RHEINZINK®

STANDING SEAM TECHNOLOGY

Installation Guideline

DESIGN AND APPLICATION

2nd Edition, January 2010

1. Material

1.1 Introduction

This booklet is an important guide for everyone working and designing with RHEINZINK. It is a valuable addition to other planning documents, both at the construction site and in the office. Included in this booklet are basic installation techniques and standard details, along with tables, which must be followed for the proper installation of RHEINZINK.

These installation instructions cannot allow for all structural problems or special solutions and do not preclude independent thinking or actions. This booklet provides basic comprehensive information about the material for both the novice and the experienced tradesman or architect. It also serves as an excellent reference book for standard roof and curtain wall standing seam systems.

Country-specific deviations from standards, guidelines and tables, are summarized in Chapter 8.

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 Alloy and quality*

According to DIN EN 988, RHEINZINK material is titanium zinc. RHEINZINK-alloy consists of electrolytic high-grade pure zinc with a purity of 99.995 %, conforming to DIN EN 1179. The alloy has 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)*.

1.3 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. Compared with other building materials, CO_2 utilization for RHEINZINK production is at the lower end of the scale.

State-of-the art facilities, well thought-out logistics and favourable processing properties attest to this. Environmentally-conscious actions are documented by means of the Environmental Management System ISO 14001:2004 and tested and certified by the TÜV Rheinland Group.

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

- **Natural material**
- **Low energy input for production**
- **Durability**
- **Low rate of corrosion**
- **An established cycle for recyclable material**
- **High percentage of recycling**

Other significant properties of zinc are:

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

* *RHEINZINK – Applications in Architecture Chap. I. 2.2*

** *RHEINZINK – Applications in Architecture Chap. I. 2.1*

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)*.

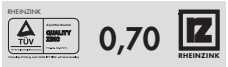
1.4 Proper shielding is provided against electromagnetic radiation

There is a lot of controversy concerning electromagnetic radiation. Within this context, the International Society for Electrosmog Research [Die Internationale Gesellschaft für Elektrosmogforschung (IGEF e.V.)] has ascertained the shielding properties of RHEINZINK. The result: over 99 % of existing electromagnetic radiation is shielded. Biological tests conducted on individuals confirm the technical measured values and indicate – particularly in grounded conditions – a harmonizing effect on the heart, circulation and nervous system. Increased relaxation is evident.

1.1

1.2

1.3



1.4

1.5 Identification

1.1 RHEINZINK-sheets and -coils: serial number stamping of the underside of the metal in blue (in two lines)

1.2 Eaves gutters and rainwater downpipes: serial number stamping – embossed stamp

1.3 Accessories for roof drainage systems: embossed stamp

1.4 Pallets containing roof drainage system products: adhesive labels on packaging containing detailed product data

1.6 Material properties

- Density (spec. weight) 7.2 g/cm³
- Melting point 418 °C
- Recrystallisation temperature > 300 °C
- Coefficient of thermal expansion in rolling direction* 2.2 mm/m · 100 K
- Metal thickness

Metal thickness mm	Nominal size (girth)								
	1000	670	600	500	400	333	280	250	200
1.20	8.64	5.79	5.18	4.32	3.46	2.88	2.42	2.16	1.73
1.00	7.20	4.82	4.32	3.60	2.88	2.40	2.02	1.80	1.44
0.80	5.76	3.86	3.46	2.88	2.30	1.92	1.61	1.44	1.15
0.70	5.04	3.38	3.02	2.52	2.02	1.68	1.41	1.26	1.01

Table 1: Table of weights for standard nominal size and metal thickness in kg/m

** RHEINZINK – Applications in Architecture Chap. I. 2.2.5/I. 3.3*

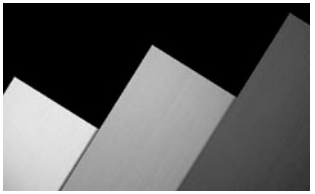


Fig. 1: RHEINZINK-surfaces bright rolled, „preweathered pro blue-grey" and „preweathered pro graphite-grey"

1.7 Surfaces

The surface finishes of the upper and undersides of RHEINZINK are visually different because of the grain of the metal. Coils and sheets are marked on the underside of the metal with a serial number stamp. The direction of rolling of the metal is clearly evident.
Please watch for the following when handling the material:

- the upper side should always be visible
- for panel lengths of ≤ 1.0 m, each piece should be laid uniformly, in the direction of rolling

1.7.1 RHEINZINK-bright rolled

This application can be used for all sheet metal work using standing seam and soldering techniques. The time required for the natural patina to develop depends on the application, roof pitch, etc.

1.7.2 RHEINZINK-„preweathered pro blue-grey"/„preweathered pro graphite-grey"

The „preweathered pro blue-grey" surface quality was developed by RHEINZINK many years ago, specifically for areas in which the appearance of a „finished" or weathered RHEINZINK-surface was required upon completion of the project. Since 2003, a "preweathered pro graphite-grey" surface quality has also been available.
The pre-weathering process utilized by RHEINZINK, which is unique worldwide, has two distinct advantages: the etching affords the surface the appearance of a patina, which would otherwise take years to develop naturally. The

RHEINZINK-quality „preweathered pro graphite-grey" is darker and has as a rule a light green sheen to it like slate. The natural surface properties are preserved during the etching process – the surface can be soldered without pre-treatment and the patina develops as it would naturally. "Aging with dignity" is not prevented; this has been proven in the field for many decades.

To the greatest possible extent, the material reduces the reflections typical of thin sheet metal (appearance of oil canning). In 1988, a large scale plant was put into operation, in which up to 1000 mm wide (blue-grey) and 700 mm (graphite-grey) wide coils were cleaned and scoured prior to etching. The result of etching is a uniform colour, which cannot, however, be compared to a RAL colour. The material, which is fully recyclable, is largely protected from traces of handling, such as fingerprints, by means of an organic surface treatment. Greater protection during storage and transportation is also achieved. This protective film will allow oil-free forming in roll-formers.

Note:

Generally speaking, in order to prevent potential colour variations, it is recommended that material for a project be ordered at the same time so that it all comes from the same production batch. Surface colour variations are purely visual and, as the patina forms, the colours will even out. In order to protect the surface during installation, transportation and storage and from negative external influences during the construction phase, the visible face of façade systems is covered with a plastic film.

This is self-adhesive protective plastic film which is applied at the plant and should be removed immediately after installation, at the end of each work day.

Waviness

Coils

The appearance of slight undulations is characteristic of thin sheet metal and is not treated in any way. These waves (oil canning) are the result of natural internal stresses within the material, after undergoing coiling and de-coiling procedures in the plant as well as corresponding forming processes (profiling, etc.) during fabrication and installation.

When light is reflected on the bright-rolled surface, its changing appearance is much more noticeable. As the patination process continues, this perception decreases. If aesthetics are important, for e.g. for façades and roofs, "preweathered pro blue-grey" or "preweathered pro graphite-grey" is recommended.

Fig. 2: RHEINZINK-bright rolled surface, VITRA Administrative Building in CH-Birsfelden

Sheets

Optimum surface evenness is achieved by using sheets, which RHEINZINK produces and supplies in lengths of up to 6 m. Wave dimensions are subjected to strict controls and may not exceed the value defined according to DIN EN 988, which is 2 mm per m. RHEINZINK-standards stipulate a max. of one wave, 1 mm high, per m of panel length.

1.8 Response to external influences

1.8.1 Installation under other metals

Absolutely safe:

- Aluminium, bright rolled or coated
- Lead
- Stainless steel
- Galvanized steel (rust streaking is possible if the cut edges are unprotected)

Questionable:

- Copper

1.8.2 Installation under other building materials

Questionable:

- unprotected, bituminous waterproof sheeting for roofs without granular coating (oxide acid corrosion)
- PVC-roofing sealants (hydrochloric acid emissions)

1.8.3 Installation with other building materials, including mortar

- Mineral-containing materials such as lime, cement and plaster tend to corrode metal if they are in contact with moisture.
- A suitable underlay should be installed between RHEINZINK-sections and these building materials.
- Installation sequence: Clean these materials prior to RHEINZINK-installation (use temporary protective sheeting wherever possible).
- De-icing salt, combined with moisture, will corrode metal

1.8.4 Influence of oil heating systems

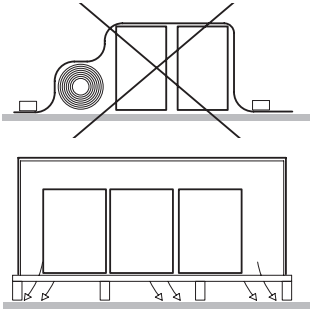
Due to the contents and additives contained in heating oil, discolouration of RHEINZINK-surfaces can occur where oil heating is used. This happens to all roofing material; it is a visual impairment and does not affect durability.

Note:
The owner must be made aware of this phenomenon. Discolouration does not occur when gas heating systems are used.

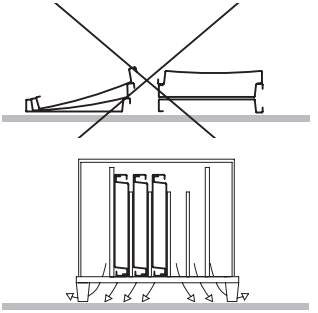
2. Processing

2.1 Storage and Transportation*

Always store and transport RHEINZINK-products under dry and well-ventilated conditions.



Dia. 1.1: Storage and transportation of coils, (diagram)



Dia. 1.2: Storage and transportation of profiles, panels, (diagram)

Note:
A dry ventilated area is required for proper storage at the construction site. This must be arranged with the construction supervisor.

** RHEINZINK – Applications in Architecture Chap. I. 3.1*

Fig. 3: Tensile seam test in the RHEIN-ZINK-Quality Control Dept.

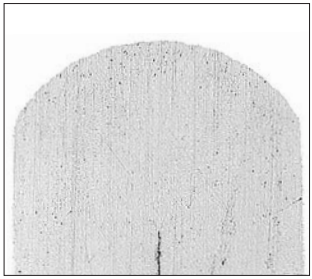


Fig. 4: Metallographic cross section of a flexural test piece after a 180° fold, without an intermediate layer, parallel to rolling direction

2.2 Processing

2.2.1 Marking

- Use soft pens; do not use sharp, pointed objects (marking tools, pocket knives).

2.2.2 Jointing techniques*

2.2.2.1 Soft soldering

- material bonded and waterproof connection of water-bearing profile seams in just one operation (gutters, valleys, copings); install expansion elements (see Tab. 17, 20, 21).

Accessories and tools:

- Soldering iron (chisel-shaped copper bit), weight > 350 g, 500 g is better
- Flux by Felder ZD-pro; for the "graphite-grey pro" surface, also use the solvent by Felder
- solder, low in antimony, DIN EN 29453 S-Pb 60 Sn 40, manufacturer's ID: L-Pb Sn 40 (Sb)

Note:
Please see "RHEINZINK-Soft Soldering Instructions".

2.2.2.2 Seaming Techniques

Double standing seams, angled standing seams, double angled standing seams, roll cap seams

2.2.2.3 Lapped joints

- Suitable for valleys on scalloped roofs, such as brick tile, slate, etc.
- Overlap widths
  valley pitch ≥ 15°,
  min. 150 mm;
  valley pitch ≥ 22°,
  min. 100 mm
- Profile joint design using feather edging

2.2.3 Forming (bending and folding)

When machine forming or forming manually, a bending radius of R ≥ 1.75 mm must be ensured.

** RHEINZINK – Applications in Architecture Chap. I. 3.6*

2.2.4 Adhesive Fastening*

- For decades, it has been the norm to use adhesives to fasten copings (see A.i.d.A Chap. V. 3.1 Enkolit®).
- For some years now, adhesives have been used successfully with metal façades (e.g. Flat-lock tile system). In extremely unfavourable conditions, such as
  – location of the structure
  – large metal widths
  fluttering sounds are significantly reduced when adhesives are used (e.g. on metal brackets).
- The manufacturer's guidelines for suitable polyurethane adhesives must be followed for the applications mentioned above.

Fig. 5: Apply Enkolit® with notched trowel

Fig. 6: RHEINZINK®-Flat-lock tiles – bonding to middle metal bracket using PU-adhesive

** RHEINZINK – Applications in Architecture Chap. V. 3.1*

2.3 Material temperature

≥ 10 °C:
Forming without taking additional action or precautions.
< 10 °C:
For work involving impact folding and for manual operations, the area should be preheated to the required temperature, e.g. with a hot air dryer.
Preheating must always occur simultaneously to forming. If additional costs for this procedure have not been included in the estimate, these should be discussed and clarified with construction management prior to work commencement.
Soft soldering can be done regardless of material temperature.

2.4 Thermal expansion and contraction*

For roofing and façade cladding (Panel length), sheet metal work and roof drainage systems (profile length), thermal expansion and contraction must be taken into account during design and construction.

Proper structural measures must be implemented, particularly for

- penetrations
- hips, valleys, eaves, ridges and verges, i.e. panels or profiles must be installed so that expansion is guaranteed.

** RHEINZINK – Applications in Architecture Chap. I. 3.3*

Calculation formula:

$$\Delta l = l_0 \cdot \Delta\vartheta \cdot \alpha$$

Formula symbols:

Δl: Thermal expansion (mm)

l_0: Length is the measured length (m)**

$\Delta\vartheta$: Temperature difference between the actual temperature during installation and the maximum or minimum installation temperature T_{verl} (K)***

α: Expansion coefficient 2.2 mm/ (10 m · 10 K)

** Distance between the fixed point and connection/termination

*** Expansion: $T_{max} - T_{verl}$
Contraction: $T_{verl} - T_{min}$
T_{min} = -20°, 253 K
T_{max} = +80°, 353 K

Fig. 7: Roof area with many penetrations

Example A:
Linear elongation
(theoretical values)

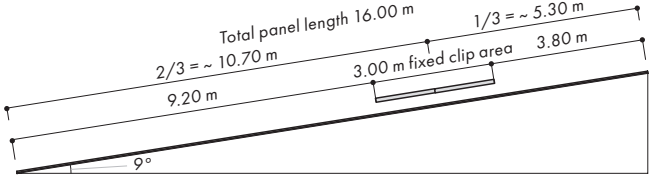
- Installation temperature of RHEINZINK 15 °C
- Panel length: 16.0 m

Expansion:

$$16\,\text{m} \cdot \frac{2.2\,\text{mm}}{10\,\text{m} \cdot 10\,\text{K}} \cdot 65\,\text{K} = 22.9\,\text{mm}$$

Contraction:

$$16\,\text{m} \cdot \frac{2.2\,\text{mm}}{10\,\text{m} \cdot 10\,\text{K}} \cdot 35\,\text{K} = 12.3\,\text{mm}$$



Dia. 2.1: Example, pent roof, roof pitch 9°, panel length 16 m

Example B:
Thermal expansion (field-related values)

- Installation temperature RHEINZINK 15 °C
- Panel length 16.0 m
- Roof pitch 9°
- Fixed clip area 3.0 m

Expansion:
Eave

$$9.2\ \text{m} \cdot \frac{2.2\ \text{mm}}{10\ \text{m} \cdot 10\ \text{K}} \cdot 65\ \text{K} = 13.2\ \text{mm}$$

Ridge

$$3.8\ \text{m} \cdot \frac{2.2\ \text{mm}}{10\ \text{m} \cdot 10\ \text{K}} \cdot 65\ \text{K} = 5.4\ \text{mm}$$

Contraction:
Eave

$$9.2\ \text{m} \cdot \frac{2.2\ \text{mm}}{10\ \text{m} \cdot 10\ \text{K}} \cdot 35\ \text{K} = 7.1\ \text{mm}$$

Ridge

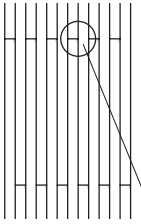
$$3.8\ \text{m} \cdot \frac{2.2\ \text{mm}}{10\ \text{m} \cdot 10\ \text{K}} \cdot 35\ \text{K} = 2.9\ \text{mm}$$

Note:
Through heat irradiation, material temperature can deviate significantly from the ambient temperature. Depending on roof pitch, time of day, season and orientation of the surface to the sun, temperature differences of up to 100 K are possible (-20 °C to 80 °C).

Intersections and thermal expansion
Practical experience; forced thermal expansion

Intersections without the possibility of thermal expansion
Linear seam: double standing seam system
Cross-joint: single seam without/with soldered continuous cleat
- staggered cross-seam (half a panel length – see Dia. 2.2)

Due to the varying degrees of linear elongation of adjoining panels caused by changes in temperature, expansion cracks are inevitable or predetermined.
If "mirror cladding" (staggered cross-seam by half a panel length) has been requested by the customer for reasons of aesthetics, the joined panels have to be treated as one single length, as far as the layout of fixed/sliding clips is concerned.
For the angled standing seam system starting at a roof pitch of ≥ 25°, thermal linear expansion is possible through the seam.



Dia. 2.2:
Pent roof, roof pitch 35°, Division of panels with mirror cladding (displaced cross-seam by half a panel length)
- *All panels below and above are fastened with sliding clips; the cross-seam does not function as an expansion element.*
- *No clips may be used in the upper back-fold of the lower panels.*
- *Arrange fixed clip areas according to Dia. 6.1, Page 43.*

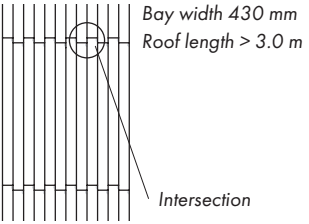
Intersection without the option of expansion
Linear seam: double standing seam system
Cross-seam: single seam without/with soldered continuous cleat

- staggered cross-seam (length of displacement ~ 30 cm see Dia. 2.3)

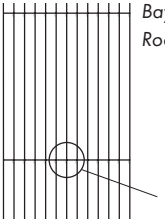
In the angled standing seam system, varying degrees of linear deformation caused by changes in temperature do not result in forced thermal expansion, which is different from the double standing seam system.

In the case of slight cross-seam offset, e.g. 30 cm, for the double standing seam system the following alternative solution is possible:

- "Seam-in-seam cross-seam design" (see RHEINZINK – Applications in Architecture Chap. III. 1.3).



Dia. 2.3 – Example D:
Pent roof, roof pitch 35°, division of panels with a minor staggered cross-seam



Dia. 2.4 – Example E:
Pent roof, roof pitch 35°, division of panels with continuous cross-seams

Intersection with expansion possibilities

Linear seam: angled standing seam or double standing seam
Cross joint: single seam without/with soldered continuous cleat

- Linear cross-seam (see Dia. 2.4)
- The standing seam can be designed as a turned down seam. (see Chap. 3, Dia. 8.2/8.3)

This technique has been the norm for decades.

2.5 Fastening*

The type of fastening and the arrangement thereof, depends not only on the nature of the substructure, but also on the dimensions and the function of the elements to be fastened. Distinctions are made between direct, indirect and adhesive fastening. Indirect fastening guarantees linear expansion of the material brought about by a change in temperature

- in the case of panels, by using sliding clips
- in the case of profiles (copings), by using continuous cleats, including expansion elements

Direct fastening of profiles (e.g. flashing strips) using nails, screws or rivets, is permitted for lengths of up to 3,0 m. If the joints of individual lengths (gutters, sheet metal profiles, etc.) are connected by soft-soldering, expansion elements must be installed (see Tables 17, 20, 21).

** RHEINZINK – Applications in Architecture Chap. I. 3.5*

3. RHEINZINK-Roofing Systems – Seamed Roof Coverings

3.1 Roof designs

Ventilated and non-ventilated roofs must be planned and designed according to DIN 4108-3.

3.1.1 Ventilated designs – component layers

- Inner cladding/installation level
- Vapour barrier, airtight connection, S_d-value, depending on length/pitch of roof
- thermal insulation (DIN 4108)
- breather membrane (optional) also functions as an erection cover (Dia. 3.1)
- Height of ventilated space
- Supporting structure: wooden sheathing
- Function level (Dia. 3.2)
- RHEINZINK-Roofing

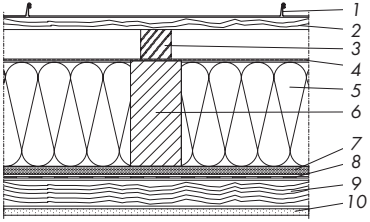
Roof pitch	Ventilated space Min. height mm	Intake/exhaust ventilation openings Min. net width mm	
≥ 3° to ≤ 15° (≤ 5°*[1])	80 (100*[1])	40 (60*[1])	*[2]
> 15°	40	30	*[2]

Tab. 2: Height of ventilated space in relation to roof pitch

*[1] *With a roof pitch of DN ≤ 5°, gabled roofs can be ventilated from eave to eave – with a building width of max. 30 m, a vapour barrier of Sd ≥ 100 m is required or calculated proof of moisture*

*[2] *In areas of extreme weather, always use sealant tapes in double standing seams up to ≥ 2 m in roof incline above the enclosed building space.*

Isolated cases: Ventilating cross sections are controlled values; deviations are possible in isolated cases, provided there is substantiating evidence! Functional efficiency of the ventilation system is not automatically restricted by reduced values. For measures involving the application of underlays and sealant tapes, please see Chapter 3.1.3.



Dia. 3.1:
Ventilated roof structure with non-ventilated supporting structure and fully insulated rafters

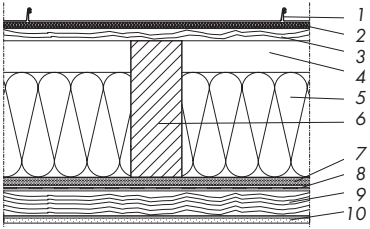
1 RHEINZINK-standing seam roof
2 Wooden sheathing 24mm/160mm max., GK 0 (not impregnated), DIN 68 800
3 Beams, GK 0 (not impregnated), DIN 68 800, height of ventilated space (see Table 2)
4 Breather membrane S_d-value[1] ≤ 0,2 m (optional)
5 Fully insulated rafters, dimensioning according to En EV, compliance with min. values according to DIN 4108 for the individual components is a must
6 Rafters GK 0 (not impregnated), DIN 68 800
7 Plywood sheets as summer thermal insulation (BFU- or OSB-boards as a heat dampening storage layer)
8 Airtight layer with a vapour barrier function, UV-resistant, S_d-Value ≥ 2,0 m, please see table

S_d-Value outer, S_{d0}	S_d-Value inner, S_{d1}
≤ 0.1 m	≥ 0.1 m
≤ 0.3 m; ≤ 0.2 m*	≥ 0.2 m
> 0.3 m	≥ 6 x S_{d0}

** Avoid use of chemical wool preservatives*

9 Installation level
10 Inner cladding

[1] *S_d-Value of breather membrane should be smaller than the S_d-Value of the airtight layer.*



Dia. 3.2:
Ventilated roof structure with structured underlay

1 RHEINZINK-standing seam roof
2 Structured underlay at roof pitches ≤ 15°
3 Nominal thickness of sheathing 24 mm/160 mm, GK 0 (not impregnated), DIN 68 800 or plywood sheet BFU/OSB
4 Ventilated layer, height of ventilated space (see Table 2)
5 Thermal insulation, dimensioning according to EN EV; compliance with min. values for an individual component as per DIN 4108 is a must
6 Rafters GK 2 (impregnated), DIN 68 800
7 Plywood as summer thermal insulation (BFU or OSB boards as a heat dampening storage layer) (optional)
8 Airtight layer with a vapour barrier function, UV-resistant, S_d-Value ≥ 2,0 m, please see table

S_d-Value outer, S_{d0}	S_d-Value inner, S_{d1}
≤ 0.1 m	≥ 0.1 m
≤ 0.3 m; ≤ 0.2 m*	≥ 0.2 m
> 0.3 m	≥ 6 x S_{d0}

** Avoid use of chemical wool preservatives*

9 Installation level
10 Inner cladding

Specifications for suitable structured underlays are available upon request.

Other solutions for ventilated roof structures
- Mounted structures
- On roof insulation elements

Note:
The S_d-Value of the airtight layer is based on normal room temperature.
Buildings used for special purposes (swimming pools, hospitals, etc.) always require a special moisture proofing as per DIN 4108.

3.1.2 Non-ventilated designs

There are various possibilities for planning and designing non-ventilated structures.
We have extensive experience with the following designs:
- Rockwool-Prodach-insulation system
- FOAMGLAS® using claw plates/metal rails
- Bauder PIR MDE
- Puren M – insulation element for metal roof
- Fully insulated rafter with and without wooden sheathing (wood moisture ≤ 20 mass- %) or BFU/OSB boards

Roof design recommendations are available upon request.
Our application engineering consultants are also available to help you on site.

3.1.3 Underlays

General

When RHEINZINK is installed on wooden sheathing – with or without impregnation – no underlay is required. In the case of plywood, or large-sized roof sheathing, a structured underlay must always be used (regardless of the roof pitch).

- No underlay on wooden sheathing
- Structured underlay for extensive substructures
- Structured underlay for all non-ventilated substructures

Note:

Underlays that store moisture may not be used. The double installation of underlays is only possible if a structured underlay is used as the upper layer (Example: V13 + Enka®-Vent).

If an erection cover is required, but there is no breather membrane/subroof (structurally impossible), we recommend the solution depicted in Table 3 (page 32) for ventilated structures and the solution presented in Table 4 (page 33) for non-ventilated structures.

3.1.4 Structured underlays

Criteria used to evaluate a suitable structured underlay

- The structured mats recommended by RHEINZINK with/without felt should have a netto thickness of ~ 7 mm.
- The underlay beneath the structured mat may not become adhered to the metal underside.
- The underlay should not transport moisture capillary.
- The underlay should not store moisture.

Fig. 8: Application: Eave detail of standing seam roof with structured underlay

Fig. 9: Structured underlay, installation above wooden sheathing

Fig. 10: Structured mat without underlay, Enka®-Vent

Ventilated roof structures
RHEINZINK-ventilated roofs are a clam shell structural design, divided into three layers:

- roof
- ventilation layer with sufficient air intake and exhaust openings
- supporting structure with windproofing, thermal insulation and an airtight vapour barrier

	Roof pitch	Highly recommended	Recommended	Permitted	Not permitted
RHEINZINK-Click Roll Cap System	≥ 3°	1	2	/	4
	> 15°	1	2	4	/
Double Standing Seam System	≥ 3°	1	2	2	3/4
	> 15°	1	2	4	/
Angled Standing Seam System					
■ European lowland	≥ 25°	1	2	2/4	/
■ High alpine region	≥ 35°	1	2	2/4	/

Table 3: Sub-roofs, underlays and sealant tapes for ventilated design in relation to the climate at the building site.

Legend for Tables 3 and 4:
1 No underlay with rainproof underlay, breather membrane, under-roof, etc. (according to Professional Regulations of Roofers – Fachregeln des Dachdeckerhandwerks)
2 Structured underlay e. g. Colbond, Enka®-Vent on underlay, Bauder-Top-Vent 02 NSK, Dörken-Delta-Trela, DuPont-Tyvek Metall, Klöber-Permo sec

Non-ventilated roof structures
Non-ventilated roofs covered with RHEINZINK are single shell structures, which are divided into two layers:

- roofing, including a structured underlay for moisture compensation
- a supporting structure with windproofing, thermal insulation and an airtight vapour barrier

	Roof pitch	Highly recommended		Permitted	Not permitted
RHEINZINK-Click Roll	≥ 3°	2		2	4
Cap System	> 15°	2		2	4
Double Standing Seam	≥ 3°	2		2	3/4
System	> 15°	2		2	4
Angled Standing Seam System					
■ European lowland	≥ 25°	2		2	4
■ High alpine region	≥ 35°	2		2	4

Table 4: Design of underlays and sealant tapes for non-ventilated structures in relation to the climate at the building site

3 underlay (V 13 or similar) supplemented with a RHEINZINK-Sealant tape
4 underlay (e.g. V 13 or similar)

For roof pitches of ≥ 3° - ≤ 7° and in the event of ice dams, a sealant tape should be installed into the seam in the eaves.

Comments pertaining to Tables 3 and 4:
The choices given in the tables below are based on the norm. Deviations are possible in consideration of:

- Detailed design
- Roof geometry/landscape (penetrations)
- Regional climate conditions (drifting snow, ice dams, humidity, rain, wind conditions, sandstorms)
- Roofing requirements for special purpose buildings (e.g. hospitals, swimming pools, etc.)
- Engineering design, insulation (watch gradient of vapour pressure)

RHEINZINK-Application Engineering in Datteln must be consulted on deviations.

Notes:

- For standing seam roofs, machine seaming is preferred, due to a tighter seam.
- Due to the drying behaviour of plywood sheets (plywood, OSB-sheets, etc.), roof insulation systems and other large surface area substructures, structured underlays should always be used.
- underlays or membranes permeable to diffusion are only suited for ventilated structures for roof pitches of ≥ 15°, if they do not store water.
- Apart from its function as a vapour pressure equalizing layer, the structured underlay offers other benefits as well. For example, noise reduction up to 8 dbA, melt water removal, improved material expansion, tolerance equalizer vis-à-vis nail heads, no adhesion of bituminous underlays, etc.

- In heavy snowfall areas (high alpine regions, etc.), a RHEINZINK-Sealant tape should be installed into the double standing seams ≥ 2,0 m from the outer edge of the building in the direction of the roof gradient to avoid melt water penetration (Dia. 5.1).
- Structured underlays are always required in the tropics. The height of standing seams should always be increased to minimum 35 mm (downpours). Pay close attention to the substructures used specific to the country in question – please contact our regional consultant.
- The installation of sealant tapes provides the standing seam with increased impermeability. Installation depends on the situation (roof landscape), climate, type of roof (e.g. barrel roof).
- In the case of bituminous underlays, a double underlay is not permitted because of the danger of moisture build-up and storage between the layers. However, installing structured underlays on bituminous underlays is possible when renovating.

3.2 RHEINZINK-Roofing*

Roof pitch Deg. °	Roof pitch ca. percent % (cm/m)
3	5
7	12
10	17
15	27
20	36
25	47
30	58

Table 5: Conversion table for roof pitch – degree in percentages

3.2.1 Seam Systems

Selecting the seaming system, as well as additional measures, depends on the roof pitch. As a rule, seam systems are used to ensure rainproof roofing.

** RHEINZINK-Applications in Architecture Chap. III.*

3.2.2 Design recommendations for ventilated metal roof systems with water-bearing layers

Underlays consist of suspended or free spanned breather membranes according to EN 13859, which support the roof in its rainproofing function.

- Overlap of at least 10 cm on the edges
- Fastened to the rafters

Rainproof underlay

Sub-coverings are made up of overlapping roofing membranes or sheets supported by the substructure.

- The counter-battening is installed on top and not integrated into the subcovering.
- Sealing strips can be used to seal perforations caused by fasteners

Rainproof under-roof

Under-roofs are designed with the aid of waterproof sheeting. The seam and butt joints must also be waterproof.

- The counter-battening is not integrated.
- Perforations caused by fasteners can be sealed with sealant tapes.
- Penetrations must be rainproof.

Waterproof under-roof

This variation is designed with watertight sheeting and watertight seam and joint areas.

- Penetrations are also integrated and are waterproof.
- Openings and open penetrations caused by fasteners are not permitted.

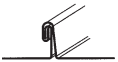
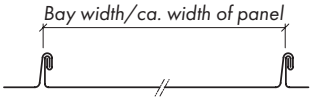
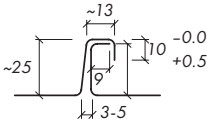
Seam systems	Roof pitch
Click Roll Cap System	≥ 3°
Double Standing Seam 	≥ 3°
Angled Standing Seam 	≥ 25°*

Table 6: Selection of roof system subject to roof pitch.
** In regions with heavy snowfall from 35° roof pitch.*

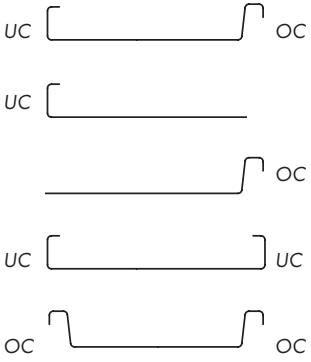
3.2.3 Design of standing seam systems, terminology/ dimensions



Dia. 4.1: Double standing seam, bay width/panel width



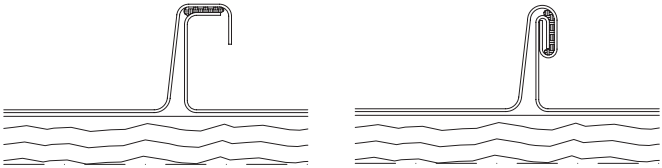
Dia. 4.2: Profile dimensions – Double Standing Seam, manufactured by machine



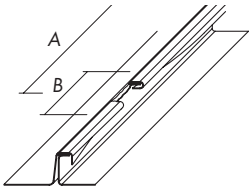
Dia. 4.3: Types of panels available

OC = over-cloak (overlapping seam)
UC = under-cloak (underlapping seam)

3.2.3.1 Sealing seams with RHEINZINK-sealant tapes



Dia. 5.1: Location of RHEINZINK-sealant tape



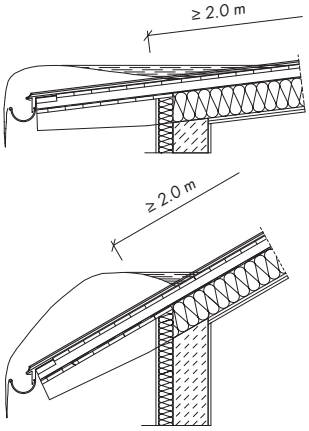
A *The open seam should be pressed against the angled seam every 50 cm*

B *ca. 60 mm (width of clinching pliers)*

Dia. 5.2: Position of sealant tape; sequence of installation steps

To prevent the sealant tape from forming "bowls" during machine seaming and to ensure the functional efficiency of the seaming machine:

- the over-cloak should be closed as an angled standing seam every 50 cm (width of clinching pliers);
- the seams of the installed panels should be closed immediately, at the latest by the end of the day;
- "Winterset", if required due to cold ambient temperatures, should be set no higher than level 5.



Dia. 5.3:
Isolated case – ice dam formation: Position of RHEINZINK-sealant tapes in the event of ice dam formation, regional application. Snow guards as per country-specific requirements.

3.2.3.2 Panel width/material thickness and number of clips

RHEINZINK-Roofing – seamed roof coverings are always fastened indirectly using clips.

- Static requirements according to DIN 1055 Part 4/pr EC1: Extraction value per clip: 300 N, safety factor 1.5
- Fasteners (nails, etc.) should be distributed evenly on the clip.

Note for pent roofs:
Based on practical experience, it is recommended that panel width be limited to 430 mm for mono-pitch roofs with roof overhangs. Material thickness should be 0,8 mm.
This serves to prevent noise which occurs when the panels bend (max. 20 mm) during strong winds.

Coil width/mm	500	570	600	670	700	800
Panel width/mm*	420	490	520	590	620	720
Panel width/mm**	430	500	530	600	630	730
Material thickness/ mm	0.7	0.7	0.7	0.7	0.7	0.8
Wind loads in kN/m²						
- 0.3	4/500	4/500	4/500	4/500	4/500	4/400
- 0.6	4/500	4/500	4/500	4/500	4/400	4/400
- 0.9	4/500	4/500	4/500	4/500	4/400	4/400
- 1.2	4/500	4/500	4/500	4/500	4/400	4/400
- 1.5	6/350	6/350	6/350	6/300	6/250	6/250
- 1.8	7/300	7/300	7/300	7/300	7/250	7/250
- 2.1	8/250	8/250	8/250	9/250	9/200	9/200
- 2.4	8/250	8/250	8/250	9/250	9/200	
- 2.7	10/200	10/200	10/200	10/200	10/150	
- 3.0	11/200	11/200	11/200	11/150		
- 3.3	11/200	11/200	11/200	11/150		
- 3.6	13/150	13/150	13/150	13/150		
- 3.9	13/150	13/150	13/150			
- 4.2	15/150	15/100	15/100			
- 4.5	15/150	15/100	15/100			
- 4.8	17/100	17/100	17/100			
- 5.1	17/100	17/100	17/100			

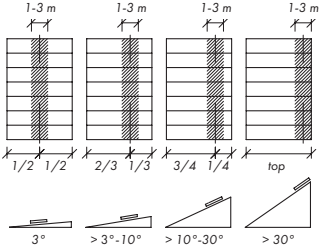
Table 7: Min. number of RHEINZINK clips (per m²); maximum space between clips (mm) in relation to wind loads.
Comments: Wind load tables in Chapter II. 3.1.1. The table can be used for all fasteners, provided an extraction value of 300 N per clip is guaranteed (see Chap. II. 3.4.1). Calculating the clips and spaces is based on panel lengths of ca. 3 m on average.
** panel width when produced manually / ** produced by machine*

3.2.4 Sliding clips to ensure thermal expansion of panels during changes in temperature

- For roofing panel lengths of > 3 m to ≤ 10 m (standard case)
  For panel lengths >10 m to ≤ 16 m, long sliding clips should be used.
- For façade cladding panel lengths of > 1 m
- If there are penetrations on roof surfaces, please take fixed clip areas into account (see Dia. 7)

3.2.5 Fixed clips to fasten panels on roofing

- Panel lengths ≤ 10 m (standard case):
  Fixed clip area ≥ 1 m to 3 m
- Panel lengths of ≤16 m (only possible up to 30° roof pitch):
  Fixed clip area 3 m



*Dia. 6.1: Schematic depiction; arrange fixed clips according to roof pitch**

** ZVSHK (Sheet Metal Standards)*

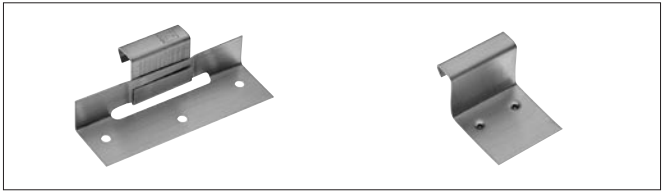
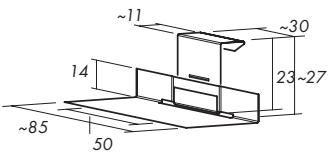
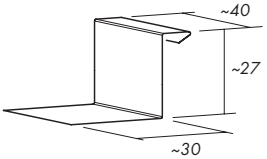


Fig. 11: RHEINZINK-sliding clips (pre-assembled) and fixed clips



Dia. 6.2: Dimensions of pre-assembled sliding clips, material thickness: lower part 0.8 mm, upper part 0.7 mm

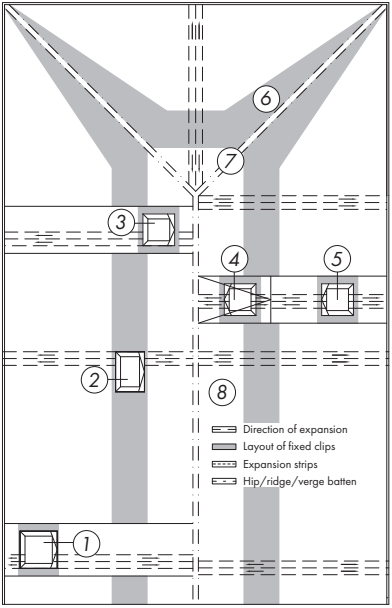


Dia. 6.3: Dimension of fixed clips, material thickness: 0.8 mm

3.2.6 Panel length*

Panel lengths of ≤ 10 m, (standard case). If the panel is > 10 m to ≤ 16 m and particularly if there are penetrations in the roofing, please contact a RHEINZINK-application engineer.

** RHEINZINK-Applications in Architecture, Chap. III. 1, III. 2*



1/3 Penetration outside fixed clip area with expansion strip

2 Penetration within fixed clip area without expansion strip

4/5 Penetrations arranged in a row, elevated design recommended

6 Fixed clip area

7 Hip

8 Ridge

Dia. 7:

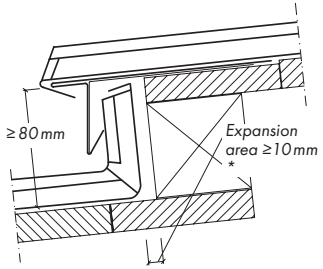
3.2.6.1 Application

Fixed clip area for hipped roof with expansion strips

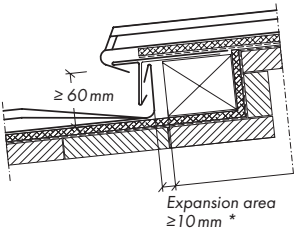
- Roof pitch 9°
- Panel length 16 m
- staggered position with roof penetrations (see examples of calculations Chap. 2.4)

If penetrations are > 3 m wide (elevator shafts, etc.), expansion strips should be installed on the sides in order to accommodate lateral expansion.

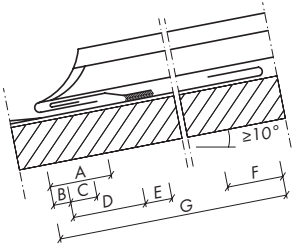
3.2.7 Cross-joint design



Dia. 8.1.1: Stepped falls connected via "pinched seam"; Roof structure according to Dia. 3.1

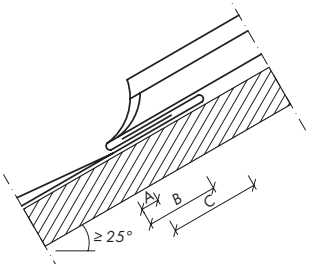


Dia. 8.1.2: Stepped falls connected via "turned down" seam; structured underlay (example), roof structure according to Dia. 3.2



Dia. 8.2: Cross-joint: single seam with continuous soldered cleat

A Back-fold of upper panel
B Expansion area ≥ 10 mm
C Back-fold cleat ca.15 mm (stiffens the edge)
D Width of cleat ca. 40 mm
E Width of soldering ca. 10 mm
F Back-fold of lower panel ca. 30-50 mm
G Overlap area of upper panel ca. 250 mm



A Expansion area ≥ 10 mm*
B Back-fold upper panel ≥ 30 mm*
C Back-fold lower panel ≥ 40 mm*

* If panel lengths are > 10 m, increase expansion area to 15 mm (see Chap. 2.4 – examples).

Dia. 8.3: Cross-joint: single seam

Cross-joint design	Roof pitch
Stepped falls (Dia. 8.1.1 and 8.1.2)	≥ 3°
Single seam with continuous soldered cleat (Dia. 8.2)	≥ 10°
Single seam (Dia. 8.3)	≥ 25°

Table 8: Cross-joint design in relation to roof pitch

3.3 Lightning protection

Within the framework of European Standardization, lightning protection has been regulated anew and implemented by way of Din EN 62305 – Lighting Protection.
With respect to RHEINZINK-roofing, comprehensive testing was conducted, the results of which contributed to the development of the standard.
Part 3 in EN 62305 describes the protection of buildings – Supplementary Sheet 4 of Part 3 explores the utilization of metal roofs in the lightning protection system.
Accordingly, RHEINZINK-roofing systems can be used as outer lightning protection.
For other roofing systems and in the case of coated surfaces, individual certificates may be required.

3.3.1 Lightning current arrester and diversions

According to standard, RHEINZINK-roofing systems, roof edges, fascias and surrounds made of RHEINZINK in a material thickness of min. 0,70 mm, function as lightning current arresters. Lightning rods should be placed in the ground to divert the lightning current. The function of these conductors is to divert the lightning current to the grounding system as quickly as possible. These rods should be made of aluminium-wrought alloy, in order to prevent rust streaking. Certification and technical specifications of lightning conductor wires, cables and terminals are outlined in DIN EN 62305.

Note:
The supply terminals must be installed so that thermal expansion of the roof is not impeded (Fig. 3.)

3.3.2 Requirements of lightning protection systems

The requirements to use a lightning current arrester is regulated in DIN EN 62305 and is often prescribed for public buildings such as hospitals, community centres and data centres. It's up to homeowners to make a decision with respect to their residences. In isolated cases, we recommend consulting the relevant manufacturer.

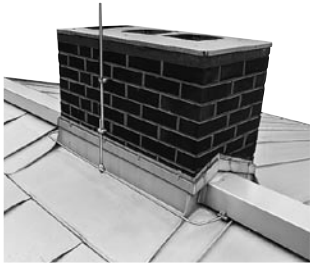


Fig. 12: Lightning protection system complete with lightning rod on chimney head

3.3.3 Jointing techniques

All of the connections used for RHEINZINK-roofing systems such as seaming, edging, folding, clamping, including the use of sealant tapes in standing seams, are approved and suitable connections. The tradesperson must demonstrate to the installer of the lightning protection system that the joints he's using have been constructed according to manufacturers' guidelines.

Fig. 13: Proper installation allows for thermal expansion of panel

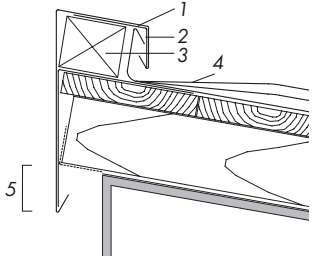
Fig. 14: Incorrect installation of lightning rod terminal to panel

Wires and cables made of aluminium-wrought alloy should be used to connect the lightning rod from the standing seam over the eave gutters. If galvanized steel is used, rust streaking could occur over time because of the wire.

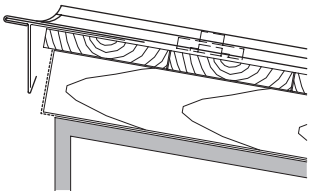
Approved terminals must be used to connect the lightning rod to the metal roof, so that thermal expansion of the roof and gutter is not impeded. Connecting to the eave fold-over could cause damage.

Fig. 15: Pent roof ridge

Fig. 16: Ridge as eave termination



Dia. 9: Pent roof ridge with batten



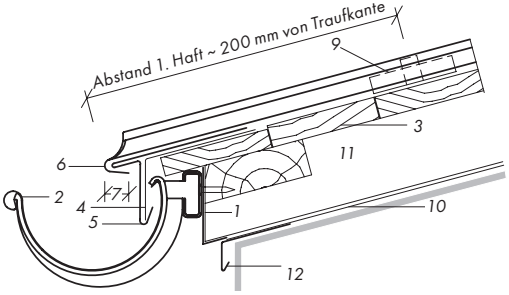
Dia. 10: Pent roof ridge with standing round seam termination

1 RHEINZINK-coping
2 Continuous cleats made of galvanized steel 1.0 mm
3 Wooden batten ≥ 60 mm
4 Turned down seam
5 Façade overlap depending on height of building ≥ 50 mm

Note: Not recommended
Because the seam termination is too long, the expansion distance to the connection profile is deficient and the back-fold of the panel is completely closed, the standing round seam termination has proven not to be rainproof.

3.4 Roof detail *

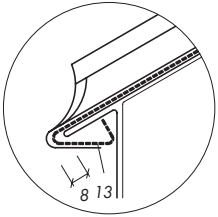
3.4.1 Eave



Dia. 11: Standard eave detail for RHEINZINK-Standing Seam covers, bracket-mounted gutter with snap-lock bracket according to DIN EN 1462

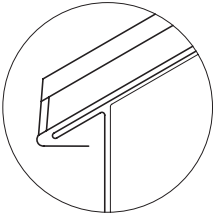
1 RHEINZINK-Diamond Mesh Sheet; free opening A0 63 %, large air intake opening (see Tab. 2, P. 26 and notes pertaining to individual certificates)
2 Gutter with/without slope
3 Lower fascia board
4 Continuous cleats made of galvanized steel; material thickness ≥ 1 mm if length of side post is ≥ 50 mm
5 RHEINZINK-Eaves Flashing, material thickness ≥ 0.8 mm
6 Back-fold panel, opening ca. 30° (optimum drip behaviour)
7 Hook-in width of eaves flashing ≥ 30 mm
8 Provide space between panel and eaves flashing: ≥ 10 mm (thermal expansion required)
9 Install first clip directly after eaves flashing (~200 mm)
10 Breather membrane (optional)
11 Height of ventilation space
12 Eaves profile
13 Template for installation assistance for expansion area and folding

3.4.1.1 Eave terminations



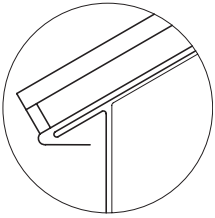
Dia. 11a: Design variation: Eave termination standing round

- *machine pre-fabrication possible*
- *use distance template*



Dia. 11c: Design variation: standing diagonal

- *pre-fabrication by machine not possible*
- *use distance template*

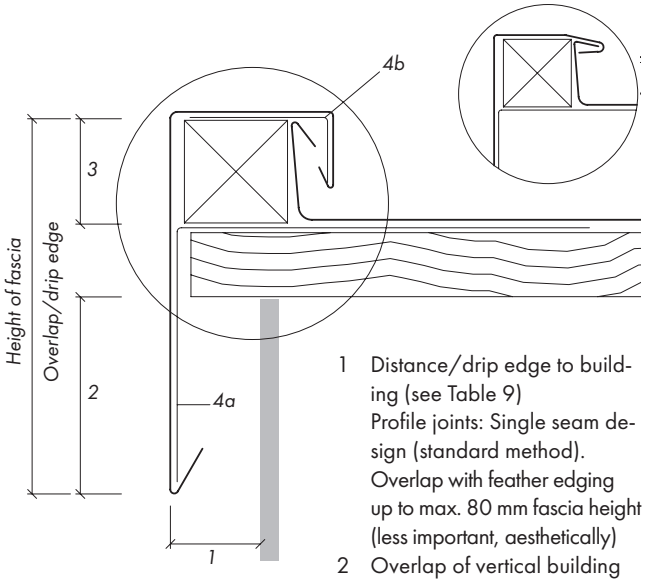


Dia. 11b: Design variation: standing straight

- *pre-fabrication by machine not possible*
- *use distance template*

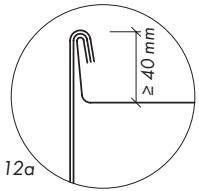
** RHEINZINK – Applications in Architecture Chap. III. 1.3, III. 2.3, III. 3.3*

3.4.2 Verge

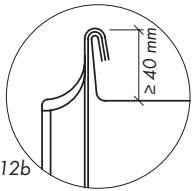


Dia. 12: Verge with batten and RHEINZINK-Verge Profile

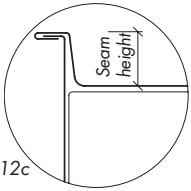
1 Distance/drip edge to building (see Table 9)
Profile joints: Single seam design (standard method).
Overlap with feather edging up to max. 80 mm fascia height (less important, aesthetically)
2 Overlap of vertical building components
3 Connection height of verge seam
4a Fastening with galvanized continuous cleats, material thickness 1.0 mm, with/without return
4b the same as 4a, however, RHEINZINK, material thickness is 0.8 mm



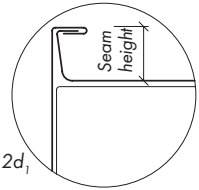
12a



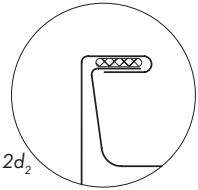
12b



12c



$12d_1$


$12d_2$

For panel lengths of up to 6,0 m, the following detail solutions may be used:

12a Verge without batten, connection height (see Tab. 9)

12b Seamed verge with upper panel termination, standing round.
Connection height (see Tab.9). Optimum alignment is attained by using additional continuous cleats made of RHEINZINK, material thickness 0.8 mm.

12c Seamed verge as angled seam (over-cloak), e.g. for barrel roofs and round dormers: connection height ca. 25 mm

$12d_1$ Verge as angled seam (under-cloak):
Connection height = seam height

$12d_2$ For roof pitches of < 25°, with sealant tapes

Building height (m)	Overlap (mm)	Distance drip edge (mm)	Connection height verge**(mm)
< 8	≥ 50	≥ 20	40 - 60*
8 to 20	≥ 80	≥ 20	40 - 60*
> 20 to ≤ 100	≥ 100	≥ 20	60 - 100

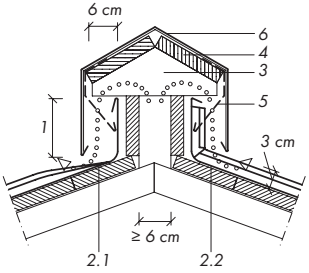
Table 9: Cover vertical building components and distance (drip edge) from building

* *for roof pitches of ≤ 10° or extreme regional load, a connection height of 60 mm is preferred.*

** *Coordinate with height of pent roof ridge (aesthetics)*

Note:
See Table 2, P. 26 and instructions for isolated cases.
Depending on the detail design (fascia height/building height), special structures may be required apart from continuous cleats made of galvanized steel.
In the case of pent roof ridges, the height of the fascia is adjusted to the verge overlap and is thus higher and wider than described in Table 9.

3.4.3 Ridge detail for a vented gable roof

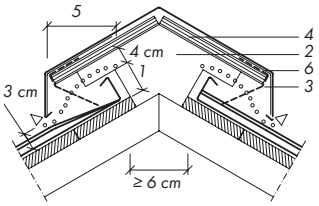


Dia. 13.1: Ridge for a vented gable roof, design variation: high design with ventilation cross-sections

Fig. 17: Flush ridge termination on verge, high design

1 Connection height for roof pitches of
< 5° ≥ 150 mm
< 22° ≥ 100 mm
≥ 22° ≥ 80 mm
2.1 Panel termination, design with turned down seam; not possible with existing wooden structure
2.2 Pinched seam panel termination
3 Spacer block
4 Wooden sheathing/ OSB-board
5 Perforated sheet, RHEINZINK-Diamond Mesh Sheet, A0 63 %, both sides
6 RHEINZINK-Coping with continuous cleats (galvanized steel)

Note:
100 % protection from drifting snow is only possible by using sub-roofs. RHEINZINK-design recommendations available upon request or contact our application engineering consultants.



Dia. 13.2: Ridge detail for a vented gable roof > 25°, design variation: low design with vent cross-sections

Note:
100 % protection from drifting snow is only possible by using sub-roofs. RHEINZINK-design recommendations available upon request or contact our application engineering consultants.

1 Connection heights can be reduced by up to 60 mm by using wider copings.
Panel terminations:
- pinched seams (height > 80 mm)
- turned-down seam (height 60-80 mm)

The panel termination should be selected based on the nature of the load, construction and roof pitch.
2 Spacer blocks for ventilation
3 Perforated sheet, RHEINZINK-Diamond Mesh Sheet, A0 63 %, both sides
4 Wooden sheathing/OSB-board
5 Overlap width = ca. double the connection height
6 RHEINZINK-Copings with continuous cleats, galvanized steel

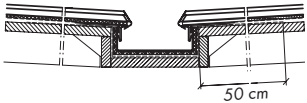
Fig. 18: Flush seamed ridge termination on verge fascia, low design

3.3.4 Valley details

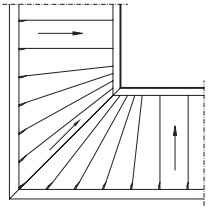
Valleys, design variations as per Table 10.

Note:

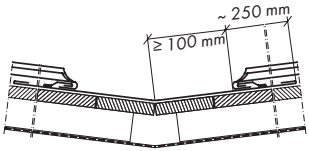
- provide for ventilation in sub-structure.
- Seamed valley can only be up to 3 m panel length (linear expansion caused by changes in temperature).
- Design variation for "recessed valley", see Chapter on Roof Drainage "boxtype gutter", design with overflow gutter, no air intake, primarily for roof pitches of ≤ 5°.
  Recessed valley without overflow gutter, roof pitch > 5° to ≤ 10°.
- Design with tapered panels, alternative solution in the event that recesses for hollow gutters for roof pitch≥ 5° have not been considered in the design, or for aesthetic reasons.



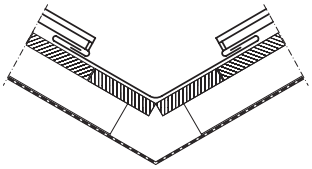
Dia. 14.1: Valley design recessed on both sides without air intake, ***bonded so that it is watertight (ca. 50 cm)*** *and structured underlay, roof pitch ≥ 3° to ≤ 5°*



Dia. 14.2: Valley design with tapered panels



Dia. 14.3: Valley design with single seam and continuous soldered cleat, standard size/girth ≥ 800 mm



Dia. 14.4: Valley design with single seam

Note:
The valley pitch is generally smaller than the roof pitch. If the valley runs in a 45° angle (top view) toward the eave, the conversion factor is 1.414.
Given the above-mentioned conditions, a 10° roof pitch corresponds to a valley pitch of ca. 7°.
Design of valley joints:
- ≤ 10° soft soldering
- > 10° see Table 10.

Roof pitch	Valley design
≥ 3° - ≤ 5°	recessed valley (Dia. 14.1)
> 5° - ≤ 10°	recessed valley or tapered panels (Dia. 14.2)
> 10°	Valley with soldered cleat (Dia. 14.3) ■ soldered, standard ■ flanged
≥ 25°	Valley with single seam (Dia. 14.4)

Table 10: Valley design depending on roof pitch

3.4.5 Other connection heights/ measures

Lateral connection heights:

< 5° = 150 mm
< 22° = 100 mm
≥ 22° = 80 mm
(in the case of tiles, from top edge of cover material 65 mm)

Other connection heights for seamed roofing:

- Pent roof ridge ≥ 60 mm
- Pent roof ridge on rising wall etc. (see Chapter on Ridge for Vented Gable Roof)

Note:
The standard design for a connection profile on a rising wall calls for a water check; if wall material such as slate, etc. is used, no water check is required.

3.4.6 Details for bituminous roof edge sealing

3.4.6.1 Roof edge terminations with RHEINZINK-Flat Roof Edge Expansion Element (wall, connection, verge, etc.)

Note:

- Width of adhesive flange on flashing: ≥ 120 mm
- Protective coating of flashing required up to 2 cm above the top edge of roof covering
- Slip flashing
- Never direct the torch flame directly onto the expansion element or the soldered joint of the RHEINZINK-flashing without taking precautions.

3.4.6.2 Eaves flashings, sealing function

- indirect fastening by using continuous cleats and single clips made of RHEINZINK
- Joint design: soft soldering
- Install Flat Roof Edge Expansion Element (see Table 21)
- Full-surface protective coating to non-sealed flashing and roof drainage system

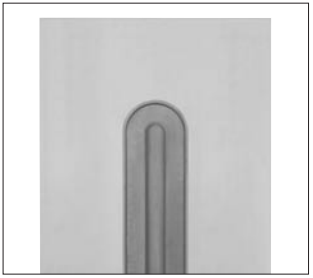


Fig. 19. RHEINZINK-Flat Roof Edge Expansion Element

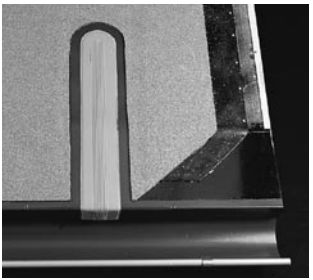


Fig. 20: Eaves detail RHEINZINK-Gutter with eaves flashing and expansion element

3.4.6.3 Eaves flashings, supporting, non-sealing function

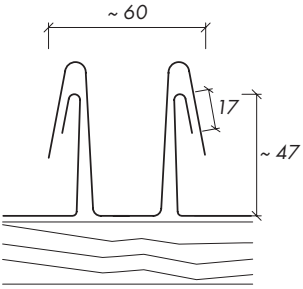
- Bond the eaves flashing up to the drip edge with roof sealant
- Slip flashings
- Flashing length ≤ 3 m
- Direct fastening, nails/screws
- Loosely overlap profile joints 3-5 cm
- Suitable full-surface protective coating

3.5 Safety precautions for seam coverings*

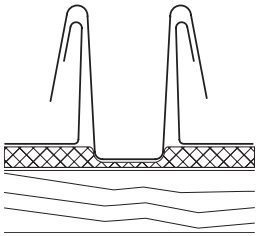
- Personal safety as per DIN EN 516
- Fall prevention as per DIN EN 517
- Snow guard systems according to federal/regional country building codes (seam clip systems)
- Gutter-/rooftop heat tracing (self-regulating systems)
- Lightning protection systems/-conductor and grounding systems. Take panel expansion into account when installing clips; do not fix to turned-down edge of eaves. Coordinate with qualified electricians.

Material for safety precautions should be selected based on compatibility with RHEINZINK-roofing.

** RHEINZINK – Applications in Architecture, Chap. III. 5.3*



Dia. 15.1: Dimensions for RHEINZINK-Click Roll Cap System



Dia. 15.2: RHEINZINK-Click Roll Cap System with structured underlay

3.6 RHEINZINK-Click Roll Cap System

3.6.1 System components

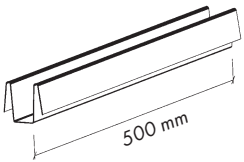
The roll cap system is the oldest installation system still in wide use today. In the case of the RHEINZINK-Click Roll Cap System, panels up to 6 m long are produced ex works in a single operation using profilers. For longer panels, mobile profilers for construction sites can also be leased. The pre-profiled roll cap is available in the standard length of 3 m (lengths of up to 6 m are available upon request). The system is suitable for roof pitches starting at 3° without undertaking additional sealing measures. Increased loads will require the installation of a structured underlay or weather and rainproof sub-roofs.

Note:

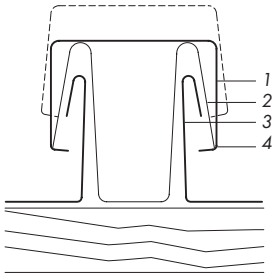
The SM-SL "RZ" snow guard bracket by SM-Systeme, D-71634 Ludwigsburg, is designed specifically for the RHEINZINK-Click Roll Cap System.

3.6.2 Simple Installation

Once the roof area has been divided, the pre-profiled panels are installed at intervals of ca. 50 mm. Using at least two screws, the RHEINZINK-Click Roll Cap Fasteners are fastened to the substructure. The capping is clicked directly on to the fastener and secured to prevent slipping. Five holes have been pre-punched in the base of the fastener to accommodate a variety of applications. Based on normal wind loads, the number of fasteners is 1.5 per m^2 in the middle, 2 per m^2 in the edge area and 3 per m^2 in the corners.



Dia. 15.3: RHEINZINK-Click Roll Cap Fastener



Dia. 15.4: With the RHEINZINK-Click Roll Cap System, the capping is pressed laterally over the fastener, until the cap foot engages audibly (clicks).

1 Roll Cap has been roll-formed specifically to "click-in", with a ca. 6 cm precise-fitting overlap to accommodate expansion (see Dia. 15.5)
2 Fastener, galvanized steel with a double-sided click area and 5 fixing holes, 500 mm long
3 RHEINZINK-panels
4 Click area

3.6.3 Functional Certainty

The fastener ensures unimpeded movement of the RHEINZINK-panels in the event of linear expansion due to changes in temperature.
Thus, panel lengths of up to 20 m can easily be realized. Longer panels can be realized when involving RHEINZINK-Application Engineering. The panel is fixed at one point by notching the foldback and bending it over the fastener.
The special advantages of the fastener are particularly evident in non-ventilated roofing structures with insulation on the roof: As this system requires fewer fixing rails per insulating panel than other types of seams, its application is very economical.
Rivets are used to fix the roll caps to one bracket in order to prevent slipping.

3.6.4 Advantages of the system

- The four RHEINZINK-system components: Click Roll Cap Fastener, galvanized steel, ridge termination cap, eaves termination cap for roofs and façades, roll cap, roll cap expansion/opening or plug-in ca. 60 mm (see Dia. 15.5)
- Rainproof linear seam connection ≥ 3°
- Panel length up to 20 m

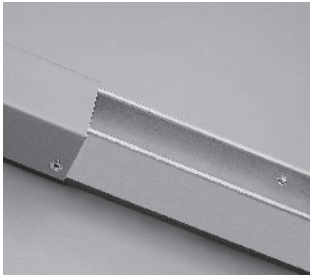
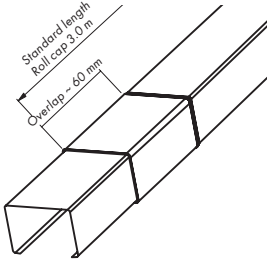


Fig. 21: Roll cap fastening to prevent slipping



Dia. 15.5: RHEINZINK-Roll Cap, profile joint with plug-in

Arrange roll caps so that the plug-in is on the eaves side. The plug-in offers the potential of an aesthetically pleasing detail. If the roof pitch is flat, the roll cap plug-in should be sealed (e.g. ENKOLIT).

Installation:
In order to prevent the Click Roll Cap panel from damage when drilling holes for rivets, a metal angle should be placed behind the fastener to protect the panel.

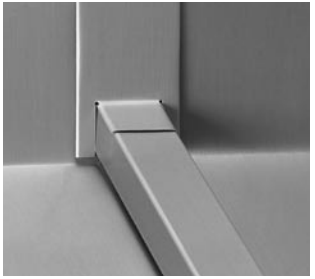


Fig. 22: RHEINZINK-Ridge termination

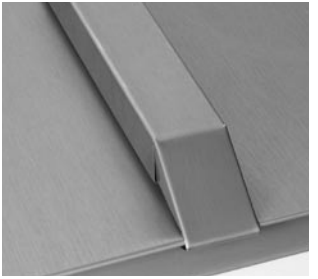


Fig. 23: RHEINZINK-Eaves termination

The components of the Click Roll Cap System are finished products, which present an economical and visually mature, practical solution. The RHEINZINK-eaves termination guarantees straight eave edge. Forced thermal expansion is prevented.

Name	Length mm	Thickness mm
Fastener, galvanized steel with 5 fixing holes, height 52 or 58 mm	500	1.00
Ridge termination cap	167	0.70
Eaves termination cap for roof and wall	500	0.80
Pre-profiled roll cap, straight, plug-in on one side ~ 60 mm	3000*	0.80

Table 11: Components of RHEINZINK-Click Roll Cap system

* *other lengths are available upon request*

Fig. 24: RHEINZINK-"Solar PV Standing Seam"

Fig. 25: RHEINZINK-"Solar PV Click Roll Cap"

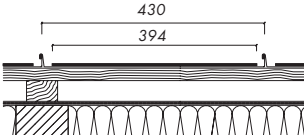
3.7 RHEINZINK-"Solar PV Standing Seam" and "Solar PV Click Roll Cap" Systems

RHEINZINK-"Solar PV Standing Seam" and "Solar PV Click Roll Cap" are the optimum combination of ecological solar energy production and architectural design using conventional seaming techniques: efficient thin-film solar modules are fixed to RHEINZINK-standing seam panels and the Click Roll Cap System using durable, full-surface adhesive technology.

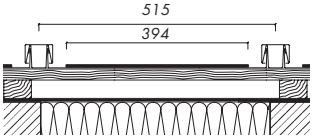
- Prefabricated RHEINZINK-panel, including UNISOLAR®-cells
- Roof-integrated solar panels
- TÜV-tested adhesive technology
- High energy production, even with diffused light or little sunshine using Triple Junction Technology
- Roofing or façades cladding and energy extraction in one
- Public investment promotion www.solarfoerderung.de

Energy savings – Promotion

According to the "Renewable Energy Law" (EEG), as of 01.01.2004, the power supply compensation for energy, for up to 30 KW produced through photovoltaic systems on roofs is 39.57 Euro-Cents/KWh (2010). See www.solarfoerderung.de for interactive, individual consultation with respect to solar incentives.



Dia. 16.1: RHEINZINK-"Solar PV Standing Seam"



Dia. 16.2: RHEINZINK-"Solar PV Click Roll Cap"

Module data for Standing Seam and Click Roll Cap	Cell type	Triple junction solar cells made of thin-film silicon
	PV-Module	394 mm x 2848 mm
	Nominal output	68 Wp ± 10 %
	Operating voltage V_{MPP}	16.5 V
	Nominal current I_{MPP}	4.13 A
	No-load voltage V_{OC}	23.1 V
	Short circuit current I_{SC}	5.1 A
	Certificate	IEC 61646 (CEC 701) Safety Class 2 (TÜV Rheinland)
	Connection	MC-box incl. 600 mm cable
"Solar PV Standing Seam"	Dimensions	430 mm x 4000 mm
	Roof area	430 mm x 3000-3900 mm
	Material thickness	0.7 mm
	Weight/m²	9.65 kg
"Solar PV Click Roll Cap"	Dimensions	475 mm x 4000 mm
	Roof area, incl. roll cap	515 mm x 3000-3900 mm
	Material thickness	0.7 mm
	Weight/m²	10.23 kg

Tab. 12: Module data and dimensions for roof cladding using RHEINZINK-"Solar PV Standing Seam" and "Solar PV Click Roll Cap"

4. Seamed wall cladding

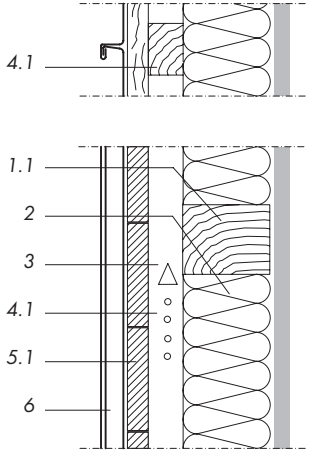
For aesthetic reasons, RHEINZINK-seamed wall cladding is always designed as an angled standing seam.

Note:
Wherever possible, avoid using double standing seams for façade cladding, as tools and machines may cause a disproportionate amount of stress-related deformations and mechanical damage. If this technique is used, please address your concerns in writing to the client.

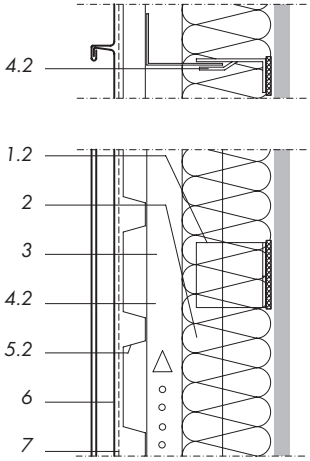
Other design variations:
- combination of standing seam/ RHEINZINK-"Click Roll Cap System"
- "Click Roll Cap System"
- Flat-lock tiles/small tiles (hook-in seam technique)

4.1 Substructure

- Wood (Dia. 17.1)
- Metal (Dia. 17.2)



Dia. 17.1: Angled standing seam cladding on a wooden substructure



Dia. 17.2: Angled standing seam cladding on a metal substructure

Wall structure

1 Supporting structure as per fire regulations:
1.1 made of wood (battens)
1.2 made of metal with Thermo-stop (bracket system)
2 Thermal insulation (as per DIN 4108)
3 Height of ventilation area ≥ 40 mm (standard is 20 mm), and width of ventilation openings ≥ net 20 mm must be co-ordinated in the design
Please see Table 2, P. 26 and notes regarding isolated cases.
4 Supporting structure:
4.1 made of wood (battens)
4.2 made of metal (bracket system)
5 Sheathing:
5.1 made of wooden sheathing (nominal thickness is 24 mm/ width ≤ 100 mm) or BFU/ OSB-plywood sheets
5.2 made of metal (trapezoidal profiles, galvanized steel or coated steel)
6 RHEINZINK-Angled Standing Seam System
7 Underlay (acoustic insulation)

As a rule, wall claddings are more demanding aesthetically than roofing. The aesthetics can be optimized through the following:

Material selection:
- RHEINZINK-"preweathered pro blue-grey"/RHEINZINK-"preweathered pro graphite-grey"
- Sheet material
- When ordering RHEINZINK-"preweathered pro", a single production batch should be used for each individual area.
- Different batches can be used for flashings, base strips, window copings, etc.
- Work should not be interrupted in an individual section. Colour deviations in this case are normal and are caused by the natural carbonization process, which occurs over time.
- Coordinate with site management/customers.

Technical data:
- Sheet-/coil width ≤ 600 mm, for aesthetic reasons (fusion process etc.) bay widths of ≤ 430 mm are recommended.
- Material thickness 0.80 mm
- Avoid double standing seam system
- Coordination with planner/site management is required, if details are not described in the specifications.
- Panel layout should be aesthetically pleasing, by using adapter or custom panels.
- Restraints with penetrations, advertising signs and lightning protection clips should be avoided.
- Panel lengths:
  optimal: up to 4.0 m
  maximum: ca. 6.0 m

4.2 Detailed design

4.2.1 Window opening – symmetrical division of panels

Bay width:

a: bay width

~ *a:* max. deviation ± 5 cm (aesthetics)

Types of panels:

B_1: Standard panel OC/UC

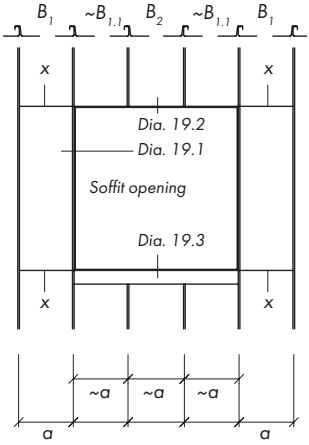
~ $B_{1.1}$: Standard panel OC/UC

B_2: *Custom panel OC/OC*

x: Cross-seam

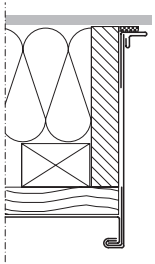
Note:

- Symmetrical division of panels
- Soffit connection with seams facing outwards (left and right should be identical), custom panel (two over-cloak seams OC/OC) required
- Cross-seam at lintel/windowsill (not absolutely necessary)
- Seamed soffit profile at windowsill coping (see Fig. 26).



Dia. 18: Example – window connection with symmetrical division of panel

4.2.1.1 Window connections

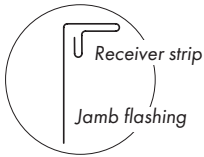


Dia. 19.1: Jamb with window connection using a receiver strip

Fig. 26: Jamb on lateral connection windowsill coping

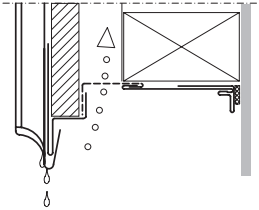
Notes pertaining to Dia. 19.1:

- indirect fastening of jamb flashing to façade panel
- installation of receiver strips in window area
- symmetrical seam layout (see Dia. 18)

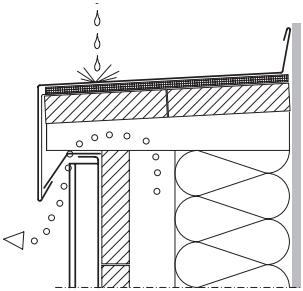


Dia. 19.1.1: Receiver strip detail

Note:
No direct fastening with screws.



Dia. 19.2: Window lintel with ventilation and window connection using receiver strip



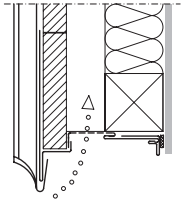
Dia. 19.3: Windowsill coping bonded with Enkolit and ventilation – wall cladding

Notes pertaining to Dia. 19.2:

- Provide ventilation opening (see Table 2 and instructions for isolated cases)
- Two-part design, perforated strip and lintel profile, (substructure is not visible)
- indirect fastening of flashings
- installation of receiver strips

Notes pertaining to Dia. 19.3:

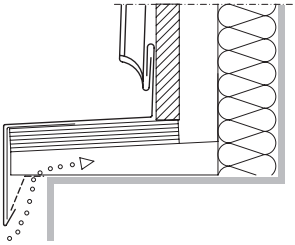
- Windowsill coping fastened with galvanized continuous cleats, material thickness ≥ 1.0 mm.
- To avoid drumming sounds, windowsill copings should be full surface bonded with Enkolit.
- Wherever possible, avoid soldering the joints of the windowsill coping on top of RHEINZINK-Façade claddings. Use RHEINZINK-UDS-connectors for fastidious detail.
- Provide a ventilation opening (see Table 2 and notes for isolated cases).



Dia. 20.1: Base flush, with ventilation

4.2.2 Base detail of façade cladding flush or not flush

Notes pertaining to Dia. 20.1:
see Dia. and description 19.2

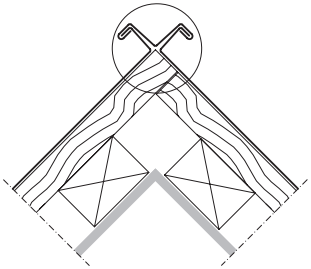


Dia. 20.2: Base detail not flush, with ventilation

Notes pertaining to Dia. 20.2:
Design variation: base detail is visible

- with base/cornice coping, e.g. for wall projections
- provide ventilation opening
- cornice coping joints; design according to technical requirements
- if there are vertical wall parts made of plaster underneath the cornice coping, other details may be necessary (protection from moisture, dirt, etc.)

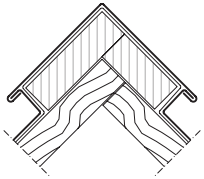
4.2.3 Outside corners of building



Dia. 21.1: Design with seam cap (corner profile), design and aesthetics created through symmetry of flashing.

Dia. 21.2: Diagonal seam

Dia. 21.3: Straight seam, one-sided



Dia. 21.4: wide design; flashing with wooden substructure

Note:
Pay attention to the dimensions for panel production. In order to avoid excess bulging of the panels, the width must be made to precise dimensions, without any plus tolerances. This applies primarily to Dia. 21.2/21.3.

4.2.4 Inside corners of building

Note:
Wherever possible, inside corners of a building should be folded without a seam in the corner. Seam connections to cladding should be executed to suit the direction of the installation.

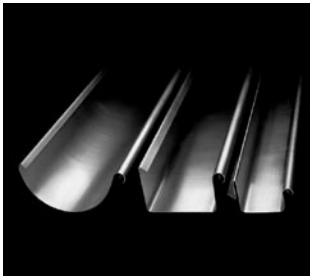


Fig. 27: RHEINZINK-Gutters with pre-fabricated bead notch

5. Roof drainage system

RHEINZINK offers a variety of eaves gutters, rainwater downpipes and accessories. RHEINZINK-Roof Drainage products are tested and manufactured according to DIN EN 988, DIN EN 612 and the Quality Zinc Criteria Catalogue (TÜV). These products are available in RHEINZINK-bright rolled, "preweathered pro blue-grey" and "preweathered pro graphite-grey" surfaces.

5.1 Applicable standards and additional requirements

Application of DIN EN 612:

- Eaves gutters are classified as X and Y, depending on the bead diameter or corresponding section modulus (DIN EN 612,Tab.1).
- Rainwater downpipes are classified as X and Y (DIN EN 612, Tab.2), depending on the dimension of the seam overlap

All RHEINZINK-products fall into the X classification and thus meet the requirements of Y.

Application of DIN EN 1462:

- Gutter brackets are divided into three classes, based on their load capacity

Designation according to DIN EN 612 for eaves gutters and rainwater downpipes:

- Cross section and product description
- The number of this standard (EN 612)

- Identification field:
  Nominal size of eaves gutter, respectively, the diameter or cross-section of the downpipe in mm; type of material;

Example of designation:
half-round suspended eaves gutter EN 612-333-Zn

DIN EN 612 marking without other declarations for eaves gutters and rainwater downpipes:

- trade name or trademark of manufacturer
- abbreviation for country of manufacture
- number of this European standard (EN 612)
- identification field: see above

Additional requirements:
Due to different climatic conditions in Germany and, in order to guarantee existing roof drainage systems, compliance with stipulations regarding form and dimensions according to DIN EN 612 is required.

5.2 Dimensioning for bracket-mounted external systems (DIN EN 12 056-3)

For economic reasons and to ensure self-cleaning, pipe work and other components comprising part of the rainwater drainage system should only be calculated for an average rainfall. Within the scope of DIN 1986-100, the ideal rainfall lasts for 5 minutes and is constant. According to DIN 1986-100, rainwater downpipes, collecting and underground pipes should be calculated for a regional five-minute rainfall intensity, which is to be expected every 5 years (r5/5). Contrary to the customary blanket regulation of r = 300 l/s/ha for Germany used to date to calculate rainwater drainage systems, in northern and southern Germany, smaller and larger rainfall intensities will need to be used respectively to calculate rainwater drainage systems.

Rainwater runoff is calculated according to the following equation:

$$Q = r_{T/Tn} \cdot C \cdot A \cdot \frac{1}{10000}$$

Q : rainwater run-off in l/s
$r_{T/Tn}$: rainfall intensity in l/s/ha
C : run-off coefficient (C = 1.0 for all roof areas that do not store water, independent of the roof pitch)
A : projected precipitation area in m^2 of the floor plan

Rainfall specifications are available from regional government authorities or through the German Weather Service.

A new principle contained in DIN 1986-100 stipulates that overloading drainage systems should be limited in order to avoid damage. This can be achieved by installing emergency overflow systems and limiting excess pressure in the drainage system. Roofs designed with internal/ secret gutters and light-weight built flat roofs must always have emergency overflows that drain directly to the ground.

Note:
The RHEINZINK-Homepage contains a calculation program to dimension bracket-mounted drainage systems: www.rheinzink.de.

5.2.1 Data/dimensions of suspended eaves gutters, halfround or box-type, outside of buildings according to DIN EN 612

Nom. size	Min. metal thickness	Bead diameter		Height of front side Min dim.			Excessive rise of water check to bead		
		RHEIN-ZINK	DIN EN 612	RHEINZINK		DIN EN 612	RHEINZINK		DIN EN 612
				half-round	box-type	min.	half-round	box-type	min.
	mm	mm	mm	mm	mm	mm	mm	mm	mm
200	0,65	16	14	48	42	40	8	8	6
250	0,65	18	14	61	55	50	10	10	6
280*	0,70	18	14	72	–	55	11	–	6
333	0,70	20	14	86	75	55	11	10	6
400**	0,80	22	18	107	90	65	11	10	6
500	0,80	22	20	136	110	75	21	20	6

Table 13: Nominal sizes, material thickness, bead diameter, see DIN EN 612/production data RHEINZINK GmbH & Co. KG, minimum requirements

* *box-type not available*

** *Note: according to DIN EN 612, 0.8 mm material thickness is absolutely essential. Non-compliance is considered a violation of ZVSHK, ZVDH etc. (Sheet Metal Standards).*

5.2.2 Data/dim. gutter brackets for eaves made of RHEINZINK according to DIN EN 1462

Nom. size	c mm	Dimensions for increasing loads b x s, series*, mm			
	± 3	1	2	3	4
200	230 270	25 x 4	25 x 4	25 x 4	—
250	280 330	25 x 4	30 x 4	**25 x 6**	—
	410 500	25 x 4	—	—	—
280	290 350	30 x 4	30 x 5	**25 x 6**	25 x 8
	390 480	30 x 4	—	—	—
Snap-lock bracket**	—	—	—	—	x
333	300 370	30 x 5	**25 x 6**	40 x 5	30 x 8
	450	30 x 5	—	—	—
Snap-lock bracket**	—	—	—	—	x
400	340 430	30 x 5	40 x 5	25 x 8	30 x 8
	410	30 x 5	—	—	—
500	375 515	40 x 5	40 x 5	30 x 8	30 x 8

Table 14: Dimensions (length/cross-sections) for half-round eaves gutters according to DIN 18461 and EN 1462

Nom. Size	c mm	Dimensions for increasing loads b x s, series*, mm			
	± 3	1	2	3	4
200	230 270	25 x 4	25 x 4	25 x 4	—
250	280 330	25 x 4	30 x 4	**25 x 6**	—
333	300 370	30 x 5	**25 x 6**	40 x 5	30 x 8
400	330 420	30 x 5	40 x 5	25 x 8	30 x 8
500	350 490	40 x 5	40 x 5	30 x 8	30 x 8

Table 15: Dimensions (length/cross-sections) for box-type eaves gutters, mm

Gutter bracket intervals ± 40 mm	Typical load category Series	High load category Series
700 mm	1	3
800 mm	2	4
900 mm	3	—

Table 16: Gutter loading categories and maximum fixing distances

Explanations of tables 14, 15 and 16:

c Fixing leg
b x s cross-section of gutter bracket
* for dimensioning see Table 16
** tested according to DIN EN 1462

Note:
Installation of roof gutters is either horizontal or with an incline, depending on specifications or as agreed with the customer.

5.2.3 Expansion elements for bracket-mounted eaves gutters

Eaves gutter, bracket-mounted	Nominal size	Max. distance (m) Expansion element
Halfround* and box-type*	≤ 500 > 500	15.0 10.0
Eaves gutter/on roof gutter	≥ 400	8.0
Custom shape	≤ 500	8.0

Table17: installation of expansion elements for bracket-mounted eaves gutters
** according to DIN EN 612*

Note:
As a rule, half the distance should be allowed for fixed points (corners and connections, etc.)
When installing cylindrical gutter connectors (soldering), thermal expansion of the eaves gutters due to changes in temperature, is not guaranteed.

Dia. 22 (right side):
Example: Layout of expansion elements for a RHEINZINK-roof drainage system (nominal size ≤ 500 mm), halfround or box-type according to DIN EN 612 on an L-shaped building (bracket-mounted system, dimensions in m).

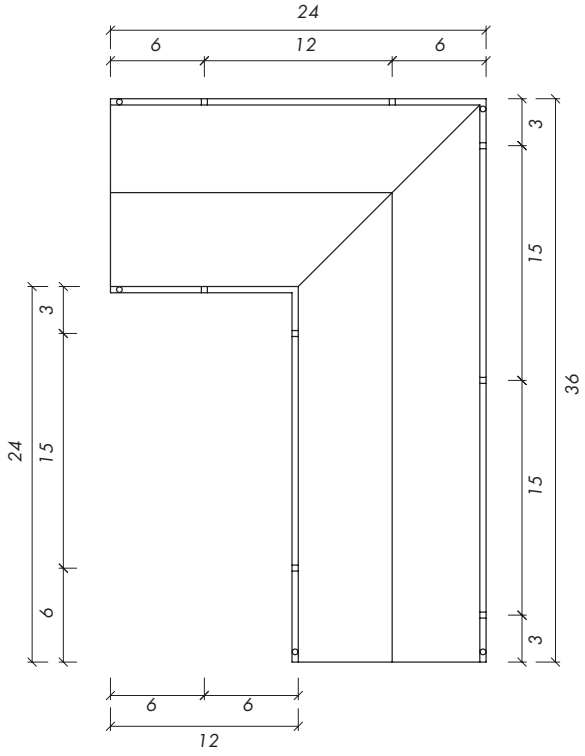

24
6
12
6
3
15
15
3
36
24
3
15
6
6
6
12

Fig. 28: RHEINZINK-Roof Drainage System, complete and precision-fitted – 30 years guarantee

5.3 Eaves gutter accessories

We strongly recommend that all roof drainage components are used from one system – the RHEINZINK-Roof Drainage System, identified by the RHEINZINK-stamp.

Installation products from various sources can cause installation problems and differences in colour during patination.

5.4 Rainwater downpipes according to DIN EN 612

RHEINZINK-Rainwater Downpipes, round and box-type, with additional requirements comply with DIN EN 612. For circular rainwater downpipes, we recommend the high frequency welded (Patent) seam design for reasons of aesthetics and strength.

Each length of pipe is expanded at one end to form a 50 mm long socket. This is done at the plant.

Round diameter (mm), high frequency welded	Square edge length (mm), soldered inside	Material thickness (mm)
≤ 100	< 100	≥ 0.65
> 100	≥ 100, < 120	≥ 0.70
	≥ 120	≥ 0.80

Table 18: Material thickness depends on the diameter or square edge length of rainwater downpipe. Excerpt from DIN EN 612.

Note:

- The standard pipe length of round rainwater downpipes is 2 m and 3 m; other lengths are available upon request.
  The standard pipe length of square rainwater downpipes is 2 m.

Benefits of RHEINZINK-Rainwater Downpipes compared with conventionally manufactured rainwater downpipes:

- Remaining lengths can easily be expanded using the appropriate equipment (e.g. MASC) or can be fitted into each other using the RHEINZINK-Pipe sockets.
- Strength of weld is approximately equal to strength of material
- 100 % recyclable
- Linear, minor dimensional deviations

6. RHEINZINK for copings

6.1 Sheet metal work for all copings

Countless profile shapes are required for sheet metal work. All customary flashings can be produced in our regional Service Centres – according to dimensions or sketches.
Standard profiles are in stock. Standard profile length is 3 m; other profile lengths are available upon request.

Applications:
Flashings for
- tile and slate roofing, etc.
- roof sealings (bituminous sheeting, etc.)
- walls, cornices, connection profiles, valleys, box-type gutters, windowsill copings

Material:
- RHEINZINK-bright rolled
- RHEINZINK-"preweathered pro blue-grey"
- RHEINZINK-"preweathered pro graphite-grey"

Fig. 29: RHEINZINK-flashing profiles

Fig. 30: RHEINZINK-flashing as a wall coping

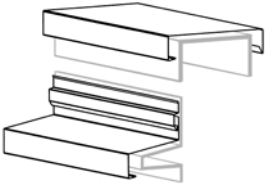


Fig. 24.1: RHEINZINK-detail copings for roof edge

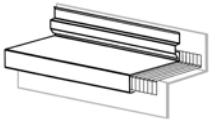


Fig. 24.2: Joint detail for cornice coping with flashing strip and UDS-connector

Profile	Design/ application	Nom. size mm	Material thickness mm	
			RHEINZINK-recommendations	Min. requirements, standards
Wall-, cornice-, base-, roof edge termination profiles	with cont. cleats [5]	≤ 400 > 400 > 600	0.70 0.80 1.00	0.70
	glued [1]	≤ 400 > 400	0.80 1.00	0.70
Windowsill copings	with cont. cleats [5]	≤ 600 > 600	0.80 [2] 1.00	0.70
	glued [1]	≤ 400 > 400	0.80 [2] 1.00	[3]
Valleys [4]	for all roofing materials	≤ 400 > 400 > 800	0.70 0.80 1.00	0.70
Eaves flashings	for roof coverings (tiles, slate, etc.)	≤ 400 > 400	0.70 0.80	0.70
	for RHEINZINK-roof coverings/ wall claddings	≥ 167	0.80	[3]

Table 19: Material thickness in relation to nominal size (girth); RHEINZINK-recommendations, applicable standards and/or regulations.

Comments pertaining to Table 19:

1 Manufacturers' guidelines (Enke) should be taken into account regarding material thickness. Additional continuous cleats should be installed, particularly in the case of large overhangs and vertical legs at or above 50 mm (see Tab. 9).

2 1.0 mm material thickness is preferable (linearity, aesthetics).

3 No specifications in building codes.

4 Full-surface support is required.

5 Continuous cleats made of galvanized steel ≥ 1.0 mm.

Fig. 31: Attic – cornice copings

Note:
RHEINZINK-recommendations with respect to material thickness should be complied with for reasons of linearity and aesthetics. All flashings should be fastened indirectly. Avoid direct fastening.

6.2 Jointing techniques

Jointing of individual RHEINZINK-flashings depends on the required water tightness for the specific design detail.

Jointing technique	Pitch (incline) longitudinally	Comment
Soft soldering	unlimited	Expansion elements required for profile lengths of ≥ 3 m
Single seam with additional continuous soldered cleat	≥ 10°	see Dia. 8.2
Single seam	≥ 25° [1)]	see Dia. 8.3
Overlap	≥ 15°	valleys, etc. (tile roofing), avoid using on metal roof coverings

Jointing technique	Pitch (incline) horizontally	Comment
RHEINZINK-UDS-connector, single seam, flat expansion joint	≥ 3°	0° pitch (formation of zinc hydroxide due to formation of puddles = only affects appearance, joint connection through soft soldering

Note:
Where there is no incline, the pools of water on the surface will result in zinc hydroxide (this does not affect service life or durability, only aesthetics).

RHEINZINK-recommendation:
due to various watertight jointing techniques, a minimum pitch of 3° in a cross-wise direction (wherever possible, to the roof), is recommended.

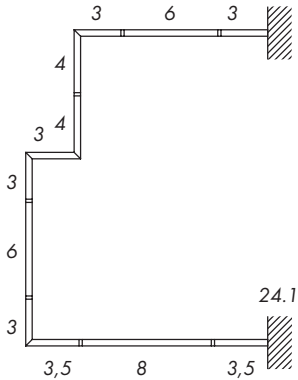
Avoid using standing seams as profile joints, or restrict panel length to 1.0 m.

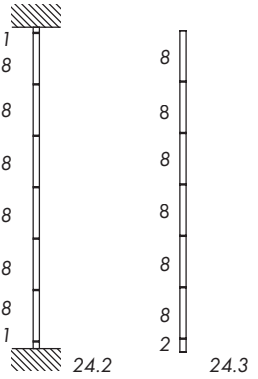
RHEINZINK-UDS-connectors can be installed for all flashings.

6.3 Design of flashing joints to accommodate expansion

The installation of expansion elements is necessary for soft-soldered connections.

Types of design:
- commercially manufactured expansion elements
- flat expansion joints
- single seam with/without additional continuous soldered cleat
- joint connections using RHEINZINK-UDS-connectors





Examples of three design variations: layout of expansion elements for a wall coping made of RHEINZINK, nominal size/girth 600 mm.

Note:
As a rule, half the distance is always required for fixed points (corners, connections, etc.) (see Tab. 21).

Dia. 24.1:
With a total flashing length of 50 m with 2 wall connections and 4 corners to the building, 7 expansion elements are required.
Dia. 24.2:
For the same flashing length with 2 wall connections, 7 expansion elements are also required.
Dia. 24.3:
For the same flashing length without wall connections, only 6 expansion elements are required.

7. Spacing of expansion elements for roof gutters and flashings

Eaves gutters, flashing profiles	Nominal size/girth	max. distance of expansion elements (m)	Regulations/recommendations
Bracket-mounted gutters	≤ 500	15.0	ZVSHK regulations [Central Association for Plumbing, Heating and Air Conditioning], ZVDH [Central Association of German Roofers]
Special shape gutters: quarter eave	≤ 500	15.0	DK-STANDARD
Roof eaves gutters	≥ 400	8.0	RHEINZINK-recommendation
Edge gutter	> 500	8.0	Ö-STANDARD
Interior eaves gutters, round, box-type	≥ 500 < 500	8.0 10.0	Professional regulations
Shed roof gutters	> 800	6.0	RHEINZINK-recommendation
Flashing profiles, glued on or fastened indirectly	all nom. sizes	8.0	Professional regulations
Flashing profiles, glued (roof sheeting)	all nom. sizes	6.0	Professional regulations

Note:
Half the distance should always be maintained for fixed points (corners, connections, etc.). The prescribed guidelines can be exceeded slightly.

8.0 Standards/guidelines

Excerpt from important standards and guidelines, which are also applicable to Germany: National Building Codes; Trade Code for Metal Roofers (ZVSHK, ZVDH);

DIN 1055	Action on structures
DIN 1986	Drainage systems in private ground;
DIN 4102	Fire behaviour of building materials and components;
DIN 4108	Thermal Insulation in buildings; En EV
DIN 4109	Sound insulation in buildings;
DIN 4426	Safety requirements for workplaces and accesses
DIN 18195	Water-proofing of buildings
DIN 18299	General technical contractual conditions
DIN 18334	Carpentry and timber construction works;
DIN 18338	Roofing and roof sealing;
DIN 18339	Sheet metal works;
DIN 68800	Protection of timber in buildings;
DIN EN 13859	Flexible sheets for waterproofing – Definitions and characteristics of underlays – Underlays for discontinuous roofing
DIN EN 62305	Protection against lightning – Part 3: Physical damage to structures and life hazard (IEC 62305-3 Supplementary sheet 4)

DIN EN 501	Roofing products from metal sheet
DIN EN 516	Prefabricated accessories for roofing – Installations for roof access
DIN EN 517	Prefabricated accessories for roofing – Roof safety hooks
DIN EN 612	Eaves gutters with bead stiffened fronts and rainwater pipes with seamed joints made of metal sheet;
DIN EN 988	Zinc and zinc alloys;
DIN EN 1462	Brackets for eaves gutters
DIN EN 12056-3	Gravity drainage systems inside buildings, etc.
DIN EN 13501	Fire classification of construction products and building elements
DIN EN 13162	Thermal insulation products for buildings – Factory made mineral wool (MW) products
EN ISO 9001	Quality management systems
EN ISO 14001	Enviromental management systems
ENISO 14025	Environmental labels and declarations

This booklet does not include technical data and detailed design information on façades using panel and profile techniques/S-Lock panels and small flat-lock tiles and QUICK STEP®-roofing systems or their flashing profiles. For other comprehensive information, including detailed solutions, please see the following RHEINZINK-publications:

- RHEINZINK – Applications in Architecture, 2nd edition, January 2000
- QUICK STEP® – The RHEINZINK Stepped Roof Planning and Application
- Reveal Panels System technology for façades Design and Application
- Flat-lock Tiles System technology for façades Design and Application
- Horizontal Panels System technology for façades Design and Application
- Solar PV Solar System Solutions for Roofs and Façades Design and Application
- QUICK STEP®-SolarThermie Solar System Solutions for Roofs Design and Application
- Operating Instructions – soft soldering Design and Application
- RHEINZINK-Supply and Service Program
- RHEINZINK-Design Recommendations
- RHEINZINK-Innovations: Product Overview

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NOTES

NOTES

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