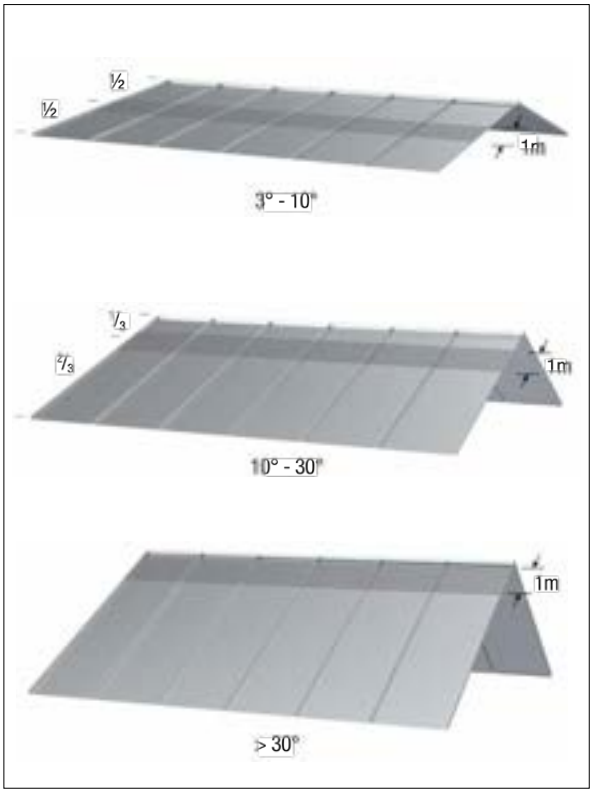


Figure 6.1.5

6.1.1 Technical drawings

For the built up alternatives of the roof structure see chapter 4.5 of this manual.

The technical details in paragraph 6.1.2 are based on the built up of a ventilated substructure as shown below.

The construction of the roof is built up as follows, beginning on the inside:

1. Ceiling - any type
2. Damp control course made from metal or plastic film
3. Supporting rafters - generally made from wood
4. Insulation material according to thermal requirements
5. Ventilated cavity: thickness depends on the pitch of the roof
6. Timber boarding, planed no less than 23 mm, not tongue-and-grooved, installed horizontally with gaps between the boards of at least 5 mm
7. Zinc standing seam system

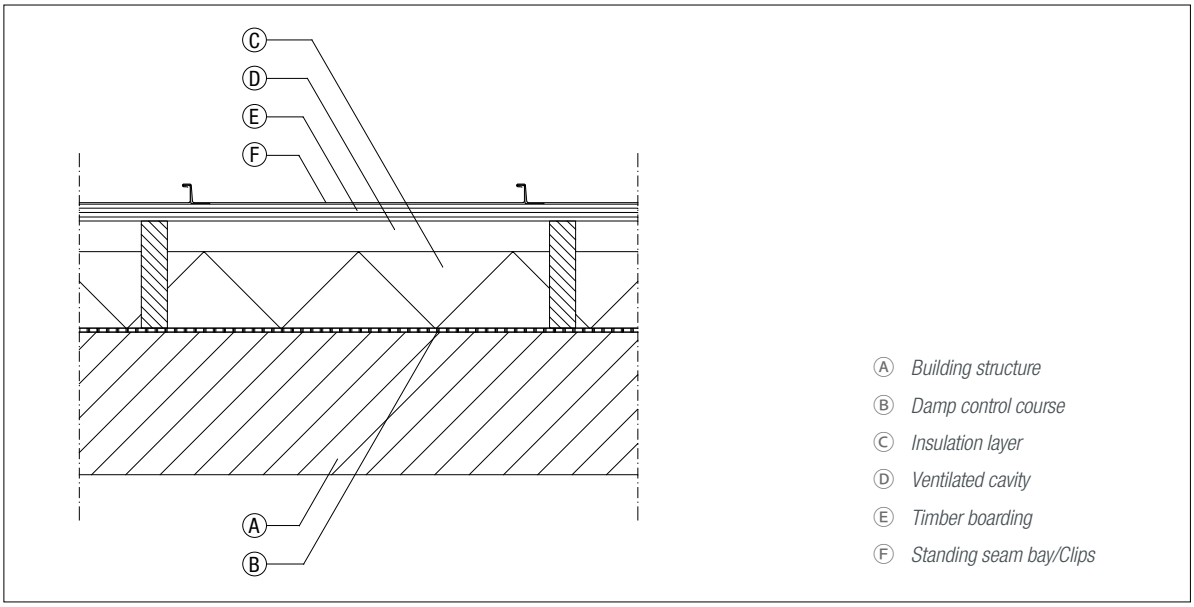


Figure 6.1.6

6.1.2 Standard details standing seam system

Below are some examples of typical details for roofing. These details outline the standard situation and serve as a guideline for applying the standing seam system on a ventilated roof structure.

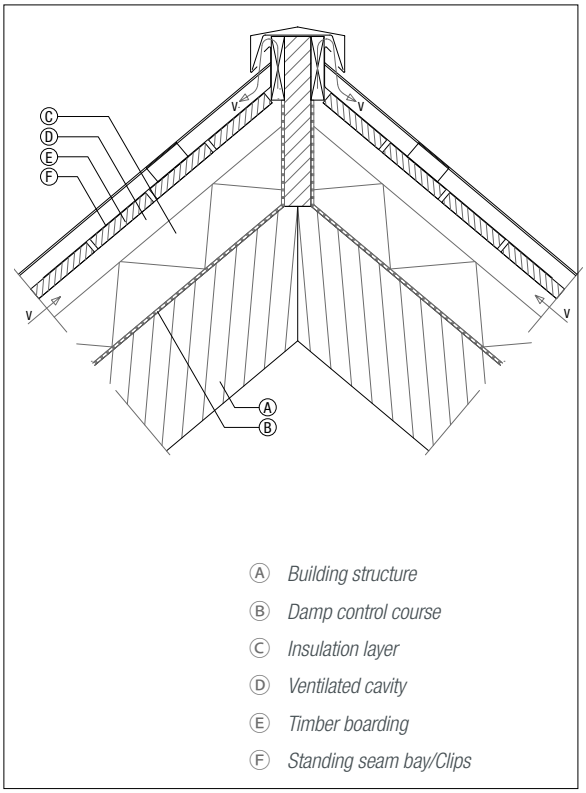


Figure 6.1.7 Ridge detail

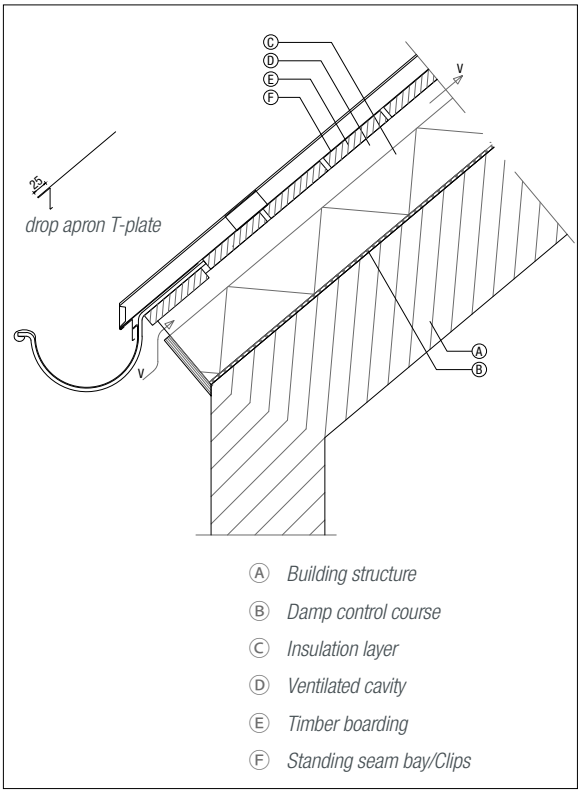


Figure 6.1.8 Gutter detail

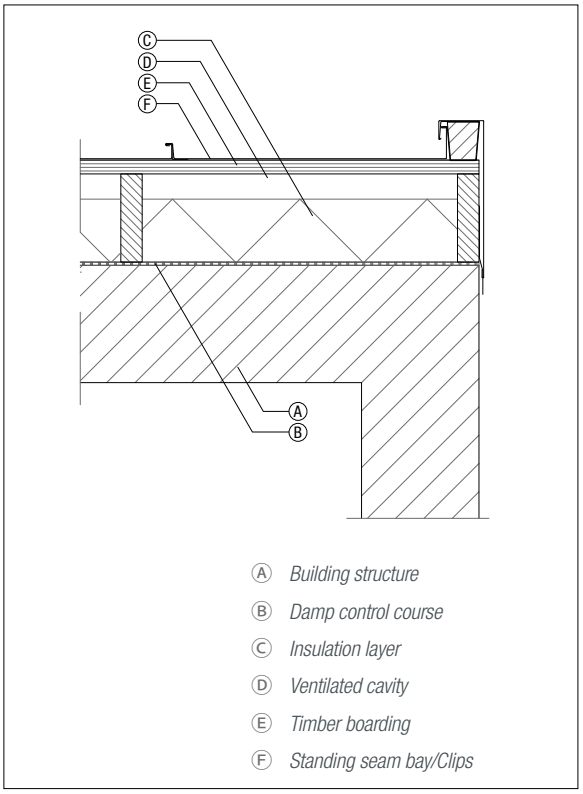


Figure 6.1.9 Batten verge detail

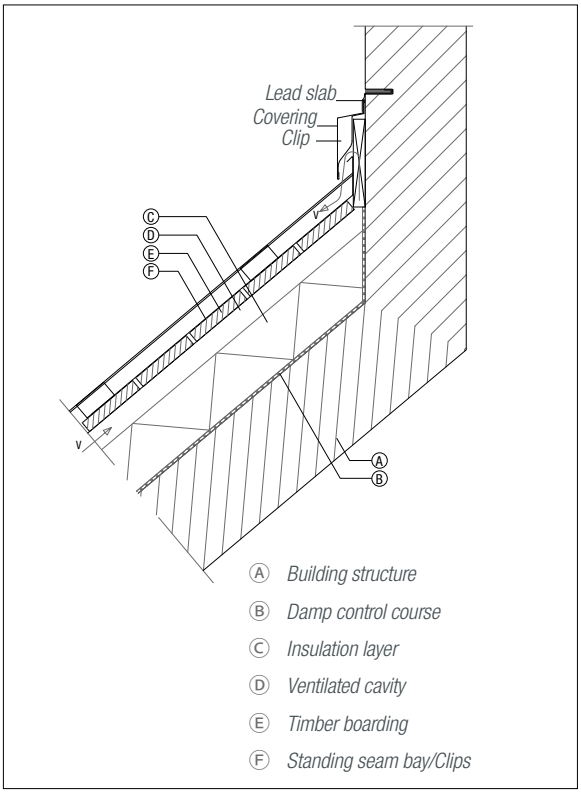


Figure 6.1.10 Wall abutment detail

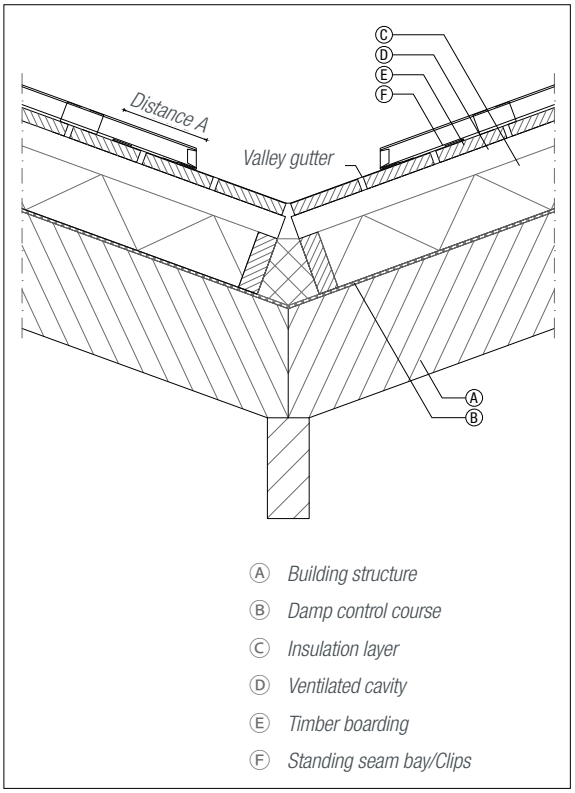


Figure 6.1.11 Valley gutter detail roof pitch > 15°

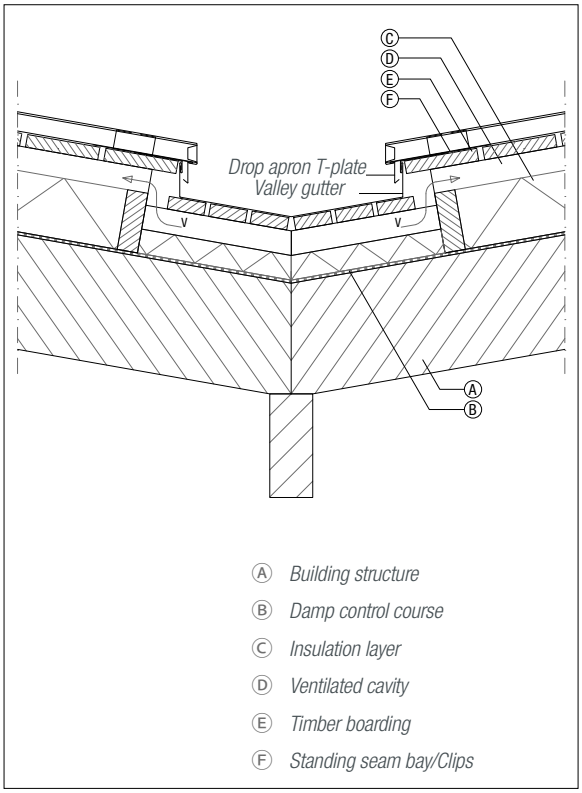


Figure 6.1.12 Valley gutter detail roof pitch < 15°

Private house Valkenburg

6.2 Roll Cap System

The roll cap roof system is suitable for large and small roofs with a pitch of the roof of at least 3°, preferably > 7°, and as façade cladding. The standard NedZink roll cap roof consists of zinc bays with upstands on both sides and separated by trapezoidal wood rolls. Zinc caps are used to cover these wood rolls. This gives the roll cap its characteristic and robust appearance.

A roll cap roof is a cladding that consists of zinc sheets equipped with upstands in the longitudinal direction. Between the bays, so-called wood rolls are installed on the timber boarding. These rolls have a trapezoidal cross section with a width of 40-50 mm and a height of 60 mm. The water tight finishing between roof bays and wood rolls is obtained by a covering profile (roll capping).

Roll cap roofs are installed with clips on the timber boarding. The minimum width of a clip is 50 mm with a minimum sheet thickness of 0.65 mm. Depending on the assembly system, the clip is installed on or under the wood roll. Fixed and sliding clips must also be used with Roll cap roofs. The fixed clips fix the ridge track and the sliding clips allow expansion in the longitudinal direction. For the positioning of the fixed clips, the same rule applies as with a standing seam roof.

Support

The roll cap system must be fully supported by unplaned, untreated wooden boards at least 23 mm thick, not tongue and grooved, with gaps of at least 5 mm.

The space between the boards can be larger, depending on the pitch of the roof, i.e.

roof pitch up to 45º	5 – 10 mm
roof pitch from 45º - 70º	5 – 50 mm
roof pitch from 70º - 90º	5 – 100 mm

The construction requirements are also important here. Use galvanised nails with a zinc-layer thickness of at least 20 microns or AISI 304 stainless steel for fastening.

Standard details

Below are some examples of typical details for roofing. These details outline the standard situation and serve as a guideline for applying the roll cap system on roof structures.

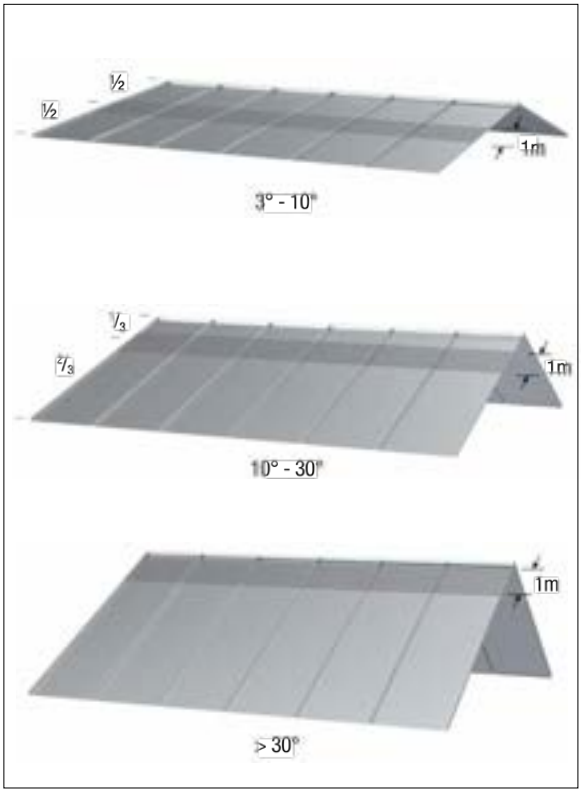


Figure 6.2.1

Figure 6.2.2

Figure 6.2.3

Figure 6.2.4

6.2.1 Technical drawings

For the built up alternatives of the roof structure see chapter 4.5 of this manual.

The technical details in paragraph 6.2.2 are based on the built up of a ventilated substructure as shown below.

The construction of the roof is built up as follows, beginning on the inside:

1. Ceiling - any type
2. Damp control course made from metal or plastic film
3. Supporting rafters - generally made from wood
4. Insulation material according to thermal requirements
5. Ventilated cavity: thickness depends on the pitch of the roof
6. Timber boarding, planed no less than 23 mm, not tongue-and-grooved, installed horizontally with gaps between the boards of at least 5 mm
7. Zinc roll cap system

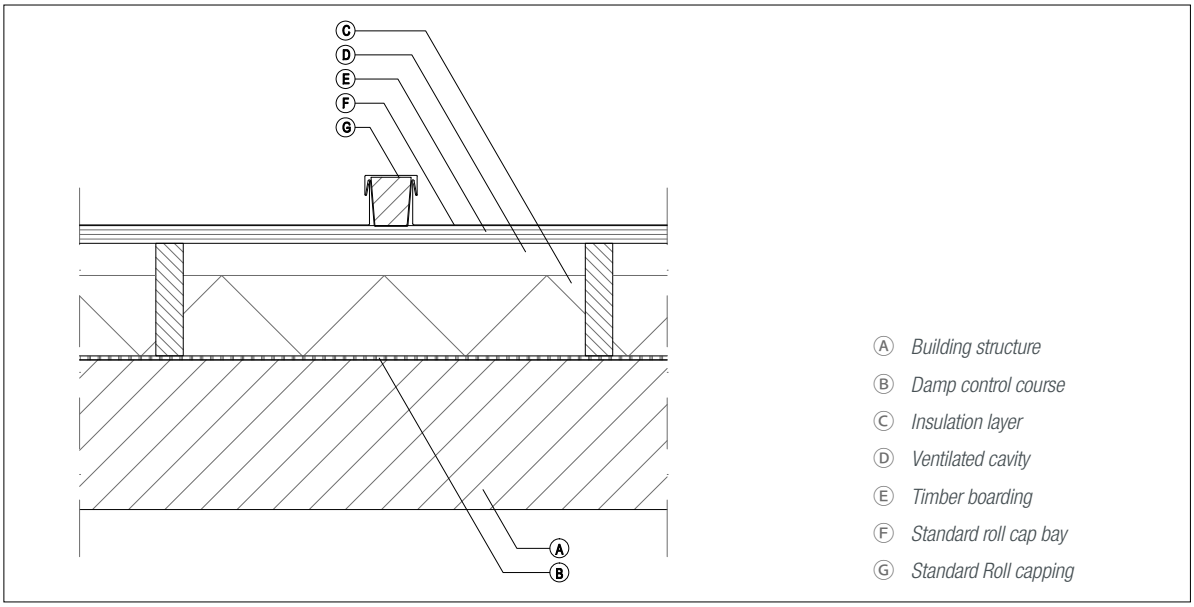


Figure 6.2.5

6.2.2 Standard details roll cap system

Below are some examples of typical details for roofing. These details outline the standard situation and serve as a guideline for applying the roll cap system on a ventilated roof structure.

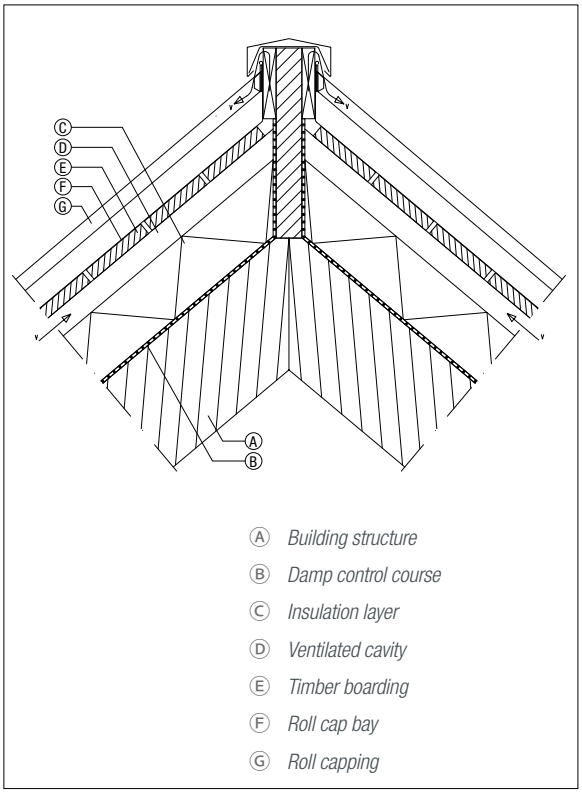


Figure 6.2.6 Ridge detail

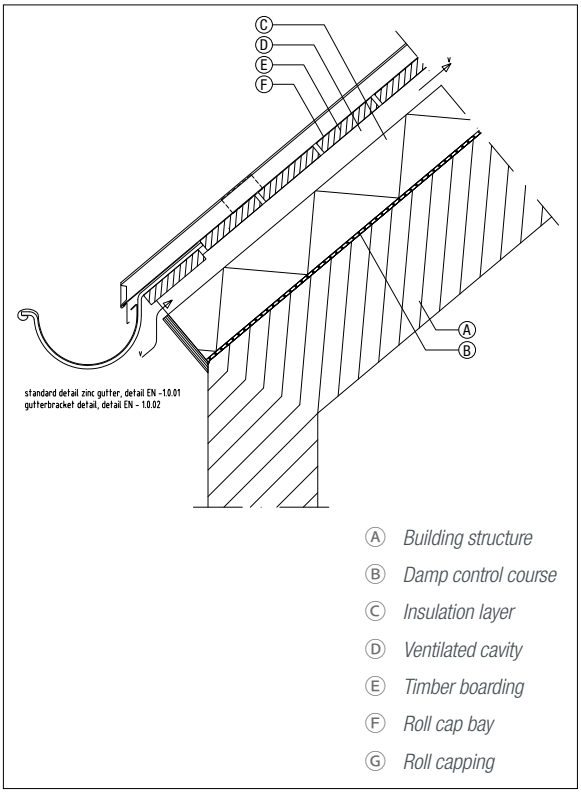


Figure 6.2.7 Gutter detail

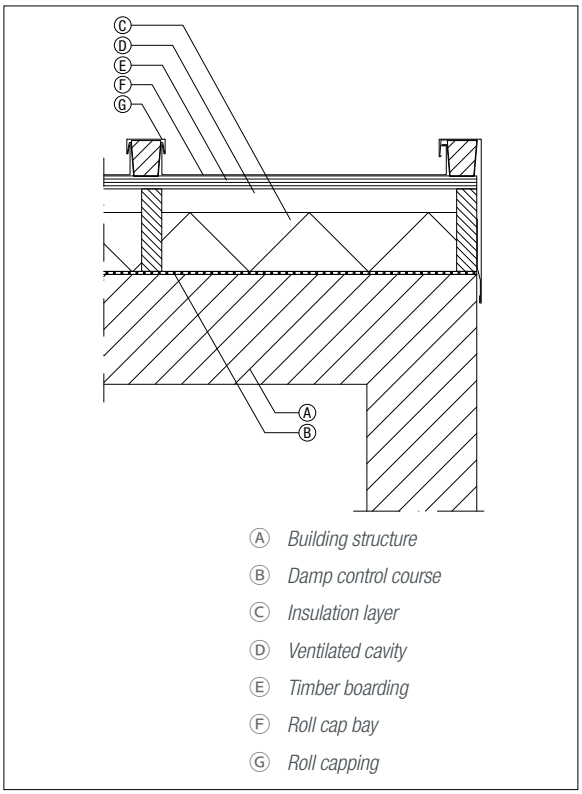


Figure 6.2.8 Batten verge detail

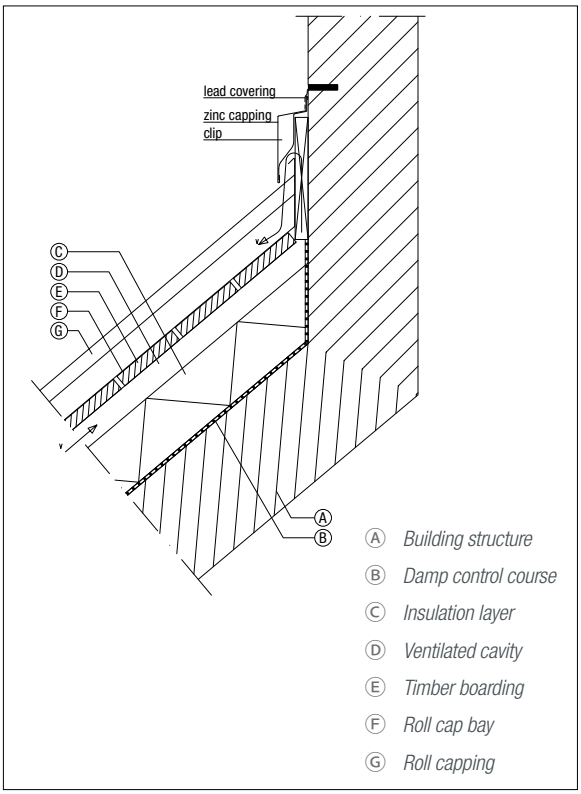
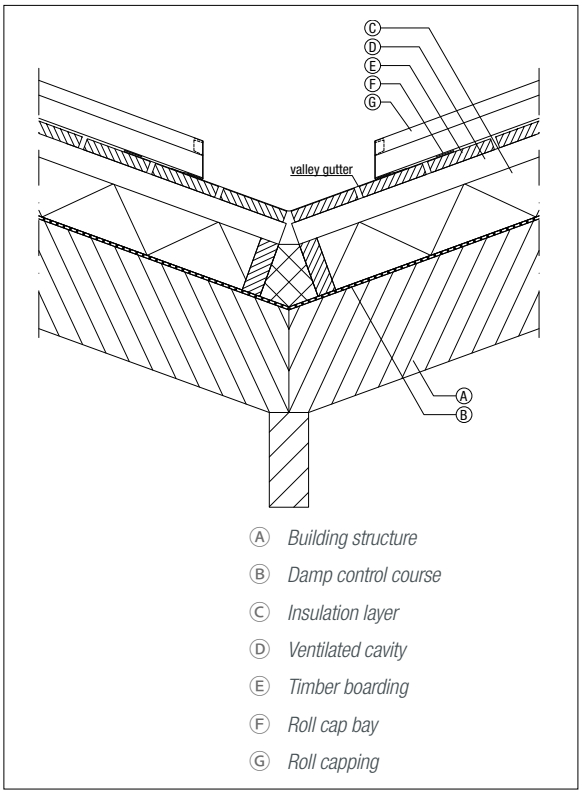
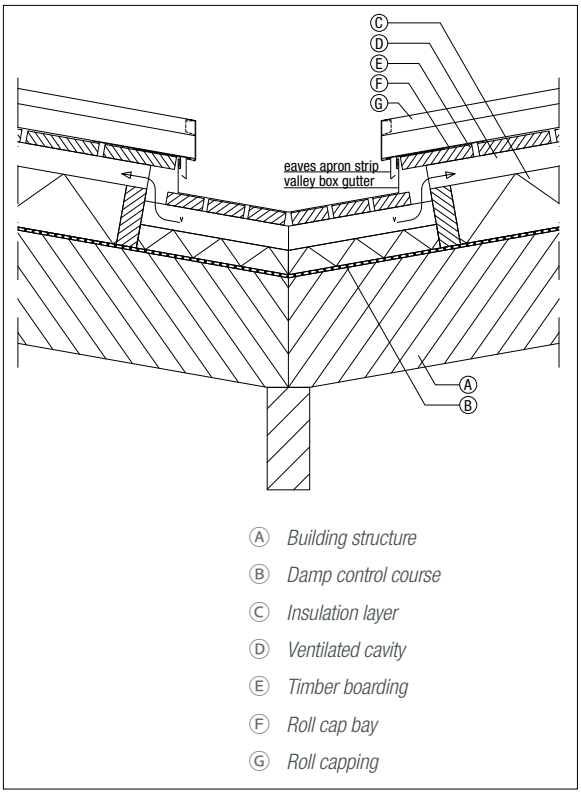


Figure 6.2.9 Wall abutment detail



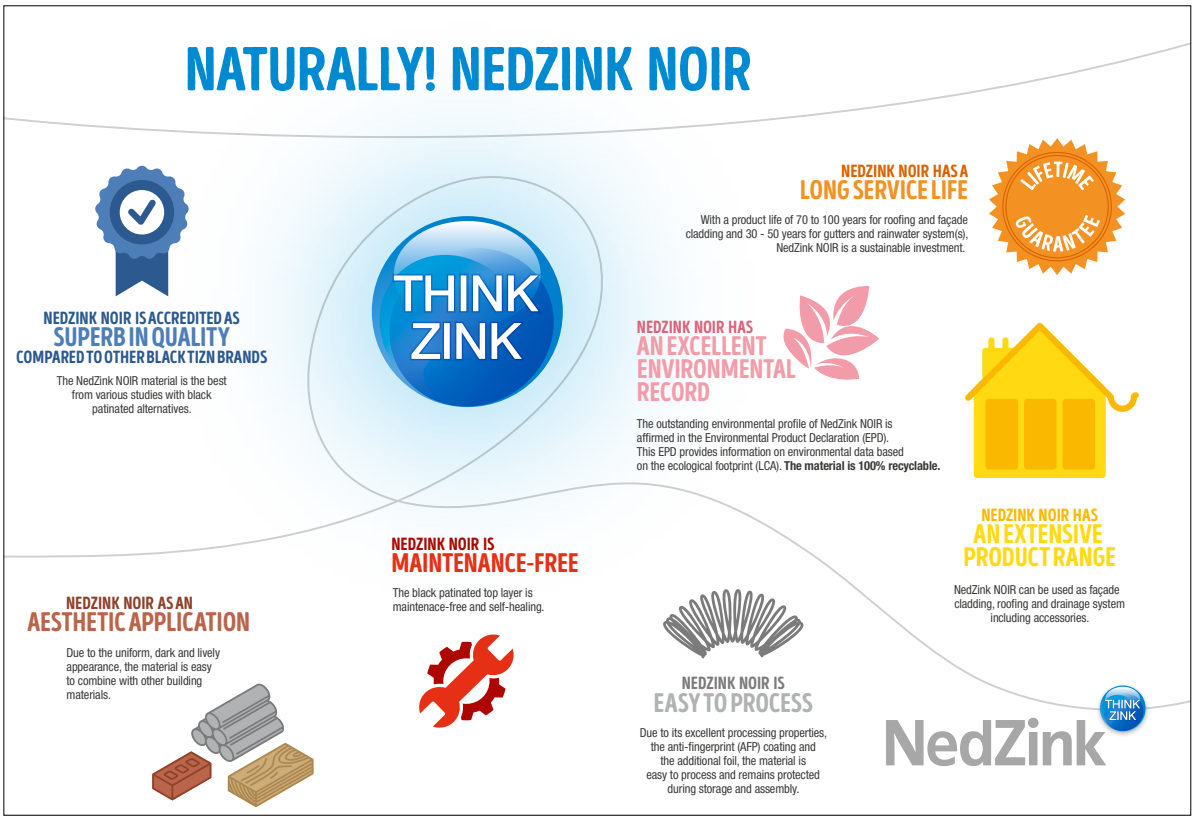
Ⓐ Building structure
Ⓑ Damp control course
Ⓒ Insulation layer
Ⓓ Ventilated cavity
Ⓔ Timber boarding
Ⓕ Roll cap bay
Ⓖ Roll capping

Figure 6.2.10 Valley gutter detail roof pitch >15°



Ⓐ Building structure
Ⓑ Damp control course
Ⓒ Insulation layer
Ⓓ Ventilated cavity
Ⓔ Timber boarding
Ⓕ Roll cap bay
Ⓖ Roll capping

Figure 6.2.11 Valley gutter detail roof pitch <15°



6.3 Lozenge System

The lozenge system is used for covering large and small sloping and vertical surfaces. The minimum pitch of the roof is 25° or 18° when the vertex of the lozenge is soldered. The standard lozenge system consists of small, uniform bent plates which hook onto each other. The most common form of a lozenge is the square, although the rhombus is also used. The square lozenge is discussed in this chapter. In addition to lozenge, the names zinc tiles or zinc slates are also used.

Lozenges provide a good solution for cladding of moderately curved surfaces. When hooked together, the lozenges form a mosaic of uniform surfaces with the vertical and horizontal diagonals.

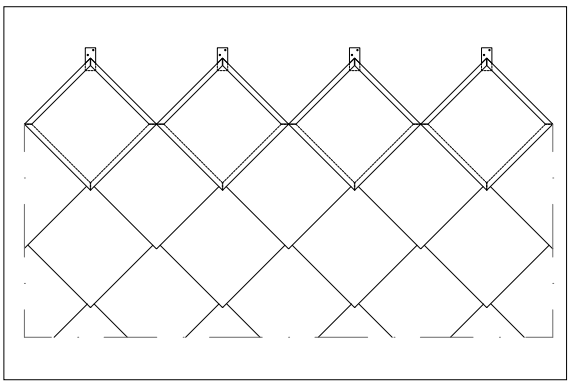


Figure 6.3.1

Lozenge size	Cutting size	Number/m²
450 x 450 mm	500 x 500 mm	Approx. 5,6
280 x 280 mm	330 x 330 mm	Approx. 15,3
200 x 200 mm	250 x 250 mm	Approx. 32

Tabel 6.3.1 Dimensions of lozenge, square model

Specifications of the parts

Figure 6.3.1 is a schematic representation of the lozenge system. Aside from the standard lozenges, other dimensions are also possible.

The lozenges are bent 25 mm as shown in figure 6.3.2

Figure 6.3.3 A shows the half-lozenge for eaves abutment and figure 6.3.3 B shows the half-lozenge for ridge abutment.
Seizes and material thicknesses are the same as with whole lozenges.
With a “top” half-lozenge, both a sliding clip and a soldered clip can be used.

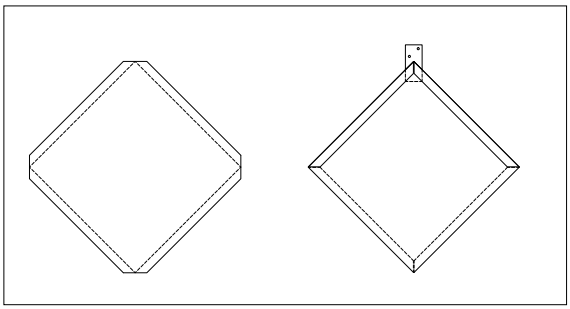


Figure 6.3.2

Lozenge size width ’B’	Cutting size	Number/m²
200 mm*	250 mm	Approx. 25,6
250 mm*	300 mm	Approx. 15,3
280 mm*	330 mm	Approx. 11,9

* other dimensions are possible

Table 6.3.2

Sliding clip, 70 mm x 50 mm

Material thickness as for the lozenge. The sliding clip functions as a support clip. These support clips can be made by the sheet metal worker himself.

Soldered clips

Width: 50 mm. Length approx. 100 mm, depending on the location and space for fitting on the base.
The clip can be made by the sheet metal worker himself and soldered to the lozenge.

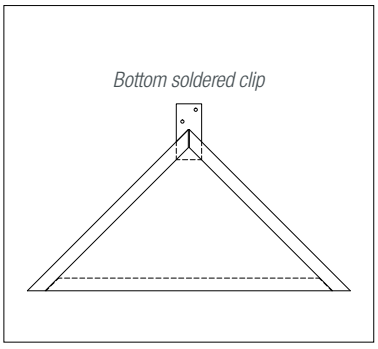


Figure 6.3.3 A

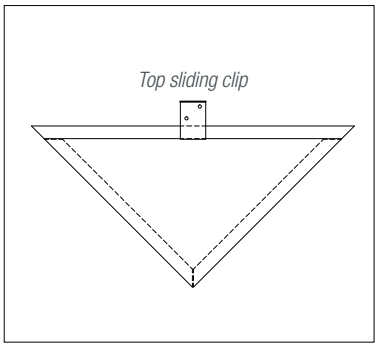


Figure 6.3.3 B

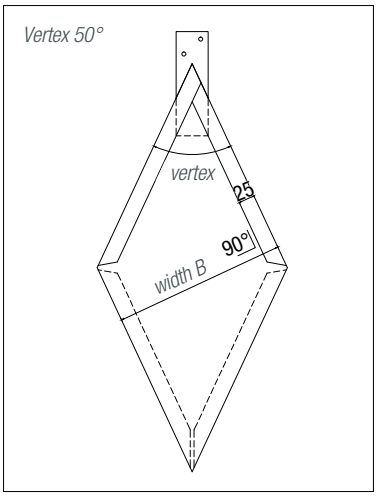


Figure 6.3.4

Profiles

The dimensions of the eaves profiles, attachment profiles, etc. will depend on the on-site dimensions and can either be made by the sheet metal worker or supplied custom-made in lengths as custom items.

Support

The lozenge roof must be fully supported by timber, preferably of rough, unplanned boards, 23-25 mm thick and not tongue and grooved, with gaps of at least 5 mm. Use galvanised nails with a zinc-layer thickness of at least 20 microns or AISI 304 stainless steel for fastening.

6.3.1 Technical drawings

For the built up alternatives of the roof structure see chapter 4.5 of this manual.

The technical details in paragraph 6.3.2 are based on the built up of a ventilated substructure as shown below.

The construction of the roof is built up as follows, beginning on the inside:

1. Ceiling - any type
2. Damp control course made from metal or plastic film
3. Supporting rafters - generally made from wood
4. Insulation material according to thermal requirements
5. Ventilated cavity: thickness depends on the pitch of the roof
6. Timber boarding, planed no less than 23 mm, not tongue-and-grooved, installed horizontally with gaps between the boards of at least 5 mm
7. Zinc lozenge system

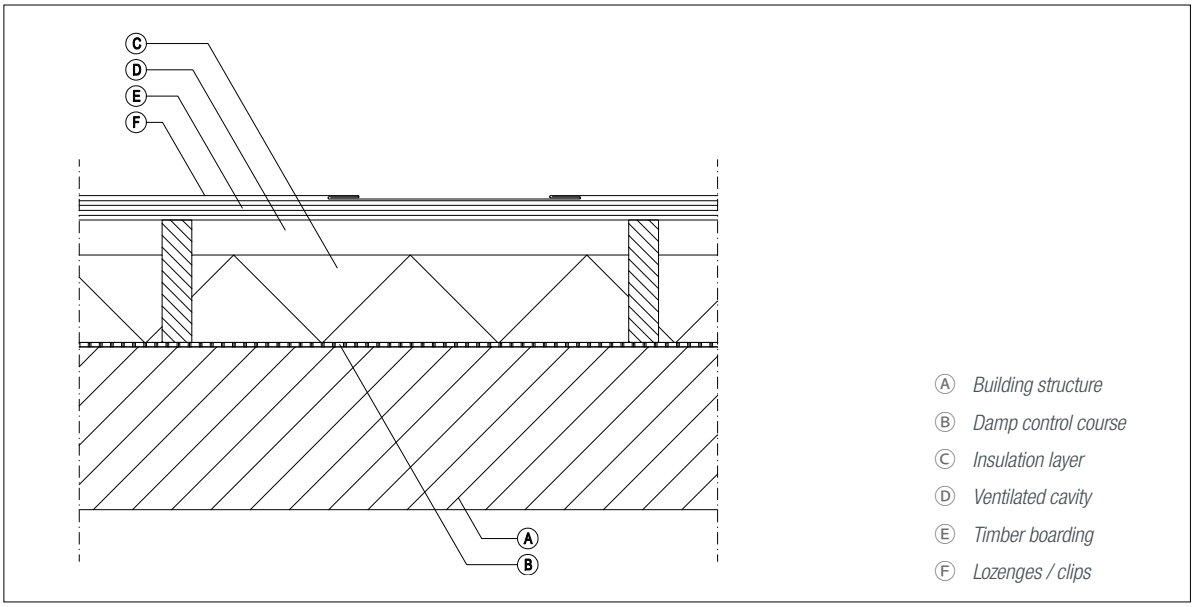
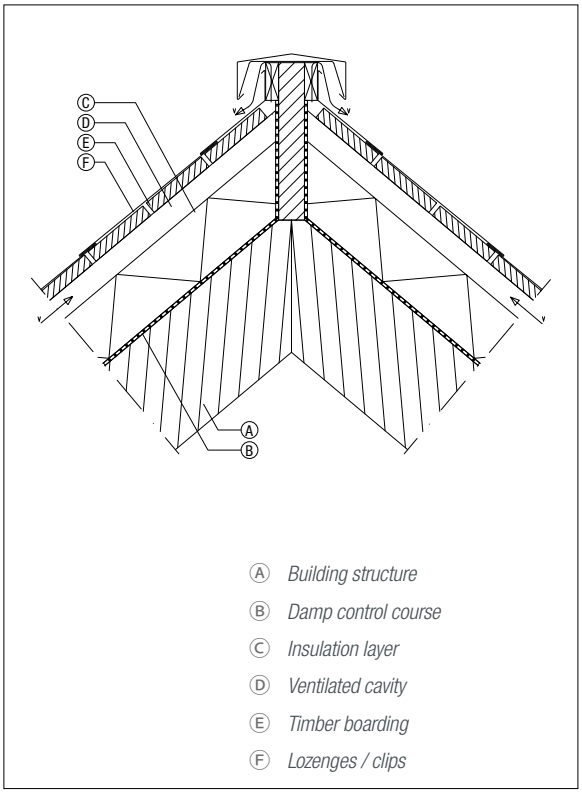


Figure 6.3.5

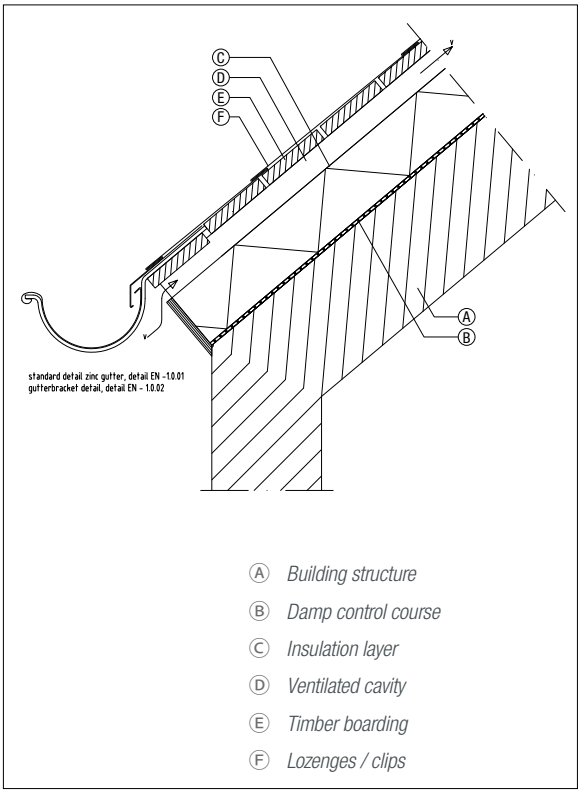
6.3.2 Standard details lozenge system

Below are some examples of typical details for roofing. These details outline the standard situation and serve as a guideline for applying the lozenge system on a ventilated roof structure.



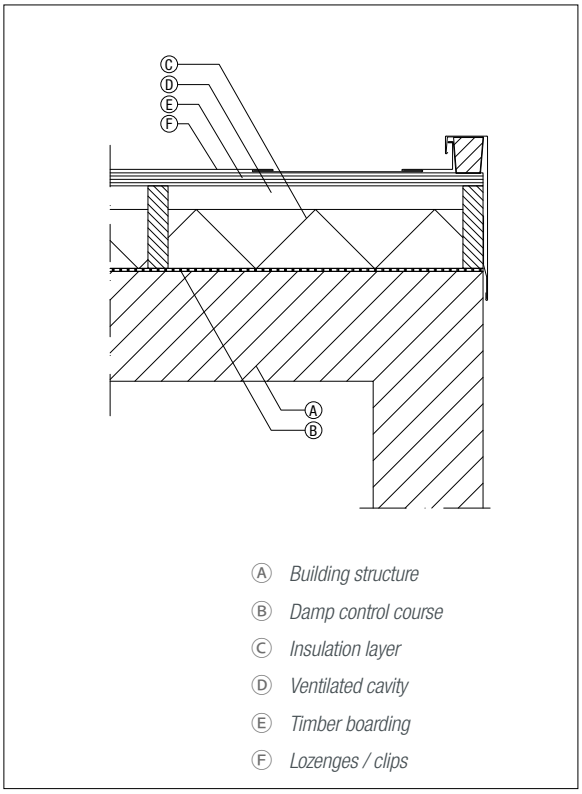
Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation layer*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Lozenges / clips*

Figure 6.3.6 Ridge detail



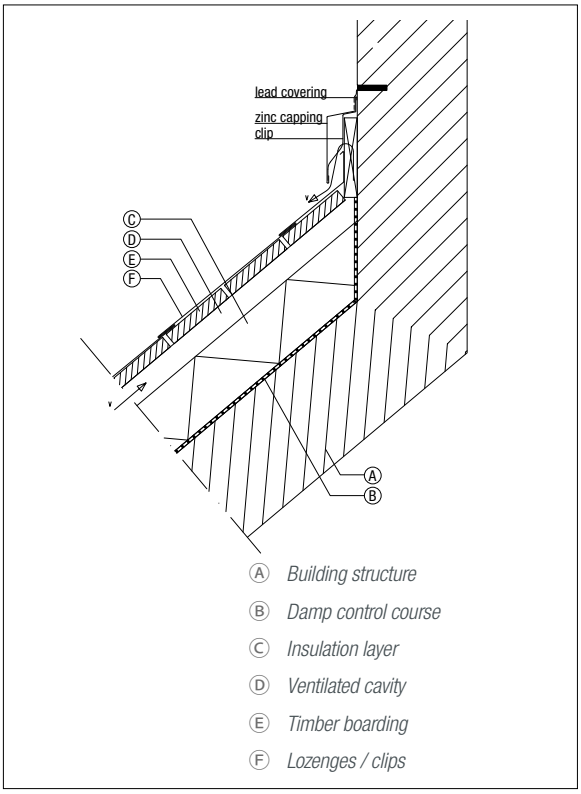
Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation layer*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Lozenges / clips*

Figure 6.3.7 Gutter detail



Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation layer*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Lozenges / clips*

Figure 6.3.8 Batten verge detail



Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation layer*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Lozenges / clips*

Figure 6.3.9 Wall abutment detail

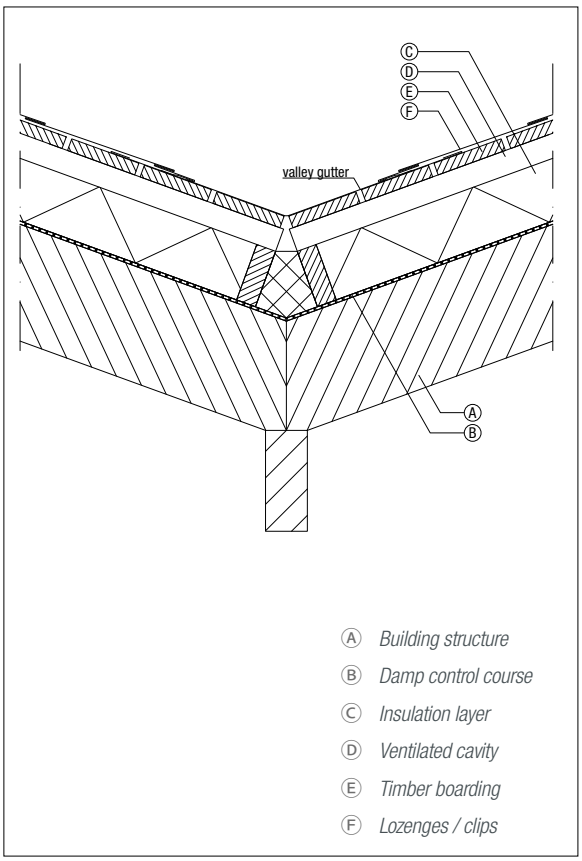


Figure 6.3.10 Valley gutter detail roof pitch >15°

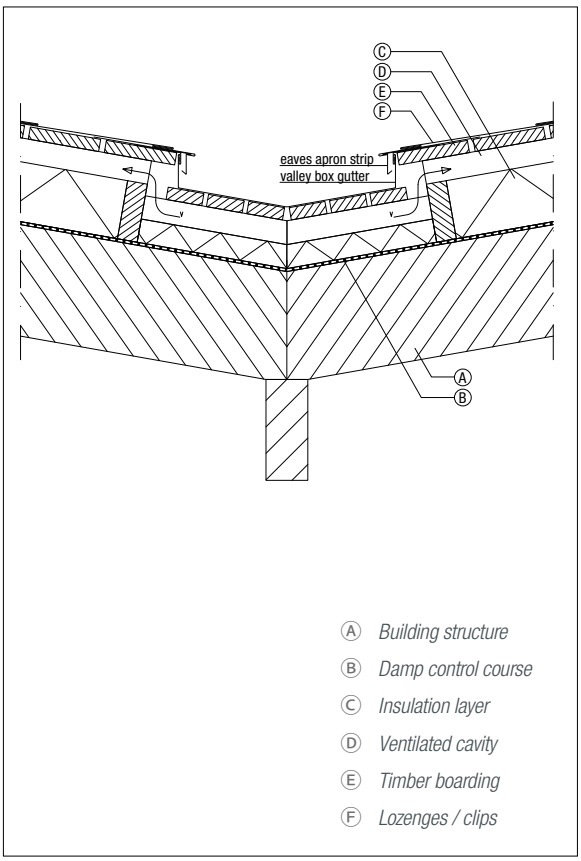


Figure 6.3.11 Valley gutter detail roof pitch <15°

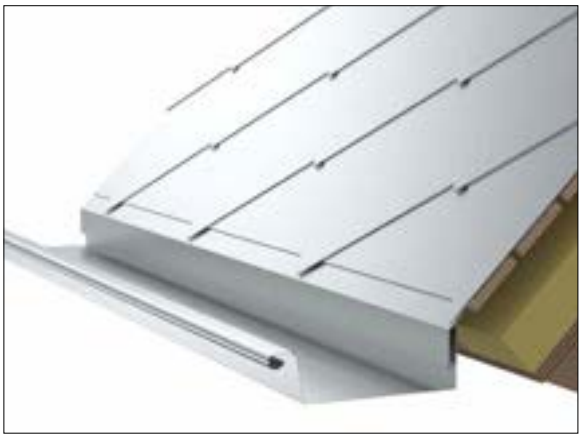


Figure 6.3.12 Details lozenge system on a ventilated substructure.

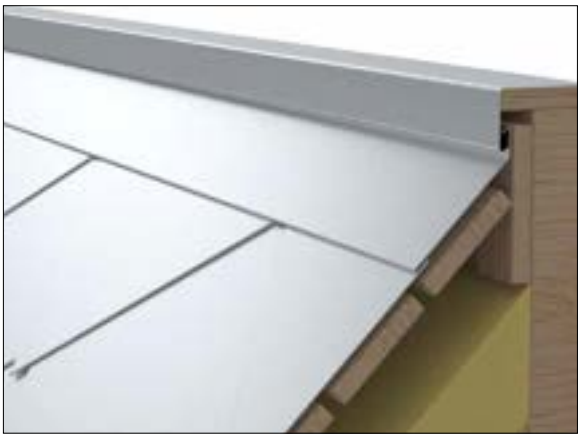


Figure 6.3.13 Details lozenge system on a ventilated substructure.

7 Façades

Titanium zinc is ideal for use as façade cladding for small or large surfaces. The traditional (roof) systems such as standing seam and lozenge systems can easily be used as façade cladding options. Applications in cassette, interlocking, overlapping and corrugated profile systems are also highly suitable.

7.1 Standing Seam System (Single Lock)

The standing seam system makes it possible for a façade to be covered with titanium zinc quickly because preformed bays are used, and the seams are folded mechanically, reducing manual folding to a minimum. The preformed bays are supplied in custom-made sizes and are locked together on site with a single or double fold, by machine or by hand. Aside from straight bays, curved (convex and concave) and tapered bays can be made without problems. The bays are secured to the substructure by means of fixed clips and sliding clips.

Standings seam system for façades

With a standing seam façade system, the zinc bays are connected in the longitudinal direction with standing seams (material thickness 0.80 mm). The allowable bay width is determined by the wind load and the height of the façade. If the standing bay installed horizontally, then it is recommended to limit the bay width to 300 to 430 mm for optimal work, and to limit the length to about 5 meters for handling reasons. If the standing seam bays are installed vertically, then limiting the bay width to 500 mm or less and the bay length to about 6 meters is recommended for handling reasons.

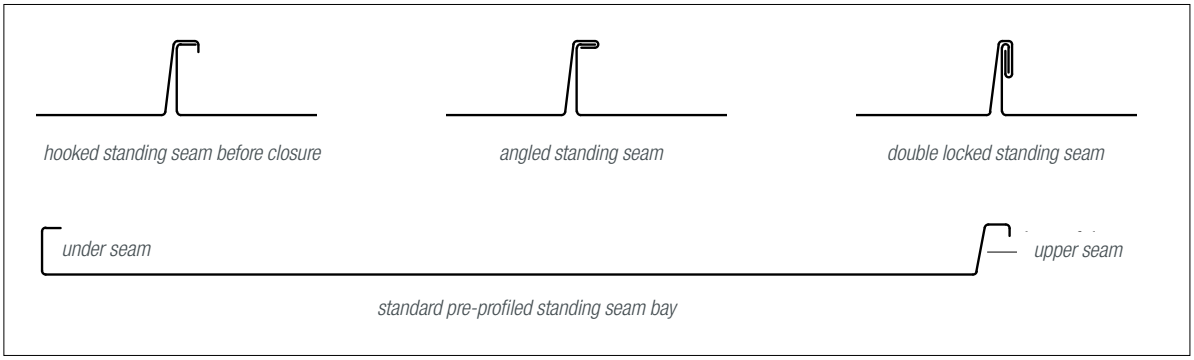


Figure 7.1.1

Standing seam

Standard standing seam bay for façade cladding.

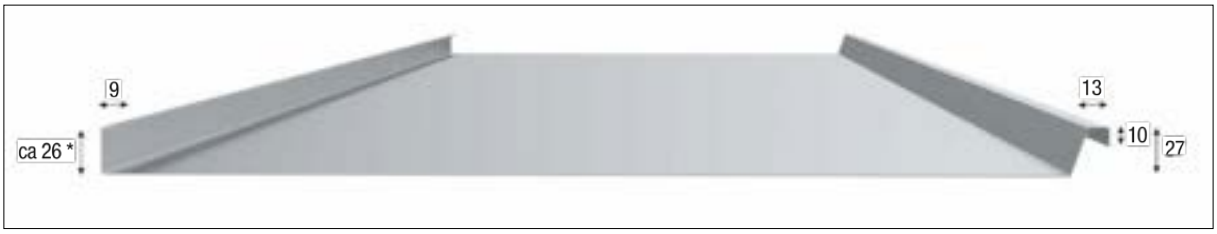
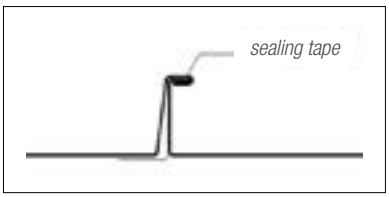


Figure 7.1.2 Standing seam bay

To improve the rain proofing aspect of a standing seam façade, sealing tape can be affixed between the seams. This is also recommended for unventilated systems to prevent leakage.



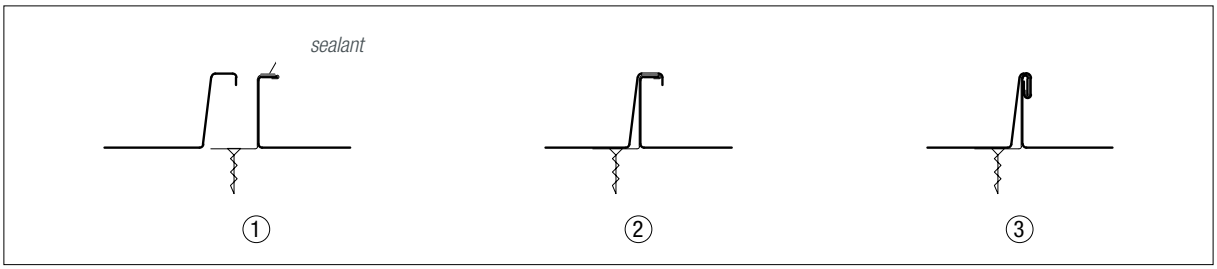


Figure 7.1.3

Fastening the clips

The bays are secured to the substructure by means of fixed and sliding clips (see figure 7.1.4).
The fixed clips secure the standing seam bay and the sliding clips make longitudinal expansion possible. The clip is secured over the lowest standing seam bay and on the sub construction. Then the top standing seam bay is placed over this and folded shut.

Figure 7.1.4

Support

The standing seam system must be fully supported by unplaned, untreated wooden boards at least 23 mm thick, not tongue and grooved, with gaps of at least 5 mm and maximum 100 mm. The construction requirements are also important in this. Use galvanised nails with a zinc-layer thickness of at least 20 microns or AISI 304 stainless steel for fastening.

7.1.1 Technical drawings

For the built up alternatives of the façade substructure see chapter 4.6 of this manual.

The technical details in paragraph 7.1.2 and 7.1.3 are based on the built up of a ventilated substructure as shown below.

The construction of the façade is built up as follows, beginning on the inside:

1. Building structure - any type, although it must be able to support the insulating material, or have the insulation attached to it
2. Damp control course made of metal or plastic film
3. Supporting rafters – generally made from wood
4. Insulation material according to thermal requirements
5. Ventilated cavity appr. 25 to 30 mm
6. Timber boarding unplaned timber boarding 23 mm minimum thickness, not tongue and groove, installed horizontally with gaps between the boards
   Horizontal bays: The gap depends on the placing of the clips for the horizontal bays
   Vertical bays: The gap must be at least 5 mm. The boards may be spaced up to 100 mm, to be determined by the builder
7. Standing seam system

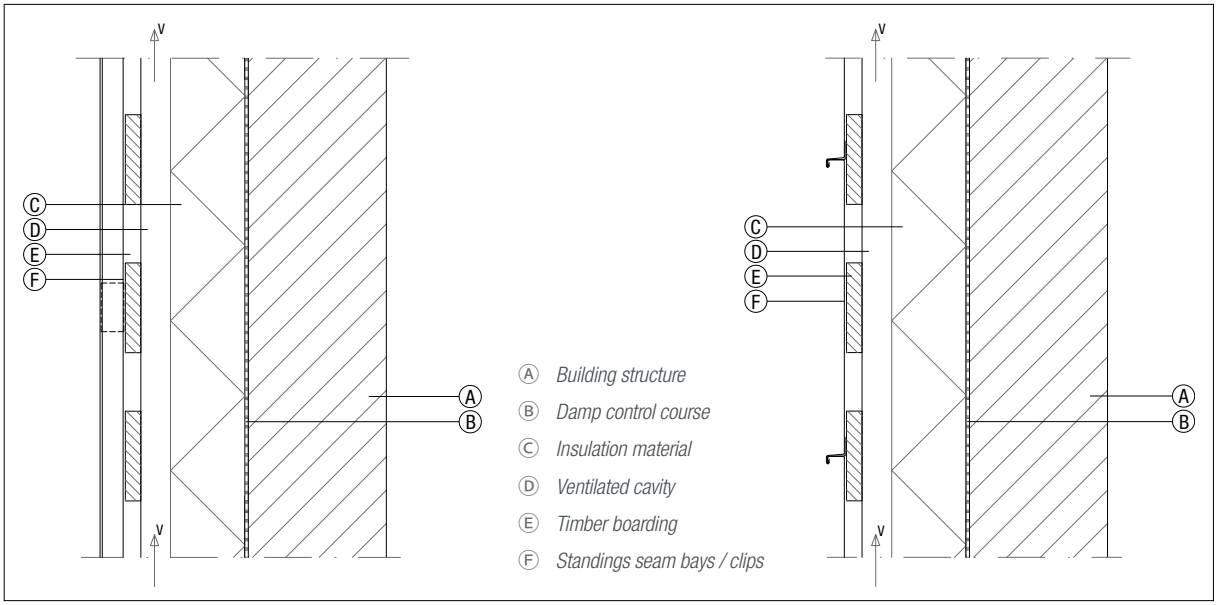
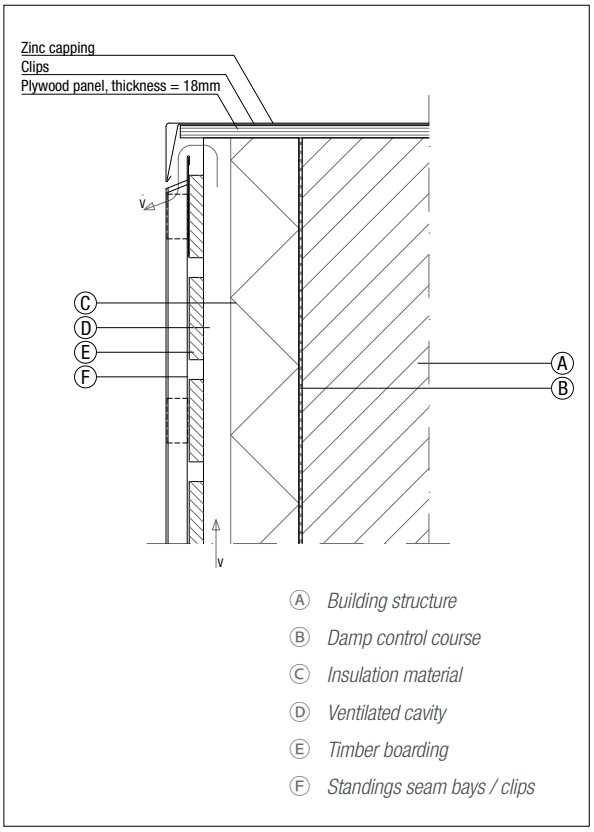


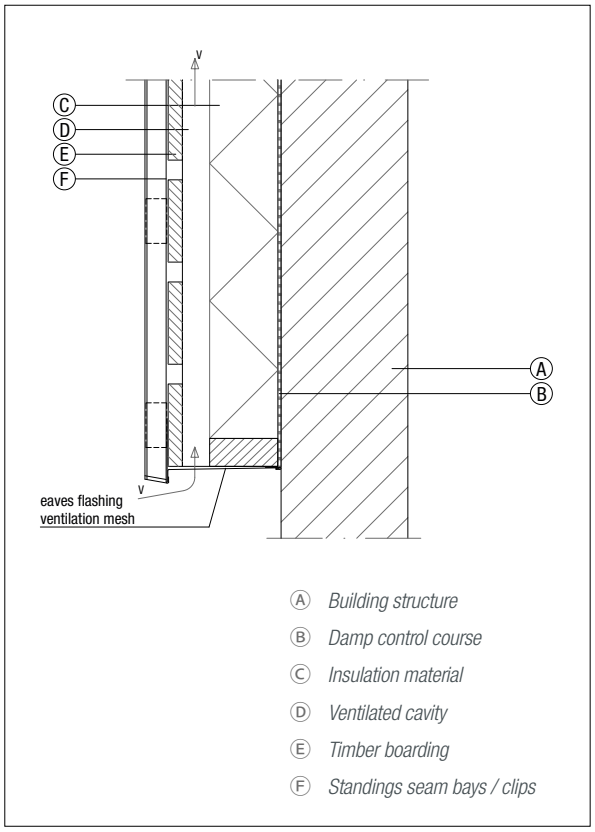
Figure 7.1.5

7.1.2 Standing seam system details ventilated vertical bay



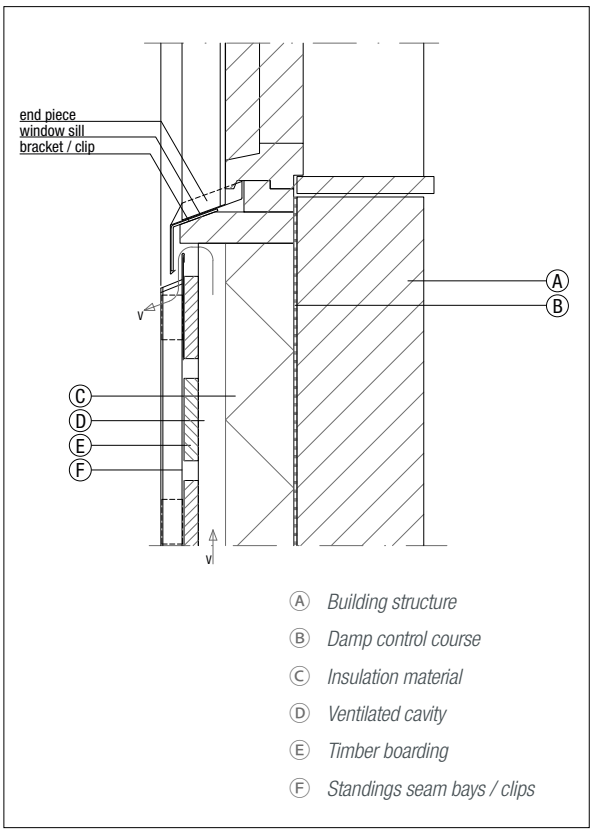
Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Standings seam bays / clips*

Figure 7.1.6 Ridge connection



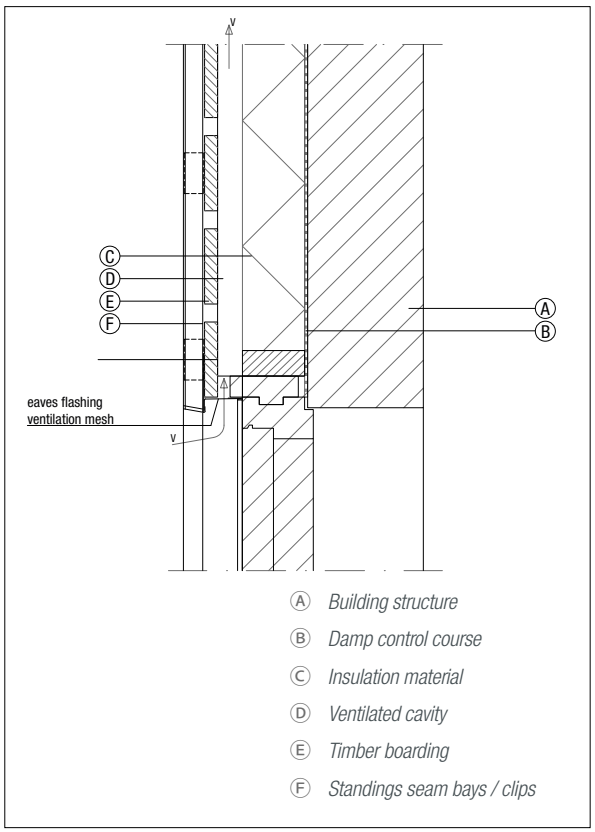
Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Standings seam bays / clips*

Figure 7.1.7 Eaves connection



Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Standings seam bays / clips*

Figure 7.1.8 Window sill



Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Standings seam bays / clips*

Figure 7.1.9 Window head

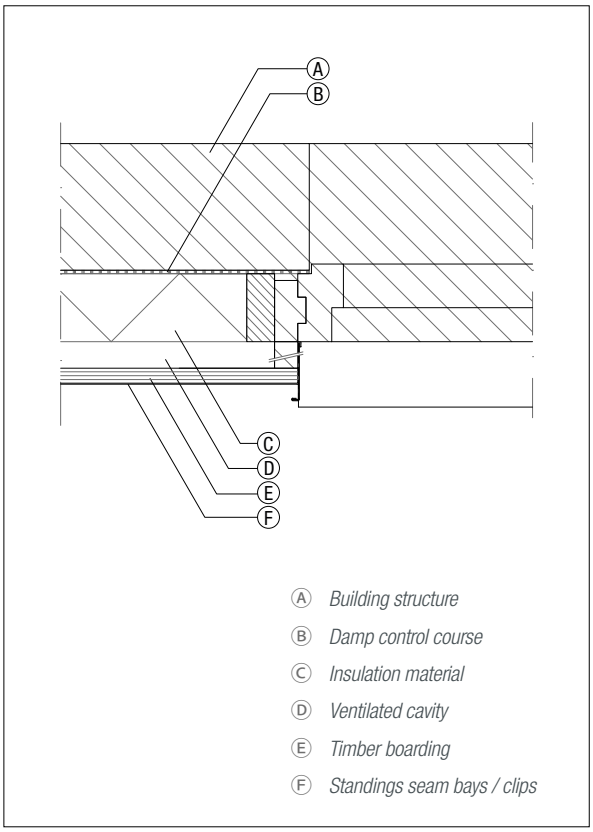


Figure 7.1.10 Window jamb

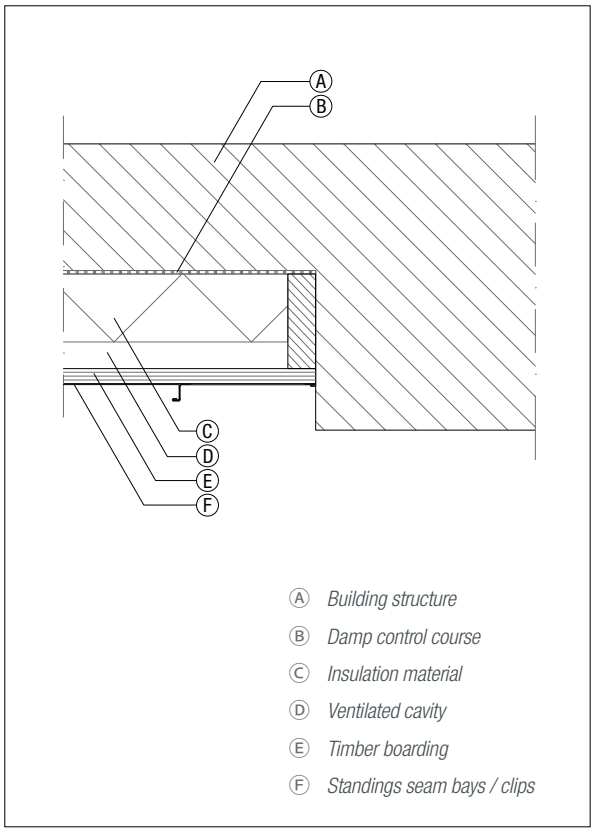


Figure 7.1.11 Wall abutment

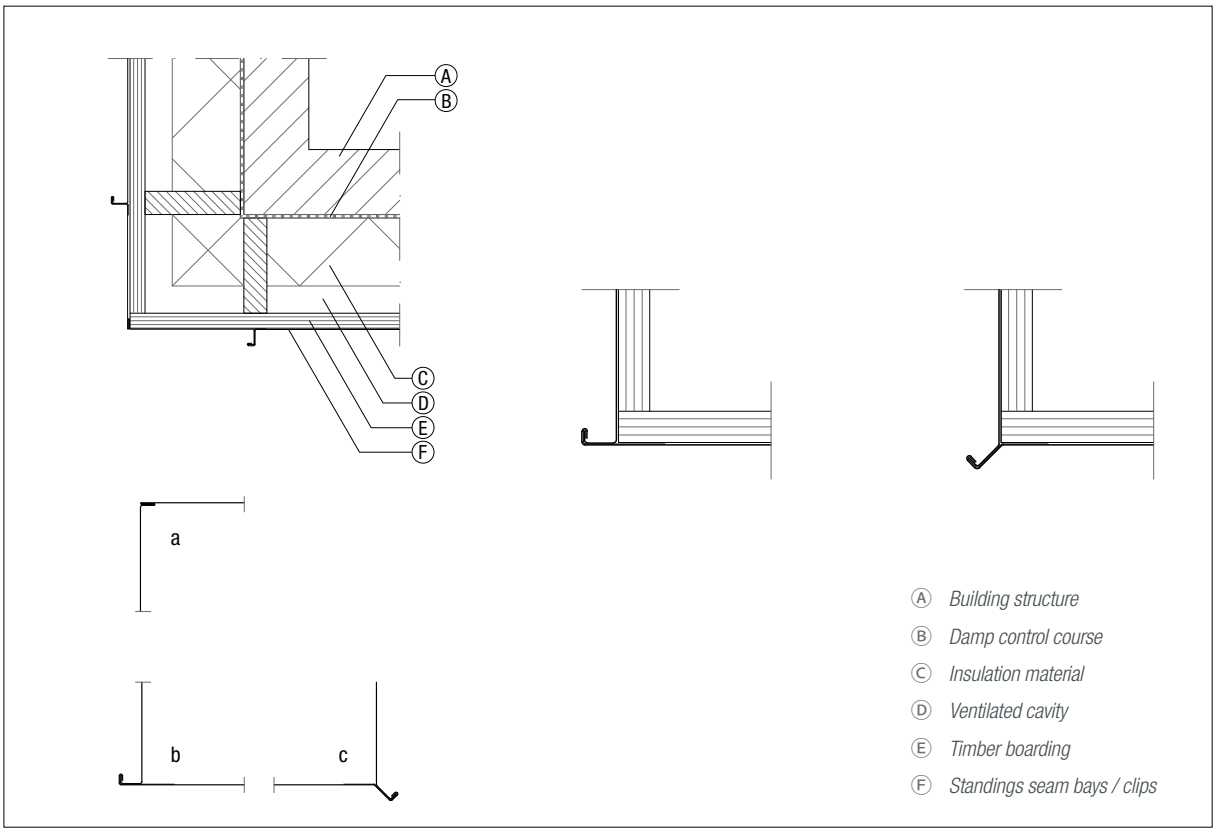


Figure 7.1.12 Outside corner

7.1.3 Standing seam system details ventilated horizontal bay

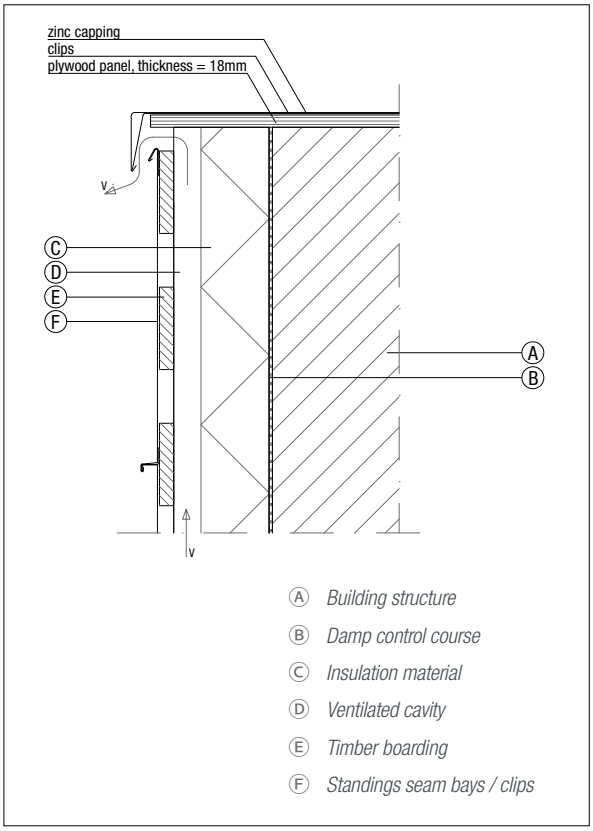


Figure 7.1.13 Ridge connection

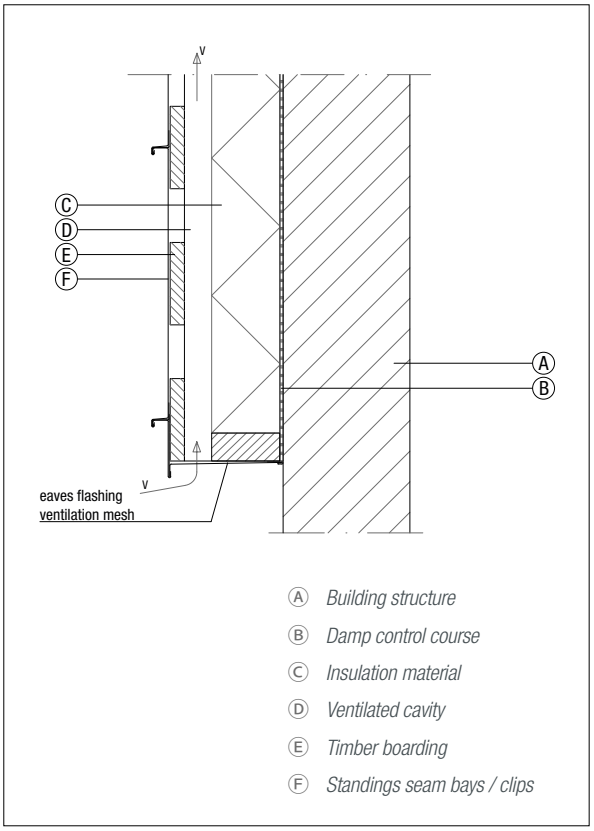


Figure 7.1.14 Eaves connection

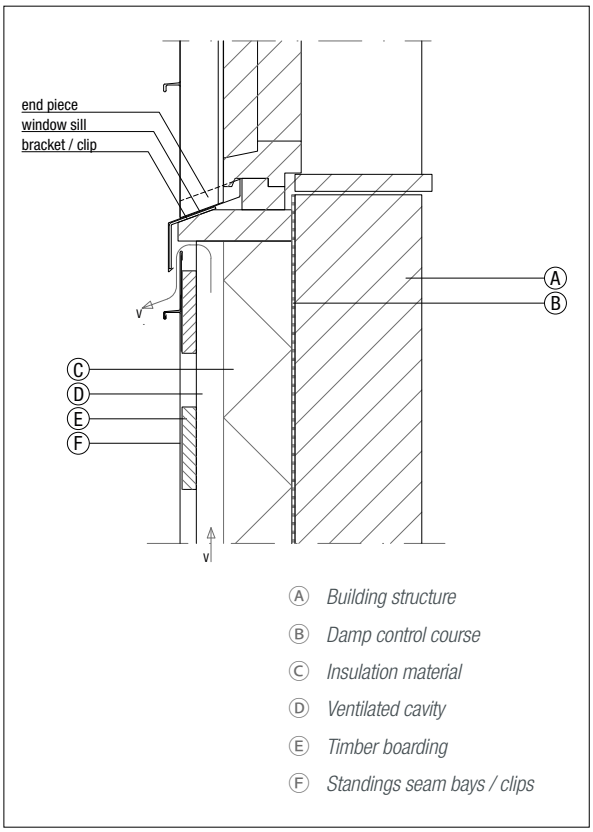


Figure 7.1.15 Window sill

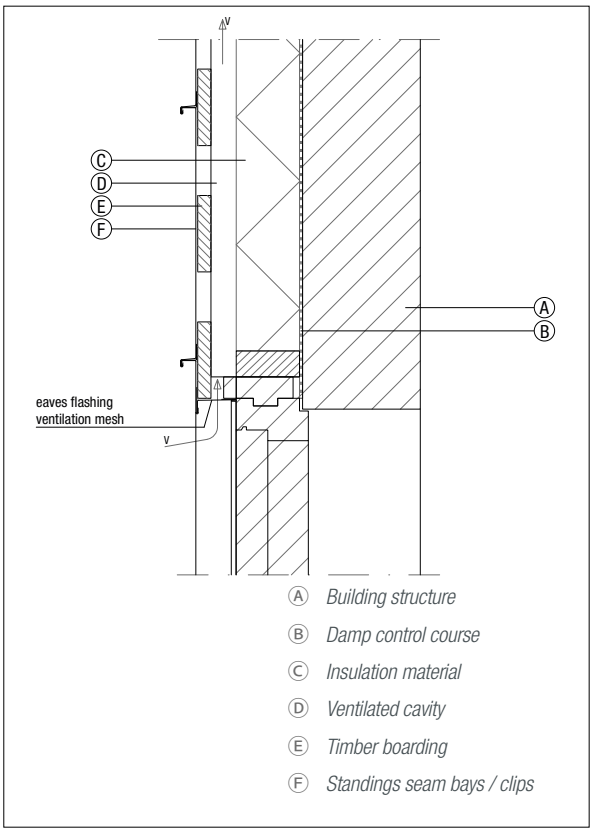


Figure 7.1.16 Window head

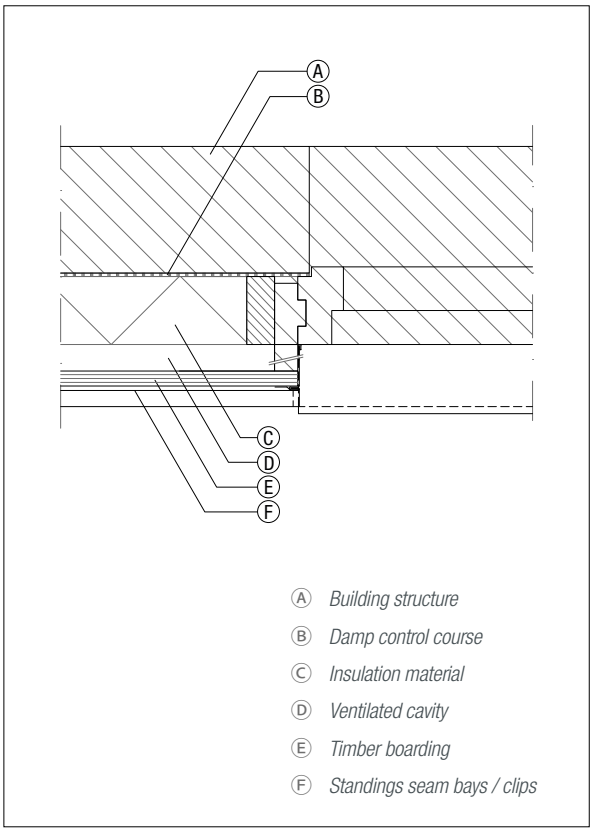


Figure 7.1.17 Window jamb

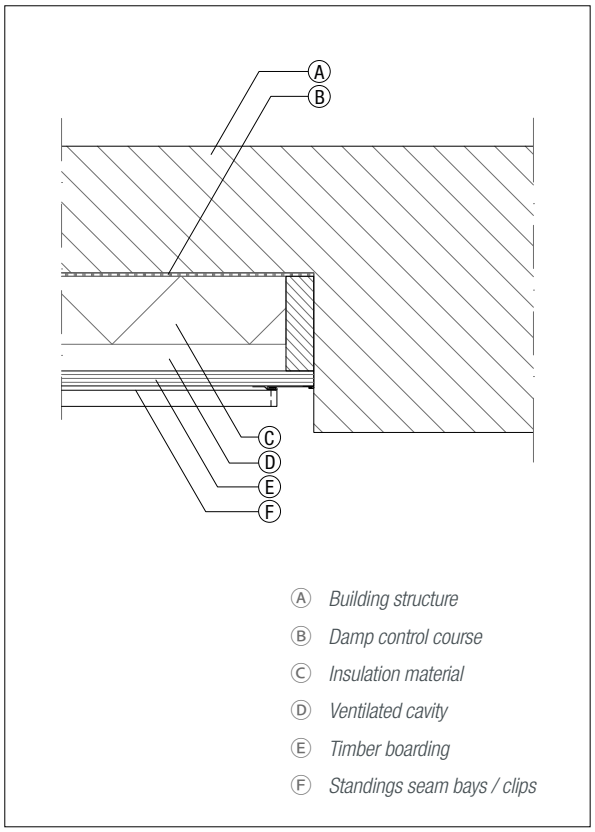


Figure 7.1.18 Wall abutment

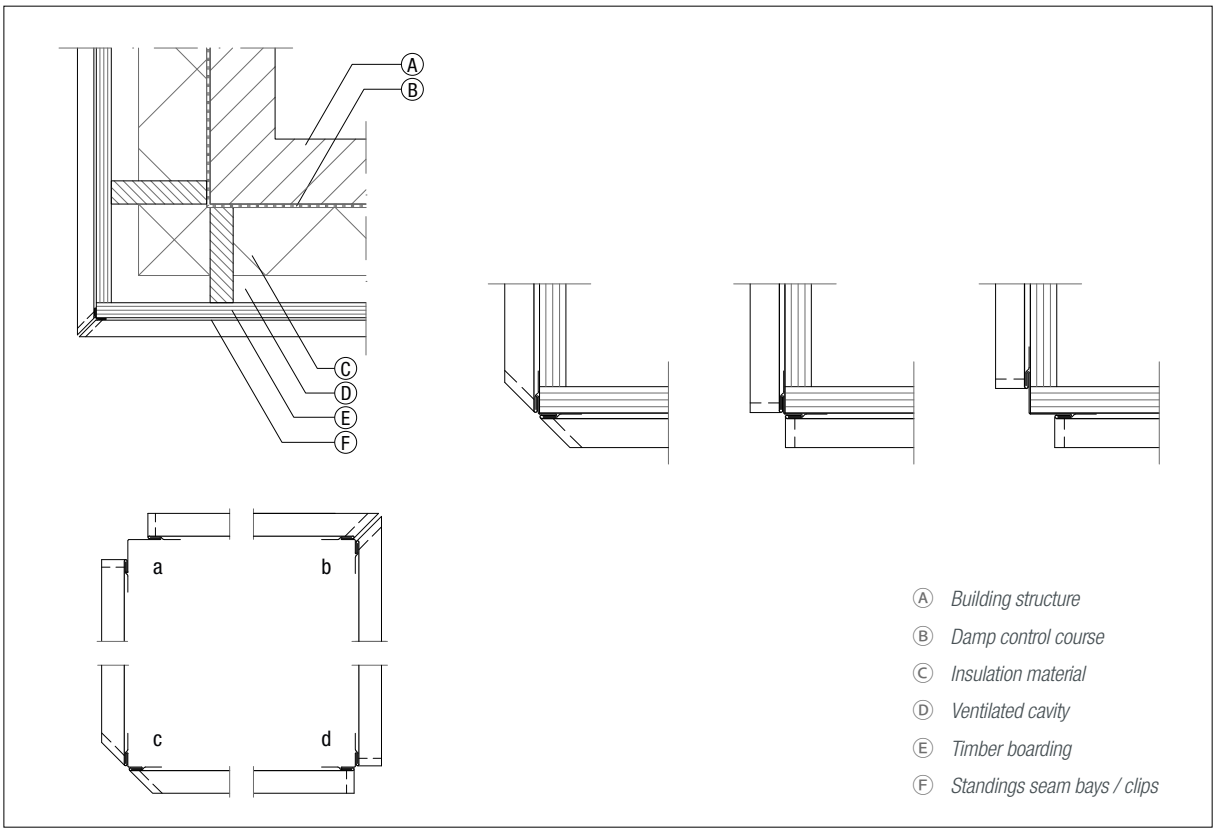


Figure 7.1.19 Outside corner

7.2 Interlocking Panel System

The Interlocking Panel (Reveal Panel) system is suitable as façade cladding and can be installed both vertically and horizontally or even a combination. Therefore the system offers architects possibilities to implement their designs for most building shapes by using this system.

Interlocking panel system for façade.

The system consists of profiled zinc sheets with a variable width size, typical coverage with a joint (reveal). The dimensions of the panels and joints are variable, as are the lengths of the panels. The characteristic of this panel is a tongue and groove systems with concealed fasteners.

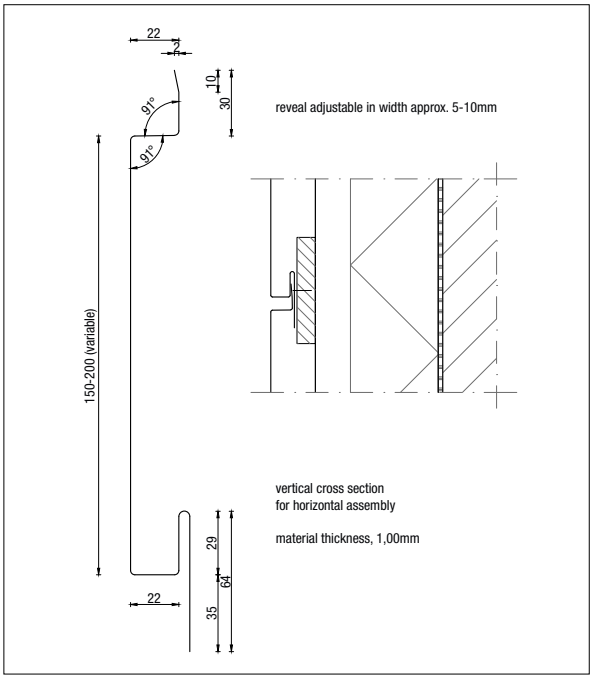


Figure 7.2.1

This examples shows the Reveal Panel supported by a wooden structure, preferably unplaned timber boarding, 23-25 mm thick, not tongue-and-grooved.

The gap between the timber boards must be at least 5 to 10 mm. The boards may be spaced up to 100 mm, to be determined by the builder.

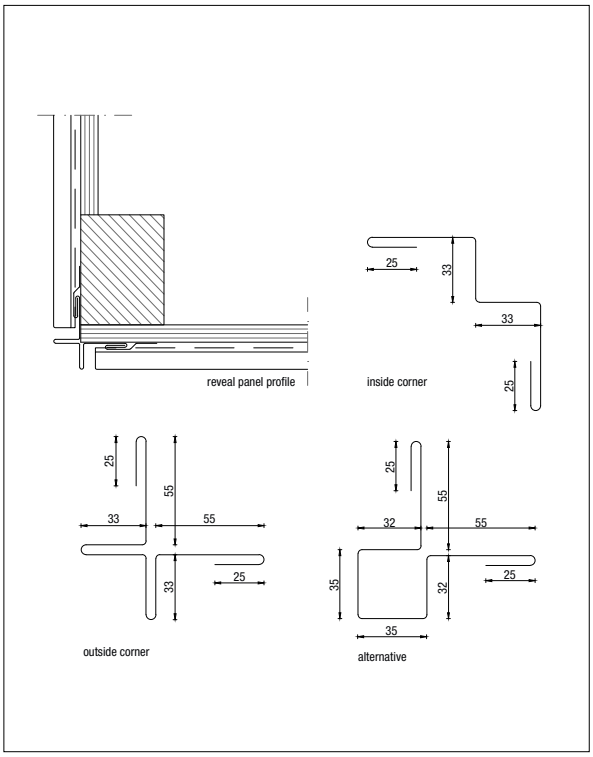


Figure 7.2.2 Connection profiles.

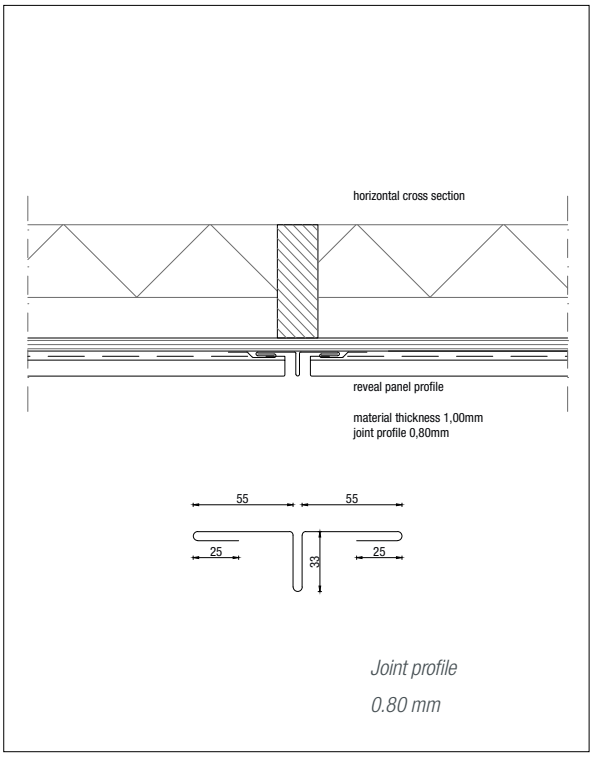


Figure 7.2.3 Joint profiles.

Assembly

The profiled panels are secured to the underlying timber boards, preferably using galvanised steel screws. Depending on the chosen panel profile type, a reveal is created between the different parts, which can be set between 5 and 10 mm width. The profile lengths are a maximum of 5 meters. For lengths longer than 4 meters, slotted holes are recommended to take up length changes of the zinc.

7.2.1 Technical drawings

For the built up alternatives of the façade substructure see chapter 4.6 of this manual.

The technical details in paragraph 7.2.2 and 7.2.3 are based on the built up of a ventilated substructure as shown below.

The construction of the façade is built up as follows, beginning on the inside:

1. Building structure - any type, although it must be able to support the insulating material, or have the insulation attached to it
2. Damp control course made of metal or plastic film
3. Supporting rafters – generally made from wood
4. Insulation material according to thermal requirements
5. Ventilated cavity appr. 25 to 30 mm
6. Timber boarding unplaned timber boarding 21 mm minimum thickness, not tongue and groove, installed horizontally with gaps between the boards
   Horizontal bays: The gap depends on the placing of the clips for the horizontal bays
   Vertical bays: The gap must be at least 5 mm. The boards may be spaced up to 100 mm, to be determined by the builder
7. Standing seam system

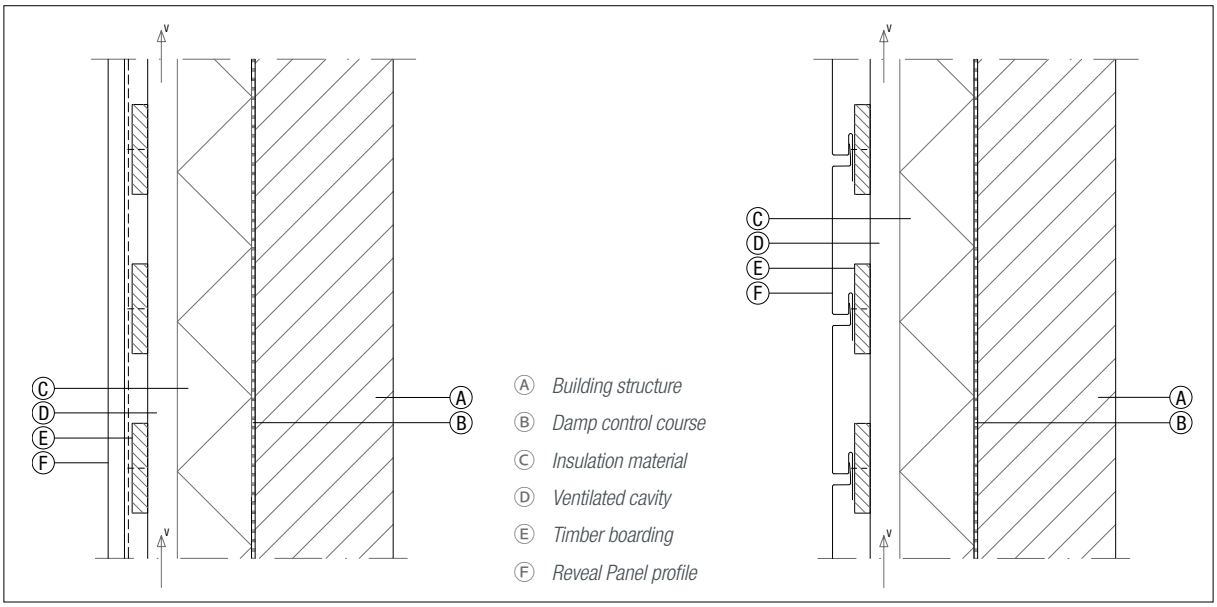
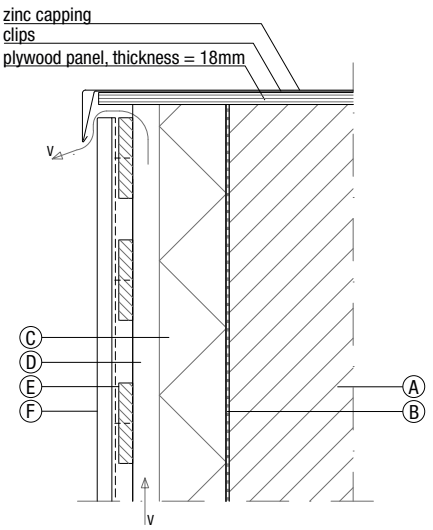


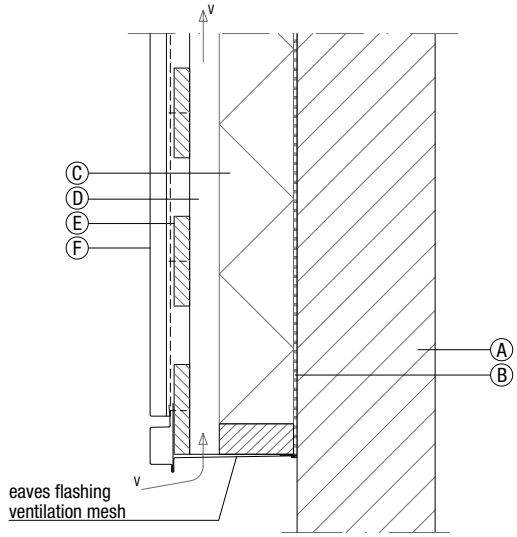
Figure 7.2.4

7.2.2 Interlocking Panel System details ventilated vertical bays.



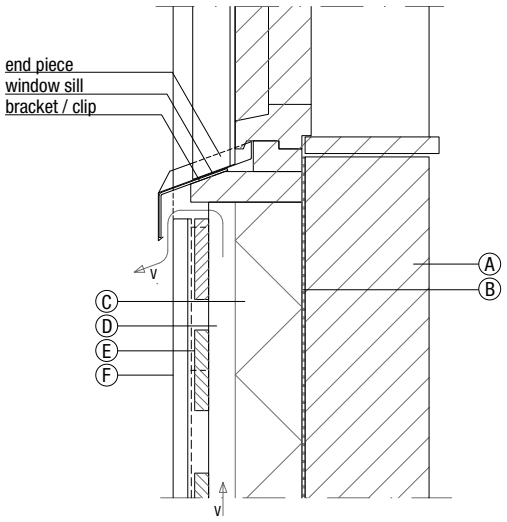
Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Reveal Panel profile*

Figure 7.2.5 Ridge connection



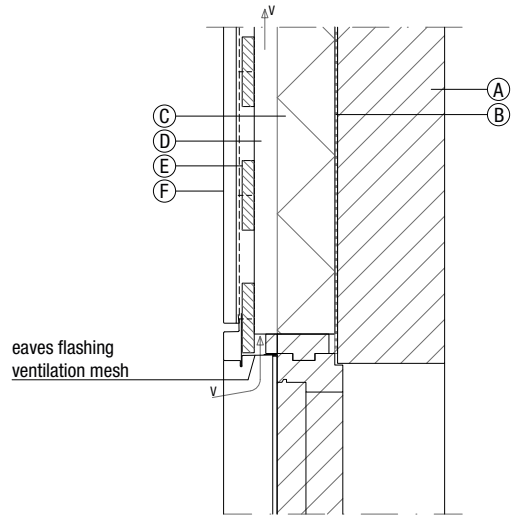
Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Reveal Panel profile*

Figure 7.2.6 Eaves connection



Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Reveal Panel profile*

Figure 7.2.7 Window sill



Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Reveal Panel profile*

Figure 7.2.8 Window head

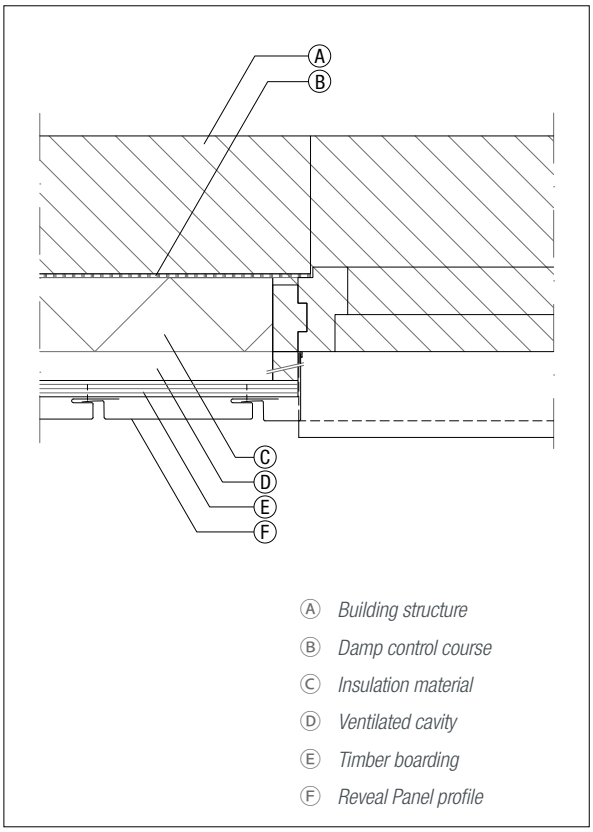


Figure 7.2.9 Window jamb

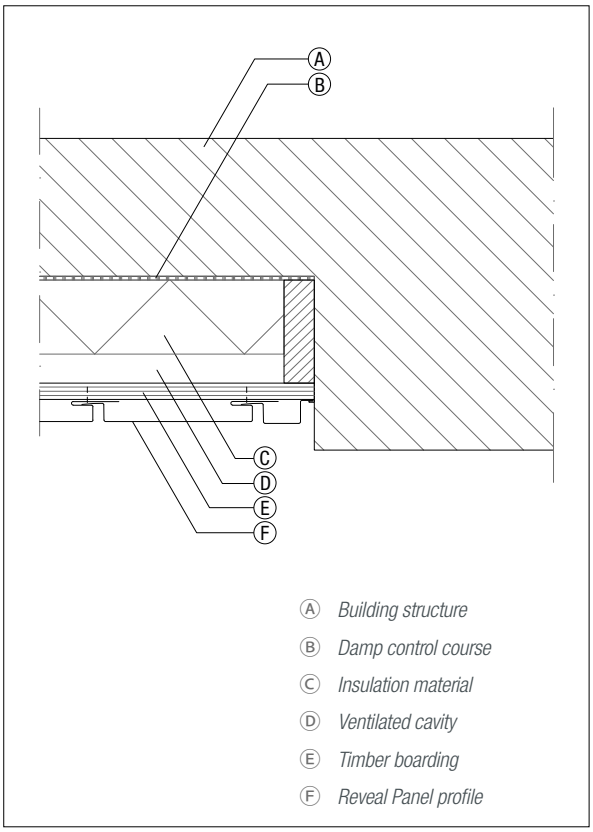


Figure 7.2.10 Wall abutment

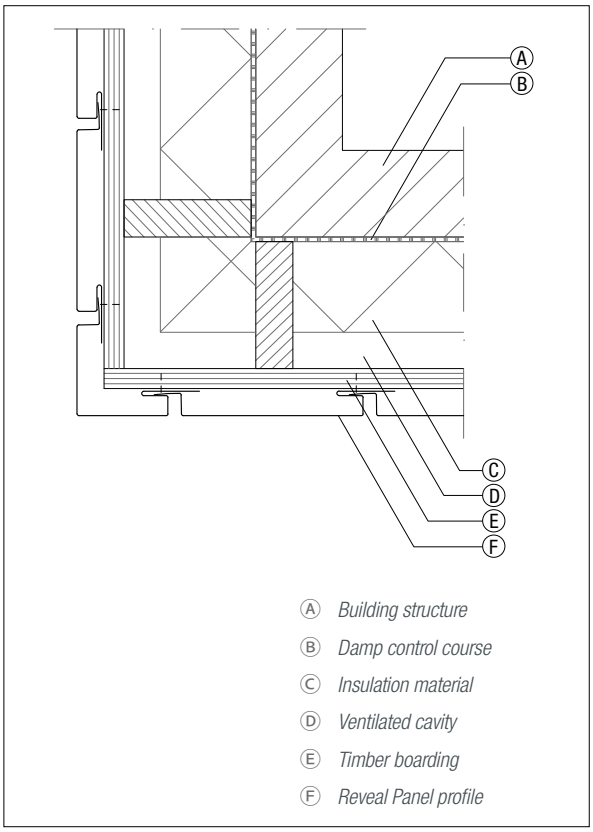
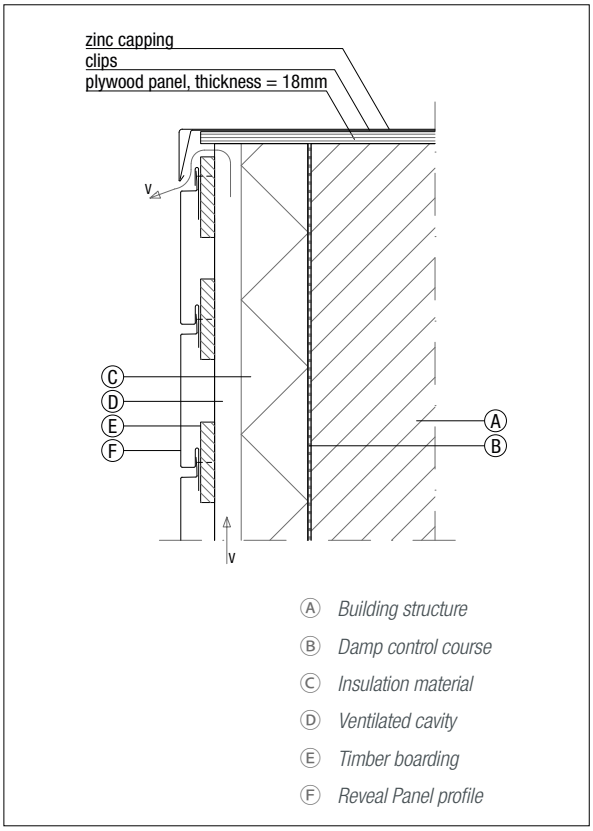


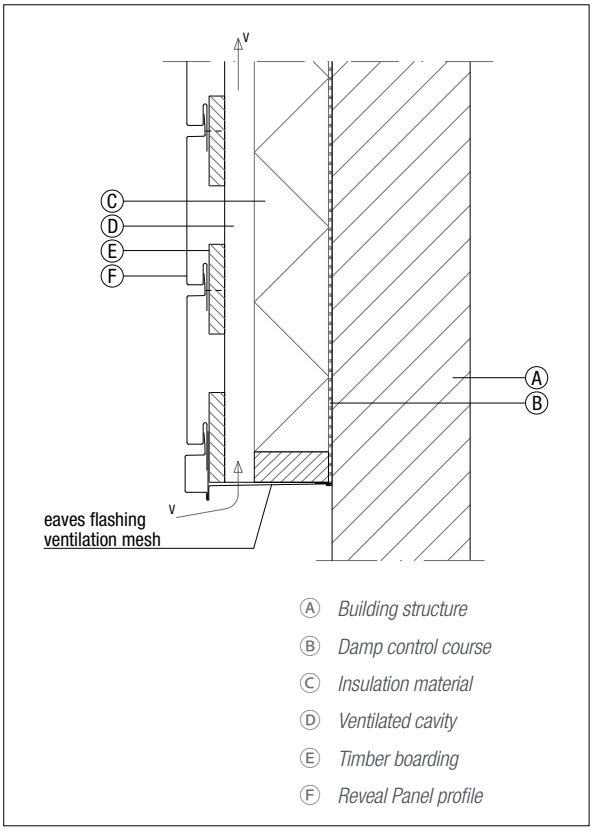
Figure 7.2.11 Outside corner

7.2.3 Interlocking Panel System details ventilated horizontal bays.



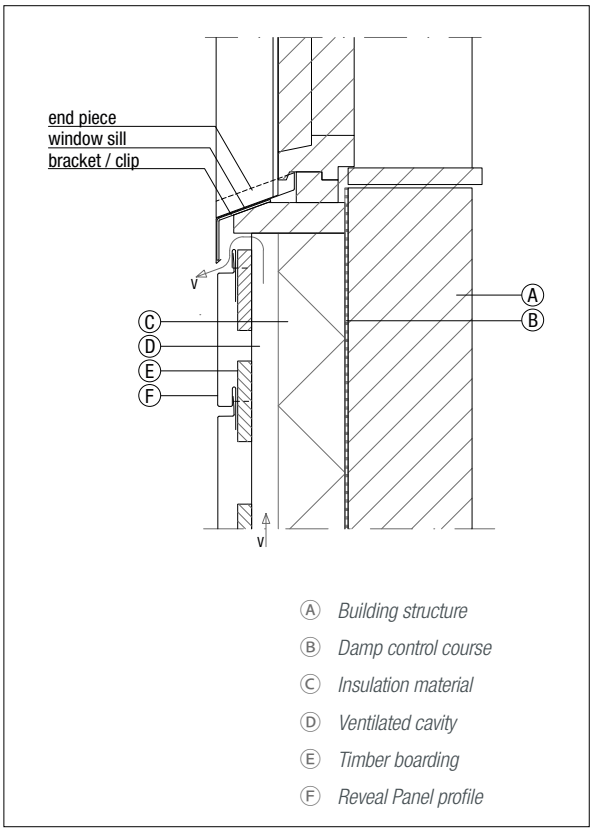
Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Reveal Panel profile*

Figure 7.2.12 Ridge connection



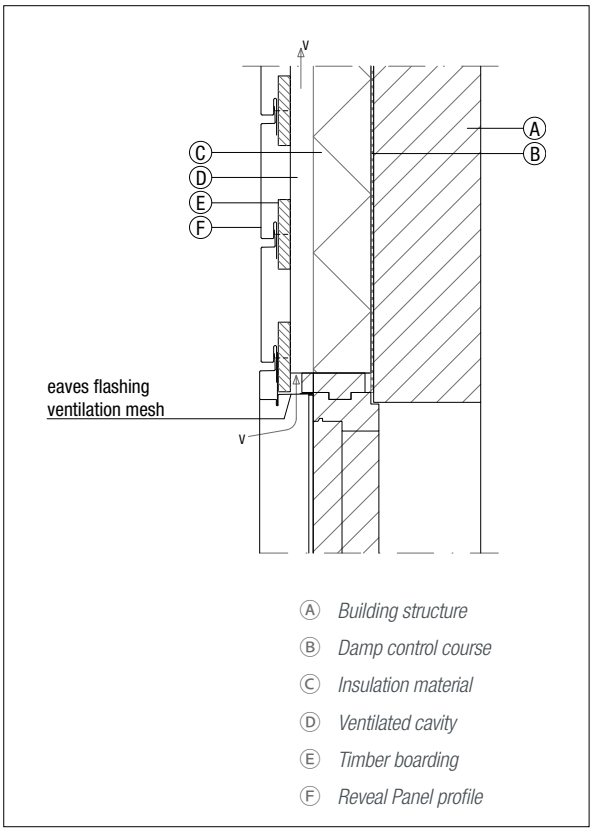
Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Reveal Panel profile*

Figure 7.2.13 Eaves connection



Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Reveal Panel profile*

Figure 7.2.14 Window sill



Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilated cavity*
Ⓔ *Timber boarding*
Ⓕ *Reveal Panel profile*

Figure 7.2.15 Window head

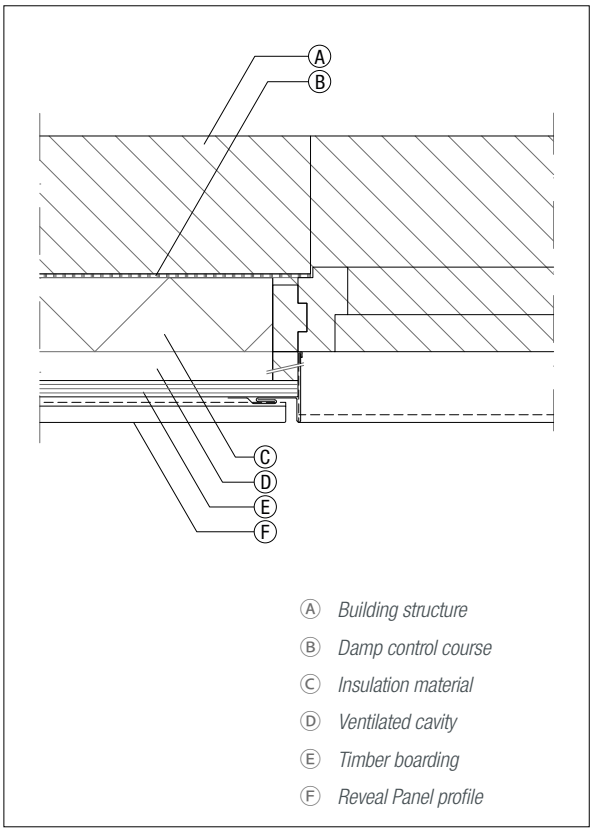


Figure 7.2.16 Window jamb

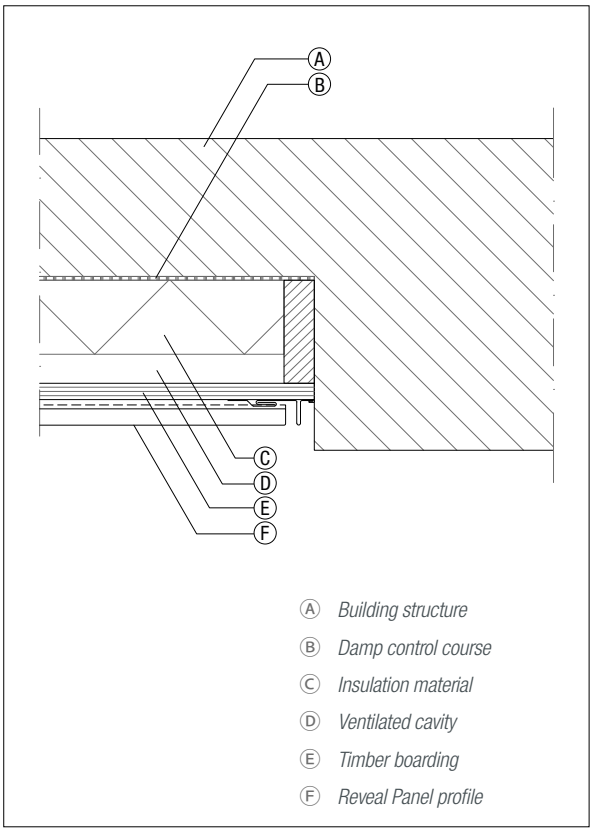


Figure 7.2.17 Wall abutment

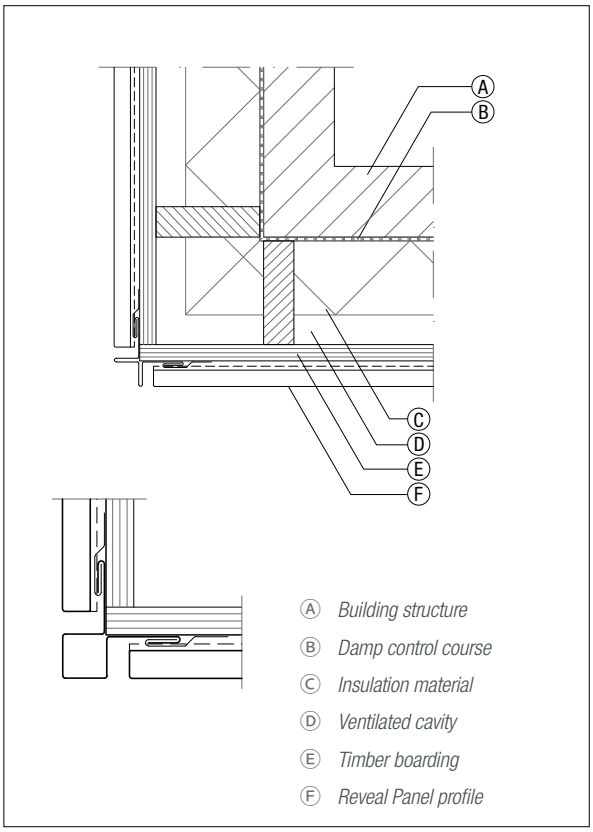


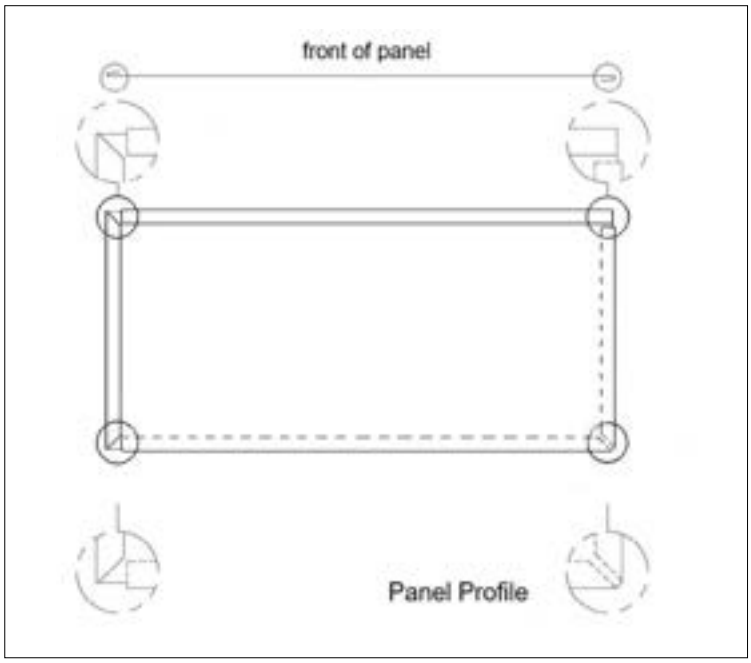
Figure 7.2.18 Outside corner

7.3 Flatlock Panel - Lozenge System

The flatlock system can be used as horizontal panels (flatlock) and square or rhomboid panels which are called lozenges. The zinc cladding is made up of zinc tiles or zinc slates (uniform, small sheets) that are hooked together like a mosaic. Cladding of small, large and even moderately curved surfaces is possible using this system.

Rectangular Flatlock Panel system for façade.

The rectangular shape is the most common. Size and material thickness are mainly standardized, but can be customized per project. The panels are attached with concealed sliding clips. The dimensions of the eaves profiles, attachment profiles etc. will depend on the on-site dimensions.



For example

Typical coverage:	900 x 400 mm
Max coverage:	200 x 400 mm
Thickness	0.80 mm, 1.0 mm

Figure 7.3.1 Example Flatlock Panel

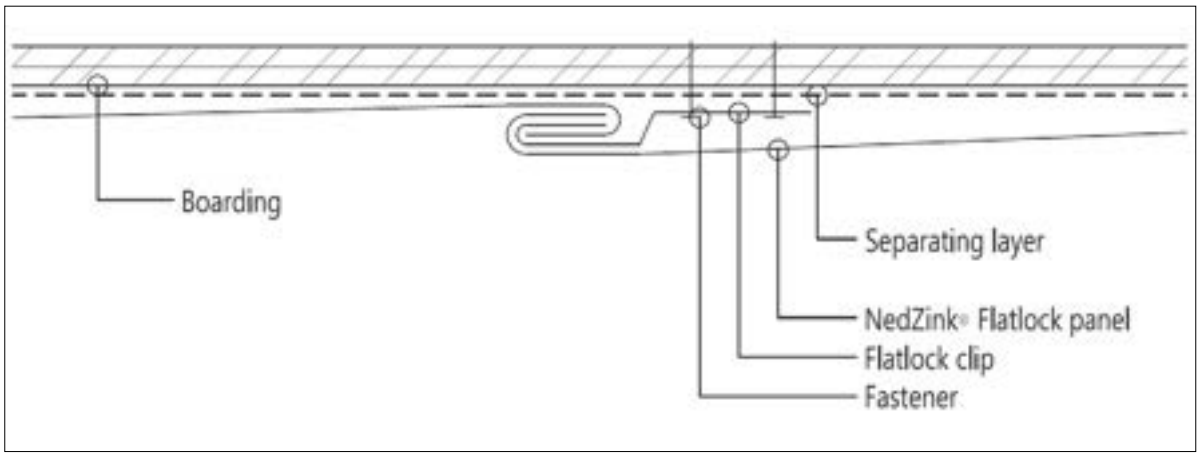


Figure 7.3.2 Flatlock Horizontal Section

Square lozenge system for façade

The traditional lozenge system (square or rhomboid) is used for covering of large and small inclined and vertical surfaces. The standard NedZink lozenge system consists of small, uniform bent plates that hook onto each other. The most common form of a lozenge is the square, although the rhombus is also used. In addition to lozenge, the names zinc tiles and zinc slates are also used.

Specifications of standard components

Figure 7.3.3 is a schematic representation of the lozenge system. Aside from the standard lozenges, other dimensions are also possible. The square lozenges are bent 25 mm as shown in figure 7.3.4.

Figure 7.3.5 A shows the half-lozenge for eaves abutment and figure 7.3.5 B shows the half-lozenge for ridge abutment. Sizes and material thicknesses are the same as with whole lozenges. With a “top” half-lozenge, both a sliding clip and a soldered clip can be used.

Sliding clip, 70 mm x 50 mm

Material thickness as for the lozenge. The sliding clip functions as a support clip. These support clips can be made by the sheet metal worker himself.

Soldered clips

Width: 50 mm, length approx. 100 mm, depending on the location and space for fitting on the base.
The clip can be made by the sheet metal worker himself and soldered to the lozenge.

Profiles

The dimensions of the eaves profiles, attachment profiles, etc. will depend on the on-site dimensions and can either be made by the sheet metal worker or supplied custom-made in lengths as custom items.

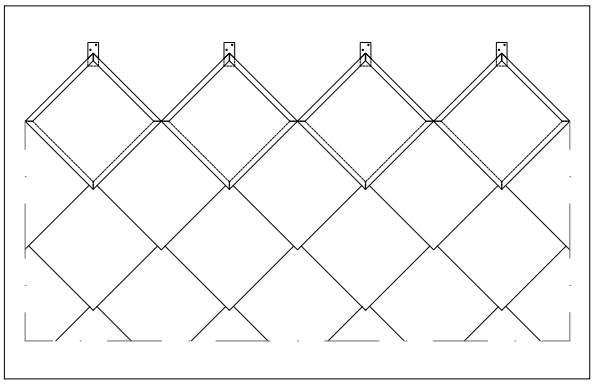


Figure 7.3.3

Lozenge size	Cutting size	Number/m²
450 x 450 mm	500 x 500 mm	approx. 5,6
280 x 280 mm	330 x 330 mm	approx. 15,3
200 x 200 mm	250 x 250 mm	approx. 32

Table 7.3.3

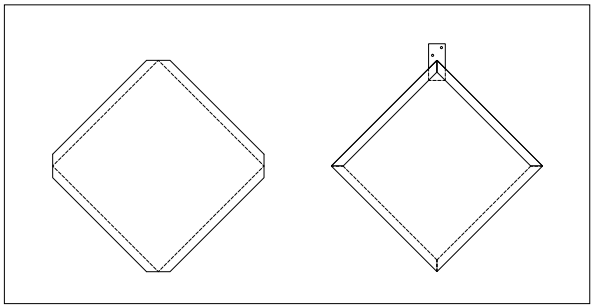


Figure 7.3.4

Lozenge size width ’b’	Cutting size	Number/m²
200 mm*	250 mm	approx. 25,6
250 mm*	300 mm	approx. 15,3
280 mm*	330 mm	approx. 11,9

Table 7.3.4 Dimensions of standard lozenge, rhombus, vertex 50°

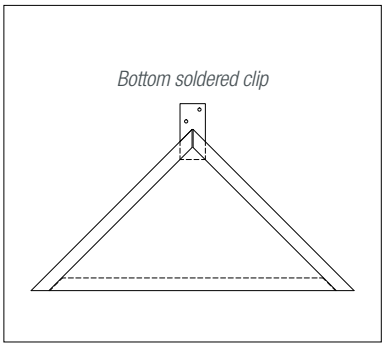


Figure 7.3.5 A

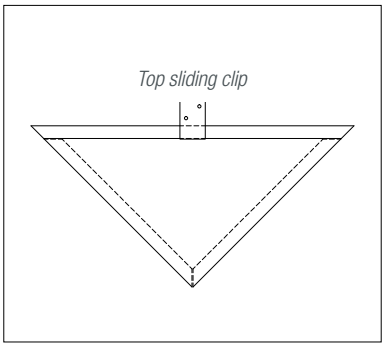


Figure 7.3.5 B

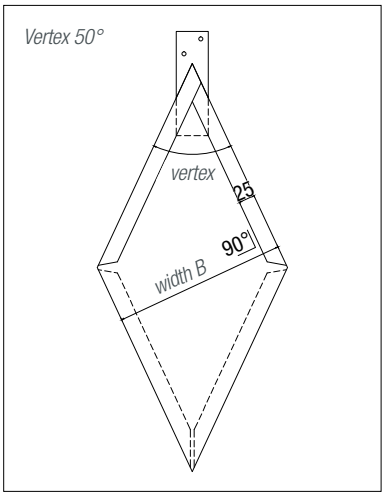


Figure 7.3.6

Support

The lozenge roof must be fully supported by timber, preferably of rough, unplanned boards, 23-25 mm thick and not tongue and grooved, with gaps of at least 5 mm. Use galvanised nails with a zinc-layer thickness of at least 20 microns or AISI 304 stainless steel for fastening.

7.3.1 Technical drawings

For the built up alternatives of the façade substructure see chapter 4.6 of this manual.

The technical details in paragraph 7.3.2 are based on the built up of a ventilated substructure as shown below.

The construction of the façade is built up as follows, beginning on the inside:

1. Building structure - any type, although it must be able to support the insulating material, or have the insulation attached to it
2. Damp control course made of metal or plastic film
3. Supporting rafters – generally made from wood
4. Insulation material according to thermal requirements
5. Ventilated cavity appr. 25 to 30 mm
6. Timber boarding, planed no less than 21 mm, not tongue-and-grooved, installed horizontally with gaps between the boards of at least 5 mm
7. Lozenge system

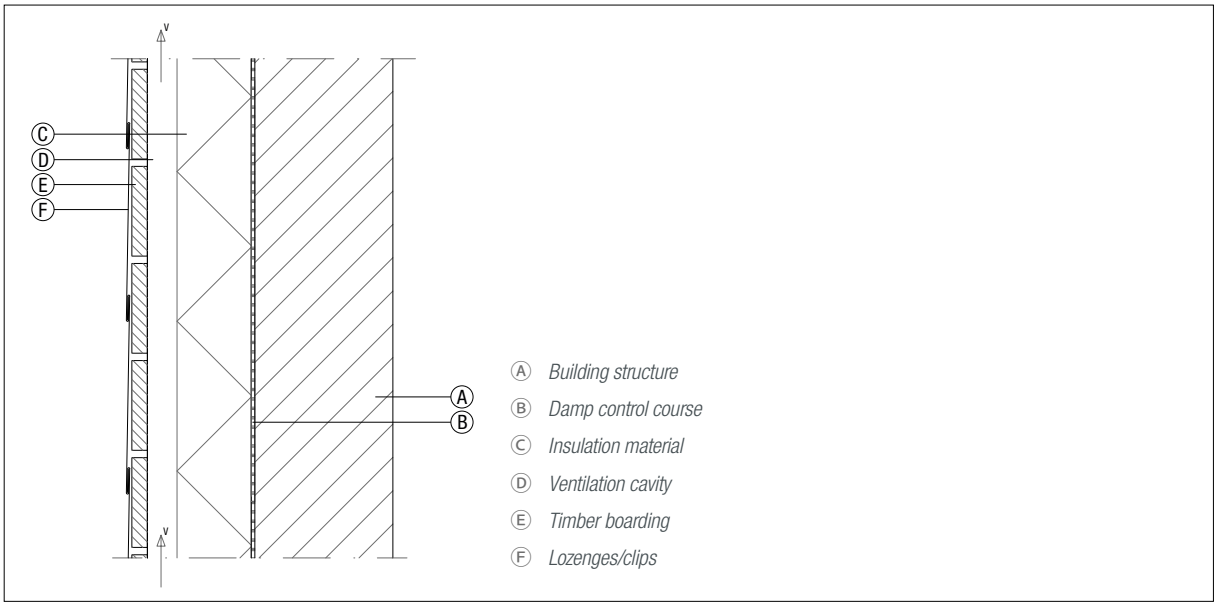
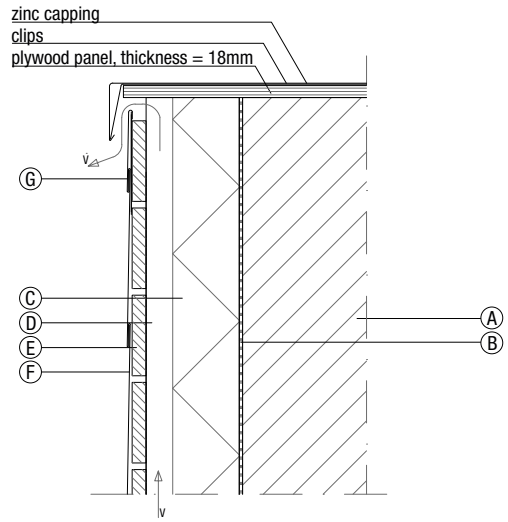


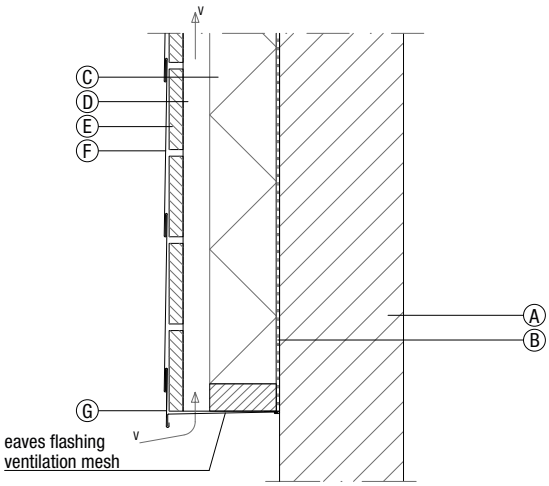
Figure 7.3.7

7.3.2 Lozenge system details ventilated



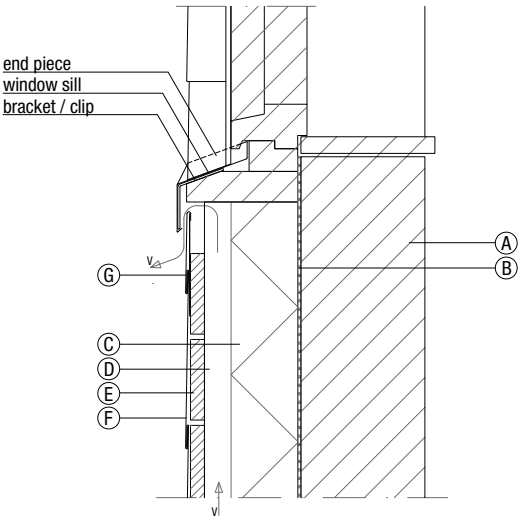
Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilation cavity*
Ⓔ *Timber boarding*
Ⓕ *Lozenges/clips*
Ⓖ *Upper flashing*

Figure 7.3.8 Ridge connection



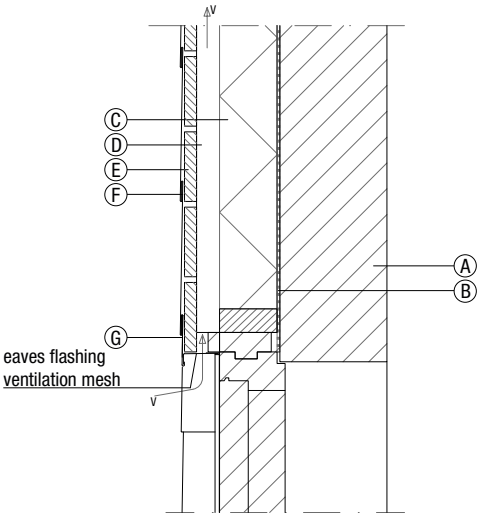
Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilation cavity*
Ⓔ *Timber boarding*
Ⓕ *Lozenges/clips*
Ⓖ *Bottom flashing*

Figure 7.3.9 Eaves connection



Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilation cavity*
Ⓔ *Timber boarding*
Ⓕ *Lozenges/clips*
Ⓖ *Upper flashing*

Figure 7.3.10 Window sill



Ⓐ *Building structure*
Ⓑ *Damp control course*
Ⓒ *Insulation material*
Ⓓ *Ventilation cavity*
Ⓔ *Timber boarding*
Ⓕ *Lozenges/clips*
Ⓖ *Bottom flashing*

Figure 7.3.11 Window head

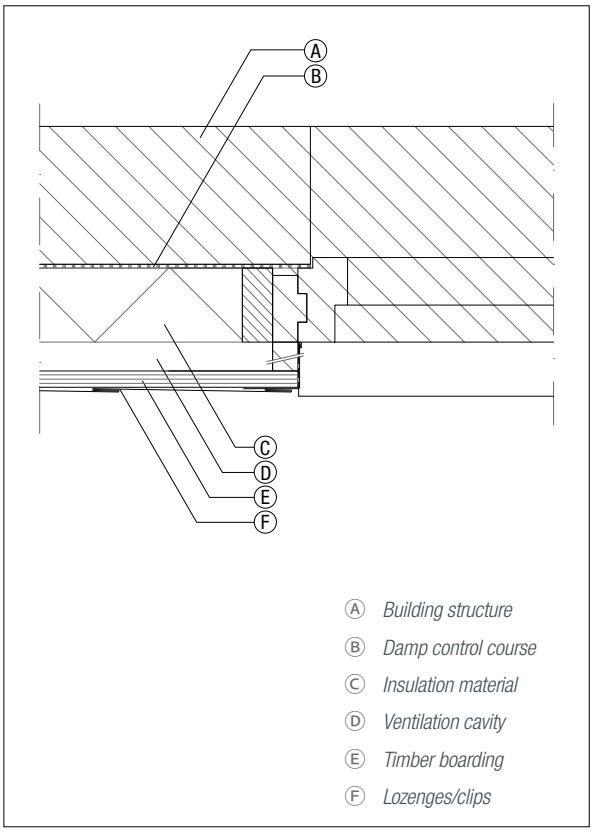


Figure 7.3.12 Window jamb

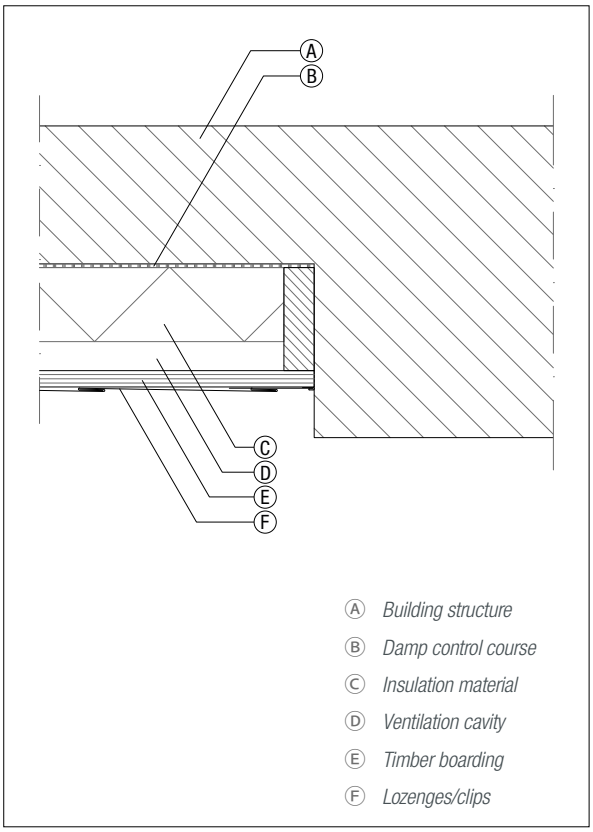


Figure 7.3.13 Wall abutment

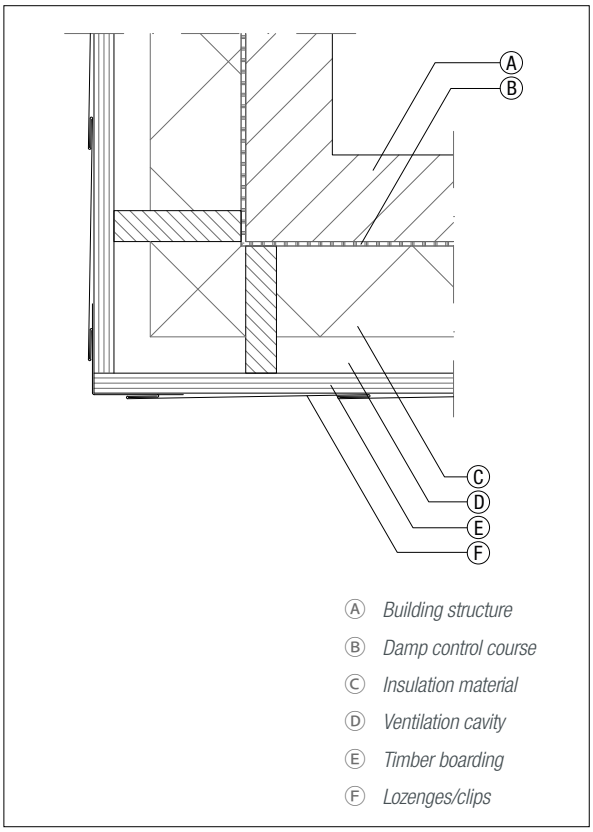


Figure 7.3.14 Outside corner

7.4 Overlapping Panel System

Overlapping panel or shiplap panel for façades

The overlapping (shiplap) system is a façade cladding with a layered built-up. The joint creates shadows when exposed to light and shade and gives this system its unique appearance. The system does not have any reveals. The profiles are easy to manufacture and efficient to install on site by means of concealed fasteners. The system is installed horizontally and the ideal alternative to the conventional timber cladding. Due to its scalloped profiles it creates a distinctive design. The shiplap panels are prefab formed and available in multiple shapes and dimensions.

Recommended dimensions are:

Variable width:	200 mm up to 320 mm
Length:	up to 900 mm
Thickness:	0.80 mm, 1.0 mm

7.5 Corrugated Panel System

The corrugated panel system for façade

The corrugated systems offer the ease of installation and can be assembled horizontally, vertically or diagonally. Both the Sinusoidal corrugated and Trapezoidal corrugated profiles are characterized by its exchange of light and shadow.

The sinusoidal profile is 'wave' corrugated and is available with either exposed or concealed fasteners. From a design point of view, the sinusoidal panels are characterized by the slight exchange of light and shadow, which will vary depending on the corrugation height. This system may be installed horizontally, vertically or diagonally.

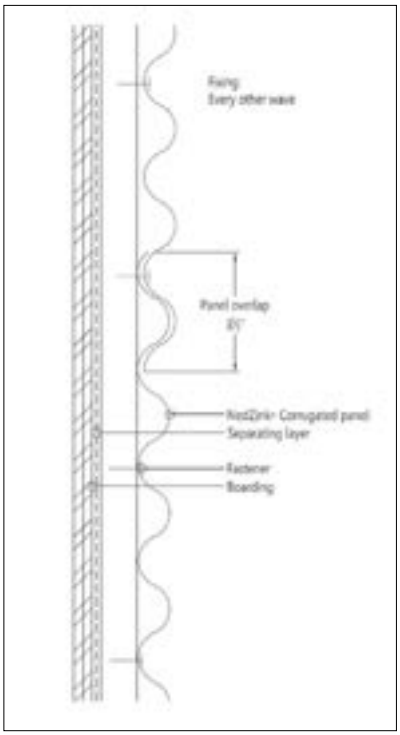


Figure 7.5.1 Corrugated-Panel

Standard panel sizes:

The panels are prefab formed and available in multiple shapes and dimensions.

Standard panel type	18/76	25/115	43/180
Wave depth/width	18 mm - 76 mm	25 mm - 115 mm	43 mm - 180 mm
Width useable	836 mm	805 mm	720 mm
Radius for curving install horizontal	15 m	30 m	40 m
Panel weight thickness 1 mm	8.7 kg/sq m	9 kg/sq m	9,5 kg/sq m
Panel length 1.8 m to 6 m			

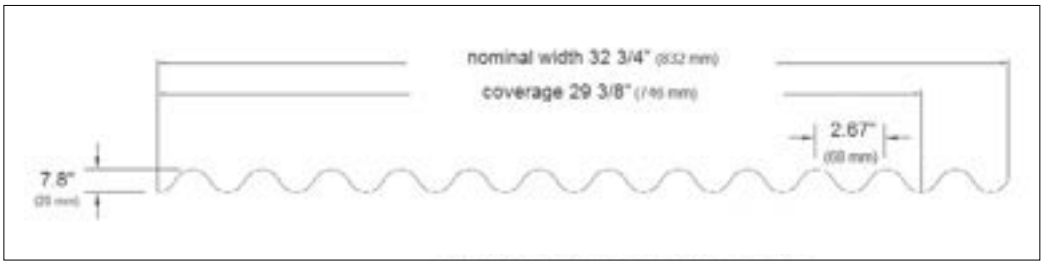


Figure 7.5.2 Example Sinusoidal Profile

7.6 Cassette System

The cassette system for façade

The cassette system is modular and allows design versatility and the lightweight systems lends itself to installation in either vertical or horizontal applications. The grid size can be customized per project/order. The panel size and seams between the various panels can vary and adjusted to the acquired. The cassette is made of solid zinc with a material thickness of 1.0 mm.

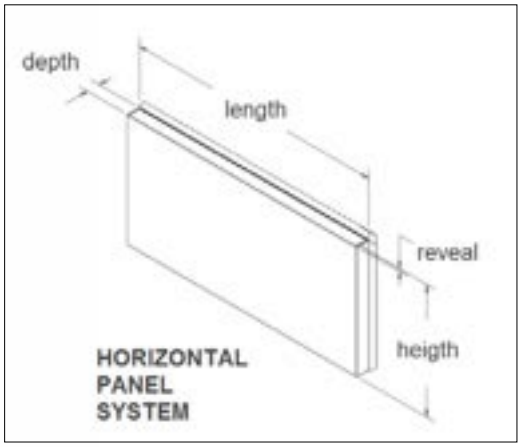


Figure 7.6.1 Panel System

7.6.1 Technical drawings

For the built up alternatives of the façade substructure see chapter 4.6 of this manual.

The construction of the façade is built up as follows, beginning on the inside:

1. Building structure
2. Ventilated or damp proof built up
3. Extruded aluminum bracket system
4. Cassete panel

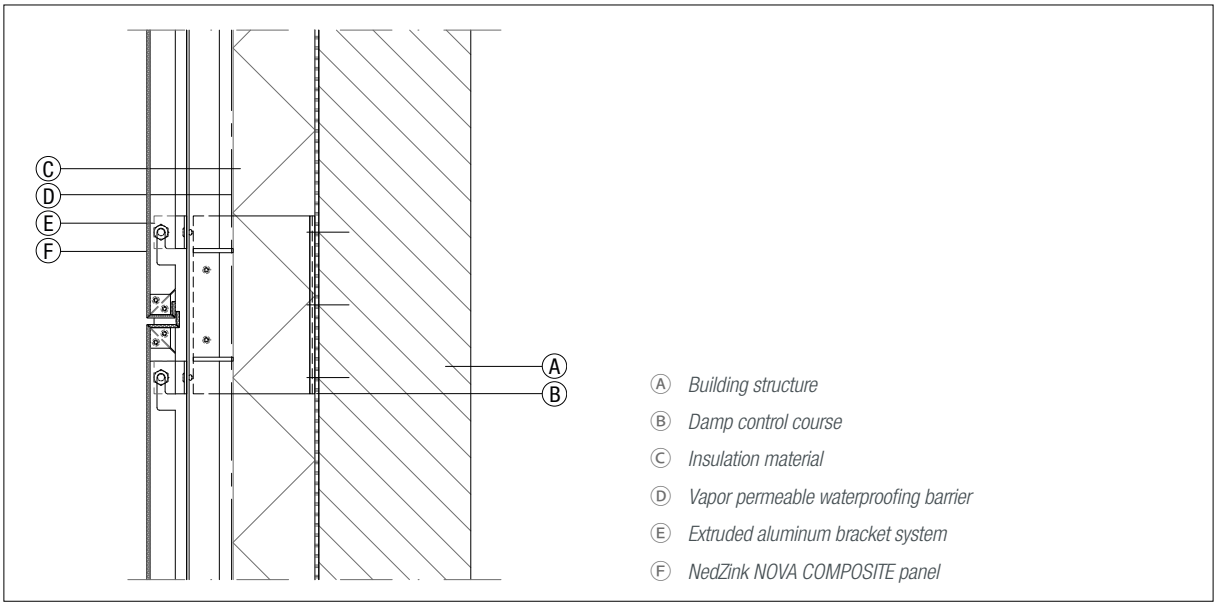


Figure 7.6.2

8 Rainwater systems

Gutters are used for the collection of rainwater. The rainwater is guided through downpipes into a sewer, other disposal point or collector. Gutters are produced in many variations and their use is various. In general, gutters are available in different forms and numerous applications.

8.1 Application

The suspended gutter has a semi-circular cross section, which in the past was made using a piece of round wood. The box gutter has a slightly trough, or box-shaped, cross section. The diagonal gutter has a back height edge in line with the surface of the sloping roof, and a front height edge, which forms a right angle, in other words a ‘diagonal’ design.

Downpipes are produced in various types. The most common is the round tube, but tubes with square, rectangular and other forms can be applied. The standard rainwater downpipes come with a soldered seam or a double seam. The diameter of the tubes is extended at one end so different lengths can be put together. To complete the drainage system the gutters and pipes must be fitted together with end pieces, brackets, bends, gutter outlets etc.

8.2 Roof Gutters

Roof gutters must comply with the NEN-EN 612 standard. NedZink standard prefab roof gutters are produced in a standard length of 3 meters. Depending on the type of gutter, different lengths of up to 6 meters can be supplied on request. Non-standard prefab gutters are produced from sheets of NedZink material according to drawings supplied by the installer. Non-standard prefab gutters must also comply with NEN-EN 612.

8.2.1 Box and suspended gutters

Dutch standard gutters are subdivided into suspended gutters (half-round) and box gutters (rectangular). See examples of both below.

Details bead

Bead diameter	Developed width
20 mm	65 mm
22 mm	70 mm
24 mm	75 mm
26 mm	85 mm
35 mm	110 mm
50 mm	165 mm

Table 8.1

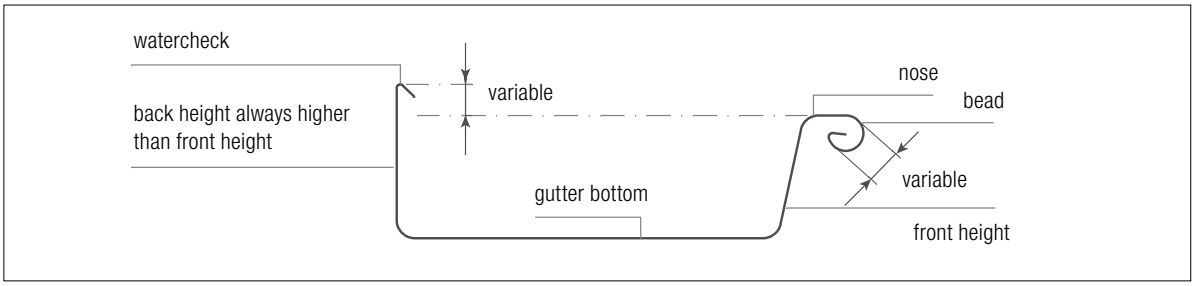


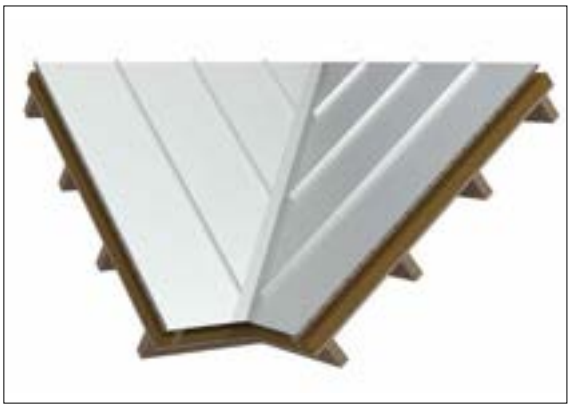
Figure 8.1.1

8.2.2 Customised Gutters

Non-standard box and suspended gutters are referred to as customised gutters. Below we provide some examples

Valley gutters

Valley gutters are used to collect water between two sloping roofs at the point of a valley rafter.



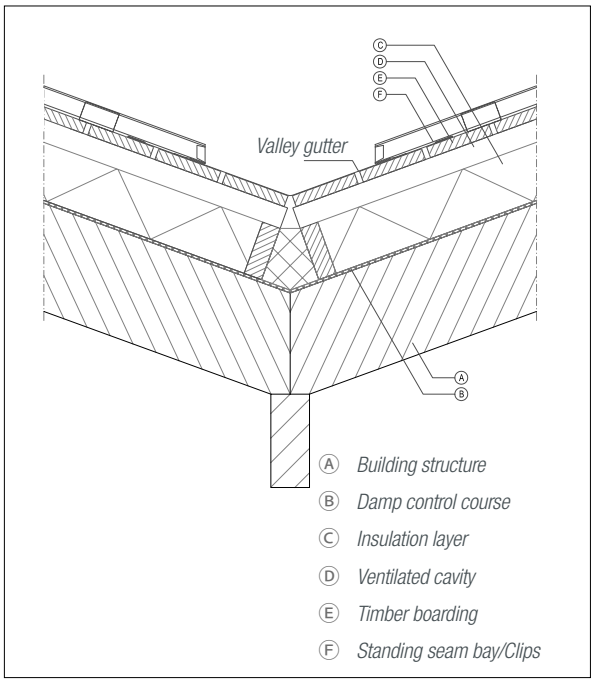


Figure 8.1.2 Valley gutter

Gutters in the roof surface

Gutters in the roof surface are sunk into or concealed below the level of the zinc roof covering in, for example, a standing seam structure.

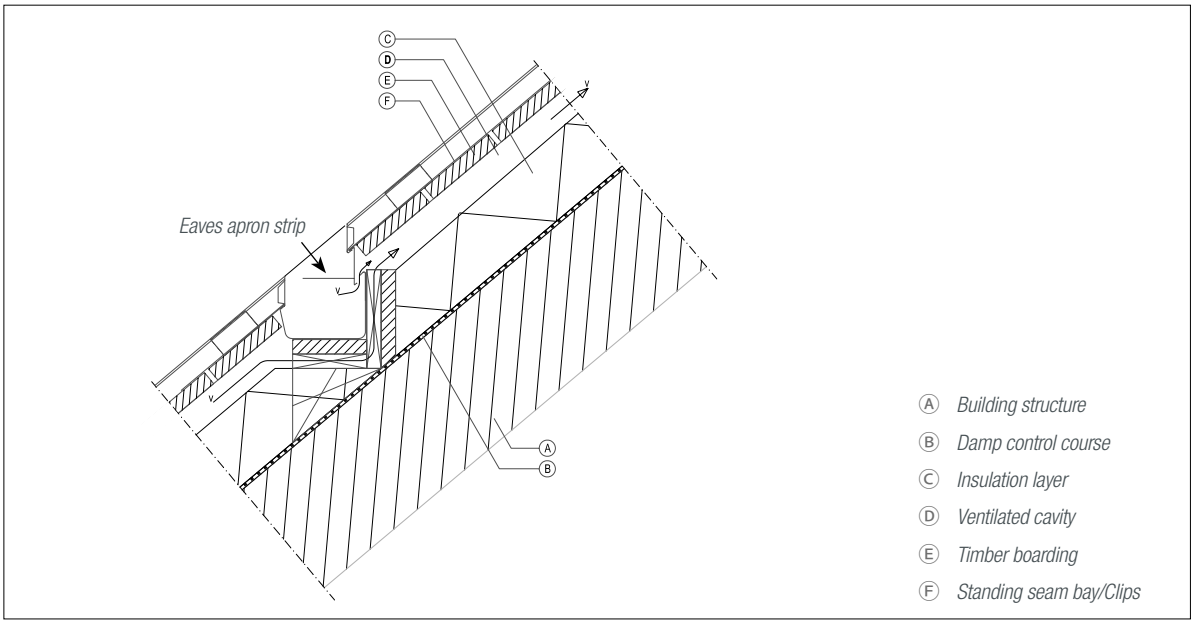


Figure 8.1.3

Concealed gutters

Concealed gutters are positioned vertically at a dormer or wall abutment.

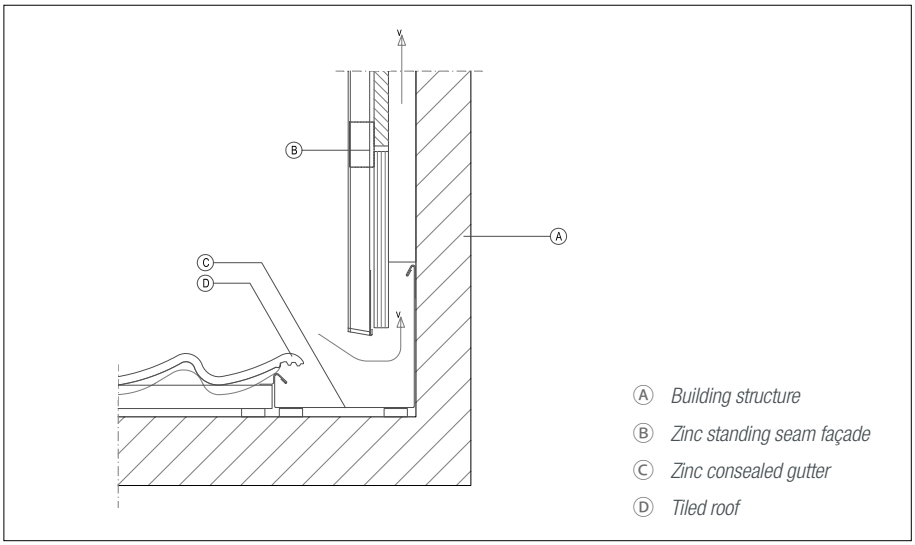


Figure 8.1.4 Concealed gutter

8.3 Roof gutters support

8.3.1 Supported by brackets

Installation

The gutter parts should preferably be installed from left to right and against the slope (from low to high). The structural conditions do not always allow this. When choosing another installation direction, the installation from low to high is more important than from left to right (draining overlap!).
At one side of the of the gutter a locating edge or fitted edge has been applied to facilitate the joining together of the gutters. The gutter parts, starting at the bead, are joined together with a minimum overlap of 10 mm. With the same rotating movement, the gutter parts with the bead are placed in the correct position over the lip or steel angle profile of the brackets.

The clip at the back height of the bracket is now bent downwards over the water check of the back height, in such a way that the gutter can continue to move in the circumstances of contraction and expansion. The use of nails for the same purpose is not permitted as this is disastrous for the service life of the gutter! The overlap of the gutter can now be soldered. Note the minimum overlap of 10 mm and flow through of the soldering of at least 10 mm.

Gutter brackets

The hot dip galvanised gutter brackets to be used must meet the NEN-EN 1462 standard and must, according to the specifications of the manufacturer, be suitable for the type of gutter to be installed.

Figure 8.1.5

Figure 8.1.6

The form of standard and non-standard gutter brackets must be adjusted to the form of the wall plate, the required slope, the pitch of the roof and the position of the gutter to be installed (back height higher than front height).

A gutter bracket must be attached to the wall plate with at least 2 galvanised or stainless-steel screws. The distance between the gutter brackets amounts to max. 660 mm centre-to-centre. The slope in the direction of the outlet piece must amount to at least 2 mm per meter of gutter length.

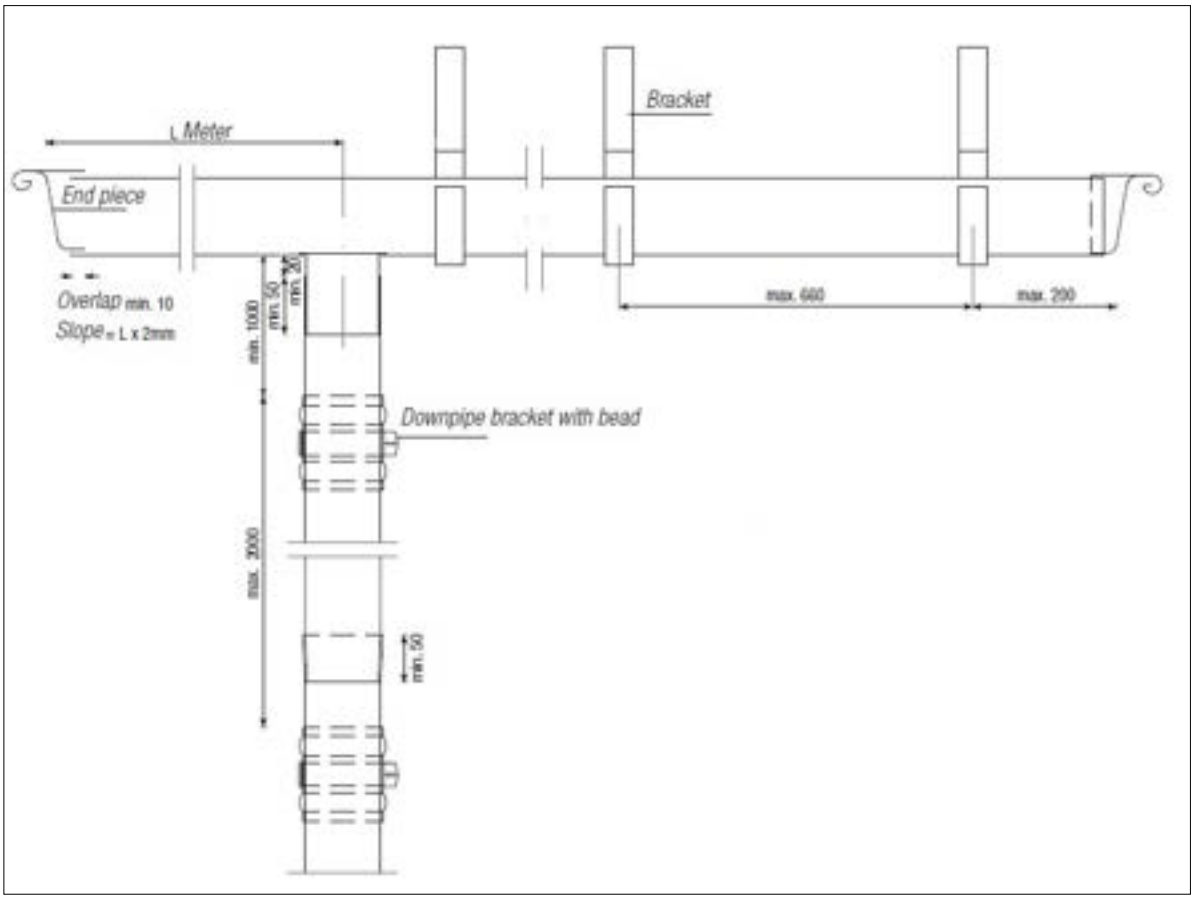


Figure 8.1.7

8.3.2 Supported by wooden box

This type is fully supported by a structural construction. In most cases it consists of a wooden box structure.

Installation

- The bottom width of the gutter must be at least 10 mm smaller than that of the box. The back height min. 10 mm higher than the front height.
- The gutter parts must be preferably installed from left to right and against the slope (from low to high). The construction conditions may not always allow for this. When choosing another installation direction the installation from low to high is more important than from left to right (drainage overlap!).
- Clips are attached at the edge of the front height of the box with a minimum width of 70 mm and a thickness of 0.80 mm. Attach the clips with 3 galvanised or stainless-steel flat-headed nails. A clip must pierce approximately ¾ into the bead. Secure the gutter with clips of 30 mm wide at the rear upright. The maximum clearing distance is 660 mm.
- If the bottom width of the gutter is greater than 300 mm, a clip must be applied under the seam on the bottom of the gutter. The overlap of the clip must then be 25 mm and the clip may not be soldered.
- The distance between the clips is max. 660 mm centre-to-centre. Clips of min. 30 mm width are further attached to the wooden back height at the same distances and are bent over the water check of the gutter.
- The outlet piece in the supporting box construction must be spacious enough to allow the gutter to contract and expand. This means that the outlet piece, with the rain pipe slipped around it must have an oval cavity with at least 20 mm of space.

Support

The support is part of the building construction and is usually made of wood. Gutters of NedZink material can be applied directly to unplaned wood. NedZink recommends installing a vapor-permeable layer on newly-impregnated and bonded wood at the bottom of the gutter tray in order to prevent attack by condensation on the backside of the zinc. The same advice also applies to supports of concrete or other stony materials, where the separating layer also prevents wear on the zinc. Before applying the zinc, check that the supporting wooden container is clean and does not contain protruding nail heads or screws.

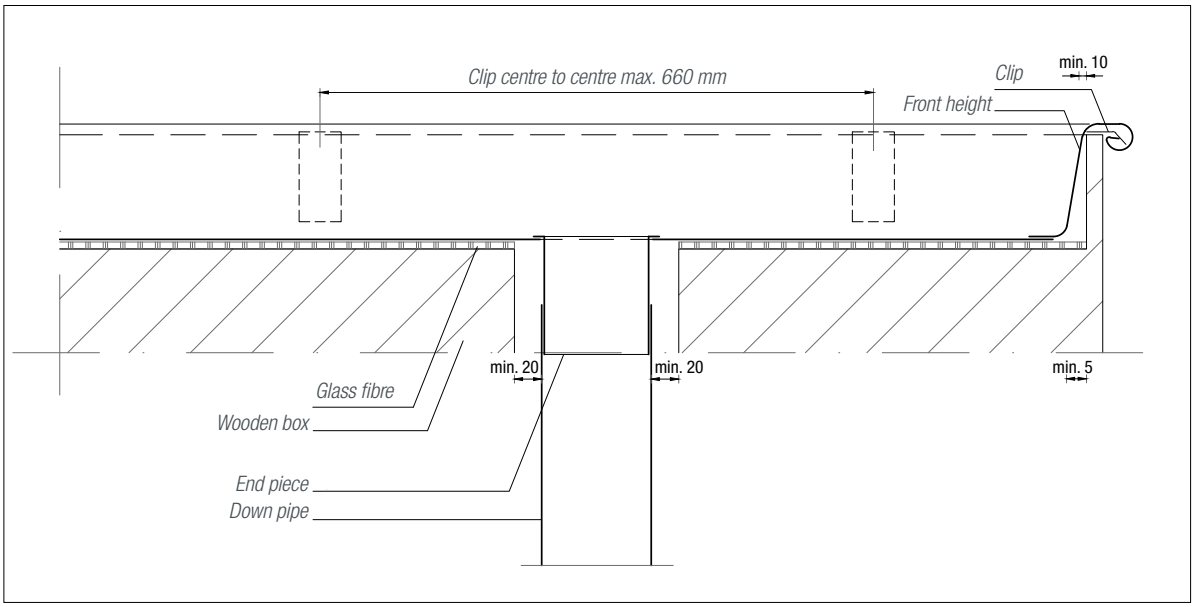


Figure 8.1.8

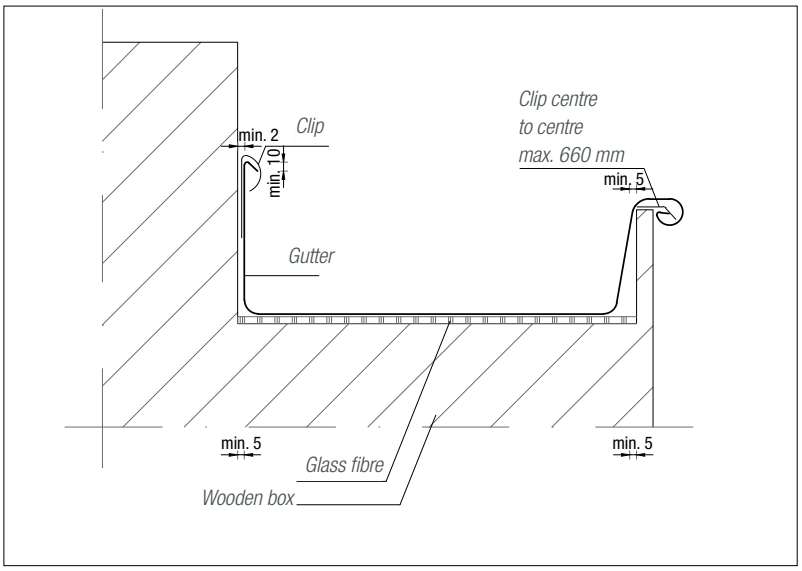


Figure 8.1.9

The box is to be measured at various places and following measurements should be taken:

- Upper opening width.
- Bottom width.
- Height and slope of front height and rear height of the wooden box.
- Thickness of the edge of the front height of the wooden box.
- Length of the various gutter surfaces.

Opening of the outlet piece

The outlet piece in the supporting box construction must be spacious enough to allow the gutter to contract and expand. This means the outlet piece, with the rain pipe slipped around it must have an oval cavity with at least 20 mm of space to the left and to the right and in the other two directions, at least 5 mm. See figure 8.1.8.

Design of the gutter

See figures 8.1.8 & 8.1.9. The following basic rules must be observed:

- The upper opening width of the gutter must be at least 4 mm smaller than that of the box.
- The bottom width of the gutter must be at least 10 mm smaller than that of the box.
- The front height of the gutter must be 1 to 2 mm larger than that of the box.
- The bead protrudes over the edge of the box and does not rest on it.
- The back height min. 10 mm higher than the front height.
- The slope of the gutter is equal to that of the box including any bent forms.
- The further dimensional proportions in accordance with NEN-EN 612.
- The ends of the gutter must have at least 10 mm space in relation to the ends of the supporting box

8.4 Rainwater Downpipes

Rainwater downpipes are made from NedZink NTZ® and must meet EN 612. Standard prefab lengths are 2 and 3 meters. Non-standard downpipes can be supplied. Non-standard prefab downpipes must also meet EN 612. Rainwater downpipes can be supplied as a rounded, square, or rectangular model. The longitudinal seam is welded and one of the ends is expanded. Table 8.2 below contains the standard rainwater downpipes.

Standard rainwater downpipes

Diameter	Mass	Thickness	length
Round 80 mm	1,161 kg/m	0,65 mm	2 & 3 m
Round 100 mm	1,451 kg/m	0,65 mm	2 & 3 m
Square 80 mm	1,485 kg/m	0,65 mm	2 & 3 m
Square 100 mm	1,860 kg/m	0,65 mm	2 & 3 m

Table 8.2

Installation

- The down pipes are hung from above to below.
- In principle, the rainwater downpipes are not soldered, they are slipped in to one another with a min. overlap of 50 mm.
- The upper short length of piping may not be able to press against the bottom side of the gutter and must therefore have at least 20 mm space.
- The outlet piece must be slipped at least 50 mm into the downpipe, so that the projecting outlet piece must be 70 mm in length.
- Each length of piping must be bracketed at least once.
- The brackets must be attached at a maximum of 2 meters distance, and the upper bracket must be installed at least 1 meter under the gutter bottom, see figure 8.1.7.
- The distance between the back of the pipe and the façade must be at least 30 mm.
- The bracket spacing is 2 meters.
- To make lateral movement of the gutter possible, the first hinge bracket is to be placed 1 meter from the bottom of the gutter.
- The distance between the bottom gutter and top of the drain pipe is to be at least 20 mm to allow for expansion of the tube.

8.5 Expansions

Expansion sleeves are necessary to absorb the expansion and contraction of the roof gutter. An expansion device must always be supported by a bracket.

In practice we distinguish between two types of expansion pieces, mechanical expansion (see figure 8.1.10) and rubber expansion (see figure 8.1.11).

Figure 8.1.10

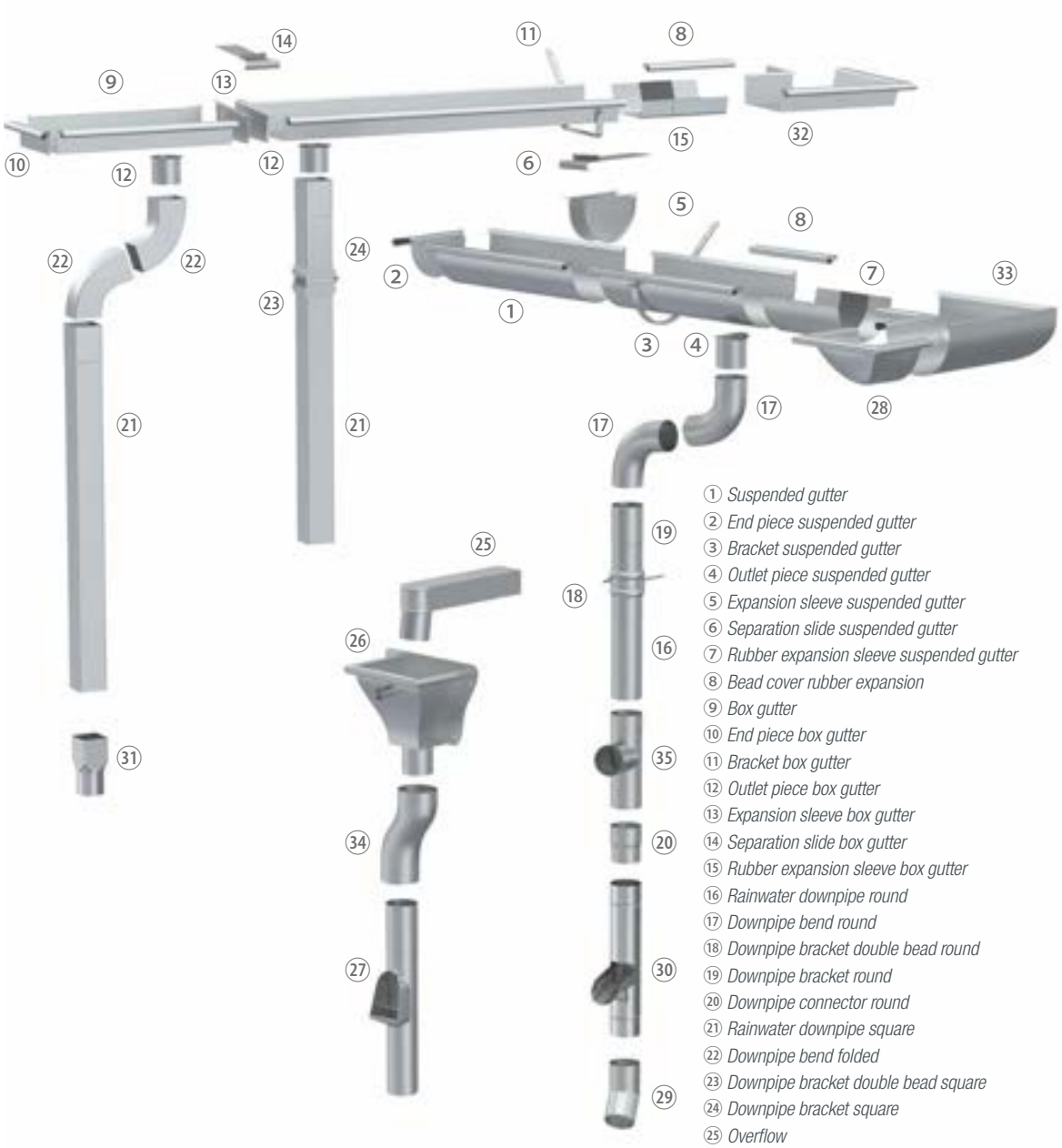
A mechanical expansion has an expansion joint and a separation slide on the left and right.

Figure 8.1.11

A rubber expansion is fitted with a rubber galvanised expansion piece and a zinc beaded edge.

8.6 Accessories

Accessories are required to collect rainwater in gutters and drain it via rainwater downpipes. A wide range of accessories are available, as shown below.



① *Suspended gutter*
② *End piece suspended gutter*
③ *Bracket suspended gutter*
④ *Outlet piece suspended gutter*
⑤ *Expansion sleeve suspended gutter*
⑥ *Separation slide suspended gutter*
⑦ *Rubber expansion sleeve suspended gutter*
⑧ *Bead cover rubber expansion*
⑨ *Box gutter*
⑩ *End piece box gutter*
⑪ *Bracket box gutter*
⑫ *Outlet piece box gutter*
⑬ *Expansion sleeve box gutter*
⑭ *Separation slide box gutter*
⑮ *Rubber expansion sleeve box gutter*
⑯ *Rainwater downpipe round*
⑰ *Downpipe bend round*
⑱ *Downpipe bracket double bead round*
⑲ *Downpipe bracket round*
⑳ *Downpipe connector round*
㉑ *Rainwater downpipe square*
㉒ *Downpipe bend folded*
㉓ *Downpipe bracket double bead square*
㉔ *Downpipe bracket square*
㉕ *Overflow*
㉖ *Hopper head*
㉗ *Leaf guard*
㉘ *End piece half round suspended gutter*
㉙ *Elbow round*
㉚ *Rain diverter*
㉛ *Adapter piece*
㉜ *External corner box gutter*
㉝ *Internal corner suspended gutter*
㉞ *Downpipe S-curve round*
㉟ *T-branch*

Overview accessories.

9 Building features

Dormers roofing, roof inserts and penetrations can be covered in zinc relatively easily. Zinc is also easy to use to cover window frames. Zinc windows sills have a long lifespan and offer the advantage that they can be made fully waterproof by soldering them at the end pieces. Zinc cappings and wall coverings can be customized, including the required bead or flat drip.

9.1 Zinc Cappings and Wall Copings

Zinc cappings made from NedZink material can be applied successfully as a covering to the roof edge of flat roofs that are covered with bituminous, plastic or rubber material, whether or not with gravel or terrace tiles as a load. These roofing materials can cause problems on the roof edge.

This is the result of a number of factors:

- effect of sunlight (heat and U.V. rays)
- differences in expansions between trim, substructure and covering
- bulging of bitumen due to a low softening point
- loosing of the glued edge of the roof trim
- mechanical damage of the roof edge

These harmful effects can be avoided by fully covering the edge of the roof with a titanium zinc capping. If NedZink material is used and applied with the necessary craftsmanship, the expected service life is 50 years or longer.

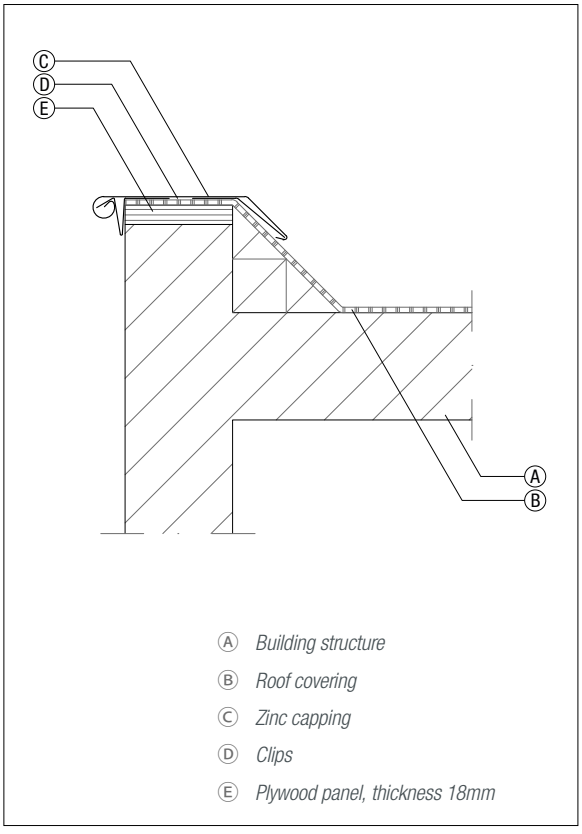


Figure 9.1.1 Zinc capping with bead

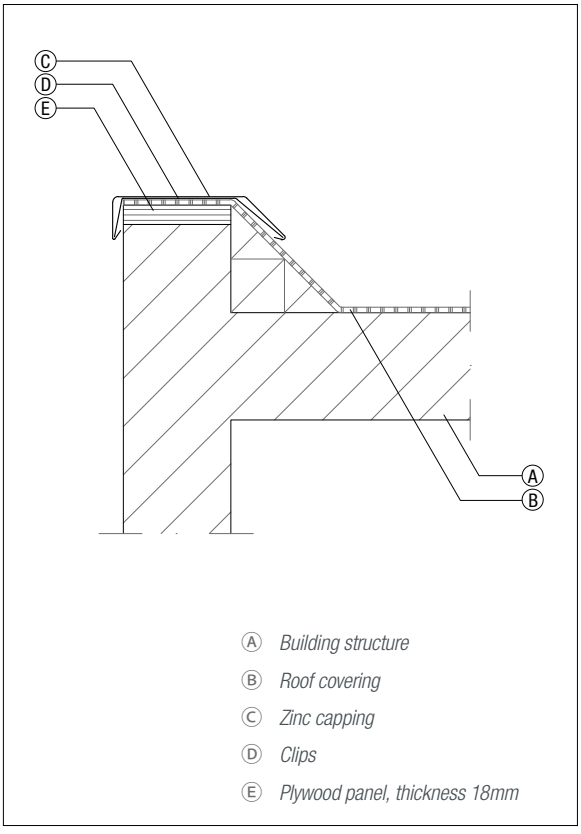


Figure 9.1.2 Zinc capping with flat drip

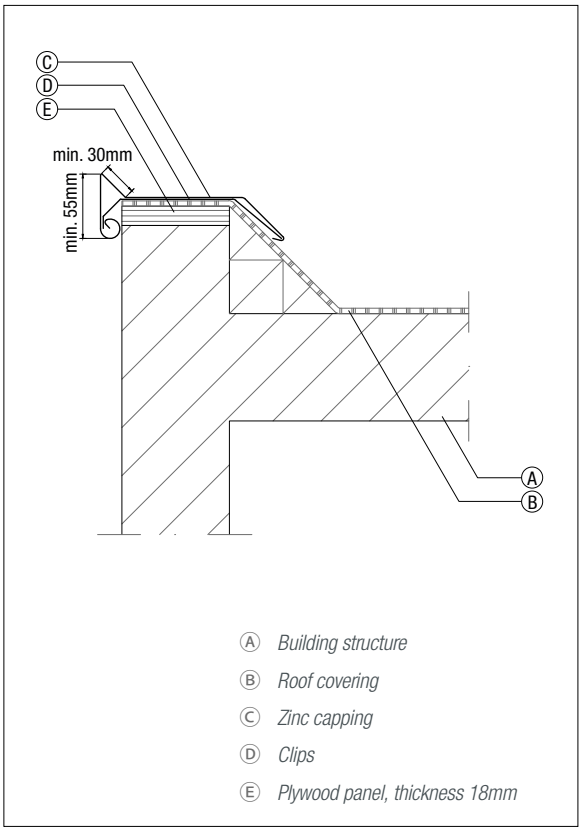


Figure 9.1.3 Zinc capping with ridge

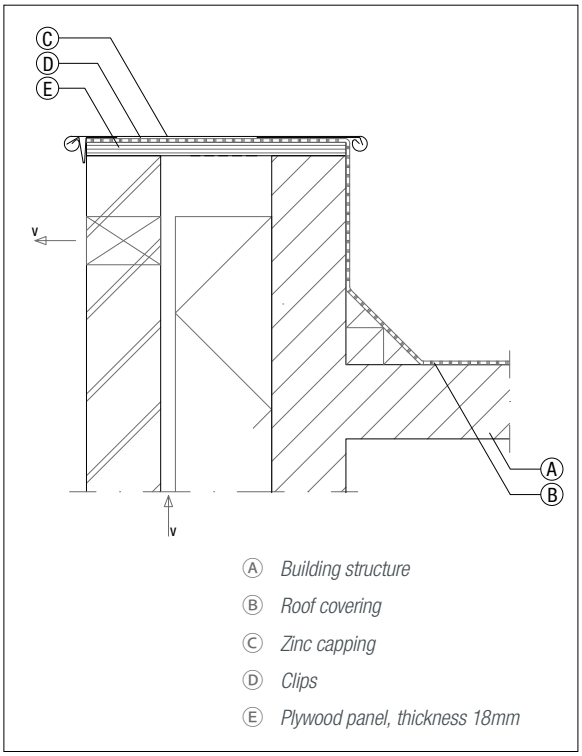
The zinc capping is designed according to the example figures 9.1.1, 9.1.2 and 9.1.3.
A number of important construction details:

- the upper surface of the zinc capping must slope down in the direction of the roof or must be provided with a rain ridge, see figure 9.1.3
- the zinc capping is attached by means of zinc clips of a width of at least 80 mm that are fastened to the edge of the roof with at least two screws of zinc nails. The distance between the clips amounts to a maximum of 1 meter.
- the material for the clips must be at least 0.80 mm thick.
- the use of stainless steel or galvanished steel clips is recommended for zinc cappings with a long sloping part of > 150 mm. The same goes for zinc cappings with a developed width as from 450/500 mm, by wich the zinc capping can be regarded as a roof bay. The number of clips must be adapted to this.
- the zinc cappings must be soldered to one another up to a maximum of 12 meters length with an overlap of at least 15 mm. After every 12 meters an expansion sleeve must be fitted at one's option, see figure 9.1.4.

Figure 9.1.4

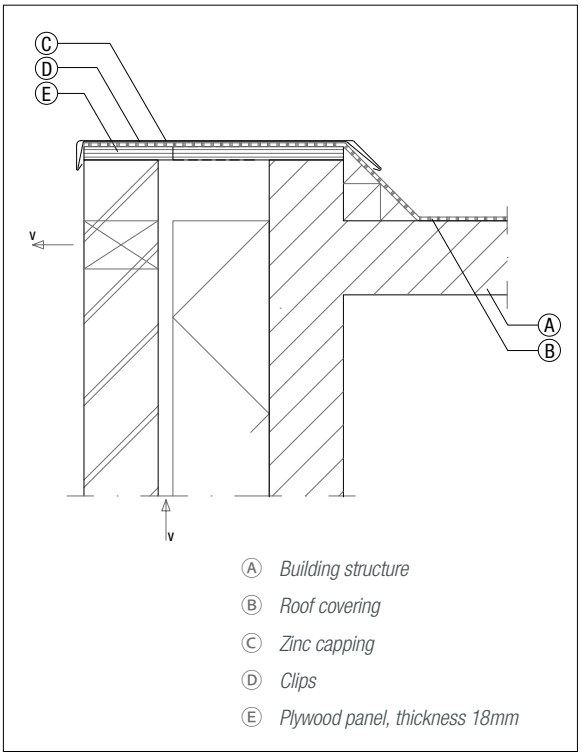
Wall copings

The principle of the capping can also be applied as a wall covering. It is recommended that the top of the wall be fitted with wooden components to which the zinc wall covering can be secured. The covering must also be secured with clips to ensure thermal expansion. The same rules apply as those for zinc cappings for attaching the expansion pieces.



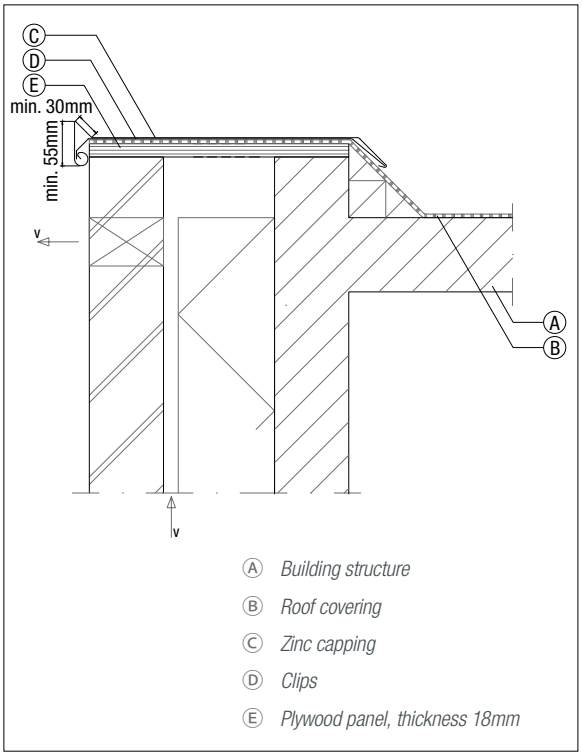
Ⓐ *Building structure*
Ⓑ *Roof covering*
Ⓒ *Zinc capping*
Ⓓ *Clips*
Ⓔ *Plywood panel, thickness 18mm*

Figure 9.1.5 Wall coping with bead



Ⓐ *Building structure*
Ⓑ *Roof covering*
Ⓒ *Zinc capping*
Ⓓ *Clips*
Ⓔ *Plywood panel, thickness 18mm*

Figure 9.1.6 Wall coping with flat drip



Ⓐ *Building structure*
Ⓑ *Roof covering*
Ⓒ *Zinc capping*
Ⓓ *Clips*
Ⓔ *Plywood panel, thickness 18mm*

Figure 9.1.7 Wall coping with ridge

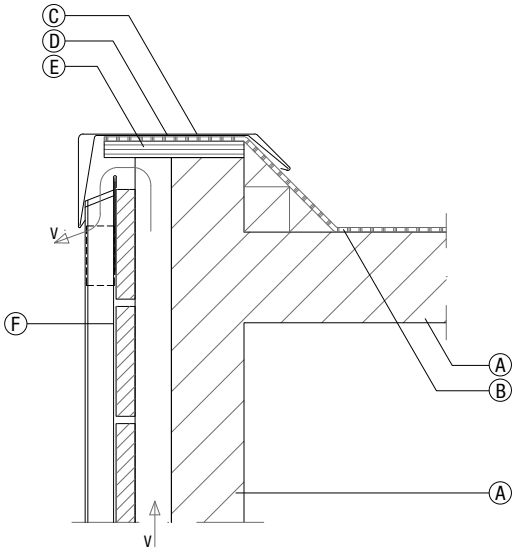
Figure 9.1.8

9.2 Dormers

When a dormer on a tile roof is covered with zinc, first the valley gutters are placed along the side bolsters of the dormer. These gutters will be connected to the existing standard gutter. The gutters are placed at the roof and to the side of the dormer by means of clips.

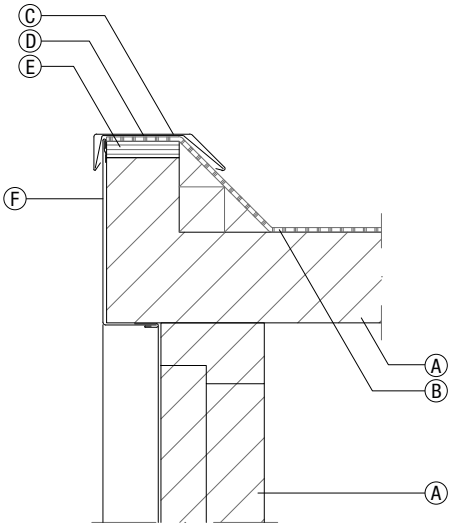
The side bolsters are fitted as façade cladding and secured with clips to the underlying wooden structure. The preference is for a standard system cladding such as a standard seam system. For small surfaces there is also the option of sheets connected to each other using hooked edges. The hooked edges also contain the clips for fixation to the woodwork. The clips must allow adequate expansion of the side bolsters, to prevent bulging.

Joints and connections should always have sufficient space to guarantee the thermal movement of the zinc. Especially with this kind of application it is advisable to fit the coverings prior to soldering, clipping or seaming to prevent problems due to the thermal effects. Only then it is possible to perform correctly with waterproof details.



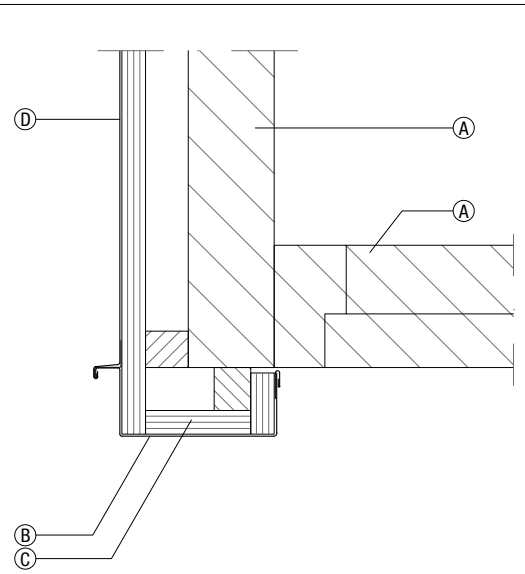
Ⓐ *Building structure*
Ⓑ *Roof covering*
Ⓒ *Zinc capping*
Ⓓ *Clips*
Ⓔ *Plywood panel, thickness 18mm*
Ⓕ *Zinc standing seam façade*

Figure 9.2.1 Zinc capping with dormer cheek



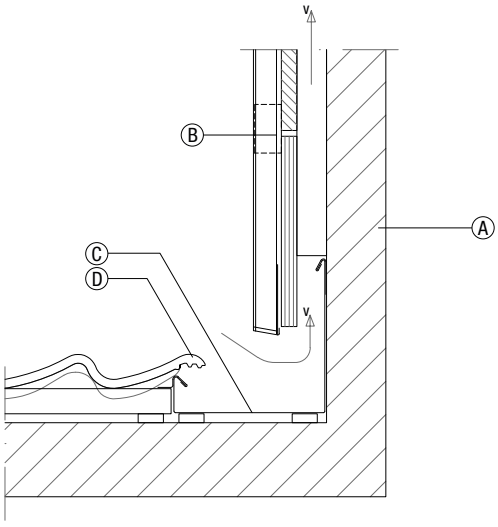
Ⓐ *Building structure*
Ⓑ *Roof covering*
Ⓒ *Zinc capping*
Ⓓ *Clips*
Ⓔ *Plywood panel, thickness 18mm*
Ⓕ *Zinc covering*

Figure 9.2.2 Zinc capping front vertical standing seam



Ⓐ *Building structure*
Ⓑ *Zinc capping*
Ⓒ *Plywood panel, thickness 18mm*
Ⓓ *Zinc standing seam façade*

Figure 9.2.3 Dormer front with dormer cheek



Ⓐ *Building structure*
Ⓑ *Zinc standing seam façade*
Ⓒ *Zinc concealed gutter*
Ⓓ *Tiled roof*

Figure 9.2.4 Dormer, concealed gutter, with vertical standing seam dormer cheek vertical standing seam

9.3 Roof Penetrations

Roof inserts

Joints between vent pipes, ventilation channels and chimneys and the roof covering must be watertight. Titanium zinc can be used in zinc roof coverings as well as coverings made from other materials, such as tiles. A concealed gutter and spreader construction are often used to achieve the correct joint between the insert and the roof covering.

Roof penetrations

In the case of roof penetrations techniques, such as a ridge finish, a side connection and bottom connection are used.

The zinc should not be fitted around the roof penetration too tightly. There must be room left for the roof covering to expand and contract.

9.4 Skylights

With zinc roof coverings, it is possible to place roof windows to achieve the required daylight in the underlying spaces. With standardized skylights, fittings are available to enable standard or recessed installation of the roof window.

It is possible to insert skylights in zinc roofs to obtain sufficient daylight in the underlying rooms. Accessories are available to achieve a standard or recessed installation for standard skylights. This involves using flashings that ensure a streamlined transition and guaranteed rainwater drainage.

Besides a wide range of auxiliary profiles for the skylights, it is also possible to integrate the skylight in the roof using a spreader or other special customisation.

10 Processing information

10.1 Soldering zinc

Soldering is the process of connecting two metal parts using another metal that has a lower melting point. The metals to be connected are not melted in the process. The metal that creates the connection is the solder.

The soldering work must be carried out in such a way that the solder flows satisfactorily, and the minimum overlap requirements are satisfied:

- For vertical soldered joints (e.g. rainwater downpipes) and soldered joints of gutter ends and other accessories min. 4 to 5 mm.
- For horizontal and inclined soldered joints an overlap of min. 10 mm. These are strength joints.

One must use a soldering bit with a weight of more than 500 gram, which must be used at the correct temperature (350-400 °C).

A bit with a flat sole and a width of 10 - 15 mm gives the best results for soldering most joints in zinc work. One may need a bit with a different form, min. weight 350 gram and a sole of 5 mm in width, only for places that are difficult to reach. For the form of the bits see figure 10.1.

The lifespan of a soldering bit is determined by regular maintenance. The copper oxide on the bit will always have to be removed and deeply worn bits must be forged into the proper shape. Copper oxides and fluid remnants on the sole of the bit are removed using a sal ammoniac block. This is achieved by rubbing the soldering bit back and forth on the stone at working temperature.

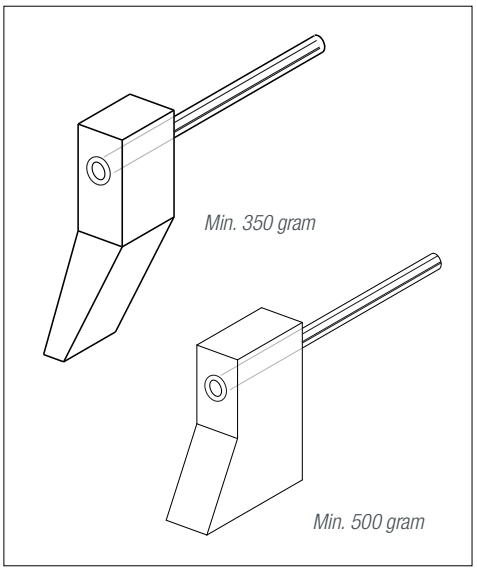


Figure 10.1 Form of the bits

10.1.1 Natural zinc

Soldering natural titanium zinc

There are various brands of soldering flux 'suitable for titanium zinc', which can produce good soldering results. We recommend using soldering fluxes for new and old zinc.

These soldering fluxes must have the following properties:

- The zinc is scarcely or not corroded after the soldering.
- Do not produce harmful vapors.
- The flux residue can be easily removed.
- Do not cause rust on tools.

Soldering flux application process:

- Apply soldering flux to the top of the bottom sheet where the soldered joint is to be made. Make sure there is a 10 mm overlap to create a strong joint.
- Apply soldering flux to the bottom surface of the top sheet.
- Place the top sheet on to the bottom sheet and apply the top sheet with soldering flux. Make sure that you also cover the joint.
- Solder the materials together using a hot bit and 50/50 or 40/60 solder. Use a bit with a weight of 500 to 750 gram.
- Carefully remove any remaining soldering flux with a damp sponge or cloth.

It is especially advisable not to work with hydrochloric acid whether or not mixed with soldering flux, as this is harmful to the health, tools and the zinc. Before applying the soldering flux, ensure that the zinc surface is clean and that the lap to be soldered will close properly. The maximum permissible gap is 0.5 mm. When the soldering has been completed, the joints must be cleaned as quickly as possible with a damp sponge or cloth.

For soldering the zinc two alloys are recommended:

- Tin-lead 50/50, low in antimony, melting range 183-216 °C.
- Tin-lead 40/60, low in antimony, melting range 183-235 °C.

A lower temperature results in insufficient heat transfer, which causes ‘clumps and blisters’ to form between the joint. A higher temperature results in the tin burning or the zinc recrystallizing (annealing). The lead in the alloy is just a filler. The percentage of tin determines the melting area and the tensile strength of the solder. Solder with a low level of antimony must be used to solder zinc. Antimony causes a granular solder joint and increases the melting area.

10.1.2 Old zinc

The difference between soldering old and new zinc is the pollution and the patina layer that have formed on the zinc. In order to achieve a good solder joint the overlaps to be soldered must first be thoroughly cleaned and restored to bright metal surfaces. This can best be done by scraping and/or sandpapering, then apply the soldering flux and solder as described for new zinc above.

10.1.3 Pre-weathered zinc and NedZink Nuance

Soldering pre-weathered zinc

In order to obtain a good soldering joint the joint must first be polished to a bright metal surface.The pre-patina layer must therefore be removed in advance. This is called scraping and there are two possibilities:

1. Mechanical sanding, in which the patina is removed by sanding or grinding. This can be done manually or using an electric tool (sander or grinding machine).

2. Chemical stripping, in which the patina is removed using a chemical stripper. With a one-step stripper NedZink NOVA, NedZink NEO and NedZink NOIR can be removed with one fluid, including the AFP (Anti-Fingerprint) layer. The NedZink Nuance has an extra layer on the pre-patinated surface and therefore it is necessary to remove the pigment layer first before removing the other layers.

Process for mechanical sanding and soldering NedZink NOVA, NEO, NOIR and NUANCE:

- Mark out the patina layer to be removed using a T-square or ruler.
- Remove the patina layer manually with sanding paper or a power tool until the bright metal surface is visible.
- Then solder the bright metal surface according to the instructions in paragraph 10.1.1.

Process for chemical stripping and soldering NedZink NOVA, NEO and NOIR:

- Mark out the patina layer to be removed using a T-square or ruler.
- Coat the surface to be removed with a one-step fluid for NedZink NOVA, NEO and NOIR and leave to work for 20 seconds.
- Remove the patina with a clean cloth.
- Repeat if necessary.
- Then solder the bright metal surface according to the instructions in paragraph 10.1.1.

Process for chemical stripping and soldering NedZink NUANCE:

- Mark out the patina layer to be removed using a T-square or ruler.
- Coat the coloured patina layer with a dedicated colour stripper and leave to work for 10 seconds.
- Remove the dissolved pigment with a clean cloth.
- Coat the patina layer to be removed with a regular stripper (HCL based) or one-step stripper and leave to work in for 20 seconds.
- Remove the patina with a clean cloth.
- Then solder the bright metal surface according to the instructions in paragraph 10.1.1.

The preference is for mechanical sanding rather than chemical stripping, because it allows the patina to be removed in a more controlled manner, which means that a stronger and watertight seam is produced after soldering. However, in places that are difficult to reach with a sander or grinding machine, the only option is to remove the patina chemically before soldering.

10.2 Guidelines

Profiling and folding zinc

Every rolled metal, NedZink material included, will show tension in a certain way. This is a consequence of the rolling process. With modern production techniques, these tensions are reduced to a minimum. Nevertheless, it may be that these tensions occur, to a lesser degree, after the NedZink material is processed by third parties.

The zinc material must also be folded in a way that creates a gentle radius rather than a sharp fold. This is the case for all equipment whether it be hand tools, CNC equipment or profilers. Damage, deep scratching and suchlike of the surface during processing should be avoided. If necessary, tools and machines need to be cleaned beforehand and any sharp edges must be removed in order to avoid any risk of damage.

Natural zinc and pre-weathered zinc should always have an internal folding radius of at least 2x the thickness of the zinc sheet, and the zinc should never be folded if the temperature of the metal is less than +7°C to avoid damage to the zinc (e.g. micro-cracks).

When using NedZink Nuance, this radius should be increased to 3x the thickness of the zinc sheet, and the folding should only be carried out when the temperature of the zinc is at least +10°C to avoid damage to the zinc (e.g micro-cracks). All folding of the zinc should be carried out with the protective film in place.

Anti-Fingerprint

An Anti-Fingerprint coating is applied on the pre-weathered material to prevent fingerprints during installation and to optimize machine processing. This AFP gives the material a slightly shiny surface, which will disappear over time.

PE self-adhesive foil

NedZink NOVA, NedZink NEO and NedZink NOIR can be delivered with a temporary self-adhesive PE-foil for additional protection of the surface during the application. This film protects the surface from damage and contamination during assembly or subsequent work.

The protection is only functional when the film is not damaged. The adhesion of the film can be stronger in colder periods of the year. This protective film should be removed as soon as possible after installation. The temperature of the zinc should be at least 7 °C. Lower temperatures lead to unevenness of the patina and water trapped between the zinc and the film can cause the formation of zinc hydroxide stains. These stains are very difficult to remove.

The foil is not durable UV resistant and intended only for temporary protection. Particularly at high solar radiation and high metal temperatures there is a risk of damage. The foil should not be used in fabrication techniques such as a standing seam.

Surface protection

NedZink NATUREL is supplied with a bright, rolled surface. Exposure to the outside air and moisture results in a protective layer of zinc carbonate, which is called the patina. This process begins immediately after installation and will continue until a uniform patina is obtained. In the beginning, the appearance of the patina layer may look slightly mottled. Other factors that play a role in this patina process are: the orientation / geometry of the building, the weather conditions during assembly, and the storage of the titanium zinc prior to assembly.

Colour differences

NedZink NOVA, NedZink NEO and NedZink NOIR are natural products and as a consequence minor colour differences will occur. A unique production process results in an extremely consistent colour, but there is always a possibility of colour variations (production batch related). Use material from the same production batch for each particular project to avoid colour variations. The production batch number is stated on the backside of the material.

Colour differences on a pitched roof

Always mount NedZink NOVA, NedZink NEO and NedZink NOIR in the same rolling direction (also to avoid colour variations). The rolling direction is indicated by arrows on the rear of the material. This rolling direction must be checked before installing the material.

After many years the pigments of NedZink NUANCE will gradually fade and the colour of the pre-weathered NedZink NOVA will appear on the surface. The durability of the pigments is highly dependent on environmental factors, such as the location of the building, temperature, UV exposure and air quality. Damage, perforation and adverse environmental factors can significantly shorten the lifetime of the pigments.

10.3 Installation

Installation

Titanium zinc from NedZink can be used in ventilated and unventilated applications. In all cases (either ventilated or unventilated) the recommendations as stated on www.nedzink.com or in the NedZink technical instruction manual must be followed. Zinc is a metal that expands and contracts with changes in temperature. In all cases, there must be an allowance for the free thermal expansion of the material when installed.

When handling zinc gloves must be worn. The acid nature of perspiration will leave finger prints on the zinc that can remain visible for some time.

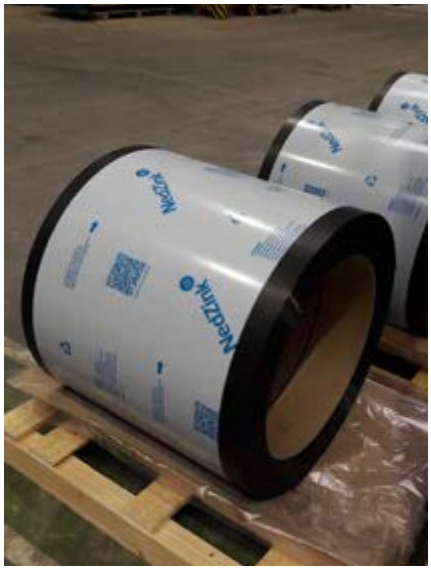
Rolling direction pre-weathered zinc

Always mount the pre-weathered NedZink material in the same rolling direction (also to avoid colour variations).

The rolling direction is indicated by arrows on the rear of the material. This rolling direction must be checked before installing the material.

In order to prevent colour differences in the long term, it is necessary to take the rolling direction into account when placing pre-weathered material.

Placing elements next to each other with an opposite rolling direction will eventually lead to colour differences that do not disappear due to the patina process.



Rolling direction printed on foil

Oil canning

Zinc roofs and façades are made of thin sheets and the presence of slight deformation or buckling of the sheet material is inherent to the material and part of the aesthetic aspect of zinc. This slight waviness does not have any effect on the lifespan of the zinc roofing or wall cladding. The ductility of the material is one of the special properties of zinc. Oil canning can be more visible at times of the day depending on the angle at which the sunlight shines on the roof or façade.

Visible oil canning on a sunny day

Scratches

Bright rolled zinc has the property that it patinates and as a result, that it forms a natural protective layer. A small scratch, which will be visible at the beginning, will progressively disappear over time. If the scratch is particularly deep or wide, then it is better to replace the panel. Small scratches on NedZink Natural usually fade over time.

Salt deposition

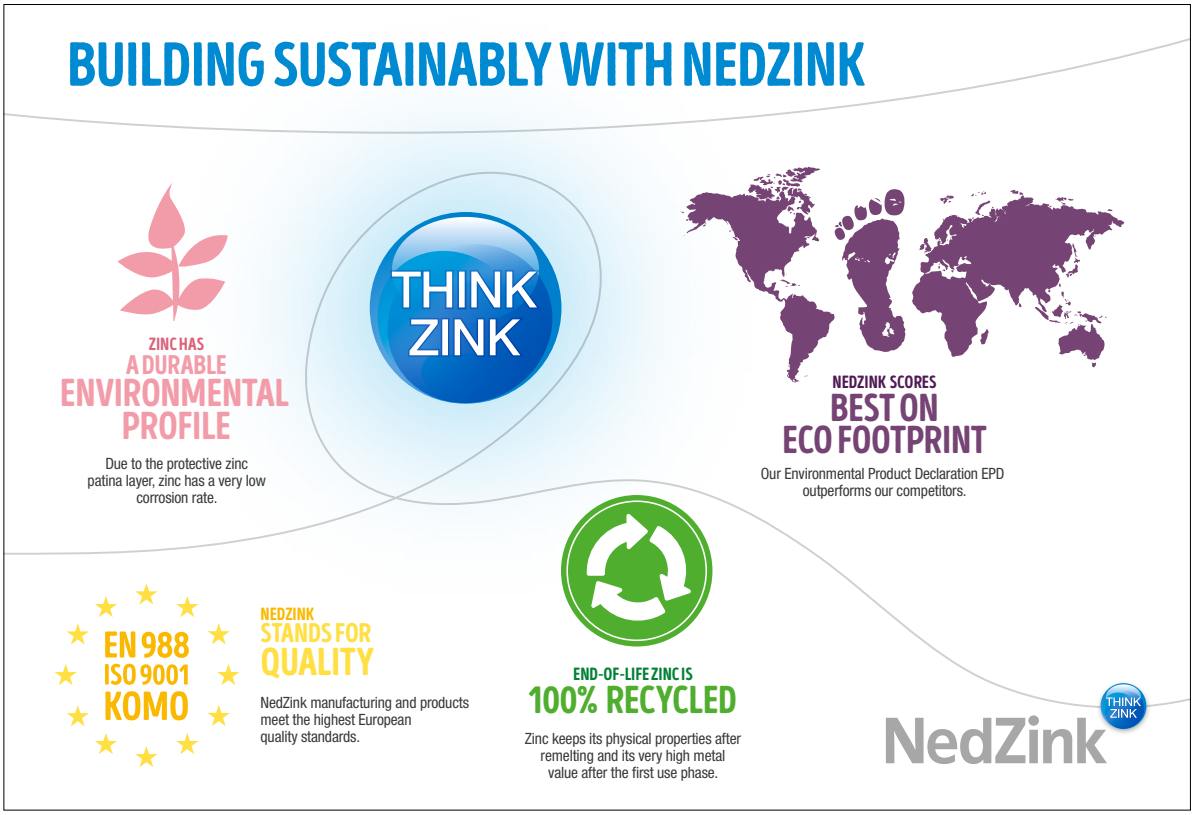
When using NedZink material on the coast, salt water can remain and then evaporate, leaving a whitish salt deposit. This deposit can give rise to white rust formation. Rainwater should normally be sufficient to remove or reduce this deposit. In a period without rain or for undersides or other hidden areas that will not be cleaned by the rain, we recommend that you wash the zinc regularly with clear warm water (not under high pressure) to clean.

11 Sustainable performance

NedZink is aware of its social responsibility. The policy is designed to prioritize sustainability and the environment. This is reflected in a number of important product certificates, including ISO and an Environmental Product Declaration.

11.1 Durability

Zinc makes a significant contribution to preserving our environment. NedZink titanium zinc has an exceptionally low corrosion value, and as a result also a very low emission value. The life span of professionally-assembled roof gutters in titanium zinc exceeds 60 years. Roofing and façade cladding in NedZink titanium zinc protects a building for up to 70 or even 150 years.



Old titanium zinc building material can be 100% recycled, so valuable resources are saved, and a real contribution is made to preserving our environment. If you opt for titanium zinc you are opting for a natural and extremely durable building material.

NedZink has an Environmental Product Declaration (EPD) for NedZink Natural, NedZink NOVA, NedZink NEO and NedZink NOIR.

These EPD's, which also received the ECO platform label, provide information about the product's environmental data, based on the lifecycle analysis or its ecological footprint. By comparing the various EPD's customers can now choose an environmentally conscious product more easily.

11.1.1 EPD Environmental Product Declaration

The independent German Institute Bauen und Umwelt e.V. (IBU) awarded NedZink an Environmental Product Declaration for NedZink NATUREL, NedZink NOVA, NedZink NEO and NedZink NOIR.

These EPDs, which also received the ECO platform label, provide information about the product's environmental data based on the lifecycle analysis or its ecological footprint. By comparing the various EPDs with one another customers can now choose an environmentally conscious product more easily.

Following this certification NedZink has taken a new step forward in terms of sustainability and quality. The EPDs provide vital data for the environmental assessment of buildings as set out in the new European project for the "Sustainability of buildings". In order for the independent IBU to objectively compare the environmental impact of NedZink NATUREL, NedZink NOVA, NedZink NEO and NedZink NOIR, it is tested and validated according to the ISO 14025, 14040 and 15804 standards.

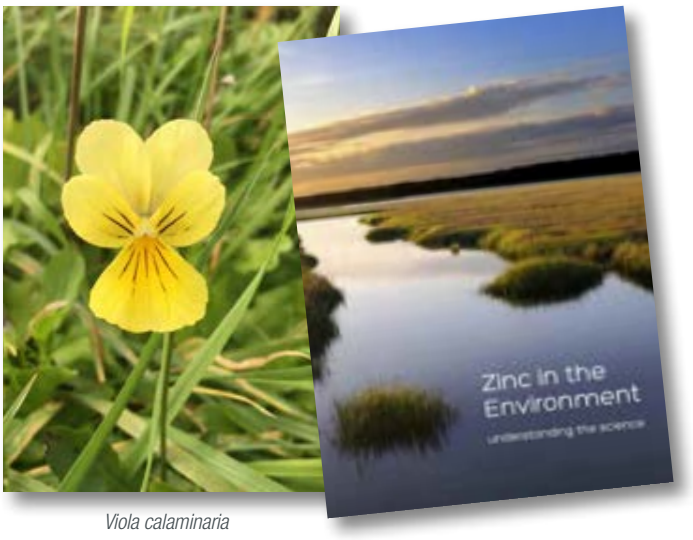
They examined the lifecycle analysis (LCA) of each of the three zinc products. The LCA is a tried and tested method, which makes it possible to assess and quantify the environmental impact of the product in every phase of its lifecycle. This includes, among others, CO2 emissions, energy and water consumption and air pollution. The EPDs can be compared based on these indicators, facilitating an environmentally conscious product choice.

11.1.2 Environment

Zinc is a metal that has been used in building and renovation work for centuries. Examples of its application include gutters, rainwater downpipes and roof and façade cladding. Zinc is not only chosen for aesthetic reasons, it is also a sustainable option. Zinc is a reliable and durable material offering a long lifespan. It is consistent with the circular economy. After use the material can be melted down again and serve as a raw material for new applications. Moreover, zinc is a highly functional metal: it ensures that rainwater is drained in a reliable manner.

And this is important because leaks are a major inconvenience and cause serious damage. Zinc is also a popular material due to its unique appearance. There are few building materials that provide a total environmental balance that is as positive as that of zinc. Zinc lasts over 75 years. After use zinc is collected and recycled. Over 95% of zinc is reused. Zinc offers an outstanding environmental profile due to its long lifespan and high degree of recycling.

The Building Decree of 2012 makes it mandatory for building permit applicants to calculate the sustainability of the building to be delivered. This calculation applies to all parts of the building, including the materials used. Data from the National Environment Database is used to perform the calculation. Calculations reveal that zinc scores better than aluminum, PVC and polyester. The score of four materials used to produce a gutter was calculated.



Viola calaminaria
adapts to zinc in the soil.

11.1.3 LEED & BREEAM Recognition

LEED

NedZink's product range including NedZink Naturel, NedZink NOVA, NedZink NEO, and NedZink NOIR has been awarded verified Environmental Product Declarations (EPDs) by the German Institut Bauen und Umwelt (IBU). These EPDs are based on the ISO 14025 and EN 15804 standards, ensuring transparency and consistency in measuring environmental performance across the full product lifecycle. This recognition plays a key role in the contribution of NedZink products to LEED (Leadership in Energy and Environmental Design) certification. In LEED v4 and v4.1, materials with third-party verified EPDs are eligible for points under the Materials and Resources (MR) credit category, particularly in the 'Building Product Disclosure and Optimization Environmental Product Declarations' credit. Products like NedZink NATUREL, NedZink NOVA, NedZink NEO and NedZink NOIR allow project teams to meet the criteria for product transparency while also selecting durable, recyclable, and low-maintenance materials. Their inclusion not only supports credits related to material disclosure but also helps meet broader sustainability goals concerning energy use, emissions, and resource optimization within LEED-certified buildings.

BREEAM

NedZink's high-quality titanium zinc materials NedZink NATUREL, NedZink NOVA, NedZink NEO, and NedZink NOIR are supported by comprehensive Environmental Product Declarations (EPDs) issued by the Institut Bauen und Umwelt (IBU) in Germany. These EPDs are compliant with the European EN 15804 standard, which is fully recognized under the BREEAM certification system. In BREEAM assessments, EPDs play a critical role in the Mat 01 credit (Environmental Impacts from Construction Products), where verified lifecycle data is used to demonstrate reduced environmental impacts of specified building materials. Furthermore, the responsible sourcing of materials, addressed in Mat 03, is reinforced by NedZink's transparency and commitment to sustainable production. As a result, the inclusion of IBU-certified products such as NedZink NOVA, -NEO, -NOIR and NATUREL, supports a project's ability to achieve higher scores in BREEAM by contributing to both the Life Cycle Assessment and Responsible Sourcing credits. These products offer not only technical performance and aesthetic appeal but also documented environmental responsibility, making them ideal for sustainable construction projects pursuing BREEAM certification.

11.2 ISO certification

The ISO certificate for the quality management system at NedZink ensures consistent and uniform high quality, meeting our own standards and far exceeding NEN-EN 988. NedZink material can be recognized by its unique stamp.

A continuous stamp is applied to the rear of all products, in accordance with the provisions of EN 988, with the markings:

- NedZink NTZ
- The name titanium zinc in 4 languages; Dutch, German, French and English
- Product standard EN 988
- The nominal thickness
- Batch number
- Year of production


LRQA

Current issue date: 1 April 2022
Expiry date: 31 March 2025
Certificate identity number: 10430089

Original approval(s):
ISO 9001 - 15 April 1992

Certificate of Approval

This is to certify that the Management System of:

NedZink B.V.

Hoofdstraat 1, 6024 AA Budel-Dorplein, The Netherlands

has been approved by LRQA to the following standards:

ISO 9001:2015

Approval number(s): ISO 9001 – 0023998

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

The scope of this approval is applicable to:

Production and trading of Titan Zinc Products

Paul Graaf

Area Operations Manager, Europe

Issued by: LRQA Nederland B.V.

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11.3 Health and zinc

International Zinc Association, ‘Zinc Saves Kids' supports undernourished children in developing countries. These children suffer from health problems directly related to zinc deficiency. Zinc supplements are a quick, easy and effective cure.

Zinc plays an essential role in the biological processes of human beings, fauna and flora. It is one of the minerals vital for the body's performance and for several of the body's biological functions. Your body needs zinc to create muscles, bones and hair. A zinc deficiency may lead to growth retardation. Your immune system also needs zinc to function properly.

Iconic spheres on the Korean Han River

The advice given in this Technical Advice Book is a guideline and entirely without obligation. NedZink B.V. does not accept any liability which is the result of or connected to handling these recommendations. NedZink reserves the right to change the characteristics of its products and systems change without prior notice.

All disputes ensuing from the advice referred to previously, except those with regard to which the court of law, section cantonal court has absolute jurisdiction, shall be adjudicated exclusively by the competent court in ‘s-Hertogenbosch, without prejudice to the competence of any other court with respect to provisional measures, measures of conservation or compulsory measures.

NedZink

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