RHEINZINK®

REVEAL PANEL

System technology for façades

DESIGN AND APPLICATION

Disclaimer

RHEINZINK GmbH & Co. KG always considers state-of-the art technology, along with current product development and research when issuing engineering opinions or comments. These type of statements or recommendations describe optional designs in standard cases based on a European climate, specifically Europe's interior climate. It is not possible to consider every scenario, in which more extensive or restrictive measures may be required. Thus, an opinion issued by RHEINZINK GmbH & Co. KG does not replace the planning advice of a responsible architect or planner for a specific building project or the advice given by the company carrying out the tasks, while considering practical local conditions. Using the documents provided by RHEINZINK GmbH & Co. KG is a service, which excludes liability for damages or claims of any kind. Contingent liability for malice or gross negligence, as well as liability in the event of injury to body, life or health of an individual is unaffected. Claims in accordance with the product liability law also remain unaffected.

Foreword

This document is based on practical experience and is commensurate with the current status of knowledge from Research and Development. It also complies with recognized regulations and state-of-the-art technology. It describes the worldwide application of RHEINZINK-Façade Systems for universally designed façade cladding and is the basis for professional design and conventional solutions in application technology.

This handbook shall serve as a guideline for design and implementation, subject to current building techniques. We would like to point out, however, that situations may arise in the field, for which the type of cladding presented in this handbook may not be applicable, or, may only be applicable in a limited capacity. Consequently, the detail drawings depicted here describe the standard details of the systems only. The effects the system will have on the project, as well as the location, climatic conditions and the demands on the physical structure, must be taken into consideration by the planner.

Compliance with the application techniques and specifications contained in this handbook do not exclude responsibility on the part of the client.

We reserve the right to undertake changes based on new developments. Please contact our Department of Application Engineering should you have any questions with respect to the system. We are also grateful for any suggestions you may have pertaining to product or design.

Datteln, January 2010

CONTENT

1. Material

1.1 Alloy and quality

RHEINZINK is titanium zinc, manufactured in accordance with DIN EN 988. RHEINZINK-alloy consists of electrolytic high-grade pure zinc with a purity of 99.995 % conforming to DIN EN 1179, alloyed with exact percentages of copper and titanium. RHEINZINK-products are certified according to DIN EN ISO 9001:2008 and are subject to voluntary testing by TÜV Rheinland Group (the relevant local inspection and monitoring body) according to the stringent requirements of the Quality Zinc Criteria Catalogue *(available upon request)*.

Ecological relevance

RHEINZINK is a natural material, which meets today's strict ecological requirements in many areas. Environmental protection is evident in the production, transportation and installation of this material. State-of-the-art facilities, well thought-out logistics and favourable processing properties attest to this.
Environmentally conscious handling is documented through the adoption of ISO 14001:2004, the Environmental Management System, tested and certified by the TÜV Rheinland Group.

Other significant aspects of the overall ecological assessment of zinc are:

- **Natural material**
- **Low energy requirement**
- **Durability**
- **An established cycle for valuable material resources**
- **High percentage of recycling**

Other significant properties of zinc are:

- **Vital trace element**
- **Extensive resources**

RHEINZINK has been declared as an environmentally sound building product according to ISO 14025 Type III by the German Institute Construction and Environment. The environmental product declaration includes the entire life cycle of RHEINZINK-products, from raw material extraction to production and use phase, right up to the end-of-life stage and recycling. An integral part of the environmental product declaration is a life cycle assessment (LCA) according to ISO 14040 *(declaration available upon request)*.

RHEINZINK provides protection against electromagnetic radiation

There is a great deal of controversy in the public domain surrounding electromagnetic radiation. Within this context, the International Society for Electro-Smog Research [GEF e.V.] has analyzed and determined the shielding properties of RHEINZINK.
The result: more than 99% of existing electro-magnetic radiation is shielded. Biological tests conducted on human beings confirm the technical values and indicate a harmonizing effect on the heart, circulation and nervous system – especially when grounded. Relaxation of the body increases.

Sustainable value

With a lifetime spanning several generations, RHEINZINK is a material that sets standards. The 30-year guarantee underscores the durability of this 100% recyclable material. This creates a sense of additional security.

1.2 Material properties

- Density (spec. weight) 7,2 g/cm^3
- Melting point 418 °C
- Recrystallisation temperature > 300 °C
- Coefficient of thermal expansion:
  in length as rolled:
  2,2 mm/m x 100 K
  in transverse direction
  1,7 mm/m x 100 K
- Modulus of elasticity
  ≥ 80000 N/mm^2
- Non-magnetic
- Non-combustible

Mechanical properties
(measured lengthwise)

RHEINZINK-bright rolled, "preweathered$^{\text{pro}}$ blue-grey":

- 0,2 % (yield strength) (R_p 0,2)
  110 - 160 N/mm^2
- Tensile strength (R_m)
  150 - 190 N/mm^2
- Total elongation (A_{50})
  ≥ 35 %
- Vickers hardness (HV 3)
  ≥ 40

RHEINZINK-"preweathered$^{\text{pro}}$ graphite-grey":

- 0,2 % (yield strength) (R_p 0,2)
  ≥ 140 N/mm^2
- Tensile strength (R_m))
  ≥ 180 N/mm^2
- Total elongation (A_{50})
  ≥ 50 %
- Vickers hardness (HV 3)
  ≥ 40

Material thickness (mm)	Weight (kg/m^2)
1,00	7,24
1,20	8,60
1,50	10,80

Table 1:
RHEINZINK-weight according to material thickness in kg/m^2 (numbers have been rounded)

*

* *recognized environmental label for building products put out by the German Federal Environmental Agency*

1.3 RHEINZINK-bright rolled, "preweathered pro blue-grey" and "preweathered pro graphite-grey"

Many years ago, RHEINZINK developed the "preweatheredpro blue-grey" finish and, as of 2003, the "preweatheredpro graphite-grey" finish, to be used specifically for façades, where a "finished look" of the RHEINZINK-surface is required when the product is delivered.
By using a process, which is unique worldwide, it is possible to change the surface so that it looks very much like a naturally weathered surface – both in colour and structure – without impairing process capability or the natural formation of the protective layer.
Insofar as possible, preweathering the material reduces the appearance of surface reflections, which are typical for thin sheet metal (the appearance of waves).
As a result of increased demand, a large-scale production facility was put into operation in 1988, in which coils of up to 1000 mm wide (blue-grey) or 700 mm (graphite-grey) are cleaned and scoured.
This process (etching) results in an even colour, which, however, cannot be compared to a RAL-colour.
By undergoing a new organic surface treatment, this material, which is 100% recyclable, is protected, for the most part, from processing traces such as fingerprints. It also provides better protection during storage and transportation.

Recommendation:
Oil-free cloth gloves should be used during processing and handling.

Generally speaking, in order to eliminate the possibility of visual disparities, material should be ordered from the same batch for a specific project.
Surface disparities are purely visual and, as a rule, disappear bit by bit as the patina forms.

In order to protect the surface during transportation, storage and installation and from negative influences during construction, the façade systems are provided with a thin strippable plastic film. **This is a one-sided protective adhesive film, which should be removed at the end of each working day, immediately following installation.**

1.4 Storage and transportation

Always store and transport RHEINZINK-products in a dry, well-ventilated area.

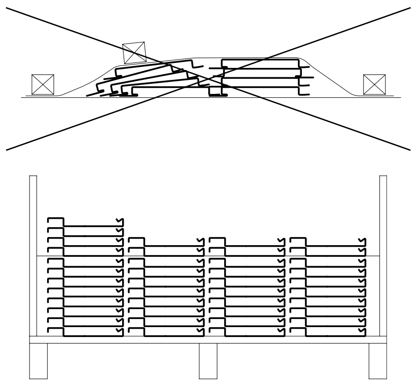


Fig. 1:
Storage and transportation of profiles and panels, (diagram)

Note:
For optimum storage on the construction site, please ask construction management for a dry, well-ventilated space or use containers.
Do not place cover sheets directly on the material.

1.5 Surfaces

RHEINZINK-"preweatheredpro" is used for RHEINZINK®-façade systems. This material has a permanent surface coating. When the building is finished, it will have the classical-modern blue-grey/graphite-grey look, typical of zinc. RHEINZINK-façades do not require cleaning or maintenance. As a result of natural weathering, the façade will get slightly darker with time..

1.6 Structural physics

- **Weather protection**
- **Moisture regulation**
- **Thermal economy**
- **Rear ventilation**
- **Sound proofing/fire protection**

The rear-ventilated façade is a multi-layered system, which, when designed properly, guarantees permanent functional capability. By functional capability, we mean that all requirements pertaining to structural physics are met. This is described in detail below.

By separating the rain screen façade from the thermal insulation and supporting structure, the building is protected from the weather.

The supporting outer walls and the insulation remain dry and thus fully functional. Even when driving rain penetrates open joints, it is quickly dried out as a result of the air circulation in the ventilation space. The bracket-mounted rear-ventilated façade protects the components from severe temperature influence. Heat loss in the winter and too much heat gain in the summer are prevented.

Thermal bridges can be reduced considerably.

In the case of rounded parapets and dormer girders, the substructure and thermal insulation should be protected from penetrating moisture with a suitable layer.

1.7 Airtightness

This does not apply to the rear-ventilated façade, as this component itself cannot be airtight.

The building must be airtight before the rear-ventilated façade is installed. A solid brick or concrete wall will ensure that the building is airtight. Penetrations (e.g. windows, ventilation pipes, etc.) must be sealed from the building component to the supporting structure. In the case of a skeleton construction, the wall surface must also be sealed.

If the building envelope is improperly sealed (wind suction, wind pressure), there is a high degree of ventilation/energy loss, which, along with drafts, creates unpleasant room temperature. Dew or condensation can be expected on the leeward side of the building.

Air circulation in the room should be provided through air conditioning or by opening the windows.

1.8 Weather protection

Rear-ventilated façade cladding protects the supporting structure, the water-proofed thermal façade insulation, and the substructure, from the weather.
Bracket-mounted rear-ventilated façades provide a high degree of protection from driving rain.
Because of the physical structure, it is impossible for the rain or capillary water transfer to reach the insulating layers. Furthermore, moisture can always be drawn out through the ventilation space. This allows the insulating layers to dry out quickly, without impeding thermal insulation.

1.9 Moisture

Rear-ventilated façade cladding provides protection from driving rain and moisture. Moisture penetration as a result of diffusion does not occur in the rear-ventilated façade.
When the supporting structure is windproof, the diffusion current density is too small to cause the dew point temperature to drop.

1.10 Thermal economy

In order to understand the thermal economy of the rear-ventilated façade, we must first consider the various heat flow rates, as well as the air exchange between the rear-ventilation space and the outside air, separately, in terms of structural physics.

1.10.1 Thermal insulation

In the winter, heat flow from the inside to the outside is referred to as a heat transfer co-efficient (U-value).
The smaller the value, the smaller the quantity of heat escaping to the outside. The U-value is determined by the heat conductivity of the thermal insulation and insulation thickness.
The high-grade thermal insulation is a contribution to environmental protection and pays for itself in a relatively short period of time through low heating costs.

1.10.2 Summer thermal insulation

Summer thermal insulation should provide comfort: The amount of heat flowing from the outside to the inside sh ould remain as small as possible. Proper thermal insulation, as well as a certain mass in the construction itself, will help to achieve this objective.
The advantage of a bracket-mounted, rear-ventilated façade, is that a large portion of the heat which streams onto the cladding is diverted through convective air exchange.

1.10.3 Thermal bridges

Thermal bridges are elements of the building envelope, that have high thermal conductivity (have high U-values) and are continuous from the warm side to the cold side of the thermal insulation. Apart from general design-dependent thermal bridges of a building, e.g. protruding balconies, the installation of the substructure must be taken into account in the case of a rear-ventilated façade. Thermal bridges can be reduced significantly by installing an insulating strip between the supporting structure and the substructure (thermal break).
Proper installation of the insulation reduces the formation of thermal bridges.

1.11 Fire protection
Metal façades with a metal substructure and appropriate fasteners meet the highest requirements for non-combustibility (Building Material Class A1, DIN 4102). In the case of bracket-mounted, rear-ventilated façades, it may be necessary to install firestops.

1.12 Rear-ventilation
The free ventilation cavity between the façade cladding and the layer behind it must be at least 20 mm. Tolerances and plumbness of the building must be taken into account. In some places, this rear-ventilation space may be reduced locally up to 5 mm – e.g. by means of the substructure or the unevenness of the walls.

1.12.1 Air intake and exhaust openings
The rear-ventilation space requires intake and exhaust vent openings. These openings must be designed so that their functionality is guaranteed for the lifetime of the building. It cannot be hindered through dirt or other external influences. The openings are located at the lowest and highest point of the façade cladding, as well as in windowsill and window lintel areas, and penetrations. In the case of higher, multi-storey buildings, additional intake and exhaust vent openings should be provided (e.g. at each floor).

1.13 Soundproofing
To prove that a façade design is soundproof, the entire wall structure, as well as each building component (windows, etc.) must be defined. The use of proper static fasteners will prevent any potential noise development as a result of the cladding.

1.14 Processing
Bending radii
Zinc and its alloys are anisotropic, which means they have different properties parallel and horizontally to the rolling direction.

The mechanical effects of this anisotropy is reduced to such a degree with RHEINZINK through the alloys and the rolling process, that RHEINZINK, independent of the direction of rolling, can be folded at 180° without cracking. When processing in order to manufacture a cold-rolled or pressed profile, compliance with the minimum radii is recommended (see Table 3).

1.15 Other applicable standards and guidelines
All trades must adhere to applicable DIN EN-/DIN-standards.
Guidelines for the design of metal roofs/façade cladding and sheet metal work. Government regulations, building codes.

Building height	Size of rear-ventilation	Free ventilation shaft
≤ 6 m	20 mm	200 cm²/m
> 6 m ≤ 22 m	30 mm	300 cm²/m
> 22 m	40 mm	400 cm²/m

Table 2: Specifications pertaining to rear-ventilation space Source: FVHF 20.09.94

Material thickness	Bending radius R_i Min.
1.00 mm	1.75 mm
1.20 mm	2.10 mm
1.50 mm	2.63 mm

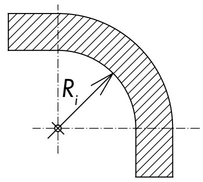


Table 3: Recommended bending radii (inner radius) for RHEINZINK

2. RHEINZINK-Profile group Reveal Panel SF 25

The reveal panel opens up a wealth of design possibilities for the designer, because it can be installed vertically and diagonally. Variable spacing of the reveal joints (0-30 mm) underscores segmentation when the reveal panel is used. The reveal panel is available in widths of 200-333 mm.

Static load tables

Load tables are based on DIN 18807 for profile section properties.
Deflection:
1/180 for façade components
Safety factor:
g = 1.50
(this is taken into account in the tables)

Units for loads and forces

The load tables indicate permissible forces and loads in kN/m².
Deflection values in relation to span width are given for single span, double span or multi-span conditions.
The following indicators are used for display purposes:
Single span ■
Double span ■■
Multi-span ■■■

Span width in m		0,50	0,60	0,80	0,90	1,00	1,20	1,40	1,50	1,60	1,70
Permissible wind load	■			3,50	3,14	2,83	2,36	2,00	1,89	1,78	1,67
in kN/m²	■■	2,20	1,85	1,42	1,28	1,14	0,95	0,86	0,82	0,77	0,73
	■■■	2,50	2,14	1,56	1,41	1,30	1,09	0,95	0,91	0,87	0,83

SF 25-200, s = 1,00 mm

Span width in m		0,50	0,60	0,80	0,90	1,00	1,20	1,40	1,50	1,60	1,70
Permissible wind load	■			2,83	2,50	2,27	1,89	1,62	1,49	1,40	1,32
in kN/m²	■■	1,78	1,48	1,14	0,99	0,93	0,82	0,70	0,65	0,59	0,53
	■■■	2,04	1,70	1,30	1,16	1,03	0,91	0,81	0,76	0,71	0,66

SF 25-250, s = 1,00 mm

Span width in m		0,50	0,60	0,80	0,90	1,00	1,20	1,40	1,50	1,60	1,70
Permissible wind load	■	3,37	2,82	2,12	1,89	1,71	1,41	1,18	1,07	0,97	0,89
in kN/m²	■■	1,36	1,13	0,89	0,82	0,74	0,59				
	■■■	1,48	1,30	0,98	0,91	0,85	0,72	0,58	0,52		

SF 25-333, s = 1,00 mm

Table 4: Load table for reveal panel
Basis for design: uniformly distributed load, including the weight of the profile itself
Safety factor: 1.50
Tensile yield strength: 100 N/mm²
Width of support profile: ≥ 50 mm
DIN 18807/experimental testing at the University of Karlsruhe, Germany

2.1 Profile geometry

Metal gauge
s = 1.00 mm / 1.20 mm

Cover widths SF 25 s = 1.00 mm	Weight
200 mm	11.20 kg/m²
225 mm	10.70 kg/m²
250 mm	10.40 kg/m²
300 mm	9.84 kg/m²
333 mm	9.60 kg/m²

Cover widths of 200-333 mm
All sizes in between, in mm intervals, are possible. For widths of over 250 mm, we recommend using a material thickness of 1,20 mm.

Possible applications

- Façades
- Soffits
- Parapets

Fastening

Using rivets or screws, the panels are fastened directly onto the substructure, through the protruding leg of the groove (see detail above).
Linear expansion is restricted by limiting the length of the façade panel, and accommodated via the deflection of the substructure.

Dimensions

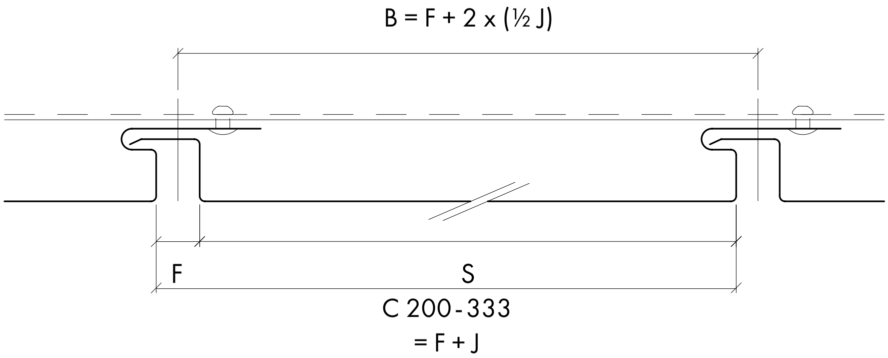
- Drawings: Dimensions in mm
- Panel designation: SF 25-287 (example)
- Standard length: ≤ 4000 mm
- B: bay width
- C: cover width
- J: joint width
- F: face width

Tolerances

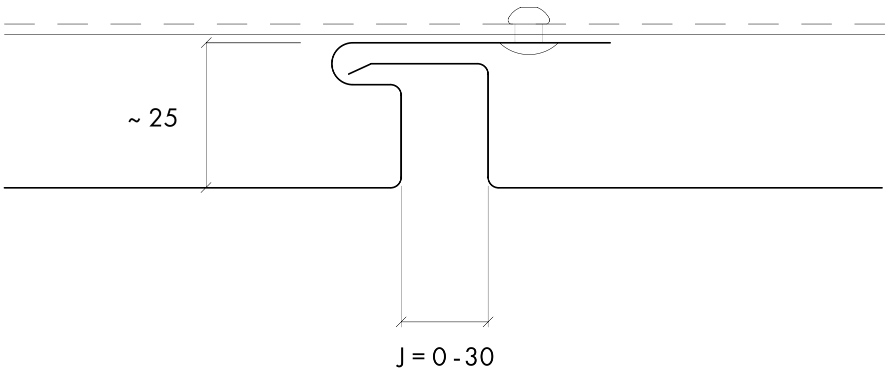
As per company standard WN 21

Note re installation:

- Reinforcing the panels at both ends with backfolds is recommended
- A 0-33 mm wide reveal joint (J) is possible
- The cover width (C) of the panel is manufactured with a minus tolerance of < 1 mm.



System section



Joint configuration

2.1.1 RHEINZINK-Reveal Panel, vertical installation

Telecom Giubiasco, Giubiasco, Switzerland

RHEINZINK-Panel, SF 25 with 20 mm reveal joint

Theater am Marientor (previously: Les Misérables), Duisburg, Germany

RHEINZINK-Panel, SF 25 with 15 mm reveal joint

2.2 Joint formation

2.2.1 Vertical panels

2.2.1.1 Horizontal joint

A: Slave profile

A virtually seamless transition from one panel to the other strongly accentuates the verticality of the façade. This type of joint formation does not affect the rear-ventilation space.

Fastening

Using rivets or adhesives, fastening is one-sided directly onto the substructure or onto the lower panel.

B: Flashing profile installed within horizontal joint

Panel with backfolds closes the vertical joint and frames the panel with a surrounding reveal joint.

C: Cornice profile

The horizontal joint can be accentuated by using profiles of varying widths. It is important not to interrupt or close off the rear-ventilation space.

2.2.1.2 Vertical joint

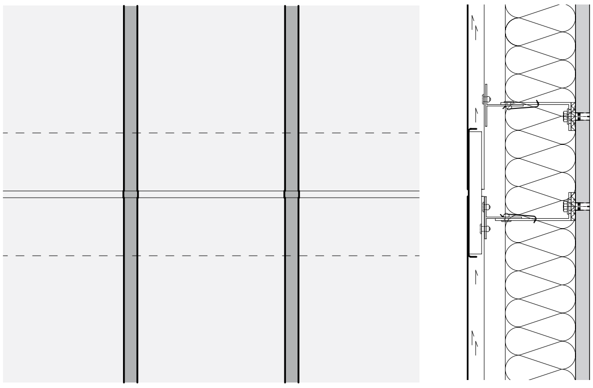
D: Butt joint

This joint is formed by using a certain type of panel. It can be developed in varying widths from 0-30 mm and affects vertical segmentation.

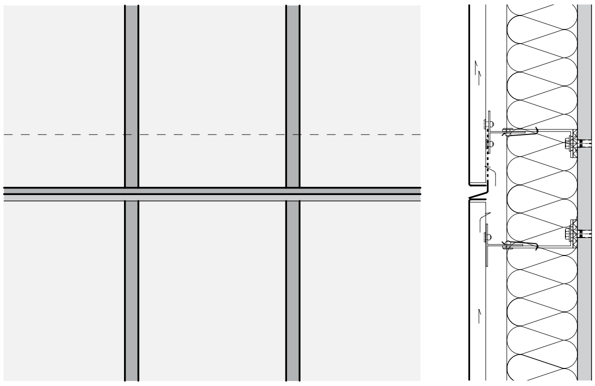
Note:

- Theoretically, all of the joint formations illustrated here can be used on all vertically installed RHEINZINK-Panels.
- Façade sections should be separated by means of expansion joints - a max. of 4000 mm (Example A, B, C).
- When determining panel lengths (Example C), air intake and exhaust openings must be taken into account.

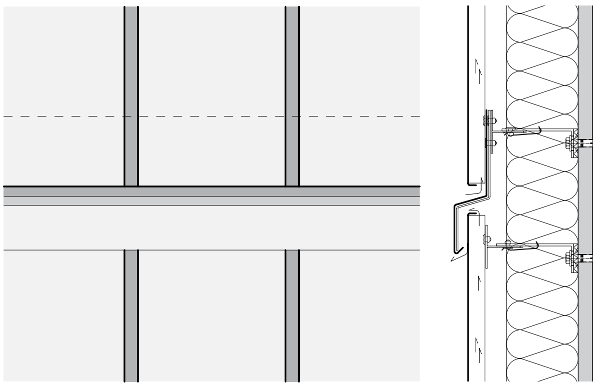
View **Profile**



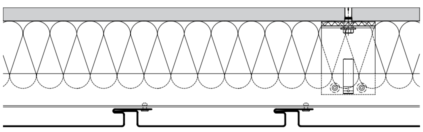
A



B



C



D

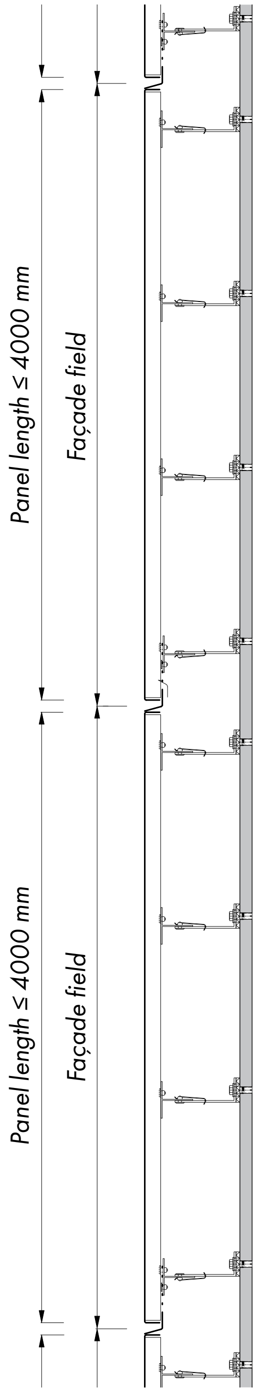
2.3 Accommodating thermal expansion of façade cladding

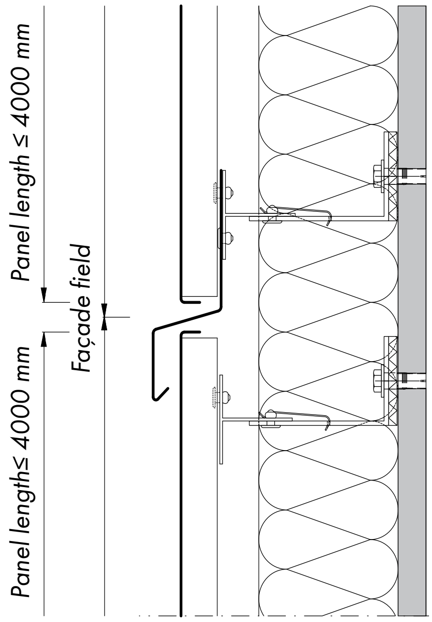
- Thermal expansion of façade profiles is accommodated by means of expansion joints.
- Statically connected fields cannot exceed 4000 mm in length. Exceptions must be discussed and approved by Application Engineering Department*.
- In the area of expansion joints the fixing to the substructure must be executed accordingly.
- The substructure must be designed to be independent for each façade field around the expansion joint.

Two examples of façade implementation illustrate the connections schematically:

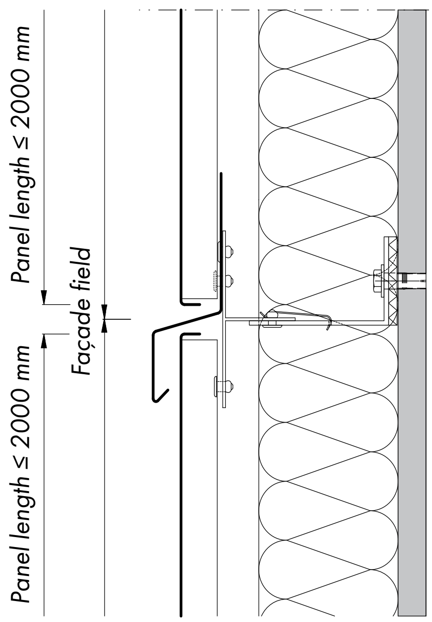
Example A
Large cladding components each form a field, which is fastened separately from the next field, by means of expansion joints.

Example B
Small façade components are combined to create one façade field. Linear expansions can be accommodated after every third component, however, the total length of 4000 mm should not be exceeded.





Fall A: technischer Fassadenfeldstoß (ausdehnungstechnische Trennung)



Example A: Façade field joint (separation by means of expansion joints)

Example B: Facade joint serving as design feature only

* see addresses and contacts on page 44

2.4 Substructure
RHEINZINK-Façade systems are normally installed on substructures consisting of single, double, or multiple non-ferrous metal systems. Apart from efficiency and the structural advantages provided by these systems, they also guarantee control and monitoring of fastening patterns and compliance with fire protection regulations. Moreover, the double and multiple systems enable building tolerances to be adjusted without difficulty.
The architectural appearance of the profiles determines the design of the substructure. Before the substructure is constructed, those concerned must determine the appropriate design, otherwise – inevitably – the design would determine the architecture.

Note:
Use of wood as a substructure for large façade surfaces in system technology is not recommended because of its behaviour when damp and difficulty in adjusting tolerances.
However, a dried wooden substructure is definitely suitable for small surface applications such as dormers, fascias and gable walls.
The location and orientation of the fixed and sliding points for metal substructures must be determined based on the type of cladding, the surface and length of the panels.

With single substructure systems, the disadvantages certainly outweigh the advantages, such as:
- inability to accommodate building tolerances
- large thermal bridges

All technical problems are solvable when double/multiple systems are used:
- local thermal bridges only
- rear-ventilation throughout is guaranteed

However, the expensive and elaborate design coupled with the fact that two or more installation procedures must be implemented must be taken into consideration.

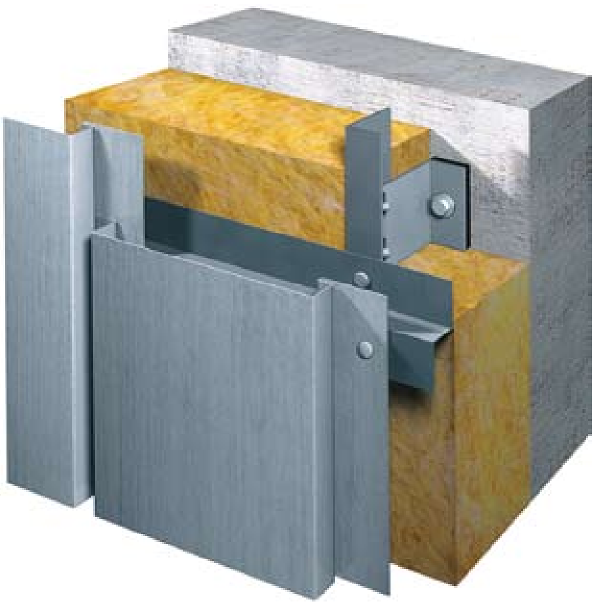
Double or two-part systems constitute the “happy medium”:

Advantages
- cost-effective
- easy accommodation of building tolerances
- local thermal bridges only

Disadvantages:
- two installation procedures
- depending on the detailing requirements additional costs can occur

Single substructure

Double or two-part substructure



Multi-part substructure

2.5 Fasteners

Fasteners are parts that connect the cladding to the substructure mechanically.
The edge distance of connections and fasteners in the substructure must be at least 10 mm. Only corrosion-resistant fasteners, which guarantee long-term function capability, may be used.

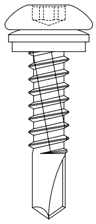
2.5.1 EJOT® Drilling screws

Area of application

Drilling screws to join
- RHEINZINK-Panels

onto
- steel substructures
- 1,5 - 4,0 mm
- aluminum substructures
- 1,5 - 4,0 mm

JT 3 - FR - 6 - 5,5 x 25 - E11



Marking	Ø x mm	Length mm	Drill capacity $t_I + t_{II}$ mm	Clamping thickness mm
JT3 - FR - 6	5.5 x	25	min. 0,63 + 1,5 max. 2,0 + 4,0	7.0

Note

When using screws without sealing washers, clamping thickness increases by 3 mm.

2.5.2 EJOT® Blind rivet with large collar

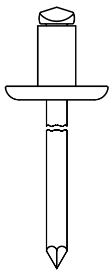
Aluminum (Al) rivet sleeve
Rivet mandrel made of high-grade steel
Secure connection

Area of application

Use blind rivets to fasten
- RHEINZINK-Panels
- steel or aluminum profile sheets

onto
- steel substructures
- aluminum substructures

Blind rivet K14 - Al/E - 5,0 x 8,0



Marking	Ø x mm	Length mm	Clamping thickn. mm	Drill hole Ø mm
Blind rivet K14 - Al/E -	5.0 x	8.0	2.5 - 4.5	5.1
	5.0 x	10.0	4.5 - 6.0	5.1
	5.0 x	12.0	6.0 - 8.0	5.1
	5.0 x	18.0	12.0 - 14.0	5.1

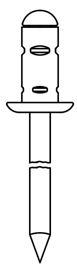
2.5.3 EJOT® Blind rivet

Aluminum (Al) rivet sleeve
Rivet mandrel made of high-grade steel
Secure connection

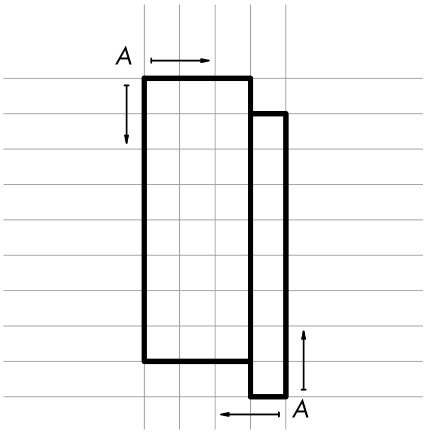
Area of application

Blind rivets are used to fasten secondary components, e.g. slave profiles.

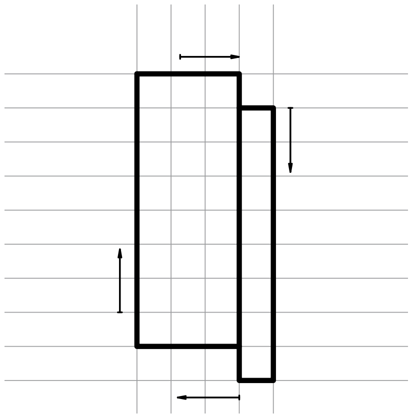
Blindniet Al/E - 4,8 x 10



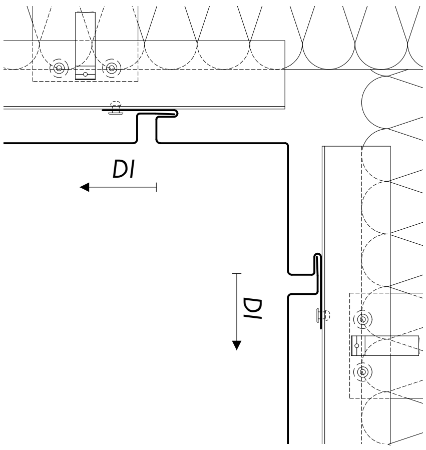
Marking	Ø x mm	Length mm	Clamping thickn. mm	Drill hole Ø mm
Blind rivet Al/E -	4.8 x	10.0	0.5 - 6.5	4.9
	4.8 x	15.0	4.5 - 11.0	4.9
	4.8 x	25.0	11.0 - 19.5	4.9



A: start of installation

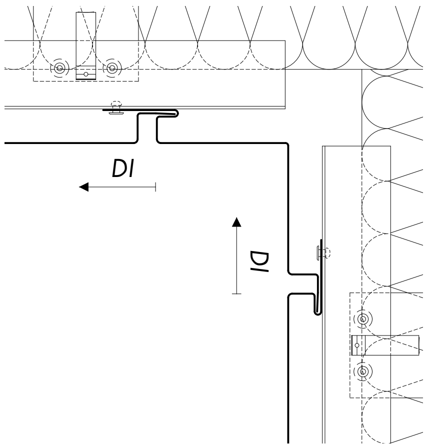


Installation can begin anywhere



Example A:

The corner panel is installed first. Building tolerances are accommodated either by installing an adapter panel in the centre of the façade, or, next to the outside corner panel.



Example B:

The corner panel is part of the continuous installation sequence. Any tolerances that need to be adjusted at this point can be accommodated by the corner panel.

2.6 Installation and building tolerances

Adapter panels are required to accommodate building and installation tolerances.

The location of these panels in the façade is determined by the installation process and sequence.

Trim work, e.g. window and door frames, corner panels, joint profiles, etc., should be installed first. The panels are manufactured at the RHEINZINK-System Centre to precise dimensions.

Dimensional adjustments can be made on site by making minimum changes to the joint width. The performance of the system is not affected by this.

The panels are installed starting at Installation Point A. Adaptor panels are generally inserted before the next section.

Depending on the size of tolerance to be accommodated, one or two adaptor panels will be installed.

Note:

Tolerance adjustment using adaptor panels ≤ 15 mm difference is hardly noticeable.

DI: direction of installation

2.7 Detail concept

Detail design creates the lasting impression of the façade. Plan details or sections are required for most of the corners, reveals, as well as connections and terminations. These must be coordinated during detail design development. Two significant design variations will illustrate this.

Visible width of the building profile or section
The spectrum ranges from sharp-edged profiles to profiles that are several centimeters wide. Precise planning allows for the widths of all termination and frame profiles to be the same, or, to vary these in desired proportions.

Projection of profiles
Depending on the detail design, the profiles either protrude from, or lie flush with the façade surface.

This overview illustrates three possible principles:

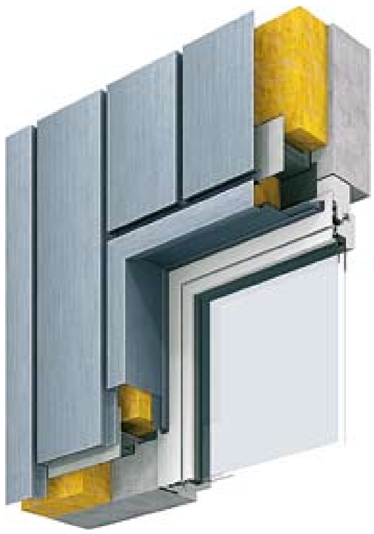
Profile group 1
A relatively wide joint profile (visible width ca. 60 mm) is selected as the building profile, which is terminated flush with the façade surface.
Various façade systems, such as cassettes or panels, can be used to form the corner of the building.

Profile group 2
A sharpe-edged profile will be installed flush with the curtain wall, so that the window frame design is not accentuated.

Profile group 3
The jamb profile selected for this window surround can replicate the joint profile (see profile group 1) and is used as a flashing in conjunction with the window sill and lintel.

Profile group 1

Profile group 2



Profile group 3

2.8 Details

2.8.1 General instructions

Third Party Trades

Connections of façade claddings to third party trades are necessary and unavoidable in most cases to ensure impermeability. Because of the warranty obligations on the part of the craftsman, sub-contracting connections and fasteners to third party trades (e.g. windows), must always be approved by the project manager of the trade in question.
Please keep the location of the scaffold anchors in mind during planning/design.

Wall structure

The layered construction is equal to a rear-ventilated metal façade. A solid brick/concrete wall or stud wall with sheathing serves as the supporting structure. Other supporting structures are possible and can be discussed with Application Engineering Department*.

Substructure

See Chapter 2.4

Load effect

In the case of two-dimensional cladding profiles (all panel types) that are only fastened on one side, flanged backfolds are required to provide additional reinforcement for all profiles in exposed building locations.

Installation instructions

We will not go into installation details here, because, when it comes right down to it, these are strongly influenced by other trades when it comes to windows, structural steel construction, etc.
The installation processes must always be determined individually for each project, considering interfaces and
the sequence of installation.
Notable deviations from the rule will be pointed out for various details.

Drip edges

Standards and regulations must be taken into consideration in the detail design, e.g. drip edges above rendered façades (dirt as a result of pollution).

Diagonal installation

RHEINZINK-Reveal panels can also be used for diagonal façade installation.
To a large extent, technical implementation of the design is commensurate with horizontal installation. Foldbacks must be fabricated on site.

2.8.2 Pictographs

Horizontal profiles
(see page 24)
H1: outside corner
H2: inside corner
H3: window jamb
H4: expansion joint

Vertical profiles
(see page 25)
V1: base
V2: windowsill
V3: window lintel
V4: roof edge

Variations

In some cases, variations for the same detail are depicted (e.g. window lintel with/without shade).
These are identified and include additional explanatory texts or drawings.

Applicability

The details and designs depicted here are suggestions, which have been implemented on various projects. Responsibility must be taken for decisions made on detail suggestions, taking into account applicable standards and regulations, as well as the stylistic intentions of the planner for the project.

Building Height	Overlap	Distance to drip edge
≤ 8 m	≥ 50 mm	≥ 20 mm
> 8 m ≤ 20 m	≥ 80 mm	≥ 20 mm
> 20 m	≥ 100 mm	≥ 20 mm

Table 6: Distance and overlap dimensions for flashings (e.g. windowsills, wall copings, verge profile, etc.)

Source: German Sheet Metal Standards 2005

* *see addresses and contacts on page 44*

2.9 Planning grid
The grid principle in
façade construction

A metal façade consists of components manufactured industrially with a high degree of precision. These components determine appearance through precise horizontal and vertical segmentation. Penetrations and terminations that are not matched/coordinated with the axis grid can have a disturbing effect.
The following instructions serve to assist proper planning of façade segmentation:

Principles

As a rule, a differentiation should be made between new construction and renovations when discussing grid problems. In the case of new construction, the façade grid can be coordinated or matched to the design; penetrations such as windows, ventilation piping, etc. are always secondary.
In the case of renovations, the penetrations (e.g. windows) cannot be displaced or removed, so the grid must be coordinated with the penetrations.
When deviating from the grid, the following principles apply:

- At terminations, one should begin or end with an entire module (X or Y)
- Dimensional differences of max. 10 mm (deviations from module X or Y, in the case of two-dimensional profiles), are not noticeable.
- Dimensional tolerances, which cannot be corrected (X or Y dimensional change) must be compensated either in the windowsill or roof edge area.
- Adjustments or displacements of height coordinates can only be implemented in the roof edge or base area.

The principles used to segment a façade are illustrated using the example of a vertical grid for horizontal cladding. This principle also applies to vertical façade cladding.

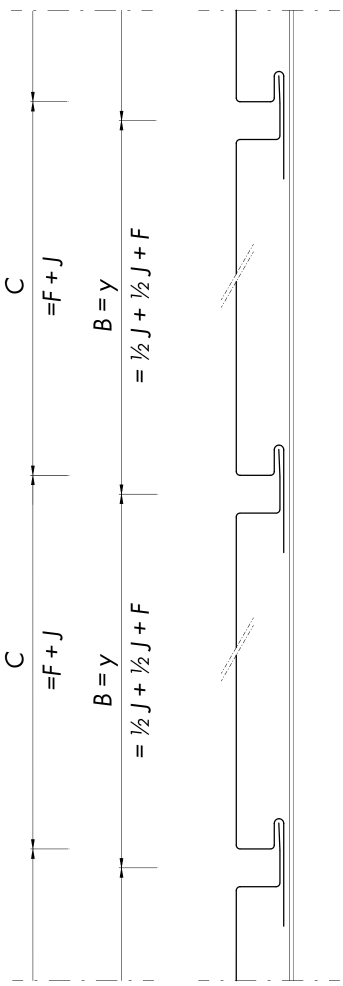
- B: bay width
- C: cover width
- J: joint width
- F: face width

Module Y

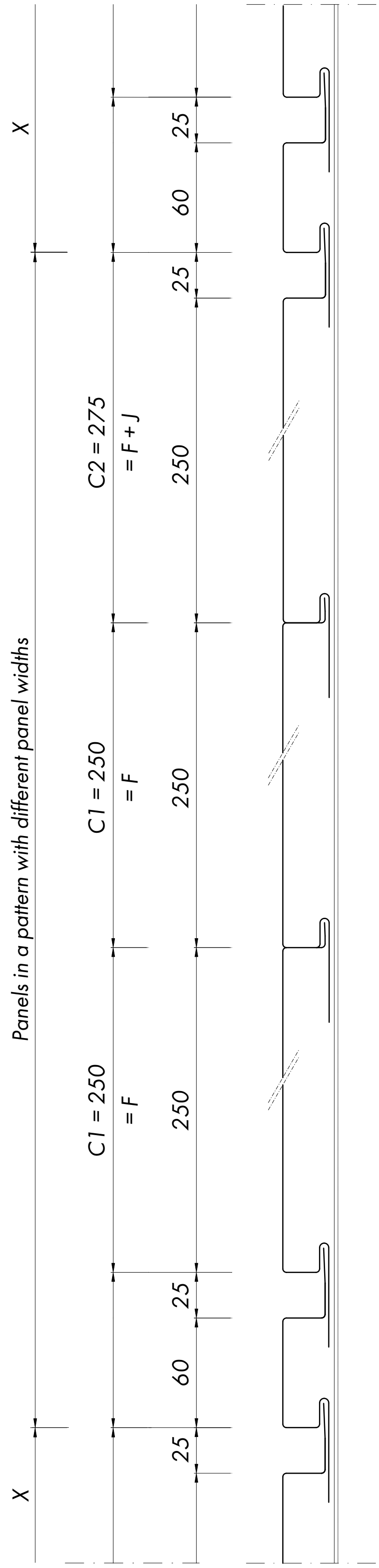
Y corresponds to the smallest segment of the façade, which is repeated again and again, e.g. panel width. The Y grid module determines the precise location of penetrations and terminations. In the case of reveal panels, the Y dimension is discretionary and is produced in cover widths of 200 mm to 333 mm, based on the project.
The bay width (Y) is formed using the visible surface of the panel and two half joints.
The cover width is established from the visible surface and the width of the joint. The width of the reveal can vary from 0 to 30 mm and is determined by appropriate length of the "tongue".

Dimension X

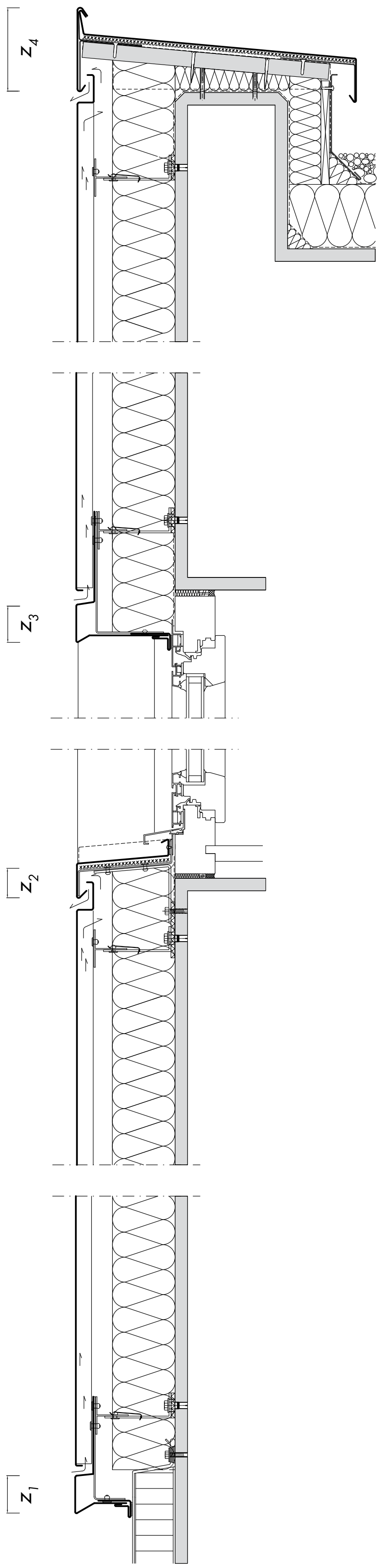
All of the sections marked with X are an integral multiple of selected module Y and, as a rule, correspond to the cover width of a profile.



Repeated panel module



Combination of panels creating a module



Position Z_4: roof edge

Grid for new construction, respectively, renovation

If the height coordinates of the roof edge do not fit into the prescribed grid selected, the following corrective options can be selected:

- change the roof edge profile/incline
- raise or lower the parapet wall or the roof edge frame.
- Changing the X or Y module

As a rule, the first two options are only viable if the flat roof is being restored at the same time.

Position Z_3: window lintel
Position Z_2: windowsill
Grid development for new construction

- Determine the relief/recess of the building envelope
- Determine the window frame profile
- Determine window location
- Determine profile geometry of window connections
- Develop design details within the grid

Grid development for renovations

- Determine window frame profile, for new/old window
- Determine window location, for new/old window
- Determine profile geometry of window connections
- Develop design details within the grid

If the location of the window or of the detail does not fit into the grid, the following corrective options can be selected:

- Change the profile geometry of the window lintel profile or the windowsill
- Adjust window height
- change the incline of the windowsill
- Change the X or Y module

Position Z_1: base

Grid development for new construction, respectively, renovation

- Define potential deviations toward the top or bottom
- Define profile geometry of base detail

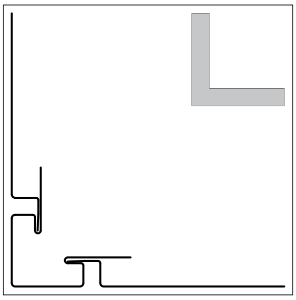
If the location of the base does not fit into the grid, the following corrective options can be selected:

- Shift the façade connection towards the top or bottom
- Change the profile geometry of the base moulding
- Lower or raise the plinth wall, if it exists or has been designed

DESIGN OVERVIEW
VERTICAL APPLICATION

2.10 Reveal panel design,vertical application

Detail H1: Outside corner, page 26



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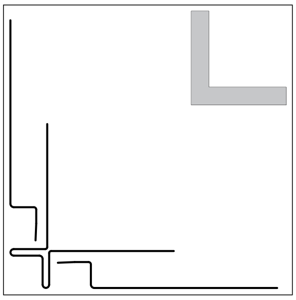
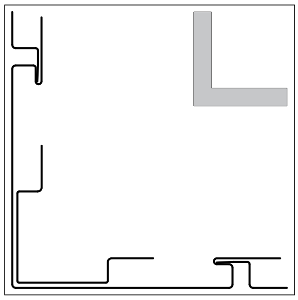
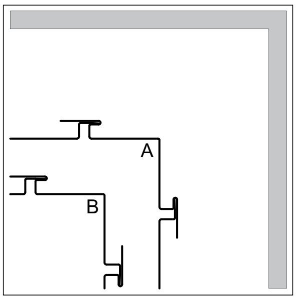


H1.2

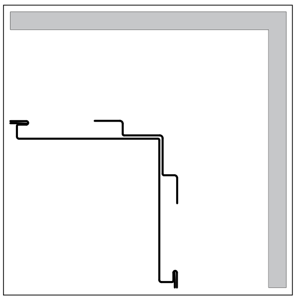


H1.3

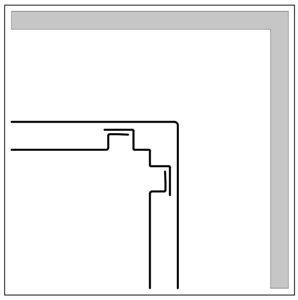
Detail H2: Inside corner, page 28



H2.1

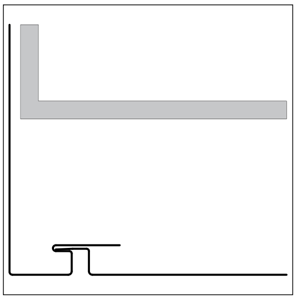


H2.2

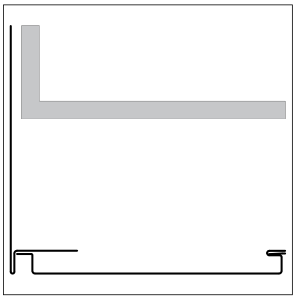


H2.3

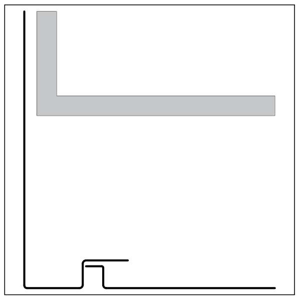
Detail H3: Window jamb, page 30



H3.1

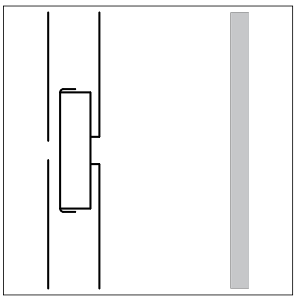


H3.2

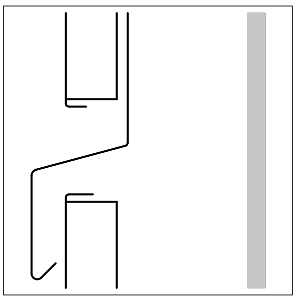


H3.3

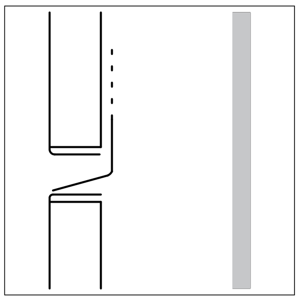
Detail H4: Expansion joint, page 32



H4.1



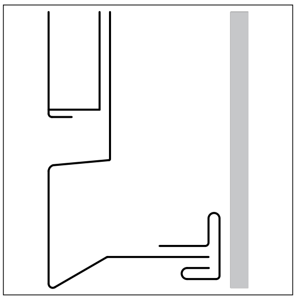
H4.2



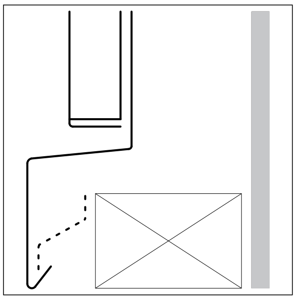
H4.3

2.10 Reveal panel design, vertical application

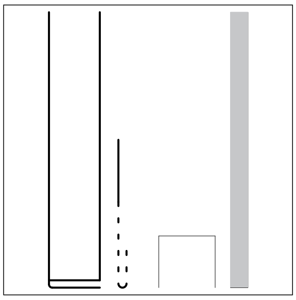
Detail V1: Base, page 34



V1.1

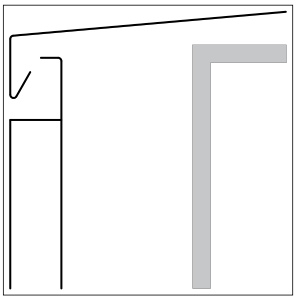


V1.2

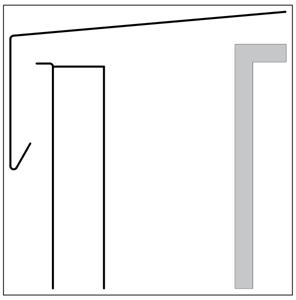


V1.3

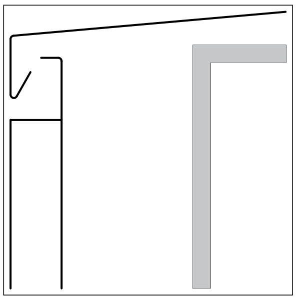
Detail V2: Windowsill, page 36



V2.1

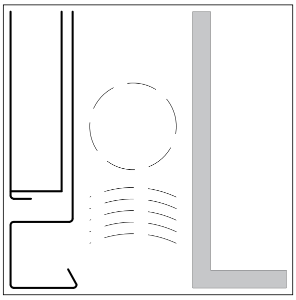


V2.2

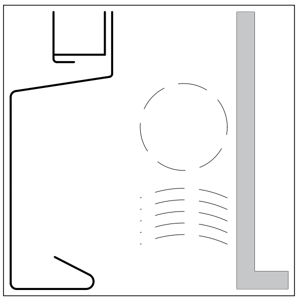


V2.3

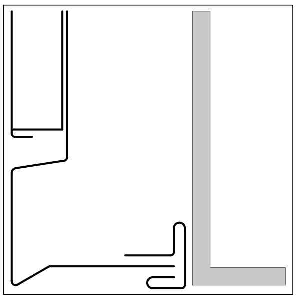
Detail V3: Window lintel, page 38



V3.1

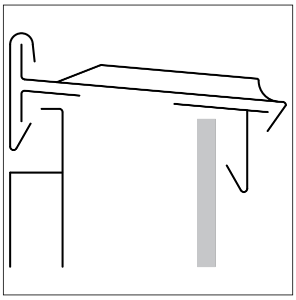


V3.2

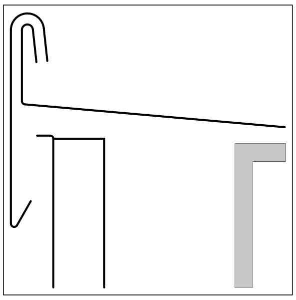


V3.3

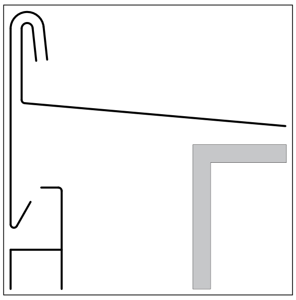
Detail V4: Two-part roof edge, page 40



V4.1



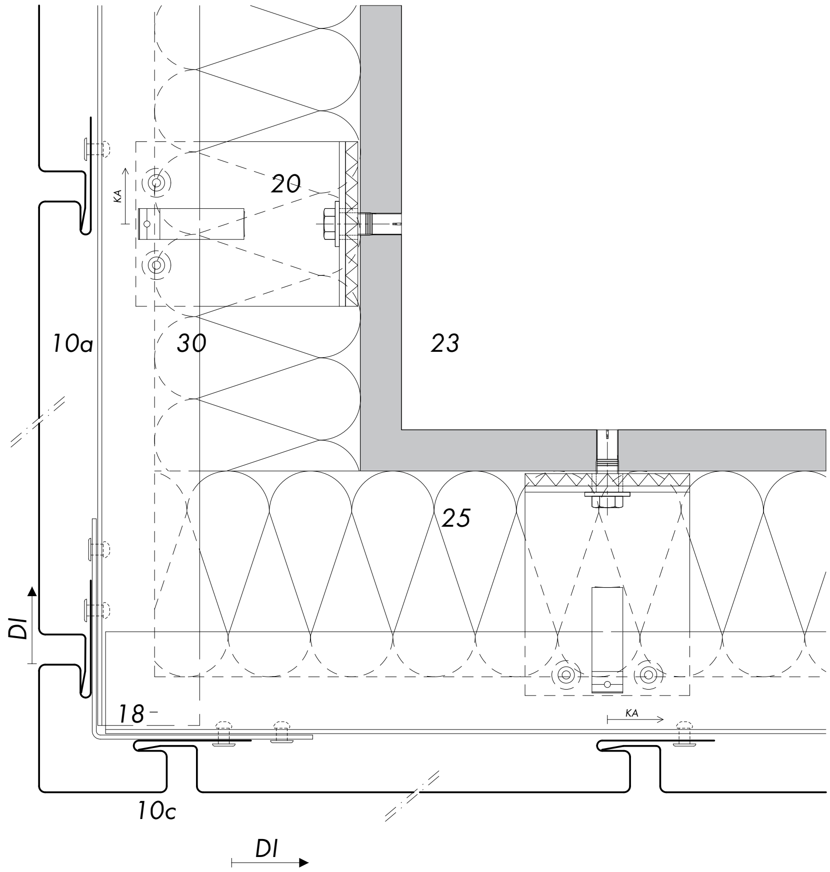
V4.2



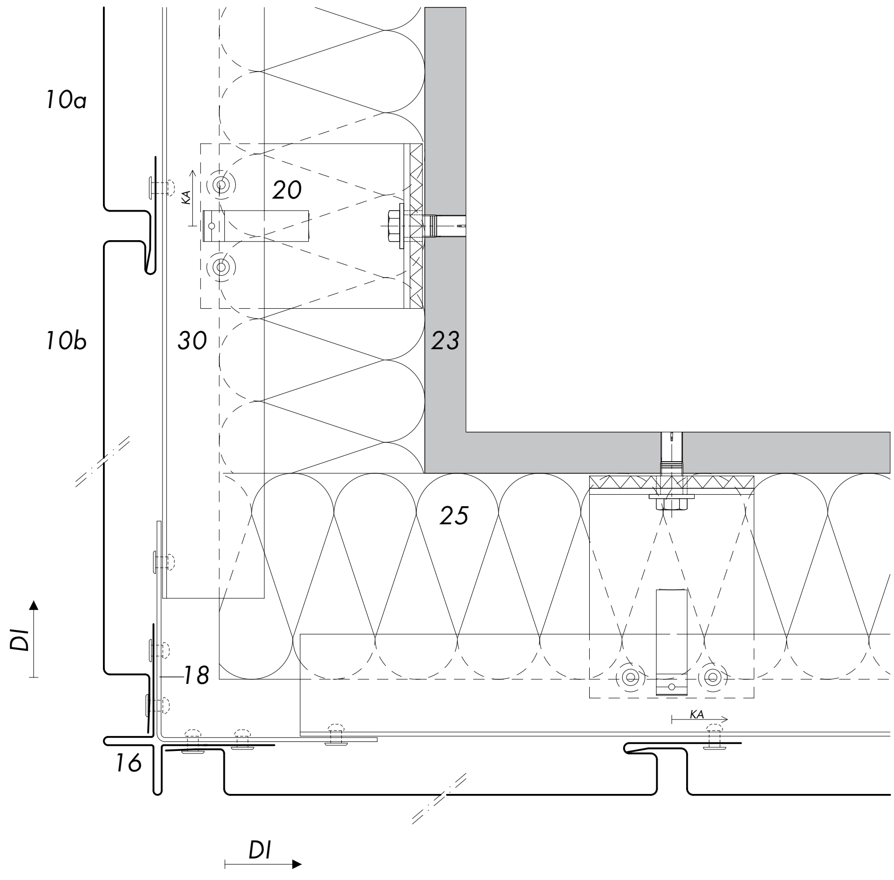
V4.3

DESIGN – VERTICAL APPLICATION
DETAIL H1: OUTSIDE CORNER

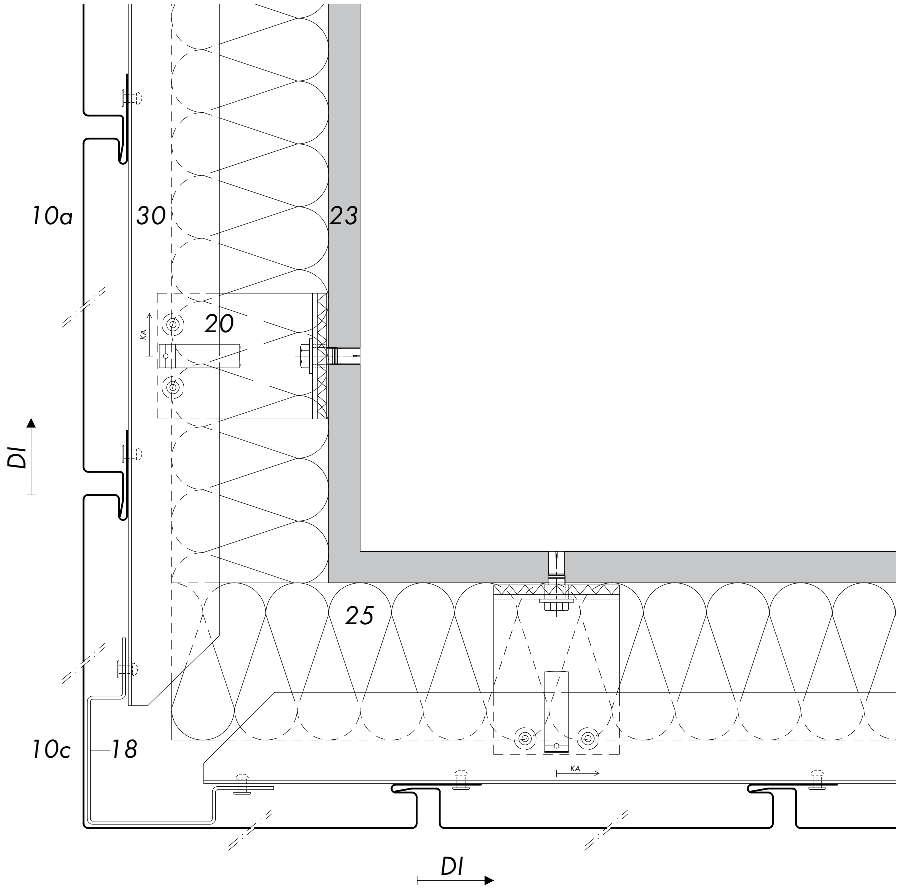
H1.1



H1.2



H1.3



2.10.1 Detail H1: Outside Corner

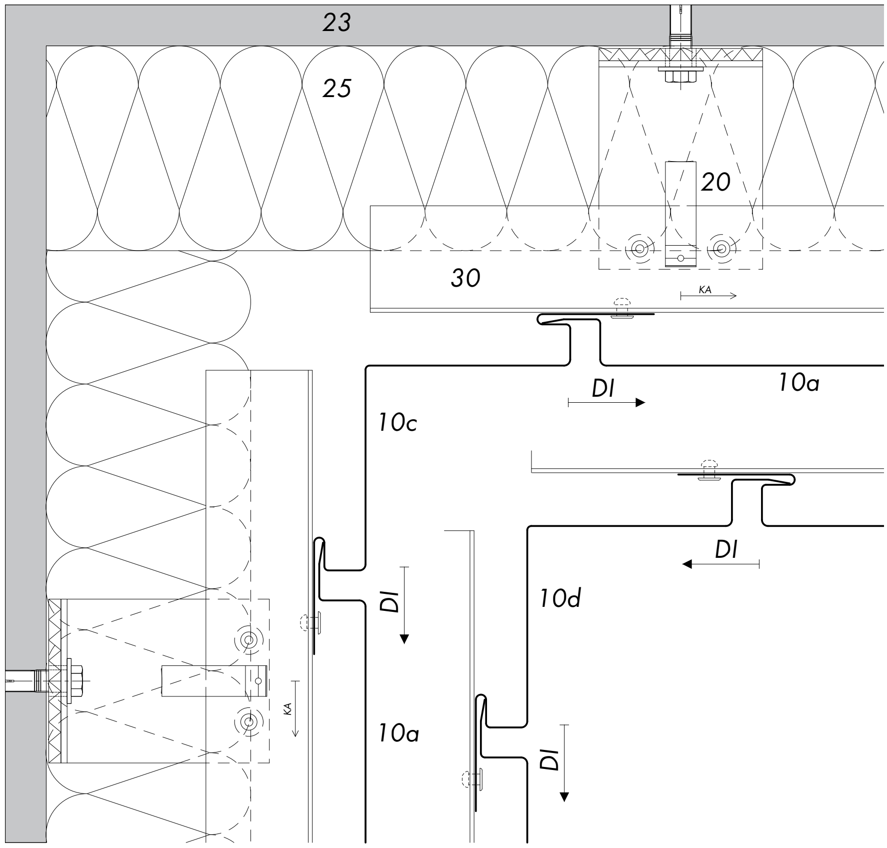
10 RHEINZINK-Reveal Panel, SF 25
  a Standard panel
  b Adapter panel
  c Corner panel groove/groove
16 RHEINZINK-Building profile
  ■ Outside corner profile
18 Support profile
  ■ Made of aluminium
20 Substructure
  ■ 2-part: wall bracket with thermal break and horizontal profile*
23 Supporting structure
25 Thermal insulation
30 Ventilation space
  ■ Height of ventilation space ≥ 20 mm

DI Direction of installation
CE Controlled expansion of substructure

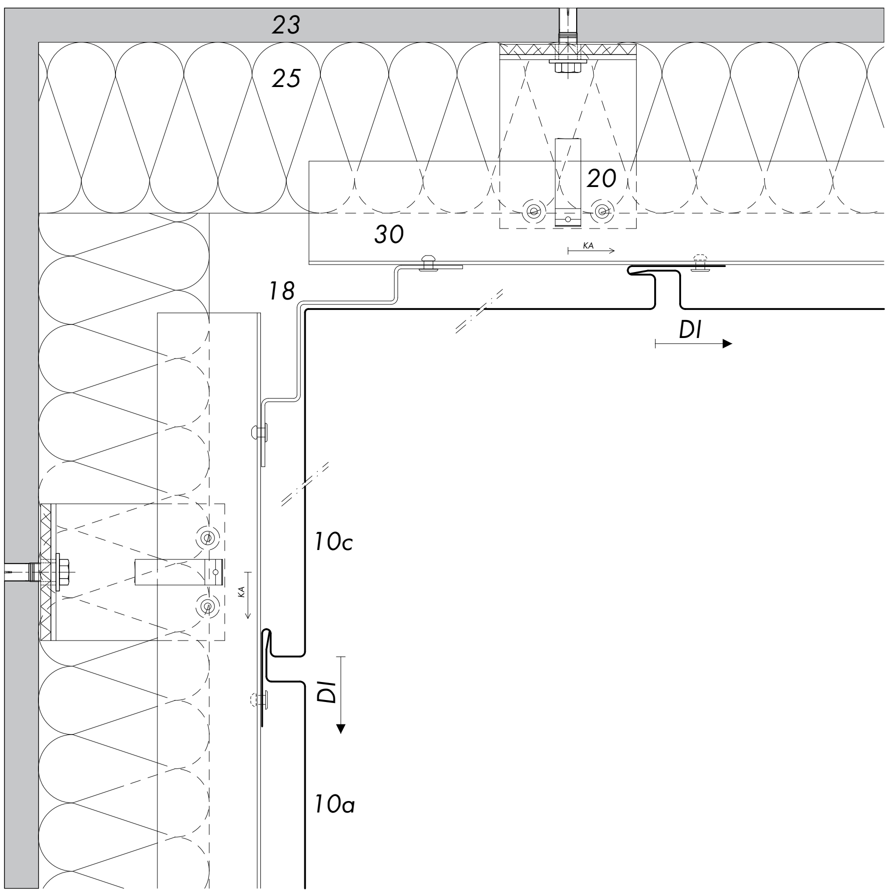
* Manufacturers' guidelines must be complied with

DESIGN – VERTICAL APPLICATION
DETAIL H2: INSIDE CORNER

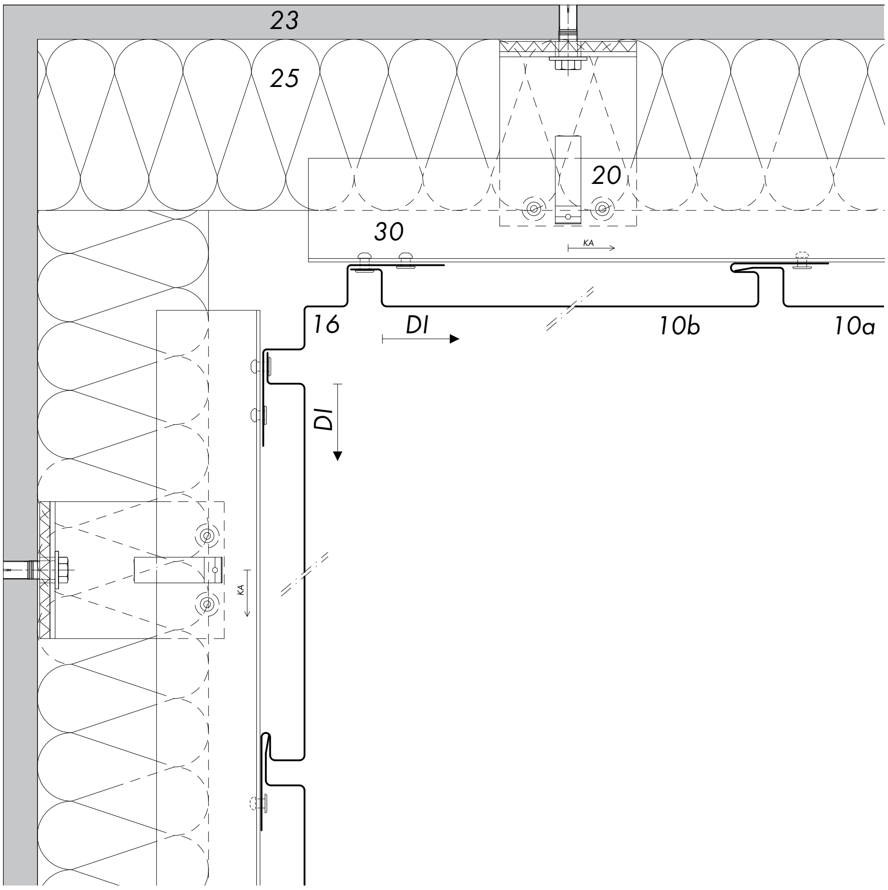
H2.1



H2.2



DESIGN – VERTICAL APPLICATION
DETAIL H2: INSIDE CORNER



H2.3

2.10.2 Detail H2: Inside Corner

10 RHEINZINK-Reveal Panel, SF 25
- a Standard panel
- b Adapter panel
- c Corner panel groove/groove
- d Corner panel groove/tongue

16 RHEINZINK-Building profile
- Inside corner profile

18 Support profile
- Made of aluminium

20 Substructure
- 2-part: wall bracket with thermal break and vertical profile*

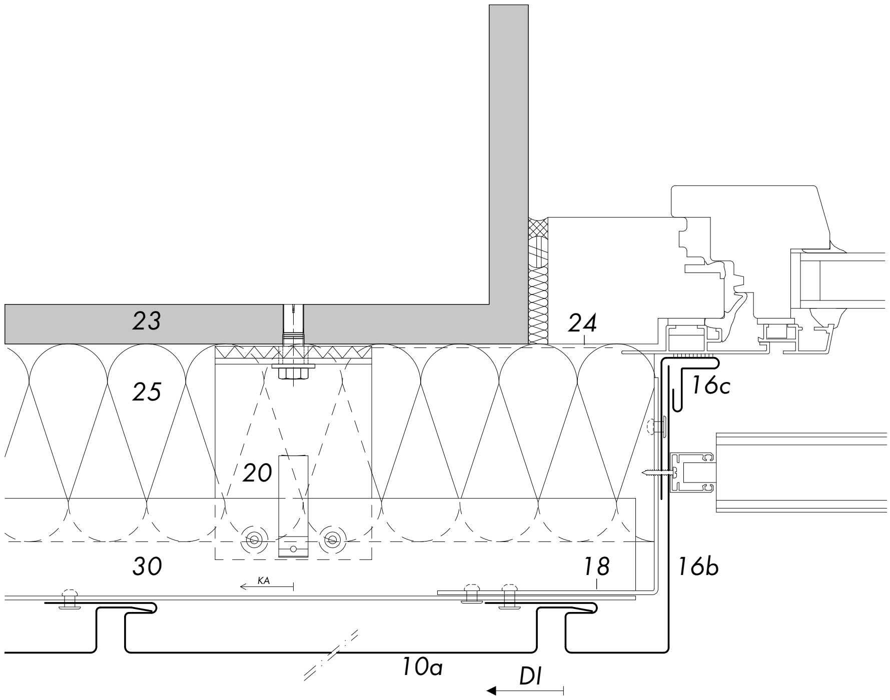
23 Supporting structure
25 Thermal insulation
30 Ventilation space
- Height of ventilation space ≥ 20 mm

DI Direction of installation
CE Controlled expansion of substructure

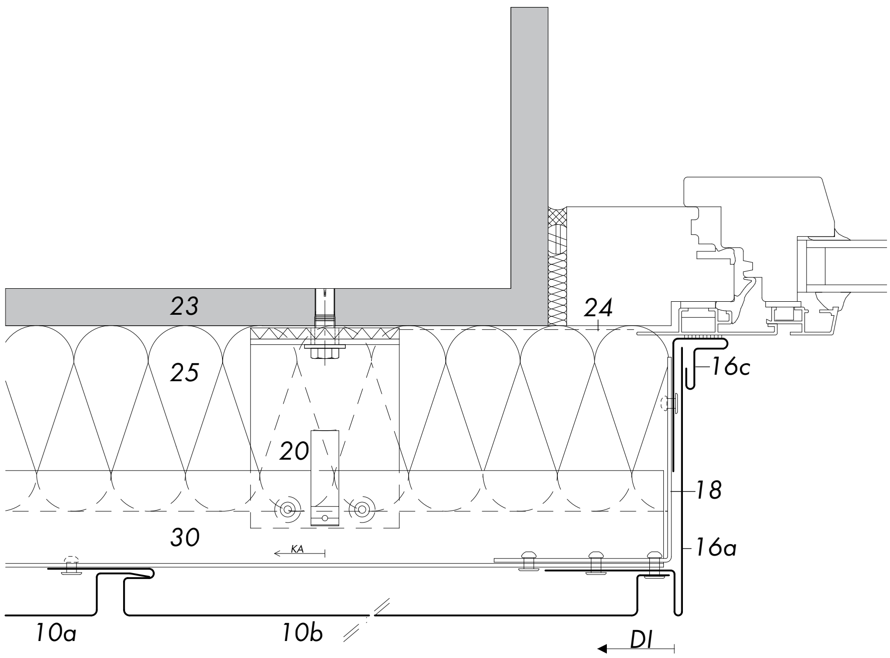
* Manufacturers' guidelines must be complied with

DESIGN – VERTICAL APPLICATION
DETAIL H3: WINDOW JAMB

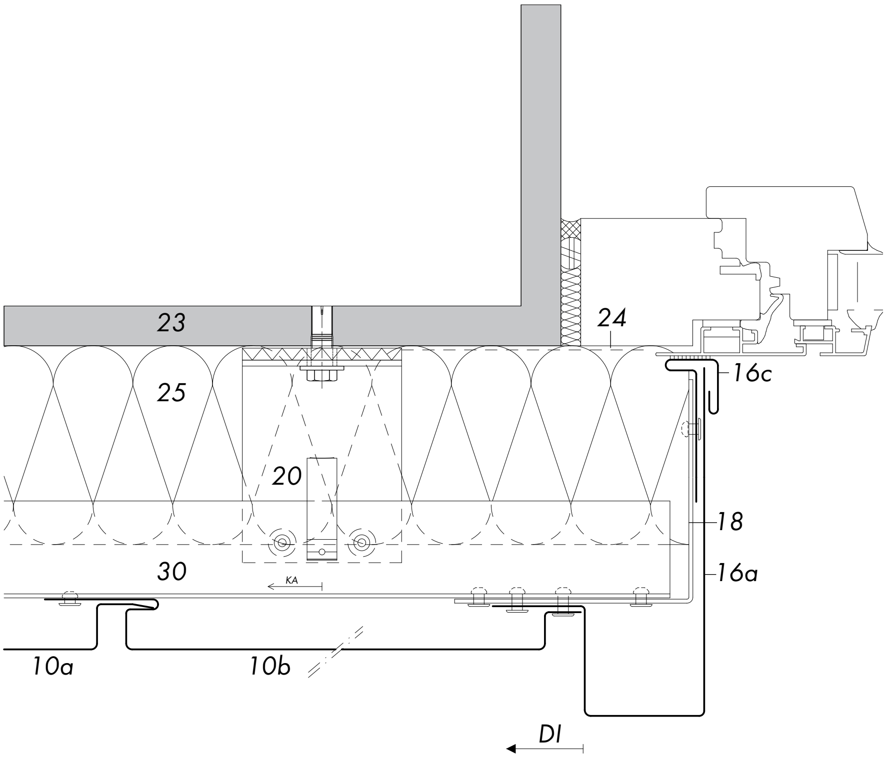
H3.1



H3.2



H3.3



2.10.3 Detail H3: Window jamb

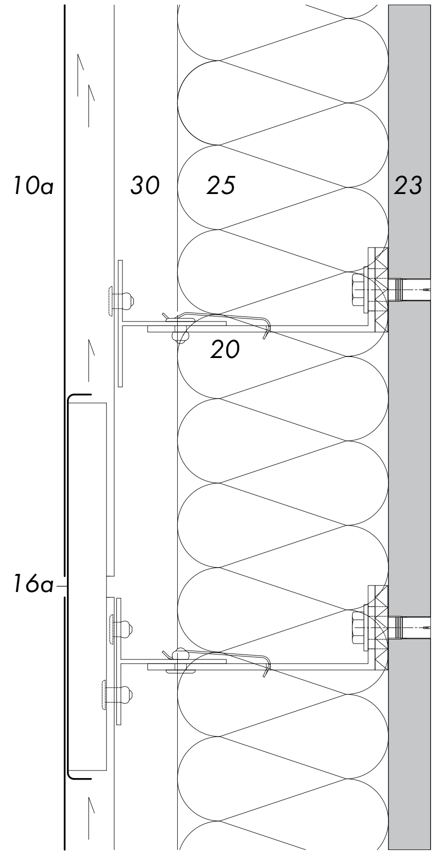
10 RHEINZINK-Reveal Panel SF 25
 a Standard panel
 b Adapter panel
16 RHEINZINK-Building profile
 a Jamb profile
 b Jamb profile with groove
 c Receiver strip with sealant tape
18 Support profile
 ■ Made of aluminium
20 Substructure
 ■ 2-part: wall bracket with thermal break and horizontal profile*
23 Supporting structure
24 Airtight sealing
25 Thermal insulation
30 Ventilation space
 ■ Height of ventilation space ≥ 20 mm

DI Direction of installation
CE Controlled expansion of substructure

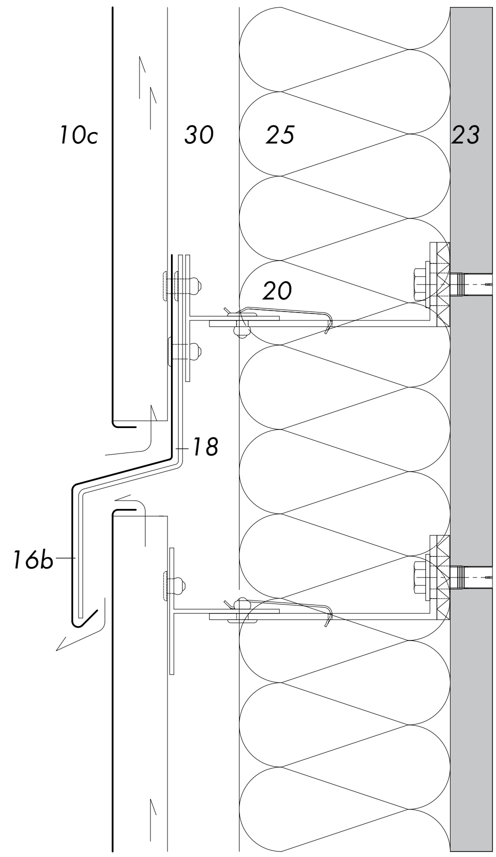
* Manufacturers' guidelines must be complied with

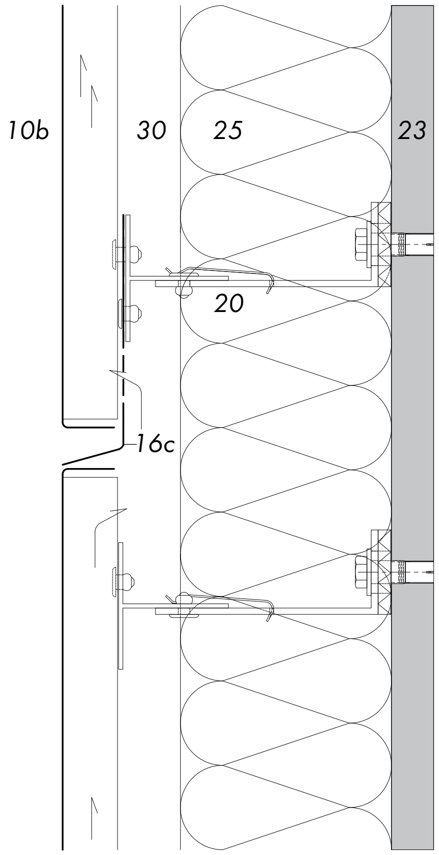
DESIGN – VERTICAL APPLICATION
DETAIL H4: EXPANSION JOINT

H4.1



H4.2





H4.3

2.10.4 Detail H4: Expansion Joint

10 RHEINZINK-Reveal Panel SF 25
- a Standard panel without boxed end
- b Standard panel with long boxed end
- c Standard panel with short boxed end

16 RHEINZINK-Building profile
- a Slave profile
- b Cornice profile
- c Joint profile, partially perforated

18 Support profile
- Made of aluminium

20 Substructure
- 2-part: wall bracket with thermal break and horizontal profile*

23 Supporting structure

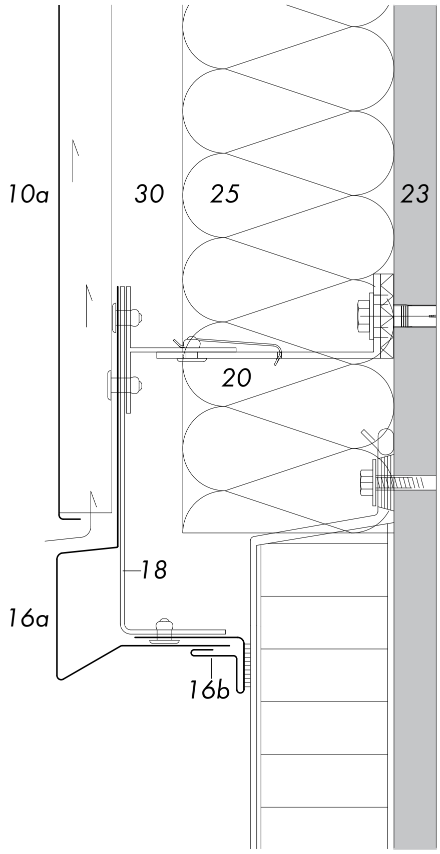
25 Thermal insulation

30 Ventilation space
- Height of ventilation space ≥ 20 mm

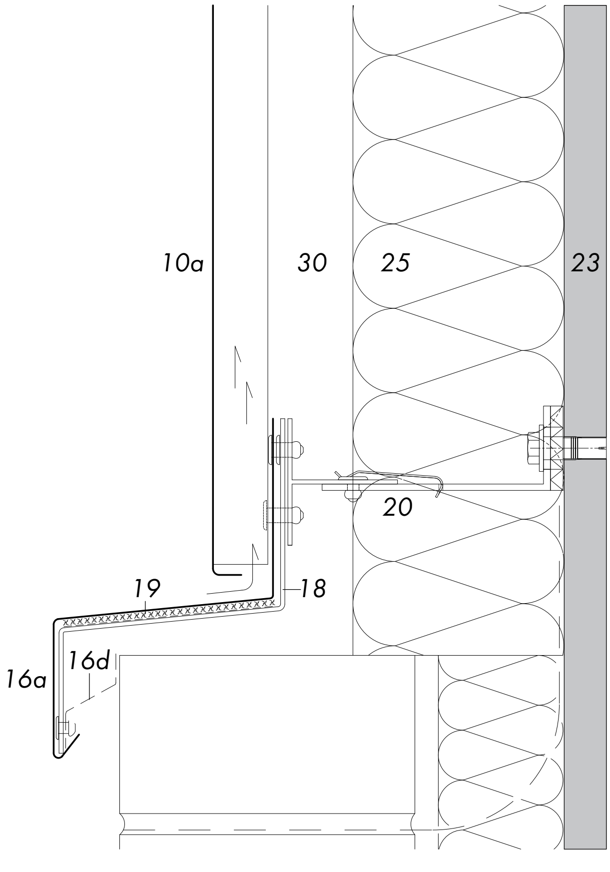
* Manufacturers' guidelines must be complied with

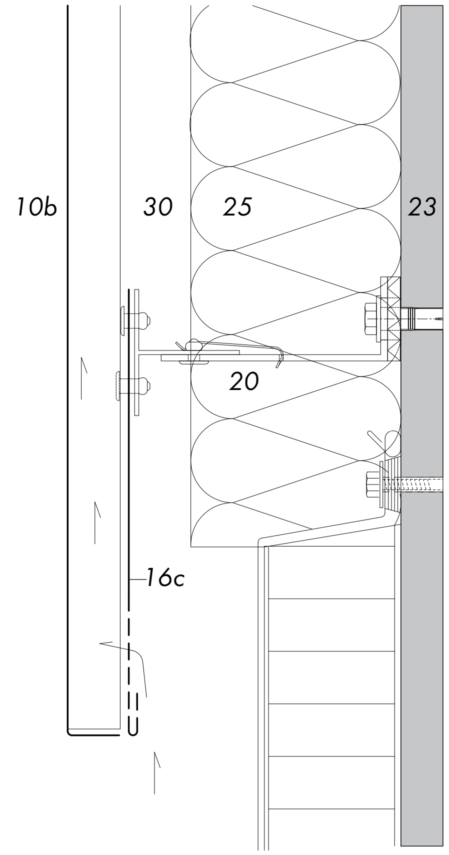
DESIGN – VERTICAL APPLICATION
DETAIL V1: BASE

V1.1



V1.2





V1.3

2.10.5 Detail V1: Base

10 RHEINZINK-Reveal Panel SF 25
- a Standard panel with short boxed end
- b Standard panel with long boxed end

16 RHEINZINK-Building profile
- a Base profile
- b Receiver strip with sealant tape
- c Ventilation profile, partially perforated
- d Perforated strip

18 Support profile
- ■ Made of aluminium

19 Seperating layer
- ■ Structured underlay

20 Substructure
- ■ 2-part: wall bracket with thermal break and vertikal profile*

23 Supporting structure

25 Thermal insulation

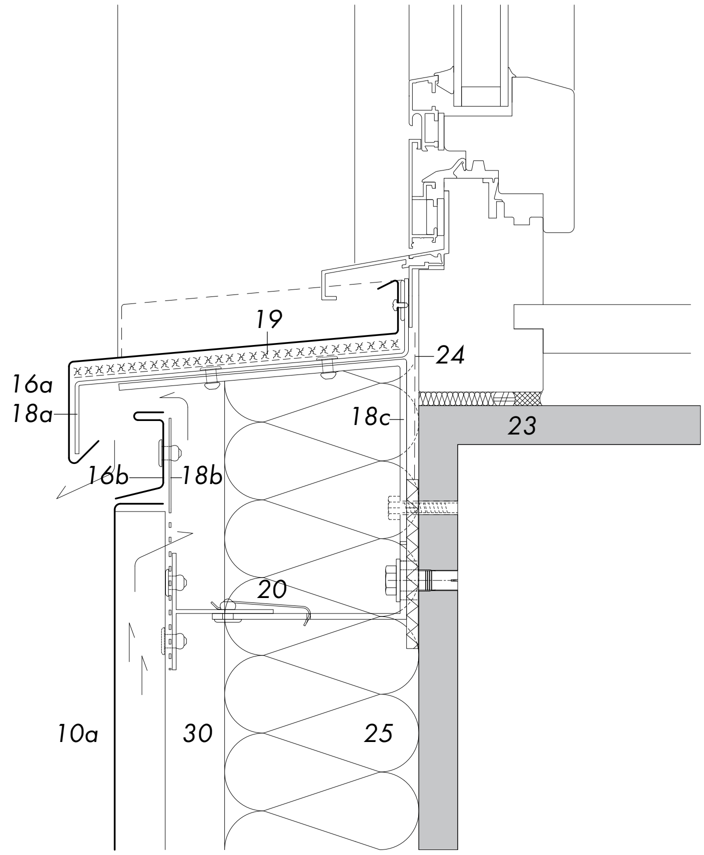
30 Ventilation space
- ■ Height of ventilation space ≥ 20 mm

* Manufacturers' guidelines must be complied with

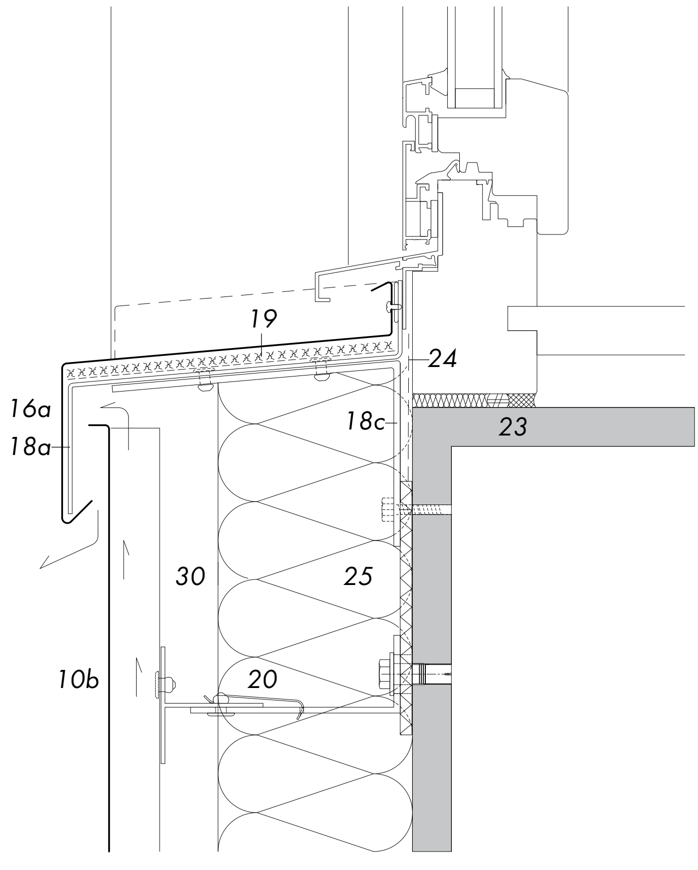
REVEAL PANELS, DESIGN AND APPLICATION

DESIGN – VERTICAL APPLICATION
DETAIL V2: WINDOWSILL

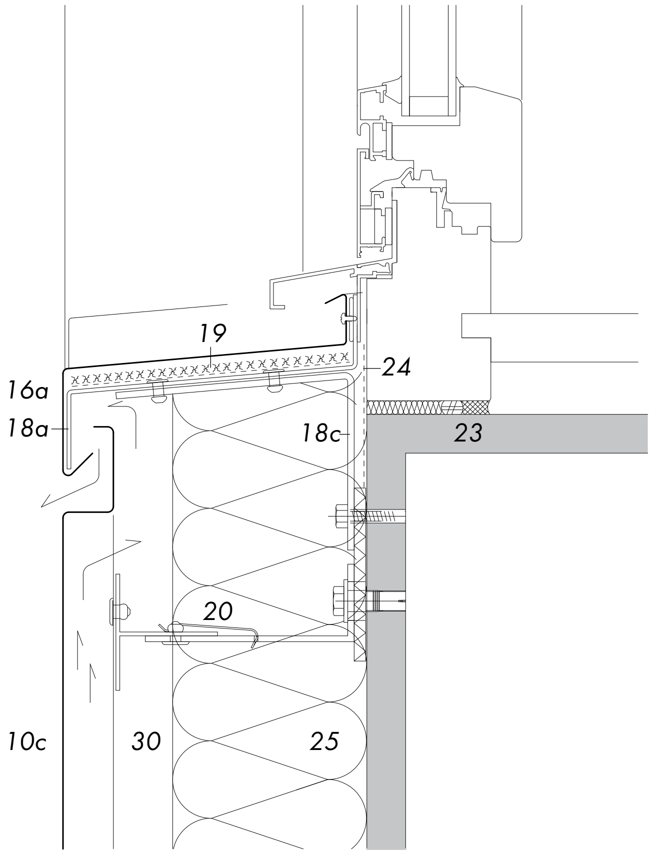
V2.1



V2.2



V2.3



2.10.6 Detail V2: Windowsill

10 RHEINZINK-Reveal Panel SF 25
- a Standard panel with long boxed end
- c Adapter panel with boxed end and water drip
- b Standard panel with short boxed end, folded outwards

16 RHEINZINK-Building profile
- a Windowsill profile, slope ≥ 3°
- b Termination profile

18 Support profile
- a Made of aluminium
- b Made of aluminium, partially perforated
- c Support bracket made of corrosion resistant steel with thermal break

19 Seperating layer
- ■ Structured underlay

20 Substructure
- ■ 2-part: wall bracket with thermal break and vertikal profile*

23 Supporting structure

24 Airtight sealing

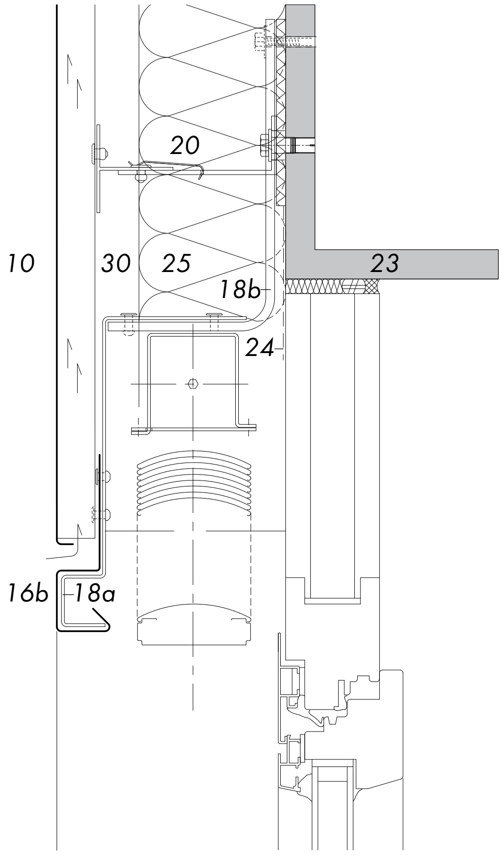
25 Thermal insulation

30 Ventilation space
- ■ Height of ventilation space ≥ 20 mm

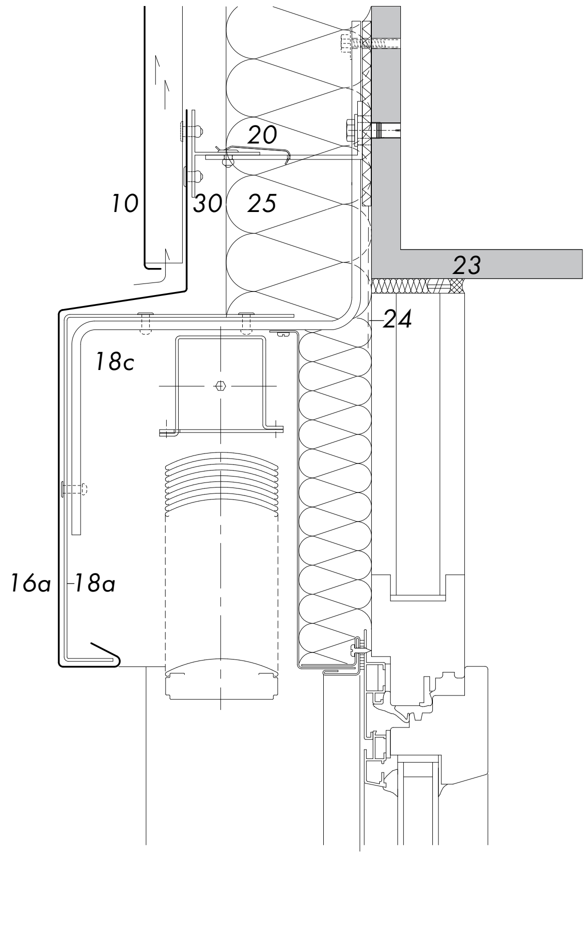
* Manufacturers' guidelines must be complied with

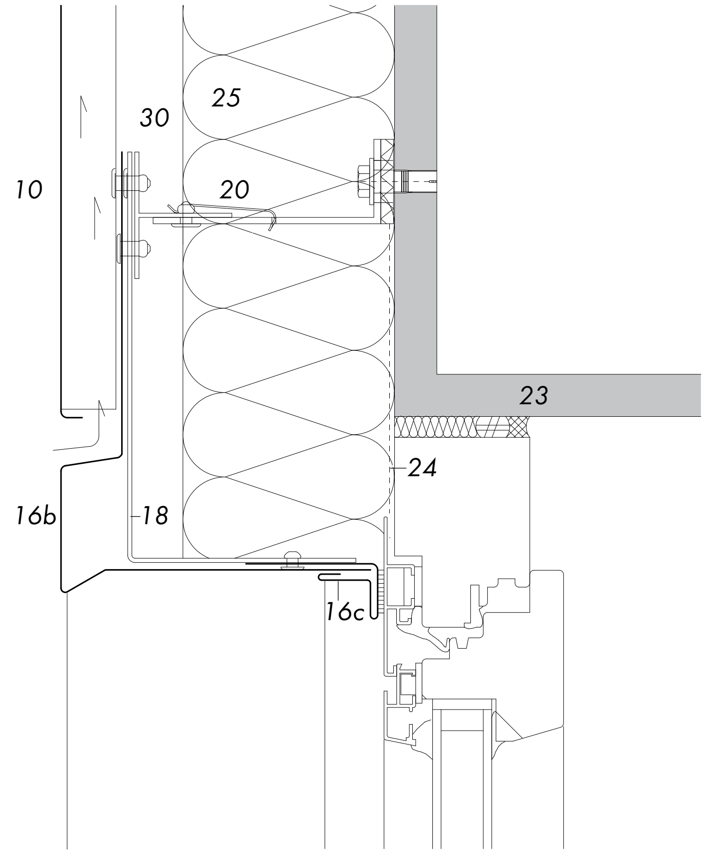
DESIGN – VERTICAL APPLICATION
DETAIL V3: WINDOW LINTEL

V3.1



V3.2





V3.3

2.10.7 Detail V3: Window lintel

10 RHEINZINK-Reveal Panel SF 25
- Standard panel with short boxed end

16 RHEINZINK-Building profile
- a Window lintel box profile
- b Window lintel profile
- c Receiver strip with sealant tape

18 Support profile
- a Made of aluminium
- b Support bracket L-shaped made of corrosion resistant steel with thermal break
- c Support bracket Z-shaped made of corrosion resistant steel with thermal break

20 Substructure
- 2-part: wall bracket with thermal break and horizontal profile*

23 Supporting structure

24 Airtight sealing

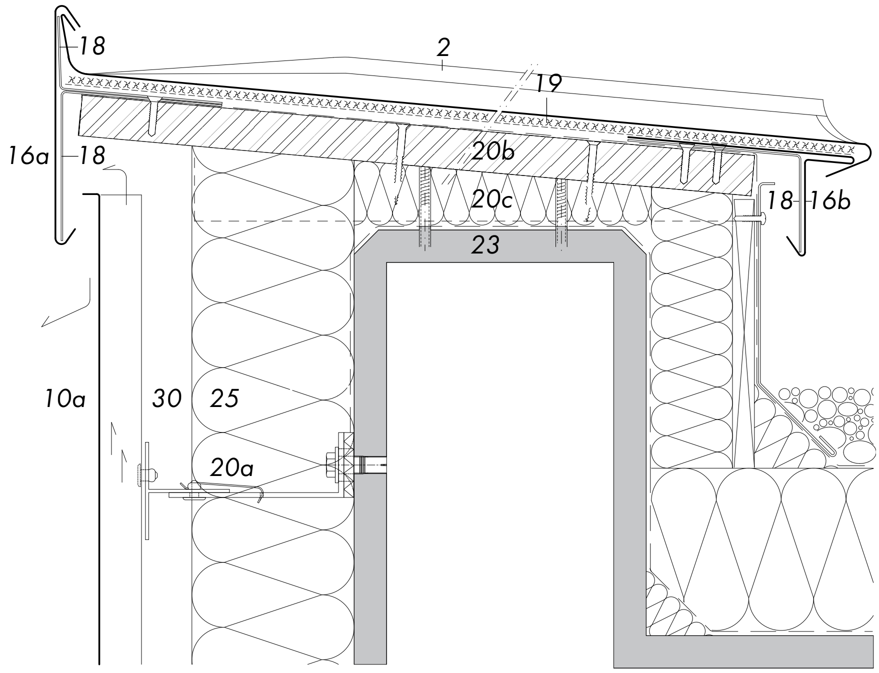
25 Thermal insulation

30 Ventilation space
- Height of ventilation space ≥ 20 mm

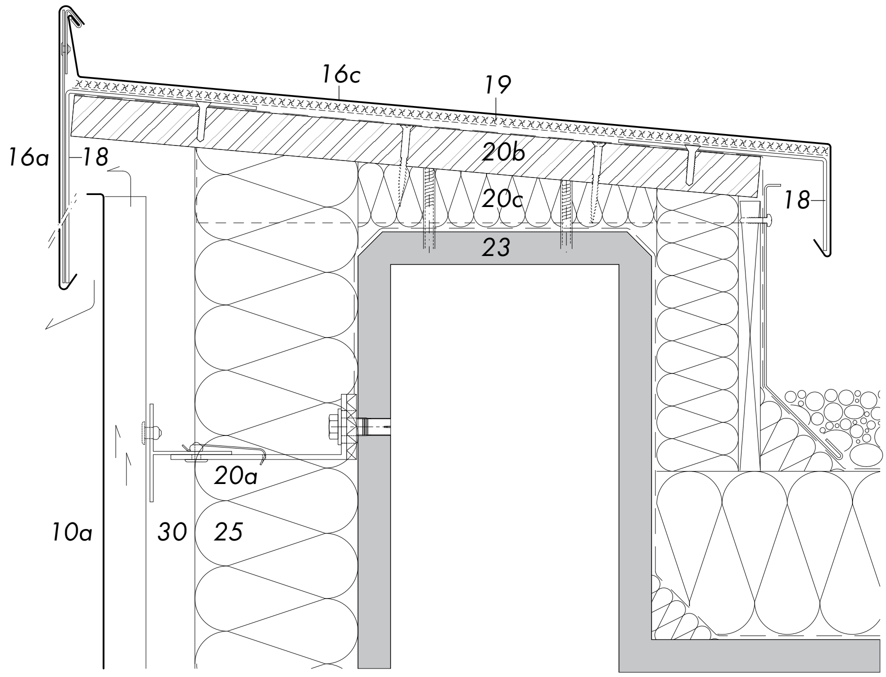
* Manufacturers' guidelines must be complied with

DESIGN – VERTICAL APPLICATION
DETAIL V4: TWO-PART ROOF EDGE

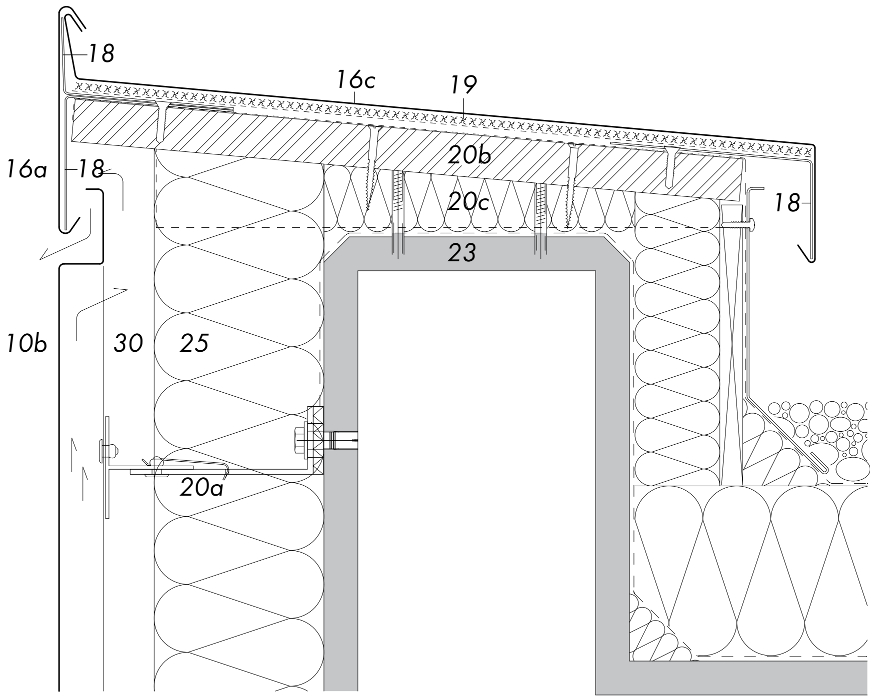
V4.1



V4.2



V4.3



2.10.8 Detail V4: Two-Part Roof Edge

2 RHEINZINK-
Double Standing Seam
10 RHEINZINK-Reveal Panel SF 25
- a Standard panel with short boxed end, folded outwards
- b Adapter panel with boxed end and water drip

16 RHEINZINK-Building profile
- a Edge profile
- b Eaves flashing
- c Wall coping

18 Support profile
- ■ Made of aluminium

19 Seperating layer
- ■ Structured underlay

20 Substructure
- a 2-part: wall bracket with thermal break and horizontal profile*
- b Plywood or sterling board
- c Wedged board

23 Supporting structure
25 Thermal insulation
30 Ventilation space
- ■ Height of ventilation space ≥ 20 mm

* Manufacturers' guidelines must be complied with

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REFERENCE PROJECTS

1

2

2

3

REFERENCE PROJECTS

4

5

For other project references, please see www.rheinzink.co.uk

LIST OF ILLUSTRATIONS

Titel: **Universität Nottingham, Business School, Nottingham, Great Britain**
Architect: Michael Hopkins & Partners, London, Großbritannien
RHEINZINK-work implemented by:
Carlton Building Services Ltd., Bolton, Großbritannien

1. **Airport, Bydgoszcz, Polen**
Architects: Pracownia Architektoniczna Arus sp. z o.o., Bydgoszcz, Poland
RHEINZINK-work implemented by:
F.H.U. Budownictwa Krest, Niepołomice, Poland

2. **Columbarium, De Nieuwe Ooster Begraafplaats, Amsterdam, Netherlands**
Architect: Karres en Brands landschapsarchitecten, Hilversum, Netherlands
RHEINZINK-work implemented by:
Loodgietersbedrijf C.J. Ockeloen v.o.f., Amsterdam, Netherlands

3. **Mt. Druitt Court House, Sydney, Australia**
Architect: Perumal Pedavoli Pty Ltd., Ultimo, Australia
RHEINZINK-work implemented by:
Perumal Pedavoli Pty Ltd., Hornsby, Australia

4. **CargoLifter Werft, Briesen-Brand, Germany**
Architect: SIAT Architektur + Technik, Munich, Germany
SIAT Bauplanung und Ingenieurleistungen GmbH & Co. OHG
RHEINZINK-work implemented by:
Thale Metallbedachung Bauklempnerei, Lingen/Ems, Germany

5. **Artemis Square, Brüssel, Belgium**
Architect: De Borman + Gerard, Brussels, Belgium
RHEINZINK-work implemented by:
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103390-RZ-GB_STAMM-000-03-05