

quality with system



EUROPEAN GUIDELINE

for the application of ETICS

CONCEPT

ETHICS

For more than five decades, thermal insulation composite systems have been invaluable aids when it comes to reducing the heating energy requirements of buildings, indeed minimising them almost to zero in recent years. We know from practical experience that there are four pillars on which the success of the system ultimately rests:

1. The quality of the planning
2. The quality of the products
3. The quality of application
4. The importance of the system concept

In order to bring these four aspects together coherently so as to maximise the benefit for the customer – that is to say the investor – the EAE has drawn up this Guideline of Quality in cooperation with the responsible national bodies.

Our aim is that all those with responsibility for the construction work – whether planners, architects, the tradesmen carrying out the work or the investor, that is to say the builder/developer – should refer to this quality guideline as a standard for the level of quality which is to be achieved. All of the illustrations therefore represent selected optimum examples which may, in practice, be subject to variation depending on the system used.

This leads to a tangible benefit for all concerned.

Let us all share the ecological and economical benefits from this, because we can only achieve success with “system-based quality”.

FOREWORD

External thermal insulation composite systems (referred to in the following as ETICS) are suitable for both new builds and old buildings, and improve their energy balance in the long term. However, only correct application guarantees optimum results! The fundamental rules should therefore have already been taken into consideration at the planning stage. These are important prerequisites for a perfect job.

What are ETICS?

Thermal insulation composite systems are used throughout Europe. EOTA, the European Organisation for Technical Approvals, was briefed by the European Commission to draw up a standard European approval guideline, ETAG 004, for ETICS on masonry and concrete substrates. For other applications, guidelines for individual cases, so-called CUAPs (Common Understanding of Assessment Procedure), were drawn up by the EOTA members on a case-by-case basis.

ETICS is the abbreviation for **E**xternal **T**hermal **I**nsulation **C**omposite **S**ystem and is used internationally in this form as standard.

This guideline for planners, awarding authorities, general contractors and installers was drawn up by the members of the EAE. This is an association of well-known European companies, system suppliers and their representatives in this field. Its objective is the reliable, fact-oriented documentation of the possible applications for ETICS. Existing technical rules and decades of experience are brought together in clearly understandable form in this application guideline.

This makes available proven solutions which help increase the value of any building if they are collectively implemented by all those involved in the construction work.

Note: All framework conditions, not only those directly affecting ETICS, but also those which are necessary as a basis or prerequisite according to the applicable national requirements, must be fulfilled by the valid national standards and regulations. The nationally specific requirements and regulations must be taken into consideration in addition to this European guideline.

This application guideline primarily deals with systems using insulation materials of the EPS and MW product types.

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1. INTRODUCTION

In terms of the functionality of a building, the key criteria defined by the European Commission include, above all, energy-saving performance and thermal insulation as well as safety in use, but also durability. This in turn requires that the components in the system are perfectly matched, which also requires professional planning and execution.

ETICS primarily fulfil the functions of thermal insulation and protecting the building against the influences of weather, but are not responsible for making the external wall airtight. This is ensured by the wall structure itself, or through corresponding construction measures in the case of installed fixtures. The functionality of the building is guaranteed through the harmonised planning and installation of all substances, materials and products used. The transition between the individual sections of work must be defined beforehand, e.g. ETICS – windows/door frame, ETICS – perimeter area, etc. ETAG 004 describes ETICS as a set of construction elements consisting of certain (specified) prefabricated components.

These system components are:

- adhesive
- insulation material
- anchors (if required)
- base coat
- reinforcement (glass fibre mesh)
- finishing coat / top coat with system primer and/or paint coating
- accessories, e.g. fabric corner strips, connection and edge profiles, expansion joint profiles, base profiles, etc.

According to the valid European Construction Products Directive, all suppliers (system suppliers and/or dealers) are obliged to supply complete ETICS approved in accordance with ETAG 004 or corresponding CUAPs, and carrying the CE symbol.

The relevant national standards and regulations of the member state in question apply to planning and installation.

Specialist installers of ETICS are obliged:

- to check products delivered to the construction site to confirm that they belong to the system. The system components must be marked accordingly (manufacturer's specifications). This marking is applied to the building product itself, to its packaging, to the pallet wrapping or the accompanying paperwork.
- to apply these in accordance with the state of the art, unless otherwise stipulated by the system supplier.

Definition of terms (description of performance classes)

In recent years, greater thicknesses of insulation material (insulation material thicknesses > 200 mm) have increasingly gained in importance. Fundamentally, the application of ETICS with greater insulation material thicknesses does not differ from that of smaller insulation material thicknesses. Although they are primarily used in new builds constructed on the low-energy house or passive house principle, greater insulation material thicknesses are being used increasingly often for thermal renovation. In this guideline, detailed solutions are presented, by way of example, which simplify both the planning and the application of ETICS and increase the reliability of the system.

Thermal renovation

Thermal renovation involves measures intended to improve the energy balance of a building. ETICS help significantly reduce heating costs as well as greatly improving living comfort. In addition, in this application ETICS are also used to renovate the possibly defective fabric of the building, instead of pure rendering or coating solutions. Moreover, due to the improved thermal insulation, ETICS also improve hygienic standards in the interior of the building and help prevent the formation of mildew.

2. BASIS

ETICS

This application guideline refers to the international guidelines and standards valid at the time of publication and primarily deals with insulation materials of the EPS and MW product types:

ETAG 004 Guideline for European technical approval for external thermal insulation composite systems with rendering

ETAG 014 Guideline for European technical approval for plastic anchors for thermal insulation composite systems

EN 13162 Thermal insulation materials for buildings – factory-made mineral wool (MW) products - specification

EN 13163 Thermal insulation materials for buildings – factory-made expanded polystyrene (EPS) products - specification

All national standards and all national application guidelines apply in addition to this [Guideline of Quality](#)

ETICS

3. GENERAL ADVICE AND PRELIMINARY REMARKS

Proper organisation of the construction site also includes the correct storage of all system components of the ETICS. Throughout the entire application, drying and hardening phase, the ambient, substrate and material temperature must be at least + 5°C (in the case of some silicate renders, at least + 7°C). Unfavourable weather conditions, such as temperatures of above + 30°C, wind and direct exposure to the sun can also affect the application properties. In this case, additional measures must be taken, for example shading by means of appropriate scaffolding nets.

It should also be ensured that only cold mixing water is used (drinking water quality). In summer, no water which has, for example, been heated up in the water hose may be used. Warmed water may be used on building sites operating in autumn and spring. (max. 30°C). The weather conditions (e.g. rain or fog) should not be allowed to have a negative influence on drying and hardening.

When planning and inviting tenders for ETICS, it should also be ensured that:

- the proposed ETICS is fundamentally suitable in terms of thermal insulation and vapour diffusion properties (e.g. adequate reveal insulation),
- the fire protection requirements of the applicable national regulations are taken into consideration,
- information is provided on the terrain in the vicinity of the building for the anchoring,
- all connections and edges as well as penetrations and structural details are planned in such a way that clear specifications on execution are provided,
- connections and edges which are permanently proof against driving rain can be manufactured in order to ensure protection of the ETICS against penetration of moisture,
- fixings for awnings, hand rails, window shutters etc. are planned in such a way that force-fitting installation without the formation of heat bridges is possible.

The laying of the ETICS may only be commenced once:

- all installations in the substrate have been laid and the resulting openings carefully sealed. The laying of installations in the ETICS is not permitted, with the exception of necessary penetrations (e.g. cables to external lighting fixtures),
- all joints and slits in the substrate have been carefully sealed,
- all surfaces which are not to be coated, such as glass, wood, aluminium, window ledges, drainage tiles etc. are protected by means of corresponding coverings,
- the substrate shows no visible signs of damp,
- interior plasters and screeds have been installed and are largely dry. Adequate ventilation must be ensured,
- all horizontal surfaces such as parapets, coping, cornices etc. have been provided with suitable coverings, in order to avoid any penetration of moisture into the ETICS during and after installation,
- clear installation specifications have been provided for all connections and edges and detail structures,
- penetrations have been planned in such a way that it can be ensured that connections and edges are permanently proof against driving rain,
- the substrate has been inspected for suitability and appropriate measures taken where necessary,
- in the case of old buildings, the causes of rising damp, efflorescence and similar problems have been remedied and the masonry has dried out sufficiently.

Neither the adhesive mortar, the base coat, the primer nor the finishing coat or any paint coatings required by the system may be mixed with non-system additives (frost protection agents and similar).

Where scaffolding is used, it must be ensured that the length of the scaffolding anchors is matched to the system thickness in such a way that the distance from the wall surfaces (working space) is adequately guaranteed (regulations on safety at work must be complied with!) and that no water can penetrate along these anchors (drill obliquely upwards).

Suitable scaffolding nets should be provided in order to protect the facade, the substrate and the individual layers against external weather influences (sun, wind, rain).

Deviation from the above limit values, in either direction, is permissible where special manufacturer-specific system products are used.

Dimensional tolerances

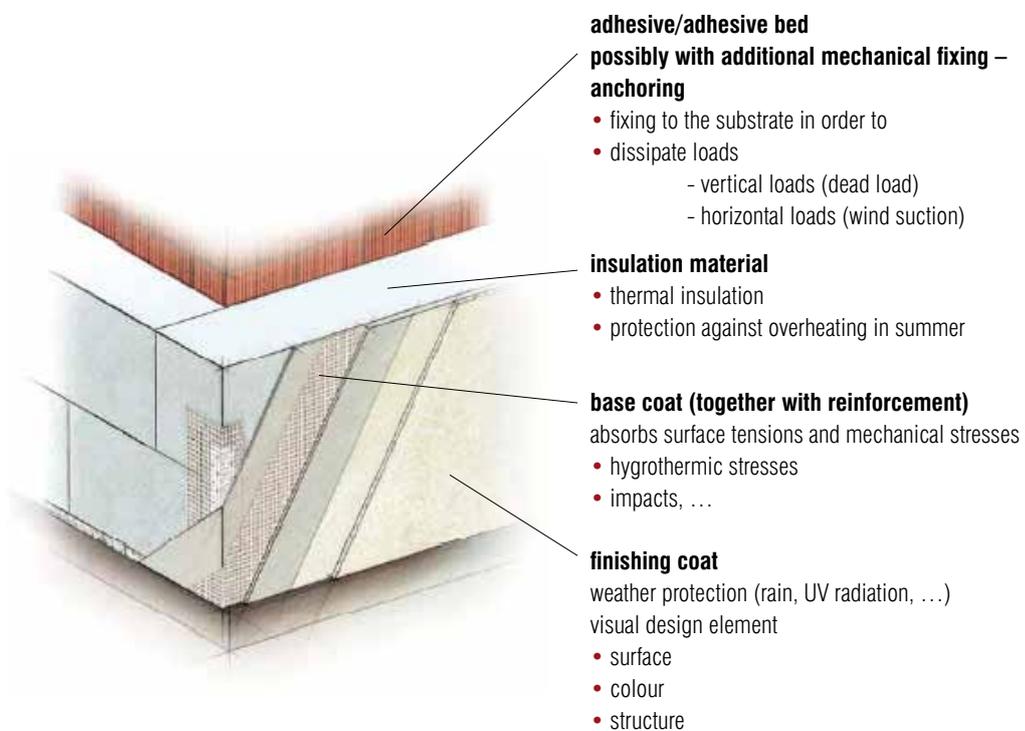
Unevenness/dimensional tolerances of the wall structure which is to be insulated are governed in the national regulations. Suitable individual measures and advice on execution can be found in the section "Preparation of the substrate".

Training

In the section setting forth the criteria according to which the serviceability of an ETICS is to be assessed, ETAG 004 also demands that installation be carried out by trained installation firms.

4. SYSTEM STRUCTURE

(COMPONENTS)



Basically, ETICS consist of the components defined in the following.

4.1 FIXING

The fixing of ETICS is defined as follows in ETAG 004:

From the design point of view, ETICS are differentiated according to the methods of fixing:

Bonded system:

- Purely bonded systems.
Systems may be fully bonded (over the entire surface) or partially bonded in strips and/or dabs.
- Bonded systems with supplementary mechanical fixings.
The load is totally distributed by the bonding layer. The mechanical fixings are used primarily to provide stability until the adhesive has dried and act as a temporary connection to avoid the risk of detachment. They can also provide stability in case of fire.

Mechanically fixed system:

- Mechanically fixed systems with supplementary adhesive.
The load is totally distributed by the mechanical fixings. The adhesive is used primarily to ensure the flatness of the installed system.
- Purely mechanically fixed systems.
The systems are secured to the wall by mechanical fixings only.

Note: The specifications in section Anchoring the insulation panels, page 38 and the applicable national regulations of the member state in question apply to the fixing of the ETICS (number of anchors and anchoring pattern).

4.2 INSULATION MATERIAL

The most commonly used insulation materials at present are expanded polystyrene (EPS in accordance with EN 13163) and mineral wool (MW in accordance with EN 13162). Expanded polystyrene and extruded polystyrene (in accordance with EN 13164) are used in areas exposed to splashed water.

4.3 RENDER SYSTEM

This consists of the reinforced base coat (= base coat with reinforcement embedded in it), the system primer, the finishing coat and system-compatible paint coatings.

5. NATIONAL BUILDING LAW REQUIREMENTS

To date, the harmonisation process on a European level has not yet been completed. Therefore, in supplementation of the European Construction Products Directive (CPD), the respective nationally-specific building law must ensure implementation of the 6 Essential Requirements (ERs). The 6 Essential Requirements apply to the construction works in question as a whole; the individual works, in our case ETICS, are also considered in this context. The Essential Requirements govern the following areas:

1. MECHANICAL RESISTANCE AND STABILITY

The construction works must be designed and built in such a way that the loadings that are liable to act on it during its construction and use will not lead to any of the following:

- collapse of the whole or part of the work;
- major deformations to an inadmissible degree;
- damage to other parts of the works or to fittings or installed equipment as a result of major deformation of the load-bearing construction;
- damage by an event to an extent disproportionate to the original cause

2. SAFETY IN CASE OF FIRE

The construction works must be designed and built in such a way that in the event of an outbreak of fire:

- the load-bearing capacity of the construction can be assumed for a specific period of time,
- the generation and spread of fire and smoke within the works are limited.
- the spread of the fire to neighbouring construction works is limited,
- occupants can leave the works or be rescued by other means.
- the safety of rescue teams is taken into consideration.

3. HYGIENE, HEALTH AND THE ENVIRONMENT

The construction work must be designed and built in such a way that it will not be a threat to the hygiene or health of the occupants or neighbours, in particular as a result of any of the following:

- the giving-off of toxic gas,
- the presence of dangerous particles or gases in the air.
- the emission of dangerous radiation
- pollution or poisoning of the water or soil,
- faulty elimination of waste water, smoke, solid or liquid wastes,
- the presence of damp in parts of the works or on surfaces within the works.

4. SAFETY IN USE

The construction work must be designed and built in such a way that it does not present unacceptable risks of accidents in service or in operation such as slipping, falling, collision, burns, electrocution, injury from explosion.

5. PROTECTION AGAINST NOISE

The construction work must be designed and built in such a way that noise perceived by the occupants or people nearby is kept down to a level that will not threaten their health and will allow them to sleep, rest and work in satisfactory conditions.

6. ENERGY ECONOMY AND HEAT RETENTION

The construction work and its heating, cooling and ventilation installations must be designed and built in such a way that the amount of energy required in use shall be low, having regard to the climatic conditions of the location and the occupants.

6. COMPLIANCE

WITH STANDARDS AND MANUFACTURER'S SPECIFICATIONS

European Technical Approvals (ETAs) are issued exclusively in relation to systems. This obliges all involved in the construction work to adhere absolutely to the system. The individual components of the system are described in the relevant ETA under point 2. If this obligation is breached, the ETICS loses its approval under building law. This also has significant effects on any existing guarantee claims.

7. SUBSTRATE

– TESTING AND PREPARATION

7.1 UNRENDERED, AS-NEW SUBSTRATES

The following substrates are suitable for the application of an ETICS:

- aerated concrete in accordance with EN 771-4,
- brick and vertically perforated brick in accordance with EN 771-1 und EN 771-3,
- cavity and solid breezeblock in accordance with EN 771-3,
- normal concrete in accordance with EN 206-1,
- lining concrete made of cement-bonded woodchip concrete lining blocks with or without integrated additional insulation in accordance with EN 15498

The installer can assume that these substrates were manufactured according to the recognised technical rules and are therefore suitable, in principle, for the application of the insulation panels. Nevertheless, before commencing work they must verify for themselves the actual condition of the substrate. Simple methods usual within the industry are described in section Substrate – testing and preparation, page 21 to 25.

7.2 OLD BUILDINGS AND/OR EXISTING RENDERED SUBSTRATES

In this case, checking of the substrate onto which the ETICS is to be applied, as well as preparation of the substrate, is of crucial importance.

The pre-treatments of the substrate which may be necessary are described in section Substrate – testing and preparation, page 21 to 25.

On these substrates, all types of ETICS must be bonded and in addition mechanically fixed.

7.3 WOOD SUBSTRATES AND LIGHTWEIGHT BUILDING BOARDS

These substrates include a wide variety of different products.

The important consideration with all of them is that they should be protected against moisture:

- since moisture can cause these substrates to swell,
- since the inherent strength of these substrates can be reduced,
- since movements of these substrates can occur, causing damage.

Suitable substrates are:

- wood-based panels for external use in accordance with EN 13986, excepting porous panels in accordance with EN 13986, section 3.7.3,
- other wood-based materials or panel materials (e.g. gypsum fibreboard), according to the system supplier's proofs of suitability.

7.4 OTHER SUBSTRATES

In the case of other substrates, their suitability for the ETICS (load-bearing capacity: structural analysis, building physics: no harmful condensate) must be proven.

7.5 TESTS

Generally valid methods of testing the substrate for its suitability for the application of ETICS include:

- visual inspection in order to assess the nature and quality of the substrate and, in particular, the dampness of the substrate, the risk of penetration of moisture into the ETICS and in order to identify any cracks in the substrate.
- Wipe test with the flat of the hand or a dark cloth in order to check for freedom from dust, harmful efflorescence or chalky old coatings.
- Scratch or score test using a hard pointed object in order to test strength and load-bearing capacity (e.g. cross-cut test, adhesive tape test).
- Wetting test using a paint brush or spray bottle in order to test the absorptive capacity and dampness of the substrate.
- On-site assessment of the dampness of the substrate (see visual inspection)
- Evenness test; if the national dimensional tolerances on the construction work are exceeded, suitable evening measures must be carried out in order to produce a load-bearing substrate suitable for the application of adhesives.
- Tear test: in coated substrates, a piece of reinforcement (glass fibre mesh) measuring at least 30 cm x 30 cm must be bedded-in using the proposed system adhesive. On being torn off after three days, only the reinforcement may become detached.
- Extraction of the anchor from the substrate in accordance with ETAG 014, Annex D, where no more specific national requirements exist.

These tests are carried out at several different points on each facade elevation chosen at random.

7.6 PRE-TREATMENT OF THE SUBSTRATE

7.6.1 MEASURES TO BE CARRIED OUT ON UNRENDERED MASONRY

Substrate		
Type	Condition	Measures
Masonry constructed of: <ul style="list-style-type: none"> • brickwork • concrete blocks • aerated concrete blocks 	Dusty	Brush off, Hydroblast, allow to dry
	Mortar residues and burrs	Chip off
	Irregularities, cavities	Smooth over with suitable mortar in a separate working step (observe drying times)
	Damp ¹	Allow to dry
	Efflorescence ²	Dry scrub and brush off
	Brittle, unstable	Chip off, replace, line (observe drying times)
	Dirty, greasy	Hydroblast ² with suitable cleaning agents, rinse off with clear water, allow to dry

Table 1

¹ in the case of rising damp, remedy causes

² max. 200 bar

7.6.2 MEASURES TO BE CARRIED OUT ON CONCRETE
(DUSTY, JOINTS OVER 5 MM)

Substrate		
Type	Condition	Measures
Walls constructed of: <ul style="list-style-type: none"> • in situ concrete • prefabricated concrete elements • lining concrete 	Dusty	Brush off, Hydroblast, allow to dry
	Sinter layer	Grind and brush
	Formwork oil residues and other releasing agents	Hydroblast ² with suitable cleaning agents, rinse off with clear water, allow to dry
	Efflorescence ¹	Dry scrub and brush off
	Dirty, greasy	Hydroblast ² with suitable cleaning agents, rinse off with clear water, allow to dry
	Mortar residues and burrs	Chip off
	Irregularities, cavities	Smooth over with suitable mortar in a separate working step (observe drying times)
	Brittle, unstable, damp ¹	Chip off, replace, (observe hardening times), allow to dry
	Lack of bond between lining slabs or bricks with the core concrete	Create a stable substrate through bonding and/or anchoring before application of the ETICS
Gaping cracks over 5 mm wide between lining slabs or bricks	Point cracks with cement mortar, joints filled with installation foam should be scraped out beforehand	

Table 2

¹ in the case of rising damp, remedy causes

² max. 200 bar

7.6.3 MEASURES TO BE CARRIED OUT ON MINERAL-BONDED OLD PAINTWORK AND RENDERING

Substrate		
Type	Condition	Measures
Mineral paints	Dusty	Brush off, Hydroblast, allow to dry
	Dirty, greasy	Hydroblast ² with suitable cleaning agents, rinse off with clear water, allow to dry
	Flaking, chalky	Brush off, scrub, hydroblast ² with clear water, allow to dry
	Damp ¹	Allow to dry
Whitewash		Should always be removed mechanically
Mineral finishing coats, base coats	Dusty	Brush off, Hydroblast, allow to dry
	Dirty, greasy	Hydroblast ² with suitable cleaning agents, rinse off with clear water, allow to dry
	Brittle, unstable	Chip off, replace, line
	Irregularities, cavities	Smooth over with suitable mortar in a separate working step (observe drying times)
	Efflorescence ¹	Dry scrub and brush off
	Damp ¹	Allow to dry

Table 3

¹ in the case of rising damp, remedy causes

² max. 200 bar

7.6.4 MEASURES TO BE CARRIED OUT ON ORGANICALLY BONDED OLD PAINTWORK AND RENDERING

Substrate		
Type	Condition	Measures
Emulsion paints Synthetic resin renders	Stable	Wash with clear water, allow to dry
	Not stable	Remove mechanically or strip, wash with clear water, allow to dry

Table 4

7.6.5 MEASURES TO BE CARRIED OUT ON WOOD SUBSTRATES AND LIGHTWEIGHT BUILDING BOARDS

Substrate		
Type	Condition	Measures
Wood substrates and lightweight building boards	Dirty, dusty	Brush off
	Cavities	Repair with suitable material incl. appropriate fixing
	Damp	Consult principal
	Lack of bond with substructure	Create a stable substrate through anchoring or screwing before application of the ETICS

Table 5

In the case of wooden structures, consideration should be paid to possible movements (e.g. in the vicinity of floor junctions). If necessary, special precautionary measures must be taken in these areas.

7.6.6 MEASURES TO BE CARRIED OUT ON SUBSTRATES WITH CERAMIC FACINGS

Substrate		
Type	Condition	Measures
Ceramic facings	Dirty, dusty	Brush, wash, allow to dry
	Irregularities, cavities	Remove and fill irregularities and cavities
	No adhesive bond (e.g. on smooth, glazed surfaces)	Create a stable substrate by applying a primer coat
	Irregularities	Level

Table 6

8. CHECKLIST

FOR THE PREVENTION OF ERRORS

This checklist is to be used for the preparation of the construction site and the associated working steps. Each list should be worked through before carrying out the working step in question.

8.1 FABRIC – NEW BUILDINGS/OLD BUILDINGS (EXISTING CONDITION)

8.1.1 QUALITY OF SURFACE

- soiling
- wall structure (concrete, brick, ...)
- mixed masonry
- open mortar joints throughout
- pronounced irregularities (projecting floors and lintels)
- stable wall surface
- unstable wall surface
- painted wall surface
- unpainted wall surface
- cavities
- chalky, sandy surfaces
- lack of cohesion between layers of render and paint coatings
- flush and plumb vertical wall

8.1.2 CRACKS

- settlement cracks
- shear cracks
- cracks in the old building

8.1.3 EFFLORESCENCE

- salts

8.1.4 GROWTHS (MICROORGANISMS)

- algae
- fungi
- other growths

8.1.5 DAMP

- rising damp
- damp penetrating into walls through cracks
- imperfectly sealed wall junctions
- missing covers

8.1.6 CONNECTIONS

- earth
- to uninsulated surfaces
- to other building components
- base
- balconies, loggias and patios
- insulation of door and window reveals
- door and window roller shutter tracks
- building joints
- window sills
- adequate overlap (cornice/window sill)
- light boxes, banners, canopies
- electrical installations
- ventilation grilles
- signage, house numbers,
- gas, water
- awning fixings, washing dryers, etc.
- satellite antennas (parabolic reflectors)
- adequate window sill/cornice overlap
- pipe elements, railings etc. which need to be integrated
- downpipes, lightning conductors,
- water tap points
- light fixtures, switches, sockets
- advertising media
- letterboxes, doorbell system,
- signage

8.2 SUBSTRATE – NEW BUILD/OLD BUILDINGS (EXISTING CONDITION)

8.2.1 PREPARATION

- remove dirt, algae and moss
- remove residues of formwork release oil/sintered skin
- remove mortar residues
- seal open mortar joints
- create flush and plumb vertical surfaces
- allow wall construction materials to dry
- remove/touch up any paint coating/render which is becoming detached
- fill any irregularities

8.2.2 PRIMING

- bond chalky/sandy surfaces
- according to manufacturer's specifications

8.2.3 CONNECTIONS

- execute according to specifications
- coordinate preliminary work with other tradesmen

8.3 PREREQUISITES / WORKING SEQUENCE

8.3.1 PREPARATION

- distance of scaffolding from wall
- drill/seal boreholes for scaffolding anchors
- protection/covering work
- supply: electricity/water
- telephone/toilets
- disposal: residual materials/waste water/toilets
- setting-up and securing of construction site

8.3.2 EQUIPMENT

- drill/stirrer
- mixing and delivery machine
- cutting tool
- general tools

8.3.3 MATERIAL

- ❑ assemble products according to specifications
- ❑ check all components for system compatibility (including accessories)
- ❑ match ETICS accessories to panel thickness, e.g. base connection, anchors, spacers etc.
- ❑ store all components in compliance with regulations
- ❑ disposal of material remnants/containers

8.4 BONDING/FIXING

8.4.1 BASE CONNECTION

- ❑ ensure flush installation
- ❑ protect lower edge of the insulation panel using base connection rail or protect edge by folding over fabric
- ❑ avoid butting of panels and rail, insert connecting pieces, adequate fixing in the join area

8.4.2 BONDING

- ❑ Bead and spot bonding
- ❑ full-surface bonding on suitable substrate
- ❑ apply adhesive so that optimal bonding is achieved, also at the corners
- ❑ avoid butt joints at corners of apertures
- ❑ lay butt joint tight and free of mortar
- ❑ lay plumb and flush

8.4.3 ANCHORING

- ❑ select suitable anchor (pull-out test)
- ❑ select tool depending type of anchor
- ❑ anchoring pattern
- ❑ define peripheral zones according to planner's specifications
- ❑ fix after adhesive compound has hardened
- ❑ number, arrangement and anchoring depth of the anchors according to manufacturer's specifications and legal requirements
- ❑ place anchors flush
- ❑ optional: countersink anchors and seal with insulation material
- ❑ check anchors for solid hold

8.4.4 RAIL FIXING

- ❑ install rails horizontally and plumb
- ❑ anchoring in accordance with proof of structural stability
- ❑ connect spacers solidly to anchoring
- ❑ form corners and connections in accordance with manufacturer's specifications (windows, doors, etc.)
- ❑ apply additional adhesive compound to insulation panels before laying in rail

8.4.5 FIRE PROTECTION

- ❑ select suitable products/systems
- ❑ position of fire protection measures according to planner's specifications (lintel sealing / peripheral seal)

8.5 SUPPLEMENTARY WORKS

8.5.1 MOVEMENT JOINTS

- ❑ should always be incorporated in the system
- ❑ type and dimensioning of the joints according to planner's specifications

8.5.2 CONNECTIONS TO OTHER BUILDING COMPONENTS

- ❑ connection must be resistant to driving rain! Follow manufacturer's instructions!
- execution variants*
- ❑ pre-compressed joint strip
 - ❑ connection strips with integrated fabric
 - ❑ form connection to ventilated roof surfaces in accordance with specifications

8.5.3 PANEL SURFACE

- ❑ remove soiling
- ❑ ensure flat surface of panels
- ❑ sand down projections, corners and edges
- ❑ remove all sanding dust
- ❑ seal open panel joints with insulation material or foam according to manufacturer's specifications
- ❑ sand off surface of polystyrene yellowed through exposure to UV and remove sanding dust

8.5.4 CORNER/EDGE PROTECTION

- ❑ lay plumb and flush

8.5.5 INCREASED RESISTANCE TO IMPACT

- ❑ embed reinforcing fabric in base coat before main reinforcement
- ❑ butt-join reinforcing fabric, do not overlap
- ❑ if two layers of glass fibre mesh are laid, also ensure that overlaps are offset

8.6 BASE COAT

8.6.1 BASE COAT / REINFORCEMENT

- ❑ apply base coat in even layer thickness in accordance with nominal thickness (manufacturer's instructions)
- ❑ embed reinforcement in base coat according to manufacturer's instructions
- ❑ minimum overlap 100 mm
- ❑ embed additional diagonal strips at corners of facade apertures
- ❑ separate connections to other building components with trowel cut
- ❑ install additional accessories before surface reinforcement

8.7 FINISHING COAT

8.7.1 SUBSTRATE (= BASE COAT)

- ❑ only apply further coatings after the base coat has dried/hardened sufficiently
- ❑ mineral base coat must have dried/hardened to an even lightness
- ❑ emulsion-bound base coat must be evenly dried/hardened

8.7.2 FINISHING COAT WITH PRIMER AND PAINT COATING

- ❑ apply primer coat in the same colour as the final coat according to manufacturer's instructions
- ❑ apply final coats of the different types of render according to the general rules of the trade and manufacturer's instructions
- ❑ work wet-on-wet with sufficient personnel to avoid lap marks
- ❑ structure evenly
- ❑ do not work in extreme sunlight and high winds (scaffolding protection net)
- ❑ pay attention to weather conditions (rain, fog, condensation)
- ❑ pay attention to delayed drying at high relative atmospheric humidity
- ❑ minimum air and substrate temperature: + 5°C
- ❑ only use same delivery batch for application and drying of each enclosed surface
- ❑ paint coatings/equalisation colours according to manufacturer's instructions

8.7.3 SPECIAL FACINGS

- ❑ example: flat facing bricks: see manufacturer's instructions

9. REQUIREMENTS FOR THE INSULATION MATERIAL

The insulation material is an important component of the ETICS. Its technical properties and qualitative suitability as a system component are indicated in the Designation Code. The most important values are stated on the accompanying papers (see Figure 1 and Figure 2). The system manufacturer guarantees that these values are complied with.

 05 Firma Muster Styroporstraße 1 A-1111 Wien Tel. 01/234 56 78 Fax 01/234 56 79 www.muster.at Werk 1 Code 123		
Fassadendämmplatte EPS entspricht ÖNORM B 6000 / zertifiziert gemäß ETAG 004		
Brandverhalten Euroklasse E	Wärmedurchlasswiderstand 1,25 m²K/W	Wärmeleitfähigkeit 0,040 W/mK
Länge 1000 mm	Breite 500 mm	Inhalt 10 Stück = 5,00 m²
 EAN-Code		Dicke 50 mm
schweißbar B 1 und nichttropfend Tr 1 gemäß ÖNORM B 3800-1 EPS - EN 13163 - L1 - W2 - T2 - S2 - P4 - DS(N)2 - DS(7)0-J1 - TR150 - BS100		

Figure 1

Deutsche Rockwool Mineralwolle GmbH & Co. OHG 45966 Gladbeck Werk 4					
MW					
Steinwolle - Putzträgerplatte Für Wärme-Dämm-Verbund-System					
Dicke mm	Länge mm	Breite mm	m ²	Kontr. Nr.:	10.02.10 7 1 4
80	800	625	15	Art. Nr.:	0135065
	A1	Euroklasse	R _D	λ _D	
		m ² x K/W	W/m K		
			2,00	0,040	
9672-CFD-1141-01					
MW-EN 13162-T5-DS(T)-CS(1)40-TR15-WUP-MU1 WAP-ab					
Mineralwolle Putzträgerplatte gem. DIN V 4106-10 und Qualitätsrichtlinie des Fachverbandes WDVS			Bauprodukt geprüft nicht		
nicht für Trittschalldämmung					
ÖSTERREICH, Produktart MW-PT					
					
ARA-Liste 01 Nr. 7238			10 Pakete / PALETTE		

Figure 2

10. SYSTEM SUPERSTRUCTURE

10.1 MIXING AND APPLYING THE ADHESIVE MORTAR

The manufacturer's instructions (labelling on container, technical leaflets, safety data sheets) should be followed when mixing the adhesive mortar. This also applies to paste-formed adhesives in which the manufacturer stipulates the addition of cement. The adhesive mortar can be applied by hand or by machine. It should be ensured that:

- no air can circulate between the insulation panel and substrate (otherwise this can lead to a stack effect),
- the panel is bonded evenly to the substrate across its surface (otherwise this can lead to a pillow or mattress effect, see Figure 3).

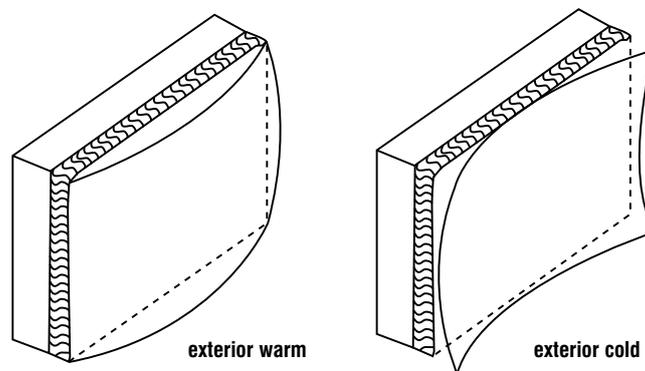


Figure 3

The adhesive can also be applied using the bead/spot method (Figure 4) or over the entire surface (Figure 5).

10.1.1 BEAD/SPOT METHOD

A border of adhesive around the circumference (bead) and 3 spots of adhesive in the middle of the panel are applied in such a way that, after the insulation panel has been pressed into place, and taking into account the permissible substrate tolerances, a minimum adhesive surface area of 40 % is achieved (in accordance with structural analysis).

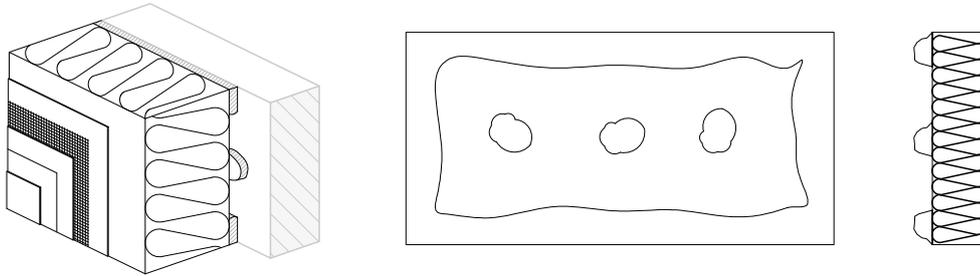


Figure 4

10.1.2 FULL-SURFACE APPLICATION

The adhesive can be applied to the insulation panel using a notched trowel (notching dependent on the evenness of the substrate).

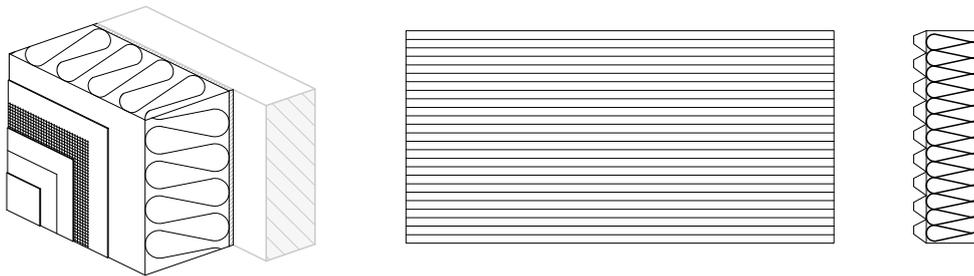


Figure 5

If the adhesive is applied by machine, it is applied to the insulation panel.

10.1.3 PANEL-SPECIFIC APPLICATION OF ADHESIVE

Expanded polystyrene (EPS)

Bead/spot method or over the entire surface of the panel.

Mineral wool (MW)

Bead/spot method or over the entire surface on the uncoated side of the panel

Mineral wool laminate (MW laminate)

over the entire surface of the panel

Note: In order to improve the adhesion of the adhesive, the adhesive is first spread under pressure in a thin layer on the uncoated side of the MW insulation panels, with the actual application of the adhesive following immediately afterwards.

10.1.4 LAYING THE TOP ROW OF INSULATION PANELS

In the area of the junction with sloping roof soffits (warm roof) it is recommended that the top row of insulation panels (cut to shape in a bevel at the top) be laid using the floating-buttering method; only afterwards is the row of insulation panels below laid in the conventional way.

In order to avoid a thermal bridge in the area of the junction with the sloping roof soffit, the top row of insulation panels should be adapted accordingly. Laying the panels using the floating-buttering method prevents any stack effect from occurring.

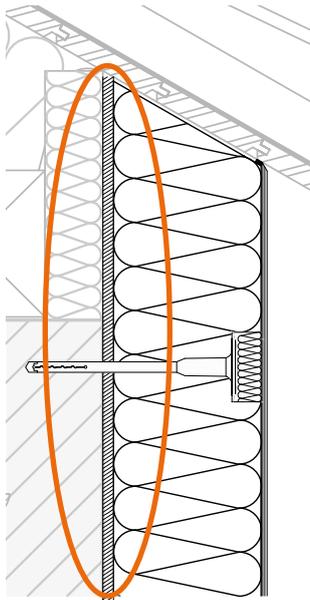


Figure 6

10.2 LAYING THE INSULATION PANELS

10.2.1 BONDING OF THE INSULATION PANELS

The insulation panels should be laid from bottom to top, tightly butted together, to form a flush bond.

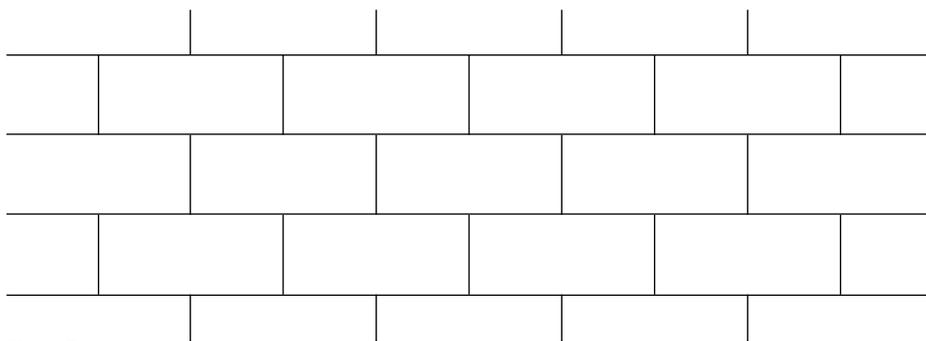


Figure 7

It must be ensured that the insulation panels are laid flat and evenly. As a basic rule, no joints may be created.

Any joints which appear must be filled with insulation material of the same type. If the width of the joint does not allow this, an appropriate foam filler may be used in joints of up to nn^* mm. In both cases, the filling must extend over the full thickness of the insulation material.

On no account may adhesive mortar penetrate into the joints between the insulation panels.

As a basic rule, only whole insulation panels may be laid. Fitting pieces > 150 mm in width of the same insulation material are permitted in isolated cases, but they may only be used on the wall surface and not on corners of buildings. Only “interlocked” whole and half panels may be used here.

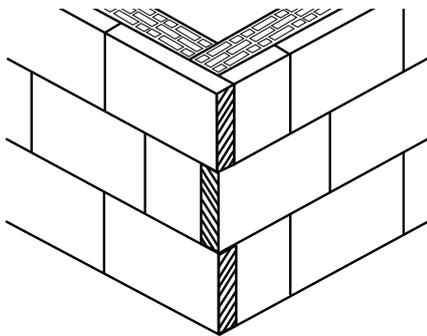


Figure 8

When cutting fitting pieces to size, it should be ensured that they are cut at right angles; suitable tools (e.g. rigid foam cutters) should therefore be used for this purpose.

Damaged panels (e.g. with broken or compressed corners or edges) may not be used.

Panels which project at the edges may only be trimmed once the adhesive has hardened (as a rule in around in 2–3 days, follow manufacturer’s instructions). Insulation panel joints may not extend into the reveal edges of wall apertures.

*Placeholder for national requirement

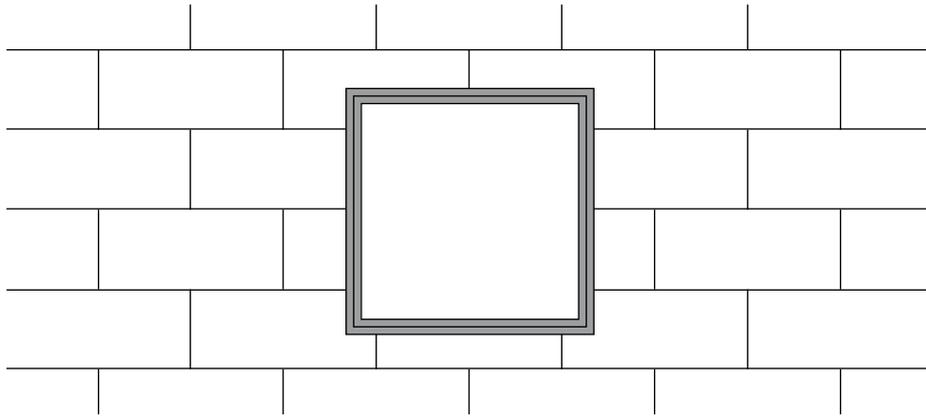


Figure 9

Panel joints may not be created over joints resulting from a change of material in the substrate and butted masonry joints (e.g. cladding) (also where the wall thickness changes and over inactive cracks). The insulation panels must overlap by at least 10 cm. Expansion joints must be incorporated and formed. (execution: see detail drawings 10a and 10b, page 79)

Projecting parts such as roller shutter boxes or face sides of floors should be bridged without a panel joint. The excess insulation material may be cut out of the back of the insulation panels to a residual thickness of at least 30 mm. However, the covering by the insulation material should amount to at least 1/3 of the original thickness of the insulation panel.

When insulating window and door reveals, as well as lintels, the insulation panels on the facade surface must first extend so far beyond the carcass edge of the reveal that the reveal insulation panels can be pressed flush into place – after the adhesive on the insulation panels on the facade has set. Only then should the projecting insulation panels be trimmed. When insulating soffits, the insulation panels on the facade surface must first extend so far beyond the carcass edge that the insulation panels on the soffit can be fixed flush into place – after the adhesive on the insulation panels on the facade has set. Only then should the projecting insulation panels be trimmed (see Figure 17 on page 44).

Note: If, due to delays in the progress of construction work, already-insulated surfaces are exposed to UV radiation for a longer period of time without protection, then the surface should be sanded thoroughly before application of the base coat.

10.2.2 LEVELLING OF IRREGULARITIES IN THE LAID INSULATION PANELS AND PROTECTIVE MEASURES

Since an even thickness of the base coat must be maintained, it must be ensured, through careful laying or subsequent sanding (e.g. EPS), that the surface of the panels is completely even. Otherwise, irregularities are to be evened out by means of the base coat (e.g. MW), whereby this smoothing layer must be allowed sufficient time to dry (follow manufacturer's instructions).

Polystyrene EPS panels

Uneven joints must be sanded down; the resulting sanding dust must be thoroughly removed. The surface of the panels yellows as a result of exposure to UV radiation; the resulting floury substance (yellow) must be completely removed before applying the reinforced base coat (sand and brush down). The reinforced base coat should be applied in accordance with section Base coat, page 43. The nominal render thicknesses in accordance with the manufacturers data's, must be complied with.

Mineral wool MW panels

Uneven joints must be levelled by means of a smoothing layer (base coat mortar) and protected against moisture. The reinforced base coat should be applied in accordance with section Application of the base coat and embedding of the reinforcement, page 45. The nominal render thicknesses in accordance with the manufacturers data's must be complied with.

Note: Definition of floating-buttering method: in the first step, the adhesive mortar is applied vertically to the panel with the notched trowel (at least 10 mm, depending on the substrate). In the second step, the adhesive mortar is applied horizontally to the adhesive substrate with the notched trowel. The insulation panel is then brought into position, with adequate pressure, in sliding movements.

10.3 ANCHORING THE INSULATION PANELS

The substrate must be of such quality or must be prepared in such a way that a permanent bond between the insulation panel and wall structure is guaranteed, either through the bonding or through bonding with additional mechanical fixing. This applies to concrete, brickwork, sand-lime brick, aerated concrete and other unrendered masonry.

Mineral wool insulation panels MW with flat fibres

must always be anchored in addition to bonding.

Mineral wool insulation panels MW with standing fibres

(laminate panels), anchoring can be omitted with full-surface bonding (see above).

Base/ perimeter insulation panels (made of EPS or XPS) must be anchored above ground level in accordance with the regulations for facade insulation panels.

10.3.1 SELECTION OF THE ANCHORS

- The anchors must comply with the requirements of ETAG 014.
- The anchors must be matched to the existing substrate in accordance with the categories for use in accordance with ETAG 014.
- If the existing substrate cannot be clearly classified, anchor-pulling tests should be carried out on the construction site.
- In the case of lining concrete walls, the anchors must be anchored in the core concrete.
- The anchors must comply with the national requirements. In addition, a structural analysis must be carried out.
- The anchors must be selected in such a way that, taking into account any render or mortar filling and the evenness of the anchoring ground, the anchors are adequately resistant to being pulled out of the substrate .
- The plate diameter of the anchors depends on the insulation material used and can differ in dimension (e.g. EPS 60 mm, MW with standing fibres 140 mm)

10.3.2 DRILLING THE ANCHOR HOLES

- Only start drilling after the adhesive has hardened sufficiently (generally 2–3 days).
- Use drill with the diameter stated on the anchor.
- Only use percussion drills or hammer drills on normal concrete and solid brickwork.
- Use the type of drill recommended by the system supplier for vertically perforated bricks, cavity breezeblocks and aerated concrete.
- Penetrate panels made of mineral wool MW with stationary drill.
- Adjust stop for drilling depth = anchor length + 10 to 15 mm.
- If anchors are being set through the reinforced base coat, follow the system supplier's advice (minimum length of the anchor).
- The minimum distance of the anchors from building edges and joins (generally 100 mm) must be observed.

10.3.3 NUMBER OF ANCHORS

The basis for calculating the proof of structural stability is EN 1991-1-4 and its national application documents. The resulting number of anchors depends on the following parameters:

- resistance of the anchor to being pulled out of the substrate
- type and quality of the insulation material (resistance to being pulled through)
- height of the building
- situation of the building
- location of the building
- form of the building

In addition, the marginal zones need to be defined (dimension, number of anchors), these are also covered by the national application documents.

National supplements (added accordingly)

10.3.4 ANCHORING PATTERN

If anchoring is necessary, then an anchor-placement plan should be drawn up before commencing work.

The following diagrams show exemplary variants:

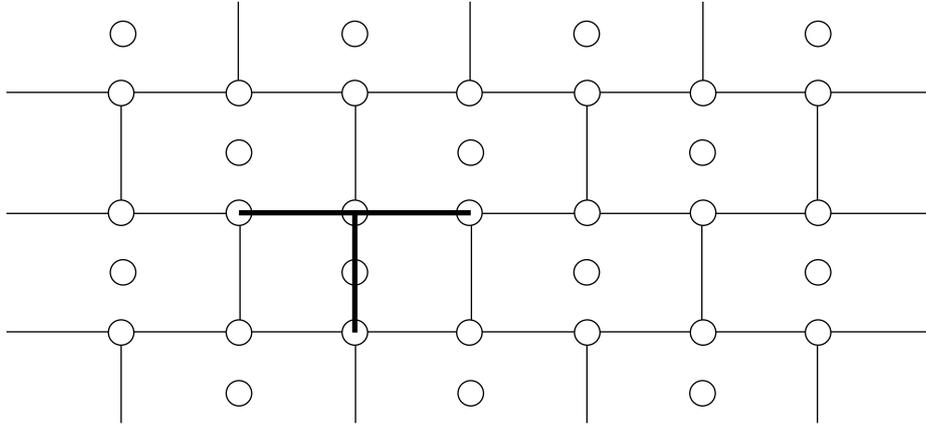


Figure 10
T-pattern

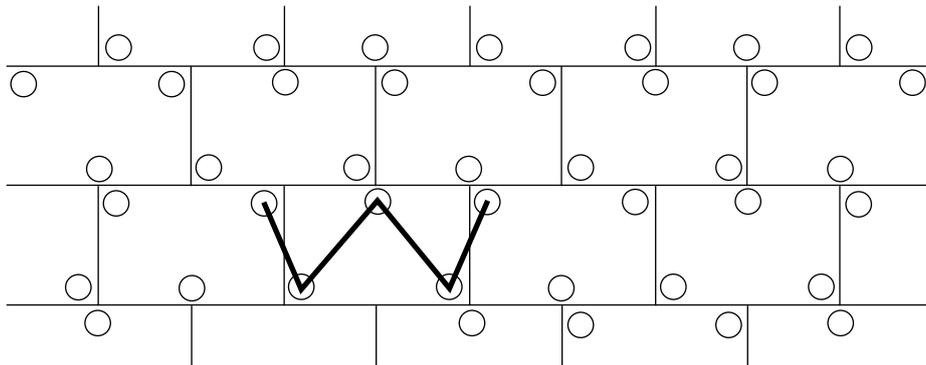


Figure 11
W-pattern

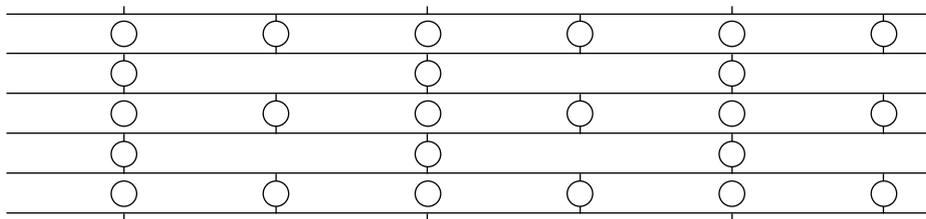


Figure 12
Anchoring for MW with standing fibres

If the ETICS is not, for the present, being continued around an external corner of a building, but ends there, even if surface-anchoring is not necessary, marginal anchoring should be installed here in accordance with section Number of anchors page 40.

If the ETICS is applied to soffits, anchors should be installed in accordance with section Anchoring the insulation panels, page 38.

10.3.5 SETTING THE ANCHORS

The anchors may only be set once the adhesive has set sufficiently.

- The anchors must be applied flush with the surface of the insulation material.*
- Depending on the type of anchor, the expansion element is either hammered or screwed in.
- The anchors must be tested for a solid hold.
- Compressed or loose anchors must be removed.
- A new anchor should be set at the side. The resulting holes should be filled with insulation material/foam filler.

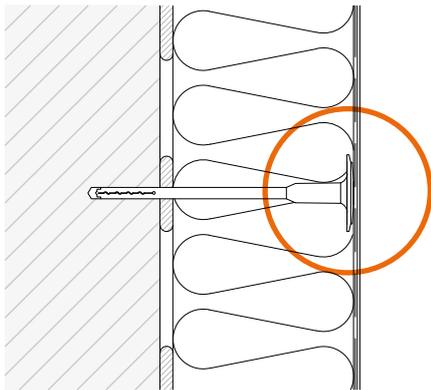


Figure 13

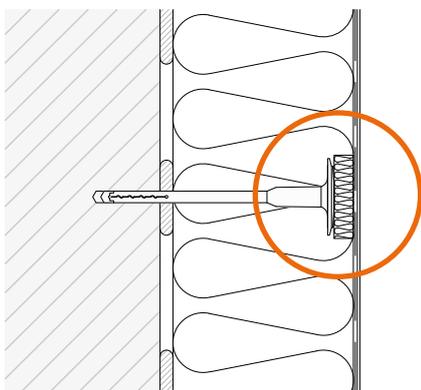


Figure 14

***Note:** This does not apply if the anchor head is countersunk into the insulation material.

10.4 BASE COAT WITH REINFORCEMENT

10.4.1 BASE COAT

Different base coats are available depending on system requirements and on the material of the insulation panels (type of material and material properties).

A distinction is made between thin, medium and thick layered base coats.

If a system with insulation panels of mineral wool is installed, then the drying time between application of the smoothing layer (see section Levelling of irregularities in the laid insulation panels and protective measures, page 38) and the reinforced base coat stipulated by the system manufacturer must be complied with.

10.4.2 MIXING THE BASE COAT

Powder-formed base coats are mixed according to the manufacturer's instructions using only clean, fresh mixing water.

Paste-formed, cement-free base coats must be stirred before use; small quantities of mixing water can be added in order to adjust the consistency (according to manufacturer's instructions).

Paste-formed base coats for which the manufacturer recommends the addition of cement should be mixed according to their instructions.

10.4.3 DIAGONAL REINFORCEMENT

On corners of window and door apertures, diagonal reinforcements are necessary and should be embedded in the base coat before applying the surface reinforcement and should be fixed so that the edge of the strip is applied directly to the corner at an angle of approximately 45°. The dimensions of the reinforcement strips are usually approximately 200 x 300 mm. Prefabricated mesh elements are also permitted.

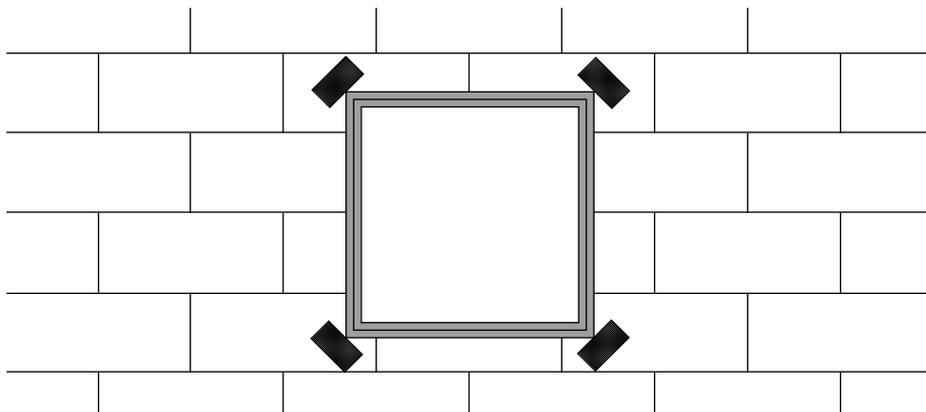


Figure 15

10.4.4 PROTECTION FOR PARTS OF THE FACADE SUBJECTED TO PARTICULAR MECHANICAL LOADS

Reinforcing mesh must be embedded in the base coat, which is applied in a thickness of roughly 2 mm, butt-joined (without overlapping), before the edge protection / corner angle profiles are installed and before the surface reinforcement is applied.

If a second layer of glass fibre mesh is used, it should be ensured that the first layer of mesh is applied without overlapping (butt-joined), but the first layer of base coat has hardened and the second layer of mesh is laid offset so as to overlap.

10.4.5 FORMATION OF EDGES, OUTER AND INNER CORNERS

Where edge protection profiles/corner angle profiles with laminated glass fibre mesh and fabric corner strips are used, the base coat should be applied in the width of the mesh strip in such a way that the edge profile and the mesh strip can be embedded in it. The connection with the surface reinforcement is to be executed with an overlap of at least 10 cm.

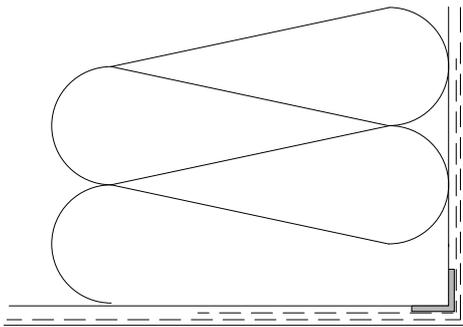


Figure 16

The formation of edges without prefabricated profiles takes place during the installation of the surface reinforcement. For this purpose, the webs of glass fibre mesh on one side are wrapped around the edge by around 200 mm and embedded in the base coat overlapping by at least 100 mm. (Figure 16)

The formation of drip edges (area of transition between facade and soffit) takes place analogously as shown in Figure 17 (vertical section!).

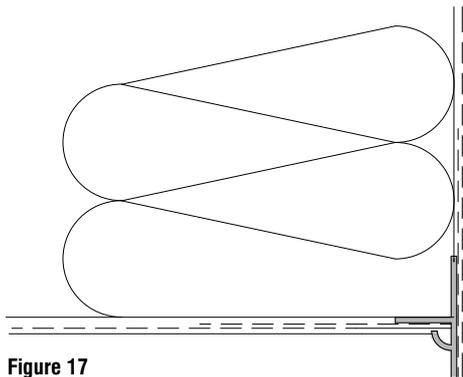


Figure 17

The inner corners can be formed in two ways:

- analogously to the formation of edges with prefabricated profiles,
- analogously to the formation of edges without profile with 100 mm overlap; this is also done at the same time as the surface reinforcement.

Edge protection angles which are used for protection against mechanical damage are applied to the reinforced base coat or to the finishing coat.

10.4.6 APPLICATION OF THE BASE COAT AND EMBEDDING OF THE REINFORCEMENT

First of all, the base coat is applied to the appropriately prepared insulation layer (see section Levelling of irregularities in the laid insulation panels and protective measures, page 38), manually or by machine, in the thickness recommended by the manufacturer.

The glass fibre mesh is embedded in the freshly applied base coat, from top to bottom – either in vertical or in horizontal webs – with an overlap of at least 10 cm, without creases, in the middle or in the outer third of the base coat. In order to ensure an adequate covering, the embedded glass fibre mesh must be coated wet-on-wet with base coat mortar. The glass fibre mesh must be covered with at least 1 mm of base coat mortar, at least 0.5 mm in the area of the overlapping glass fibre mesh.

10.5 FINISHING COAT

After allowing the base coat sufficient time to harden and following application of the system primer (follow manufacturer's instructions!) and given suitable weather conditions (see section General advice and preliminary remarks, page 12) the final coating can be applied. If the finishing coat is applied too soon there is a risk that patches will be created. Different types of finishing coat can be applied depending on the system installed.

A minimum layer thickness of ≥ 1.5 mm for a primarily scraped structure and ≥ 2 mm for a primarily stucco-like structure. In order to achieve the final surface structure, which requires a maximum grain size of the finishing coat of less than 1.5 mm, application in several layers is necessary in order to achieve the required minimum layer thickness.

10.5.1 GENERAL ADVICE ON APPLICATION

Finishing coats are mostly manufactured using natural pigments and granulates. Slight variations in colour tone and structure therefore cannot be excluded. Material from the same batch should therefore be used for each facade surface.

In the case of powder-formed finishing coats, we recommend that the mixed lime-cement mortar be mixed once again in a large container and that one should work from this. As the material is consumed, fresh material can then be added and stirred well again.

The use of sufficient personnel for each scaffolding level avoids visible lap marks. Working swiftly, wet-on-wet, avoids the possible risk of an uneven render surface in terms of colour and structure; interruptions to working on individual surfaces should therefore be avoided. In order to avoid visible lap marks between the scaffolding levels, coatings should be offset. To achieve a coloured finish, the finishing coats can be painted with facade paints matched to these. The lightness coefficient referred to in the following section should be taken into consideration, as well as the drying times for the finishing coat recommended by the system manufacturer.

Since mineral finishing coats largely harden chemically, climatic conditions (atmospheric humidity, temperature) during the hardening phase are of decisive importance to the colour tone quality.

Deviations in colour tone are therefore possible. The system manufacturers therefore recommend a system-compatible equalisation coating.

10.5.2 LIGHTNESS COEFFICIENT (HBW)

The lightness coefficient is a variable for measuring the reflection of the incident daylight (radiation) (white = HBW 100 %; black = HBW 0 %). Minimum HBW values are defined in order to avoid excessive thermal heating of the ETICS. These vary nationally between 20 and 30% (depending on climatic conditions).

10.5.3 APPLICATION OF THE SYSTEM PRIMER

This must be matched to the finishing coat (follow manufacturer's instructions!). If the base coat and finishing coat have the same binding agent basis (synthetic resin based or mineral lime cement based), the primer can be omitted.

Note: With stucco-textured renders it is recommended that the primer be applied in the corresponding colour tone of the finishing coat.

10.5.4 APPLICATION OF THE FINISHING COAT

The finishing coat can be applied manually or by machine, depending on the manufacturer's specifications and the material used.

Whether it is thrown, sprayed or floated on depends on the type of finishing coat used. A wide range of surface effects can be achieved. Depending on the type of render and the desired structure, the surface can be structured using a suitable tool; the manufacturer's application guidelines should be followed.

The required minimum layer thicknesses (see section Finishing coat, page 45), must be complied with.

Note: The finishing coat must be applied from top to bottom.

10.5.5 FINISHING COATS FOR THE BASE AND PERIMETER AREA

After the base coat and system primer have hardened sufficiently, a suitable surface coating and a suitable finishing coat should be applied. For mineral finishing coats, a suitable water-repellent coating should be applied in the base and perimeter area.

In the perimeter area, the finishing coat should be protected against the penetration of moisture through appropriate sealing.

(See section Area coming into contact with the base, splashed water and the earth, page 51)

11. PLANNING

DESIGN DETAILS

A key requirement for the functional, practical, visual and long-lasting success of ETICS is, in addition to compliance with these application guidelines, the proper and professional execution of all connections and edges. This guarantees that the stresses resulting from the influences of weather (sun, wind, rain and snow) and the use of the building (building dynamics, building physics) do not have a disadvantageous effect on the service life of the facade.

All members of the EAE offer well-designed, tested and proven solutions for the system-compatible implementation of edges and connections to the other parts of the construction work, including sophisticated system accessories.

The detail drawings are also available in the formats pdf, dxf, dwg and jpg at www.ea-etics.com.

Before commencing work, the building or the surface of the facade on which the panels will be laid should be horizontally levelled and vertically plumbed. All visible surfaces, including the reveals formed by the insulation panels and the upper and lower edges of the ETICS, are – unless these are enclosed by appropriate profiles – to be covered with a rendering system (reinforced base coat and finishing coat).

The thermal insulation layer must therefore be enclosed to such a degree that it is not exposed to direct moisture penetration, damage through insects and similar or, in the event of a fire, direct exposure to flames.

11.1 CONNECTIONS, EDGES AND PENETRATIONS

All connections to windows, doors and parapets, all roof connections and all building components which penetrate the ETICS (lightning protection installations, drainpipes, switch boxes etc, as well as their fixings) are to be executed with suitable window and door connection profiles or pre-compressed, self-restoring sealing strips.

Only ETICS accessories / products recommended by the system supplier should be used.

11.1.1 WINDOWS AND DOOR CONNECTIONS

Before fitting the connection strips to windows and French windows, particular attention should therefore be paid to the following criteria:

- that connection details have been defined, object-specifically, by the planner
- that the windows and doors have been installed in accordance with the national guidelines (e.g. RAL-compliant installation)
- that a vapour-tight connection required by the planner (“interior more vapour-tight than exterior”) was created by the window installer,
- that the substrate is dry, dust- and grease-free for the bonding of the connection strips,
- that the minimum application temperature of + 5°C (day and night) is complied with.

Correctly executed connection details play a key role in the long-term function of the ETICS. Movements (thermal changes in length) of windows, doors and glazed fixtures require the use of suitable connection elements.

The recommended applications are shown in Table 7.

The table explicitly excludes windows, doors and glazed fixtures fitted flush with the surface of the rendering. Window forms and dimensions which are not included in Table 7 should therefore be defined object-specifically.

Note: Joint sealing materials (acrylic, silicone) are not classed as a connection which is permanently resistant to driving rain. These represent a maintenance joint and must, accordingly, be replaced regularly.

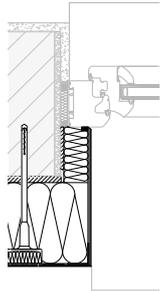
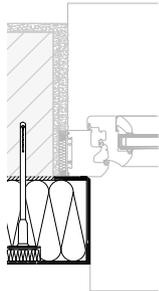
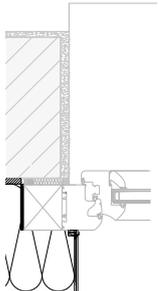
Thickness of the insulation material						
	≤ 2 m ²	2-10 m ²	≤ 2 m ²	2-10 m ²	≤ 2 m ²	2-10 m ²
≤ 100 mm	1 D	2 D	2 D	2 D	2 D	3 D
≤ 160 mm	2 D	2 D	2 D	2 D	3 D	3 D
≤ 300 mm	3 D	3 D	3 D	3 D	3 D	3 D

Table 7

Use of the window and door connection profiles

*) if the height or width of the window exceeds 2.5 m, then Type 3 must always be installed

- 1) window and door connection profile without specially defined movement compensation
- 2) window and door connection profile with two-dimensional movement compensation
- 3) window and door connection profile with three-dimensional movement compensation

11.1.2 WINDOW SILL CONNECTION

Window sills must be installed free of cavities (fill with insulation material).

Depending on the insulation material thickness and the construction of the window sill, this should be installed before application of the ETICS or afterwards. If installed subsequently, it should be ensured that the upper side of the insulation material is protected against the weather.

11.1.3 ROOF CONNECTION

With direct roof connections (warm roof), the insulation panels should be installed in such a way that as fewer cavities as possible result, and pre-compressed, self-restoring sealing strips should be installed.

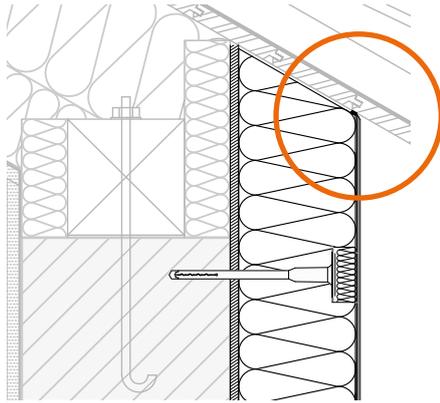


Figure 18

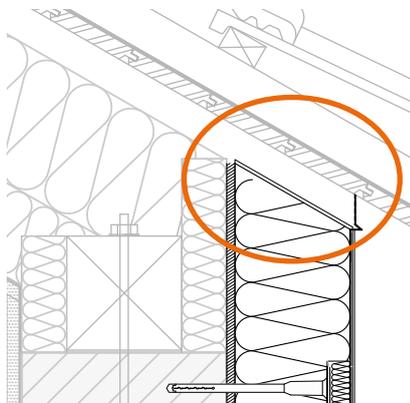


Figure 19

Note: it is recommended that a roof ventilation profile be fitted in order to keep insects and similar out of the roof cavity. The treatment of protecting roof sheeting should be agreed on with the planner.

11.2 AREA COMING INTO CONTACT WITH THE BASE, SPLASHED WATER AND THE EARTH

11.2.1 GENERAL

As a fundamental rule, only matched system components may be used in the area coming into contact with the base, splashed water and the earth. The special mechanical and moisture-related stresses must be taken into consideration here.

Note: The formation of the base and transition to the perimeter insulation must be defined by the planner.

11.2.2 AREA COMING INTO CONTACT WITH THE BASE, SPLASHED WATER AND THE EARTH

Corresponding insulation panels (perimeter insulation panels) should be used in the area exposed to splashed water (from the train or adjacent projections). This also applies to the area below ground level.

Note: Precipitation water must be conducted away from the facade through constructive measures. These usually involve a gravel bed or an anti-capillary layer. Paving stones or slabs should be laid with an appropriate gradient (away from the building) and should be structurally isolated from the building (e.g. textured waterproof membrane).

It is also possible to install the lower edge of the ETICS above ground level without a base rail; in this case, the lower edge must be created using glass fibre fabric. In the area below ground level, the first row of the panels can also be bevelled, with the base coat including reinforcement, together with a matched seal, being continued as far as the substrate (wall structure).

11.2.3 EXECUTION

Transition of the ETICS from the facade to the base area

Undercut base

With an undercut base, the lower edge of the ETICS is usually formed through the use of base connection profiles without base perforations.

The base connection profiles are fixed with suitable anchors at intervals of approximately 30 cm and at their ends. Irregularities in the substrate should be compensated with spacers, joints should be fixed with suitable connecting pieces. Gaps between the wall structure and the base connection profile should be sealed by means of suitable measures (e.g. adhesive mortar, sealing strips) in order to ensure a wind-tight execution of the lower edge (stack effect!). In order to guarantee a secure connection of the render system to the base connection profile, the use of plug-on profiles specified by the system supplier is recommended. (execution: see detail drawings 1a and 1b, pages 62, 63)

Note: With greater insulation material thicknesses it should be noted that base connection profiles can represent thermal bridges. In order to exclude the formation of thermal bridges, it is therefore recommended, when executing an “undercut base”, that a drip profile be used instead of the base connection profile (execution: see detail drawings 5a and 5b, pages 68, 69)

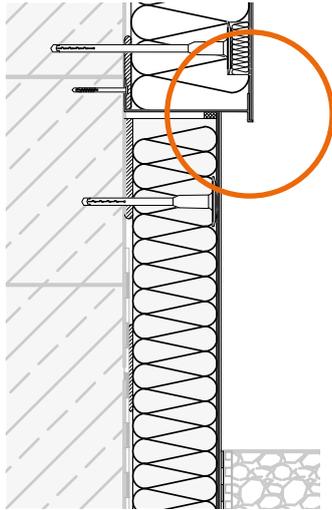


Figure 20

Flush base with separate finishing coat

When executing a “flush base with separate finishing coat”, the insulation panels for the base area connect flush with the facade insulation panels. The reinforced base coat is applied over both types of panel, but the finishing coat of the ETICS is separated from the finishing coat in the base area.

(execution: see detail drawing 2, page 64)

Flush base with continuous finishing coat

When executing a “flush base without separation of the finishing coat”, the insulation panels for the base area connect flush with the facade insulation panels. The reinforced base coat is applied over both types of panel. The system-compatible finishing coat (follow manufacturer’s instructions) is continued into the base area.

(execution: see detail drawing 2, page 64)

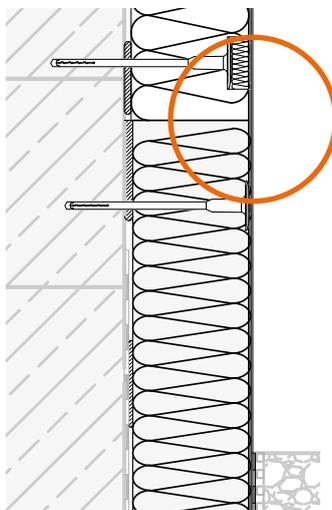


Figure 21

Transition of the base into the ground

Edge without constructed perimeter insulation

The insulation panels for the base area extending into the ground in accordance with section Area coming into contact with the base, splashed water and the earth, page 37, are cut at an angle towards the wall structure and coated with the reinforced base coat.

The reinforced base coat is applied down to the lower edge of the insulation panel, the sealing extends as far as the wall structure. The finishing coat should be continued down to approx. 15 cm below ground level (execution: see detail drawing 1b, page 63)

Edge with constructed perimeter insulation

The render system on the perimeter insulation panels, which may need to be pre-treated (roughened) ends around 200–300 mm below ground level.

If there is a difference in the thickness of the base and perimeter insulation panels, this should be evened out by means of a diagonal cut in order to allow a sealed transition. (execution: see detail drawings 1a, 2 and 5a, pages 62, 64, 68)

Base sealing in the area in contact with the earth

After determining the exterior level, all system components in the area coming into contact with the earth are given a waterproof coating, e.g. sealing compound or bitumen coating, and protected by a textured waterproof membrane.

(execution: see detail drawings 1a, 2 and 5a, pages 62, 64, 68)

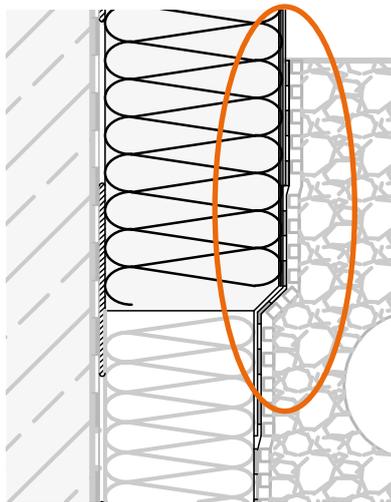


Figure 22

11.3 FACADE DIVISIONS

Like all rendered facades, facades finished in ETICS also allow divisions. The sequence in which the necessary working steps are carried out depends on the nature of the division and the material used.

11.3.1 BONDED ELEMENTS

The surface reinforcement is installed first.

11.3.1.1 Prefabricated elements

These are already reinforced and/or provided with a surface which is ready for painting and rendering. They are bonded over their full surface area over the joints and onto the hardened reinforced base coat using a suitable adhesive (follow manufacturer's instructions) and are coated.

11.3.1.2 Elements manufactured on site

These elements are bonded onto the hardened reinforced base coat using a suitable adhesive (follow manufacturer's instructions). If these do not have surfaces which are ready for painting and rendering, then a base coat should be applied to these in which the reinforcement is embedded, overlapping the surface reinforcement by at least 100 mm.

11.3.2 CUT GROOVES

The grooves should be cut into the insulation panels (not in the joints) before application of the base coat.

In order to avoid thermal bridges, the depth of the groove should not exceed 25% of the thickness of the insulation material. The maximal depth should not exceed 25 mm. The width of the grooves should never be less than their depth. It is practical for the grooves to be trapezoidal in form in order to prevent rainwater collecting in them.

All surfaces of the grooves should be reinforced with a suitable glass fibre mesh (e.g. pre-formed mesh elements) to bridge cracks, overlapping with the surface reinforcement by at least 10 cm, and coated.

Note: Such grooves result in reduction of the insulation effect at this point and interfere with the dissipation of the stress in the surface reinforcement.

ETICS

12. SUPERIMPOSITION

Existing ETICS can be overlaid with a new layer under certain circumstances. In order to ensure the function of the ETICS (existing and newly applied ETICS), thorough planning of all working steps and details of execution is necessary.

12.1 EVALUATION OF EXISTING CONDITION

This evaluation serves to arrive at a conclusion regarding the choice of superimposition measures.

In evaluating the existing condition it is necessary to check:

- the nature and condition of the substrate,
- bonding / fixing,
- the type and quality of the insulation material,
- connections to building components (e.g. windows, window sills, metal cladding of parapets, soffits),
- rendering system (e.g. weathering, layer thicknesses, cavities).

12.2 PLANNING OF THE ADDITIONAL ETICS WHICH IS TO BE APPLIED

The following dimensional and planning details should be included in the planning:

- building physics (insulation thickness, dew point, thermal bridges),
- fire protection (according to national requirements)
- connections to building components,
- installation elements for the installation of external loads (e.g. lighting fixtures, canopies) without the formation of thermal bridges
- type of the new ETICS,
- fixing of the new ETICS (proof of structural stability).

12.3 VARIANTS

The following execution variants are available:

- Variant 1: in view of its condition, the existing ETICS can be overlaid. The substrate should be pre-treated in accordance with the national standards and regulations of the corresponding member state. The anchoring is placed through both layers.
- Variant 2: The covering layer of the existing ETICS is stripped. The fixing of the new ETICS depends on the quality and condition of the insulation material and fixing (bonding / anchoring).
- Variant 3: The existing ETICS is removed.

13. NECESSARY TOOLS

13.1 QUALITY OF THE TOOLS

In order to ensure perfect application in accordance with the technical standards for application, only high-quality tools which allow precise and efficient working should be used. Metal tools, in particular, should be of stainless quality.

The manufacturer's advice on the tools to be used should be taken into consideration in order to guarantee perfect application.

13.2 QUALITY OF EXECUTION

Different requirements (levels and classes) concerning the required execution may apply in the different member states. These levels and classes must be taken into consideration during installation.

ANNEX I GLOSSARY

ETAG

European Technical Approvals Guideline

CUAP

Common Understanding of Assessment Procedure

Harmonisierte EN

Harmonised European Standards are implemented nationally, such as EN 13163

wall structure

is the part of the structure which serves as a substrate for the application of ETICS

MW

Insulation material made of mineral wool in accordance with EN 13162

EPS

Insulation material made of EPS in accordance with EN 13163

ETA

European Technical Approval

ETICS

External Thermal Insulation Composite System

EN

European standard, that has no national debt, for example, EN 13499

XPS

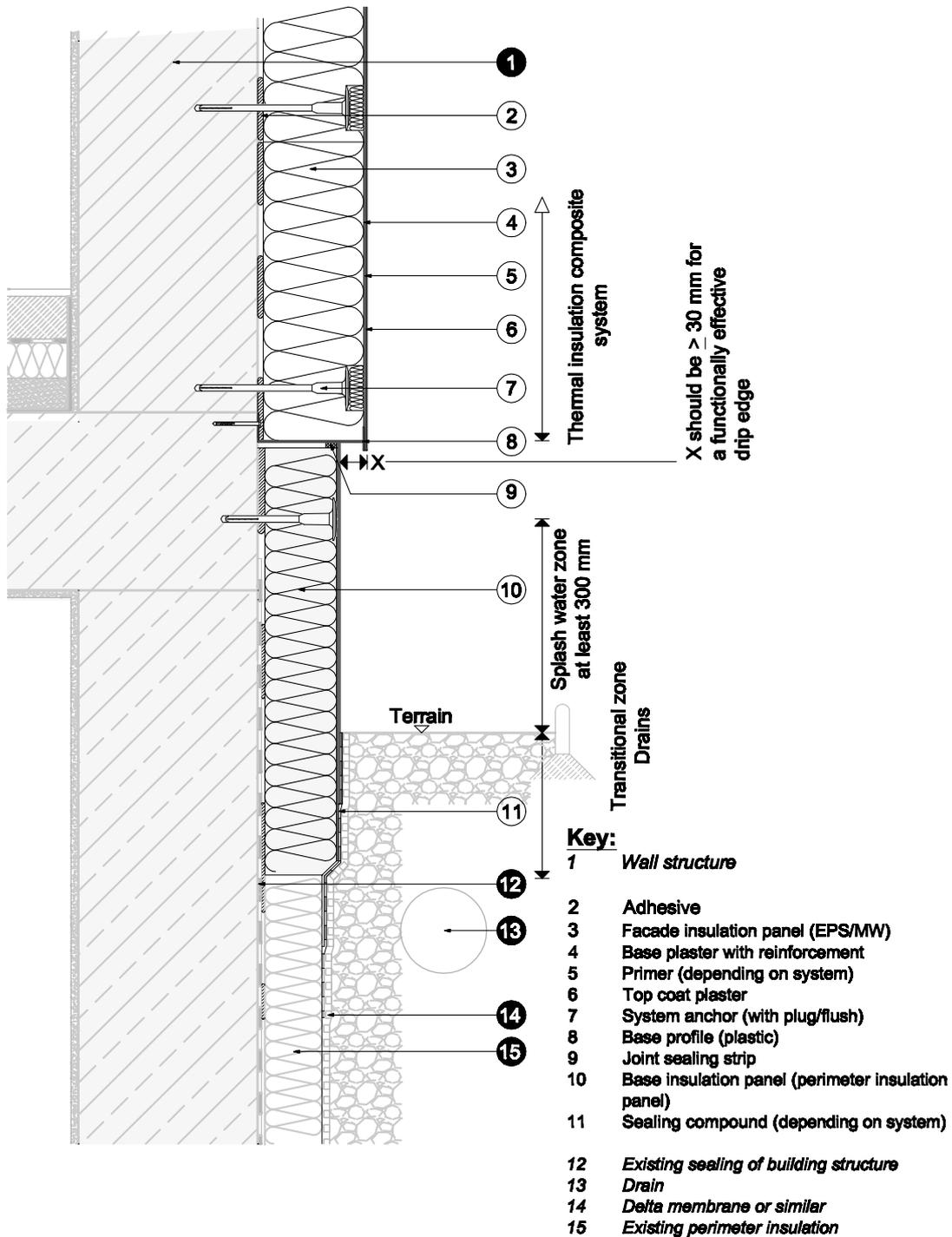
Insulation material made of extruded material in accordance with EN 13164

ANNEX II DETAIL DRAWINGS

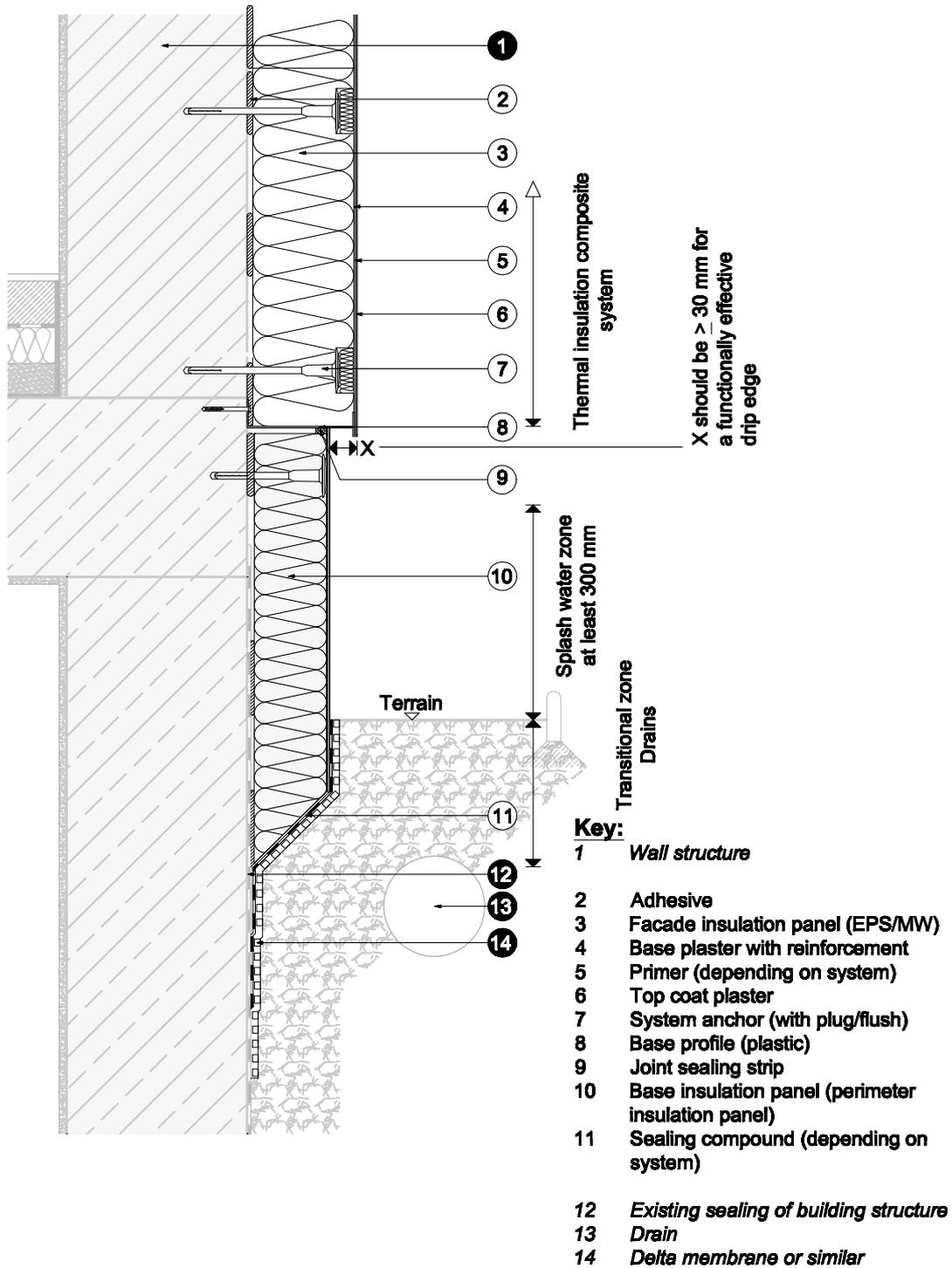
The practical applicability of the illustrated in the following details should be checked on site, because not all object-specific characteristics can be displayed. In the actual case regulations of the manufacturers can be different to these details.

Legal liability can be seen from the available details, therefore, not be deduced. Adjacent trades are shown only schematically.

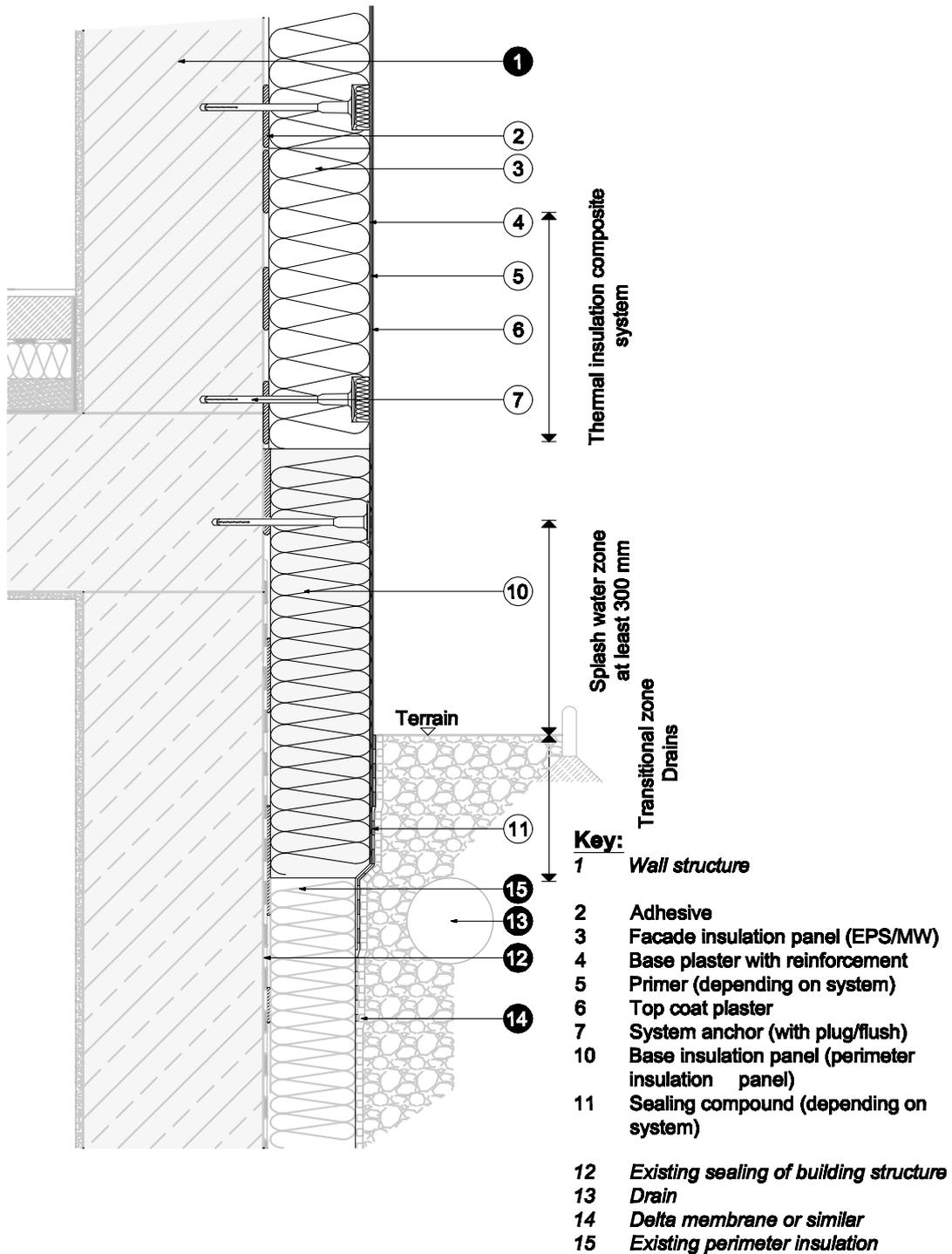
1a) RECESSED BASE WITH EXISTING PERIMETER INSULATION



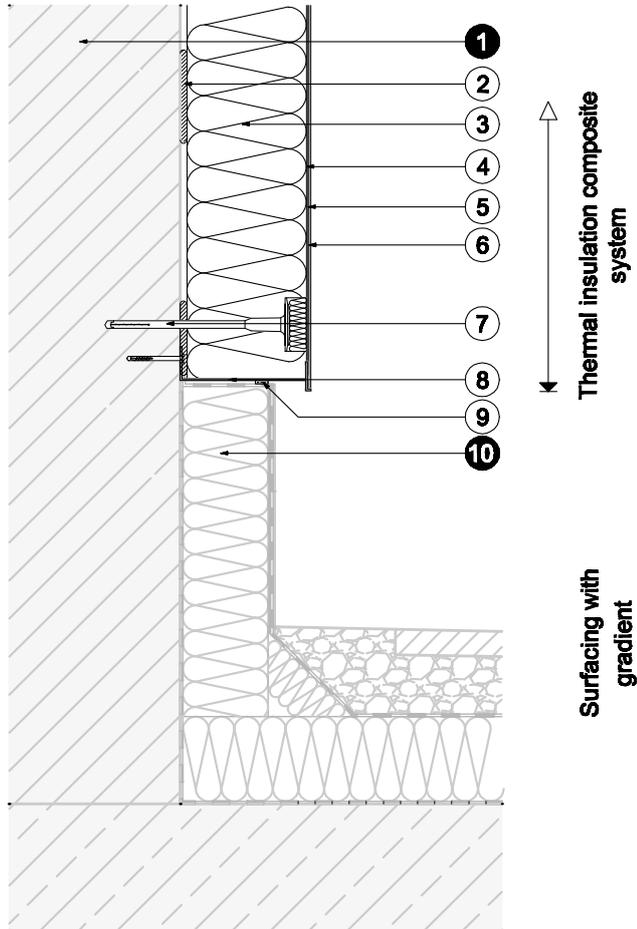
1b) RECESSED BASE WITHOUT EXISTING PERIMETER INSULATION



2) FLUSH BASE WITH EXISTING PERIMETER INSULATION



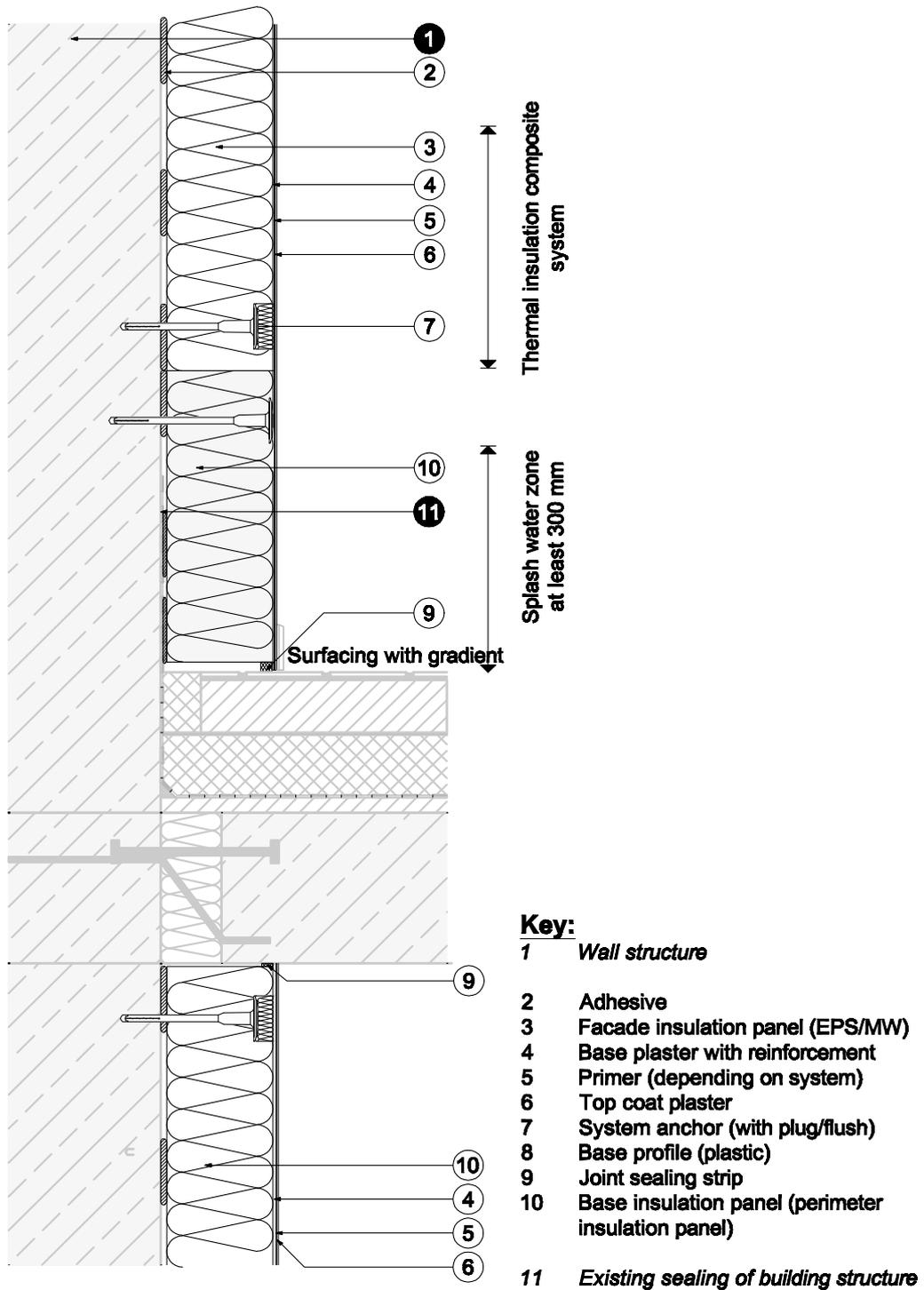
3) LOWER CONNECTION TO EXISTING FLAT ROOF STRUCTURE



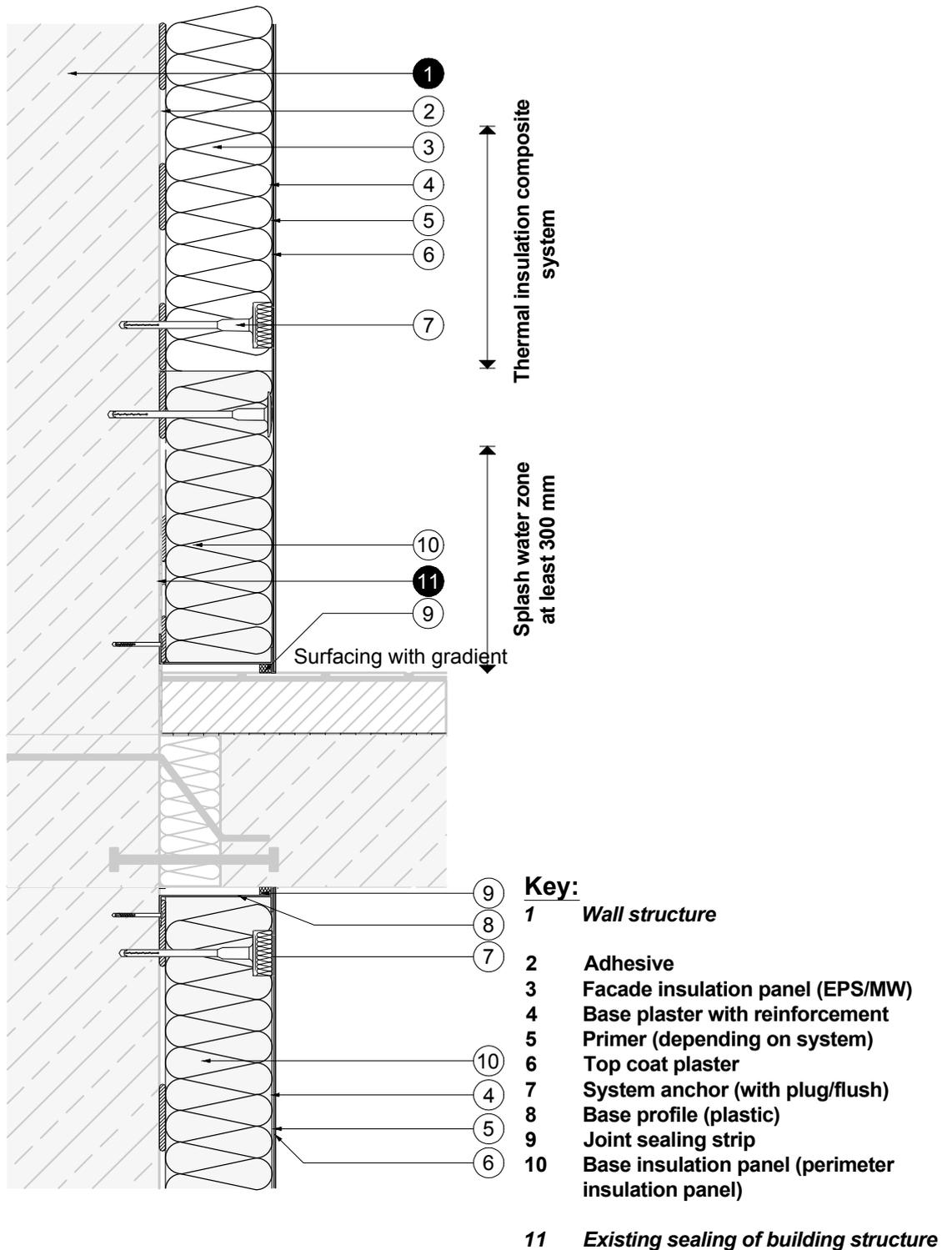
Key:

- 1 *Wall structure*
- 2 *Adhesive*
- 3 *Facade insulation panel (EPS/MW)*
- 4 *Base plaster with reinforcement*
- 5 *Primer (depending on system)*
- 6 *Top coat plaster*
- 7 *System anchor (with plug/flush)*
- 8 *Base profile (plastic)*
- 9 *Joint sealing strip*
- 10 *Existing insulation and sealing*

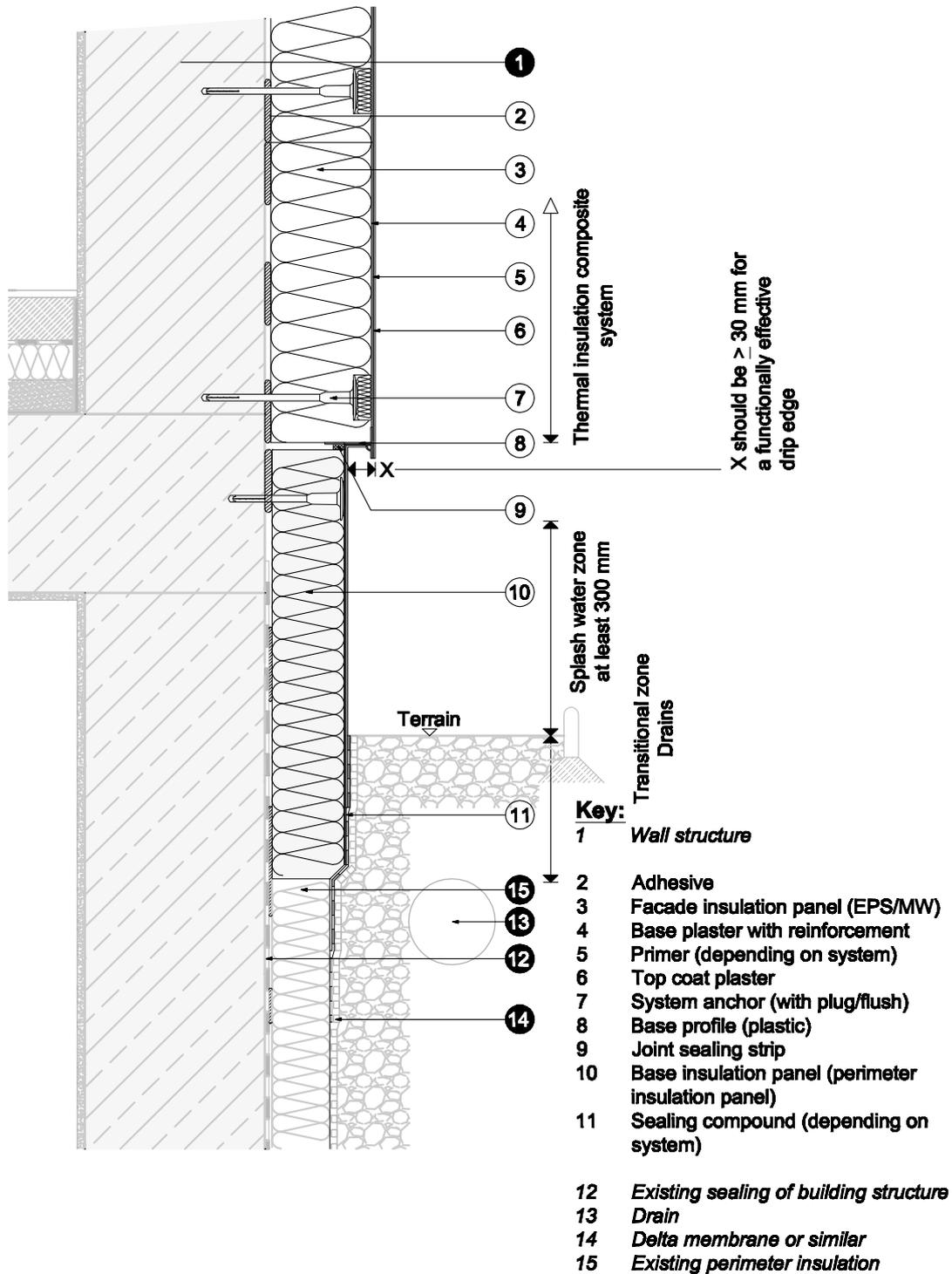
4a) CONNECTION TO A BALCONY SLAB WITH THERMAL ISOLATION (SEALING STRIP)



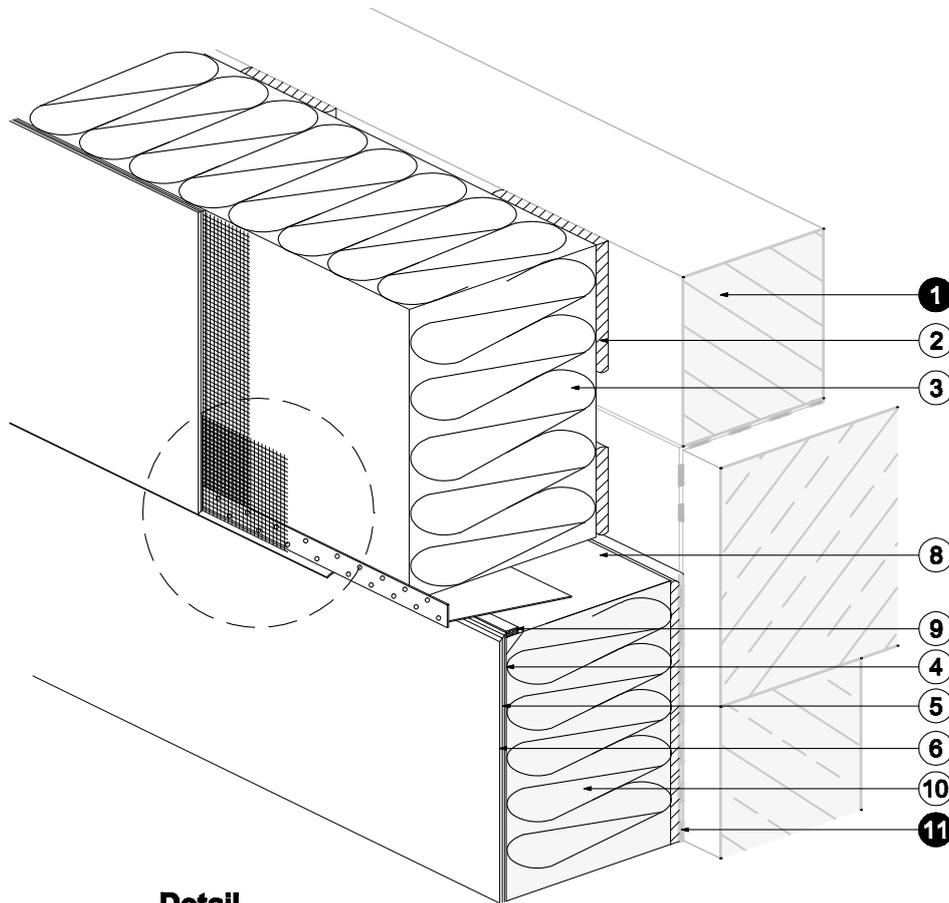
4b) CONNECTION TO A BALCONY SLAB WITH THERMAL ISOLATION (BASE PROFILE)



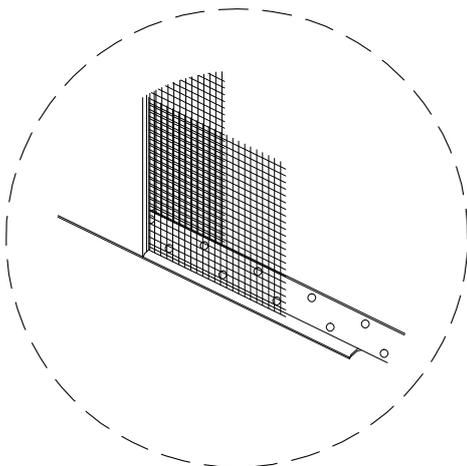
5a) RECESSED BASE BORDER WITH DRIP EDGE



5b) RECESSED BASE BORDER WITH DRIP EDGE (AXONOMETRIE)



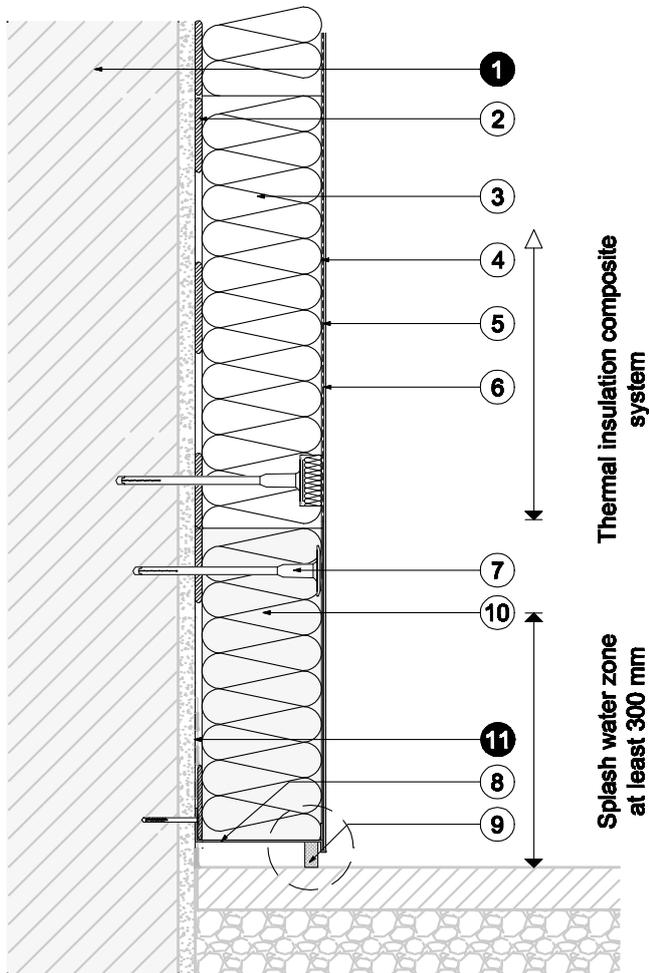
Detail



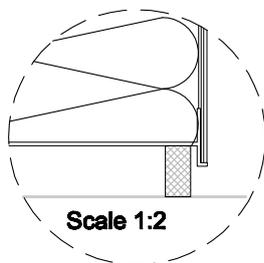
Key:

- 1 *Wall structure*
- 2 *Adhesive*
- 3 *Facade insulation panel (EPS/MW)*
- 4 *Base plaster with reinforcement*
- 5 *Primer (depending on system)*
- 6 *Top coat plaster*
- 8 *Base profile (plastic)*
- 9 *Joint sealing strip*
- 10 *Base insulation panel (perimeter insulation panel)*
- 11 *Existing sealing of building structure*

6a) CONNECTION TO EXISTING GROUND SURFACE WITH BASE PROFILE



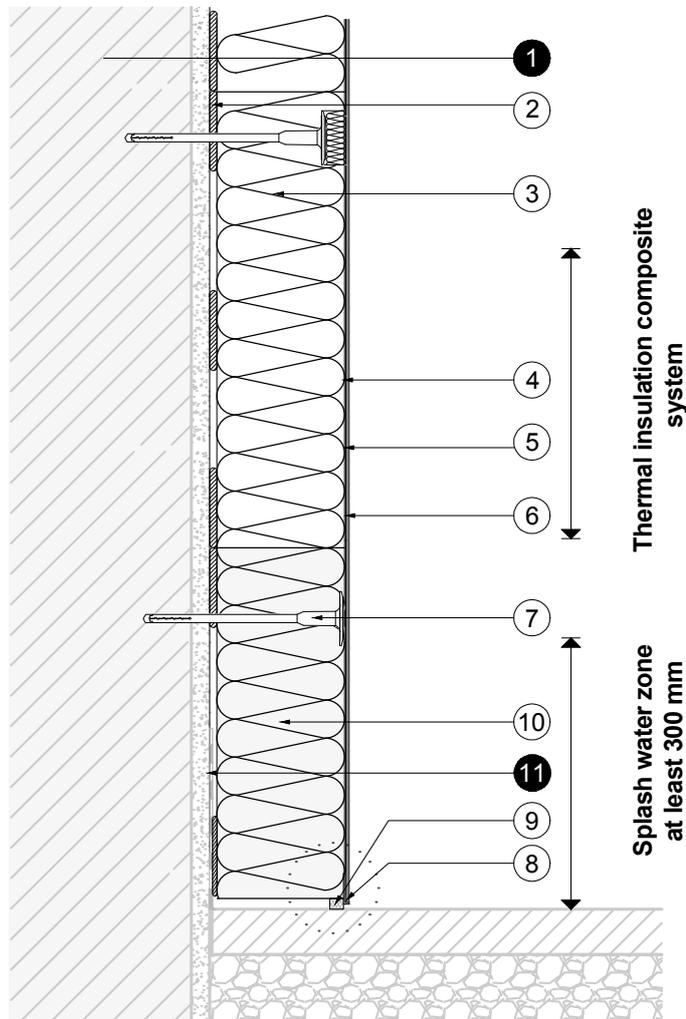
Detail



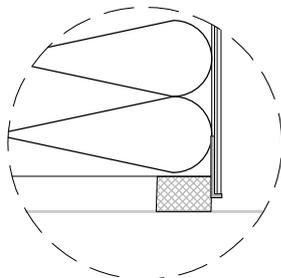
Key:

- 1 Wall structure
- 2 Adhesive
- 3 Facade insulation panel (EPS/MW)
- 4 Base plaster with reinforcement
- 5 Primer (depending on system)
- 6 Top coat plaster
- 7 System anchor (with plug/flush)
- 8 Base profile (plastic)
- 9 Joint sealing strip
- 10 Base insulation panel (perimeter insulation panel)
- 11 Existing sealing of building structure

6b) CONNECTION TO EXISTING GROUND SURFACE WITH JOINT SEALING STRIP



Detail

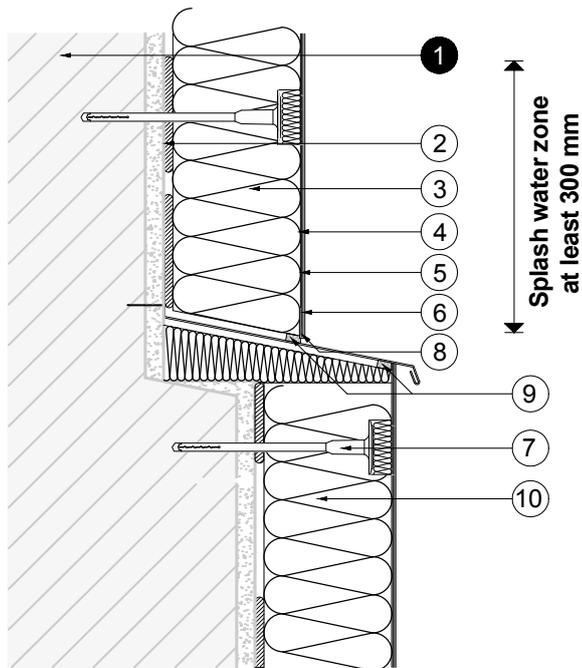


Scale 1:2

Key:

- 1 Wall structure
- 2 Adhesive
- 3 Facade insulation panel (EPS/MW)
- 4 Base plaster with reinforcement
- 5 Primer (depending on system)
- 6 Top coat plaster
- 7 System anchor (with plug/flush)
- 8 Base profile (plastic)
- 9 Joint sealing strip
- 10 Base insulation panel (perimeter insulation panel)
- 11 Existing sealing of building structure

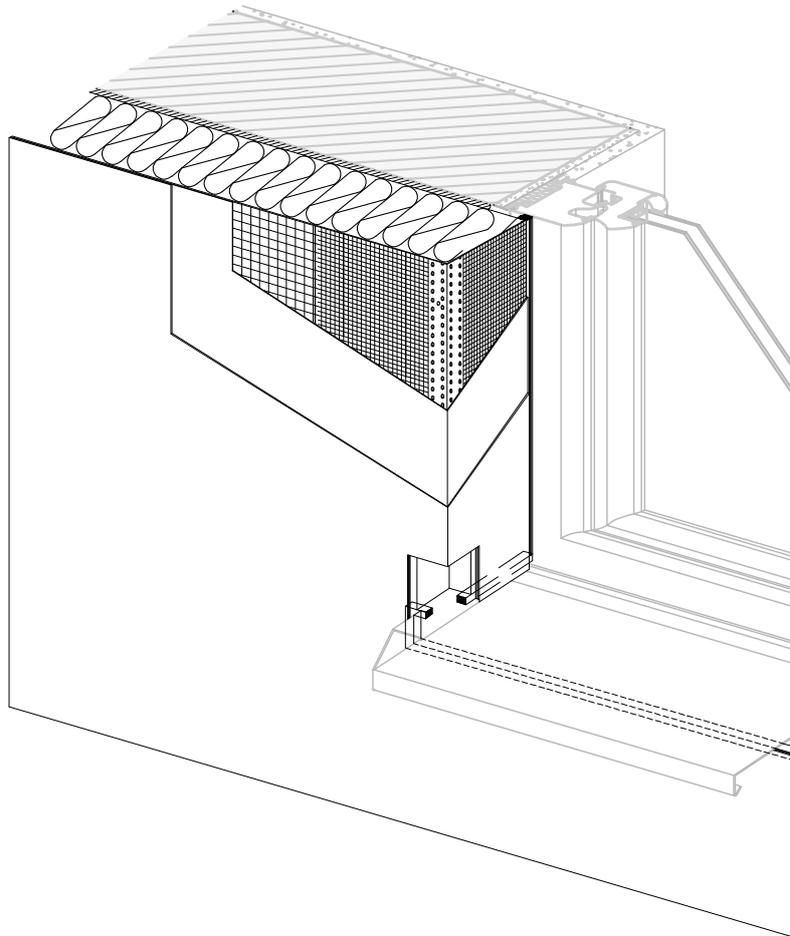
7) LOWER CONNECTION TO PROJECTING BUILDING PARTS (PROJECTING CORNICE BASE)



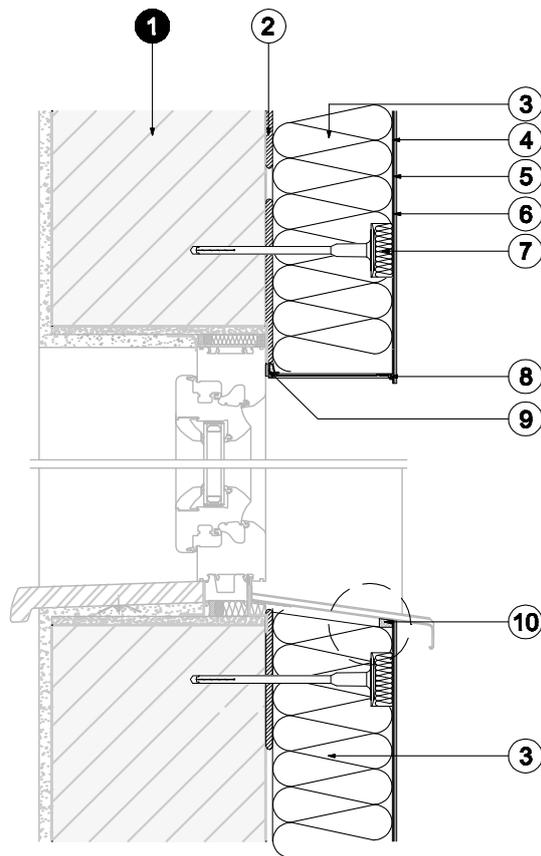
Key:

- 1 Wall structure
- 2 Adhesive
- 3 Facade insulation panel (EPS/MW)
- 4 Base plaster with reinforcement
- 5 Primer (depending on system)
- 6 Top coat plaster
- 7 System anchor (with plug/flush)
- 8 Base profile (plastic)
- 9 Joint sealing strip
- 10 Base insulation panel (perimeter insulation panel)

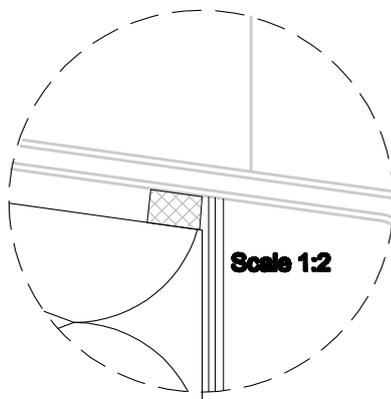
8a) OVERVIEW OF WINDOW SILL FORMATION



8b) WINDOW SILL CONNECTION TO PREVIOUSLY INSTALLED SILL



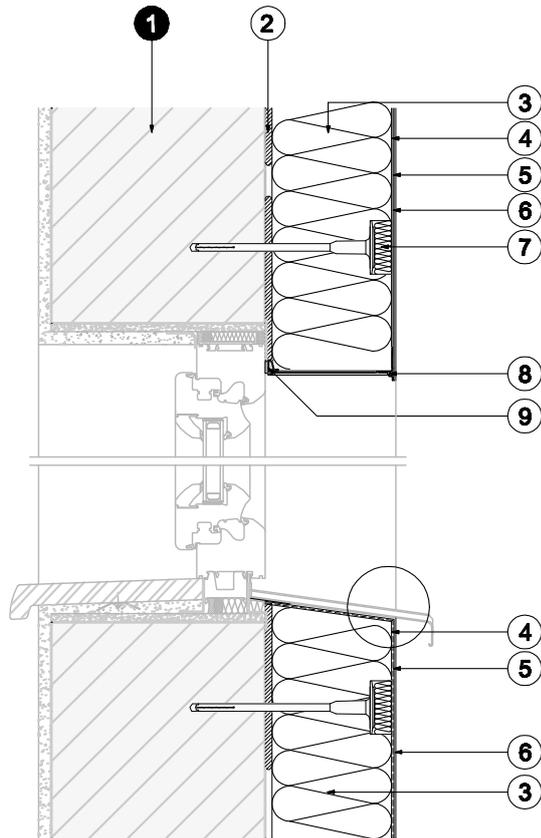
Detail



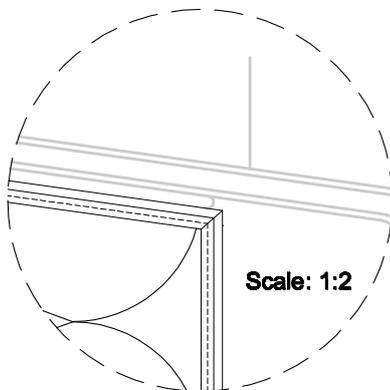
Legende:

- 1 Wall structure
- 2 Adhesive
- 3 Facade insulation panel (EPS/MW)
- 4 Base plaster with reinforcement
- 5 Primer (depending on system)
- 6 Top coat plaster
- 7 System anchor (with plug/flush)
- 8 Drip edge
- 9 Window connection profile
- 10 Joint sealing strip

8c) WINDOW SILL CONNECTION WITH SUBSEQUENTLY INSTALLED



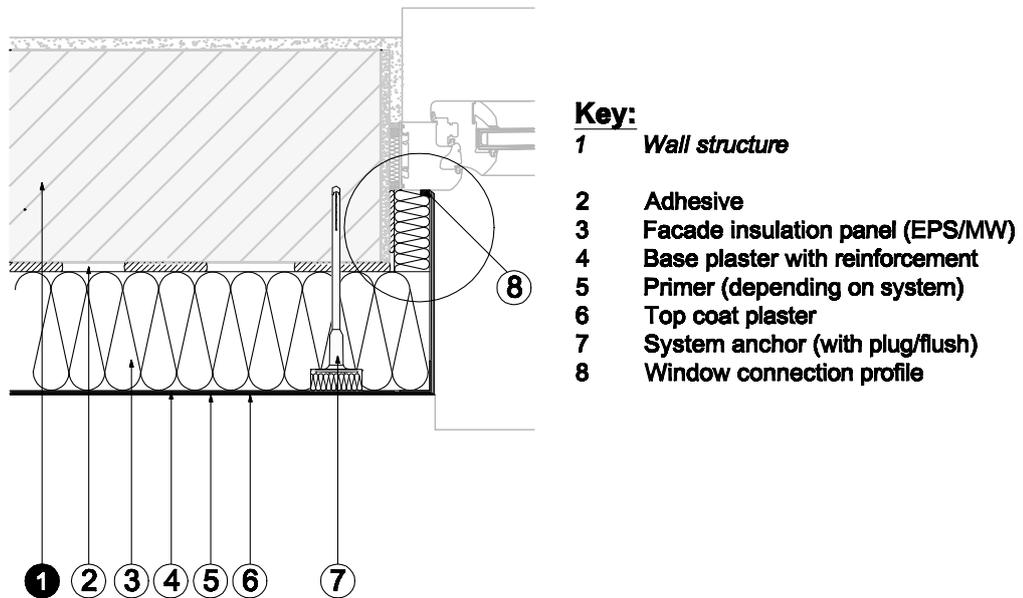
Detail



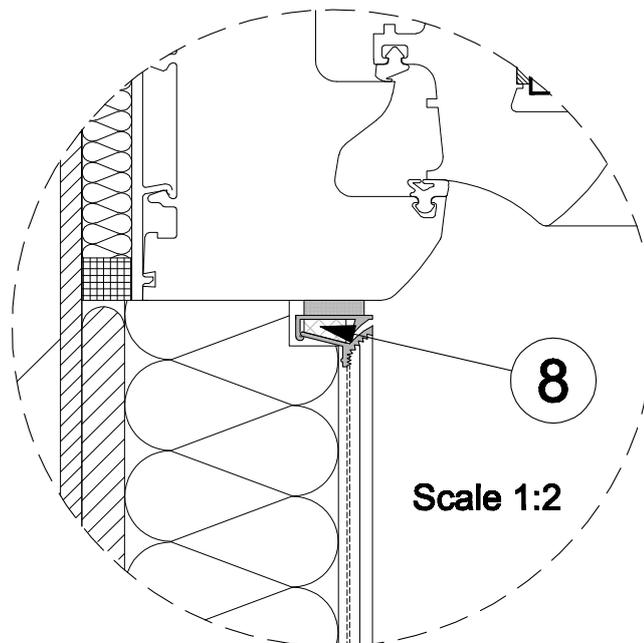
Key:

- 1 Wall structure
- 2 Adhesive
- 3 Facade insulation panel (EPS/MW)
- 4 Base plaster with reinforcement
- 5 Primer (depending on system)
- 6 Top coat plaster
- 7 System anchor (with plug/flush)
- 8 Drip edge
- 9 Window connection profile

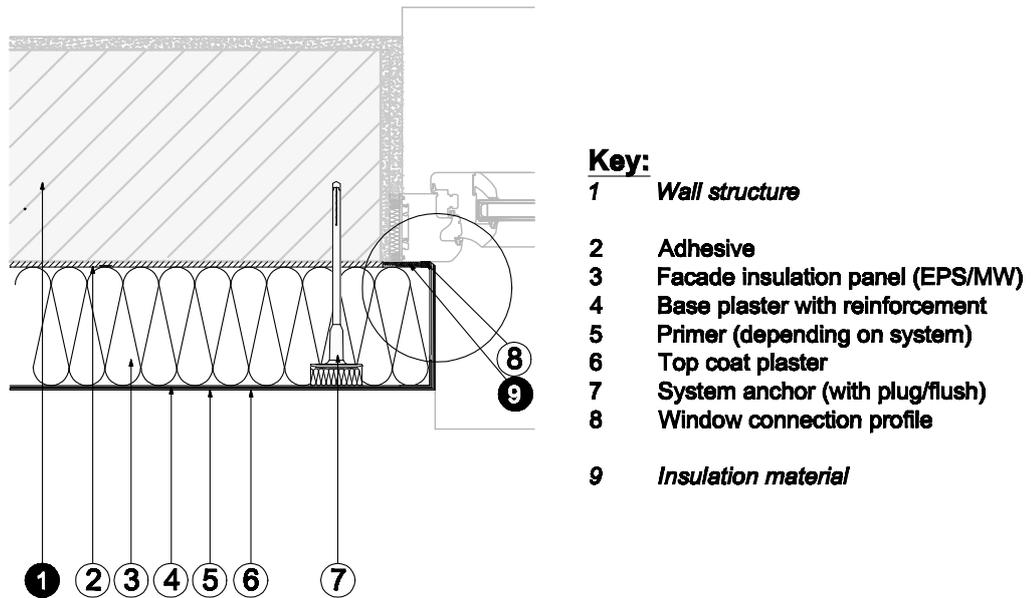
9a) CONNECTION TO WINDOWS AND DOORS WITH RECESSED REVEAL



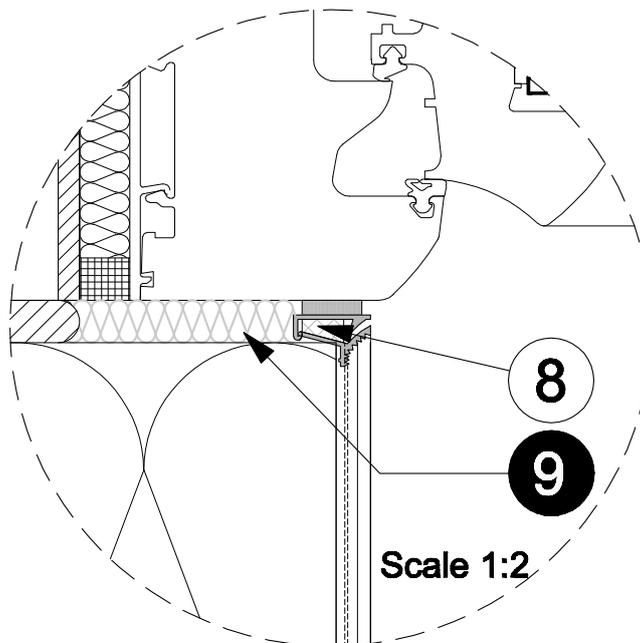
Detail



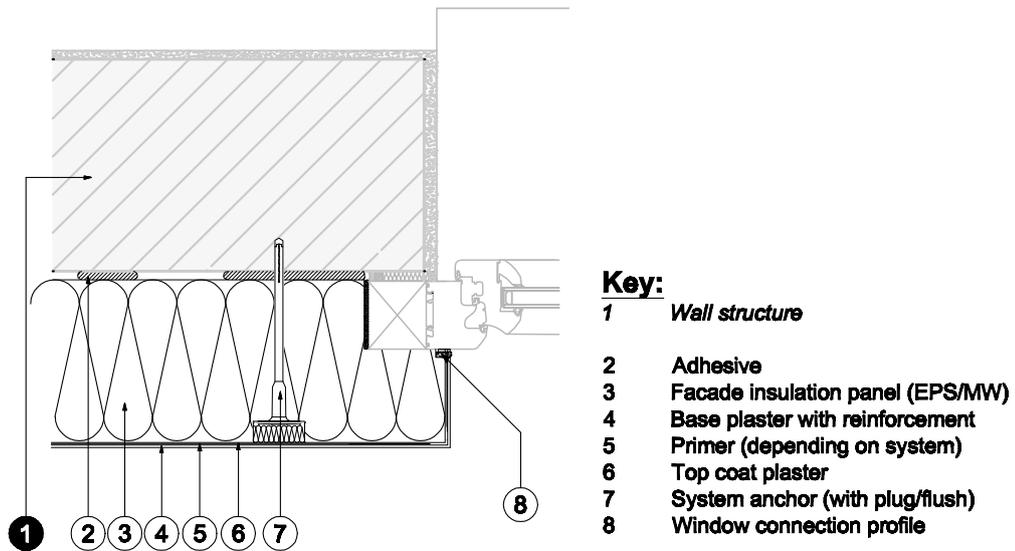
9b) CONNECTION TO WINDOWS AND DOORS FLUSH WITH THE BRICKWORK



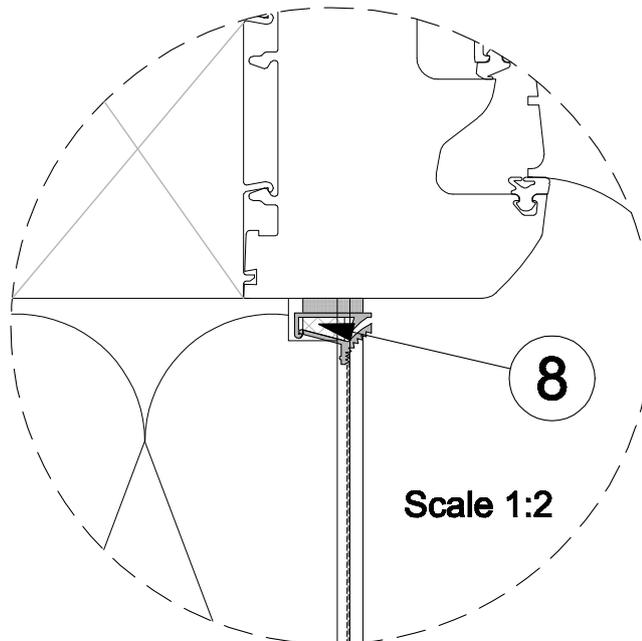
Detail



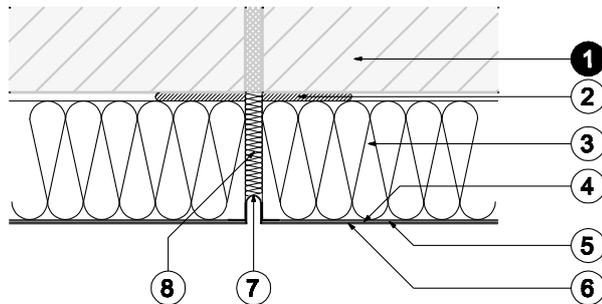
9c) CONNECTION TO WINDOWS AND DOORS FLUSH WITH THE BRICKWORK



Detail



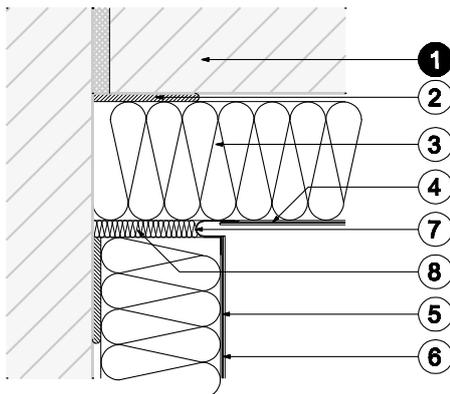
10a) E-FORMED EXPANSION JOINT PROFILE, VERTICAL, IN SURFACE



Key:

- 1 Wall structure
- 2 Adhesive
- 3 Facade insulation panel (EPS/MW)
- 4 Base plaster with reinforcement
- 5 Primer (depending on system)
- 6 Top coat plaster
- 7 Expansion joint profile
- 8 Backfilling with insulation material

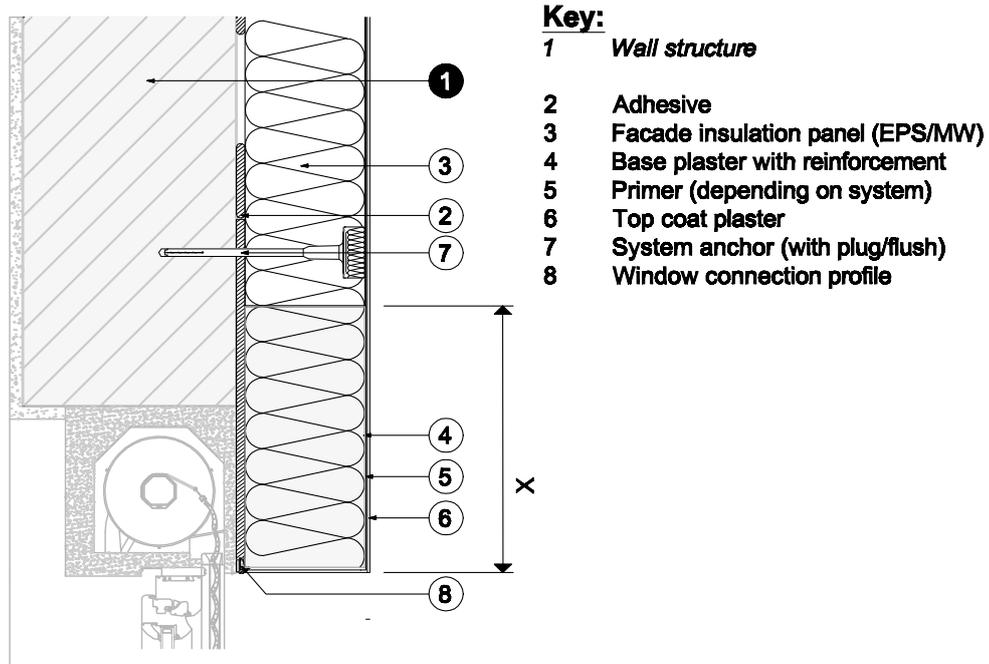
10b) V-FORMED EXPANSION JOINT PROFILE, VERTICAL, IN INSIDE CORNER



Key:

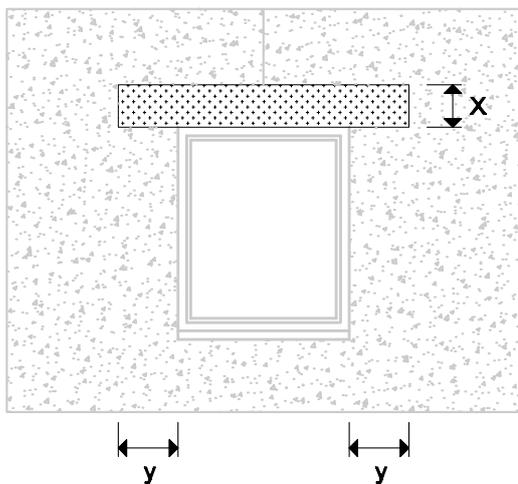
- 1 Wall structure
- 2 Adhesive
- 3 Facade insulation panel (EPS/MW)
- 4 Base plaster with reinforcement
- 5 Primer (depending on system)
- 6 Top coat plaster
- 7 Expansion joint profile
- 8 Backfilling with insulation material

11a) CONNECTION TO ROLLER SHUTTER BOX AND ROLLER SHUTTER TRACK

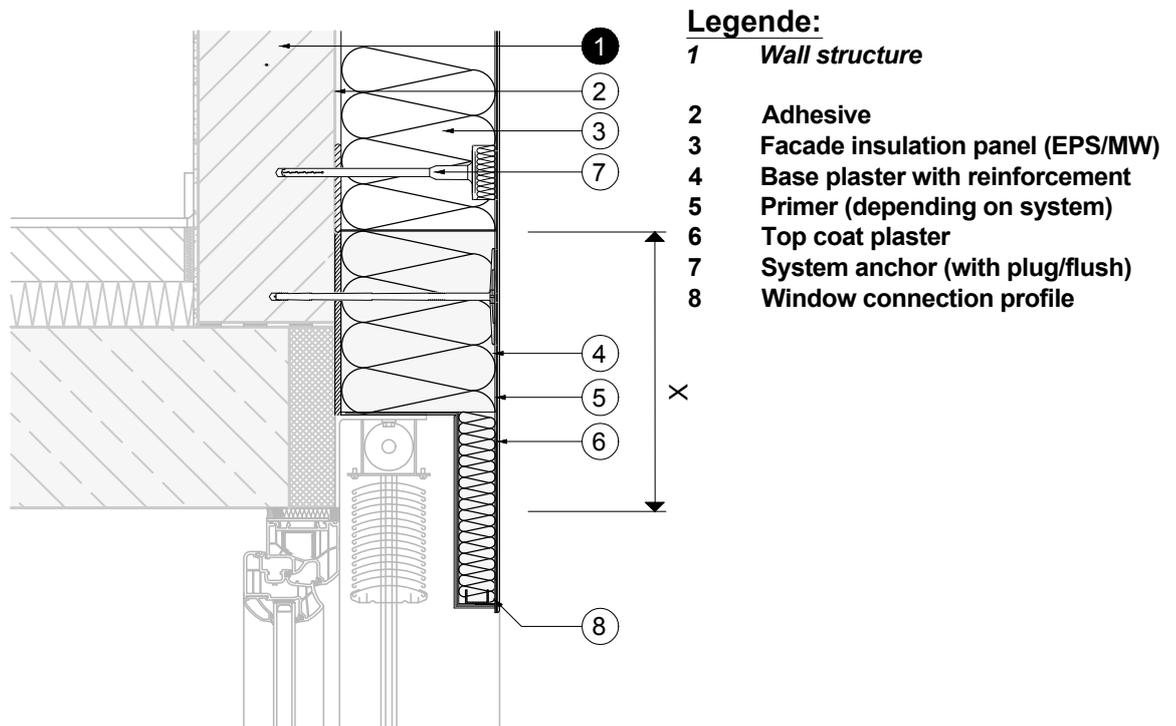


Fire protection transom
Positioned at the height of the window lintel

X ... X should be $\geq 200\text{mm}$
Y ... Y should be $\geq 300\text{mm}$

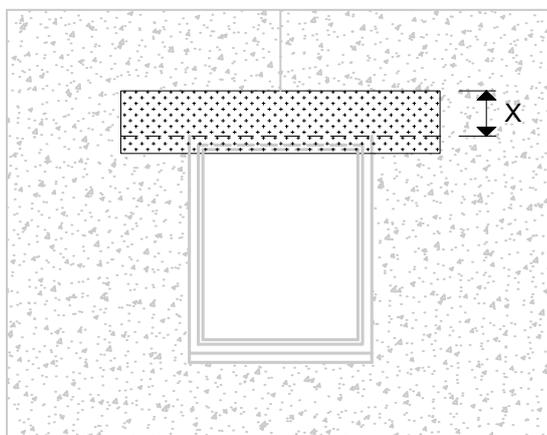


11b) CONNECTION TO ROLLER SHUTTER BOX AND ROLLER SHUTTER TRACK



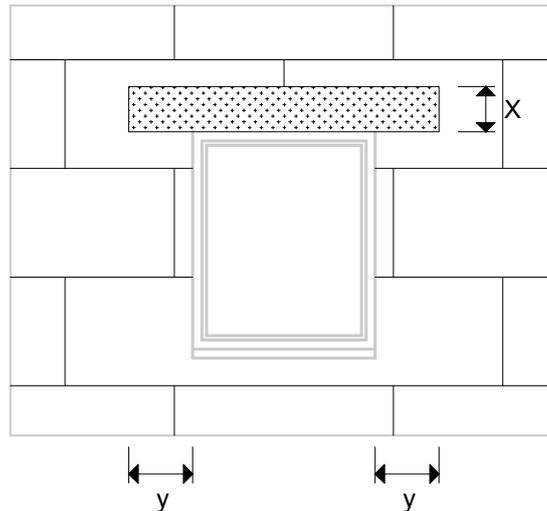
Fire protection transom
Positioned at the height of the window lintel

X ... X should be $\geq 200\text{mm}$
Y ... Y should be $\geq 300\text{mm}$



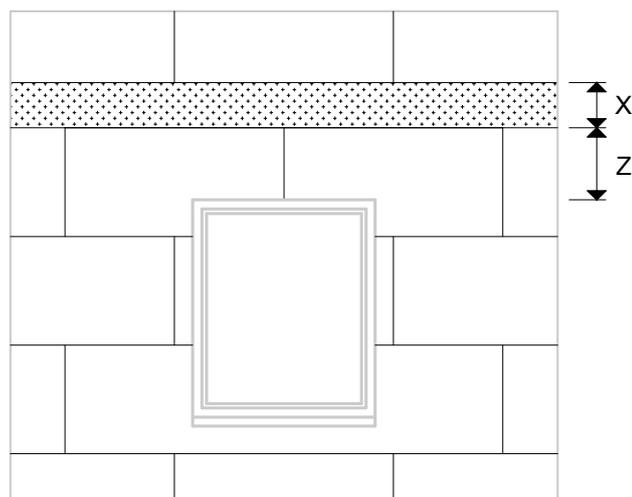
11c) POSITIONING OF THE FIRE PROTECTION TRANSOM

**Fire protection transom
Positioned at the height of the window lintel**

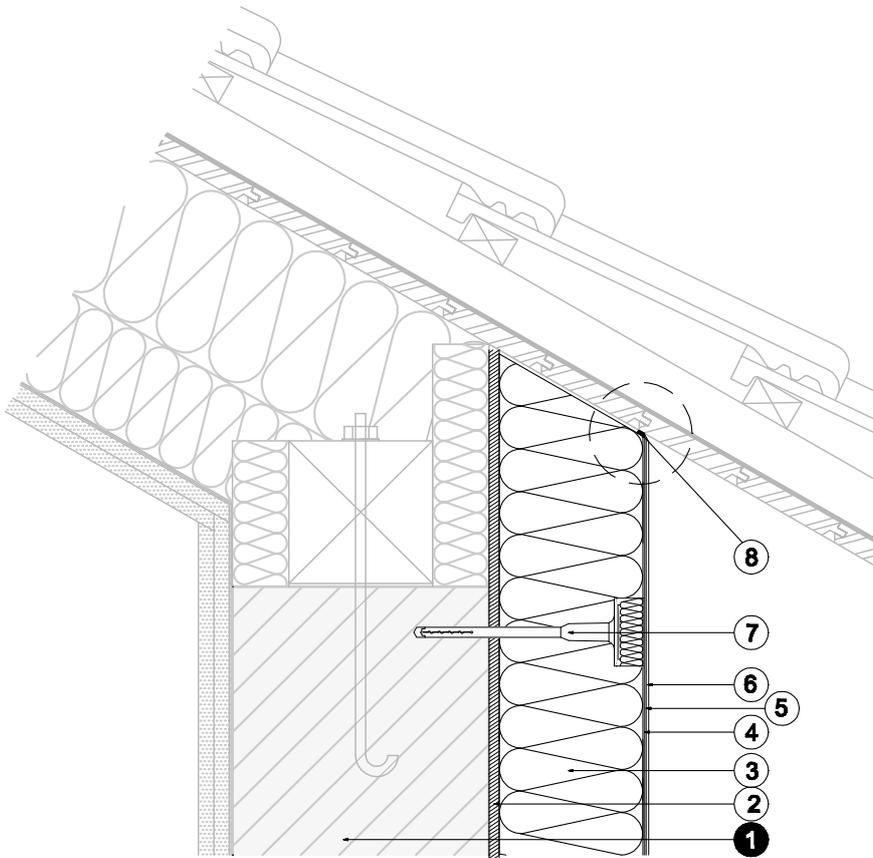


- X ... X should be $\geq 200\text{mm}$
- Y ... Y should be $\geq 300\text{mm}$
- Z ... Z should be > 150 and $< 400\text{mm}$

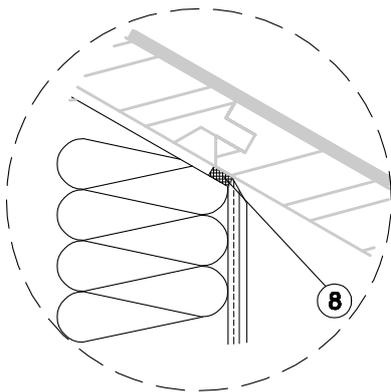
**Fire protection transom
Positioned above the next row of insulation panels**



12a) ROOF CONNECTION TO WARM ROOF



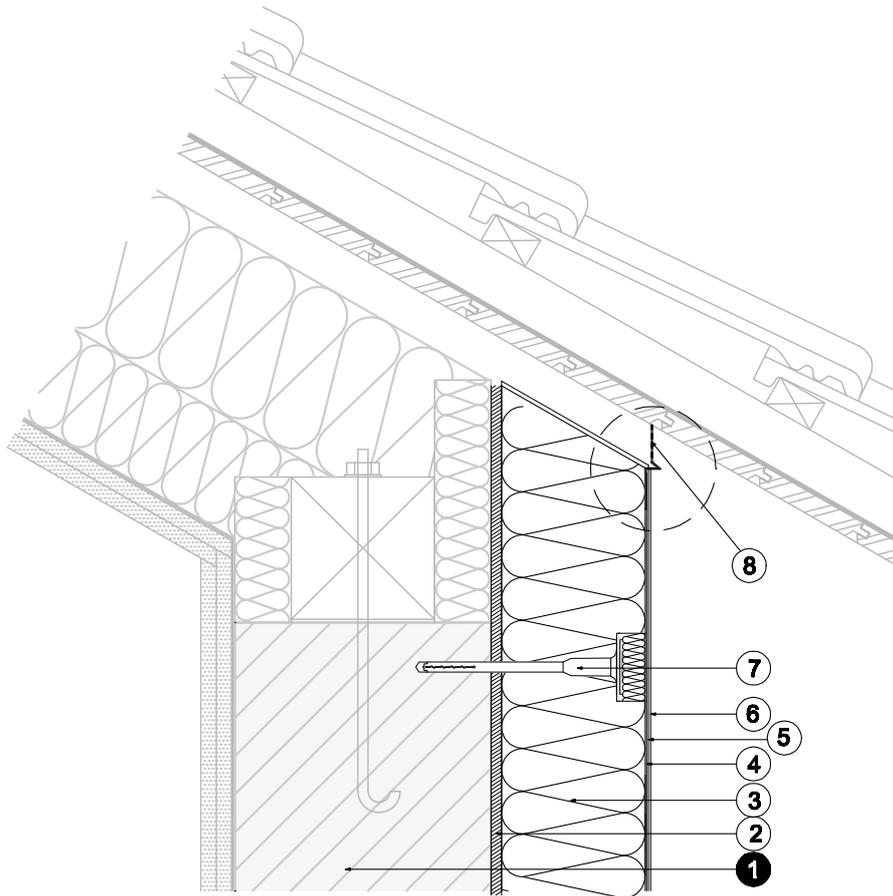
Detail



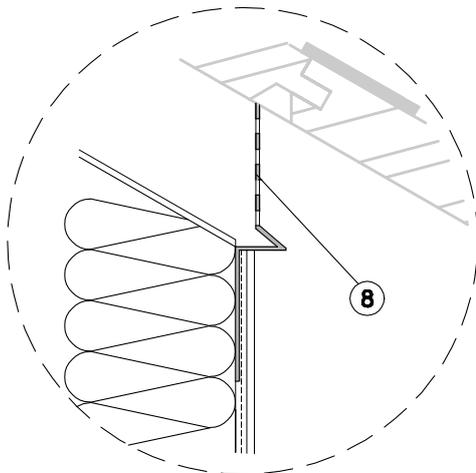
Key:

- 1 *Wall structure*
- 2 **Adhesive**
- 3 **Facade insulation panel (EPS/MW)**
- 4 **Base plaster with reinforcement**
- 5 **Primer (depending on system)**
- 6 **Top coat plaster**
- 7 **System anchor (with plug/flush)**
- 8 **Joint sealing strip**

12b) ROOF CONNECTION TO BACK-VENTILATED WARM ROOF



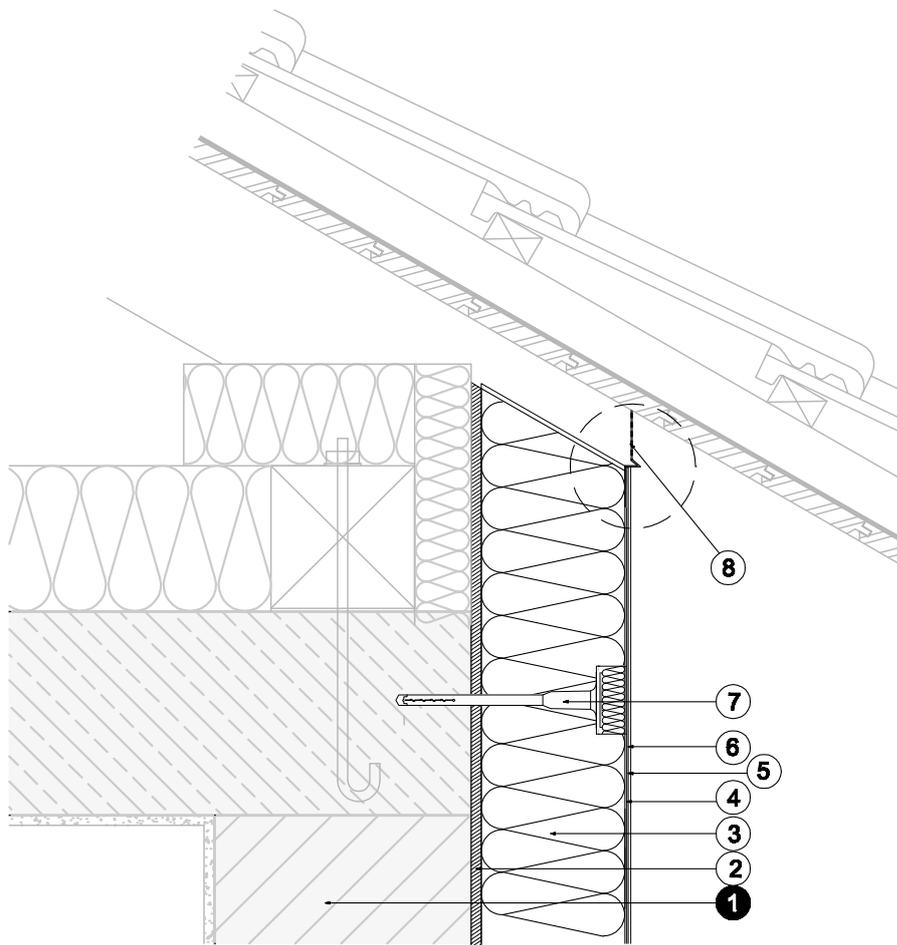
Detail



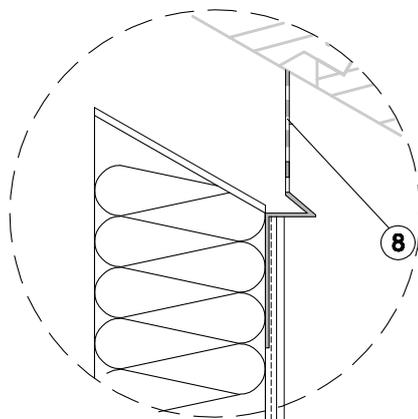
Key:

- 1 Wall structure
- 2 Adhesive
- 3 Facade insulation panel (EPS/MW)
- 4 Base plaster with reinforcement
- 5 Primer (depending on system)
- 6 Top coat plaster
- 7 System anchor (with plug/flush)
- 8 Roof connection profile

12c) ROOF CONNECTION TO BACK-VENTILATED COLD ROOF



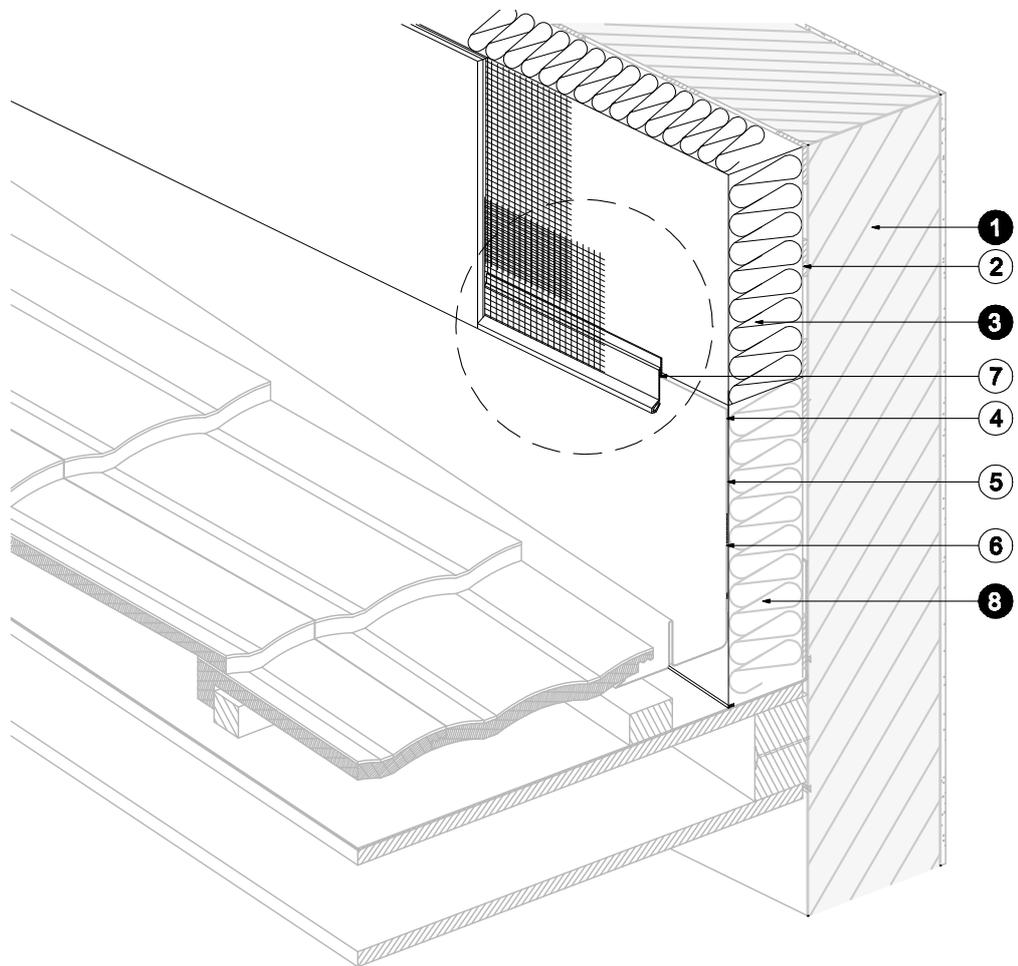
Detail



Key:

- 1 Wall structure
- 2 Adhesive
- 3 Facade insulation panel (EPS/MW)
- 4 Base plaster with reinforcement
- 5 Primer (depending on system)
- 6 Top coat plaster
- 7 System anchor (with plug/flush)
- 8 Roof connection profile

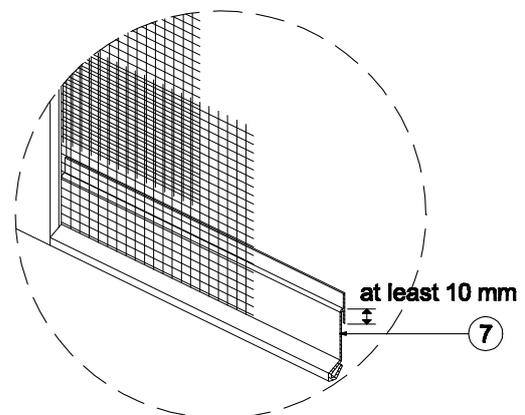
13) METAL CONNECTION PROFILE



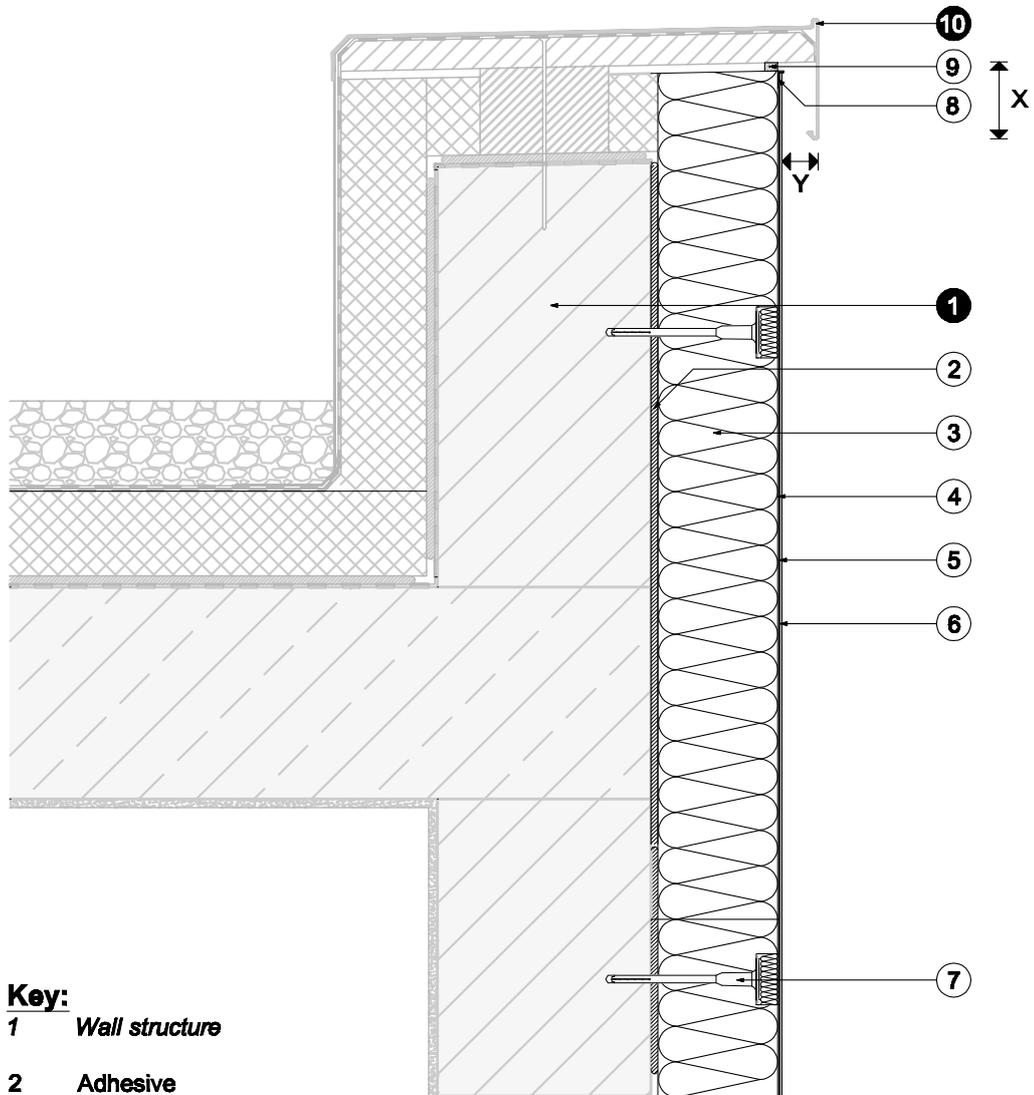
Key:

- 1 *Wall structure*
- 2 *Adhesive*
- 3 *Base insulation panel (XPS)*
- 4 *Base plaster with reinforcement*
- 5 *Primer (depending on system)*
- 6 *Top coat plaster*
- 7 *Metal connection profile*
- 8 *Base insulation*

Detail



14) PARAPET FORMATION

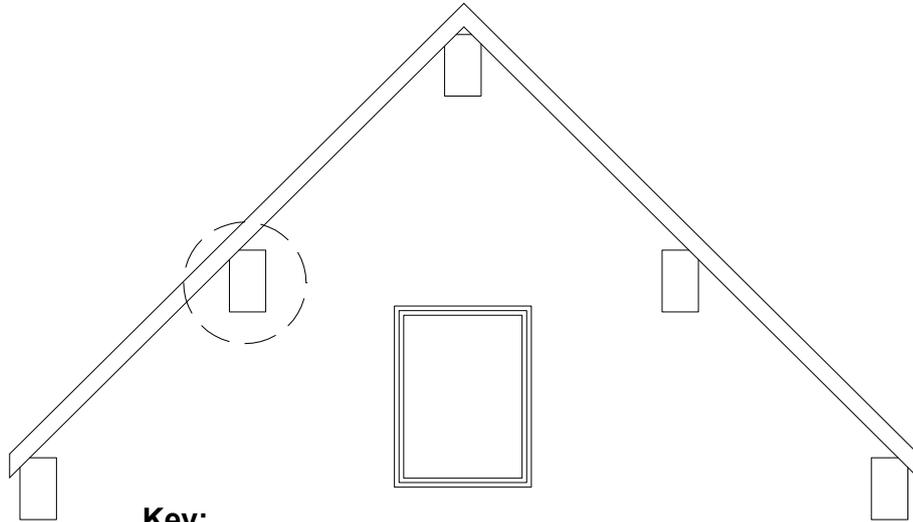


Key:

- 1 Wall structure
- 2 Adhesive
- 3 Facade insulation panel (EPS/MW)
- 4 Base plaster with reinforcement
- 5 Primer (depending on system)
- 6 Top coat plaster
- 7 System anchor (with plug/flush)
- 8 Edge profile
- 9 Joint sealing strip
- 10 Parapet flashing

The ratio X:Y is dependent on the height of the building

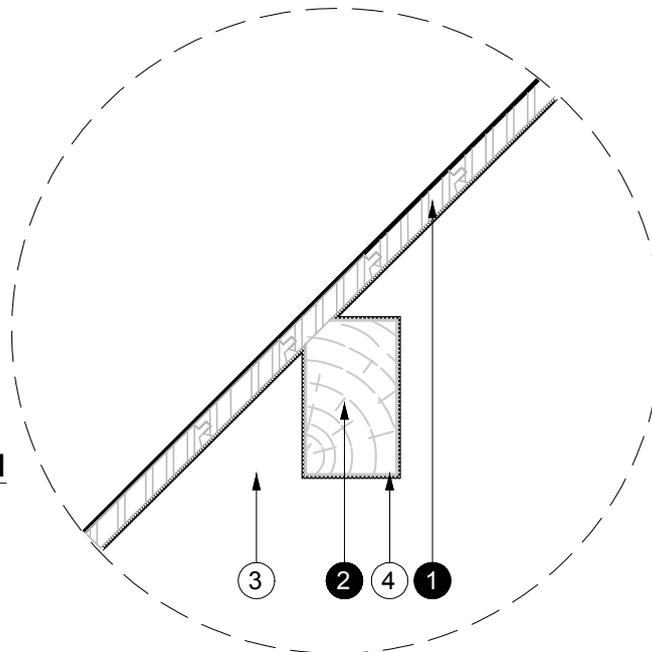
15) CONNECTION TO RAFTERS



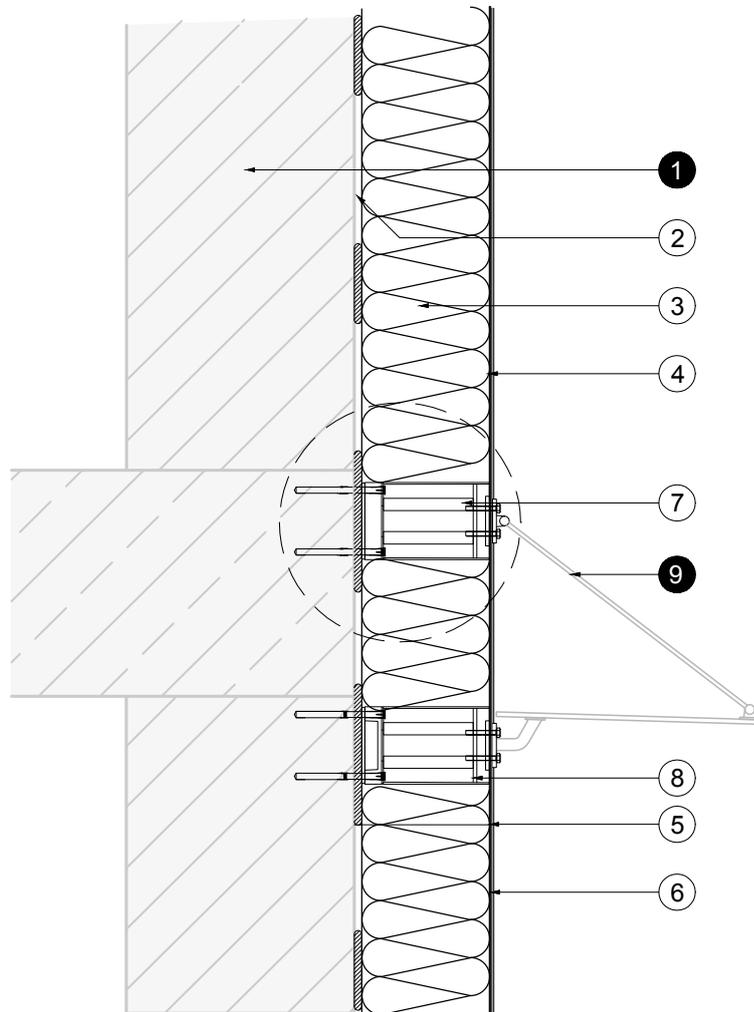
Key:

- 1 Cladding
- 2 Rafter
- 3 Facade insulation panel (EPS/MW)
- 4 Joint sealing strip

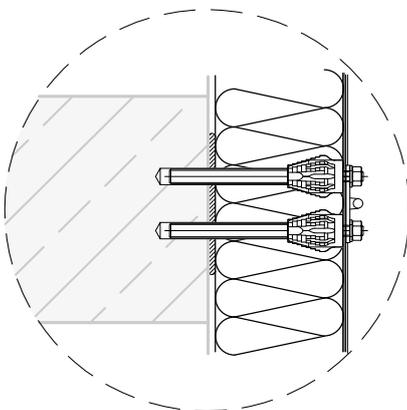
Detail



16a) DETAIL CONNECTION: EXTERNAL RAIN PROTECTION



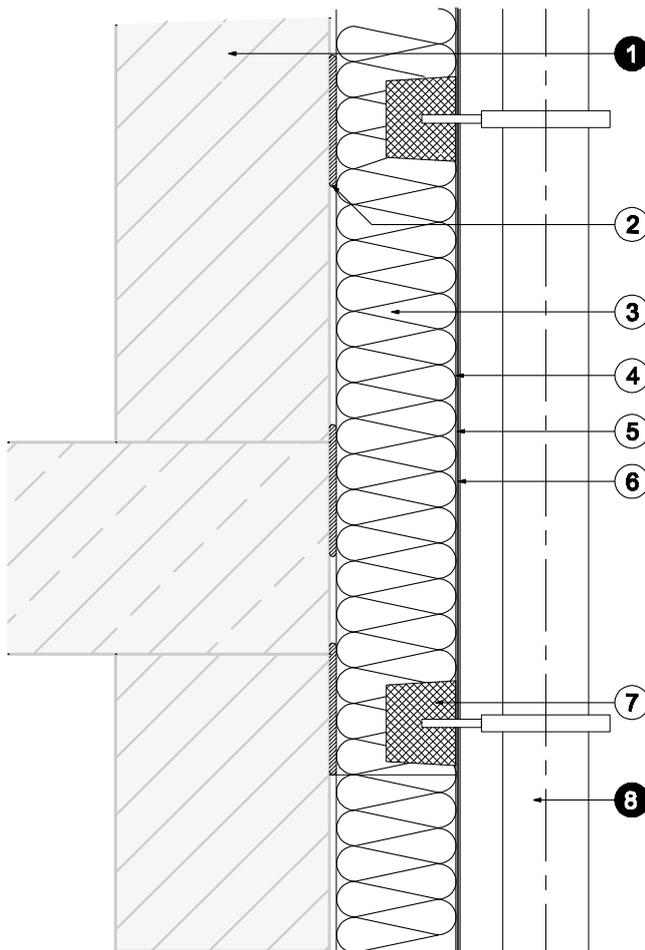
Alternative for anchors:



Legende:

- 1 **Wall structure**
- 2 **Adhesive**
- 3 **Facade insulation panel (EPS/MW)**
- 4 **Base plaster with reinforcement**
- 5 **Primer (depending on system)**
- 6 **Top coat plaster**
- 7 **Installation system Typ A**
- 8 **Installation system Typ B**
- 9 **Canopy**

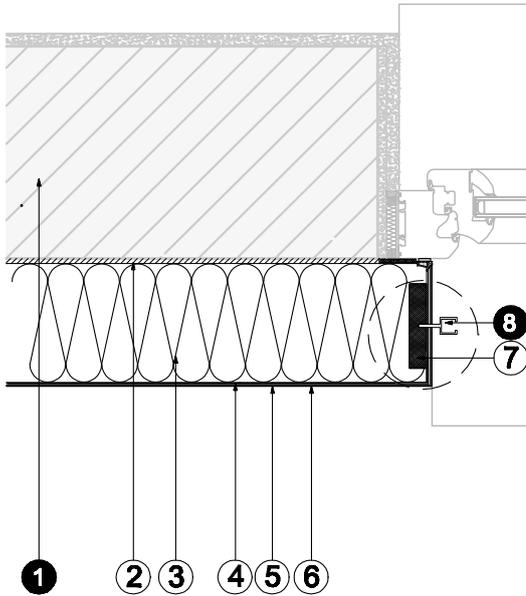
16b) DETAIL CONNECTION: DOWN PIPE – THERMALLY DECOUPLED



Key:

- 1 *Wall structure*
- 2 *Adhesive*
- 3 *Facade insulation panel (EPS/MW)*
- 4 *Base plaster with reinforcement*
- 5 *Primer (depending on system)*
- 6 *Top coat plaster*
- 7 *Installation system*
- 8 *Down pipe*

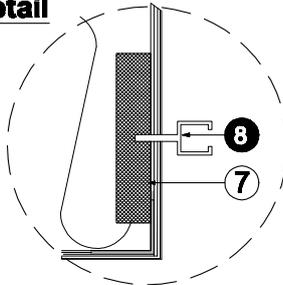
16c) DETAIL CONNECTION: ROLLER SHUTTER GUIDE TRACK



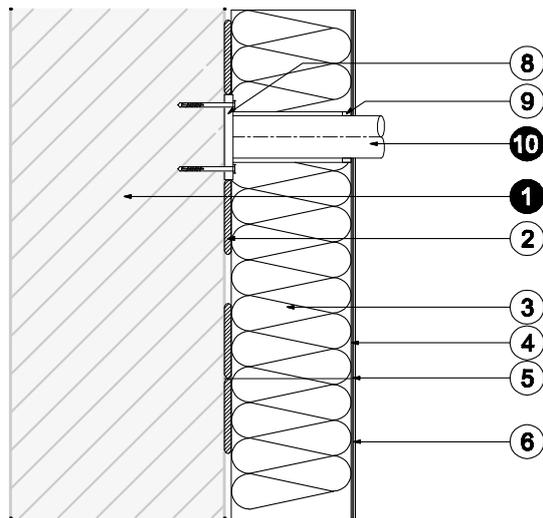
Key:

- 1 *Wall structure*
- 2 *Adhesive*
- 3 *Facade insulation panel (EPS/MW)*
- 4 *Base plaster with reinforcement*
- 5 *Primer (depending on system)*
- 6 *Top coat plaster*
- 7 *Installation system*
- 8 *Roller shutter guide track*

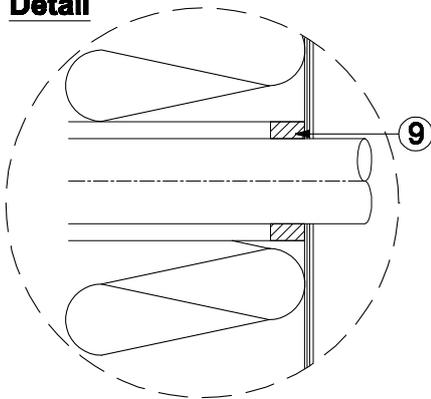
Detail



16d) DETAIL CONNECTION: BALCONY RAILING



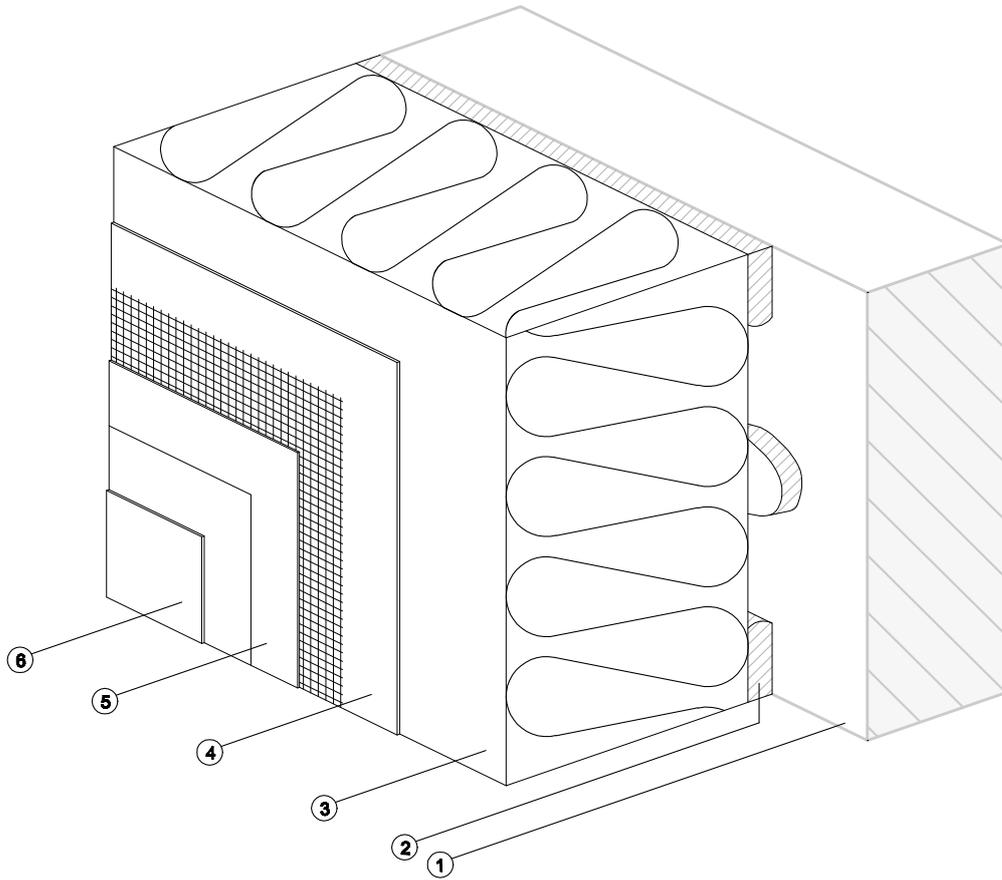
Detail



Key:

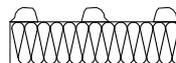
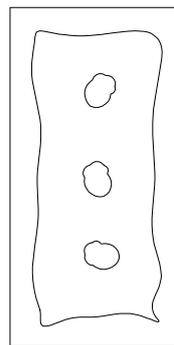
- 1 *Wall structure*
- 2 *Adhesive*
- 3 *Facade insulation panel (EPS/MW)*
- 4 *Base plaster with reinforcement*
- 5 *Primer (depending on system)*
- 6 *Top coat plaster*
- 8 *Installation system*
- 9 *Joint sealing strip*
- 10 *Balcony railing*

17a) BONDING – BEAD-SPOT METHOD

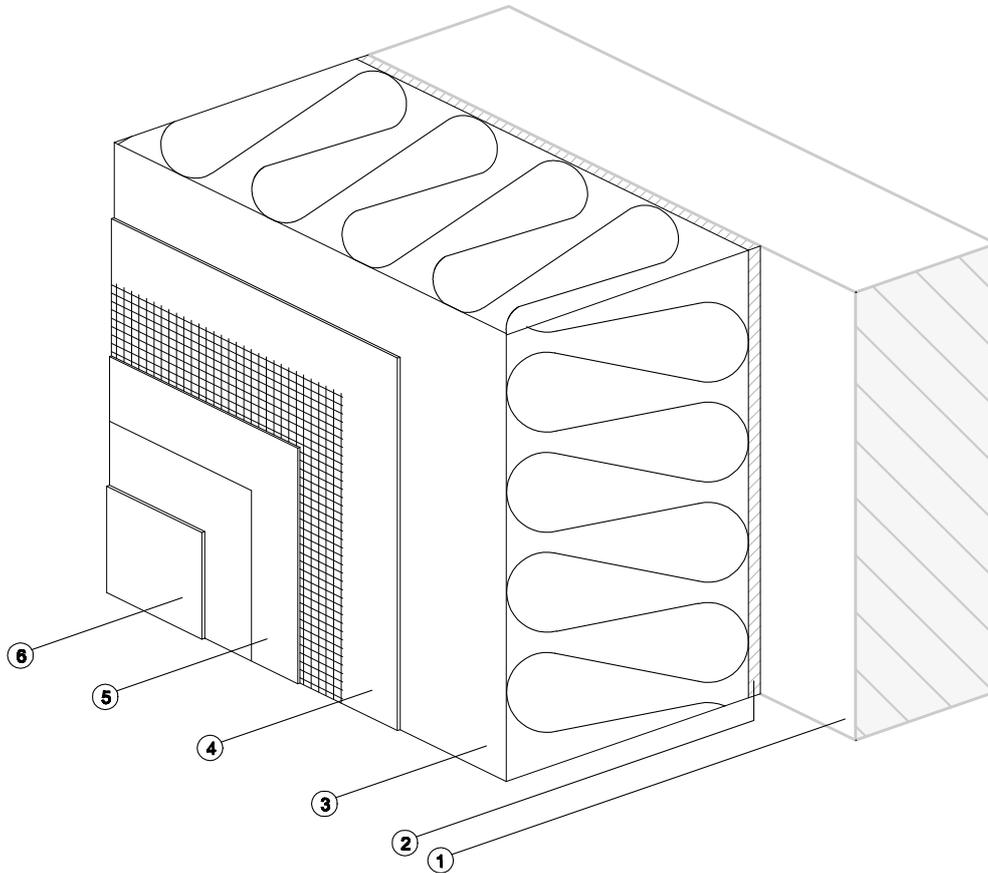


Note:

Additional mechanical fixing of the thermal insulation composite system may be necessary, depending on the substrate

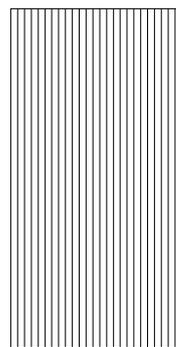


17b) BONDING – FULL-SURFACE



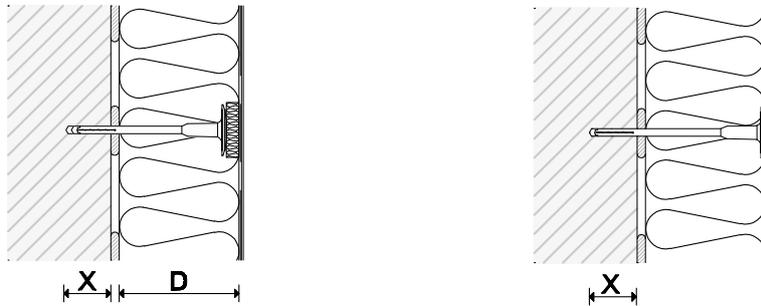
Note:

Additional mechanical fixing of the thermal insulation composite system may be necessary, depending on the substrate



18) SYSTEM ANCHOR WITH PLUG

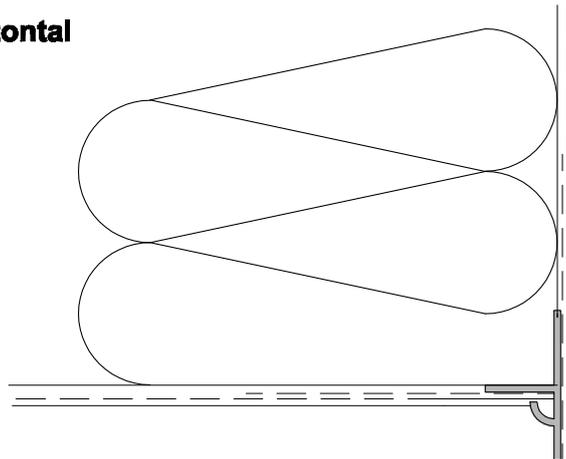
SYSTEM ANCHOR (FLUSH)



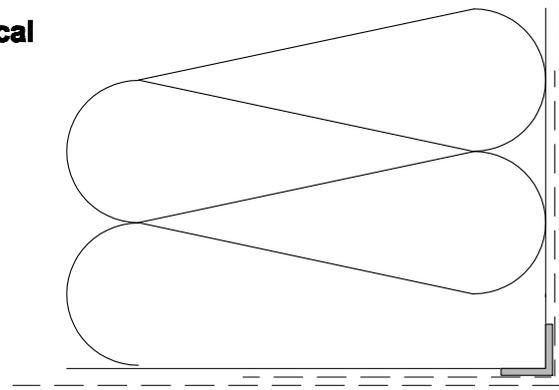
- D Minimum thickness of insulation material 8 cm**
- X Expansion zone dependent on type of anchor used and wall material**

Formation of drip edges on corners

horizontal



vertical



ANNEX III DETAIL NATIONAL SUPPLEMENTS
(ADDED ACCORDINGLY)

IMPRINT

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