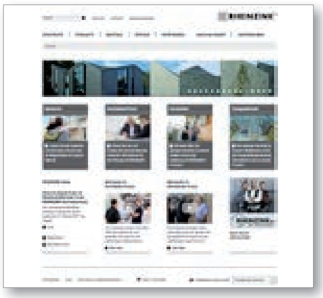
RHEINZINK®

HORIZONTAL PANEL

System Technology for Facades

DESIGN AND APPLICATION



For up-to-date information, technical reports, advanced technical information, parts lists, standard details or specifications please visit our website.

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11th edition

Foreword

This document describes the use of RHEINZINK-Flat-Lock Tiles. Although it forms the basis for proper planning and classical application solutions, it is no more than a guide for users. The detailed drawings included here describe solutions which are feasible at a practical level.

We should like to explicitly point out that in actual practice it may not be possible to create the types of cladding illustrated in this document – or not to their full extent. In this context every situation should be examined in detail by the planner in charge. It is necessary here to take account of the system-specific effects on the property and local/climatic conditions as well as the requirements in terms of building physics. Compliance with the application techniques and specifications described here does not release users from any responsibility in this regard.

This document is based on our practical experience and represents the latest findings from research and development, recognised standards and state-of-the-art technology. We reserve the right to make changes at any time in the course of further development.

If you have any queries or suggestions, please contact your customer advisor or get in touch with your local RHEINZINK sales office. All contact data can be found on our homepage **www.rheinzink.com / contact**
For an overview of our sales offices see page 44 of this document.

Datteln, October 2019

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PRODUCT LINES

CLASSIC

artCOLOR

ONE BRAND – 3 PRODUCT LINES
A perfect solution
for every requirement

To give you even more design freedom, we offer our material in three different product lines and in numerous finishes. You get the perfect solution for every requirement with the trusted RHEINZINK quality. All products exceed the high standards of EN 988 and the TÜV QUALITY ZINC criteria. The high level of manufacture is guaranteed by constant inspections and extensive laboratory tests. On this double page, we have summarised the characteristic features of our three product lines. On request, we will gladly send you samples of material.

RHEINZINK-CLASSIC
The natural material
in its most original form

RHEINZINK-CLASSIC is the most original of all material options. The bright rolled version has proven itself for over 50 years of application. Depending on the weather conditions, over time a typical blue-grey patina is formed on the naturally shiny metallic surface. The patina gradually becomes more and more distinctive and develops a unique surface character.

Surface quality:
RHEINZINK-CLASSIC® bright rolled

RHEINZINK-artCOLOR
Unlimited design in a variety of
colours

RHEINZINK-artCOLOR is the coloured version for roofing and facade cladding. A durable coating allows a wide range of colours and opens up a variety of design options for architects, planners, builders and trade customers. Classically elegant, contemporary avant-garde, contrasting or tone-on-tone. If you have a special colour requirement, we will be happy to produce RHEINZINK-artCOLOR in the shade of your choice.

Surface qualities:
RHEINZINK-artCOLOR® black-grey
RHEINZINK-artCOLOR® pure-white
RHEINZINK-artCOLOR® pearl-gold
RHEINZINK-artCOLOR® moss-green
RHEINZINK-artCOLOR® nut-brown
RHEINZINK-artCOLOR® blue
RHEINZINK-artCOLOR® tile-red

prePATINA

prePATINA

THE WORLD'S ONLY NATURALLY PRE-WEATHERED SURFACES

Only RHEINZINK has a special process in which the blue-grey or graphite-grey colour of the natural patina is achieved naturally in production. As the inventors, we called this unique pickling process "pre-weathering". Virtually imperceptible to the human eye, atmospheric influences over time create a natural protective patina that reliably protects the product. In production, any use of artificial coatings, varnishes or phosphating is avoided completely. The prePATINA line products are the only ready-made natural surfaces in the entire global zinc construction market.

Natural weathering compensates for any installation-related scratches. Only the RHEINZINK-prePATINA and the RHEINZINK-CLASSIC lines offer this self-healing effect. They are environmentally friendly and absolutely maintenance-free.

100 % SELF-HEALING
100 % MAINTENANCE-FREE
Only available from RHEINZINK

Surface qualities:
RHEINZINK-prePATINA® blue-grey
RHEINZINK-prePATINA® graphite-grey

Only RHEINZINK with its CLASSIC and prePATINA line offers three entirely natural material options made with titanium zinc!

1. Material RHEINZINK Titanium Zinc

1.1 Alloy and Quality

RHEINZINK is titanium zinc according to DIN EN 988. The RHEINZINK alloy consists of electrolytically refined zinc according to DIN EN 1179 with a purity grade of 99.995 % and precisely determined proportions of copper and titanium.

All RHEINZINK products are certified according to DIN EN ISO 9001:2008 and are subject to a voluntary inspection by TÜV Rheinland according to the strict QUALITY ZINC criteria catalogue *(please request free of charge).*

Ecological Relevance

RHEINZINK is a natural, 100 % recyclable material that has always complied fully with today's strict ecological requirements. The latest production facilities, sophisticated logistics and favourable processing properties are available. Environmentally-conscious action is documented through the introduction of the environmental management system ISO 14001:2004. It is checked and certified according to TÜV Rheinland.

We also document responsible action in regard to the environment through the introduction of an energy management system according to ISO 50001:2011. It is our intention to save as much energy as possible, to save resources and to keep the environmental impact of our products as low as possible.

Aspects of ecological Assessment

According to the holistic assessment from the Institute for Construction and Environment e.V., RHEINZINK is declared an environmentally friendly construction product according to ISO 14025, type III (EPD) and EN 18504 „Sustainability of construction works. Environmental product declarations". The examination of the environmental and health compatibility criteria also includes the entire life cycle of RHEINZINK products, from the raw material extraction to processing and use to recycling and disposal. It is based on a life cycle assessment according to ISO 14040 (LCA) *(please request the certificate free of charge).*

Electromagnetic Radiation is safely shielded

There is much public controversial debate about electromagnetic radiation. The International Society for Electrosmog Research (IGEF e.V.) has provided information here on RHEINZINK's shielding properties. The result: Over 99 % of electromagnetic smog present is shielded. Biological measurements on people confirm the technical measurements and show a harmonising effect on heart, circulation and the nervous system. Body relaxation increases.

Remaining values

With a service life that spans several generations, RHEINZINK is a material that sets news standards. The 30-year guarantee highlights the durability of the 100 % recyclable material. This offers additional protection.

1.2 Marking

RHEINZINK sheets and coils:
Recognisable by the consecutive coloured stamping on the metal underside.

RHEINZINK-
Roof Drainage Products:
Recognisable by the brand embossing.

RHEINZINK-
Roof Drainage Accessories:
Recognisable by the brand embossing.

RHEINZINK-Palette Identification:
Recognisable by the packaging label with detailed product data.

1.3 Material Properties

- Density (spec. weight) 7.2 g/cm³
- Melting point approx. 420 °C
- Expansion coefficient:
  in a longitudinal rolling direction: 2.2 mm/m x 100 K
  in a transverse rolling direction: 1.7 mm/m x 100 K
- Typical joining techniques: seaming, soft soldering, bonding, screwing, riveting
- Non-magnetic
- Non-combustable
- Electromagnetic radiation shielding
- Recyclability 100 %
- High recycling rate
- Assured material cycle
- Environmentally compatible (EPD)
- Natural material
- Low energy use
- Long service life
- Vital trace element
- Extensive resources

Metal thickness (mm)	Weight (kg/m²)
0.70	5.04
0.80	5.76
1.00	7.20

RHEINZINK weight according to Metal thickness in kg/m² (Numbers are rounded)

RHEINZINK-prePATINA® – EN 988 Titanzink/Titanium Zinc/ Zinc titane – RHEINZINK® – Datteln – MADE IN GERMANY – TÜV QUALITY ZINC – Rückseite/back side/verso – RHEINZINK-prePATINA® – 123456/78 0,70

A

RHEINZINK
TÜV | Geprüftes Bauzink QUALITY ZINC
Freiwillige Prüfung nach QUALITY ZINC - Kriterienkatalog
0,70

B

RHEINZINK
DE EN612 Zn DN 100 0,7
MADE IN GERMANY HSF

C

333l RHEINZINK

D

1.4 Patina Formation

On the natural RHEINZINK-prePATINA surface forms a bonded natural patina in the atmosphere. In so doing all the environmental influences from the air and rain water are integrated into the surface development. The material surface is maintenance free and as a natural product does not require care or cleaning.
When using the natural RHEINZINK-prePATINA line surfaces in areas subject to a marine climate, white deposits may develop on the surface due to the salt in the atmosphere. These natural deposits integrate into the natural patina and because of the colour contrast, are more visible on the darker, RHEINZINK-prePATINA graphite-grey surface. This will not affect the function or expected service life of the material when used on facades, roofs or other cladded building components. The natural patina will appear lighter when used in locations where the air contains chlorides. When used in environments where sulphur levels are higher, (e.g. industrial pollution), the patina may appear somewhat darker than usual.

1.4.1 RHEINZINK-CLASSIC bright rolled

Application for all sheet metal work in seaming and soldering techniques. Natural patina forms at different times depending on the application or roof pitch. In areas protected from rain water e.g beneath eaves or on roof edges sometimes only after a few years.

1.4.2 RHEINZINK-prePATINA blue-grey and graphite-grey

The pre-weathering process was developed by RHEINZINK 25 years ago especially for use in areas where a "finished" picture of the RHEINZINK surface is desired even at the hand-over of keys. This process allows the production of colour of a natural patina although the natural patina itself only forms after installation.

RHEINZINK is the only manufacturer world wide who uses this unique pre-weathering process. The use of a pickling process compared to a coating or phosphating process has two distinct advantages: Pickling gives the surface the appearance of a genuine patina, something that only occurs otherwise after a long time through natural influences. Pickling produces an even colour tone but is not comparable however with a RAL shade. A protective coating applied to the surface achieves temporary protection for storage, transport and processing. This protective film makes oil-free forming possible for processing in the profile roll forming machines.

The RHEINZINK quality prePATINA graphite-grey is the dark alternative and may, after a few years during the formation of patina and depending on the regional climate, develop a slight dark green sheen as with slate.

During the pickling process other natural surface properties are preserved - the surface remains solderable. The visible "Ageing with dignity" is not prevented by pre-weathering and has proved its worth in practice over many decades. The material largely reduces the typical reflections of the surface of thin sheets (oil canning).

1.4.3 Information about Processing

In order to avoid surface reactions from excessive sweating from the skin and other impurities caused by the building site, oil-free clean textile gloves should be worn.
Suitable products can be found at
www.rheinzink.de/werbemittelshop

1.4.4 Surface Uniformity

We make every effort to supply profiles with surface uniformity. Production-related slight differences can occur, which are purely of appearance in nature and which, in the prePATINA line, usually even out during the formation of patina. In order to exclude specific product-related visual imperfections, particular requirements should be requested with respect to surface uniformity.

Environmental Profile Scheme
ENP 453

* *environmental label for building products recongnized by the German Federal Environmental Agency*

1.4.5 Protection during Transportation and Installation

To protect the surface during the transport, storage and installation our façade profiles and also our surface quality artCOLOR line are delivered with a protective plastic film. It also protects against negative influences during the construction phase.

The foliation is a self-adhesive protective plastic film that is applied at the factory and is exposed during installation to UV radiation and temperature variations. If this exposure continues for a long time, the properties of the film may change and cause adhesive residues on the metal surface. To avoid these changes, we recommend removing the film immediately after the installation process.

1.4.6 Information on Wave Formation Strip Material

A characteristic surface phenomenon with strip material is the typical slight wavy structure of thin sheet metal.
These waves form because of the reaction of a natural material to the winding and unwinding process in the factory and the corresponding reworking (profiling etc.) during workshop preparation and installation.

The surface finish CLASSIC bright rolled emphasises the changing appearance because of light reflection. With increasing patination this perception reduces. If from the start e. g. for facades and roof surfaces, a high grade appearance is desired, we recommend, the surface finishes prePATINA blue-grey or prePATINA graphite-grey.

Panels

An improved evenness is obtained by using panels, which RHEINZINK can manufacture and supply at lengths up to 6 m. The measurement of corrugations is subject to strict controls and must not exceed the value defined under DIN EN 988 (max. 2 mm per metre). The RHEINZINKworks standard prescribes for each metre of sheet length e. g. max. 1 wave 1 mm in height.

1.5 Response to external Influences

1.5.1 Influence of other Metals placed on Top

Unproblematic:
- Aluminium, shiny or coated
- Lead
- Stainless steel
- Galvanised steel (rust streaking possible, e. g. caused by unprotected cut edges)

Problematic:
- Copper

1.5.2 Influence of other Building Materials placed on Top

Problematic:
- Unprotected bitumen roof sheeting without grit layer/gravel fill (acid oxidation)
- PVC roof sheeting (hydrochloric acid emissions)

1.5.3 Influence of other substances incl. Mortar

- Mineral-based materials such as chalk, cement or plaster plus moisture have a corrosive effect on metals.
- A suitable separating layer must be fitted between RHEINZINK building profiles and these building materials.
- Installation sequence: Plasterwork prior to RHEINZINK (if possible use material with plastic film)

1.5.4 Effect of Oil Heating

Discolouration on RHEINZINK surfaces can occur in the case of oil-driven heating systems because of the ingredients of the heating oil and additives. Such discolouration is more or less visible on all covering materials and has no influence on the durability of the roofing.

Note:

The builder must be informed about this situation. With gas-operated plants, discolouration is not expected.

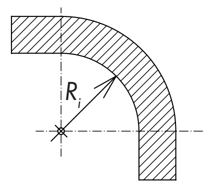
1.5.5 Base and Splash Water Areas, Rock Salt

At base areas splash water can cause staining and disturb the patination process. Rock salt in connection with moisture has a corrosive effect on metals. Therefor facade claddings should be installed with a sufficient space to the ground, not less than 30 cm as a rule.

1.6 General Processing Principles

1.6.1 Marking
Mark using soft pens and not sharp pointed objects (scribing tool, pocket knife).

1.6.2 Forming/Radii of Curvature
Zinc and its alloys are anisotropic, which means they have different properties parallel and crosswise to the rolling direction.
The mechanical effect of this anisotropism is reduced to such a degree with RHEINZINK through the alloy and rolling process, that RHEINZINK independent of the rolling direction can be folded at 180° without incipient cracking.

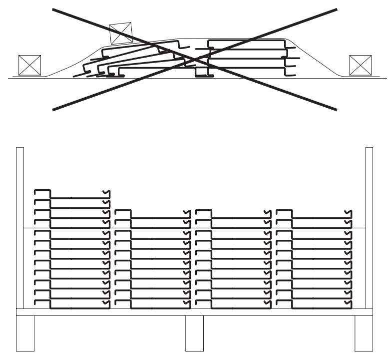


Material thickness	Radius of curvature R_i minimum
1.00 mm	1.75 mm
1.20 mm	2.10 mm
1.50 mm	2.63 mm

Recommended radii of curvature (inner radius) for RHEINZINK

1.6.3 Length Change caused by Temperature
With coverings, roofs, and facade cladding (panel length), sheet metal work and roof drainage (profile length), changes in length caused by temperature (expansion and contraction) must be taken into account in the design. In particular for penetrations, corners, joints and other transitions, the right design measures must be implemented; e.g. panels or profiles must be installed stress-free from the expansion technology perspective.

1.7 Storage and Transportation
RHEINZINK products must always be stored and transported in dry and ventilated conditions.



Storage and Transportation (Schema)

Note:
Container storage is the best method for optimum storage at the building site. If necessary request a dry and well-ventilated room from the building management. Do not place covers directly over the material as this can cause moisture or rain water to penetrate between the profiles and in the absence of ventilation lead to deterioration in appearance because of the formation of zinc hydroxide.

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

The rear-ventilated facade 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 rainscreen facade from the thermal insulation and supporting structure, the building is protected from the weather. he 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 facade 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.

1.9 Windproof Building Envelope
This does not apply to the rear-ventilated facade, as this component itself cannot be windproof.
The building must be windproof before the rear-ventilated facade is installed. A solid brick or concrete wall will ensure that the building is windproof. 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.

1.10 Weather Protection

Rear-ventilated facade cladding protects the supporting structure, the water-proofed thermal facade insulation, and the substructure, from the weather.
Bracket-mounted rear-ventilated facades 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.

1.11 Moisture

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

1.12 Thermal Economy

In order to understand the thermal economy of the rear-ventilated facade, 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.

1.12.1 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.

1.12.2 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 facade, is that a large portion of the heat which streams onto the cladding is diverted through convective air exchange.

1.12.3 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 facade.
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.

1.13 Fire Protection

Metal facades 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 facades, it may be necessary to install firestops.

1.14 Rear-Ventilation

The free ventilation cavity between the facade 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.

1.14.1 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 facade 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).

1.15 Soundproofing

To prove that a facade 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.

2. RHEINZINK-Horizontal Panel H 25
Using the horizontal panel, the designer has the option of realizing grid dimensions up to 6000 mm in length. The width of the shadow joint is fixed at 20 mm. The horizontal panel is available in widths of 200-333 mm.

Technical Approval
The Rheinzink-Horizontal Panel System is subject to EN 14782 and is approved for use with substructure spacing ≤ 1.00 m (other support spacing possible on request). In Germany the facade system is additionally governed by the Construction Products List B, Part 1 (edition 2015/2), section 1.0 relating to construction products subject to harmonised standards according to the Construction Products Directive, section 1.4.10.1 Self-supporting roof covering and wall cladding elements for interior and exterior application made of sheet metal.

Span Calculation
Span tables for profiles are based on DIN 18807 for cross-sectional values.
Deflection:
1/180 for facade components
Safety factor:
g = 1,50
(taken into account in tables)

Units for Loads and Strength
Permissible loads and force are given in kN/m^2 in the calculation tables.
Deflection values in relation to span width are given for single-, double- or multiple-span conditions.
The following symbol is used in the illustration:
Single-span ■
Double-span ■■
Multiple-span ■■■

Span width in m		0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
Permissible wind load in kN/m^2	■	3.54	2.80	2.27	1.87	1.56	1.33	1.15	1.00
	■■	1.85	1.65	1.48	1.35	1.23	1.13	1.05	0.98
	■■■	2.10	1.87	1.68	1.53	1.40	1.30	1.20	1.11

H 25-200, s = 1,00 mm

	■	2.12	1.68	1.36	1.12	0.94	0.80	0.69	0.60
	■■	1.11	0.99	0.89	0.81	0.74	0.68	0.63	0.59
	■■■	1.26	1.12	1.01	0.92	0.84	0.78	0.72	0.67

H 25-333. s = 1.00 mm

Span width in m		0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
Permissible wind load in kN/m^2	■	3.92	3.10	2.50	2.07	1.73	1.48	1.28	1.11
	■■	2.03	1.82	1.65	1.48	1.36	1.25	1.16	1.03
	■■■	2.32	2.07	1.85	1.68	1.55	1.43	1.33	1.23

H 25-200, s = 1,20 mm

	■	2.35	1.86	1.50	1.24	1.04	0.89	0.77	0.67
	■■	1.22	1.09	0.99	0.89	0.82	0.75	0.70	0.62
	■■■	1.39	1.24	1.11	1.01	0.93	0.86	0.80	0.74

H 25-333, s = 1.20 mm

Table 4: Calculation table for horizontal panel (intermediate values between building widths can be interpolated)
Basis for calculation: uniformly distributed load including profile dead load
Safety factor: 1,50
Yield limit: 100 N/mm^2
Width of support profile: ≥ 50 mm
DIN 18807/experimental testing at the University of Karlsruhe, Germany

2.1 Profile Geometry
Material thickness
s = 1.00 mm/1.20 mm

Cover widths H 25 s = 1.00 mm	Weight
200 mm	11.20 kg/m²
225 mm	10.70 kg/m²
250 mm	10.40 kg/m²
s = 1.20 mm	
250 mm	12.17 kg/m²
300 mm	11.58 kg/m²
333 mm	11.28 kg/m²

Cover widths from 200-333 mm
All sizes between in mm increments can be produced.
For widths of over 250 mm, we recommend using a material thickness of 1.20 mm.

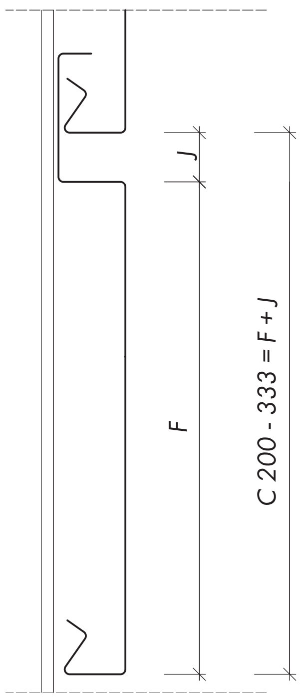
Application for outside Areas
- Facades
- Soffits
- Rounded parapets

Fasteners
The panels are screwed/riveted to the substructure through the RHEINZINK-Cast Fixing Clip. 2 fasteners must be used per clip. The location is secured by fixing the centre of the panel with appropriate fasteners.

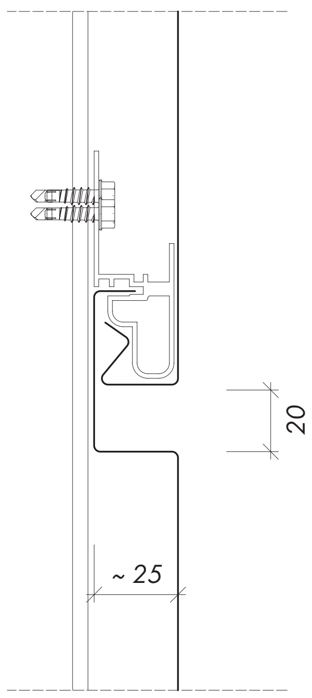
Dimensions
- Drawings: Dimensions in mm
- Panel markings: H 25 - 287 (Example)
- Standard length: ≤ 6000 mm
- C: Cover width = bay width
- J: Joint width
- F: Face width

Tolerances
According to RHEINZINK works standard

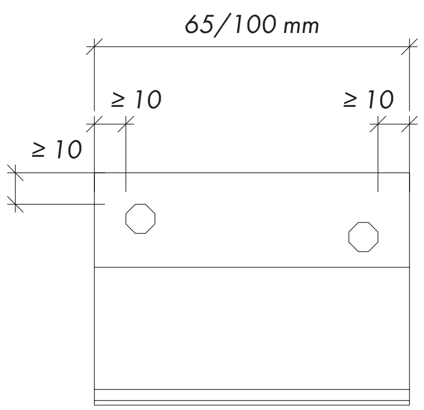
Installation Tips
- Boxed ends should be used at both ends of the panel for reinforcement.
- Panels (C) are manufactured with a minus tolerance of 1,00 mm smaller than ordered.



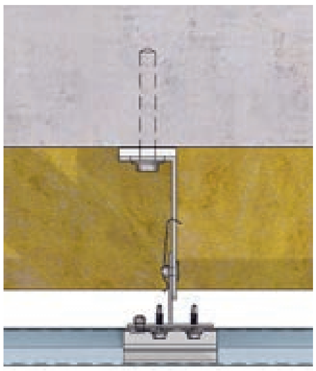
System section: grid



System section: illustration of installation allowing linear expansion



Minimum spacing for fasteners (special steel self-tapping screws or rivets) at the RHEINZINK-Cast Fixing Clip


Clips, aluminium (RHEINZINK-Cast Fixing Clip)

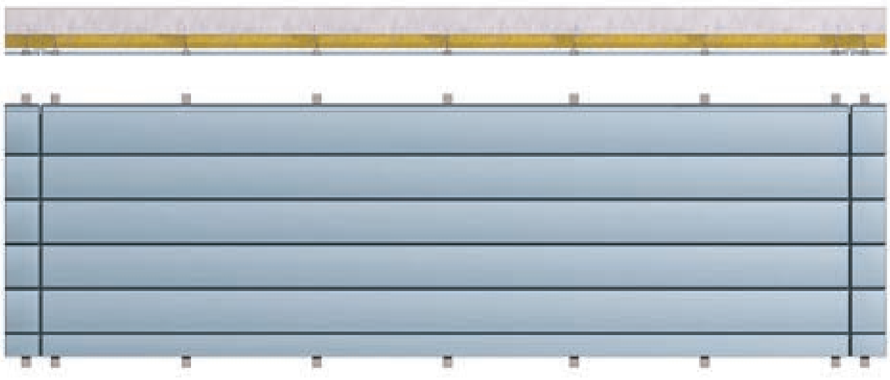


Illustration of a multi-span system

2.1.1 RHEINZINK-Horizontal Panel, Installation

Private Residence, Straden, Austria

RHEINZINK-Panel H 25 with shadow joint profile

Office building, Reykjavik, Iceland

RHEINZINK-Panel H 25 with 20 mm joint and slave profile

2.2 Joint Formation

2.2.1 Horizontal Installation

2.2.1.1 Vertical Joint

A: Slave Profile with boxed Ends

A slave profile corresponding to the panel geometry is installed behind the joint. Aesthetically speaking, this is a very conservative joint design, accentuating the horizontal orientation of the panels.

B: Joint with closed Panel

The panels are terminated with a lateral fold (boxed end) in order to prevent one from seeing into the profile and to lend greater stability to the profile.*

C: Joint profile using random structure

The staggered vertical joints make the facades come to life. By using custom profiles, the joints take the formation of shadow joints.

D: Shadow Joints

Vertical joints serve to separate the individual panel fields through expansion.

Note:

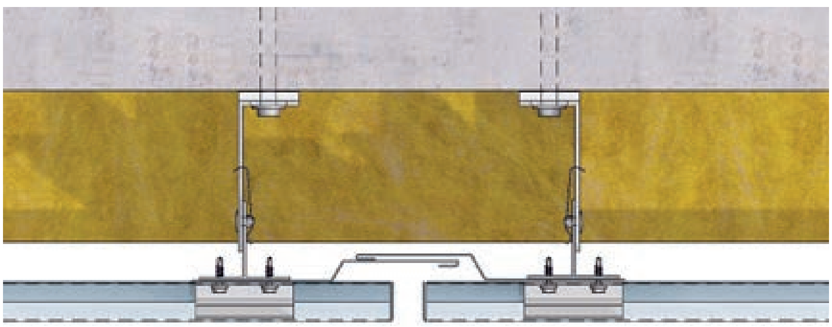
- Generally speaking, the joints should be dimensioned 5-10 mm bigger than the anticipated thermal expansion.

* If the cover width is 250 mm or greater, it is recommended that panel ends be terminated with boxed ends

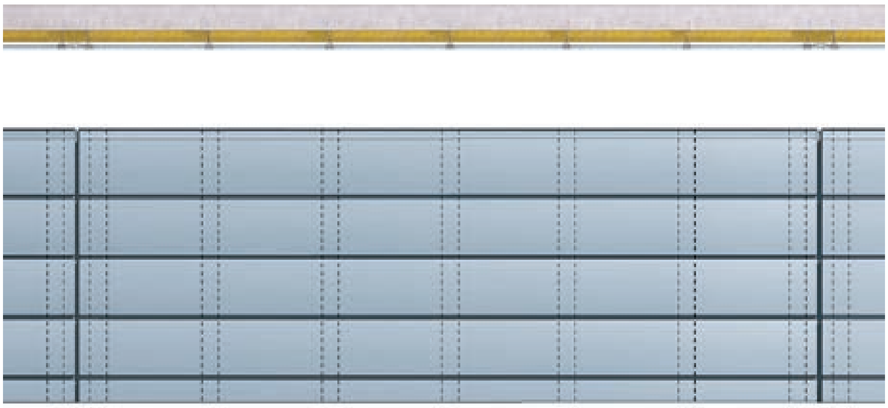
A

B

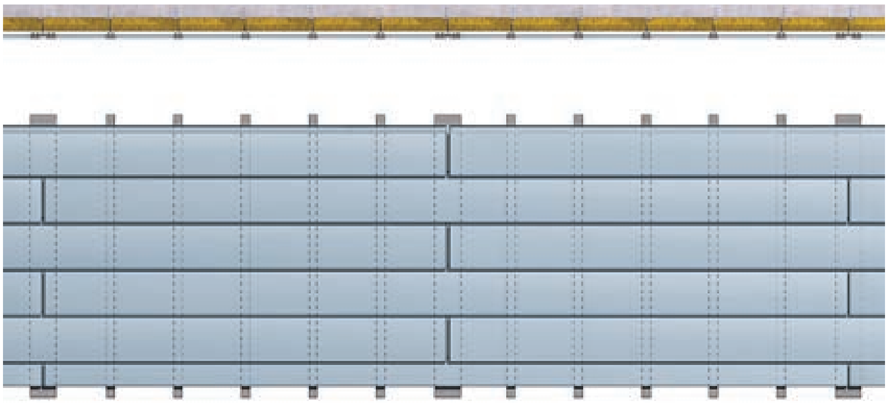
C



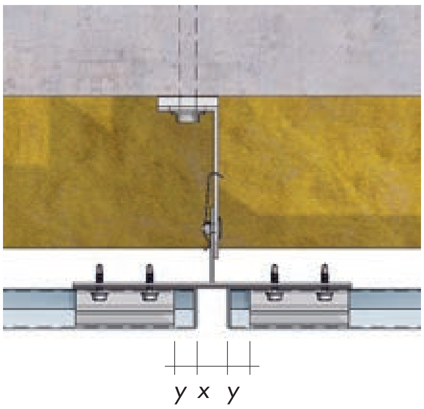
D



Example A



Example B



Example B details

2.3 Accommodating thermal Expansion of Facade Cladding

- Thermal expansion of facade profiles is accommodated by using expansion joints.
- Static continuous fields longer than 6000 mm are not permitted.
- In those joints, which will accommodate thermal expansion, the substructure must have an appropriate fastening system.
- The substructure must be designed/ formed separately for each facade field in the area of the expansion joint. Exceptions must be discussed and coordinated with the Department of Application Engineering*.

Two examples of facade design illustrate the correlation:

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

Example B
This type of cladding is characterized by the installation of semi-staggered vertical joints. If the substructure is designed properly, a double substructure in the joint profile area is no longer required. This type of installation is only possible with indirect fastening H 25, but not with a reveal panel that has been fastened directly.

When installing support profiles (horizontal panel brackets), please note that the Y dimension should always be 5 mm bigger than the calculated dimension for contracted panels.

* *see addresses and contacts, page 42*

2.4 Substructures
RHEINZINK facade systems are typically installed on substructures comprising single, two or multi-part NE metal systems. Apart from structural and economical advantages, these systems guarantee control of fastening patterns, compliance with fire protection specifications and problem-free compensation of building tolerances when two or multiple systems are used.
The architectural appearance of the profiles determines the design of the substructure. Prior to designing the substructure, the overall design must be determined. Otherwise the design will determine the architecture – which could be avoided in this case.

Note:
Due to moisture retention and problems when adjusting tolerances, we do not recommend using wood as a substructure for large facade surfaces.
For small-surface applications such as dormers, fascias and gable cladding, a dry wood substructure is definitely suitable.
The location and alignment of sliding and fixed points for metal substructures is determined based on the type of cladding, as well as the surface and length of the panels.

For single systems, the disadvantages outweigh the advantages, among others:
- great effort when accommodating building tolerances
- large thermal bridges

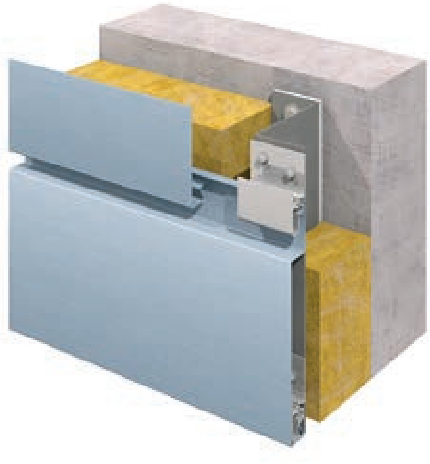
Technical problems are solved when using two- or multi-part systems:
- local thermal bridges only
- continuous rear-ventilation is guaranteed.

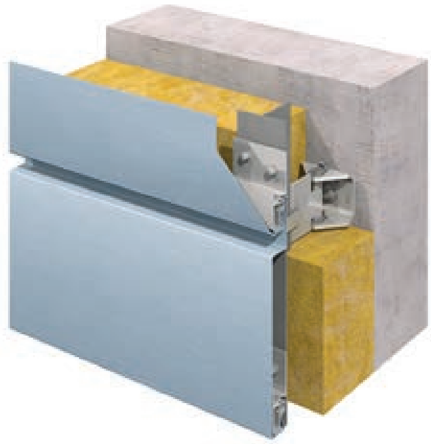
However, the high cost of design and the fact that two or more installation sequences must be carried out, should be taken into account.

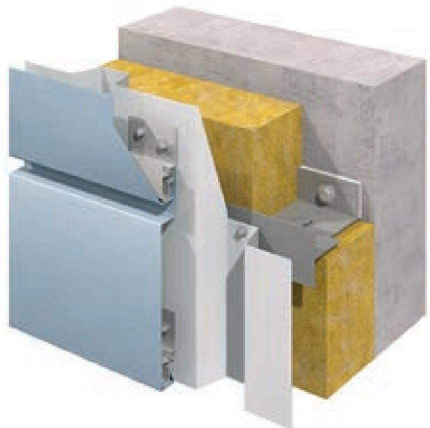
Two-part systems are the "happy medium":

Advantages:
- cost-effective
- building tolerances are easily accommodated
- local thermal bridges only

Disadvantages:
- two installation sequences
- high cost of design, depending on the detail


Single substructure


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

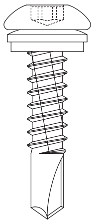
Drilling screws to join

- RHEINZINK-Cast Fixing Clip

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	0 - 7.0

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

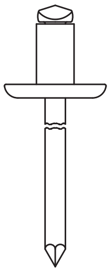
Use blind rivets to fasten

- RHEINZINK-Cast Fixing Clip
- 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

Note
Use a rivet gauge when creating sliding points.

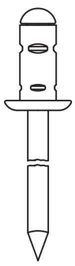
2.5.3 EJOT® Blind Rivet

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.

Blind Rivet 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

2.6 Detail Concept
Detail design has a formative influence on the facade. Building profiles are required for most corners, flashings, connections and terminations. These must be coordinated when working out the detail concept. Two significant design variations will illustrate this.

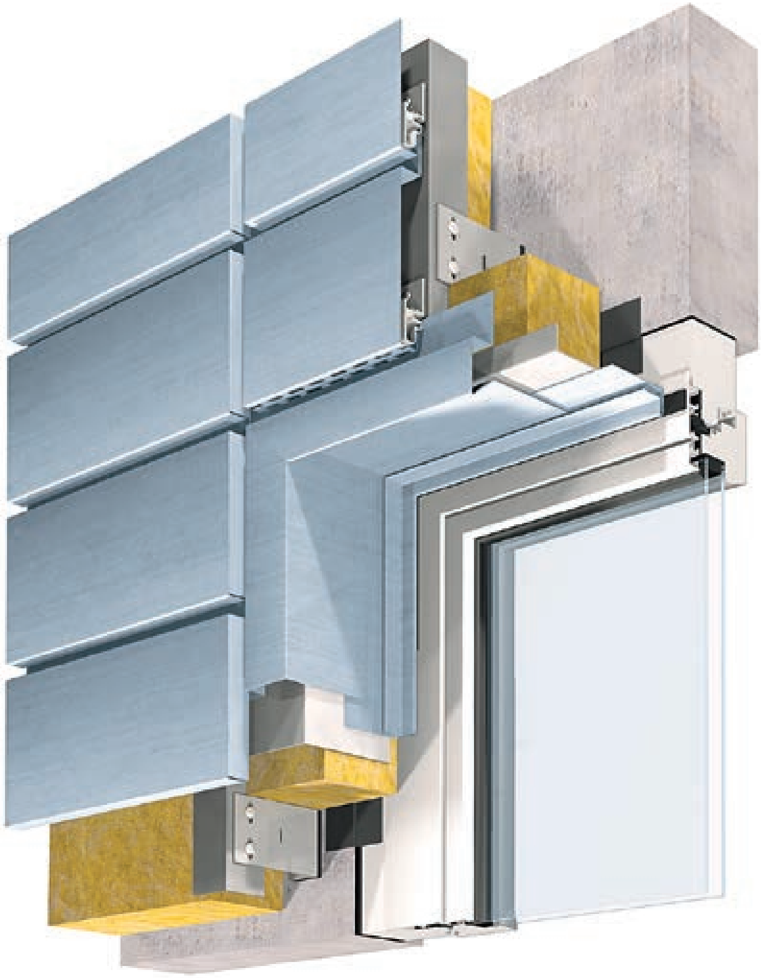
Face Width of Building Profile
The spectrum ranges from sharp-edged profiles to profiles that are several centimetres wide. Precise planning gives one the option of making the width of all termination and frame profiles the same, or to vary these proportionately as desired.

Projection of Profiles
Depending on the detail concept, profiles can either be flush with or protrude from the facade.

The overview illustrates two possible flush principles:

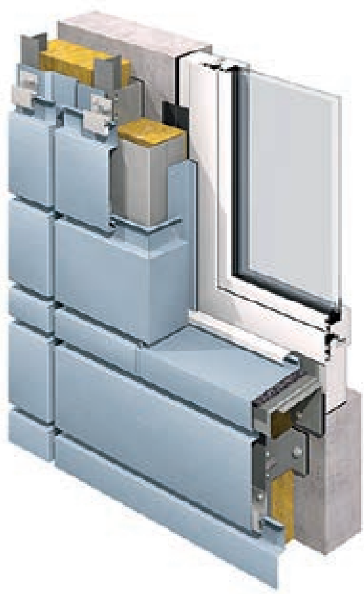
Profile Group 1
A relatively wide pilaster profile (face width ca. 60 mm) was selected for the building profile, which is terminated flush with the facade level. The edge profile, selected as the pilaster profile, is used as a flashing, in coordination with the window sill and window lintel.

Profile Group 2
This version of a corner panel forms the window flashing, accentuating the horizontal line, without any disruption in the window area.



Profile group 1

Profile group 1



Profile group 2

2.7 Details

2.7.1 General Instructions

Third Party Trades

Connections of facade 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 Construction

Layered construction is commensurate with a rear-ventilated metal facade. A solid brick or concrete wall serves as the supporting structure. Of course, it can also be substituted with a column or steel support structure.

Substructure

see chapter 2.4

Load Effect

If buildings are situated in exposed areas, boxed ends are required on all flat cladding profiles (all panel types) that are only fastened on one side, in order to provide additional reinforcement.

Installation Instructions

Detailed discussion pertaining to installation sequences has been left out deliberately, because in practical terms, these are heavily influenced by the supporting trades such as window and steel construction, etc.
Installation sequences should be determined separately for each project, taking into account the interfaces and installation sequence for each project. Noteworthy deviations are pointed out for different details.

Drip Edges

The requirements as set out by standards and regulations must be taken into account for detail design, for example, drip edges over stucco facades (soiling as a result of atmospheric deposits).

2.7.2 Pictogram

Horizontal sections (see page 26)

H1: Outside corner
H2: Inside corner
H3: Window jamb
H4: Joint/lengthwise expansion separation

Vertical sections ((see page 27)

V1: Base
V2: Windowsill
V3: Window lintel
V4: Roof edge

Variations

In some cases, variations are shown for the same detail (e.g. window lintel with/without sun shade). These are identified and explained with additional text or drawings.

Applicability

The details and designs outlined here are suggestions, which were carried out on various projects. The detail suggestions must always be coordinated responsibly, taking into account applicable standards and stipulations, as well as the designer's intentions 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 profiles, etc.)

2.8 Planning Grid

A metal facade consists of components, which have been industrially manufactured with high degree of production precision. These components determine the aesthetics through precise horizontal and vertical segmentation. Penetrations and terminations, which are not coordinated with the axial segmentation, are obtrusive.
The following instructions serve to provide for proper planning of facade segmentation:

Principles

Generally speaking, a distinction must be made between new buildings and renovations when discussing grid difficulties.
In the case of new buildings, the facade grid can be matched to the design; penetrations such as windows, chimney pipes, etc. are always ancillary to the grid.
However, when it comes to renovations, the penetrations (e.g. windows) are immovable, so that the grid must be coordinated.
The following principles apply to grid deviations:

- One should start or end with a whole module (x or y) at the transitions
- Dimensional discrepancies of maximum 15 mm on two-dimensional profiles wider than 250 mm, are not noticeable.
- Dimensional tolerances (dimensional change of y) which cannot be corrected, must be compensated in the windowsill or roof edge area.
- Adaptations or displacements of grid heights (height coordinates)can only be carried out in the roof edge and/or base area.

The principles of facade segmentation will be illustrated and explained using a grid for horizontal cladding. This principle also applies to vertical facade cladding (e.g. reveal panel).

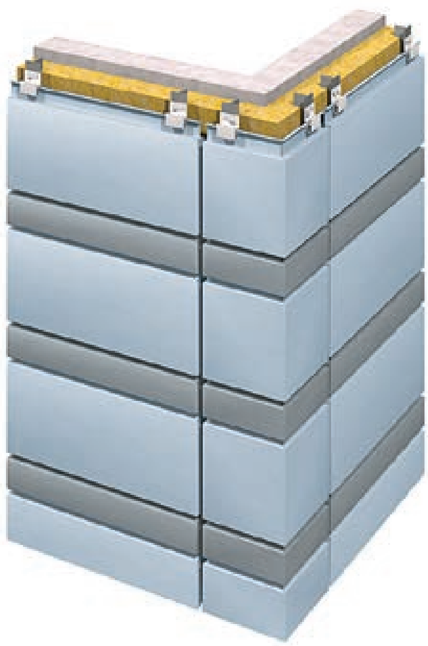
- B: Bay width
- C: Cover width = bay width
- J: Joint width
- F: Face width

Module Y

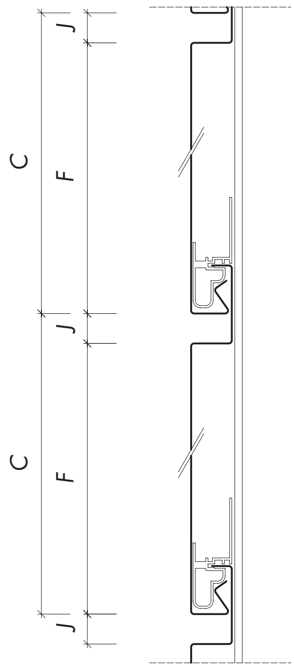
Y corresponds to the smallest unit of the facade segmentation, which repeats itself, e.g. panel width. Grid module Y determines the precise location of penetrations and transitions. In the case of horizontal panels, dimension Y can be produced with cover widths of 200 mm to 333 mm, depending on the project.
The bay width (Y) is determined by the face view of the panel and shaped in each case by a shadow joint.
The bay width = cover width is determined by the visible surface and joint width. Joint width is fixed at 20 mm.

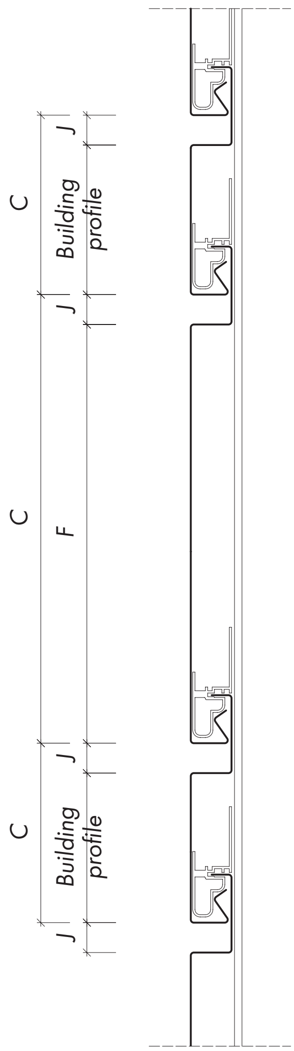
Dimension X

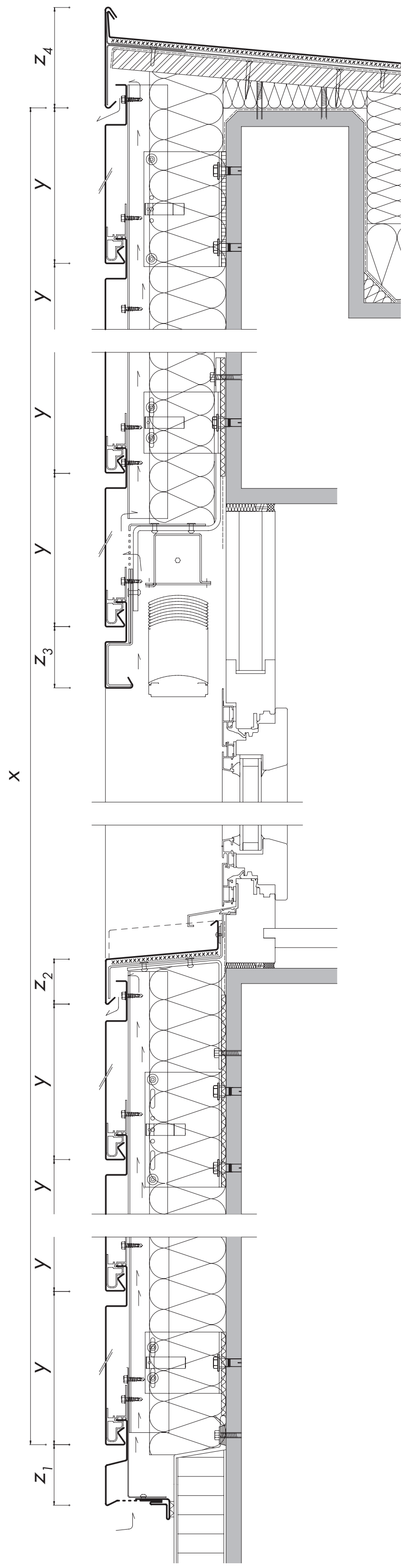
All of the segments marked with an X are a whole multiple of the selected module Y and, as a rule, correspond to the cover width of a profile.



Combination of panels and building profiles







Position Z_4: Roof Edge

Grid Planning for new Buildings, respectively Renovations

If the height coordinates of the roof edge do not fit into the grid, the following corrective measures may be selected:

- Change the roof edge profile/ incline
- Lower or raise the parapet or the roof edge frame.

As a rule, both of these possibilities only exist if the flat roof is being renovated at the same time.

- Changing module X or Y

Position Z_3: Window Lintel
Position Z_2: Windowsill
Grid Planning for new Buildings

- Determine recess of unfinished structure.
- Establish window frame profiles.
- Establish location of window.
- Establish profile geometry of window connections.
- Develop design details within the grid.

Grid Planning for Renovation Projects

- Establish window frame profile, new/old
- Establish location of window, new/old
- Establish the profile geometry of window connections.
- Establish design details within the grid.

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

- Change the profile geometry of the window lintel profile or the windowsill.
- Adapt to the height of the window.
- Change the incline of the windowsill
- Change the Y module.

Position Z_1 : Base

Grid Planning for new Buildings, respectively Renovations

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

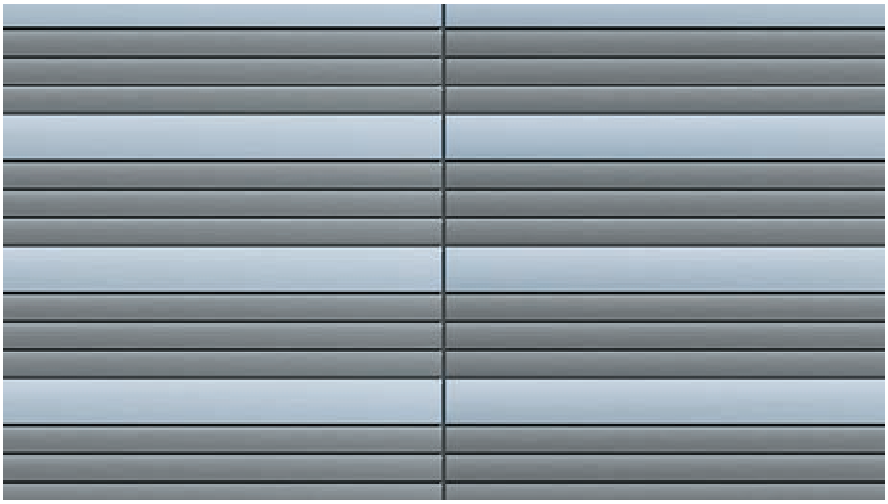
If the location of the base does not fit into the grid, the following corrective measures may be selected:

- Move the facade connection toward the top or the bottom.
- Change the profile geometry of the base profile.
- Lower or raise the base brickwork, if it has been planned for or if it already exists.

2.9 Design Variations

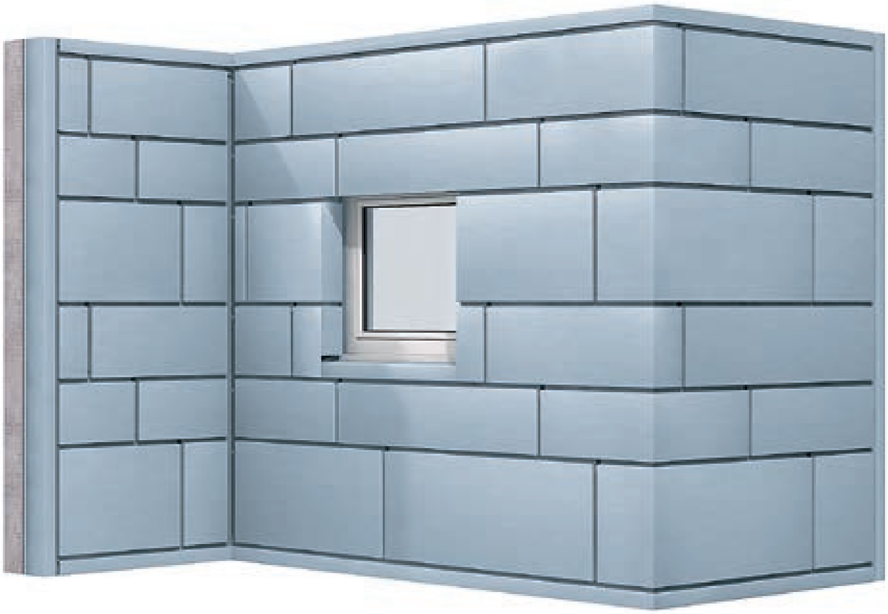
The following instructions serve to assist in proper planning of facade segmentation:
The facade images illustrated here represent a very small spectrum of design possibilities.
A combination of RHEINZINK surfaces in "preweathered pro blue-grey" and "preweathered pro graphite-grey" material qualities segment and accentuate a facade very clearly. Above and beyond that, various materials, widths and lengths can be combined. The examples shown here illustrate ½ staggered cladding, combined widths and a random structure.

½ staggered cladding accentuated by two-coloured surfaces

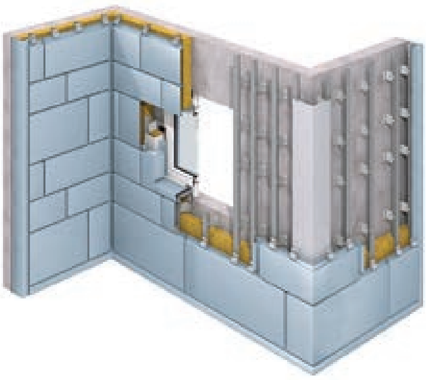


Combination facade using two different widths

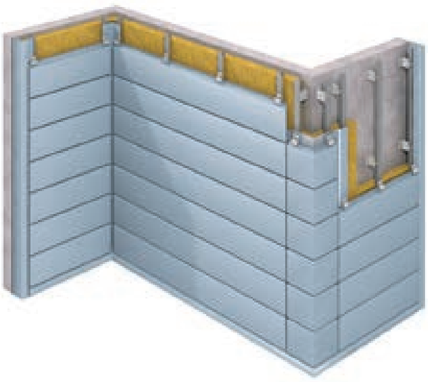
"Random structure"



Facade comprised of various widths.
The joint pattern is determined by shadow joints.



Facade installation using a "random structure"



Standard grid with outside corner panel

2.10 Installation and Building Tolerances

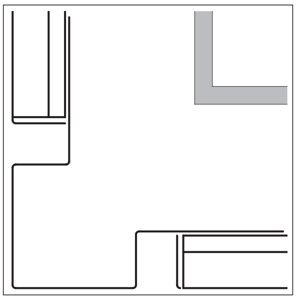
Adapter panels are used to accommodate building and installation tolerances. The position of these panels in the facade is controlled by the installation sequence: The building profiles, e.g. window and door frames, corner profiles, joint profiles, are installed first. The panels are manufactured in the RHEINZINK system center based on precise dimensions. Dimensional adaptations can be made on site by making minor changes to the joint width. This does not affect the clamping function of the panels, one to the other. The panels are installed starting at installation point A. Usually, the adapter panels are installed before the next building profile. Depending on the tolerance to be accommodated, one or two panels are fitted in.

Note:
Using adapter panels ≤ 15 mm wide to accommodate tolerances is hardly noticeable.

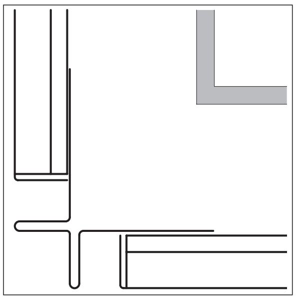
DESIGN
OVERVIEW

2.11 Horizontal Panel Application, horizontal Sections

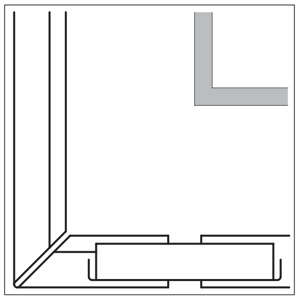
Detail H1: Outside corner, page 28



H1.1

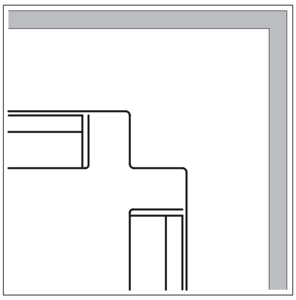


H1.2

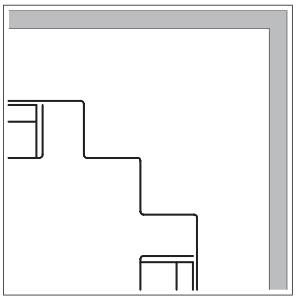


H1.3

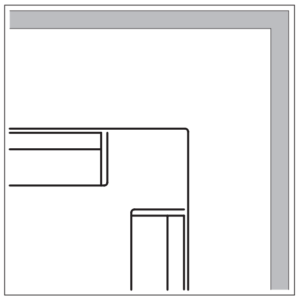
Detail H2: Inside corner, page 30



H2.1

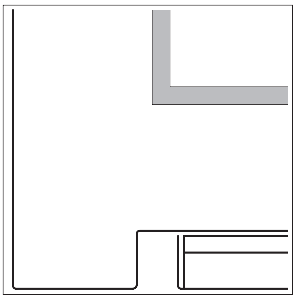


H2.2

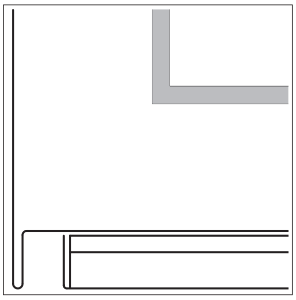


H2.3

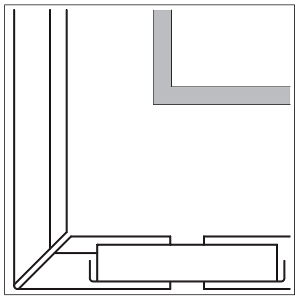
Detail H3: Window jamb, page 32



H3.1

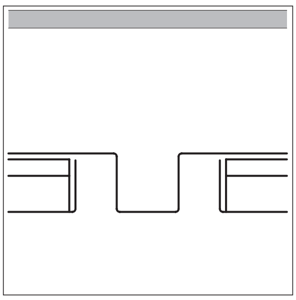


H3.2

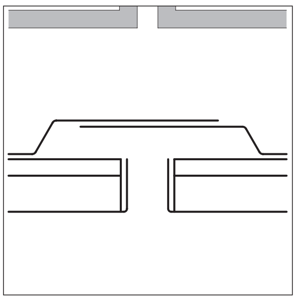


H3.3

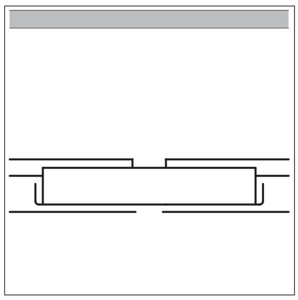
Detail H4: Expansion joint, page 34



H4.1



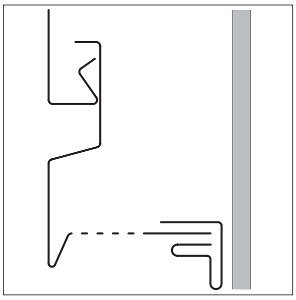
H4.2

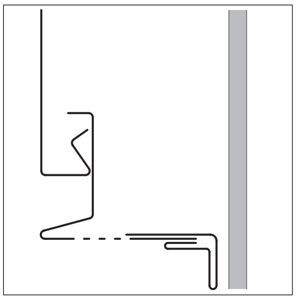


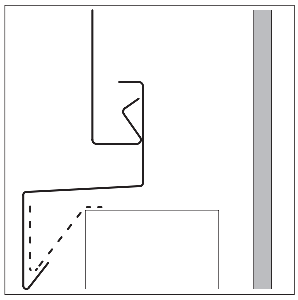
H4.3

2.12 Horizontal Panel Application, vertical Sections

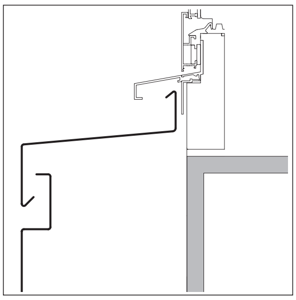
Detail V1: Base, page 36

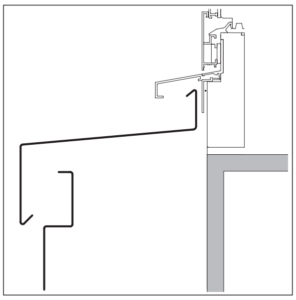

V1.1

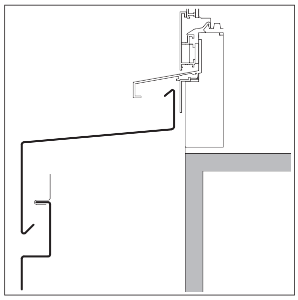

V1.2


V1.3

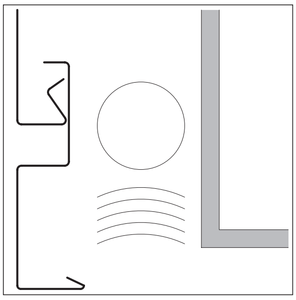
Detail V2: Windowsill, page 38

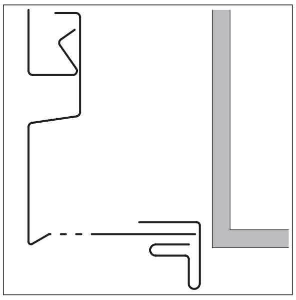

V2.1


V2.2


V2.3

Detail V3: Window lintel, page 40


V3.1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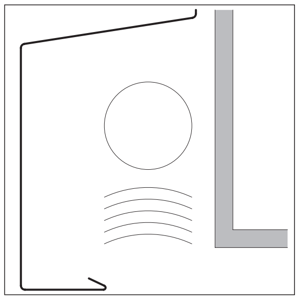
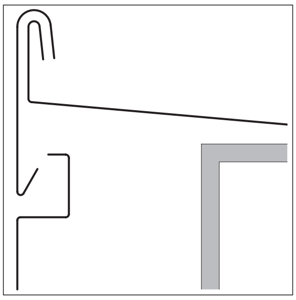
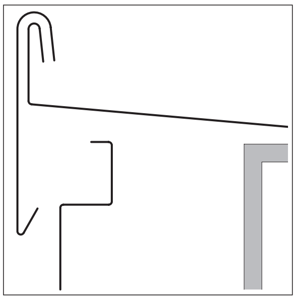

V3.3

Detail V4: Two-part roof edge, page 42


V4.1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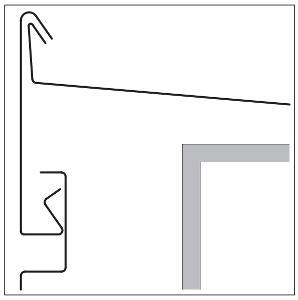
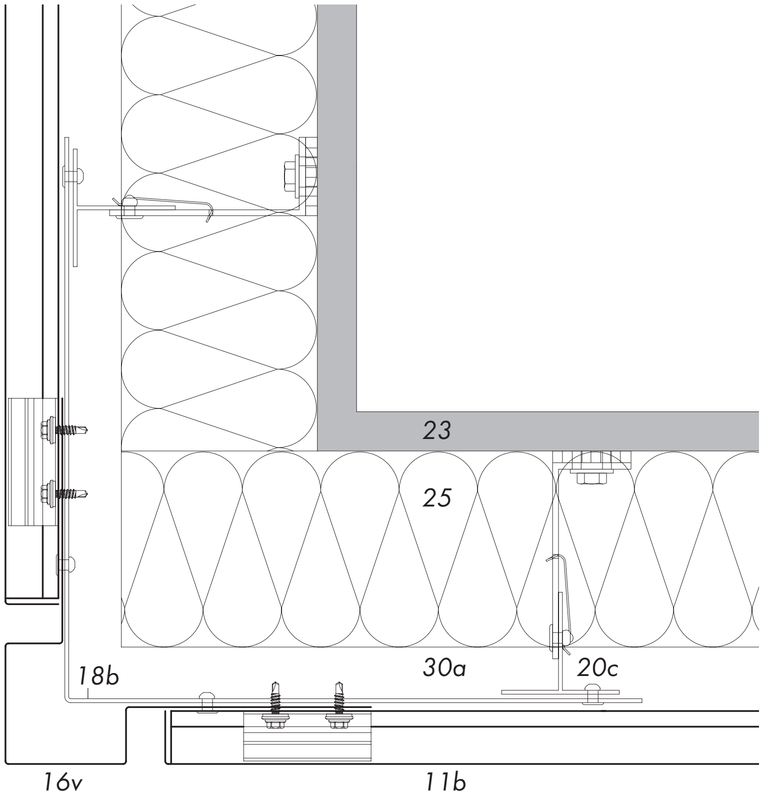
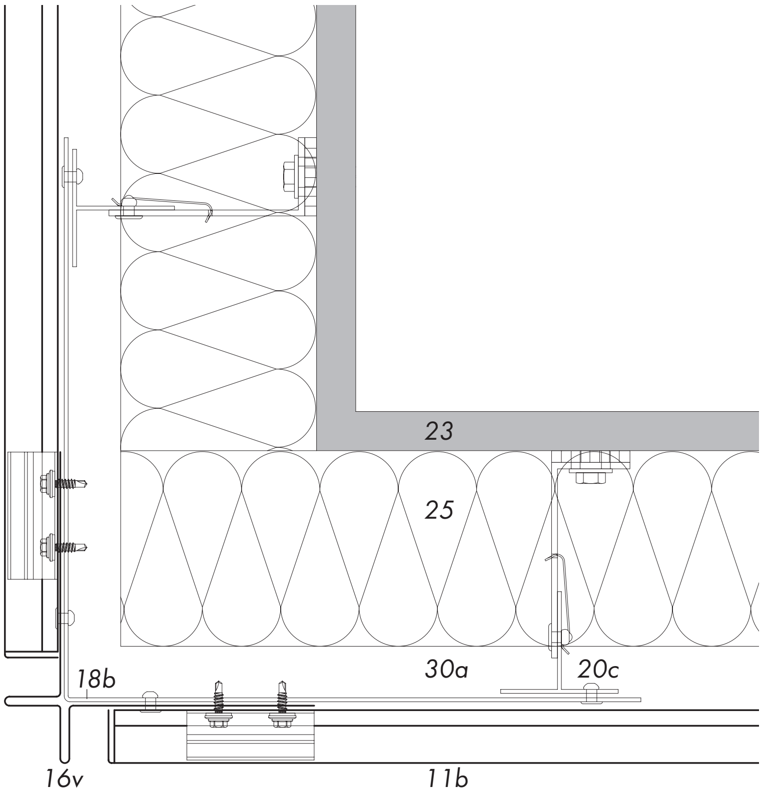

V4.3

DESIGN
DETAIL H1, OUTSIDE CORNER

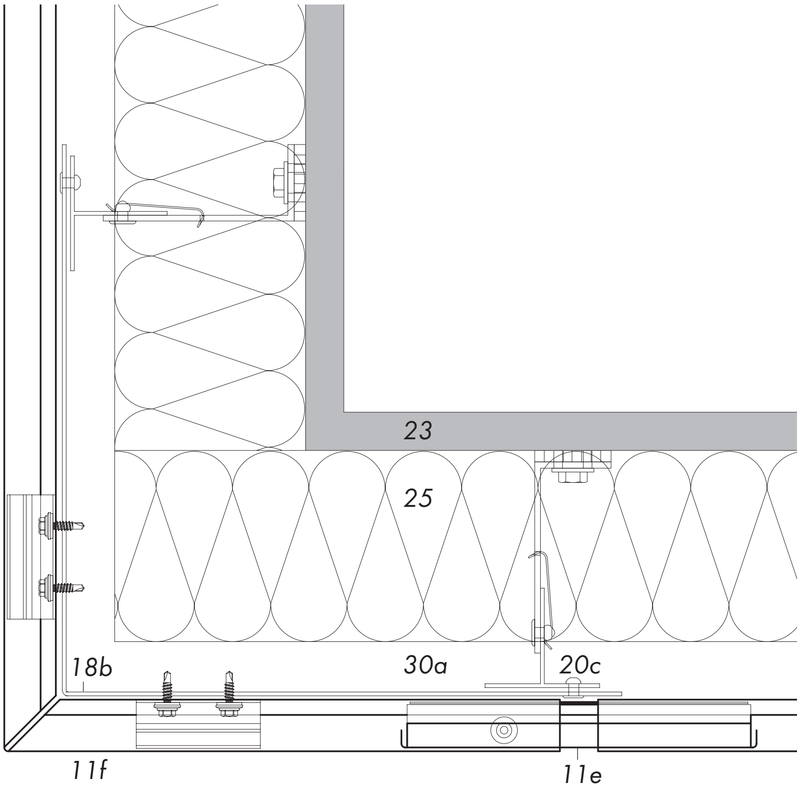
H1.1



H1.2



H1.3



2.11.1 Detail H1: Outside Corner

11 RHEINZINK-Horizontal Panel H 25
- b Standard panel, with stopend
- e Slave profile, with stopends
- f Corner panel

16 RHEINZINK-Building Profile
- v Corner profile

18 Support Profile
- b Aluminium

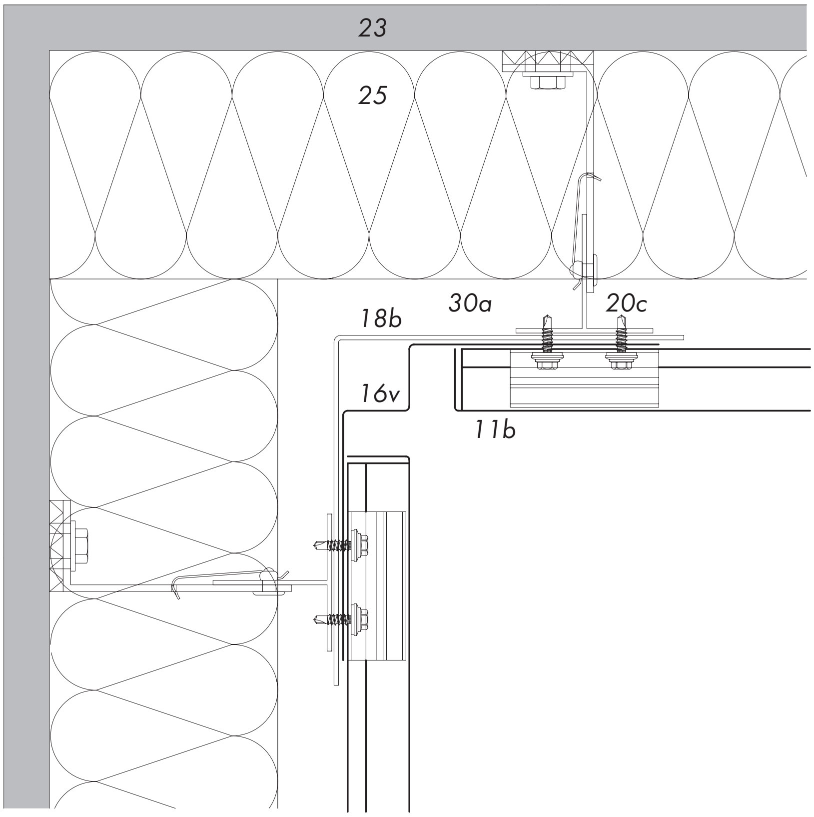
20 Substructure
- c Bracket system, with thermal break*

23 Supporting Structure
25 Thermal Insulation
30 Ventilated Air Space
- a Depth of air space ≥ 20 mm

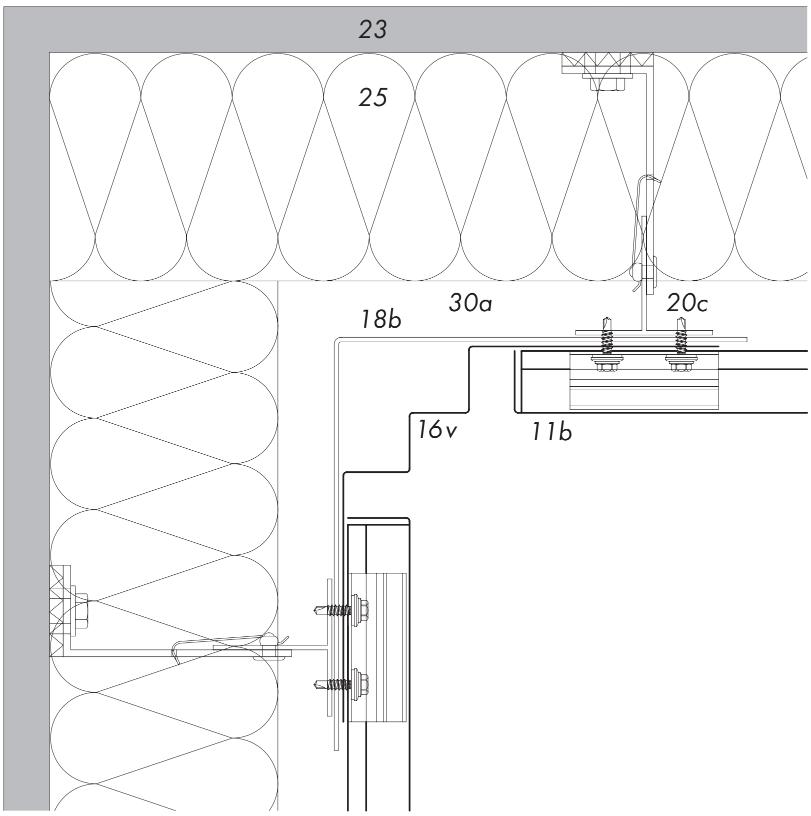
* Manufacturer´s guidelines must be observed.

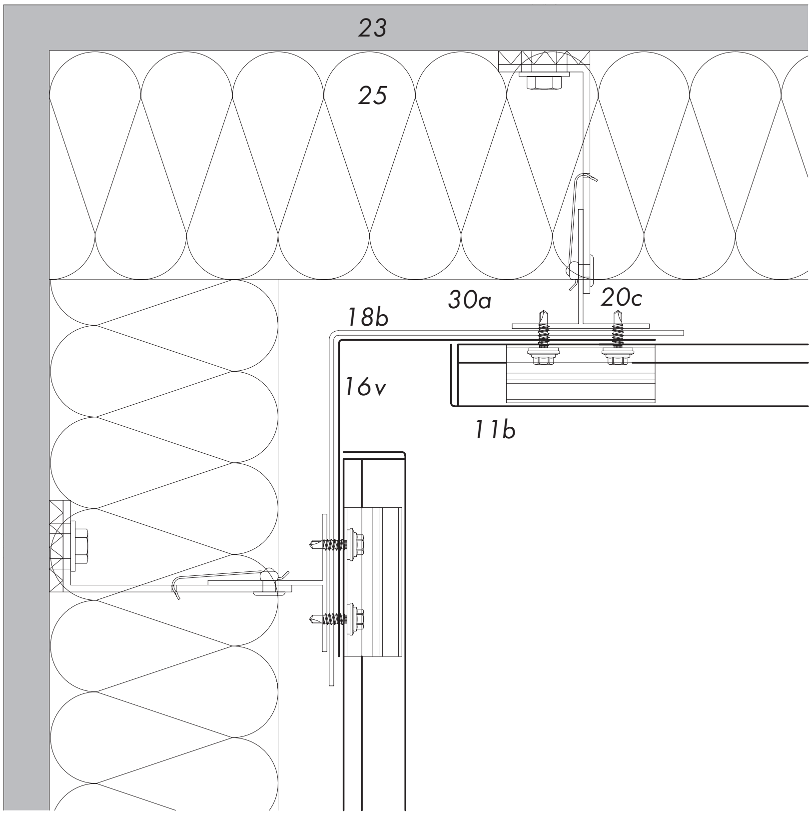
DESIGN
DETAIL H2, INSIDE CORNER

H2.1



H2.2





H2.3

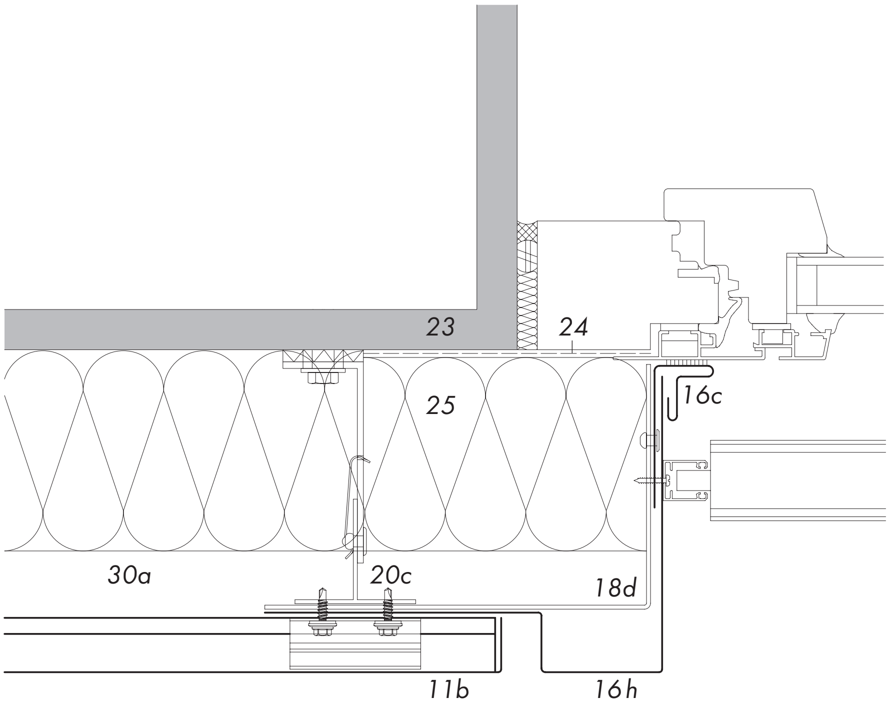
2.11.2 Detail H2: Inside Corner

11 RHEINZINK-Horizontal Panel H 25
 b Standard panel, with stopend
16 RHEINZINK-Building Profile
 v Corner profile
18 Support Profile
 b Aluminium
20 20 Substructure
 c Bracket system,
 with thermal break*
23 Supporting Structure
25 Thermal Insulation
30 Ventilated Air Space
 a Depth of air space ≥ 20 mm

* Manufacturer´s guidelines must be observed.

DESIGN
DETAIL H3, WINDOW JAMB

H3.1



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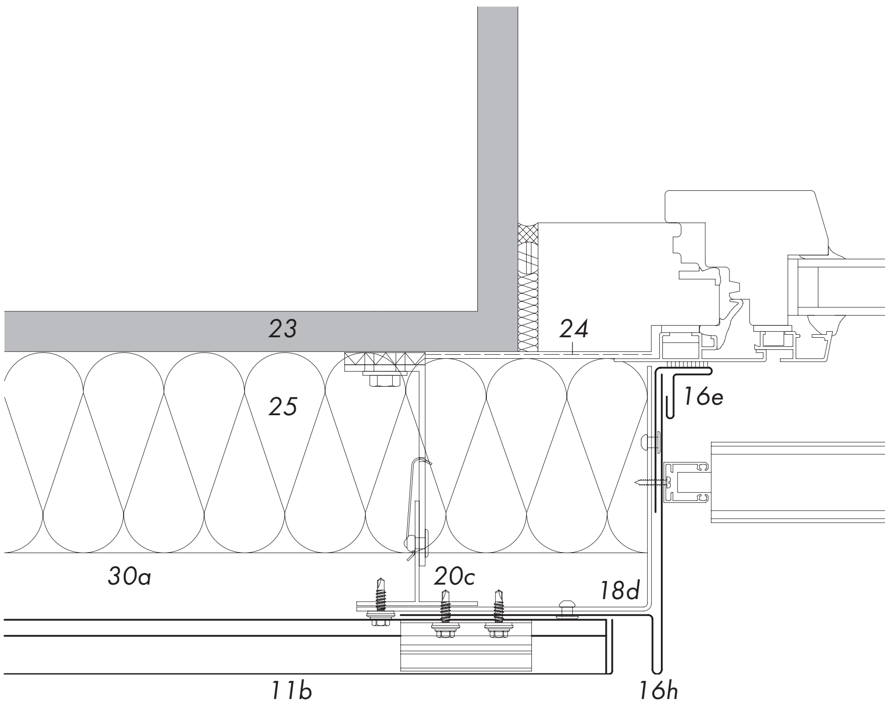
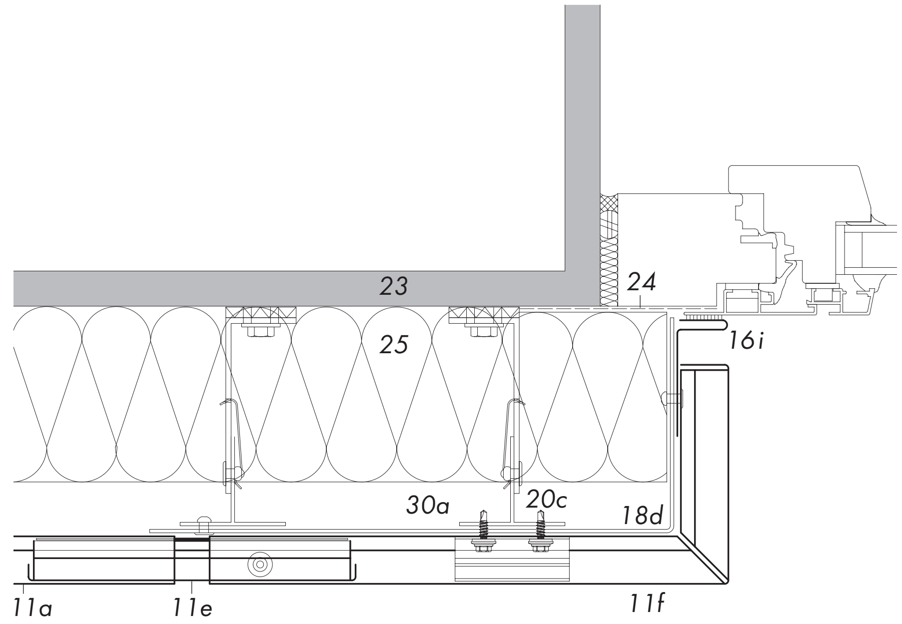


H3.3



2.11.3 Detail H3: Window Jamb

11 RHEINZINK-Horizontal Panel H 25
- a Standard panel
- b Standard panel, with stopend
- e Slave profile, with stopends
- f Corner panel

16 RHEINZINK - Building Profile
- e Receiver strip, with sealant tape
- h Jamb profile
- i Connection/ termination profile

18 Support Profile
- d Aluminium*

20 Substructure
- c Bracket system, with thermal break**

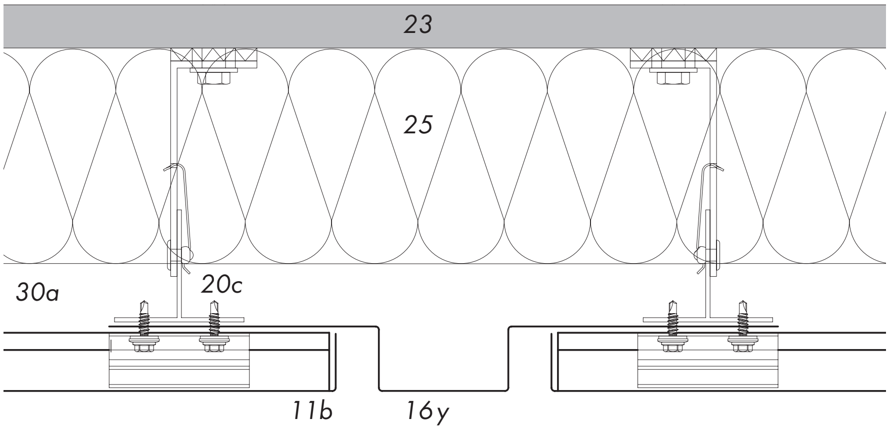
23 Supporting Structure
24 Window Foil
25 Thermal Insulation
30 Ventilated Air Space
- a Depth of air space ≥ 20 mm

* If fire breaks are required use galvanised steel ≥ 1 mm

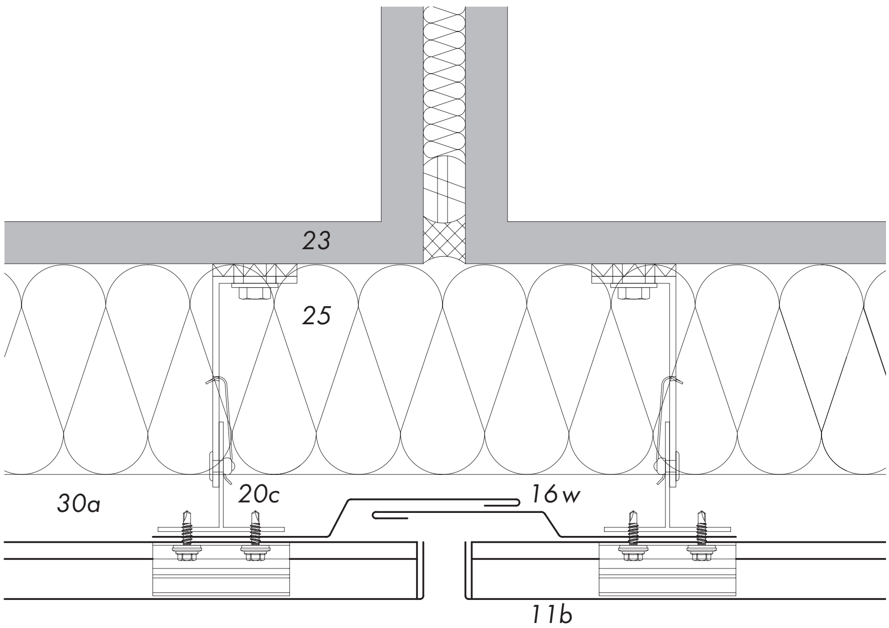
** Manufacturer´s guidelines must be observed.

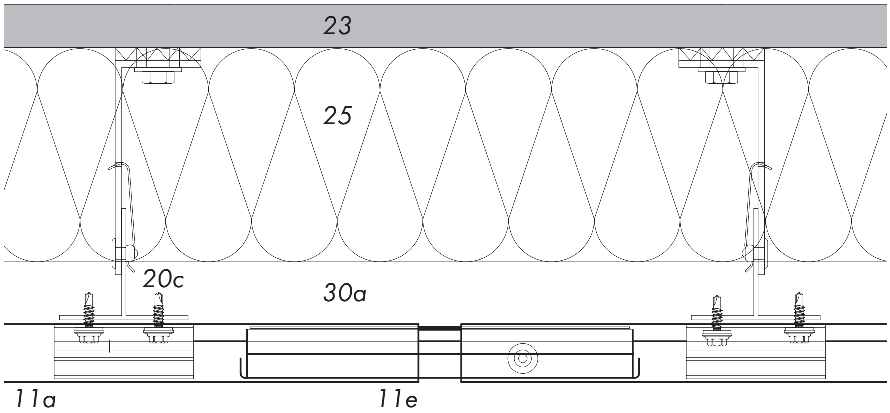
DESIGN
DETAIL H4, EXPANSION JOINT

H4.1



H4.2





H4.3

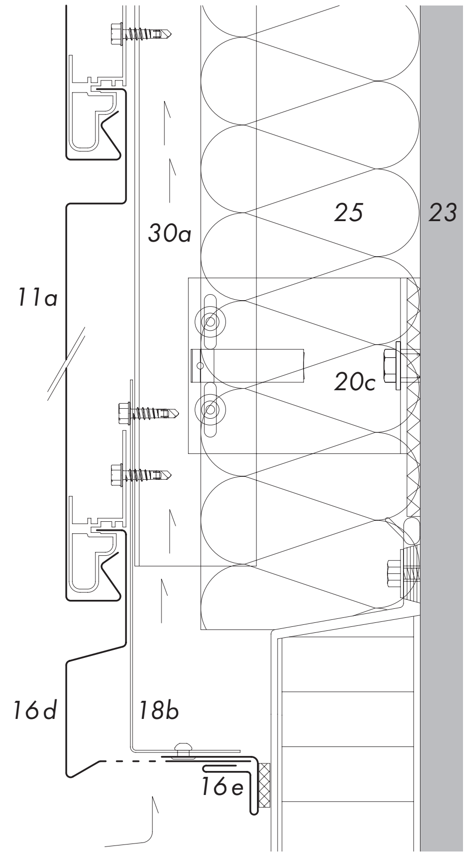
2.11.4 Detail H4: Expansion Joint

11 RHEINZINK-Horizontal Panel H 25
  a Standard panel
  b Standard panel, with stopend
  e Slave profile, with stopends
16 RHEINZINK - Building Profile
  w Shadow gap profile
  y Vertical joint profile
20 Substructure
  c Bracket system, with thermal break*
23 Supporting Structure
25 Thermal Insulation
30 Ventilated Air Space
  a Depth of air space ≥ 20 mm

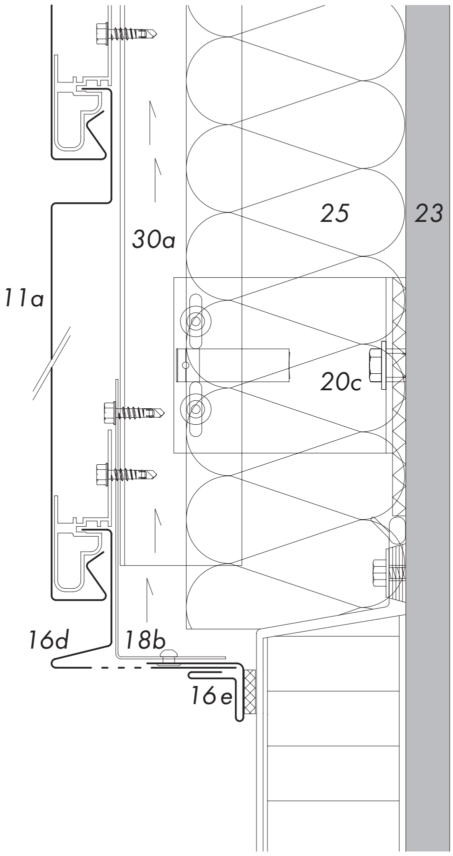
* Manufacturer´s guidelines must be observed.

DESIGN
DETAIL V1, BASE

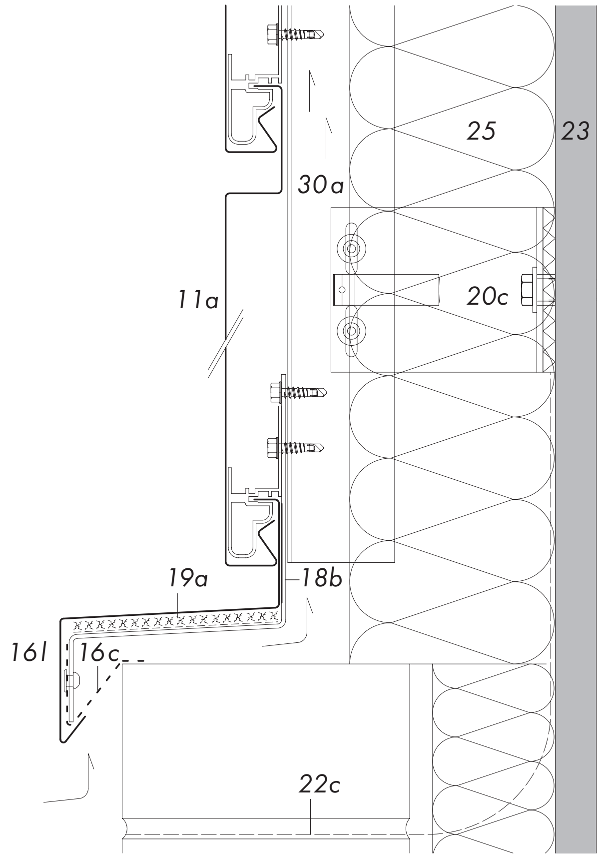
V1.1



V1.2



V1.3



2.12.1 Detail V1: Base

11 RHEINZINK-Horizontalpaneel H 25
- a Standardpaneel

16 RHEINZINK-Building Profile
- c Perforated strip
- d Base profile, partly perforated
- l Cornice coping

18 Support Profile
- b Aluminium
- ■ Detail V1.1/ V1.2: Intermittent support profile

19 Separating Layer
- a Structured underlay VAPOZINC
- ■ Alternative: glued to support profile over entire surface

20 Substructure
- c Bracket system, with thermal break*

22 Functional Layer
- c Waterproof sheeting

23 Supporting Structure

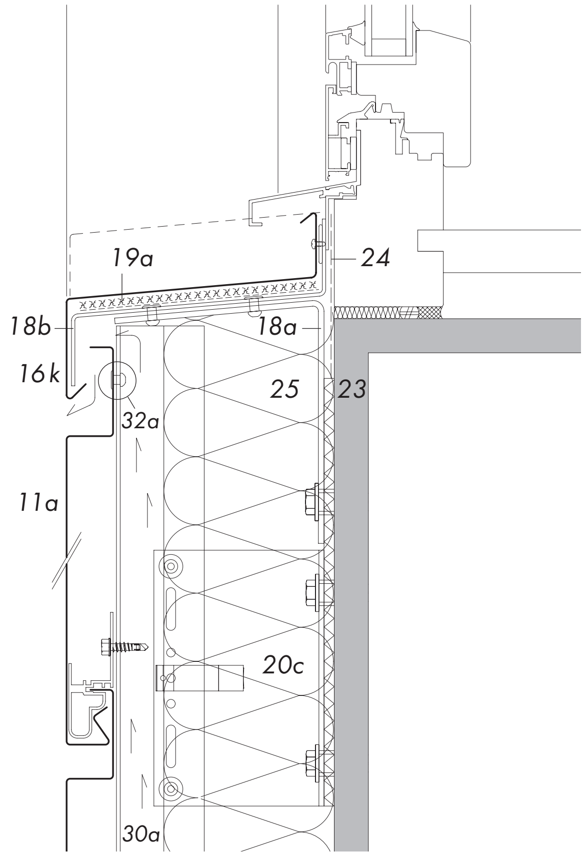
25 Thermal Insulation

30 Ventilated Air Space
- a Depth of air space ≥ 20 mm

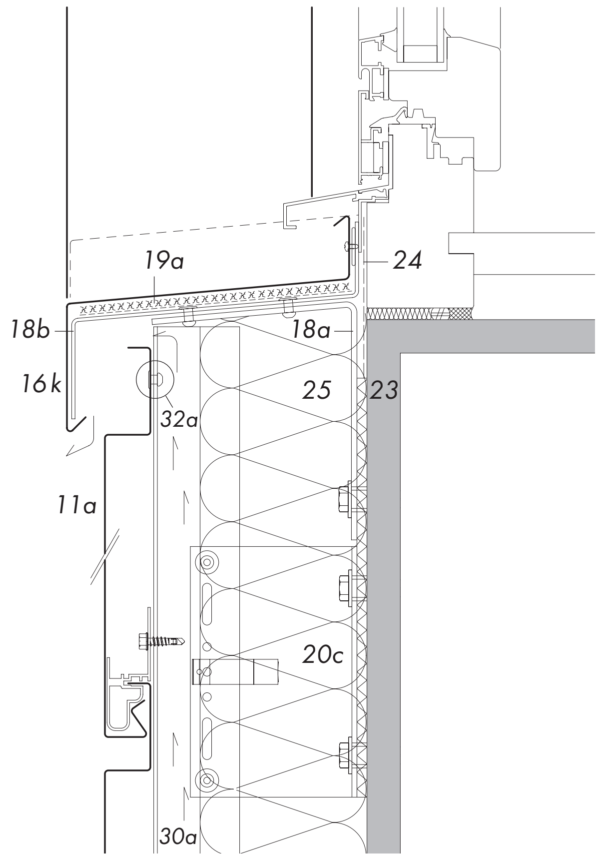
* Manufacturer´s guidelines must be observed.

DESIGN
DETAIL V2, WINDOWSILL

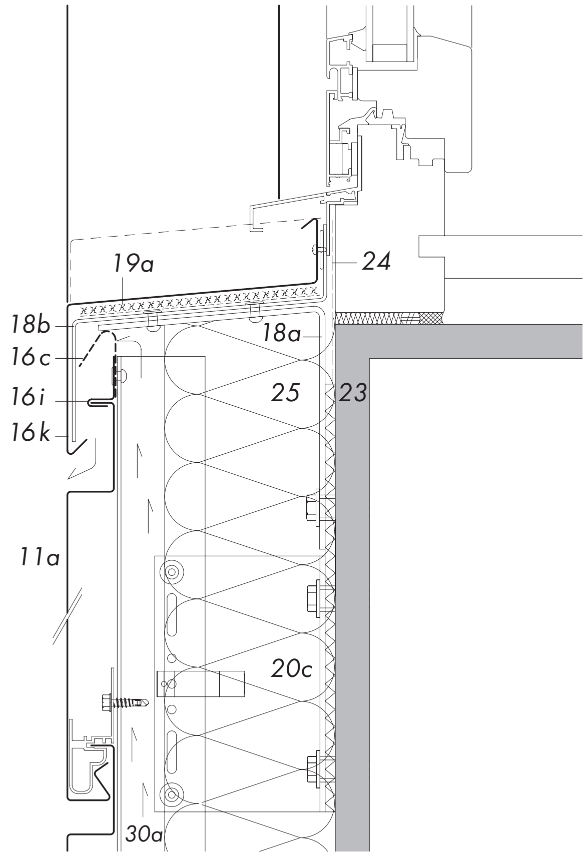
V2.1



V2.2



V2.3



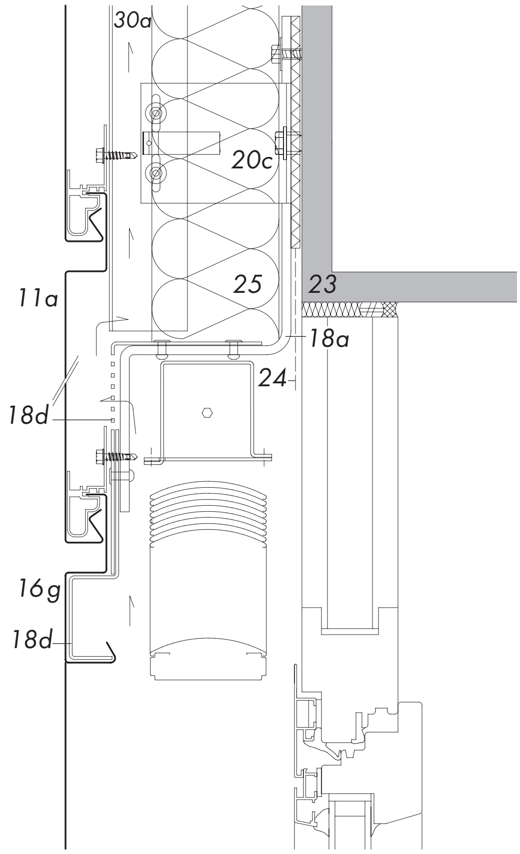
2.12.2 Detail V2: Windowsill

11 RHEINZINK-Horizontal Panel H 25
  a Standard panel
16 RHEINZINK - Building Profile
  c Perforated strip
  i Connection/ termination profile
  k Window sill coping, ≥ 3° slope
18 Support Profile
  a Galvanised steel, support angle with thermal break
  b Aluminium
19 Separating Layer
  a Structured underlay VAPOZINC
  ■ Alternative: glued to support profile over entire surface
20 Substructure
  c Bracket system, with thermal break*
23 Supporting Structure
24 Window Foil
25 Thermal Insulation
30 Ventilated Air Space
  a Depth of air space ≥ 20 mm
32 Fixing
  a Rivets, use of rivet gauge and slotted holes

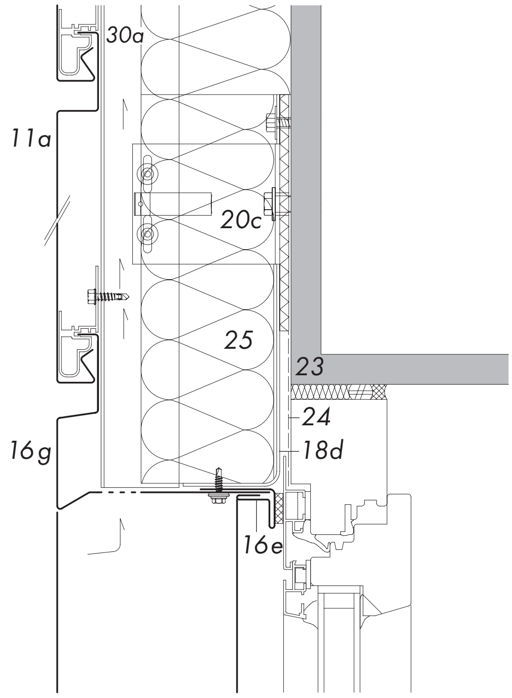
* Manufacturer´s guidelines must be observed.

DESIGN
DETAIL V3, WINDOW LINTEL

V3.1



V3.2



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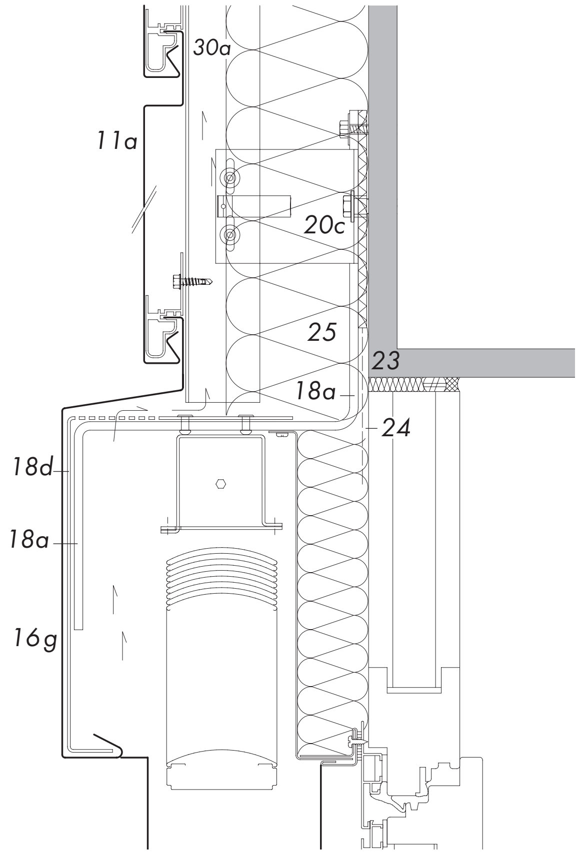


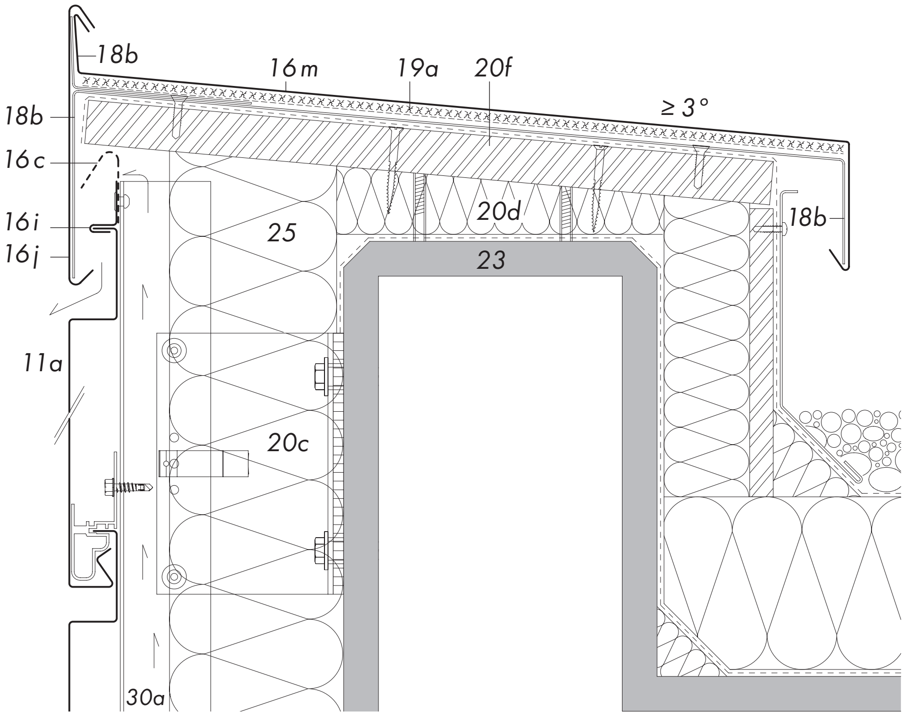
2.12.3 Detail V3: Window Lintel

11 RHEINZINK-Horizontal Panel H 25
  a Standard panel
16 RHEINZINK - Building Profile
  e Receiver strip, with sealant tape
  g Lintel profile, with and without partly perforation
18 Support Profile
  a Galvanised steel, support profile with thermal break
  d Aluminium, with and without partly perforation*
20 Substructure
  c Bracket system, with thermal break**
23 Supporting Structure
24 Window Foil
25 Thermal Insulation
30 Ventilated Air Space
  a Depth of air space ≥ 20 mm

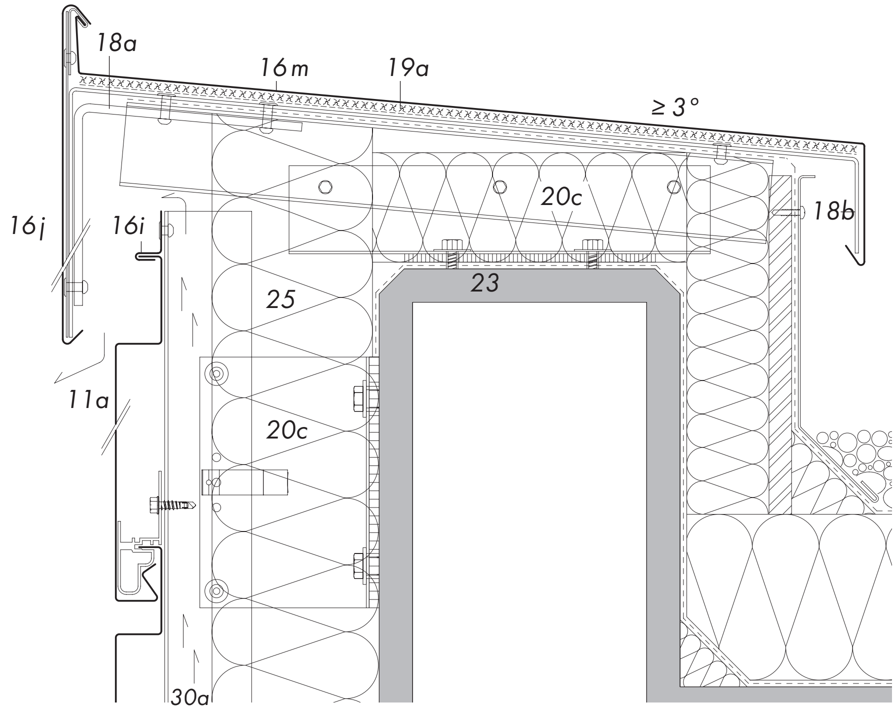
* If fire breaks are required use galvanised steel ≥ 1 mm
** Manufacturer´s guidelines must be observed.

DESIGN
DETAIL V4, TWO-PIECE ROOF EDGE

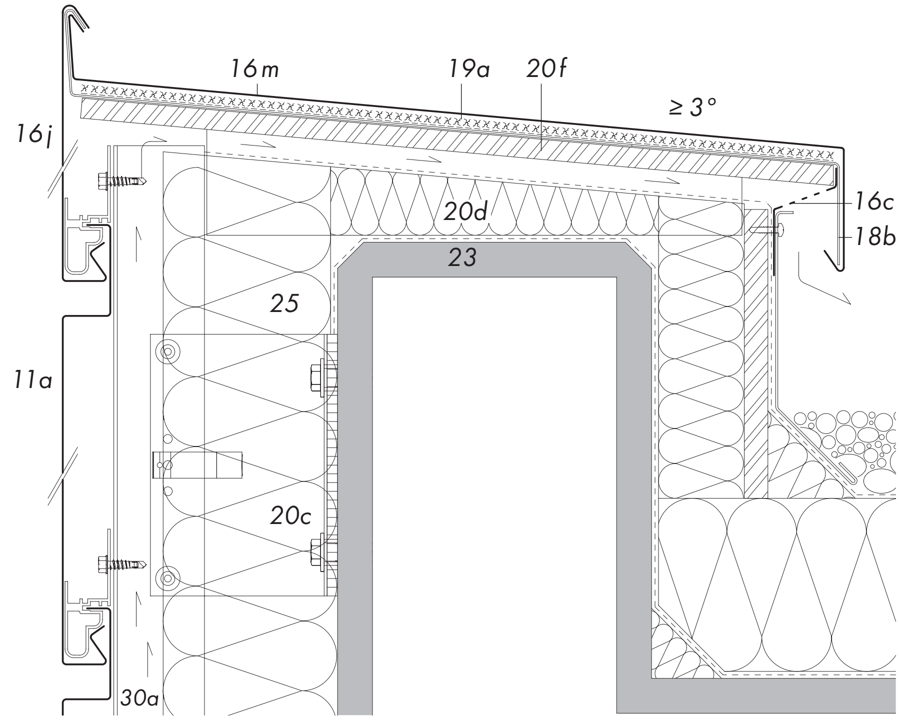
V4.1



V4.2



V4.3



2.12.4 Detail V4: Roof Edge

11 RHEINZINK-Horizontal Panel H 25
- a Standard panel

16 RHEINZINK-Building Profile
- c Perforated strip
- i Connection/ termination profile
- j Fascia profile
- m Wall coping

18 Support Profile
- a Galvanised steel
- b Aluminium

19 Separating Layer
- a Structured underlay VAPOZINC
- ■ Alternative: glued to support profile over entire surface

20 Substructure
- c Bracket system, with thermal break*
- d Wood, wedge board

23 Supporting Structure

25 Thermal Insulation

30 Ventilated Air Space
- a Depth of air space ≥ 20 mm

* Manufacturer´s guidelines must be observed.

CONTACT

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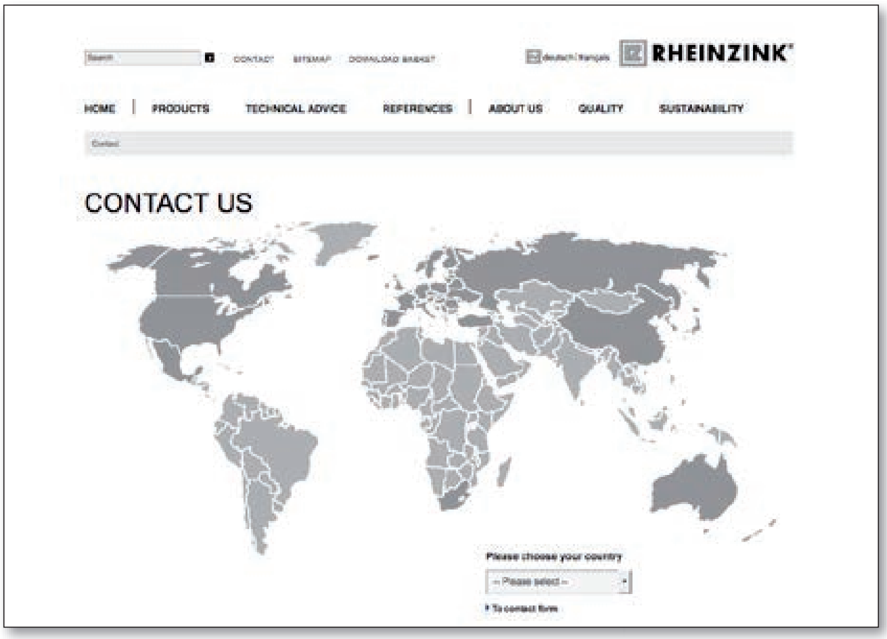

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REFERENCE PROJECTS


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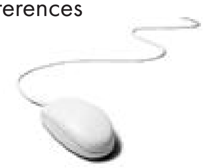
Additional project references can be found on the Internet at www.rheinzink.com



ILLUSTRATIONS

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Architect: Jahn Associates, Surry Hills, Australia
RHEINZINK-work done by:
Architectural Roofing & Wall Cladding, Hornsby, Australia

1./10. Private Residence, Colmanicchio, Italy
Architect: Mario and Giuditta Botta, Lugano, Italy
RHEINZINK-work done by:
Torsetta SA Massimo Frizzi, Muralto, Italy

2. FERI, Maribor, Slovenia
Architect: Styria d.o.o., arhitekturni atelje, Maribor, Slovenia
RHEINZINK-work done by:
KLEMAKS d.o.o., Maribor, Slovenia
PROFORMA TREND d.o.o., Zgornja Ložnica, Slovenia

3. Breeding Facility for domestic Animals in the Friedrich-Loeffler-Institute, Greifswald, Riems island, Germany
Architect: Maedebach, Redeleit & Partner, Berlin, Germany
RHEINZINK-work done by:
Bau- & Kupferklempnerei Martin Boecker, Hintersee, Germany

4. Spenglerei Pilatus, Kriens, Switzerland
Architect: Peter Amrein, Sarnen, Switzerland
RHEINZINK-work done by:
Spenglerei Pilatus AG, Kriens, Switzerland

5. Private Residence, Cantù, Italy
Architect: Paolo Pirovano, Merone, Italy
Mauro Angelo Ceresa, Cantù, Italy
RHEINZINK-work done by:
Galavotti Mauro, Gaglianico, Italy

6./11. FHS Osnabrück/new Lecture Hall, Osnabrück, Germany
Architect: Jockers Architekten BDA, Stuttgart, Germany
RHEINZINK-work done by:
Feldhaus Fenster + Fassaden GmbH & Co. KG, Emsdetten, Germany

7. Private Residence, Kaarst, Germany
Architect: petershaus Gmbh & Co. KG, Kaarst, Germany
RHEINZINK-work done by:
petersdach GmbH, Kevelaer, Germany

8. Private Residence, Neustadt, Austria
Architect: Dimiter Karaivanov, Neustadt, Austria
RHEINZINK-work done by:
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9. Private Residence, Straden, Austria
Architect: Rauchsignale, Straden, Austria
RHEINZINK-work done by:
Spenglerei Klaus Zidek, Straden, Austria

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