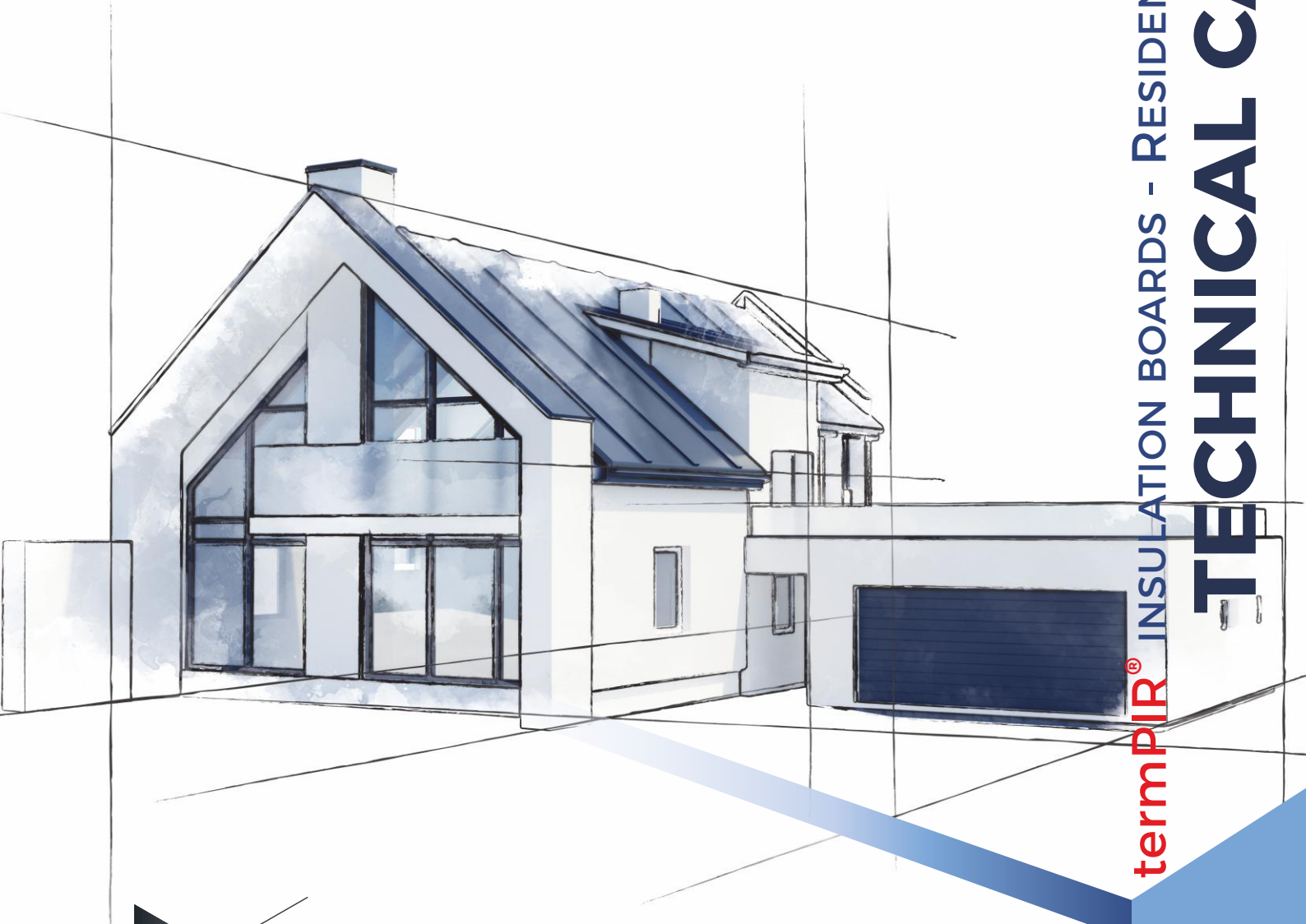




GÓR-STAL[®]
SANDWICH PANELS



termPIR[®] INSULATION BOARDS - RESIDENTIAL BUILDINGS
TECHNICAL CATALOG



termPIR[®]
insulation boards



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▷ INTRODUCTION

This publication is intended to present an assortment and technical properties of **termPIR®** boards to our customers. With over a decade of experience and extensive knowledge we perfectly know the needs of the market. As a result, we create products and solutions that give our customers real benefits.

▷ ABOUT THE COMPANY

Gór-Stal is a Polish company founded in 2003. It had originally produced and sold finished steel construction elements. The increase in demand for building materials for light industrial facilities forced co-owners to buy the line for the production of sandwich panels with a polyurethane core. It is one of the most modern and technologically advanced production lines in Europe. Gór-Stal manufactures **GORLICKA® sandwich panels** and **termPIR® insulating boards**. Sandwich panels are commonly used building materials for light cladding of industrial halls, warehouses, production halls and commercial buildings, offices, administrative buildings, freezers and cold storages. Since the beginning of the company's operation it has rapidly developed and extensively expanded its operations both geographically and in terms of product offerings. Gór-Stal is recognized by customers in Poland, Czech Republic, Austria, Romania, Belgium, the Netherlands, Luxembourg, Great Britain, France, Germany, Estonia and the Nordic countries, Slovakia, Hungary, Ukraine, Lithuania and Latvia. We currently have two factories, one in Gorlice and the other in Bochnia, where we manufacture termPIR insulation boards.

▷ PRODUCTS

termPIR® is a thermal insulation board with the core from **polyisocyanurate** foam. PIR is chemically modified **polyurethane**, which features durability and increased resistance to high temperatures. The isocyanurate structures in foams decompose in temperature over 300°C and they char partially. The charred layer prevents the penetration of high temperature through the board, which constitutes more effective protection against fire. This product, which is very popular in Europe and globally, successfully substitutes thermal insulation systems based on rock wool and styrofoam. This is due to the best thermal insulation properties in this group of construction materials, durability, easiness and quickness of installation, fulfilling of fire-fighting properties, with the material weight of about **30 kg** per cubic meter. **termPIR®** thermal insulation boards complements the system of light cladding from sandwich panels and allows for complete thermal insulation of industrial and residential buildings, from the floor to the roof using polyurethane – a modern, durable material resistant to rodents and chemical substances.

▷ APPLICATION

Thermal insulation boards **termPIR®** can be applied for thermal insulation of **almost any element** in different types of buildings. Durability, hardness and very small absorbability cause that they can be used for thermal insulation of ceilings, floors and foundations. They are also useful as a very durable insulation material for walls, roofs and thermal insulation of lofts in residential buildings.

Depending on its application, the **termPIR®** boards is made in different linings, so:

- **termPIR® AL** with gastight multilayer lining containing aluminium is a slab with the best thermal parameters recommended for the general use,
- **termPIR® WS** with fibreglass lining, which is dedicated for bonded thermal insulation systems.
- **termPIR® ETX** with fibreglass lining, which is dedicated for thermal insulation of buildings with a light wet method (so called BSO or ETICS).

In the further part of this document, details and technical drawings of typical elements of residential buildings insulated thermally with **termPIR®** boards are presented.

▷ CERTIFICATES

termPIR® boards possess the following certificates and attestations:

- Quality Management System Certificates,
- CE Declaration of Performance acc. to EN 13165,
- Fireproofing, reaction-to-fire performance, and fire non-proliferation classifications,
- Hygienic Certificate - approving for use in service, commercial, industrial, food sector, cooling, residential, and public use buildings, including healthcare buildings.

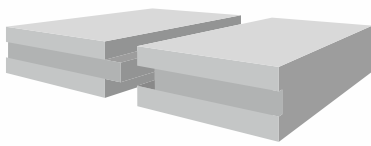
Current versions are available on the website.

▷ **PRODUCTION PROGRAM**

The **termPIR®** board is produced in a thickness **from 20 to 250 mm**. Typical dimensions of a single panel are 600X1200 mm and **1200x2400 mm**. It is possible to manufacture panels with the following dimensions: **1200x1200 mm, 1200x1800 mm and 1200x3000 mm**. In case of panels milled longitudinally only, also: **1200x3000-6200 mm**.

Precisely milled edges improve the thermal insulation and facilitate the assembly of insulation. There is a possibility to make mills: **FIT** - flat mill, **LAP** - corrugated mill, and **TAG** - tongue-and-groove mill. The surface of covering the slab with the LAP or TAG mill is smaller by approximately 2% when compared with slab with the FIT mill. The LAP mill is available for slab from 40 mm of thickness, and the TAG mill - for slab from 40 mm of thickness.

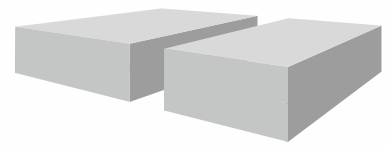
TAG - tongue and groove



LAP - stepwise milling (for orders for an area above 2000m²)



FIT - flat milling



▷ **TRANSPORT RECOMMENDATIONS**

termPIR® thermal insulation panels are packed in packages enabling their handling. The typical package height is **500 mm**. The number of panels in a package depends on its thickness. The details are shown in the table below.

Panel thickness [mm]	20	30	40	50	60	70	80	90
Number of boards in a package	24	16	12	10	10	7	6	6
Number of packages in a stack	5	5	5	5	4	5	5	4
Panel thickness [mm]	100	110	120	130	140	150	160	170
Number of boards in a package	5	5	5	4	4	4	3	3
Number of packages in a stack	5	4	4	5	4	4	5	4
Panel thickness [mm]	180	190	200	210	220	230	240	250
Number of boards in a package	3	3	3	2	2	2	2	2
Number of packages in a stack	4	4	4	5	5	5	5	5

Loading and unloading is carried out manually by single packages or using a fork lift provided with a grab for some packages. In case of longer, not typical panels, the relevant equipment or more persons should be provided for unloading. In this way, panel breaking or damage can be prevented.

Note!

Boards are prone to damage, also when they are in the packaging. It is not allowed to throw or roll the packages. The transport of thermal insulation boards should be executed by trucks intended for this purpose. Upon the reception of insulation boards, the number and quality of the delivered commodities should be checked. Discrepancies should be described in the shipping list and reported to the manufacturer immediately. Possible damage to boards on the truck should be documented with photographs.

▷ **STORAGE RECOMMENDATIONS**

- packages should be stored in a dry place; they should not be put directly on the ground, but supports should be used
- do not place heavy objects on the panels, this can cause serious damage
- protect from weather conditions
- single panels should be transported vertically so as to avoid their breaking.

▷ **TECHNICAL ASSISTANCE**

We strive to deliver friendly and professional customer service. Our technical department and sales representatives assist designers, engineers and contractors in designing, ordering and selecting our products as well as installation thereof. Our customers are thus provided with active support from the design stage to the installation stage as well as prompt technical advisory service and cost calculation. The ordering and delivery process is coordinated by the Customer Service Department (DOK).

For more information visit our websites: www.termPIR.eu and www.gor-stal.pl

▷ PARAMETERS OF termPIR® INSULATION BOARDS

Kind of core	Rigid polyisocyanurate foam (PIR)											
Apparent core density	$\rho = 30 \text{ kg/m}^3$											
Declared heat transfer coefficient for lining: AL	$\lambda_0 = 0,022 \text{ W/m}\cdot\text{K}$											
Declared heat transfer coefficient for lining: PK, WS, WS GK, BWS, BT oraz ETX	$\lambda_0 = 0,026$ for thickness: 20 - 70 mm $\lambda_0 = 0,025$ for thickness: 80 - 110 mm $\lambda_0 = 0,024$ for thickness ≥ 120 mm											
Board facing	<ul style="list-style-type: none"> PK- from kraft paper (for orders of an area of 2000 m²) AL - double-sided cladding consisting of aluminum, paper and polyethylene WS, ETX - fiberglass WS GK - protected on both sides with gas-tight lining from glass reticular fibre (WS) and with a plasterboard on one side BWS - on one side a fiberglass, on the other a bitumen lining BT - bitumen lining AL GK - protected on both sides with gas-tight lining layer composed of aluminium and with a plasterboard on one side (New!) 											
Standard board dimensions [mm]	600 x 1200 mm, 1200 x 2400 mm i 1200 x 2600 mm*											
Individual order board dimensions [mm]	1000 x 1200 mm, 1200 x 1200 mm, 1200 x 1800 mm, 1200 x 3000 mm*											
Joint types	FIT - flat milling, LAP - stepwise milling**, (for orders above 2000m ²), TAG - tongue and groove**											
Board thickness [mm]	Available boards thickness in 10 mm steps											
	20	30	40	50	60	70	80	90	100	110	120	130
Thermal resistance R [m²K/W]	0,90 ¹ 0,75 ²	1,35 ¹ 1,15 ²	1,85 ¹ 1,55 ²	2,30 ¹ 1,90 ²	2,75 ¹ 2,30 ²	3,25 ¹ 2,70 ²	3,70 ¹ 3,20 ²	4,15 ¹ 3,60 ²	4,65 ¹ 4,00 ²	5,10 ¹ 4,40 ²	5,55 ¹ 5,05 ²	6,05 ¹ 5,45 ²
Heat transfer coefficient U [W/m²K]	1,11 ¹ 1,33 ²	0,74 ¹ 0,87 ²	0,54 ¹ 0,65 ²	0,44 ¹ 0,53 ²	0,36 ¹ 0,44 ²	0,31 ¹ 0,37 ²	0,27 ¹ 0,31 ²	0,24 ¹ 0,28 ²	0,22 ¹ 0,25 ²	0,20 ¹ 0,23 ²	0,18 ¹ 0,20 ²	0,17 ¹ 0,18 ²
Board thickness [mm]	140	150	160	170	180	190	200	210	220	230	240	250
Thermal resistance R [m²K/W]	6,50 ¹ 5,85 ²	6,95 ¹ 6,30 ²	7,45 ¹ 6,70 ²	7,90 ¹ 7,15 ²	8,35 ¹ 7,55 ²	8,85 ¹ 8,00 ²	9,30 ¹ 8,40 ²	9,75 ¹ 8,80 ²	10,20 ¹ 9,25 ²	10,70 ¹ 9,65 ²	11,10 ¹ 10,10 ²	11,60 ¹ 10,50 ²
Heat transfer coefficient U [W/m²K]	0,15 ¹ 0,17 ²	0,14 ¹ 0,16 ²	0,14 ¹ 0,15 ²	0,13 ¹ 0,14 ²	0,12 ¹ 0,13 ²	0,11 ¹ 0,13 ²	0,11 ¹ 0,12 ²	0,10 ¹ 0,11 ²	0,10 ¹ 0,11 ²	0,09 ¹ 0,10 ²	0,09 ¹ 0,10 ²	0,09 ¹ 0,10 ²
Compression strength at 10% of deformation	$\geq 120 \text{ kPa}$ for thickness: 20 mm $\geq 150 \text{ kPa}$ for thickness: 30 - 250 mm											
Classification considering reaction to fire (the board itself)	E - self-extinguishing - for termPIR® AL, termPIR® WS, termPIR® WS GK, termPIR®, termPIR® ETX F - for others											

* dimensions for slabs combined with gypsum boards

** dimensions of panels with milling are 15 mm smaller (a tolerance of approx. 2 % of the surface area should be ordered). **Milling:** LAP available for the panel from 30 mm, TAG for the panel from 40 mm **LEGEND:** 1 - for termPIR® AL, 2 - for others

▷ ADVANTAGES OF termPIR®

- **low thermal conductivity index ($\lambda=0,022 \text{ W/m}\cdot\text{K}$)*** - the lower the index, the better insulation is provided by the material,
- **high resistance to fire** - in direct contact with fire, charred coating appears on the material surface, which efficiently protects the structures located deeper against fire penetration, increasing the level of resistance to fire,
- **minimisation of thermal insulation thickness** - the termPIR® board features almost twice as good thermal insulation properties as those of the currently used thermal insulation materials
- **minimisation of insulation load** - square metre of 100 mm thick termPIR® AL boards ($U = 0,22 \text{ W/m}^2\cdot\text{K}$) weighs approximately 3 kg,
- **high compression strength** makes the panel an ideal choice for flooring or terraces. termPIR® is a material which preserves its form, will not break or shrink even after many years of use,
- **water resistance** - high resistance to permeation of humidity and water (absorbability <2% for termPIR® AL i WS),
- **resistance** to chemical factors, as well as rodents, insects, fungi, and moulds.

termPIR® boards allow for thermal insulation cost reduction by:

- attractive price of m³ of the product
- smaller thickness of thermal insulation required, reduction of purchase costs
- a few times lighter, which makes transport and installation substantially less labour costly and less expensive
- assumed at the stage of designing they allow for making the building construction leaner as compared with heavier thermal insulation material, which can reduce the costs of the whole investment.

* for termPIR® AL

▷ **COMPARISON OF THERMAL INSULATION MATERIALS**

In the table, the parameters of thermal insulation made from termPIR® boards, , rock wool and Styrofoam are compared. GÖR-STAL Minimal values of heat transfer coefficient U are considered in the list for the selected partitions according to the Regulation of the Minister of Infrastructure of 01/01/2017.

The scope of application of the insulation, maximal permissible value of the coefficient U _(MAX) of the partition	Required thickness, coefficient U and weight of termPIR® boards				Required thickness, coefficient U and weight of hard rock wool board (λ=0,040 W/m·K)			Required thickness, coefficient U and weight of Styrofoam boards (λ=0,038 W/m·K)					
	[W/m²·K]	[mm]	[W/m²·K]	[kg/m²]	[mm]	[W/m²·K]	[kg/m²]	[mm]	[W/m²·K]	[kg/m²]			
Roofs, flat roofs and ceilings under unheated attics or over passages													
at t _i ≥ 16°C	0,18	120 ¹	130 ²	0,18 ¹	0,18 ²	3,75 ¹	4,2 ²	220	0,18	27	210	0,18	5,25
at 8°C ≤ t _i < 16°C	0,30	80 ¹	90 ¹	0,27 ¹	0,28 ²	2,4 ¹	2,7 ²	140	0,29	17,5	130	0,29	3,25
at t _i ≥ 8°C	0,70	40		0,54 ¹	0,65 ²	1,2		60	0,66	7,5	60	0,63	1,5
External walls													
at t _i ≥ 16°C	0,23	100 ¹	110 ²	0,22 ¹	0,23 ²	3,0 ¹	3,3 ²	180	0,22	22,5	170	0,22	4,25
at 8°C ≤ t _i < 16°C	0,45	50 ¹	60 ²	0,44 ¹	0,44 ²	1,5 ¹	1,8 ²	100	0,4	12,5	90	0,42	2,25
at t _i ≥ 8°C	0,90	30 ¹	30 ²	0,74 ¹	0,87 ²	0,75 ¹	0,90 ²	50	0,8	6,25	45	0,76	1,5
Floors on the ground													
at t _i ≥ 16°C	0,30	80 ¹	90 ²	0,27 ¹	0,28 ²	2,4 ¹	2,7 ²	Not applied			130	0,29	3,25
at 8°C ≤ t _i < 16°C	1,20	20 ¹	30 ²	1,10 ¹	0,87 ²	0,6 ¹	0,75 ²				40	0,95	1
at t _i ≥ 8°C	1,5	20		1,11 ¹	1,33 ²	0,75					30	1,26	0,75
Internal walls and ceilings between storeys													
at Δt _i ≥ 8°C	1,00	30 ¹	30 ²	0,74 ¹	0,87 ²	0,75 ¹	0,9 ²	40	1,0	5	40	0,95	1,0
Walls and ceilings separating a heated room from non-heated one													
	0,25	90 ¹	100 ²	0,24 ¹	0,25 ²	2,7	3,0	160	0,25	20	160	0,24	4

KEY: 1 - the value of heat transfer coefficient for lining of termPIR® AL amounts to 0,022 W/m·K

2 - the value of the heat transfer coefficient of the lining of termPIR® WS, BWS, BT, PK, ETX amounts to 0,024 - 0,026 W/m·K depending on panel thickness

Types of rooms : t_i ≥ 16°C - - apartments, production halls, sports halls, offices, meeting rooms, etc.; 8°C ≤ t_i < 16°C - stores and warehouses with permanent service personnel, staircases of residential buildings, market halls, etc.; t_i ≤ 8°C - stores and warehouses without permanent service personnel, garages, machine rooms, battery rooms, etc.

▷ **SELECTION OF termPIR® THERMAL INSULATION BOARDS IN RESIDENTIAL BUILDINGS**

Building element	Panel cladding type	Thickness [mm]	
		minimal	recommended
Roofs on or under rafters and flat roofs	termPIR® AL	120	150
Roofs between and under rafters	termPIR® AL, AL GK, WS GK	110 + 40	150 + 40
Flat roofs in the bonded system	termPIR® WS	130	160
Triple layer external wall	termPIR® AL	100	120
Double layer external wall in the dry system	termPIR® AL	100	120
Double layer external wall in the ETICS system	termPIR® ETX	110	120
Cellar and foundation walls	termPIR® AL	20	50
Ceilings between storeys	termPIR® AL	30	30
Ceilings over unheated spaces	termPIR® AL	90	100
Floor on the ground	termPIR® AL	80	80 - 100

▷ **BOARDS WITH INCREASED THERMAL INSULATION PROPERTIES**
termPIR® MAX19 and termPIR® MAX18

We are pleased to present the outcome of our research and development efforts. They are the products for the most demanding customers: the board featuring the record-breaking low lambda coefficient: **termPIR® MAX19: $\lambda_b=0,019$ W/m·K** oraz **termPIR® MAX18: $\lambda_b=0,018$ W/m·K**.

PRODUCT MADE FOR SPECIAL REQUEST WITH INDIVIDUAL PRICING AND DETERMINATION OF EXECUTION DATE!

PARAMETERS OF termPIR® MAX19

Kind of core	Rigid polyisocyanurate foam (PIR)												
Apparent core density	$\rho = 30$ kg/m ³												
Declared heat transfer coefficient	$\lambda_b = 0,019$ W/m·K												
Board facing	AL - double-sided cladding consisting of aluminum, paper and polyethylene												
Standard board dimensions [mm]	600 x 1200 mm i 1200 x 2400 mm												
Individual order board dimensions [mm]	1000 x 1200 mm, 1200 x 1200 mm, 1200 x 1800 mm, 1200 x 3000 mm*												
Joint types	FIT - flat milling, LAP - stepwise milling**, (for orders above 2000m ²), TAG - tongue and groove**												
Board thickness [mm]	Available boards thickness in 10 mm steps												
	20	30	40	50	60	70	80	90	100	110	120	130	
Thermal resistance R [m²K/W]	1,05	1,60	2,15	2,70	3,25	3,80	4,35	4,90	5,45	5,95	6,50	7,05	
Heat transfer coefficient U [W/m²K]	0,95	0,63	0,47	0,37	0,31	0,26	0,23	0,20	0,18	0,17	0,15	0,14	
Board thickness [mm]	140	150	160	170	180	190	200	210	220	230	240	250	
Thermal resistance R [m²K/W]	7,60	8,15	8,70	9,25	9,80	10,35	10,90	11,45	11,95	12,50	13,05	13,60	
Heat transfer coefficient U [W/m²K]	0,131	0,122	0,115	0,108	0,102	0,096	0,091	0,087	0,083	0,080	0,076	0,073	
Compression strength at 10% of deformation	NPD												
Classification considering reaction to fire (the board itself)	E - self-extinguishing - for termPIR® AL												

PARAMETERS OF termPIR® MAX18

Kind of core	Rigid polyisocyanurate foam (PIR)												
Apparent core density	$\rho = 30$ kg/m ³												
Declared heat transfer coefficient	$\lambda_b = 0,018$ W/m·K												
Board facing	AL - double-sided cladding consisting of aluminum, paper and polyethylene												
Standard board dimensions [mm]	600 x 1200 mm i 1200 x 2400 mm												
Individual order board dimensions [mm]	1000 x 1200 mm, 1200 x 1200 mm, 1200 x 1800 mm, 1200 x 3000 mm*												
Joint types	FIT - flat milling, LAP - stepwise milling**, (for orders above 2000m ²), TAG - tongue and groove**												
Board thickness [mm]	Available boards thickness in 10 mm steps												
	20	30	40	50	60	70	80	90	100	110	120	130	
Thermal resistance R [m²K/W]	1,10	1,65	2,20	2,75	3,35	3,90	4,55	5,00	5,55	6,15	6,70	7,25	
Heat transfer coefficient U [W/m²K]	0,91	0,61	0,45	0,36	0,30	0,26	0,22	0,20	0,18	0,16	0,15	0,14	
Board thickness [mm]	140	150	160	170	180	190	200	210	220	230	240	250	
Thermal resistance R [m²K/W]	7,80	8,35	8,95	9,50	10,05	10,60	11,15	11,75	12,30	12,85	13,40	13,95	
Heat transfer coefficient U [W/m²K]	0,128	0,119	0,111	0,105	0,099	0,094	0,089	0,085	0,081	0,077	0,074	0,071	
Compression strength at 10% of deformation	NPD												
Classification considering reaction to fire (the board itself)	E - self-extinguishing- for termPIR® AL												

* dimensions for slabs combined with gypsum boards

** dimensions of panels with milling are 15 mm smaller (a tolerance of approx. 2 % of the surface area should be ordered).

Milling: LAP available for the panel from 30 mm, TAG for the panel from 40 mm

▷ **COMPARISON OF TOP CLASS THERMAL INSULATION MATERIALS**

In the table below are compared the parameters of thermal insulation made from the materials featuring the best thermal insulation properties available in the market: boards **termPIR® MAX18** ($\lambda=0,018 \text{ W/m}\cdot\text{K}$), **termPIR® MAX19** ($\lambda=0,019 \text{ W/m}\cdot\text{K}$), soft rock wool ($\lambda=0,033 \text{ W/m}\cdot\text{K}$) and graphite styrofoam ($\lambda=0,031 \text{ W/m}\cdot\text{K}$). In the list below, maximal values of the heat transfer coefficient U are taken into consideration for the selected partitions of the new buildings according to the Regulation of the Minister of infrastructure (Journal of Laws 02.75.690) as required on 01/01/2017 and 01/01/2021.

The scope of application of the insulation, maximal permissible value of the coefficient $U_{(MAX)}$ of the partition		Requested thickness, coefficient U of termPIR® MAX18 boards		Requested thickness, coefficient U of termPIR® MAX19 boards		Required thickness, coefficient U of the soft rock wool		Required thickness, coefficient U of graphite styrofoam	
at $t_{\geq 16}^{\circ}\text{C}$	[W/m ² ·K]	[mm]	[W/m ² ·K]	[mm]	[W/m ² ·K]	[mm]	[W/m ² ·K]	[mm]	[W/m ² ·K]
Roofs, flat roofs and ceilings under unheated attics or over passages									
since 2017 r.	0,18	100	0,17	110	0,17	190*	0,17	180	0,17
since 2021 r.	0,15	120	0,15	130	0,15	220*	0,15	210	0,15
External walls									
since 2017 r.	0,23	80	0,22	90	0,21	n/a		140	0,22
since 2021 r.	0,20	90	0,20	100	0,19			160	0,19
Floors on ground									
since 2017 i 2021 r.	0,30	60	0,30	70	0,27	n/a		110	0,28
Internal walls and ceilings between storeys									
Walls and ceilings separating a heated room from not heated one									
since 2017 i 2021 r.	0,25	80	0,22	80	0,24	140*	0,24	130	0,24

only for walls and constructions in the plasterboard system.

▷ **WHY IT IS WORTH USING termPIR® boards?**

Property	termPIR® board	rock wool	EPS styrofoam
Thermal insulation	the best $\lambda = 0,018 - 0,026 \text{ W/m}\cdot\text{K}$	$\lambda = 0,033 - 0,040 \text{ W/m}\cdot\text{K}$	$\lambda = 0,031 - 0,038 \text{ W/m}\cdot\text{K}$
Hardness	top hardness strength to 15 tons/m ²	soft, not bearing	strength up to 10 tons/m ²
Absorbability	small absorbability < 2%	high absorbability	small absorbability < 2%
Biological resistance	fully resistant	frequent rodent habitat	rodent habitat
Chemical resistance	fully resistant	resistant	not resistant
Fire resistance	self-extinguishing	non-flammable	self-extinguishing
Application	all-purpose for roofs, ceilings, walls, foundations	limited by absorbability and strength	all-purpose
Product life-span	very long	can change the shape and parameters over time	

▷ INSULATION OF INCLINED ROOF

termPIR® boards can be installed on sloping roofs in several ways:

1. **Single layer:** under rafters, on rafters and on rafters with planking,
2. **Double layer:** under rafters and between rafters.

Due to the effectiveness of insulation, single layer installation is recommended. It is caused by the fact that a rafter appearing in one of the layers of the double layer insulation diminishes its properties substantially. That is why the under-rafter insulation must have a minimum thickness of 40 mm, in order to diminish the thermal bridge and joint thickness of the panels must be larger than in the case of the single layer installation.

The double layer installation corresponds to the most popular method of the thermal insulation of lofts using soft rock wool. The installation is similar, but due to the fact that the polyurethane panels are hard:

-the panels must be installed in a staggered way, mounted to the construction with screws, possible gaps in insulation should be sealed with installation foam and in order to seal the joints they must be additionally bonded with an aluminium tape.

-hangers of the construction profiles under the panels g-k should be mounted to the rafters through the insulation under the rafter. The single layer installation under rafters is connected with making only one, relevantly thicker insulation layer below the roof purlins, without insulation between the rafters (the layer between the rafters can also be made from rock wool). Below is listed a detailed description of over-rafter assembly method. In case of the on-rafter system with planking, the installation is analogous, it differs only in the making of the complete (or openwork) planking before the installation of termPIR® boards.

▷ GUIDELINES for roof assembly with insulation in the on-rafter system

Tools necessary for assembly:

- a screw gun with a torx and PH head
- a manual or mechanical wood saw
- a wall paper knife
- a stapler

Accessories necessary for assembly:

- aluminium tape of a width of 50 mm for sealing panel joints
- consumption: 1.25-1.5 m per each 1 m² of the termPIR® board
(one side use), available in 45 m long reels.
- vapour-permeable membrane
- consumption: 1.1 m² per each 1 m² of the termPIR® board
- fixing screws # 8 mm
 - screwed perpendicularly to the board:
screws for fixing wooden elements with washer heads GT W
with corrosion protection up to C4 class,
Consumption: 1.25-1.5 pcs per each 1m of rafters
the necessary length of a screw should be counted as a sum of:
thickness of counter batten (min. 40 mm), termPIR® board, and screw
anchorage in the rafter (min. 40 mm)
 - screwing at angle of 67° in relation to the board (towards the eave):
GT C screws for mounting timber elements with conical head
with corrosion protection up to C4 class,
Consumption: 1.25-1.5 pcs per each 1m of rafters
the necessary length of a screw should be counted as above.
The reserve for the slant is done by an allowance of 10% to the calculated length.
The screw selection table for the termPIR® boards is on the following pages.
- other screws and accessories used for traditional covering
(screws for fixing battens, covers, staples, etc.)



▷ **Stages of assembly of a sloping roof in the on-rafter system**

1. Eaves assembly.

The assembly begins with the assembly of the eaves or overhang, which will also form a sort of support for the first row of the **termPIR®** insulation boards. The eaves should be installed in such a way that they protrude above the rafter for the length equal to the thickness of the installed boards. In order for the eaves to avoid looking unnaturally wide, the bottom of the rafter can be cut and the wedge obtained in this way can be used as a support for the board from the top of the rafter.

You should remember though about taking the preliminary measurement of the rafters, you should also calculate the foreseen length of the roofline with insulation.

2. Assembly of the first row of termPIR® insulation boards.

Boards are assembled with the longer side (2400 mm) in parallel with eaves. The direction and the side of the board assembly do not matter; however, for the comfort of assembly of the following rows you should consider the panel milling direction (especially in case of the board with LAP stepwise milling). The boards of the first row should be screwed in on assembly with screws to the rafters, then the joints should be covered with the sealing tape.

3. Assembly of counter battens.

The correct assembly of the **termPIR®** thermal insulation to the roof structure is carried out through screwing of counter battens to rafters. Because counter battens become a load-bearing elements of the covering, their thickness must have at least 40 mm (or even 50 mm in case of long stretches). They are mounted to rafters using screws for timber structures with 8 mm diameter. The spacing of screws should amount to 33-40 cm (2.5-3 pcs/lm of load-bearing counter batten), where every other screw is mounted perpendicularly to the rafter and every other at an approximate angle of 67° in order to transfer the loads, which are parallel to rafters. At eave's width, the amount of screws should be increased up to 5 pcs per 1 lm of load-bearing counter batten (situation is analogical in case of two outermost rafters).

The table of screw selection is located below in this manual.

4. Arrangement of wind barrier

On the load-bearing counter battens should be placed the first layer of gas permeable lining (according to the manufacturer's indications), which will constitute as a wind barrier layer. At the bottom should be left a surplus, which will allow to lead the water from eventual covering leaks straight to a drainpipe. For the purpose of convenience of executed works, the wind barrier can be initially mounted using staples for load-bearing counter battens and later carry out the proper assembly using wooden distance counter battens with min. thickness of 25 mm. The mentioned counter battens should be mounted to counter battens using screws with shorter length than the total thickness of connected elements.

5. Assembly of subsequent row of the termPIR® insulation boards.

Please remember to move the slab connections in relation to the previous row (place them in a passing loop). The slabs of subsequent rows can be mounted using the assembly method only when such a necessity occurs. After that repeat steps 3 and 4 until you acquire a connection on the ridge of both stretches.

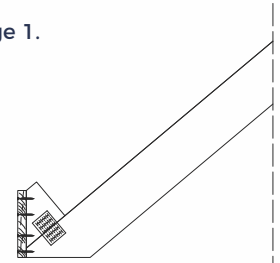
6. Connection of stretches on the ridge.

Insulation slabs should be cut on the ridge in such a way that there will be a 5-15 mm gap between the slabs. The gap should be filled out with assembly foam and the connection should be covered with sealing tape. Next, the remaining elements are mounted according to guidelines from points 3 and 4.

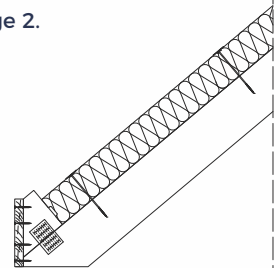
7. Assembly of battens and roof covering.

The battens should be mounted directly on load-bearing battens using screws with length not exceeding the total thickness of battens, distance counter battens, and load-bearing counter battens. In case of heavy covering please also attach the battens directly to the two outermost rafters.

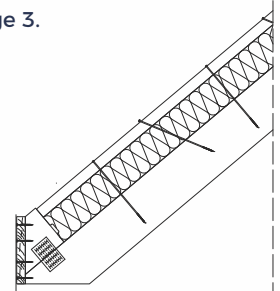
Stage 1.



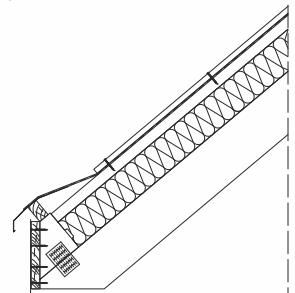
Stage 2.



Stage 3.



Stage 4.



Final detail.

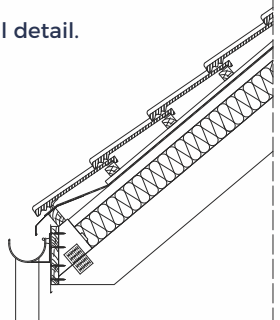


Diagram of one possible assembly method

▷ **Selection of screws for assembly of the termPIR[®] boards in the over-rafter system**

Table of selection of screws for light covering (sheet) and 40 mm thick counter battens

termPIR[®] board thickness	TOP GT W 8 mm screw installed perpendicularly	TOP GT C 8 mm screw installed at the angle of 67°
110 - 130 mm	L = 200 mm	L = 220 mm
130 - 150 mm	L = 220 mm	L = 240 mm
150 - 170 mm	L = 240 mm	L = 260 mm
170 - 180 mm	L = 260 mm	L = 280 mm
180 - 200 mm	L = 280 mm	L = 300 mm
210 mm	L = 300 mm	L = 320 mm
220 mm	L = 300 mm	L = 320 mm
230 mm	L = 320 mm	L = 340 mm
240 mm	L = 320 mm	L = 340 mm
250 mm	L = 340 mm	L = 360 mm

Table of selection of screws for heavy covering (slate) and 40 mm thick counter battens

termPIR[®] board thickness	TOP GT W 8 mm screw installed perpendicularly	TOP GT C 8 mm screw installed at the angle of 67°
110 - 120 mm	L = 200 mm	L = 220 mm
120 - 140 mm	L = 220 mm	L = 240 mm
140 - 160 mm	L = 240 mm	L = 260 mm
160 - 180 mm	L = 260 mm	L = 280 mm
190 mm	L = 280 mm	L = 300 mm
200 mm	L = 280 mm	L = 320 mm
210 mm	L = 300 mm	L = 320 mm
220 mm	L = 300 mm	L = 340 mm
230 mm	L = 320 mm	L = 340 mm
240 mm	L = 320 mm	L = 360 mm
250 mm	L = 340 mm	L = 380 mm

Examples of pitched roof details insulated thermally with termPIR[®] boards

PITCHED ROOF - On-rafter system (without planking)

Cross section through roof	012
Gable wall connection with the roof	013
Detail of connection between the roof and ceiling	014
Ceiling detail	015
Roof window detail	016
Detail at the gable wall - Cross section perpendicular to the roof surface	017

PITCHED ROOF - Under and between rafter system - W I

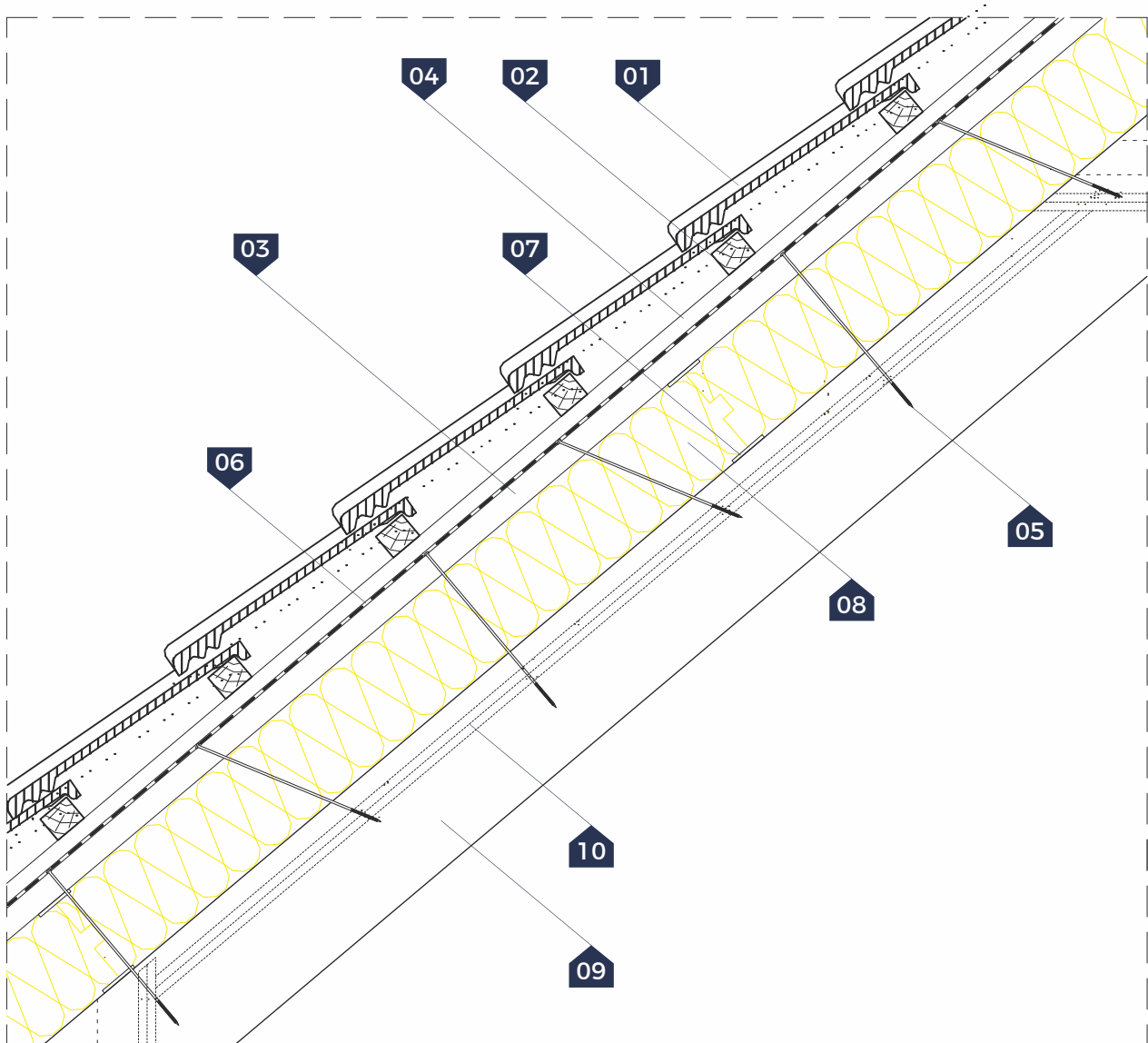
Cross section through roof	018
Detail of connection between the knee wall and roof	019
Detail of connection between the roof and ceiling	020
Ceiling detail	021
Roof window detail	022
Detail at the gable wall - cross-section perpendicular to the surface of roof	023

PITCHED ROOF - Under and between rafter system - W II

Cross section through roof	024
Detail of connection between the knee wall and roof	025
Detail of connection between the roof and ceiling	026
Ceiling detail	027
Roof window detail	028
Detail at the gable wall - cross-section perpendicular to the surface of roof	029

PITCHED ROOF - On-rafter system (without planking)

▷ Cross section through roof



▷ KEY:

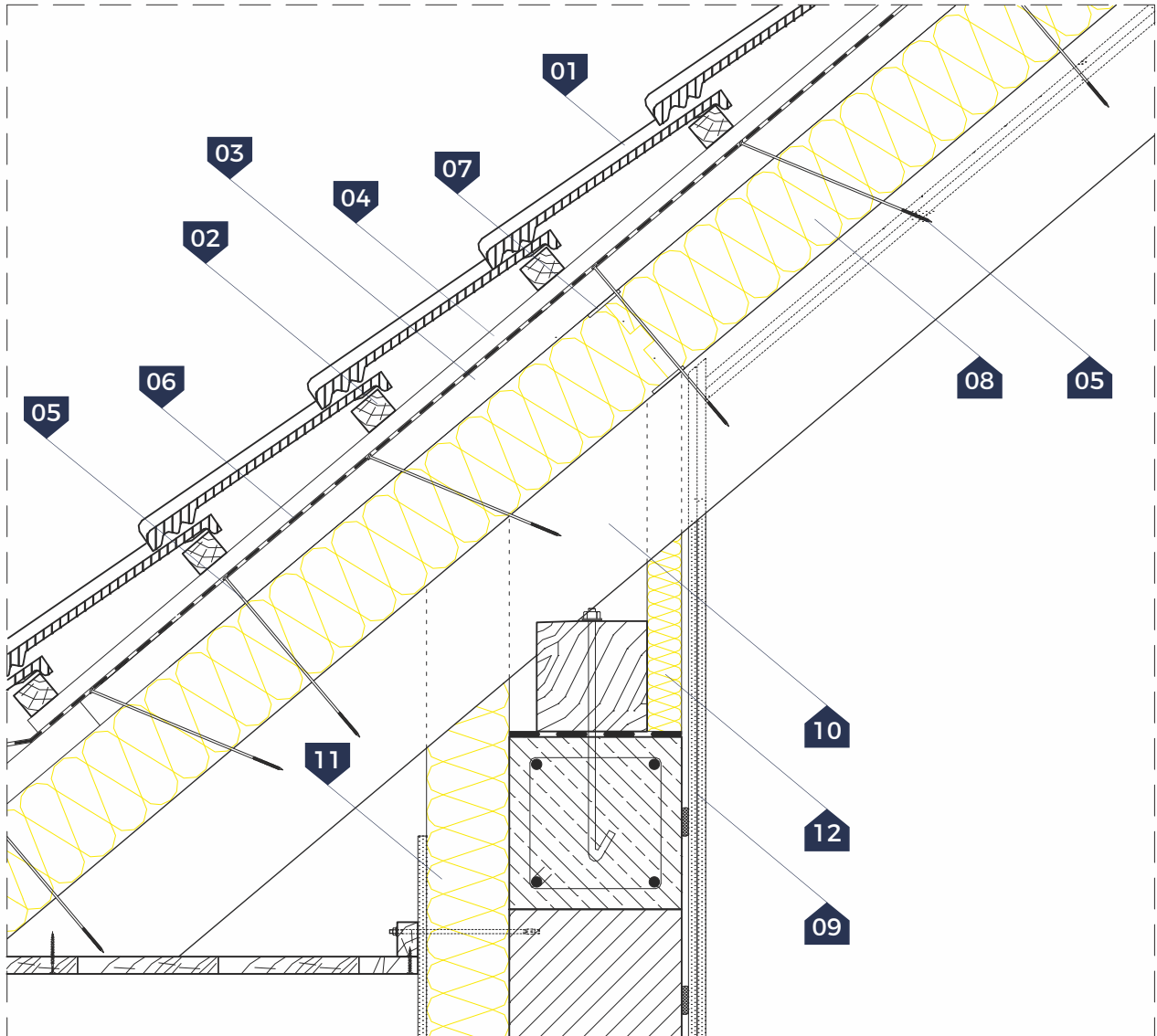
- 01. Roof cover - roof tile or steel sheet
- 02. Batten
- 03. Counter batten (thickness min. 40 mm)
- 04. Mounting strip (min. thick. 25 mm)
- 05. Screw fixing a counter-batten to a rafter
- 06. Wind insulation - vapour permeable membrane
- 07. Aluminium tape for sealing joints
- 08. On rafter thermal insulation - termPIR[®] AL board thickness 150 mm
- 09. Wooden rafter
- 10. Loft finishing - e.g. g-k panel on battens

▷ NOTE:

- a. A counter-batten is fixed to a rafter through a thermal insulation panel with self-tapping screws every 40 cm, when every second screw is installed at 67° degrees
- b. In case of high humidity rooms, it is recommended to install the vapour permeable membrane under the termPIR[®] boards

PITCHED ROOF - On-rafter system (without planking)

▷ Gable wall connection with the roof



▷ KEY:

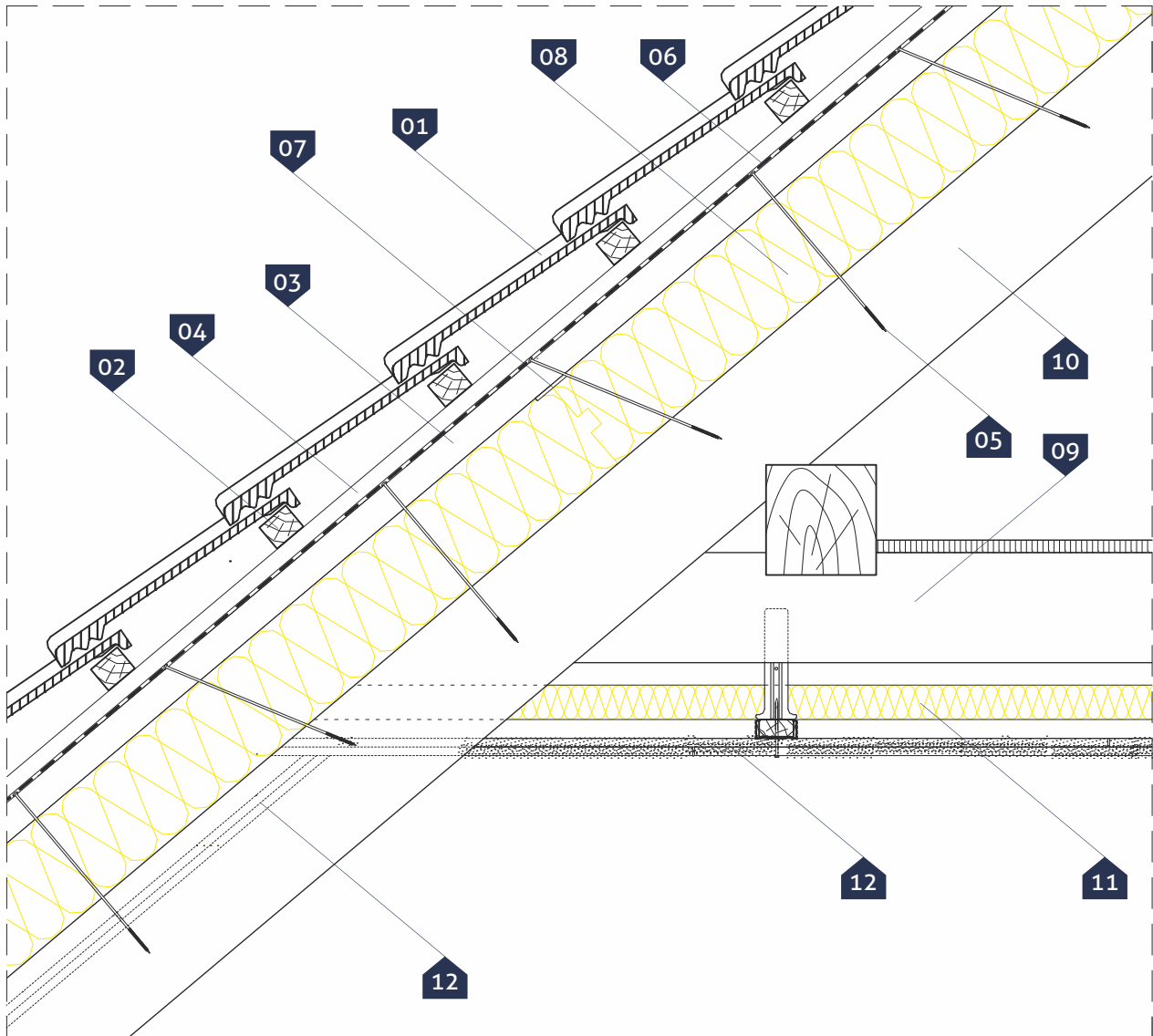
01. Roof cover - roof tile or steel sheet
02. Batten
03. Counter batten (thickness min. 40 mm)
04. Mounting strip (min. thick. 25 mm)
05. Screw fixing a counter-batten to a rafter
06. Wind insulation - vapour permeable membrane
07. Aluminium tape for sealing joints
08. On rafter thermal insulation - termPIR[®] AL board thickness 150 mm
09. Loft finishing - e.g. g-k panel on battens
10. Wooden rafter
11. Wall thermal insulation - termPIR[®] ETX panel thickness of 120 mm
12. Bottom chord thermal insulation - termPIR[®] AL panel thickness of 50 mm

▷ NOTE:

- a. A counter-batten is fixed to a rafter through a thermal insulation panel with self-tapping screws every 40 cm, when every second screw is installed at 67° degrees
- b. The cut panels are to be sealed with assembly foam
- c. In case of high humidity rooms, it is recommended to install the vapour permeable membrane under the termPIR[®] boards

PITCHED ROOF - On-rafter system (without planking)

▷ Detail of connection between the roof and ceiling



▷ KEY:

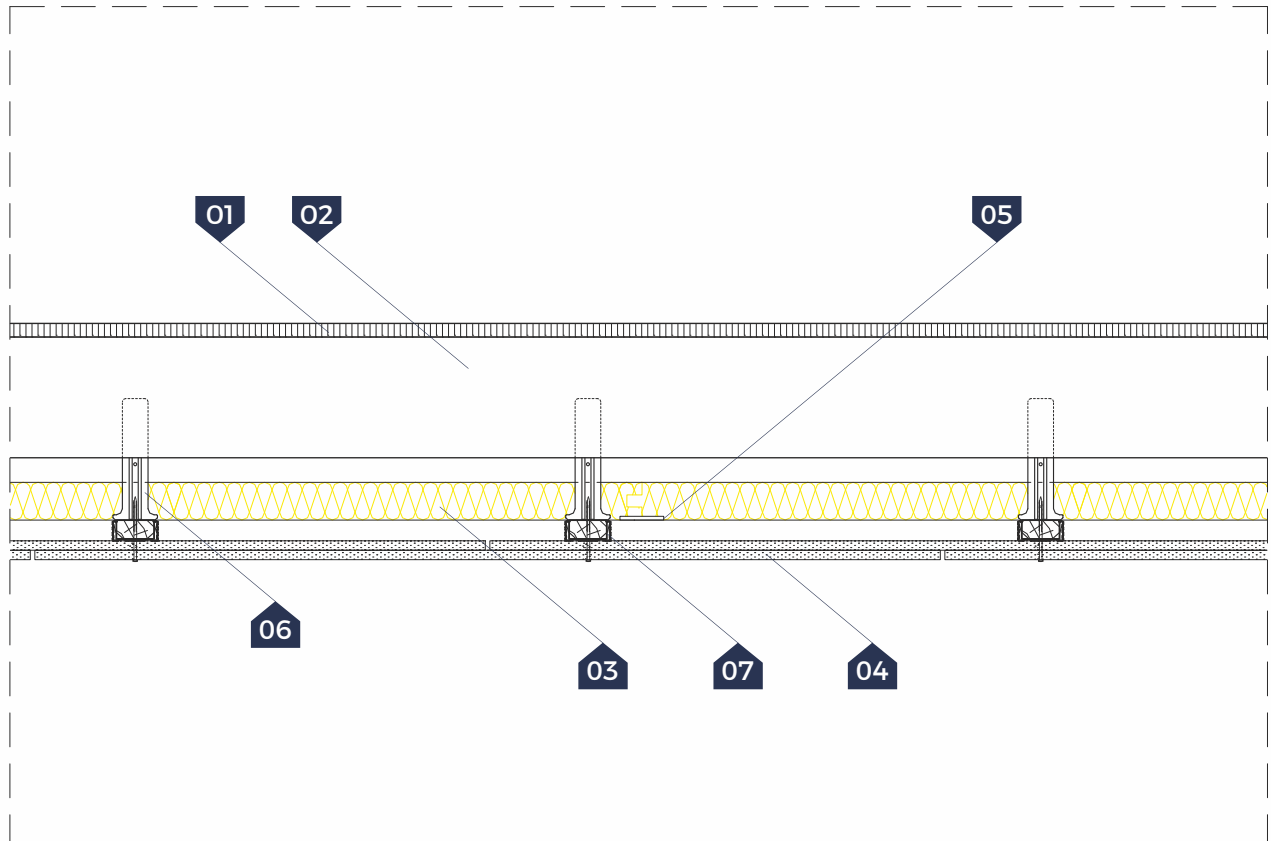
- 01. Roof cover - roof tile or steel sheet
- 02. Batten
- 03. Counter batten (thickness min. 40 mm)
- 04. Mounting strip (min. thick. 25 mm)
- 05. Screw fixing a counter-batten to a rafter
- 06. Wind insulation - vapour permeable membrane
- 07. Aluminium tape for sealing joints
- 08. On-rafter thermal insulation - termPIR® AL panel thickness of 150 mm
- 09. Collar beam
- 10. Wooden rafter
- 11. Ceiling thermal insulation - termPIR® AL panel thickness of 50 mm
- 12. Loft finishing - e.g. g-k panel on battens

▷ NOTE:

- a. A counter-batten is fixed to a rafter through a thermal insulation panel with self-tapping screws every 40 cm, when every second screw is installed at 67° degrees
- b. In case of high humidity rooms, it is recommended to install the vapour permeable membrane under the termPIR® boards

PITCHED ROOF - On-rafter system (without planking)

▷ Ceiling detail



▷ KEY:

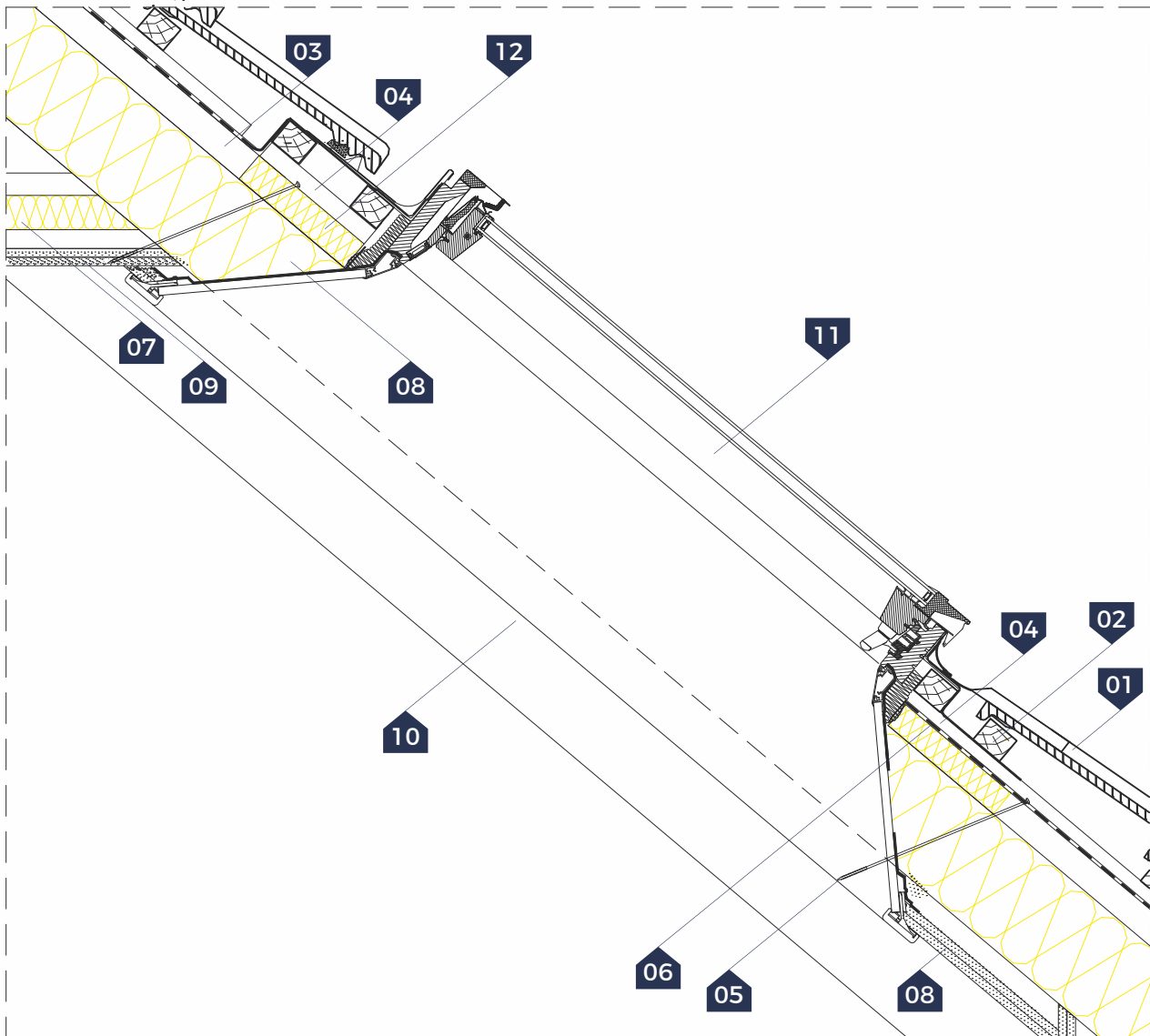
- 01. OSB board
- 02. Collar beam
- 03. Ceiling thermal insulation - termPIR® AL panel thickness of 50 mm
- 04. Finish - e.g. gypsum board on battens
- 05. Aluminium tape for sealing joints
- 06. Ceiling fixing hanger
- 07. Substructure under the gypsum board

▷ NOTE:

- a. termPIR® board are to be fixed to the ceiling with self-tapping screws
- b. In case of high humidity rooms, it is recommended to install the vapour permeable membrane under the termPIR® boards

PITCHED ROOF - On-rafter system (without planking)

Roof window detail



KEY:

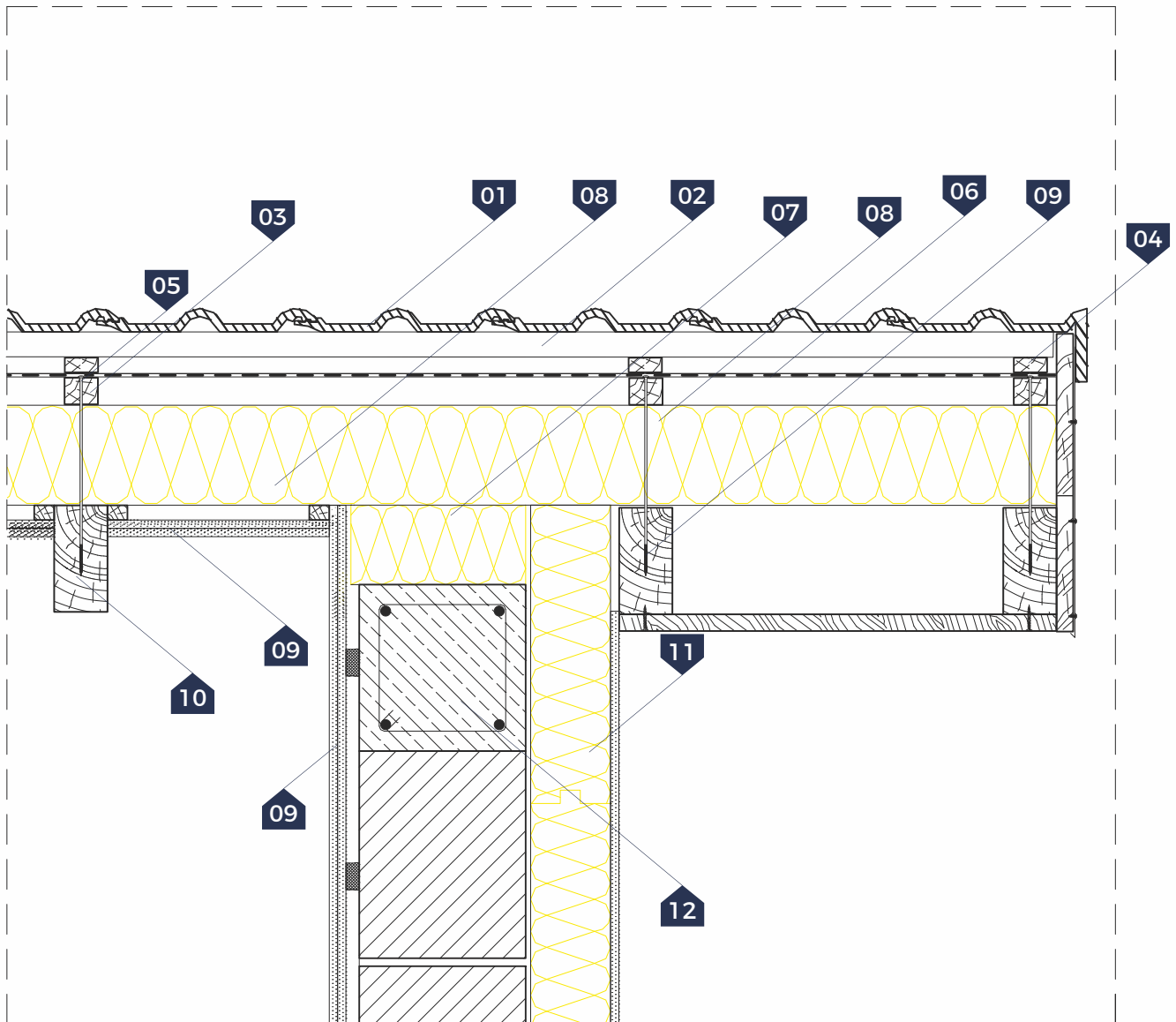
- 01. Roof cover - roof tile or steel sheet
- 02. Batten
- 03. Counter batten (thickness min. 40 mm)
- 04. Mounting strip (min. thick. 25 mm)
- 05. Screw fixing a counter-batten to a rafter
- 06. Wind insulation - vapour permeable membrane
- 07. Ceiling thermal insulation - termPIR® AL panel thickness of 50 mm
- 08. On-rafter thermal insulation - termPIR® AL panel thickness of 150 mm
- 09. Loft finishing - e.g. g-k panel on battens
- 10. Wooden rafter
- 11. Roof window
- 12. Window edge thermal insulation - termPIR® AL

NOTE:

- a. A counter-batten is fixed to a rafter through a thermal insulation panel with self-tapping screws every 40 cm, when every second screw is installed at 67° degrees
- b. The cut panels are to be sealed with assembly foam
- c. In case of high humidity rooms, it is recommended to install the vapour permeable membrane under the termPIR® boards

PITCHED ROOF - On-rafter system (without planking)

- ▷ Detail at the gable wall
- Cross section perpendicular to the roof surface



▷ KEY:

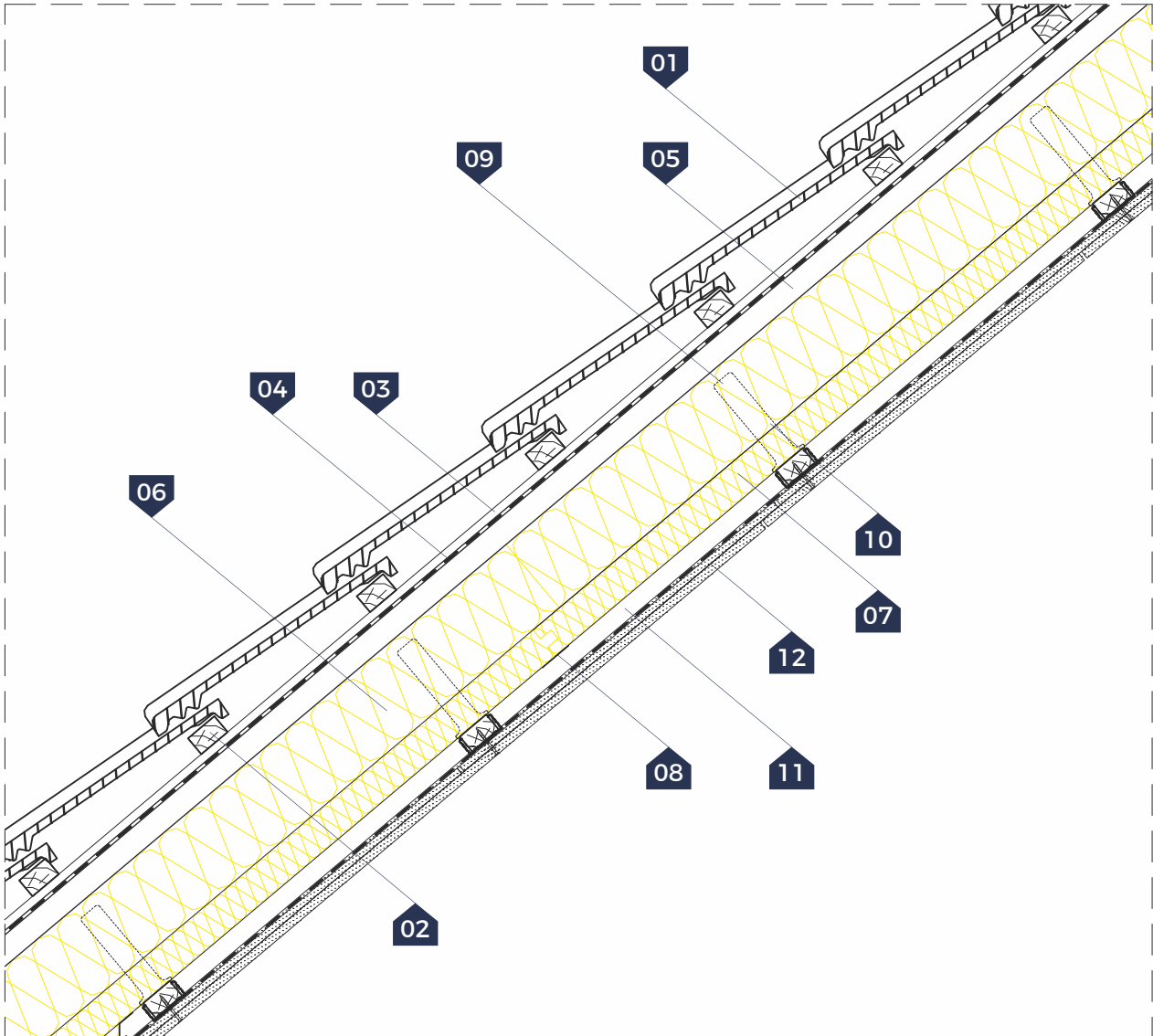
01. Roof cover - roof tile or steel sheet
02. Batten
03. Counter batten (thickness min. 40 mm)
04. Mounting strip (min. thick. 25 mm)
05. Screw fixing a counter-batten to a rafter
06. Wind insulation - vapour permeable membrane
07. Tie beam thermal insulation - termPIR[®] AL panel thickness of 50 mm
08. On-rafter thermal insulation - termPIR[®] AL panel thickness of 150 mm
09. Loft finishing - e.g. g-k panel on battens
10. Wooden rafter
11. Wall thermal insulation termPIR[®] ETX panel thickness of 120 mm
12. Tie beam locking the gable wall

▷ NOTE:

- a. A counter-batten is fixed to a rafter through a thermal insulation panel with self-tapping screws every 40 cm, when every second screw is installed at 67° degrees
- b. The cut panels are to be sealed with assembly foam
- c. In case of high humidity rooms, it is recommended to install the vapour permeable membrane under the termPIR[®] boards

PITCHED ROOF - Under and between rafter system - W I

▷ Cross section through roof



▷ KEY:

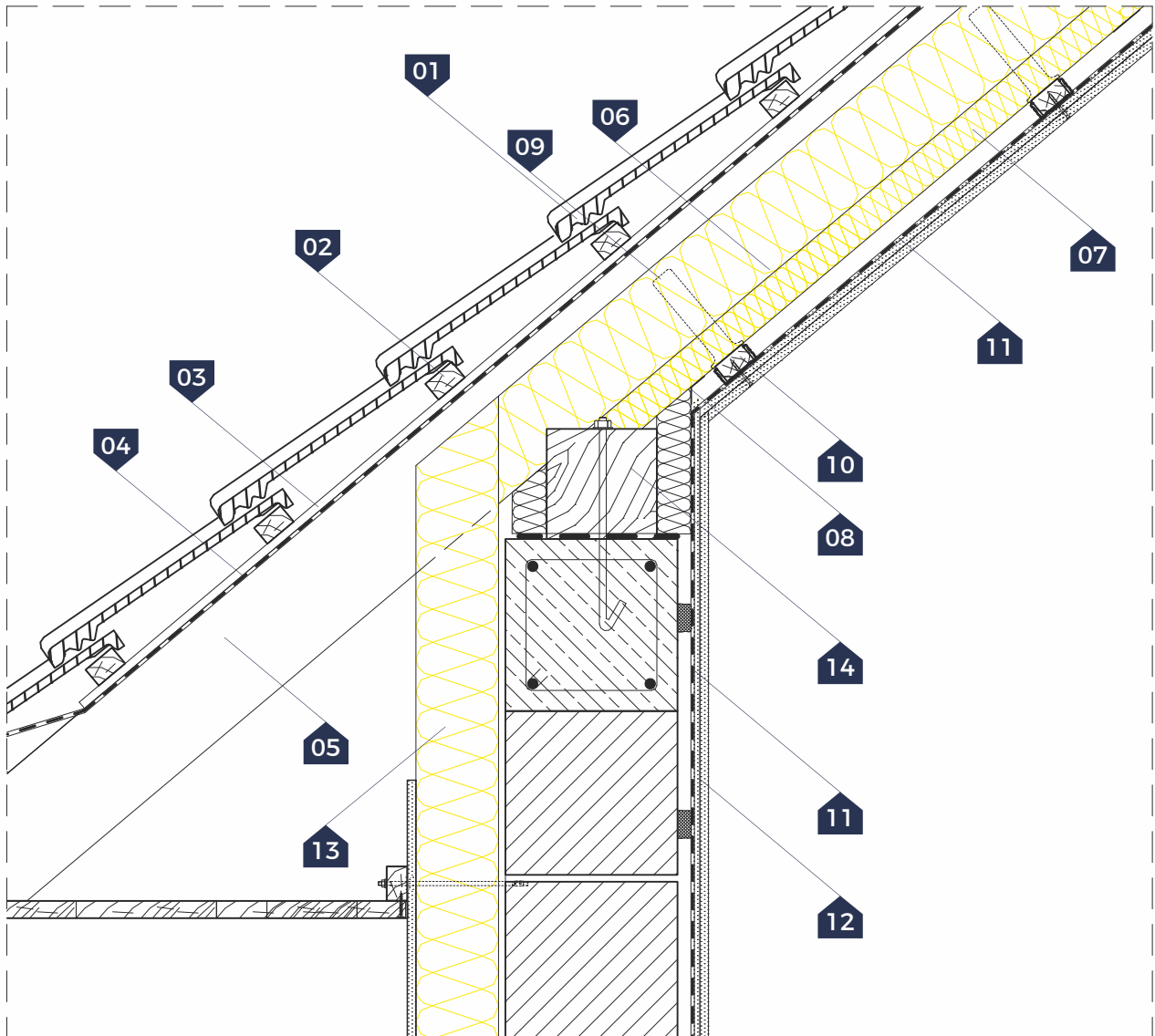
- 01. Roof cover - roof tile or steel sheet
- 02. Batten
- 03. Counter batten
- 04. Wind insulation - vapour permeable membrane
- 05. Wooden rafter
- 06. Between rafter thermal insulation - termPIR® AL board thickness of 150 mm
- 07. Under rafter thermal insulation - termPIR® AL panel thickness of 40 mm
- 08. Aluminium tape for sealing joints
- 09. Ceiling fixing hanger
- 10. Substructure under the gypsum board
- 11. Vapour permeable membrane - PE foil (for rooms with high humidity)
- 12. Loft finishing - e.g. g-k panel on battens

▷ NOTE:

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam
- b. Under rafter boards to be fixed to the rafters with self-tapping screws

PITCHED ROOF - Under and between rafter system - W I

▷ Detail of connection between the knee wall and roof



▷ KEY:

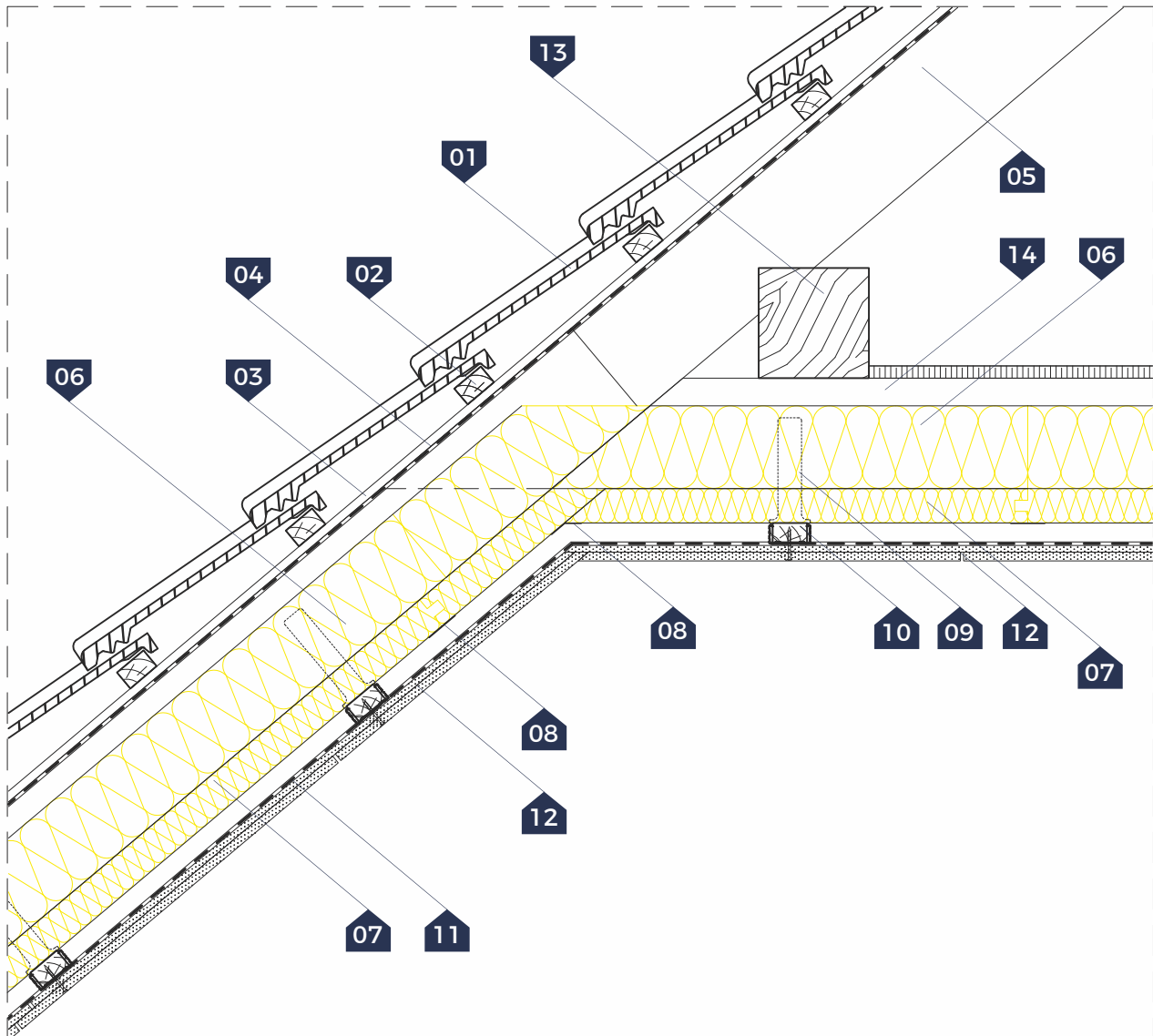
01. Roof cover - roof tile or steel sheet
02. Batten
03. Counter-batten
04. Wind insulation - vapour permeable membrane
05. Wooden rafter
06. Between rafter thermal insulation - termPIR[®] AL board thickness of 150 mm
07. Under rafter thermal insulation - termPIR[®] AL board thickness of 40 mm
08. Aluminium sealing tape
09. Ceiling fixing hanger
10. Substructure under the gypsum board
11. Vapour permeable membrane - PE foil (for rooms with high humidity)
12. Loft finishing - e.g. g-k panel on battens
13. Wall insulation - termPIR[®] ETX with thickness of 120 mm
14. Wall plate

▷ NOTE:

- a. Cut boards and inter-rafter slabs should be sealed with assembly foam
- b. Under rafter boards to be fixed to the rafters with self-tapping screws

PITCHED ROOF - Under and between rafter system - W I

▷ Detail of connection between the roof and ceiling

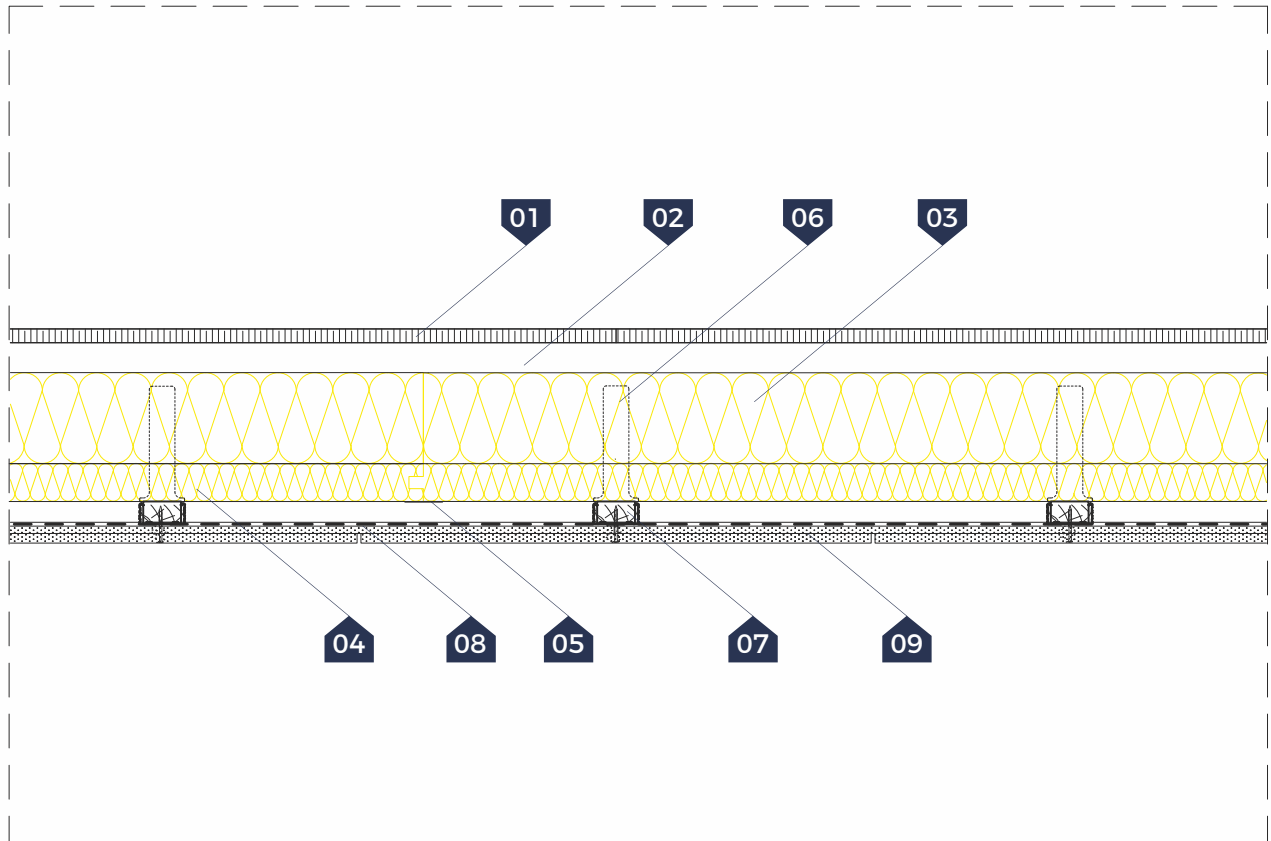


▷ KEY:

01. Roof cover - roof tile or steel sheet
02. Batten
03. Counter-batten
04. Wind insulation - vapour permeable membrane
05. Wooden rafter
06. Between rafter thermal insulation - termPIR® AL board thickness of 150 mm
07. Under rafter thermal insulation - termPIR® AL board thickness of 40 mm
08. Aluminium sealing tape
09. Ceiling fixing hanger
10. Substructure under the gypsum board
11. Vapour permeable membrane - PE foil (for rooms with high humidity)
12. Loft finishing - e.g. g-k panel on battens
13. Roof purlin
14. Collar beam

▷ NOTE:

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam
- b. Under rafter boards to be fixed to the rafters with self-tapping screws



▷ **KEY:**

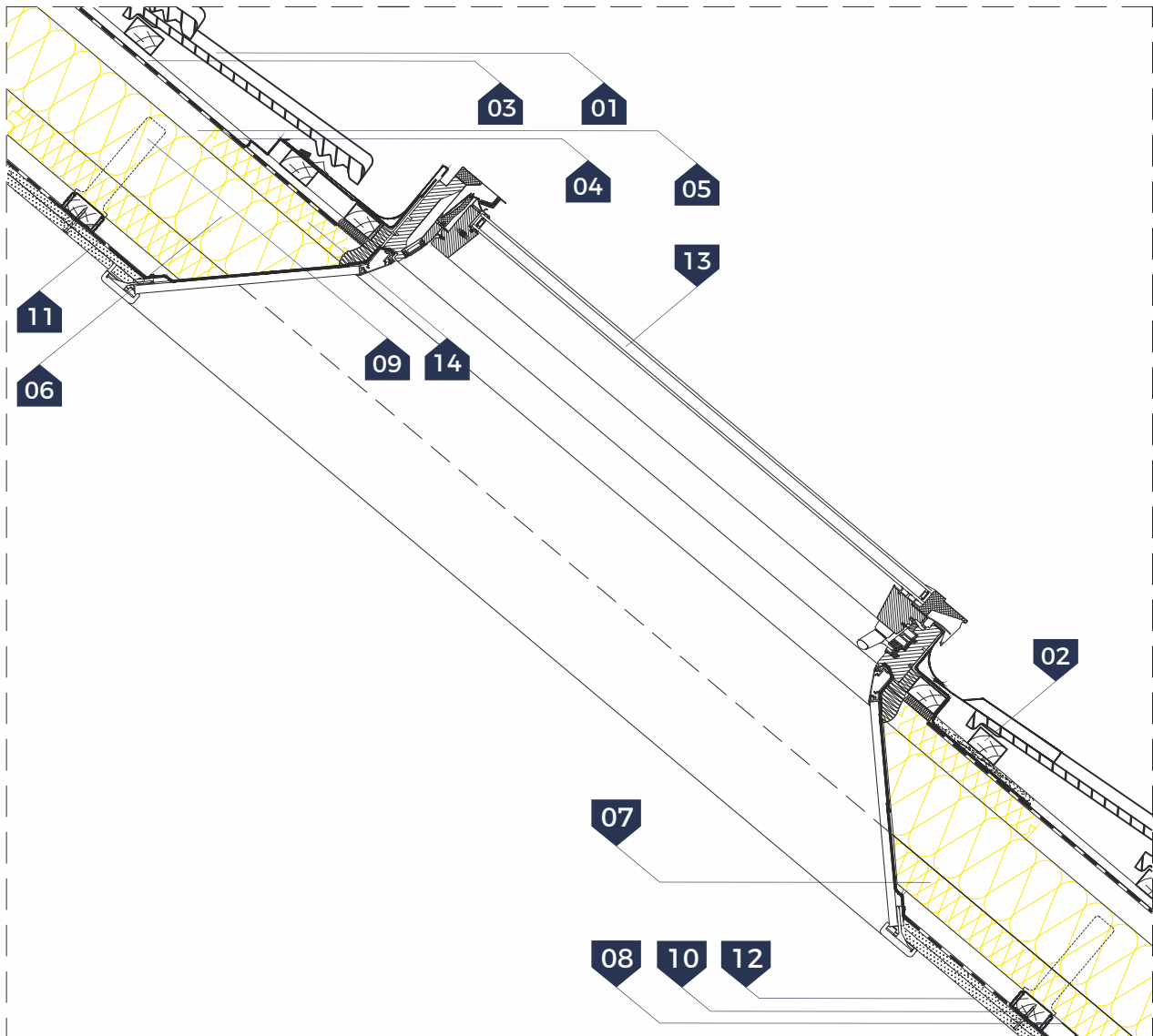
- 01. OSB board
- 02. Collar beam
- 03. Between rafter thermal insulation - termPIR[®] AL board thickness of 120 mm
- 04. Under rafter thermal insulation - termPIR[®] AL board thickness of 40 mm
- 05. Aluminium sealing tape
- 06. Ceiling fixing hanger
- 07. Substructure under the gypsum board
- 08. Vapour permeable membrane - PE foil (for rooms with high humidity)
- 09. Loft finishing - e.g. g-k panel on battens

▷ **NOTE:**

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam
- b. Under rafter boards to be fixed to the rafters with self-tapping screws

PITCHED ROOF - Under and between rafter system - W I

▷ Roof window detail



▷ KEY:

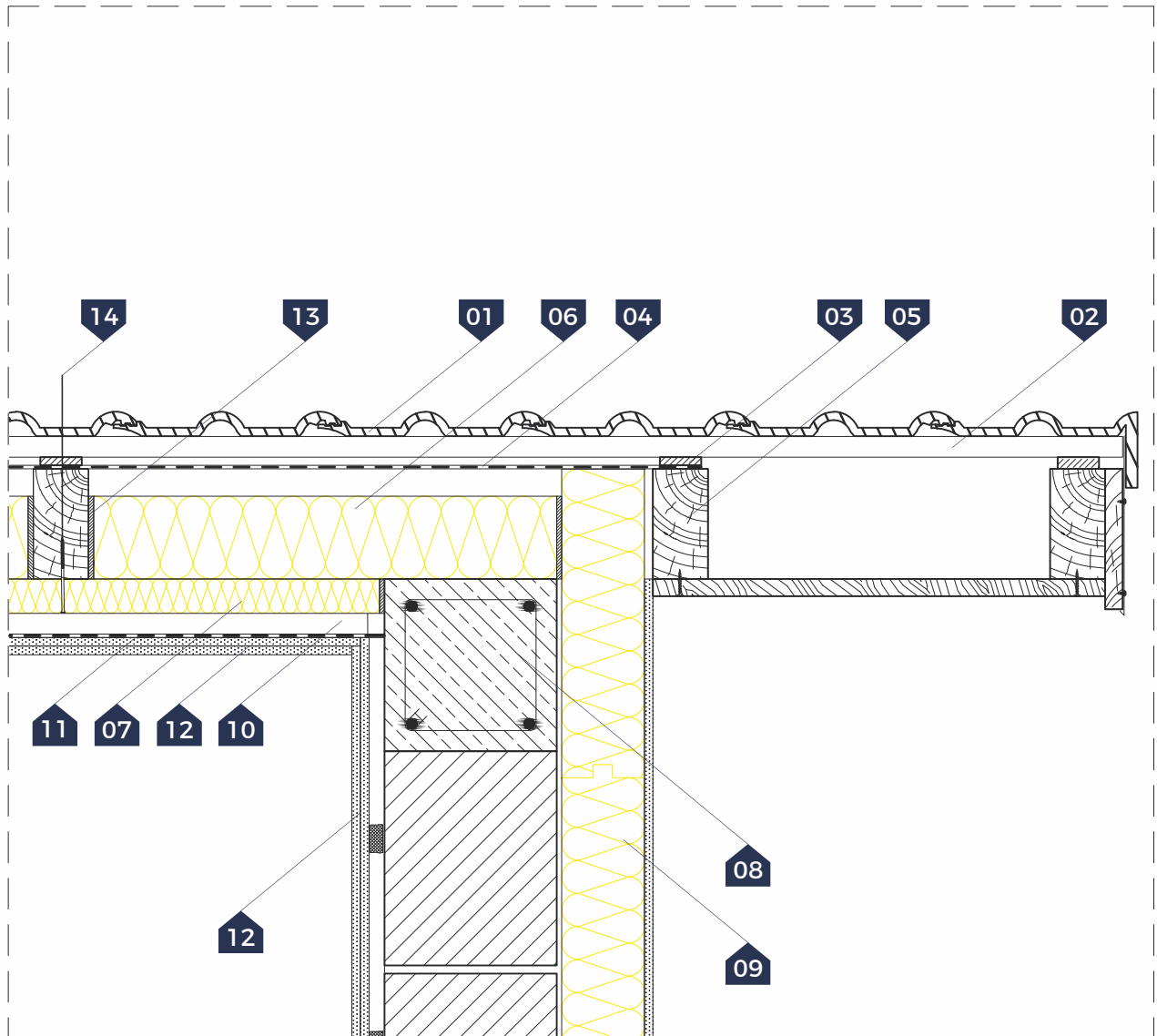
- 01. Roof cover - roof tile or steel sheet
- 02. Batten
- 03. Counter-batten
- 04. Wind insulation - vapour permeable membrane
- 05. Wooden rafter
- 06. Between rafter thermal insulation - termPIR® AL board thickness of 150 mm
- 07. Under rafter thermal insulation - termPIR® AL board thickness of 40 mm
- 08. Aluminium sealing tape
- 09. Ceiling fixing hanger
- 10. Substructure under the gypsum board
- 11. Vapour permeable membrane - PE foil (for rooms with high humidity)
- 12. Loft finishing - e.g. g-k panel on battens
- 13. Roof window
- 14. Window edge thermal insulation - termPIR® AL

▷ NOTE:

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam
- b. Under rafter boards to be fixed to the rafters with self-tapping screws

PITCHED ROOF - Under and between rafter system - W I

- ▷ Detail at the gable wall
 - cross-section perpendicular to the surface of roof



▷ KEY:

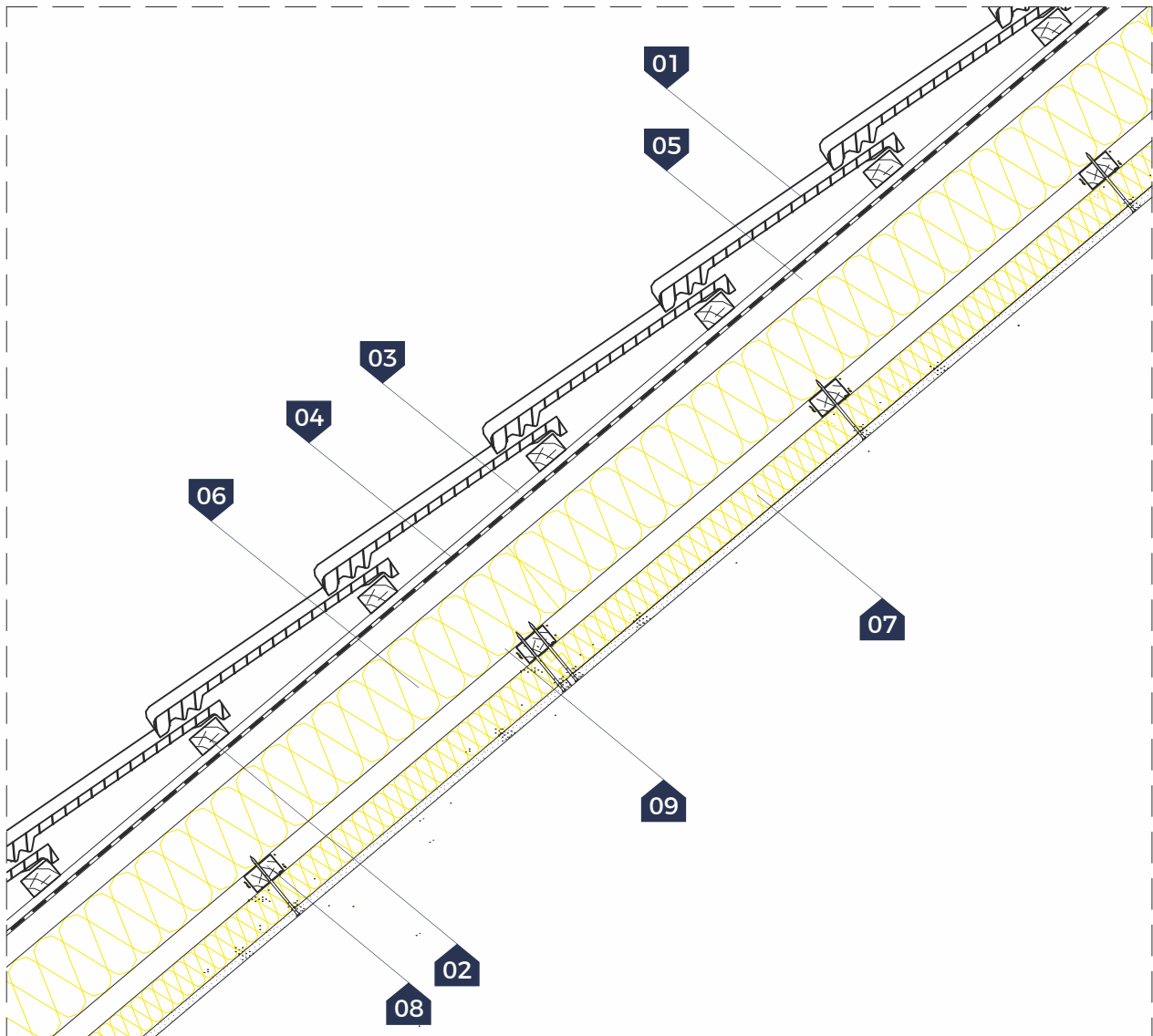
01. Roof cover - roof tile or steel sheet
02. Batten
03. Counter-batten
04. Wind insulation - vapour permeable membrane
05. Wooden rafter
06. Under rafter thermal insulation - termPIR® AL board thickness of 150 mm
07. Under rafter thermal insulation - termPIR® AL board thickness of 40 mm
08. Tie beam locking the fire wall
09. Wall thermal insulation - termPIR® ETX board thickness of 120 mm
10. Substructure under the gypsum board
11. Vapour permeable membrane - PE foil (for rooms with high humidity)
12. Loft finishing - e.g. g-k panel on battens
13. Low expandable polyurethane assembly foam
14. Self-tapping wood screw

▷ NOTE:

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam
- b. Under rafter boards to be fixed to the rafters with self-tapping screws

PITCHED ROOF - Under and between rafter system - W II

▷ Cross section through roof



▷ KEY:

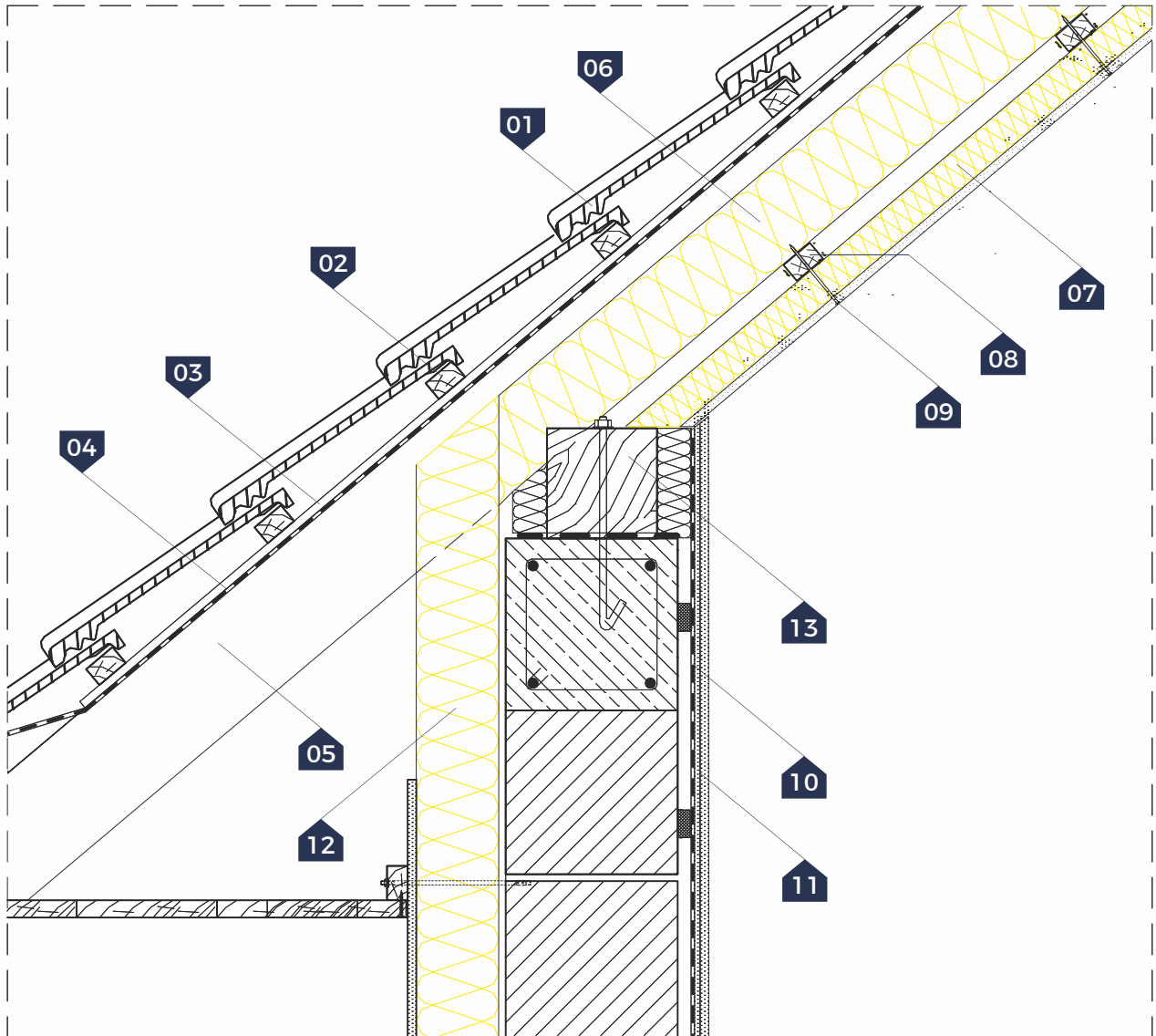
- 01. Roof cover - roof tile or steel sheet
- 02. Batten
- 03. Counter-batten
- 04. Wind insulation - vapour permeable membrane
- 05. Wooden rafter
- 06. Between rafter thermal insulation - termPIR® AL board thickness of 150 mm
- 07. Under rafter thermal insulation - termPIR® AL board thickness of 40 mm
- 08. Substructure under the termPIR® WS GK board (requirements are correspondents to the requirements for gypsum board)
- 09. Self-tapping screw for timber (screw length = slab thickness from indication + 12.5 mm + substructure thickness + 10 mm; round up to the dimension of a commercial screw)

▷ NOTE:

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam

PITCHED ROOF - Under and between rafter system - W II

▷ Detail of connection between the knee wall and roof



▷ KEY:

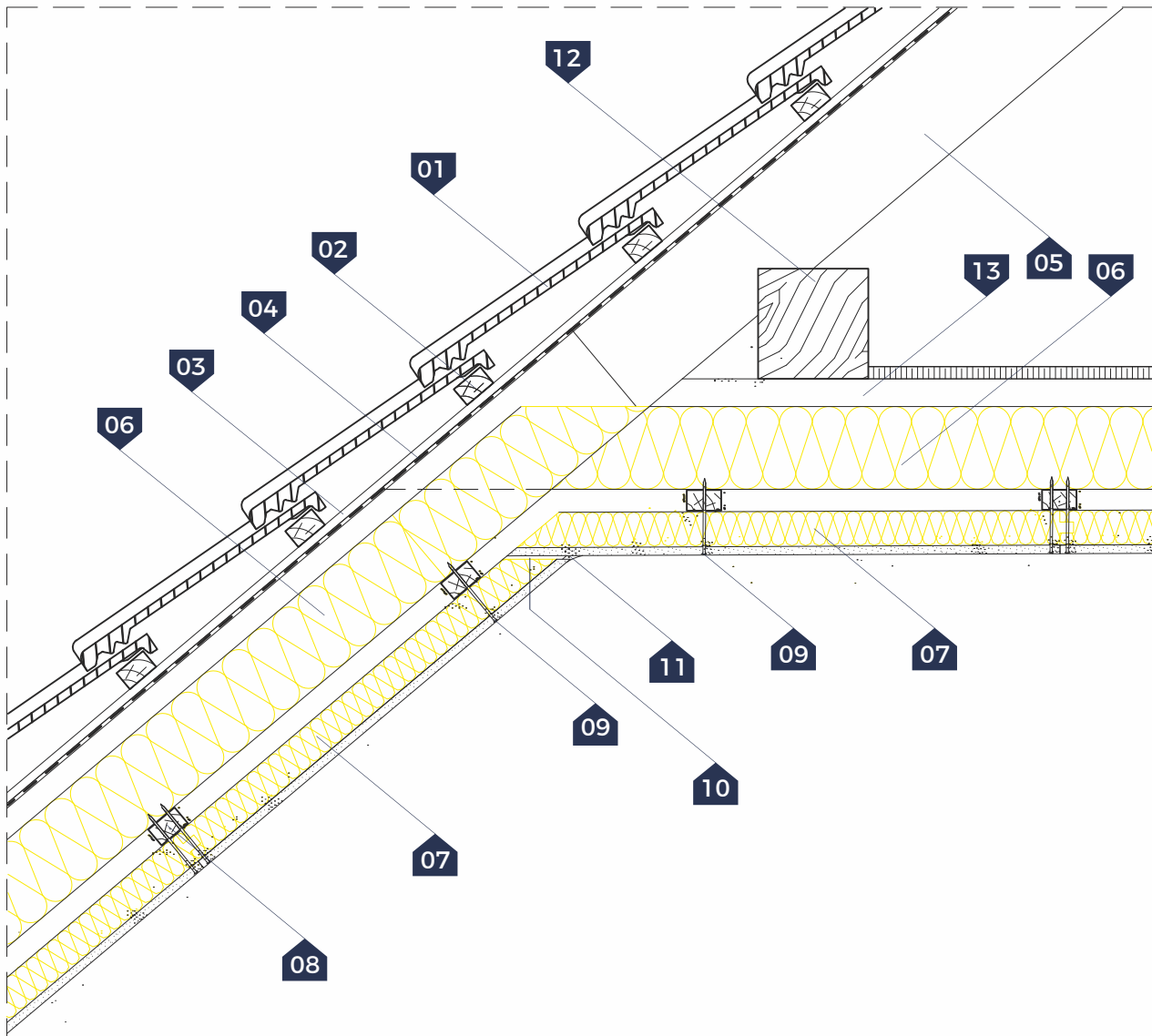
01. Roof cover - roof tile or steel sheet
02. Batten
03. Counter-batten
04. Wind insulation - vapour permeable membrane
05. Wooden rafter
06. Between rafter thermal insulation - termPIR[®] AL board thickness of 150 mm
07. Under rafter thermal insulation - termPIR[®] WS GK board thickness of 40 mm
08. Substructure under the termPIR[®] WS GK board (requirements are correspondents to the requirements for gypsum board)
09. Self-tapping screw for timber (screw length = slab thickness from indication + 12.5 mm + substructure thickness + 10 mm; round up to the dimension of a commercial screw)
10. Vapour permeable membrane - PE foil (for rooms with high humidity)
11. Gypsum board
12. Wall insulation - termPIR[®] ETX board with thickness of 120 mm
13. Wall plate

▷ NOTE:

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam

PITCHED ROOF - Under and between rafter system - W II

▷ Detail of connection between the roof and ceiling

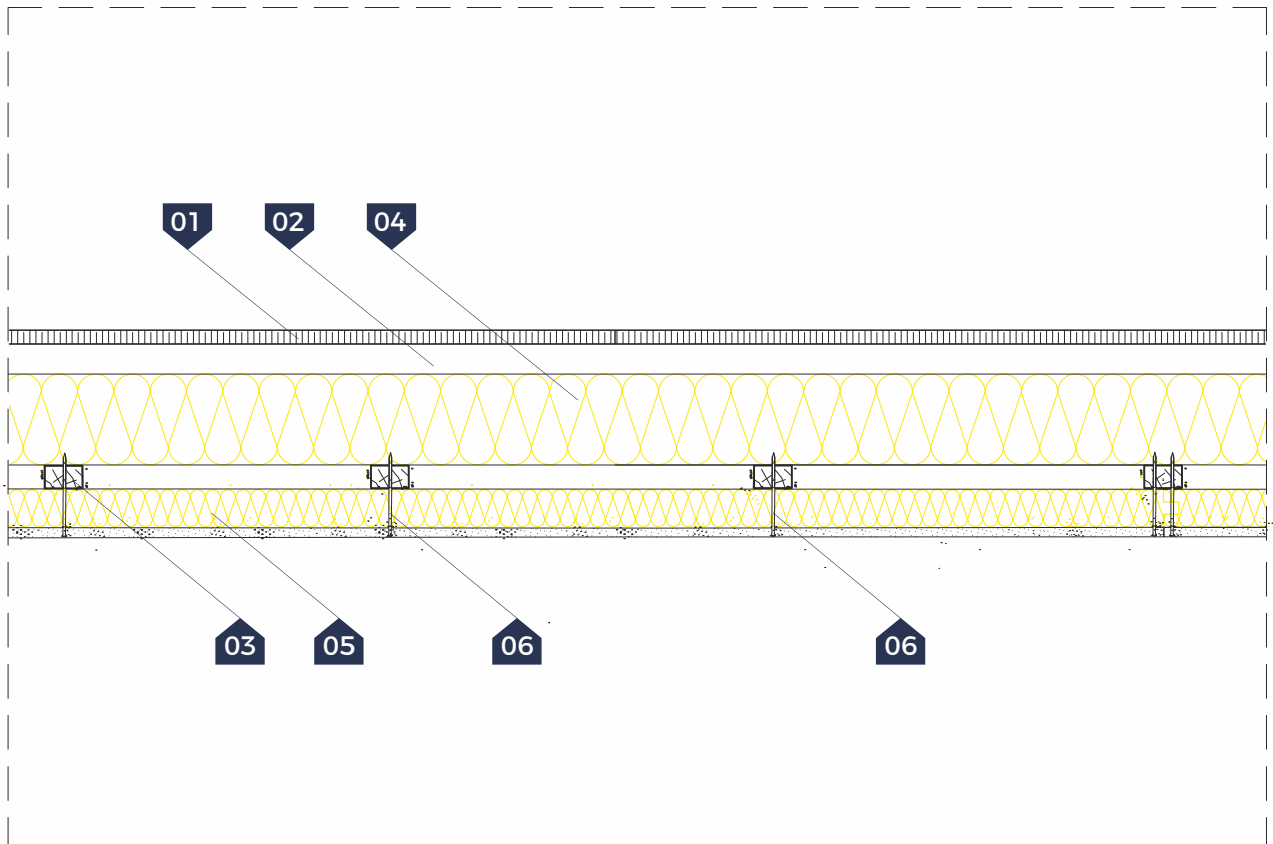


▷ KEY:

- 01. Roof cover - roof tile or steel sheet
- 02. Batten
- 03. Counter-batten
- 04. Wind insulation - vapour permeable membrane
- 05. Wooden rafter
- 06. Between rafter thermal insulation - termPIR® AL board thickness of 150 mm
- 07. Under rafter thermal insulation - termPIR® WS GK board thickness of 40 mm
- 08. Substructure under the termPIR® WS GK board (requirements are correspondents to the requirements for gypsum board)
- 09. Self-tapping screw for timber (screw length = slab thickness from indication + 12.5 mm + substructure thickness + 10 mm; round up to the dimension of a commercial screw)
- 10. Gap filled out with low pressure PIR foam
- 11. Acrylic finish
- 12. Roof purlin
- 13. Collar beam

▷ NOTE:

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam



▷ **KEY:**

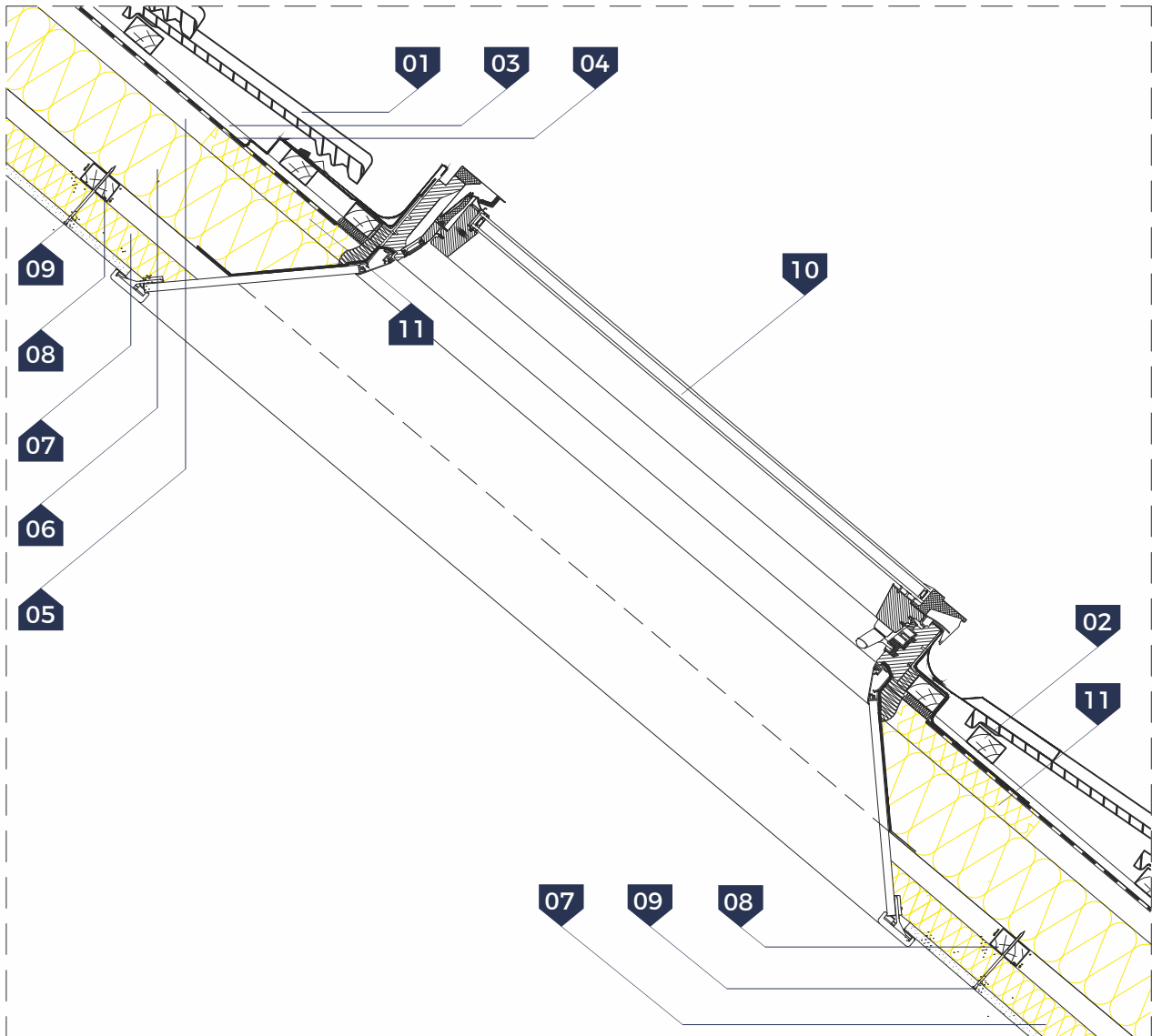
- 01. OSB board
- 02. Collar beam
- 03. Substructure under the termPIR® WS GK board (requirements are correspondents to the requirements for gypsum board)
- 04. Between rafter thermal insulation - termPIR® AL board thickness of 120 mm
- 05. Under rafter thermal insulation - termPIR® WS GK board thickness of 40 mm
- 06. Self-tapping screw for timber (screw length = slab thickness from indication + 12.5 mm + substructure thickness + 10 mm; round up to the dimension of a commercial screw)

▷ **NOTE:**

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam

PITCHED ROOF - Under and between rafter system - W II

▷ Roof window detail



▷ KEY:

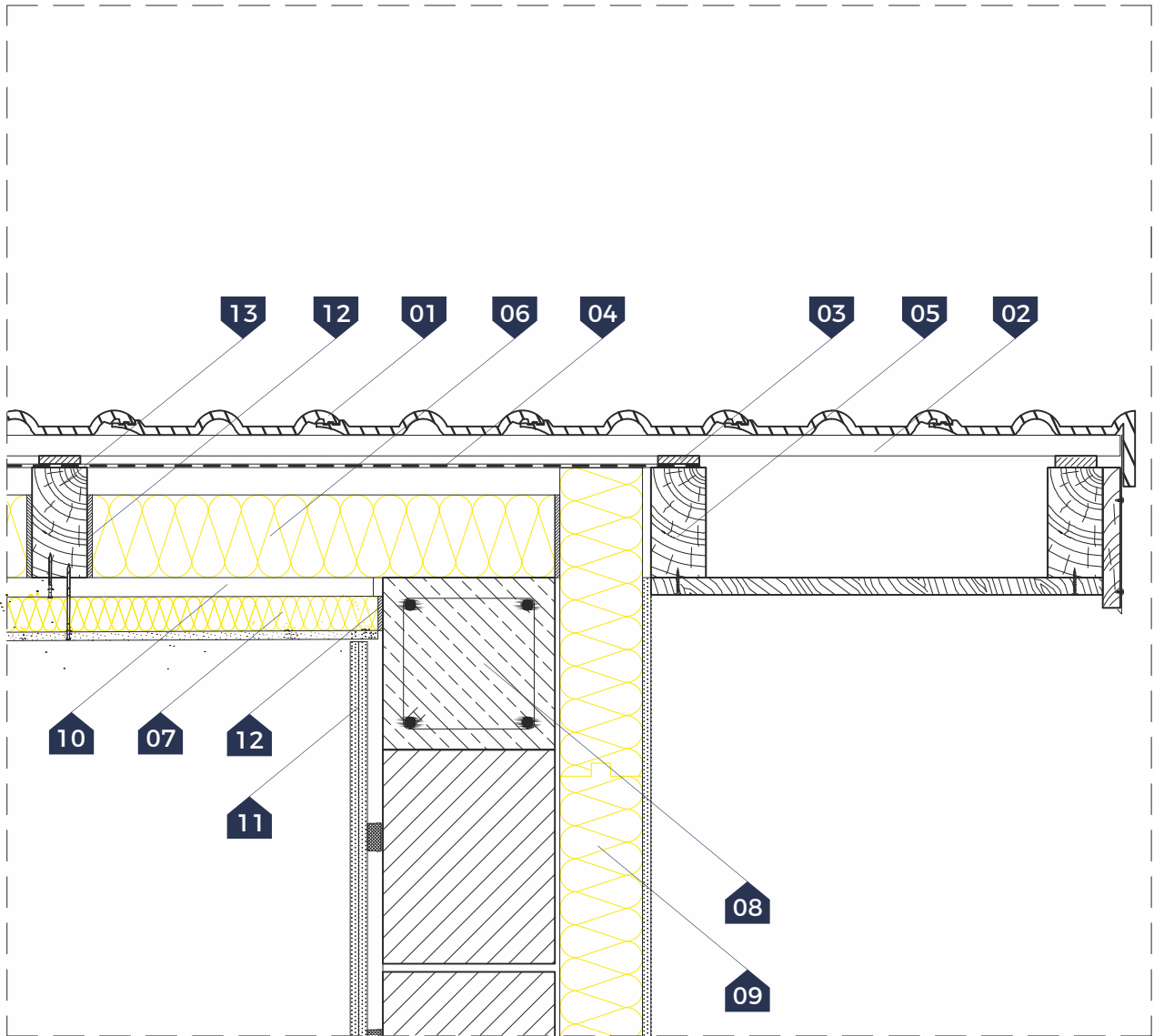
- 01. Roof cover - roof tile or steel sheet
- 02. Batten
- 03. Counter-batten
- 04. Wind insulation - vapour permeable membrane
- 05. Wooden rafter
- 06. Between-rafter thermal insulation - termPIR® AL panel thickness of 150 mm
- 07. Under rafter thermal insulation - termPIR® WS GK board thickness of 40 mm
- 08. Substructure under the termPIR® WS GK board (requirements are correspondents to the requirements for gypsum board)
- 09. Self-tapping screw for timber (screw length = slab thickness from indication + 12.5 mm + substructure thickness + 10 mm; round up to the dimension of a commercial screw)
- 10. Roof window
- 11. Window edge thermal insulation - termPIR® AL

▷ NOTE:

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam

PITCHED ROOF - Under and between rafter system - W II

- ▷ Detail at the gable wall
- cross-section perpendicular to the surface of roof



▷ KEY:

01. Roof cover - roof tile or steel sheet
02. Batten
03. Counter-batten
04. Wind insulation - vapour permeable membrane
05. Wooden rafter
06. Between-rafter thermal insulation - termPIR® AL panel thickness of 150 mm
07. Under-rafter thermal insulation - termPIR® WS GK board thickness of 40 mm
08. Tie beam locking the fire wall
09. Wall thermal insulation - termPIR® ETX panel thickness of 120 mm
10. Substructure under the termPIR® WS GK board (requirements are correspondents to the requirements for gypsum board)
11. Gypsum board
12. Low expandable polyurethane assembly foam.
13. Self-tapping screw for timber (screw length = slab thickness from indication + 12.5 mm + substructure thickness + 10 mm; round up to the dimension of a commercial screw)

▷ NOTE:

- a. Cut slabs and inter-rafter slabs should be sealed with assembly foam

▷ WALL THERMAL INSULATION IN LIGHT WET SYSTEM (ETICS)

The termPIR® thermal insulation system allows for taking advantage of PIR insulation in the currently most popular building thermal insulation system: light-wet method, also called the seamless thermal insulation system (BSO) or External Thermal Insulation Composite System (ETICS). It depends on fixing to the external walls of the building of termPIR® ETX insulation panels and then protecting them with a fibreglass net sunk in bonding-sealing mortar. The whole system is finished with masonry mortar in different methods, grain sizes and structures. The termPIR® insulation system holds the European Technical Assessment No. 17/0066 "External Thermal Insulation Composite System (ETICS)".

▷ GUIDELINES FOR CORRECT EXECUTION OF termPIR® THERMAL INSULATION SYSTEM

Below is provided an excerpt from the "Guidelines for making an ETICS insulation - the termPIR® insulation system" elaboration [1] available on the websites: www.termpir.eu and www.gor-stal.pl

The system includes termPIR® ETX insulation slabs with lining made from glass fibre, with dimensions of 600x1200 mm and thickness between 50 and 250 mm, universal styrofoam adhesives and covering of Termo-Organika® mesh, mechanical connectors with stoppers, glass fibre meshes, silicon, acrylic and polysilicate plasterwork, paints, and primers.

▷ Stages of thermal insulation execution:

1. Preparation of the base surface:

Before commencing the bonding of thermal insulation panels, the base surface to which they will be bonded must be prepared in a proper way. Each base surface must be compact, even, bearing, dry, clean and without the strata diminishing adhesion (grease, dust, etc.). Old "loose" plasters, peeling off paint and other contamination must be removed. Small uneven surfaces and cavities can be repaired a day before the bonding of the Styrofoam panel at the latest; the thicker the mortar layer, the longer the period of Styrofoam bonding (assuming: approx. 1 day for each 1 mm of mortar thickness). Absorbing base surfaces (e.g. autoclaved aerated concrete) should be covered with a universal clearcole, smooth and/or not absorbing surfaces (e.g. concrete, reinforced concrete) should be covered with bonding clearcole. In the study [1], the principles of selecting the clearcole are presented with consideration of the kind of the base surface and the basic properties of the clearcole preparations.

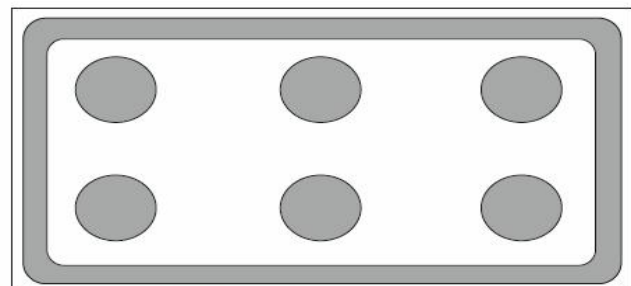
2. Bonding of termPIR® insulation boards

If the base surface is even, the universal bond should be applied in a thin, even layer on the whole surface of the termPIR® board with a toothed plastering trowel with teeth 10-12 mm (fig. 1 a). In the remaining instances, the mortar must be applied circumferentially in the distance of approx. 5 cm from the board edge, in such a way that the bond does not protrude outside the board lining and in addition apply 3 - 6 "cakes" evenly on its surface (fig. 1 b). As a result, the mortar should cover at least 80% of the board.

diagram1. Adhesive application method



a) On the whole slab



b) Point and on edges

Then the termPIR® boards should be bonded to the wall by pressing it slightly and levelling it, so that it would adhere tightly to the neighbouring boards. Possible excessive amounts of the bond protruding outside the board lining should be removed immediately. The following rows of boards should be moved in respect of the previously applied ones so that the vertical joints of the boards would preserve the staggered way of installation. Bond the boards starting from the bottom of the facade.

Application of the start stripes, even though it is not requested, facilitates the correct levelling of the first row of the bonded boards. However, the start stripes should always be used in case when there is no thermal insulation of the foundation walls. In case when the foundation walls are thermal insulated, the consecutive rows of the thermal insulation of the walls above the ground level are fixed without the start stripe, preserving the continuity of the insulation

Note: termPIR® insulation boards should be installed no sooner than 1 month after the date of their manufacture (the date of manufacture is shown on each package of termPIR® boards).

3. Pinning

Pinning and bonding of the reinforcement net should start no sooner than after two days from the bonding of **termPIR**[®] panels. Mechanical connectors applied must be selected relevantly to the kind of the base and compliant with the technical design of the thermal insulation.

The depth of pin anchorage in a base should amount to at least:

- 5-6 cm in concrete, concrete blocks, full ceramic bricks, and silicate bricks,
- 8-9 cm in aerated concrete, ex-clay concrete, and breezeblocks.

The connectors with a metal pin with a plastic head or with a strengthened plastic pin should be used. The pin disc should have a diameter of at least 60 mm and its surface should be porous with holes providing adherence of the bonding mortar. In order to avoid the formation of thermal bridges and the "ladybird" effect, the discs should be sunk relevantly in the **termPIR**[®] panel and covered with plugs cut out from grey Styrofoam of a diameter of 62 mm (sold as a product) or cut out from the **termPIR**[®] board.

Minimal number of the connectors (up to 12 m height) is 4 pcs/m², in the edge areas 6 pcs/m²

4. Execution of reinforced layer

After fixing the panels with pins, dilatational shapes and corner strips should be installed and the corners should be strengthened around doors and windows (bonding additional net stripes at the angle of 45° to the line of vertical holes) (fig. 2). Possible gaps between the bonded **termPIR**[®] boards should be filled with polyurethane foam (it is not allowed to fill them up neither with the bond nor with the mortar). Starting from the top of the wall apply universal bond on the bonded **termPIR**[®] boards using a plastering trowel (it can be the toothed or straight trowel), evenly spreading it on the surface in the layer of approx. 3 mm and sink in it the reinforcement net keeping an overlap of approx. 10 cm. The installed net should be tense and completely covered with approx. 1 mm of the bond layer. After the reinforced layer is completely dried (at least 3 days) the surface can be clearcoled with bonding or polysilicate clearcole, depending on the kind of the installed plaster.

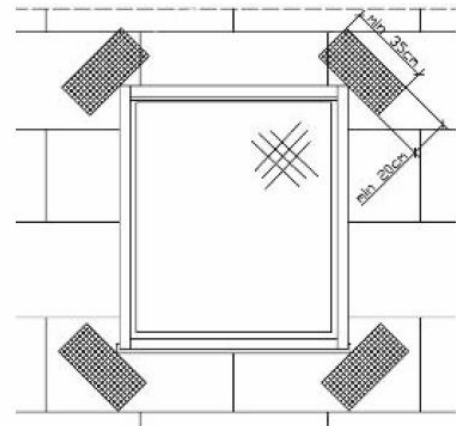


diagram 2. Reinforcement of corners of openings

5. Application of plaster

The application of plaster can commence after the clearcole is completely dried, however no sooner than after 24 hours since finishing the application of clearcole. In case of each kind of plaster, the temperature of the base, plaster and ambient temperature must be above +5°C in the course of installation and during a few following days. The selection of relevant system elements depending on the kind of the plaster is presented in table No. 5 of the study [1].

6. Painting

Painting of the facade in the **termPIR**[®] thermal insulation system is not obligatory. Painting is recommended especially in order to renovate a dirty surface. A frequent solution is also to make the external layer of the facade using mineral-polymer plaster and to paint it with one of the paints. The relevant colour of the facade can be obtained both by making thin plaster layer tinted in the requested colour as well as by painting the white plaster with paint in the required colour.

7. Control and works acceptance

In order to ensure the proper quality of the particular stages of thermal insulation works and the whole system, it is necessary to apply: - acceptance of disappearing and covered works, - partial acceptance, final (end) acceptance. The objective of controls at particular stages of works is to avoid the accumulation of possible mistakes. Failing to perform this control may lead to poor quality of the performed thermal insulation. In the course of acceptance, the following is controlled:

- base condition and geometry, the way of base preparation,
- bonding of the **termPIR**[®] thermal insulation board bonding, application of mechanical connectors,
- reinforced layer,
- metal sheet flashing,
- plaster layers and painting,
- compliance between the used insulation system components and the project,
- visual assessment of the elevation.

Examples of details of external walls insulated thermally with termPIR[®] boards

DOUBLE LAYER WALLS - the termPIR[®] ETX thermal insulation system

External wall (double layer)	033
Window detail - vertical cross section	034
Window detail - horizontal cross section	035
Balcony detail - vertical cross section	036

EXTERNAL WALLS - thermal insulation of triple layer walls

External wall (triple layer)	037
Window detail - vertical cross section	038
Window detail - horizontal cross section	039
Balcony detail - vertical cross section	040

FOUNDATION WALLS

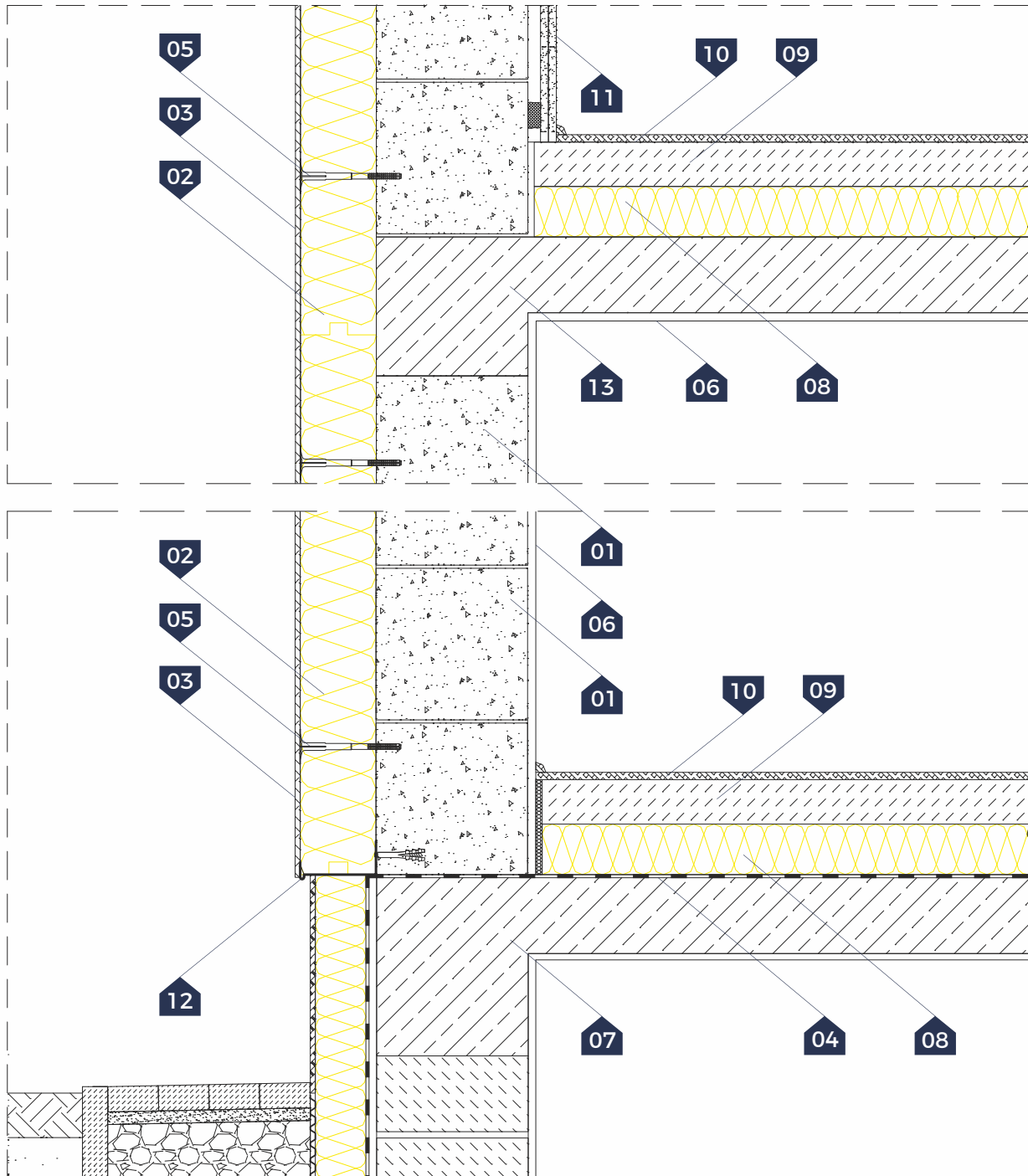
Double layer foundation wall (light type hydro-insulation)	041
Triple layer foundation wall (light type hydro-insulation)	042

CELLAR WALLS

Double layer cellar wall (light type hydro-insulation)	043
Double layer cellar wall (light type hydro-insulation)	044
Cellar window detail	
Triple layer cellar wall (light type hydro-insulation)	045
Triple layer cellar wall (light type hydro-insulation)	046
Cellar window detail	

DOUBLE LAYER WALLS - the termPIR® ETX thermal insulation system

▷ External wall (double layer)



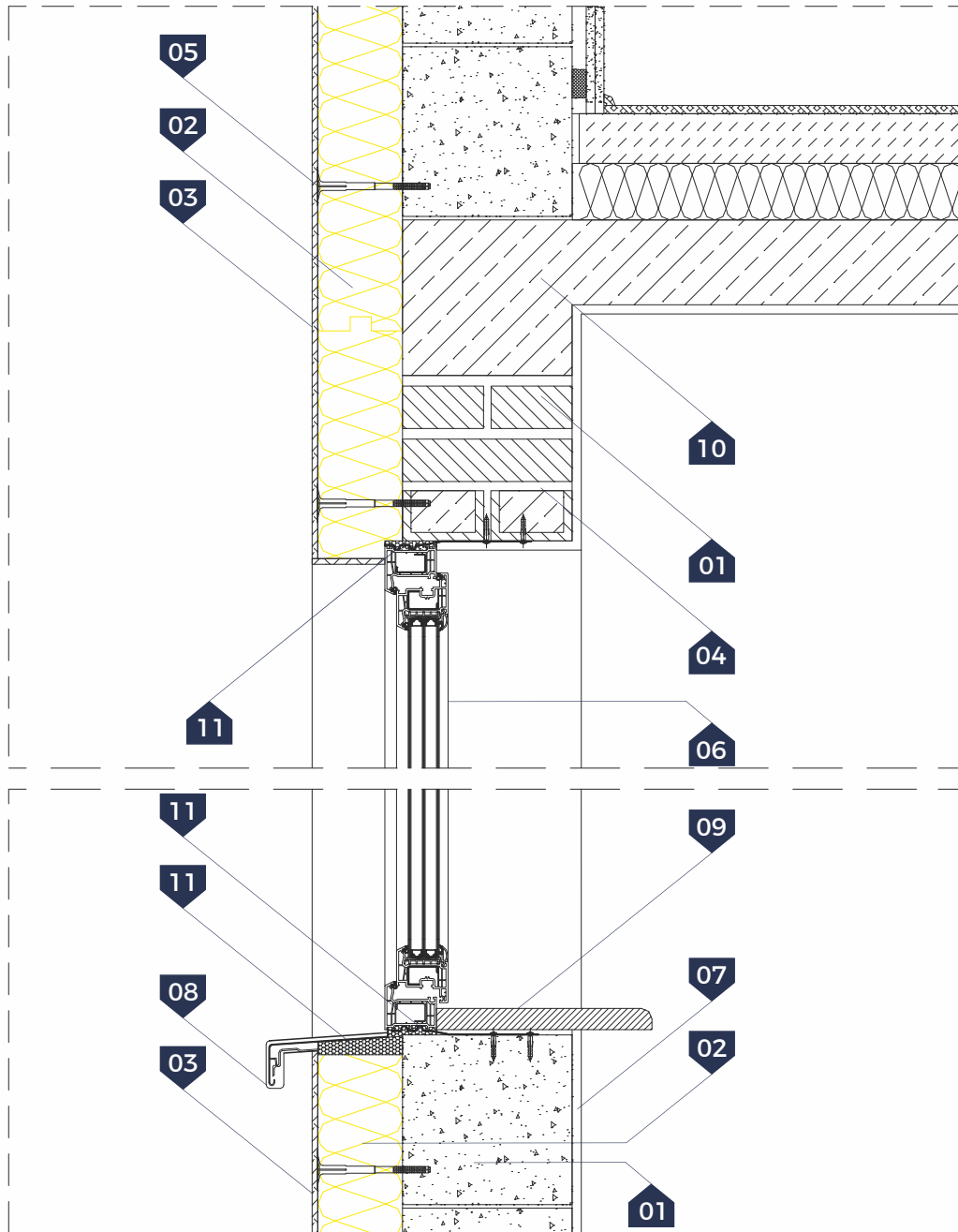
▷ **KEY:**

- 01. Ground floor wall
- 02. Wall thermal insulation - termPIR® ETX boards thickness of 120 mm
- 03. Mineral plaster on net
- 04. Horizontal damp insulation
- 05. Connector for fixing insulation
- 06. Cement-lime plaster
- 07. Tie beam and ceiling over the cellar

- 08. Floor thermal insulation - termPIR® AL/PK board thickness 100 mm
- 09. Cement floor screed
- 10. Flooring
- 11. Wall finish - e.g. gypsum board on battens
- 12. Start strip (recommended)
- 13. Crib and ceiling above the ground floor

DOUBLE LAYER WALLS - the termPIR® ETX thermal insulation system

▷ Window detail - vertical cross section

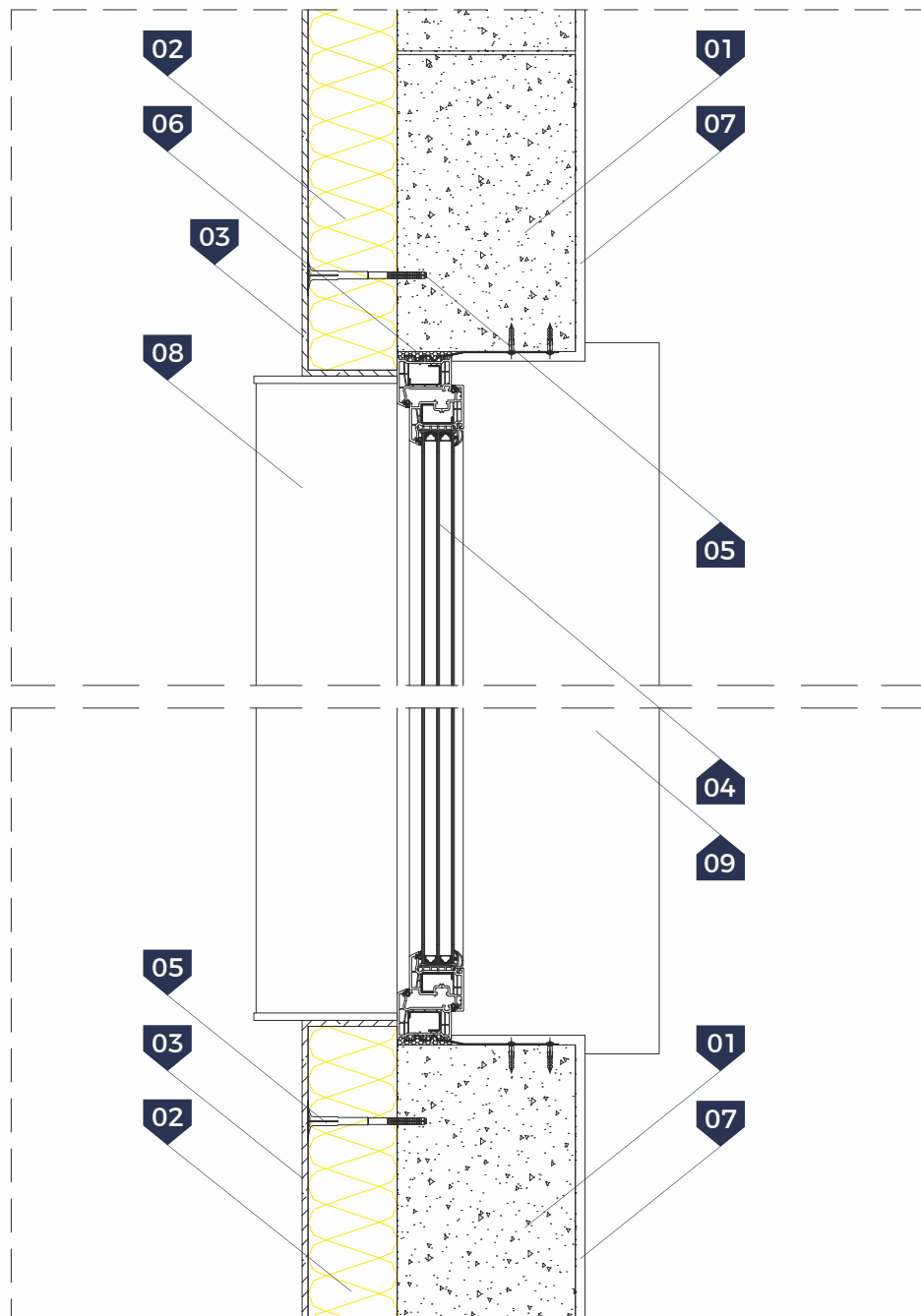


▷ KEY:

- 01. Ground floor wall
- 02. Wall thermal insulation - termPIR® ETX board thickness of 120 mm
- 03. Mineral plaster on net
- 04. Lintel
- 05. Connector for fixing insulation
- 06. Window
- 07. Cement-lime plaster
- 08. External window sill
- 09. Internal window sill
- 10. Tie beam and ceiling
- 11. Assembly foam

DOUBLE LAYER WALLS - the termPIR® ETX thermal insulation system

▷ Window detail - horizontal cross section

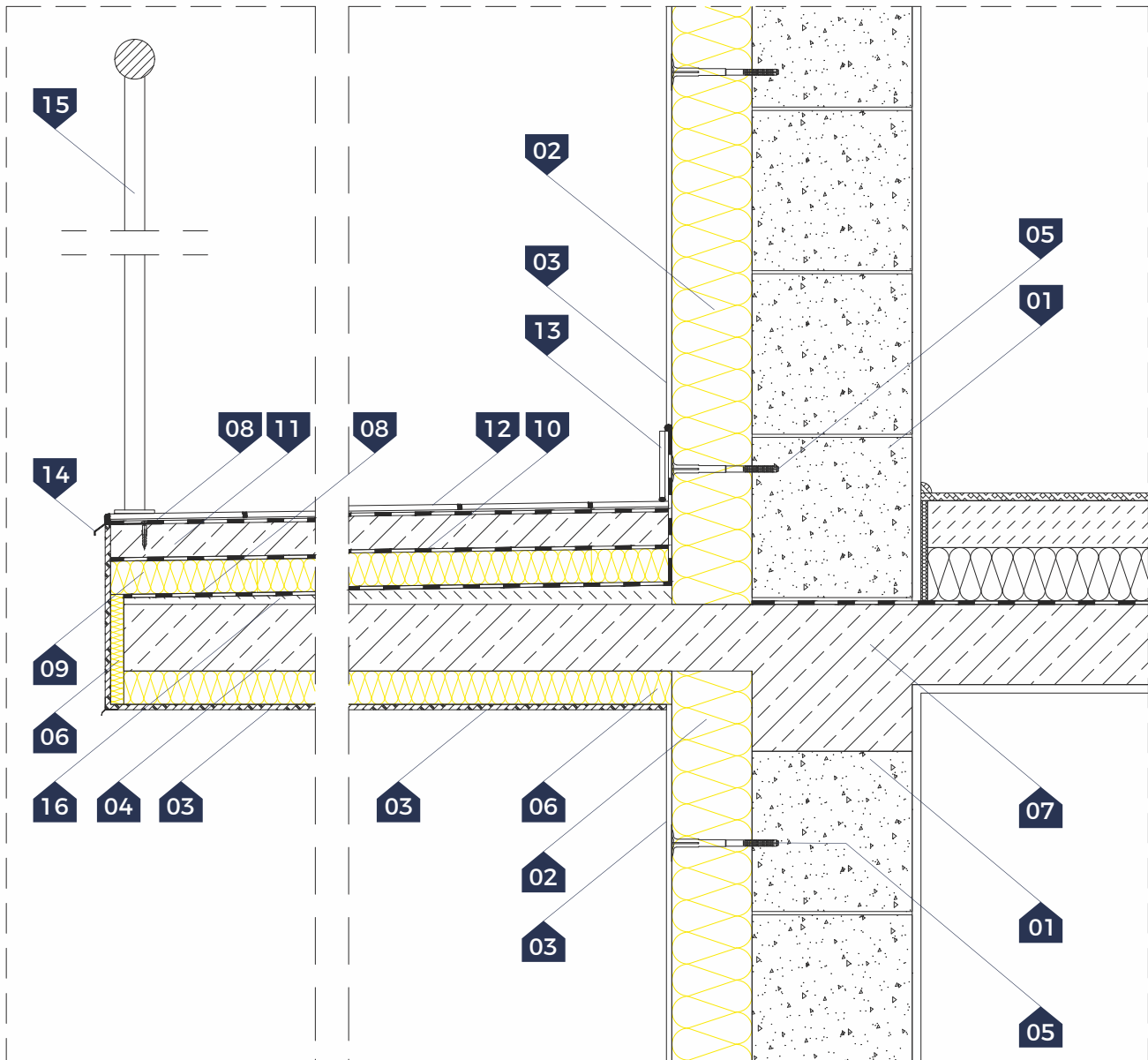


▷ KEY:

- 01. Ground floor wall
- 02. Wall thermal insulation - termPIR® ETX board thickness of 120 mm
- 03. Mineral plaster on net
- 04. Window
- 05. Connector for fixing insulation
- 06. Assembly foam
- 07. Cement-lime plaster
- 08. External window sill
- 09. Internal window sill

DOUBLE LAYER WALLS - the termPIR® ETX thermal insulation system

▷ Balcony detail - vertical cross section

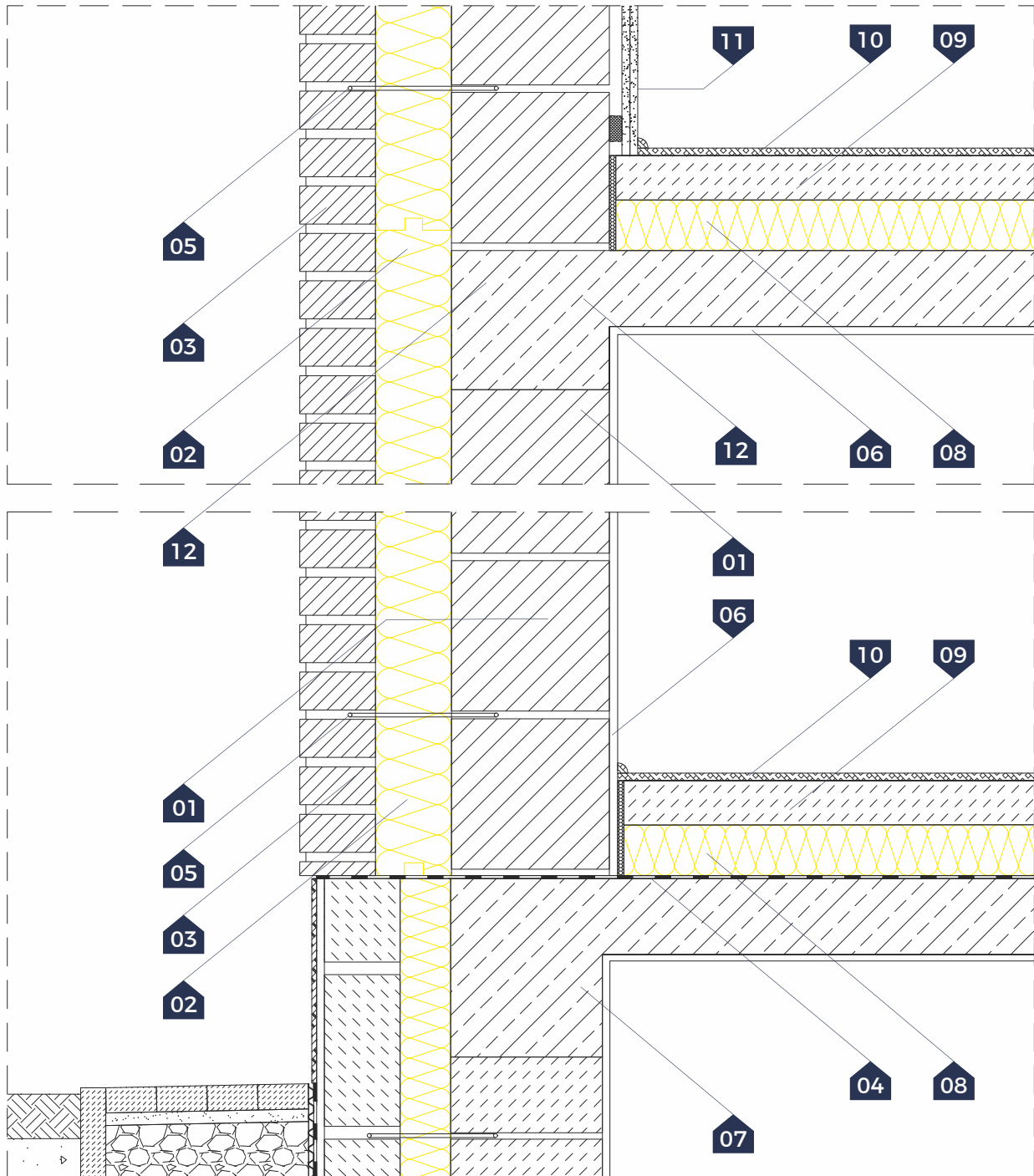


▷ KEY:

01. External bearing wall
02. Wall thermal insulation - termPIR® ETX panel thickness of 120 mm
03. Mineral plaster on net
04. Balcony slab
05. Connector for fixing insulation
06. Balcony underside thermal insulation - termPIR® ETX panel thickness of 20/50 mm
07. Tie beam and ceiling
08. Hydro-insulation
09. Balcony flooring thermal insulation - termPIR® WS/AL panel thickness of 50 mm
10. PE foil
11. Cement floor screed
12. Balcony surface
13. Plinth
14. Drip cap
15. Railing
16. Inclined layer

EXTERNAL WALLS - thermal insulation of triple layer walls

▷ External wall (triple layer)



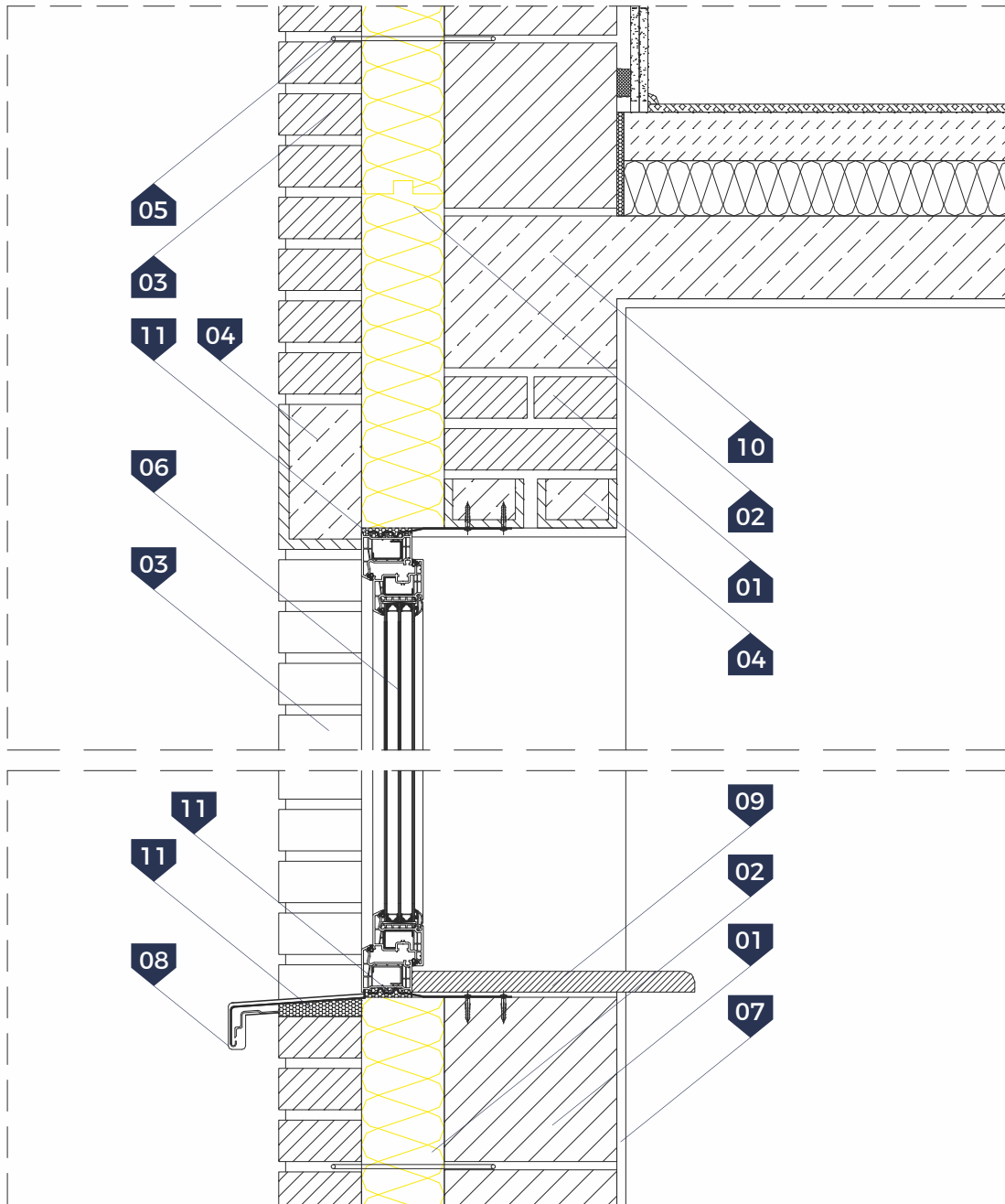
▷ KEY:

- 01. Ground floor wall - bearing section
- 02. Wall thermal insulation
 - termPIR® ETX board thickness 120 mm
- 03. Ground floor wall - protecting section
- 04. Horizontal damp insulation
- 05. Anchor connecting walls
- 06. Cement-lime plaster
- 07. Tie beam and ceiling over the cellar

- 08. Floor thermal insulation
 - termPIR® AL board thickness 100 mm
- 09. Cement floor screed
- 10. Flooring
- 11. Wall finish - e.g. gypsum board on battens
- 12. Tie beam and ceiling over the ground floor

EXTERNAL WALLS - thermal insulation of triple layer walls

▷ Window detail - vertical cross section

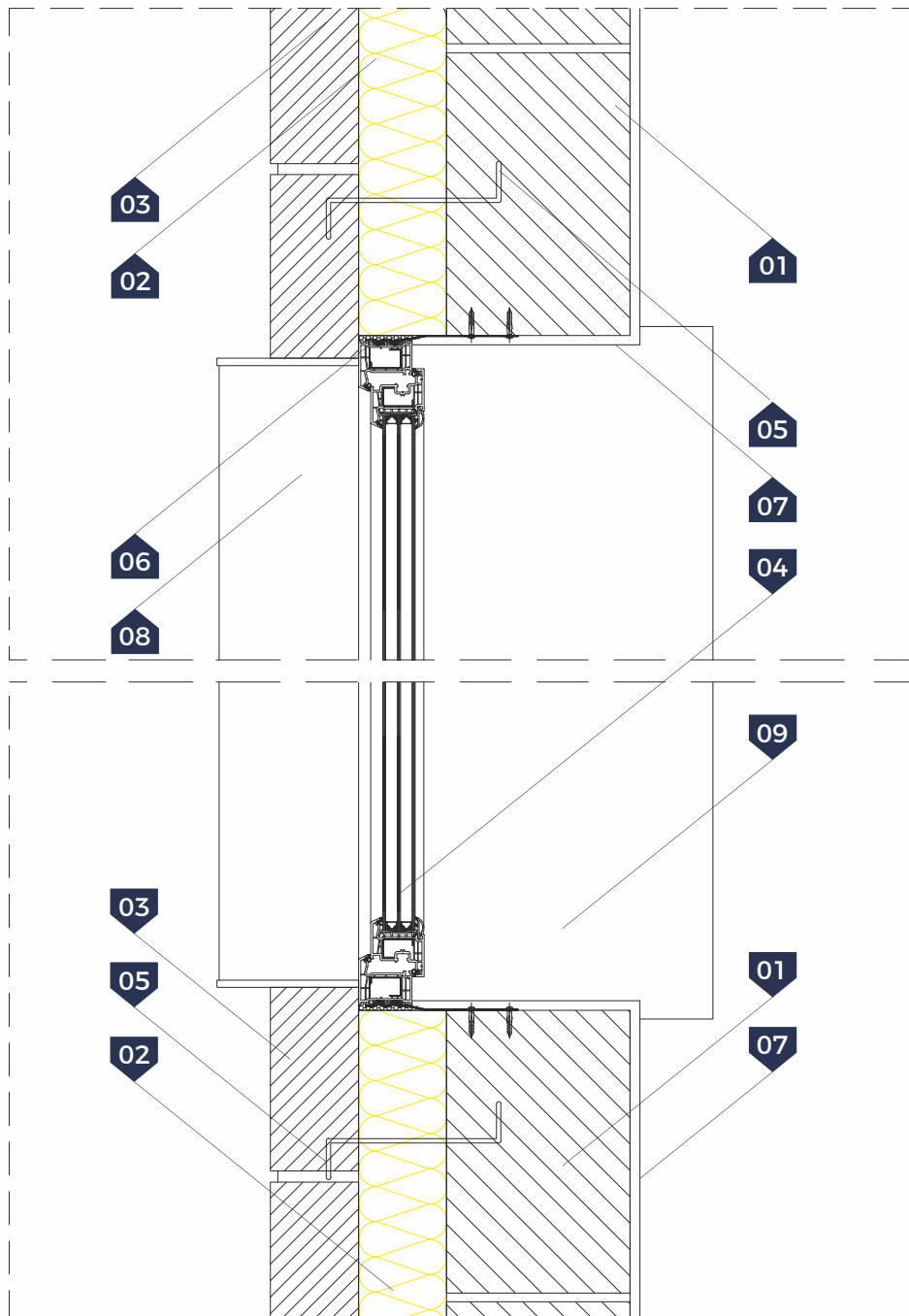


▷ KEY:

- 01. Ground floor wall - bearing section
- 02. Wall thermal insulation - termPIR® AL panel thickness of 120 mm
- 03. Ground floor wall - protecting section
- 04. Lintel of the bearing and protecting wall
- 05. Anchor connecting walls
- 06. Window
- 07. Cement-lime plaster
- 08. External window sill
- 09. Internal window sill
- 10. Tie beam and ceiling
- 11. Assembly foam

EXTERNAL WALLS - thermal insulation of triple layer walls

▷ Window detail - horizontal cross section

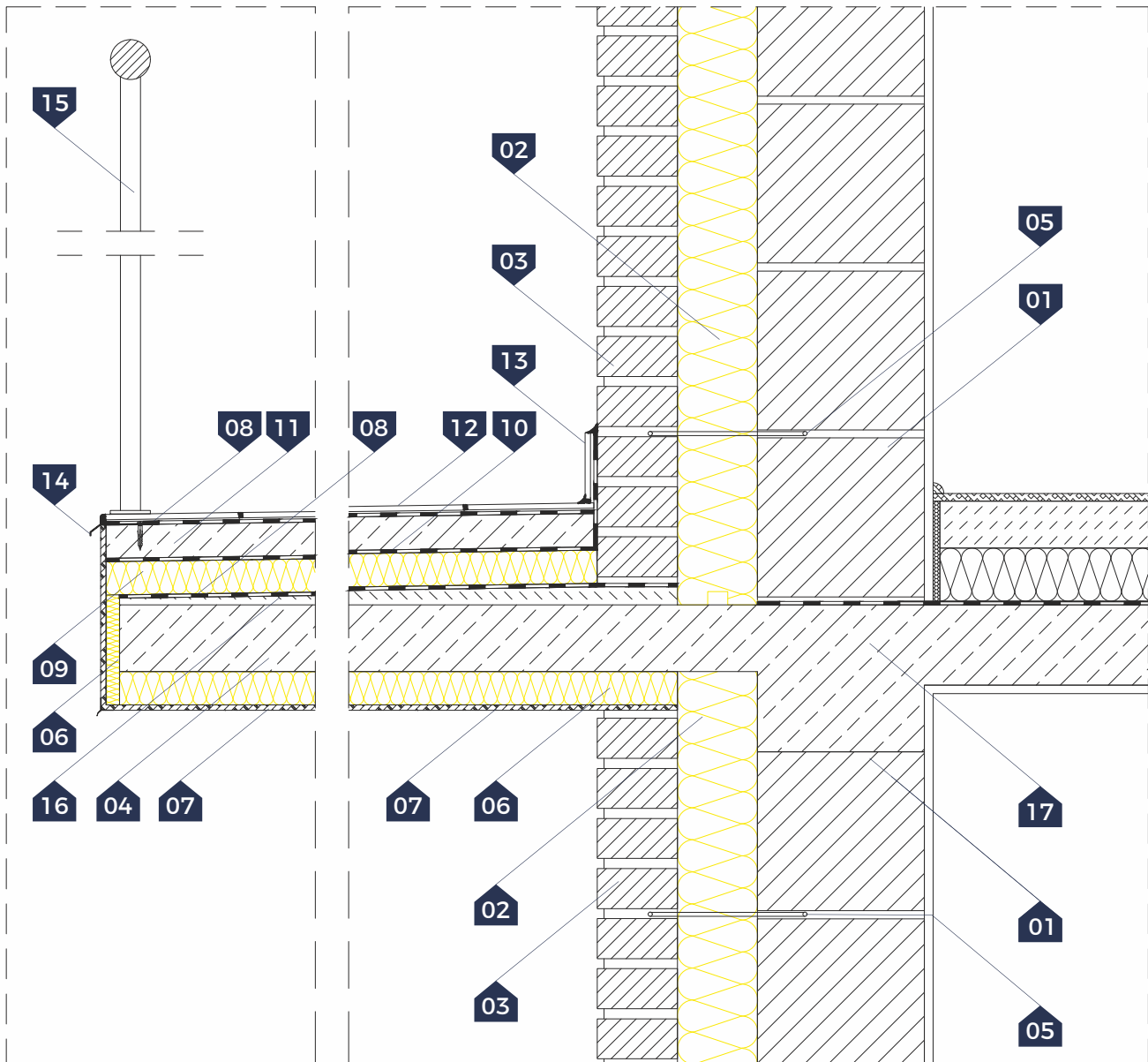


▷ **KEY:**

- 01. Ground floor wall - bearing section
- 02. Wall thermal insulation - termPIR[®] AL board| thickness of 120 mm
- 03. Ground floor wall - protecting section
- 04. Window
- 05. Anchor connecting walls
- 06. Assembly foam
- 07. Cement-lime plaster
- 08. External window sill
- 09. Internal window sill

EXTERNAL WALLS - thermal insulation of triple layer walls

▷ Balcony detail - vertical cross section

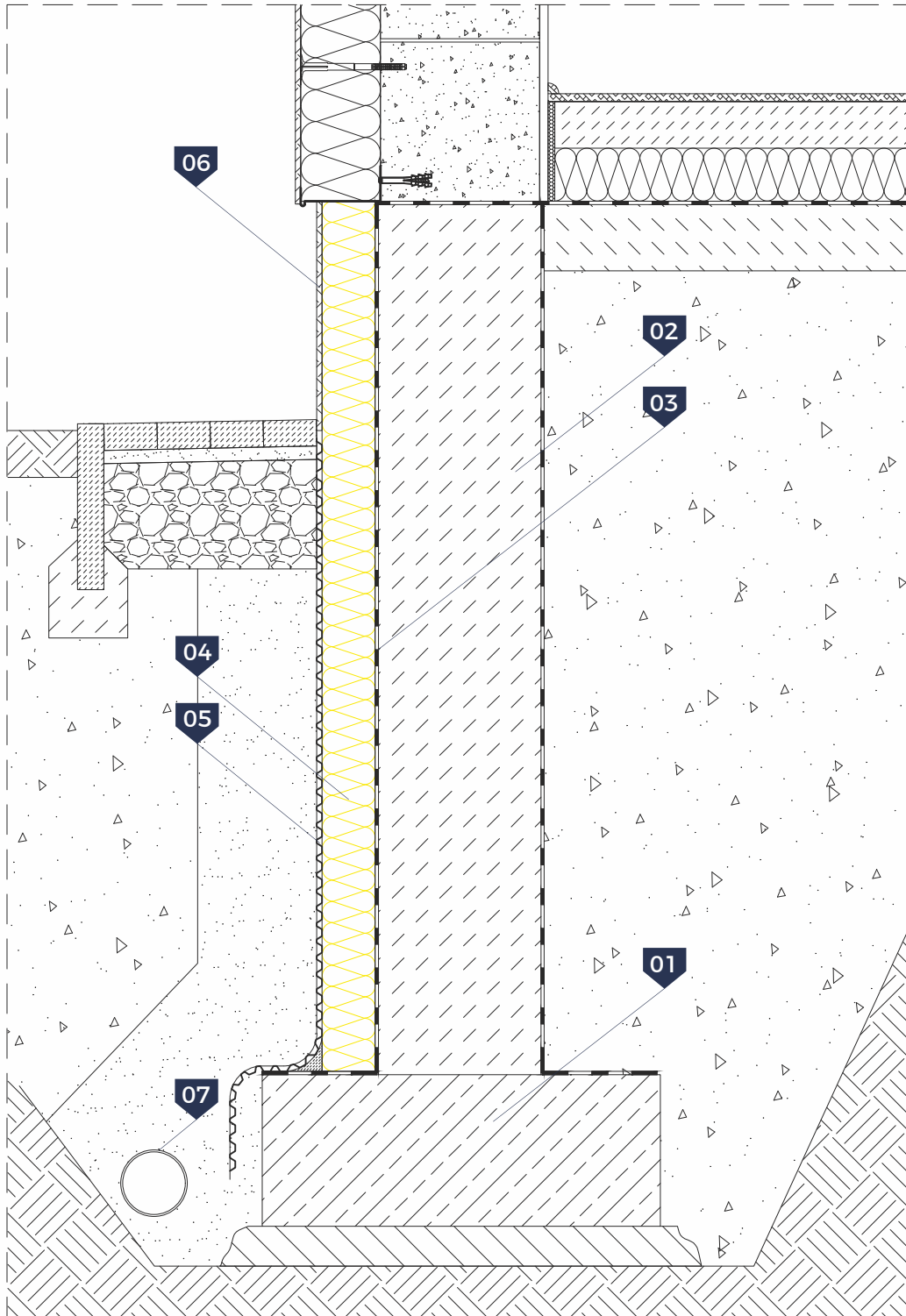


▷ KEY:

- | | |
|---|--------------------------|
| 01. External wall - bearing section | 16. Inclined layer |
| 02. Wall thermal insulation - termPIR® ETX board thickness of 120 mm | 17. Tie beam and ceiling |
| 03. External wall - bearing section | |
| 04. Balcony slab | |
| 05. Anchor connecting walls | |
| 06. Balcony underside thermal insulation - termPIR® ETX board thickness of 20/50 mm | |
| 07. Mineral plaster on net | |
| 08. Hydro-insulation | |
| 09. Balcony flooring thermal insulation - termPIR® WS/AL board thickness of 50 mm | |
| 10. PE foil | |
| 11. Cement floor screed | |
| 12. Balcony surface | |
| 13. Plinth | |
| 14. Drip cap | |
| 15. Railing | |

FOUNDATION WALLS

▷ Double layer foundation wall
(light type hydro-insulation)



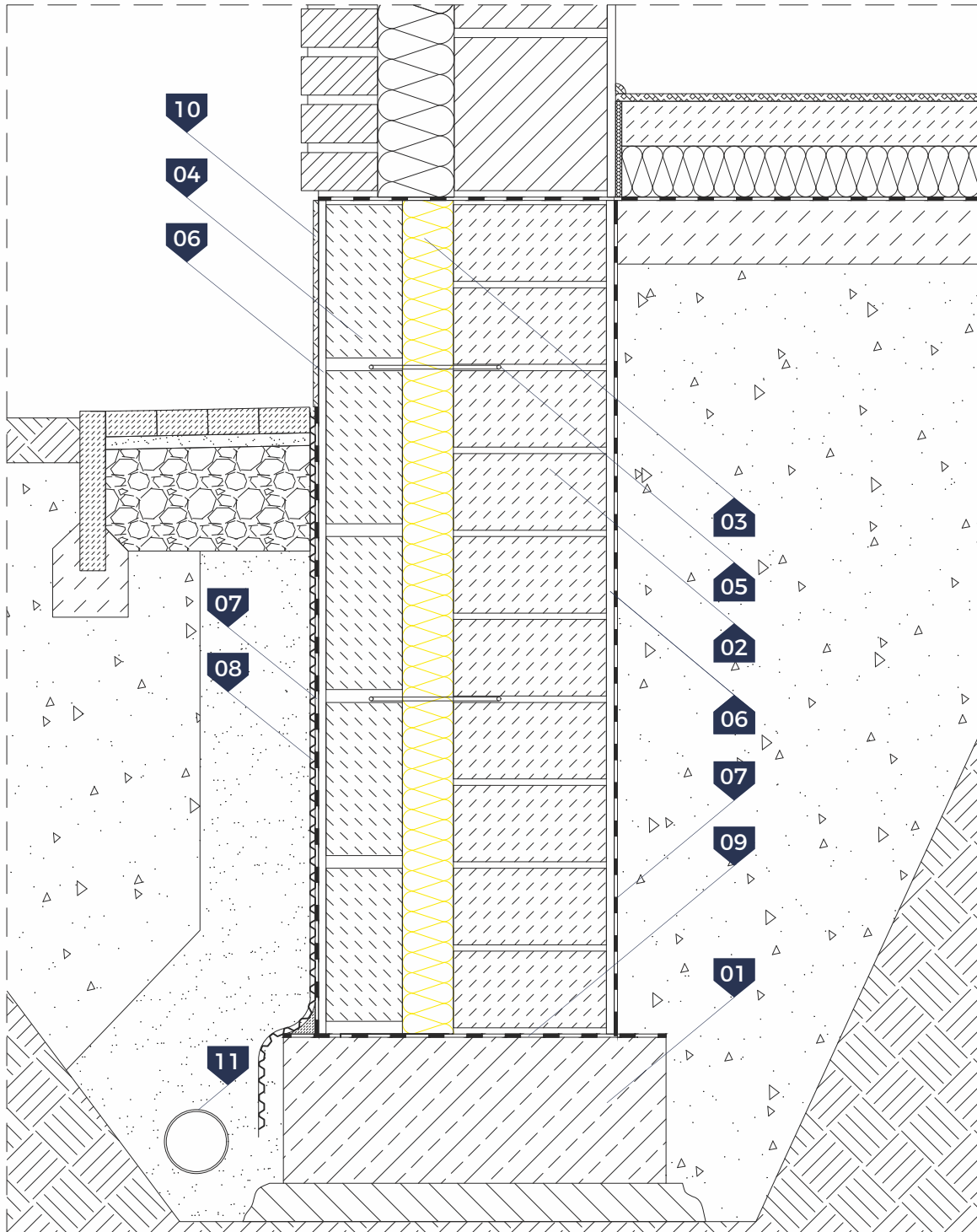
▷ **KEY:**

- 01. Strip foundation
- 02. Foundation wall
- 03. Bituminous insulation mix
- 04. Foundation thermal insulation - termPIR® board AL/WS/ETX thickness of 50 mm bonded directly to the insulation mix

- 05. Foundation foil
- 06. Finishing layer bonded to the plinth on net
- 07. Perimeter drain

FOUNDATION WALLS

- ▷ Triple layer foundation wall
(light type hydro-insulation)

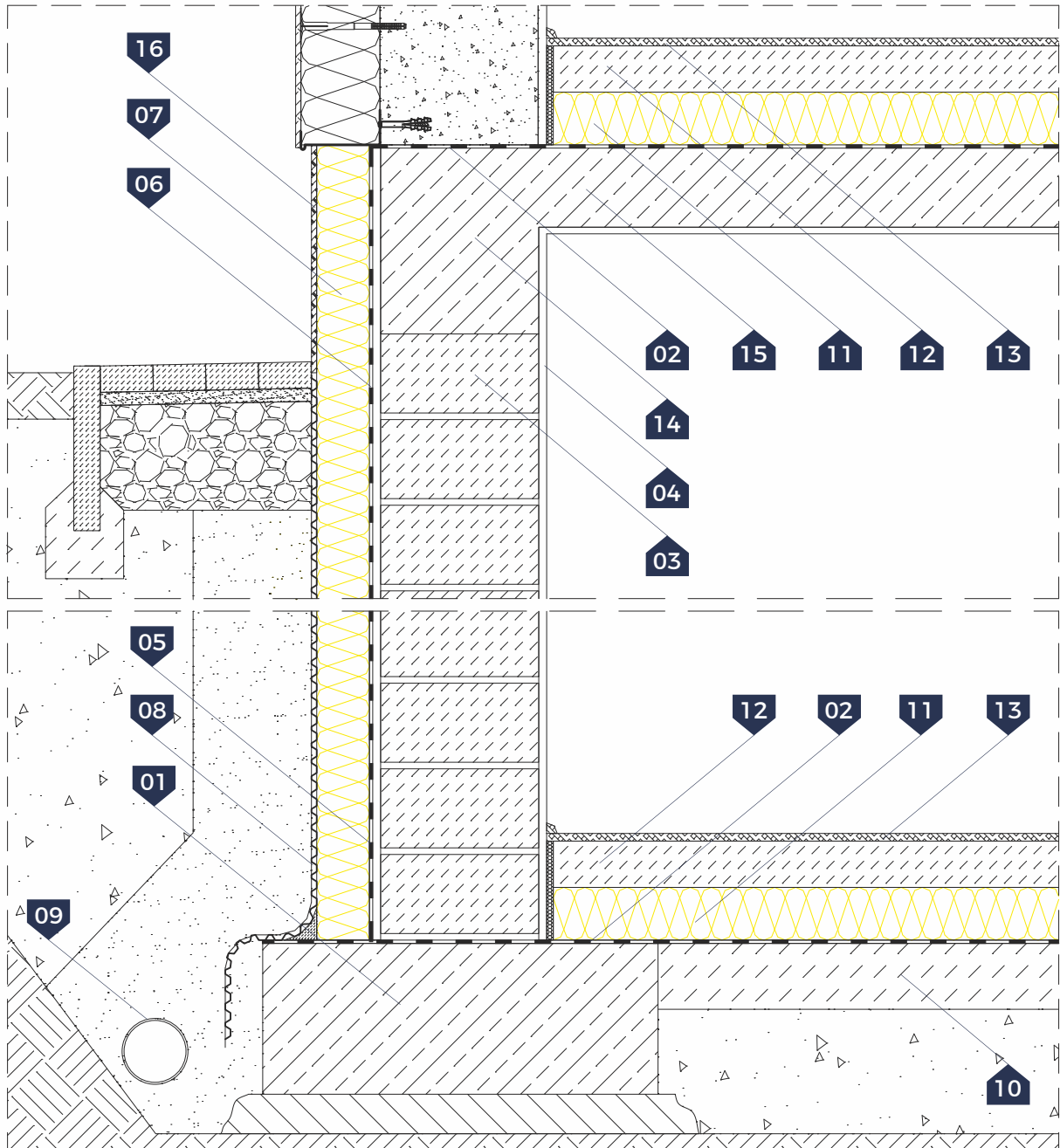


▷ **KEY:**

- | | |
|--|---|
| 01. Strip foundation | 06. Cement plaster |
| 02. Foundation wall - bearing section | 07. Bituminous insulation mix |
| 03. Foundation thermal insulation - termPIR® AL. board
thickness of 50 mm | 08. Foundation foil |
| 04. Foundation wall - protecting section | 09. Horizontal insulation |
| 05. Wall connector | 10. Finishing layer bonded to the plinth on net |
| | 11. Perimeter drain |

CELLAR WALLS

▷ Double layer cellar wall
(light type hydro-insulation)

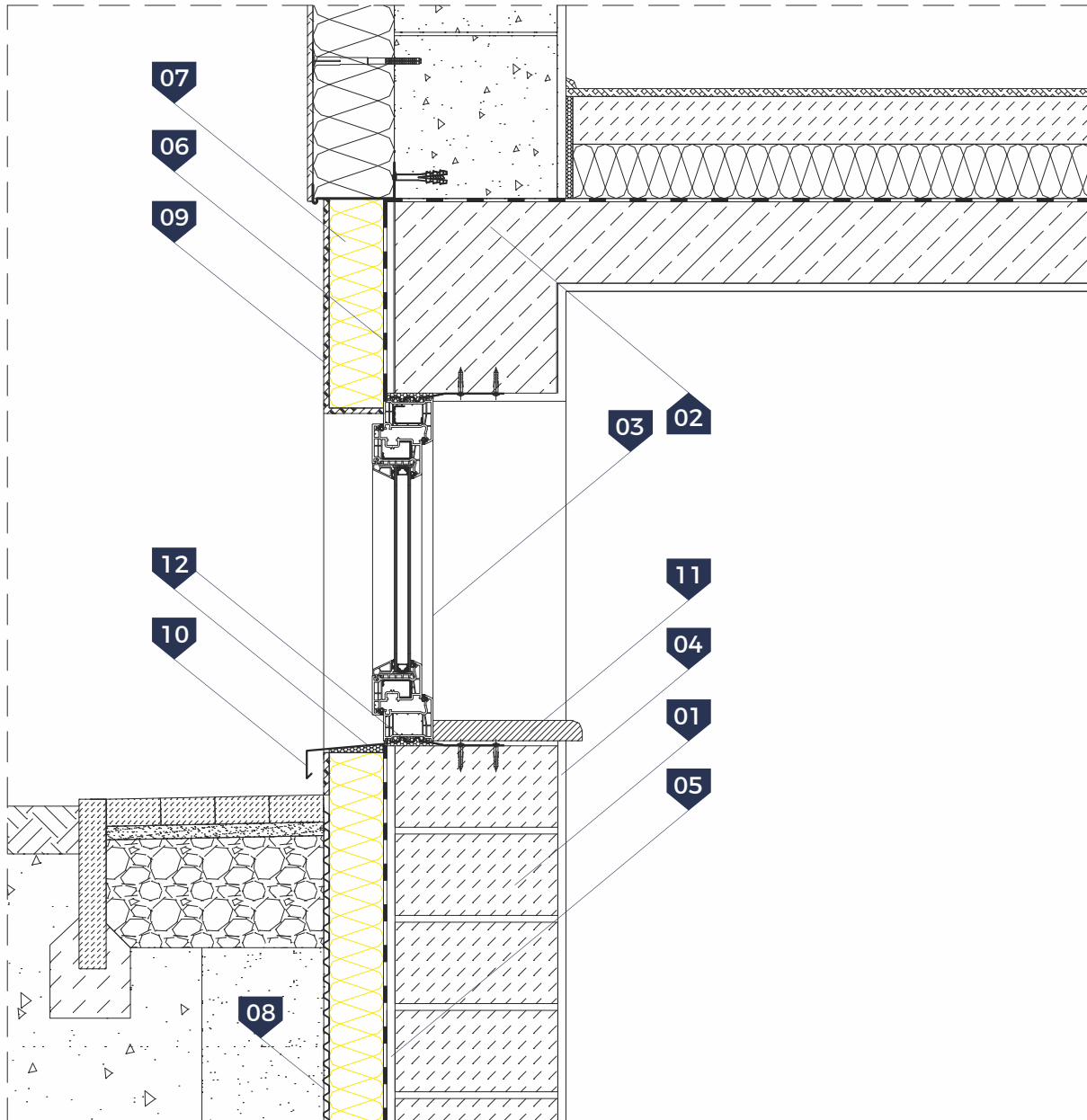


▷ **KEY:**

- | | |
|--|--|
| <ul style="list-style-type: none"> 01. Strip foundation 02. Horizontal damp insulation 03. Cellar wall 04. Cement-lime plaster 05. Cement plaster 06. Bituminous insulation mix 07. Wall thermal insulation - termPIR[®] AL/WS/ETX board
thickness of 50 mm bonded directly to the insulation mix 08. Foundation foil 09. Perimeter drain 10. Lean concrete | <ul style="list-style-type: none"> 11. Floor thermal insulation - termPIR[®] AL board
thickness of 100 mm 12. Cement floor screed 13. Flooring 14. Reinforced concrete tie beam 15. Ceiling over the ground floor 16. Finishing layer bonded to the plinth on net |
|--|--|

CELLAR WALLS

- ▷ Double layer cellar wall (light type hydro-insulation)
Cellar window detail

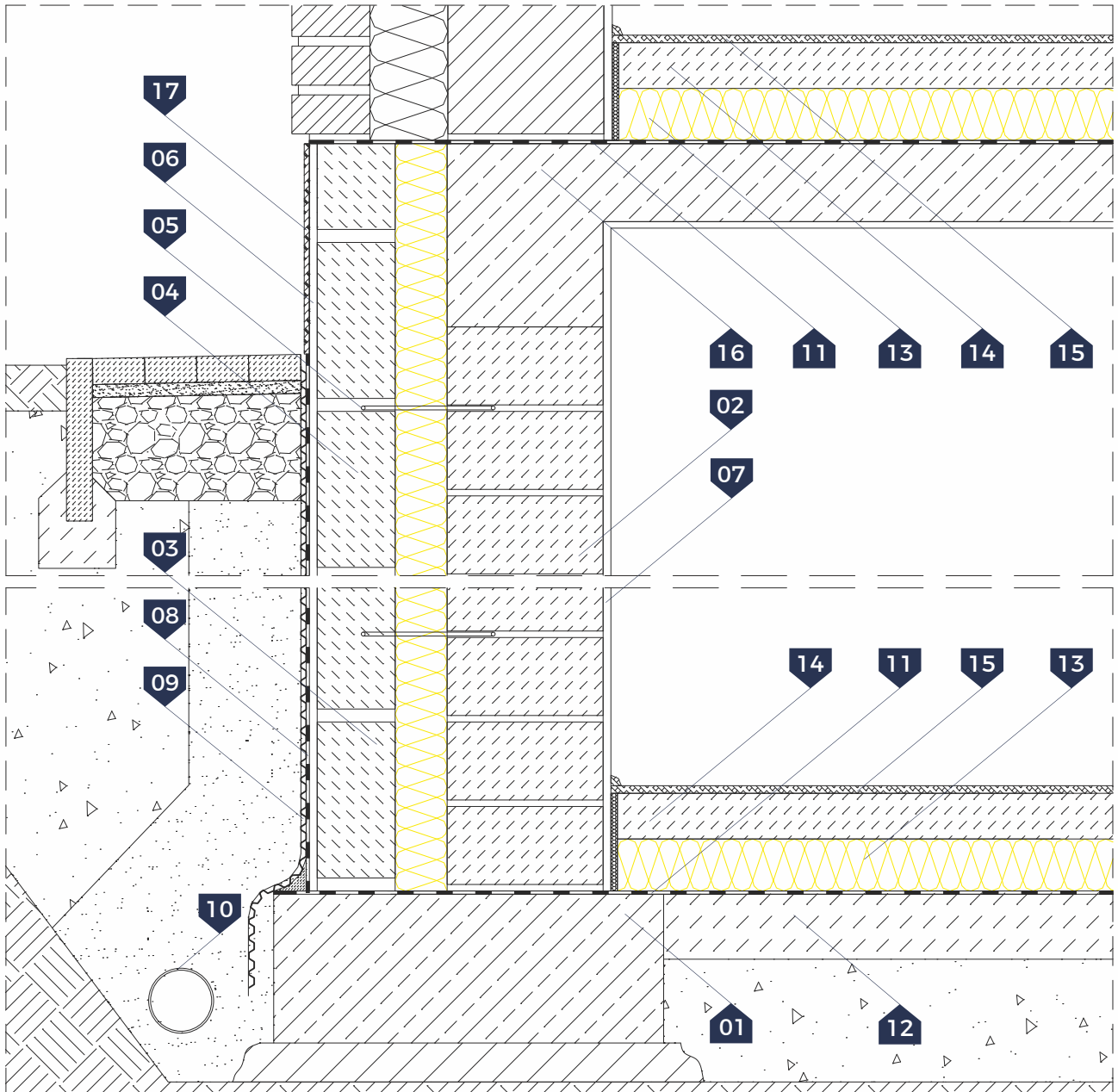


▷ **KEY:**

- 01. Cellar wall
- 02. Lintel
- 03. Window
- 04. Cement-lime plaster
- 05. Cement plaster
- 06. Bituminous insulation mix
- 07. Wall thermal insulation - termPIR® WS/ETX board thickness of 120 mm bonded directly to the insulation mix
- 08. Foundation foil
- 09. Finishing layer bonded to the plinth on net
- 10. External window sill
- 11. Internal window sill
- 12. Assembly foam

CELLAR WALLS

▷ Triple layer cellar wall
(light type hydro-insulation)

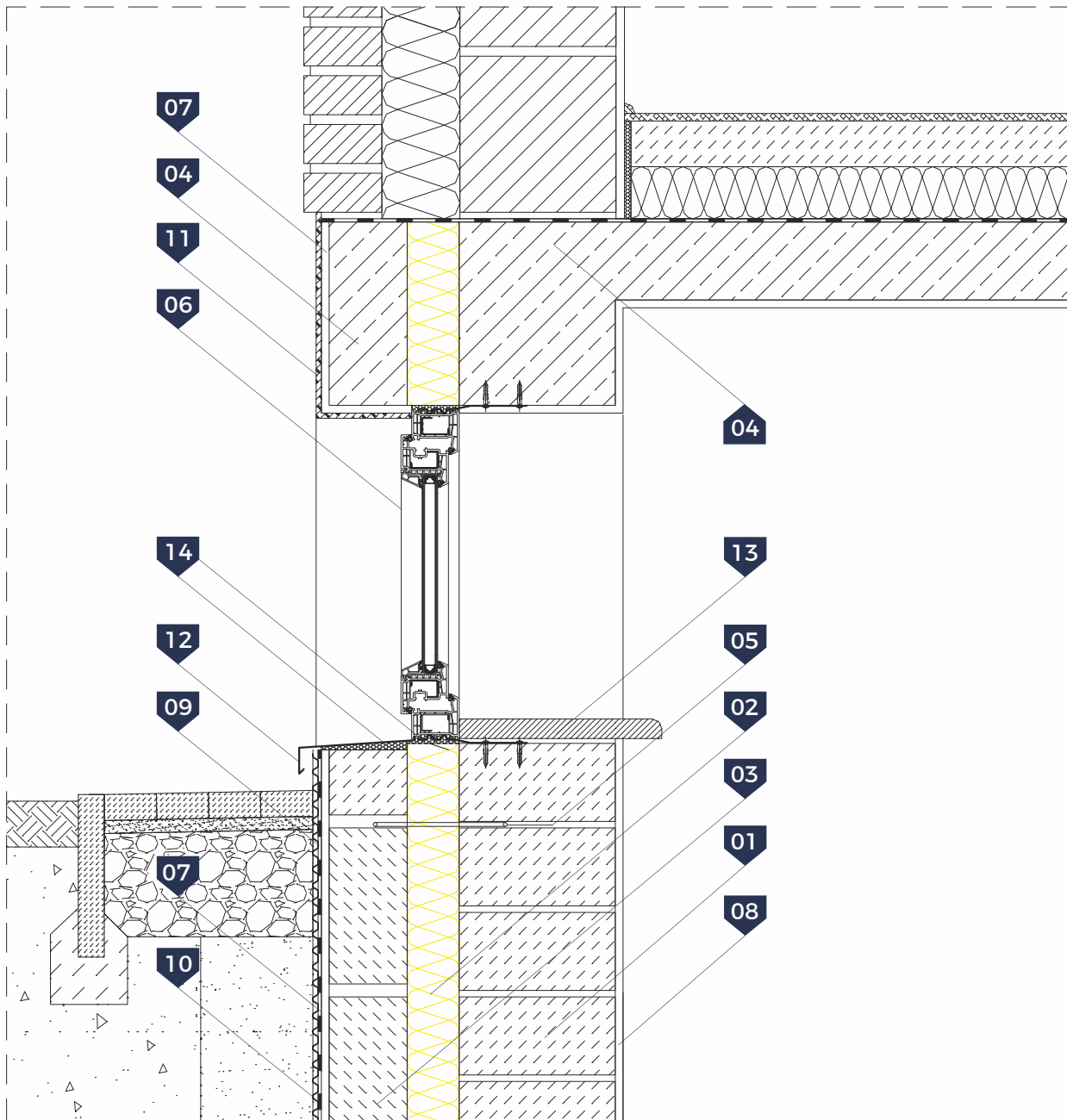


▷ **KEY:**

- | | |
|--|--|
| <ul style="list-style-type: none"> 01. Foundation batten 02. Cellar wall - bearing section 03. Wall thermal insulation - termPIR® AL board thickness of 50 mm 04. Cellar wall - protecting section 05. Wall connector 06. Cement plaster 07. Cement-lime plaster 08. Bituminous insulation mix 09. Foundation foil 10. Perimeter drain | <ul style="list-style-type: none"> 11. Horizontal insulation 12. Lean concrete 13. Floor thermal insulation - termPIR® AL board thickness of 100 mm 14. Cement floor screed 15. Flooring 16. Crib and ceiling above the cellar 17. Finish layer glued on a mesh to a base |
|--|--|

CELLAR WALLS

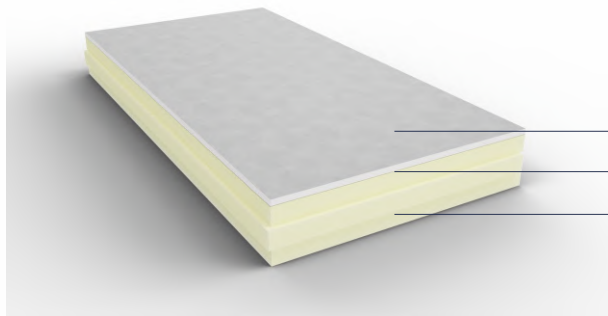
- ▷ Layer type cellar wall (light type hydro-insulation)
Cellar window detail



▷ **KEY:**

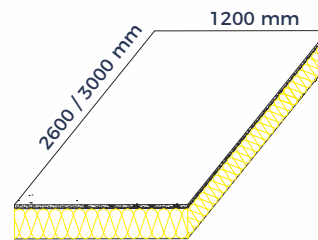
- | | |
|--|--------------------------|
| 01. Cellar wall - bearing section | 12. External window sill |
| 02. Wall thermal insulation - termPIR® AL board
thickness of 120 mm | 13. Internal window sill |
| 03. Cellar wall - protecting section | 14. Assembly foam |
| 04. Lintel of the bearing and protecting section | |
| 05. Wall connector | |
| 06. Window | |
| 07. Cement plaster | |
| 08. Cement-lime plaster | |
| 09. Bituminous insulation mix | |
| 10. Foundation foil | |
| 11. Finishing layer bonded to the plinth on net | |

▷ DIMENSIONS AND CONSTRUCTION OF termPIR® WS GK COMPOSITE THERMAL INSULATION BOARDS



▷ COMPOSITE THERMAL INSULATION BOARDS termPIR® WS GK

- ▷ gypsum board
- ▷ universal glue
- ▷ termPIR® WS thermal insulation boards



▷ INTENDED USE FOR termPIR® WS GK COMPOSITE THERMAL INSULATION BOARDS

termPIR® WS GK composite thermal insulation boards are a product designed with a view to insulate walls of buildings under the protection of the Conservator Officer, the elevations of which are a rich architectural value, thus there is no possibility to change their appearance. This product allows to make a thermal insulation layer of partition located inside the building, which is finished in a way corresponding to the one that we use to make the so-called “pre-walls” using gypsum boards. Due to their dimensions, the termPIR® WS GK slabs will also be applicable in each place that requires the insulation of big surfaces in a relatively short period of time, i.e. on stairwells or other communication routes. The structure and applied production technology enables the G6r-Stal sp. z o.o. Company to offer a product, which in the reaction-to-fire performance classification in the final use is classified as **non-inflammatory** and **non-dripping**.

▷ GUIDELINES FOR THE ASSEMBLY OF termPIR® WS GK COMPOSITE THERMAL INSULATION BOARDS

1. Preparation of base

The basis of a correctly performed assembly of slabs is the execution of base evaluation and, if necessary, application of series of procedures aimed at leading it to appropriate condition. The mentioned evaluation should be carried out according to the guidelines of the manufacturer of used adhesive. In extreme cases, e.g. during the assembly of boards on significantly uneven base, a change of assembly method from gluing to mechanical assembly may be necessary. It should be carried out according to the rules adopted for the assembly of gypsum boards.

2. Assembly of boards

In order to provide the appropriate load-bearing capacity of connection between the boards and base, at least 40% of the surface of one board must be covered in glue. This is guaranteed by applying on it 14 “pancakes” with diameter of approximately 15 cm and 10 cm wide circumferential strip. Board prepared in such way should be pressed to a load-bearing base. Any slab location corrections are carried out using a rubber hammer through a wooden washer. Please ensure that the surface of washer from the side placed next to the board is smooth and free of dirt that might destroy the gypsum board. The finish layer of the termPIR® WS GK slab must be secured against the possibility of rising dampness from the base. We recommend the application of a 10 mm wide gap between the bottom of a board and the base (alternatively you can use damp insulation at the connection point). In case of using the gap, the boards should be supported with dividers for the adhesive binding time determined by the manufacturer. If the location of a slab prevents the application of dividers, then it should be also mechanically mounted to the base using styrofoam assembly pins.

3. Wall surface finish

After 7-14 days pass from the assembly, you can start the finish of connections between the boards and connections between boards and other partitions. 5 mm and greater gaps should be first filled out with low pressure PIR foam. The final finish of board connections should be carried out according to the guidelines from the assembly of gypsum board pre-walls and the connections between boards and other partitions should be made using a painted acrylic mass.

Example details of walls of historical buildings insulated with the termPIR[®] WS GK composite thermal insulation boards.

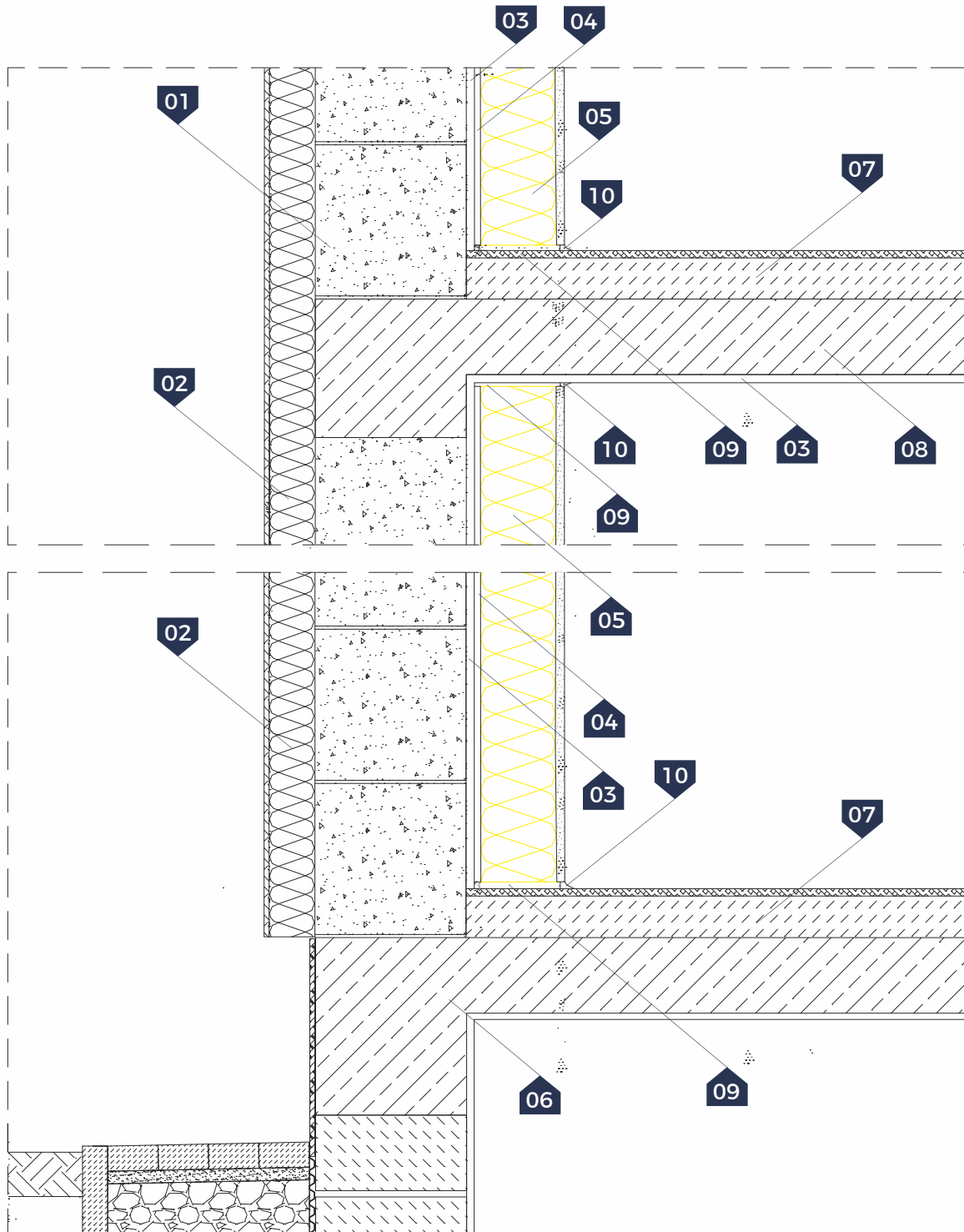
WALLS OF HISTORICAL BUILDINGS - the termPIR[®] WS GK composite thermal insulation boards

External wall - vertical cross-section	049
External wall - horizontal view	050

WALLS OF HISTORICAL BUILDINGS

- the termPIR® WS GK composite thermal insulation boards

▷ External wall - vertical cross-section



▷ KEY:

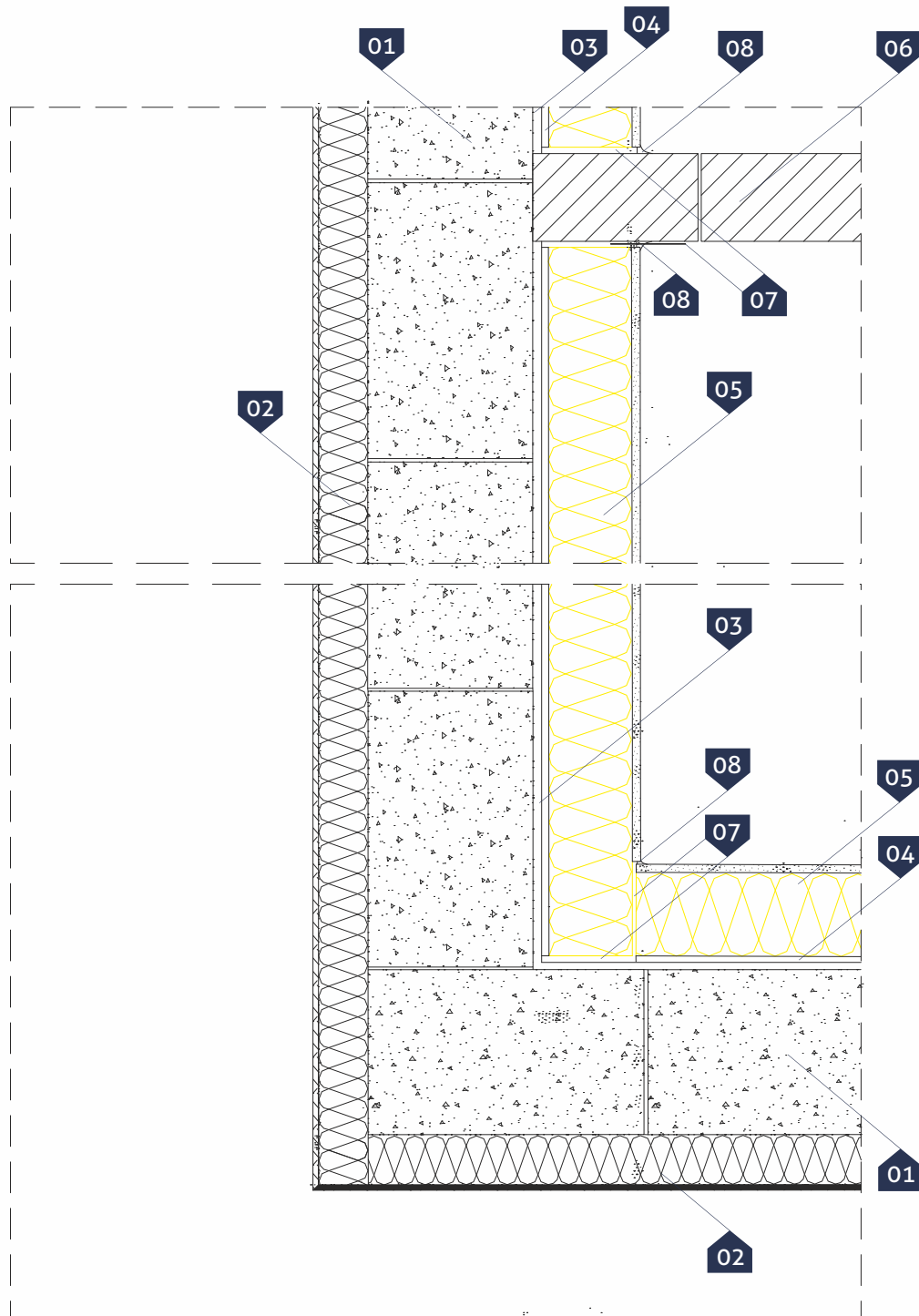
- 01. Structural part of the wall
- 02. Existing external finish of the wall
- 03. Cement- calciferous plaster
- 04. Universal adhesive
- 05. Thermal insulation of wall - termPIR® WS GK boards thick according to thermal and moisture analysis of the wall

- 06. Crib and ceiling above the cellar
- 07. Floor finish
- 08. Crib and ceiling above the ground floor
- 09. Gap filled out with low pressure PIR foam
- 10. Cover strip or acrylic finish

WALLS OF HISTORICAL BUILDINGS

- the termPIR® WS GK composite thermal insulation boards

▷ External wall - horizontal view



▷ KEY:

- 01. Structural part of the wall
- 02. Existing external finish of the wall
- 03. Cement- calciferous plaster
- 04. Universal adhesive
- 05. Thermal insulation of wall - termPIR® WS GK boards thick according to thermal and moisture analysis of the wall
- 06. Wall perpendicular to the insulated wall
- 07. Gap filled out with low pressure PIR foam
- 08. Cover strip or acrylic finish

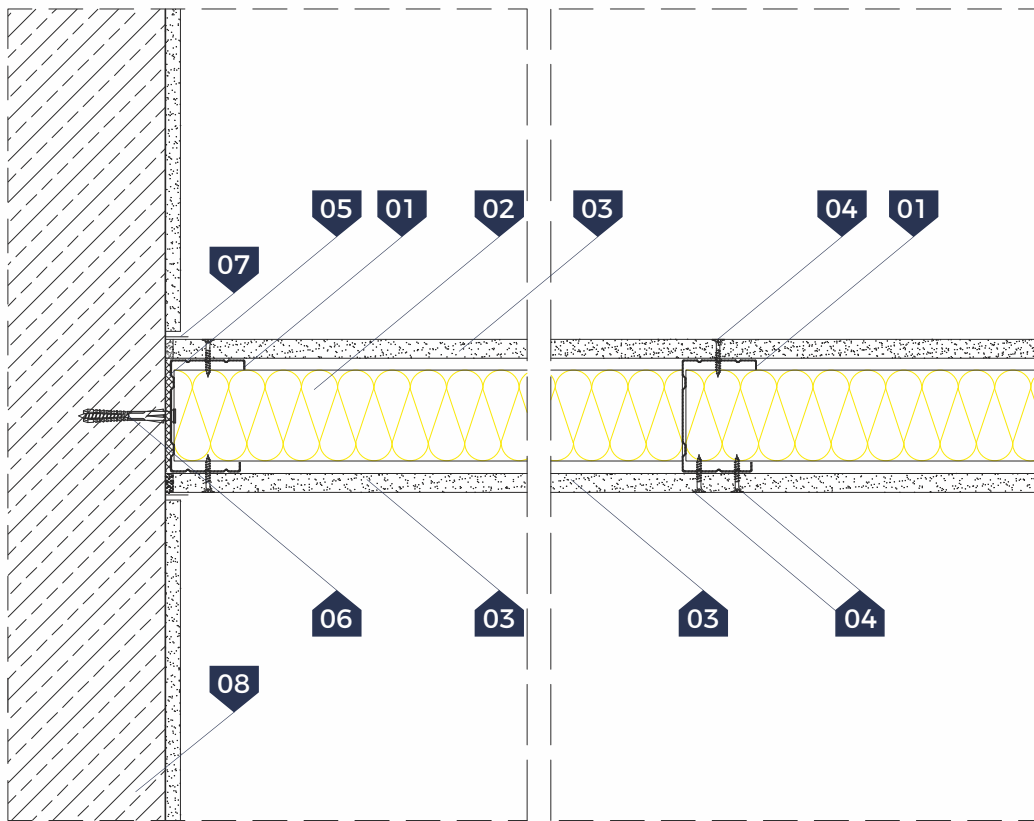
Examples of details of partition walls insulated thermally with termPIR[®] boards

PARTITION WALLS - ON STEEL STRUCTURE

Detail of a connection with the bearing wall	052
"T" type wall connection detail	053
Detail of wall assembly near the flooring	054
Detail of wall assembly near the ceiling	055

PARTITION WALLS - ON STEEL STRUCTURE

▷ Detail of connection with the bearing wall

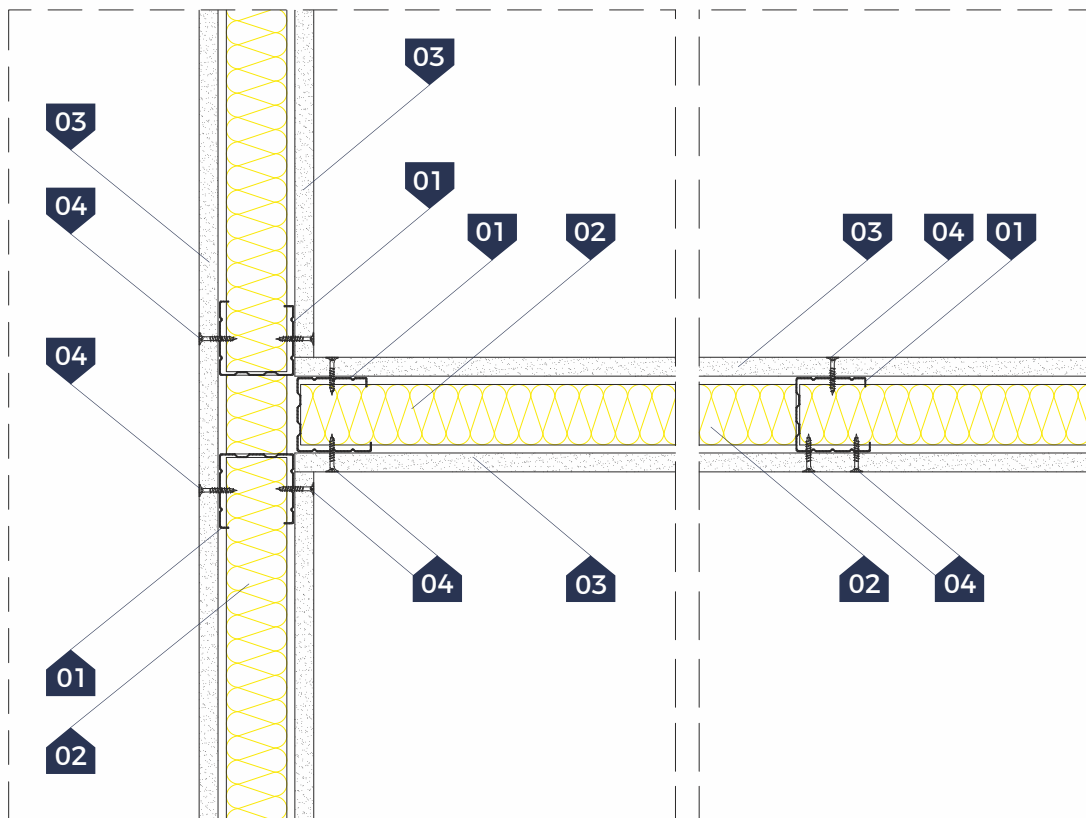


▷ **KEY:**

- 01. Partition wall construction - CW 100, CW 75, or CW 50 profile
- 02. Wall thermal insulation - termPIR® WS/AL/PK board thickness of: 90, 60 or 40 mm
- 03. Finish - e.g. gypsum board on battens
- 04. Self-tapping screw for steel
- 05. Sealing tape
- 06. Wall plug
- 07. Sliding tape
- 08. Bearing wall

PARTITION WALLS - ON STEEL STRUCTURE

▷ "T" type wall connection detail

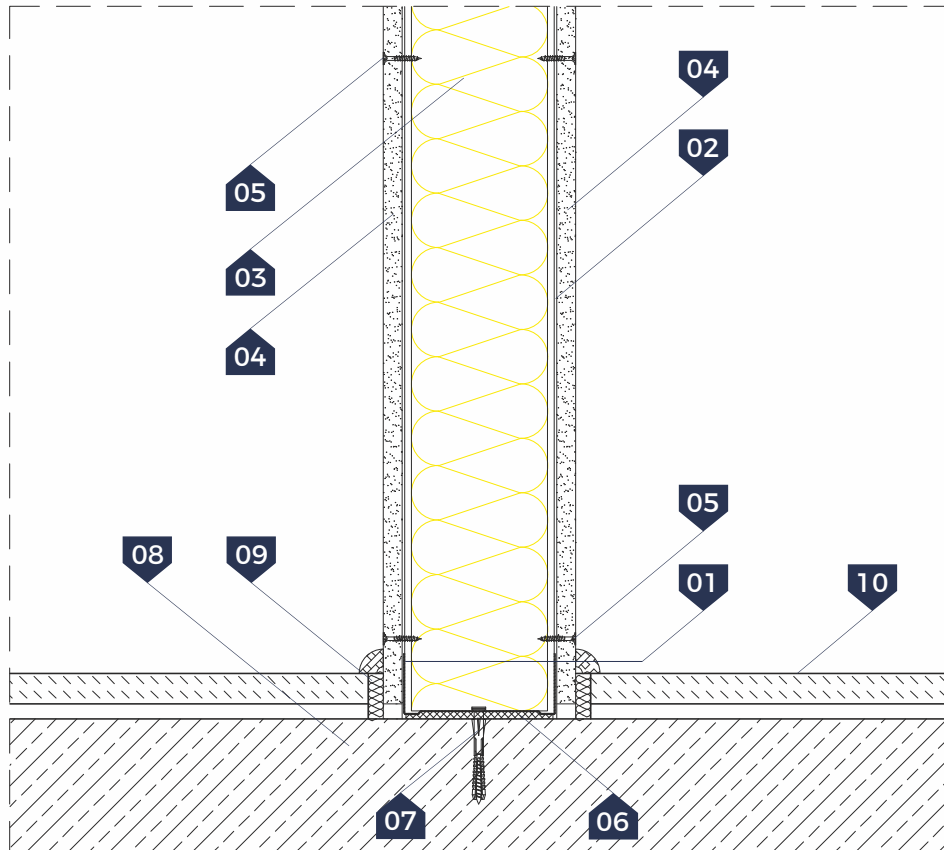


▷ **KEY:**

- 01. Partition wall construction - profil CW 100, CW 75 lub CW 50
- 02. Wall thermal insulation - termPIR[®] WS/AL/PK board thickness of : 90, 60 or 40 mm
- 03. Finish - e.g. gypsum board on battens
- 04. Self-tapping screw for steel

PARTITION WALLS - ON STEEL STRUCTURE

▷ Detail of the wall assembly near the flooring

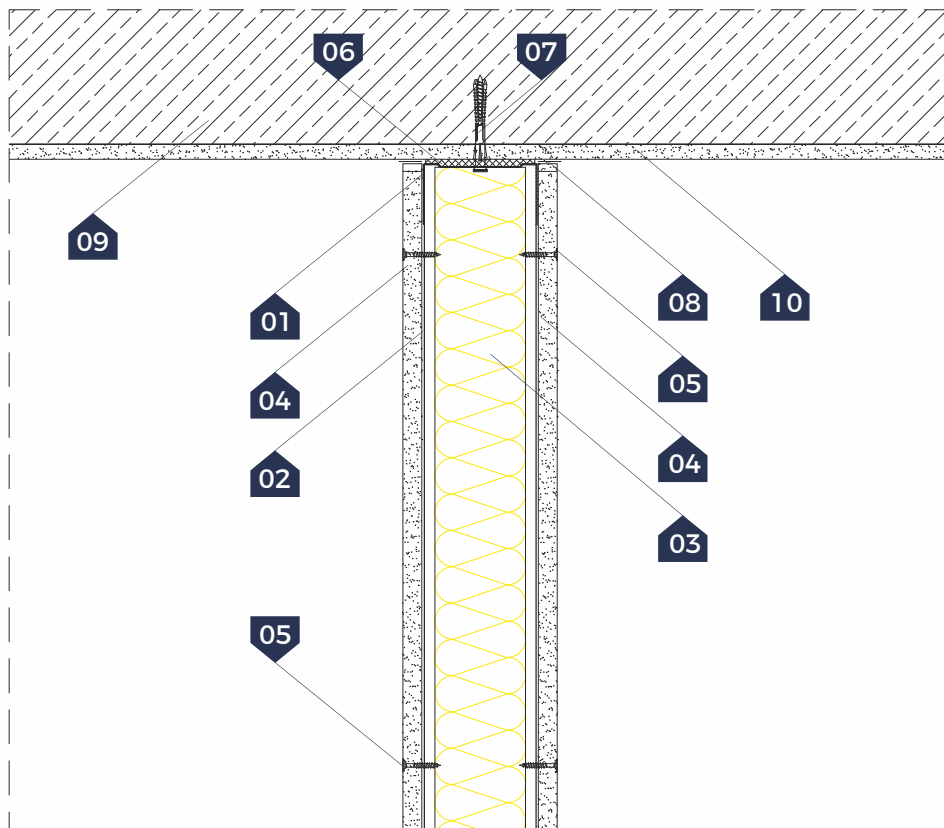


▷ KEY:

- 01. Partition wall construction - UW 100, UW 75, or UW 50 horizontal profile
- 02. Partition wall construction - CW 100, CW 75, or CW 50 vertical profile
- 03. Wall thermal insulation - termPIR® WS/AL/PK with respective thick. of: 90, 60, or 40 mm
- 04. Finish - e.g. gypsum board on battens
- 05. Self-tapping screw for steel
- 06. Sealing tape
- 07. Wall plug
- 08. Cement floor screed
- 09. Circumferential dilatation
- 10. Flooring finishing

PARTITION WALLS - ON STEEL STRUCTURE

▷ Detail of the wall assembly near the ceiling



▷ **KEY:**

- 01. Partition wall construction - UW 100, UW 75 or UW 50 horizontal shapes
- 02. Partition wall construction - CW 100, CW 75 or CW 50 vertical shapes
- 03. Wall thermal insulation - termPIR[®] WS/AL/PK with respective thick. of: 90, 60, or 40 mm
- 04. Finish - e.g. gypsum board on battens
- 05. Self-tapping screw for steel
- 06. Sealing tape
- 07. Wall plug
- 08. Sliding tape
- 09. Slab
- 10. Plaster

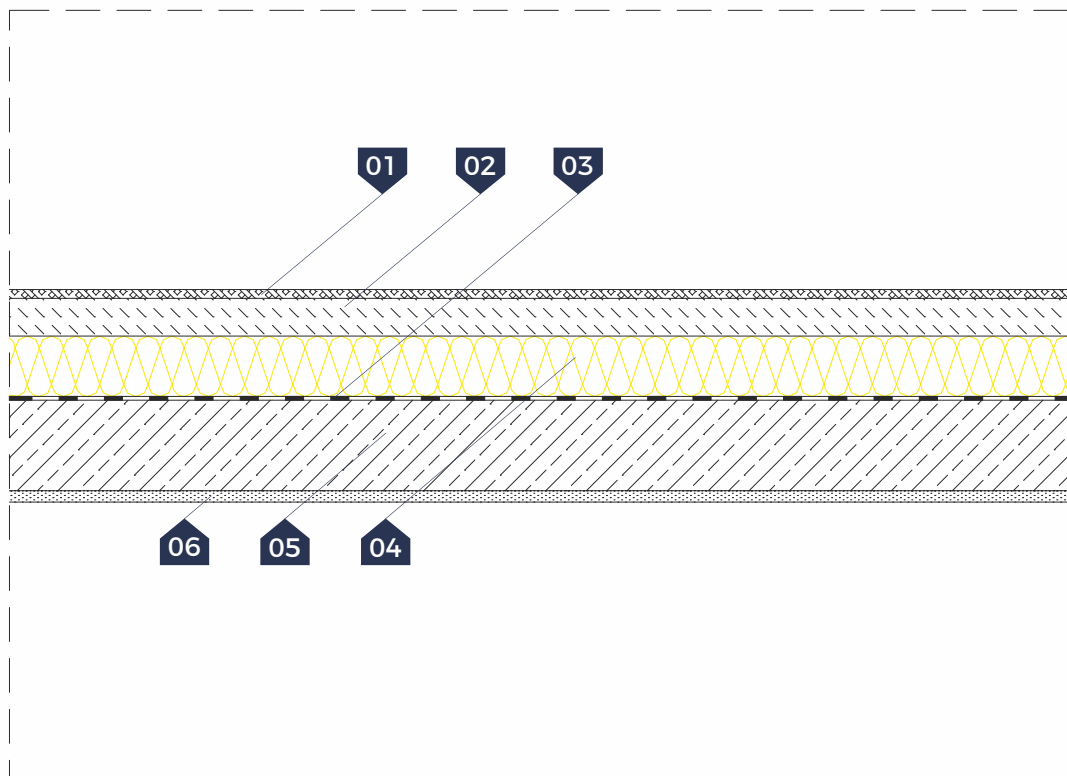
Examples of floor and ceiling details insulated thermally with termPIR[®] boards

CEILINGS AND FLOORS

Thermal insulation of the ceiling between storeys	057
Thermal insulation of the ceiling of the last storey - cross section of the ceiling	058
Thermal insulation of the ceiling of the last storey - thermal insulation of the gable wall	059
Thermal insulation of the terrace over a living compartment	060
Thermal insulation of the slab and floor on the ground	061
Thermal insulation of the slab and heated floor on the ground	062

CEILINGINGS AND FLOORS

▷ Thermal insulation of the ceiling between storeys

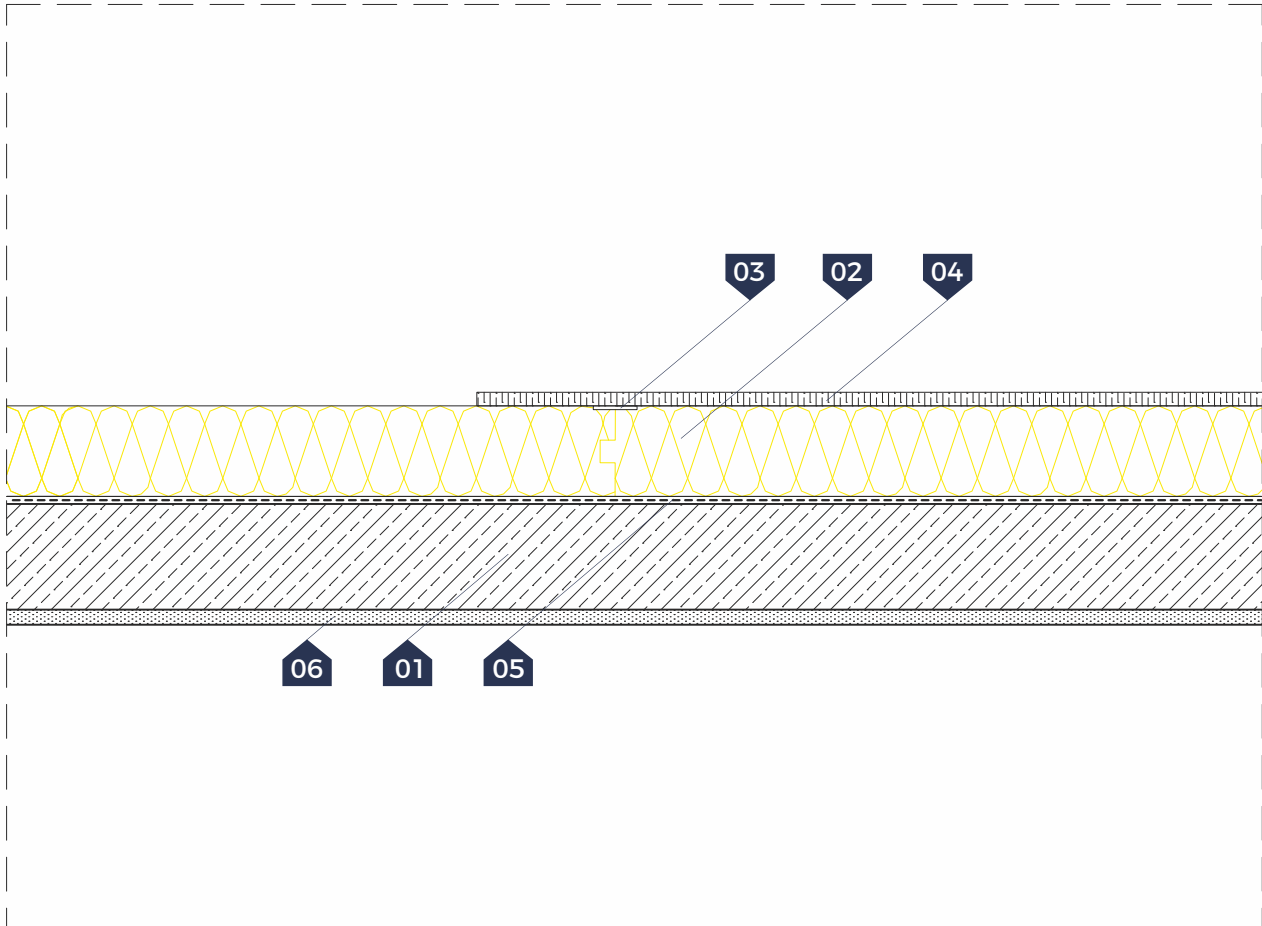


▷ **KEY:**

- 01. Flooring - finishing layer
- 02. Concrete screed - levelling layer
- 03. PE foil (option)
- 04. Floor thermal insulation - termPIR® WS/AL board thickness of 30 mm
- 05. Ceiling - reinforced concrete slab with screed for skim coat
- 06. Cement-lime plaster

CEILINGS AND FLOORS

- ▷ Thermal insulation of the ceiling of the last storey
- cross section of the ceiling



▷ **KEY:**

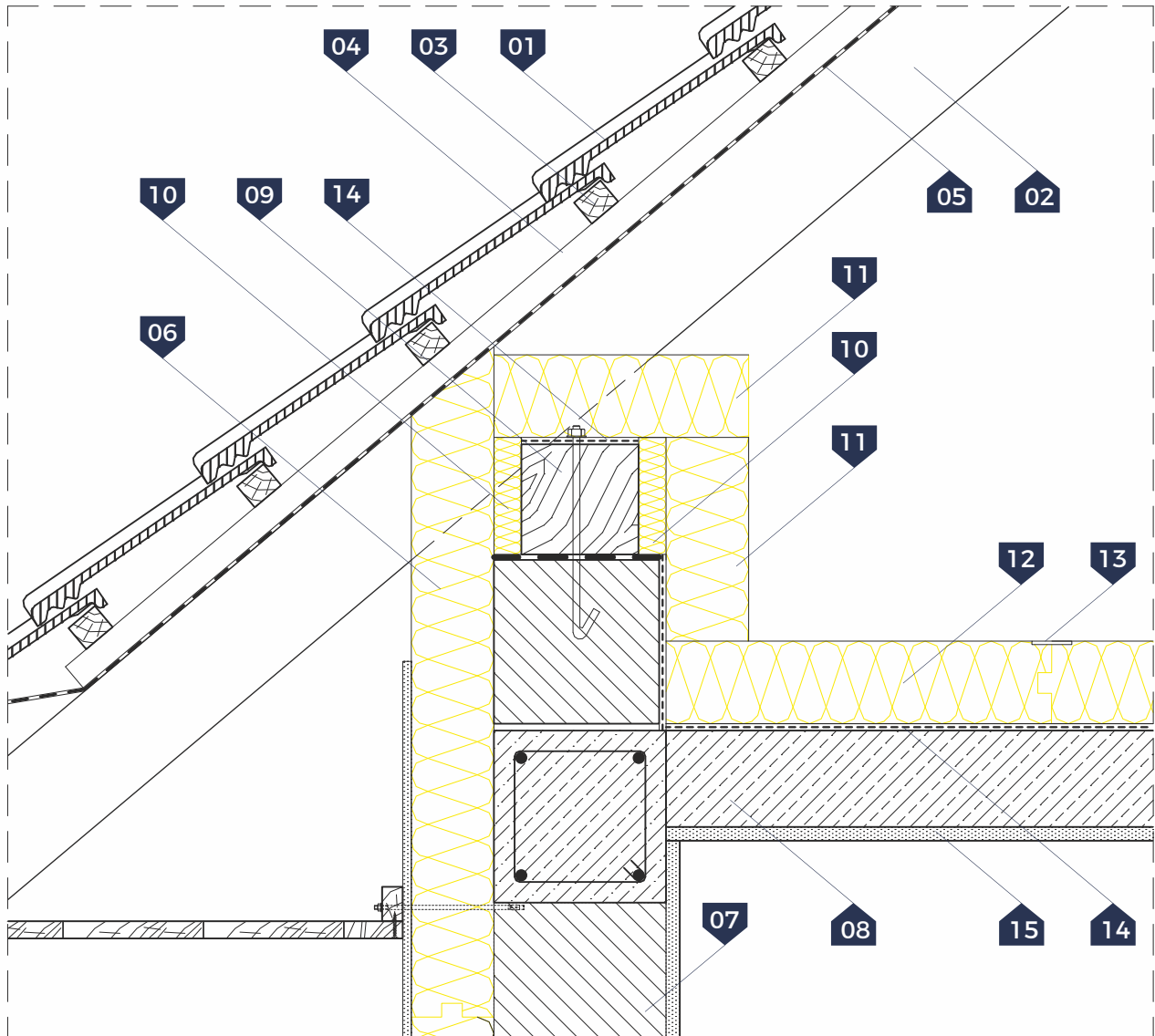
- 01. Reinforced concrete ceiling
- 02. Ceiling thermal insulation - termPIR® AL/WS insulation board thickness of 120 mm
- 03. Aluminium sealing tape
- 04. OSB board - communication
- 05. Polyurethane adhesive
- 06. Plaster

▷ **REMARKS:**

- a. The cut boards are to be sealed with assembly foam
- b. The aluminium sealing tape to be installed after installation of the boards (only for AL lining)

CEILING AND FLOORS

- ▷ Thermal insulation of the ceiling of the last storey
- thermal insulation of the gable wall



▷ KEY:

- 01. Roof cover - roof tile or steel sheet
- 02. Wooden rafter
- 03. Batten
- 04. Counter-batten
- 05. Wind insulation - vapour permeable membrane
- 06. Wall thermal insulation
- termPIR® ETX board thickness of 120 mm
- 07. External wall
- 08. Tie beam and reinforced ceiling
- 09. Bottom chord
- 10. Filling - rock wool
- 11. Bottom chord thermal insulation - termPIR® AL/WS
board thickness min 120 mm
- 12. Ceiling thermal insulation
- termPIR® AL/WS insulation board thickness min. 120 mm

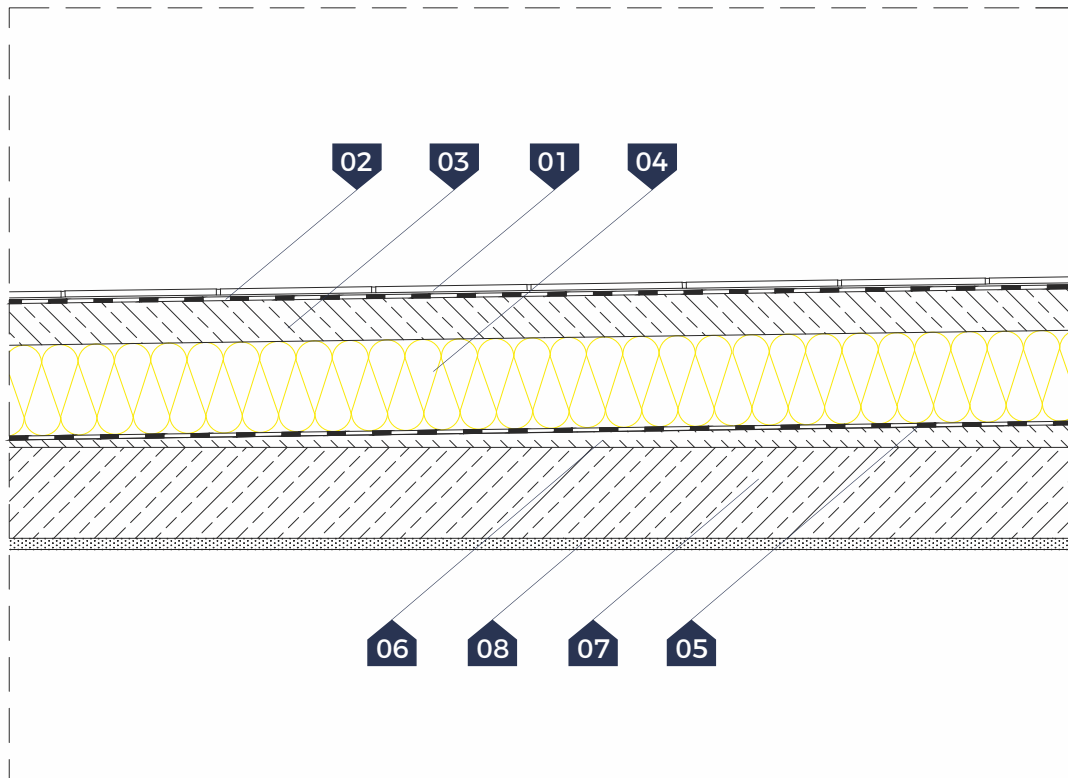
- 13. Aluminium sealing tape
- 14. Polyurethane adhesive
- 15. Plaster

▷ REMARKS:

- a. Cut boards to be sealed with the assembly foam
- b. The aluminium sealing tape to be installed after installation of the panels (only for AL lining)

CEILINGS AND FLOORS

▷ Thermal insulation of the terrace over a living compartment

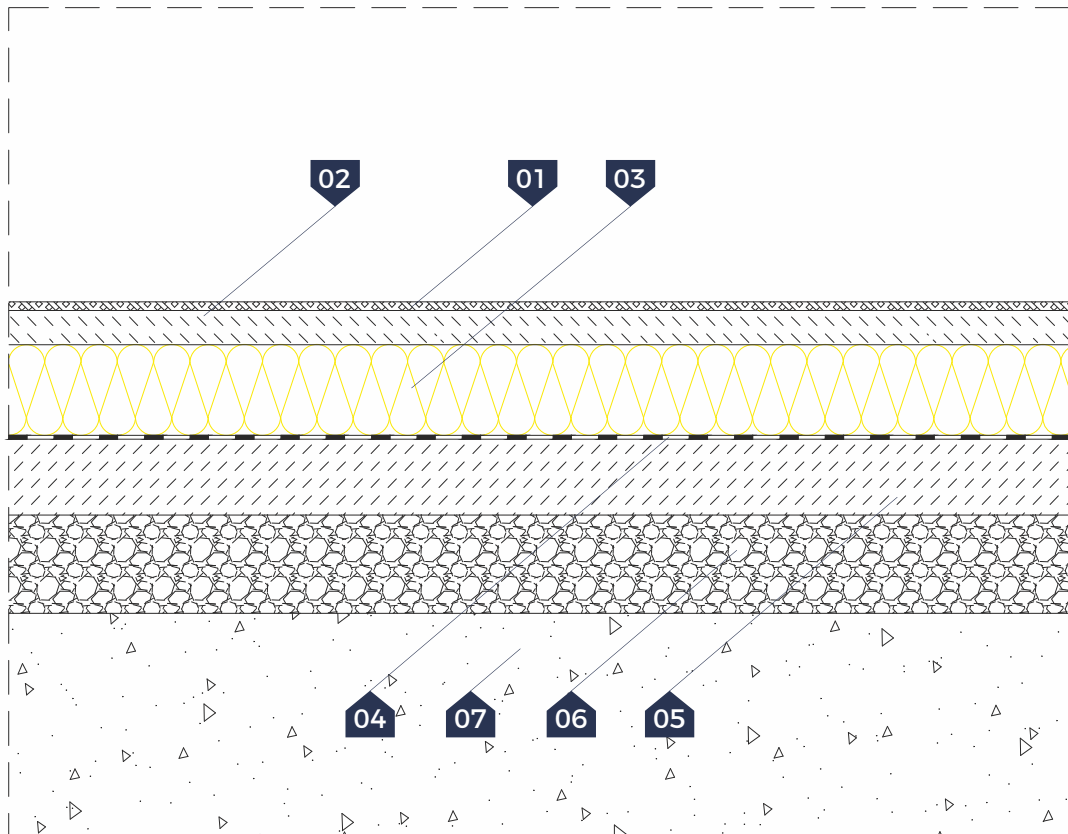


▷ **KEY:**

- 01. Terrace surface - finishing layer
- 02. Hydro-insulation
- 03. Cement floor screed
- 04. Terrace thermal insulation - termPIR® WS/AL board thickness of 120 mm
- 05. PE foil (option)
- 06. Concrete screed - inclined layer
- 07. Ceiling - reinforced concrete
- 08. Cement-lime plaster

CEILING AND FLOORS

▷ Thermal insulation of the slab and floor on the ground

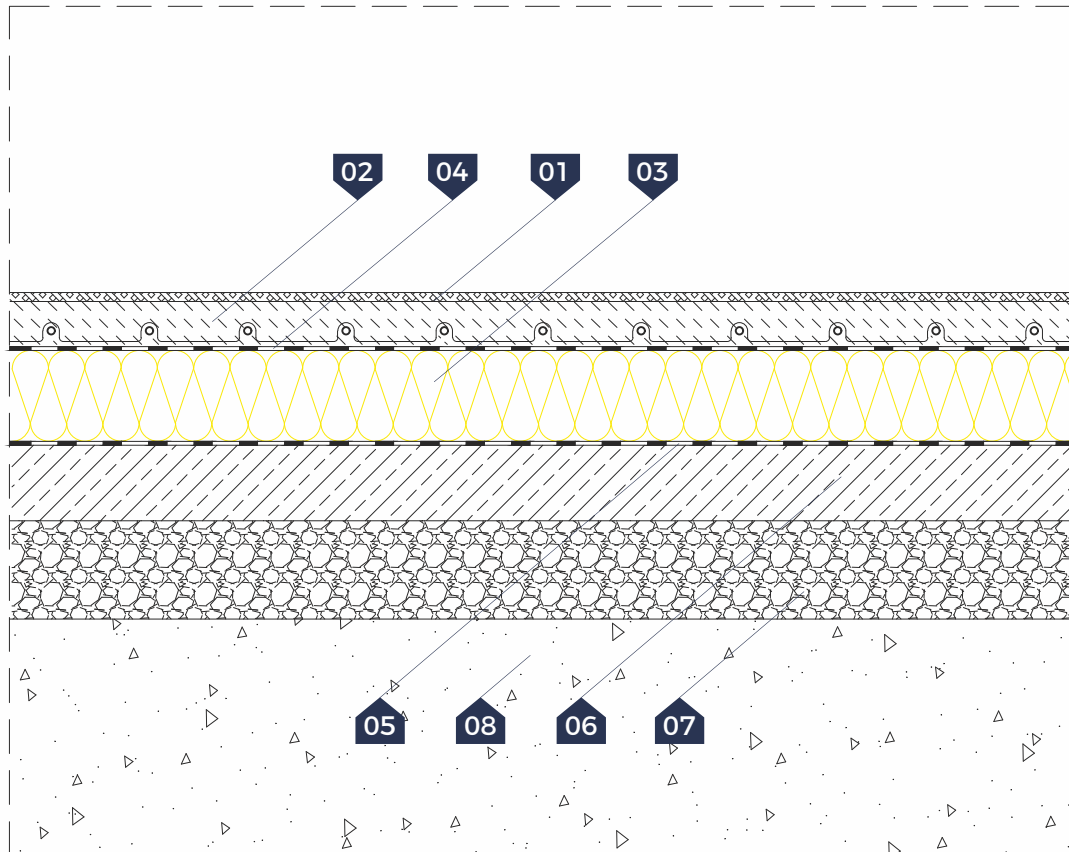


▷ KEY:

- 01. Flooring - finishing layer
- 02. Concrete screed
- 03. Floor thermal insulation - termPIR® WS/AL/PK board thickness of 100 mm
- 04. PE foil or hydro-insulation
- 05. Concrete slab
- 06. Gravel bed (or lean concrete)
- 07. Native ground

CEILINGS AND FLOORS

▷ Thermal insulation of the slab and heated floor on the ground



▷ KEY:

- 01. Flooring - finishing layer
- 02. Concrete screed (or screed) - heating layer
- 03. Floor thermal insulation - termPIR® AL board thickness of 100 mm
- 04. Foil - aluminium screen (option)
- 05. PE foil or hydro-insulation
- 06. Concrete slab reinforced with net
- 07. Gravel bed (or lean concrete)
- 08. Native ground

Order form of termPIR[®] INSULATION BOARDS



▷ **Order**
no _____ of _____

▷ **Supplier:** (name, company address, phone/fax, TIN)

Gór-Stal sp. z o.o.

No. 11 Przemysłowa st.
38-300 Gorlice
Tel./Fax: + 48 18 353 98 00
Account No: 79 1140 1081 0000 5859 5500 1001

▷ **Agent:**

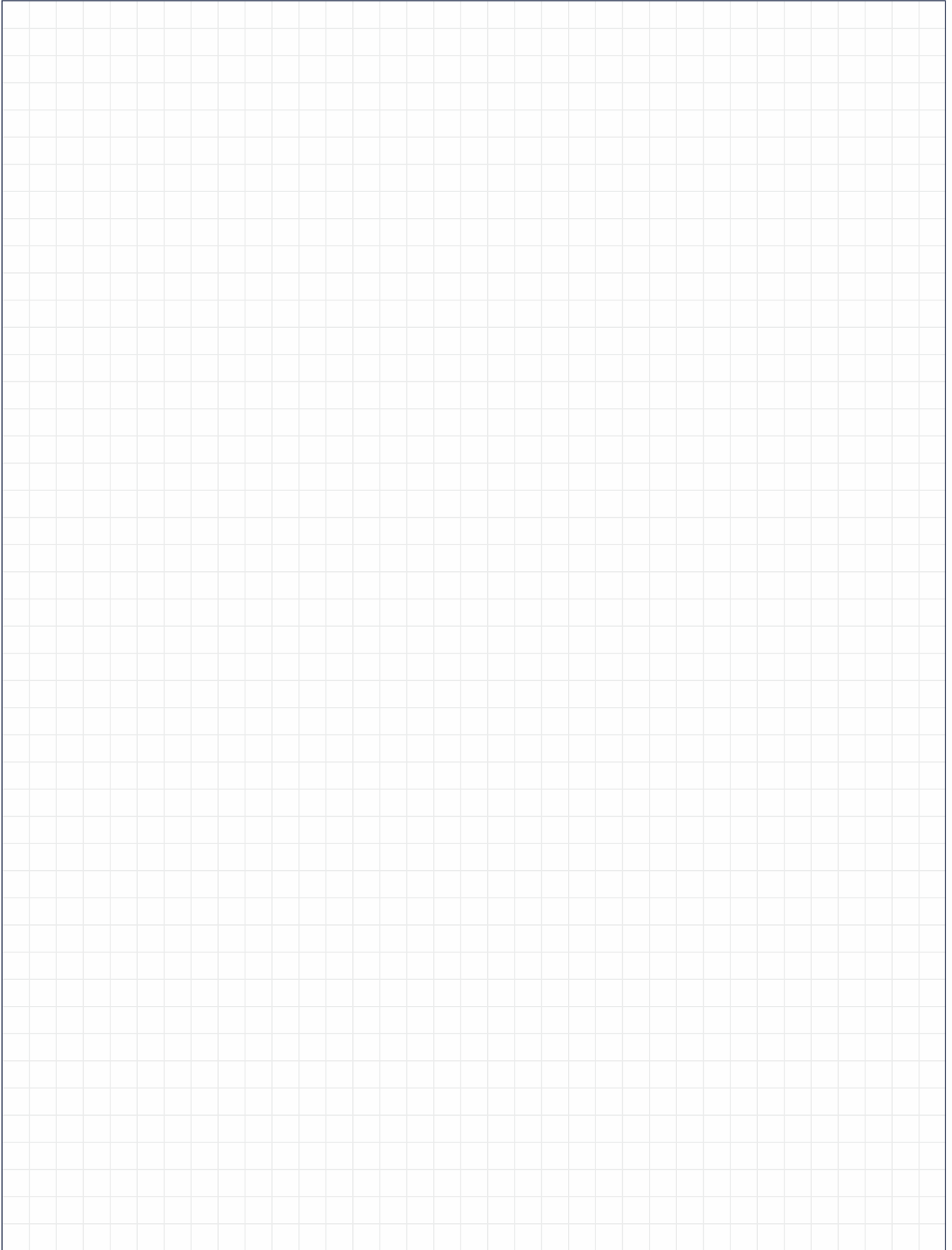
Commercial Terms	
Payment method:	
Advance (%): _____	payable until: _____
Maturity:	
Credit limit:	
Remarks:	

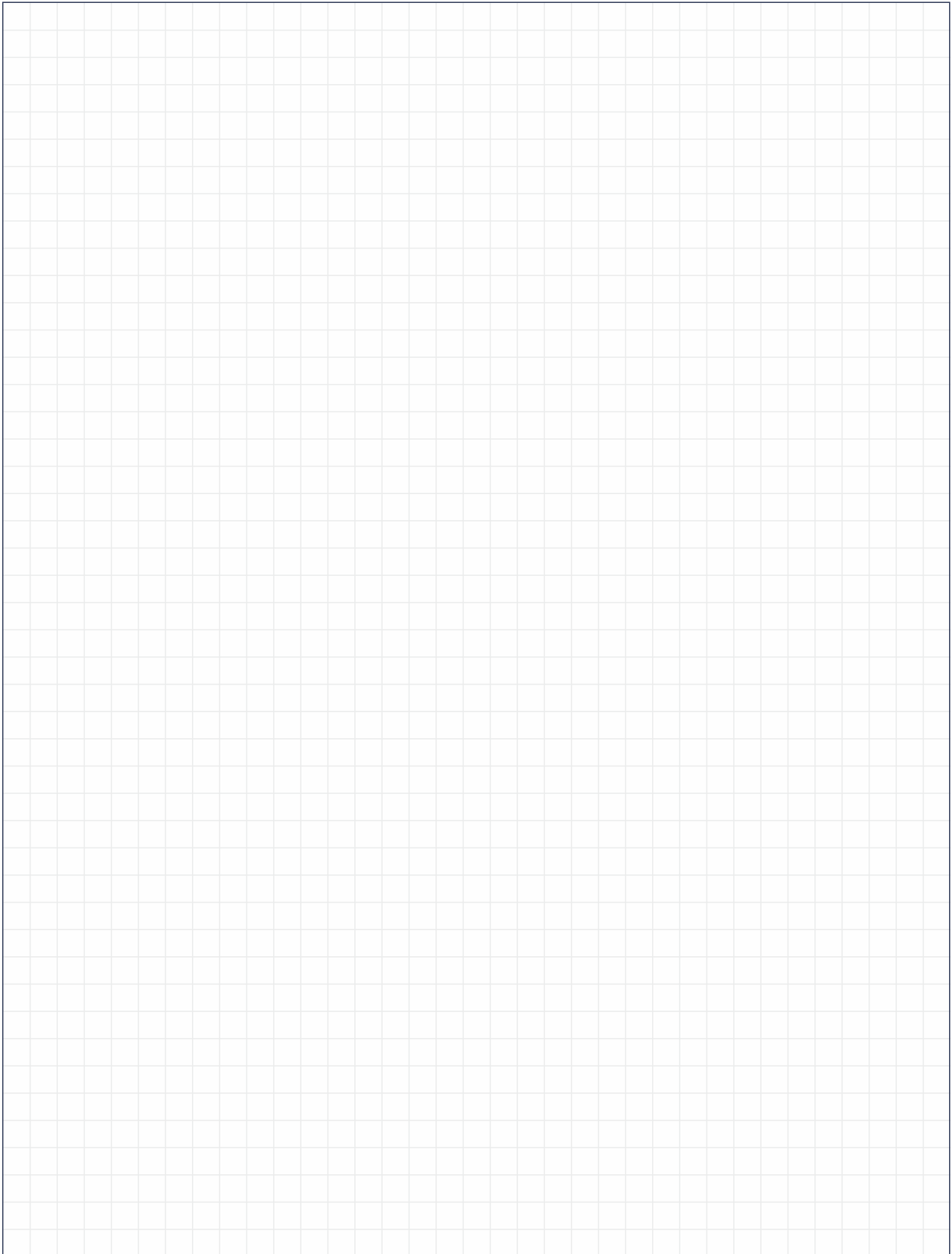
Buyer: (name, company address, phone/fax, TIN)

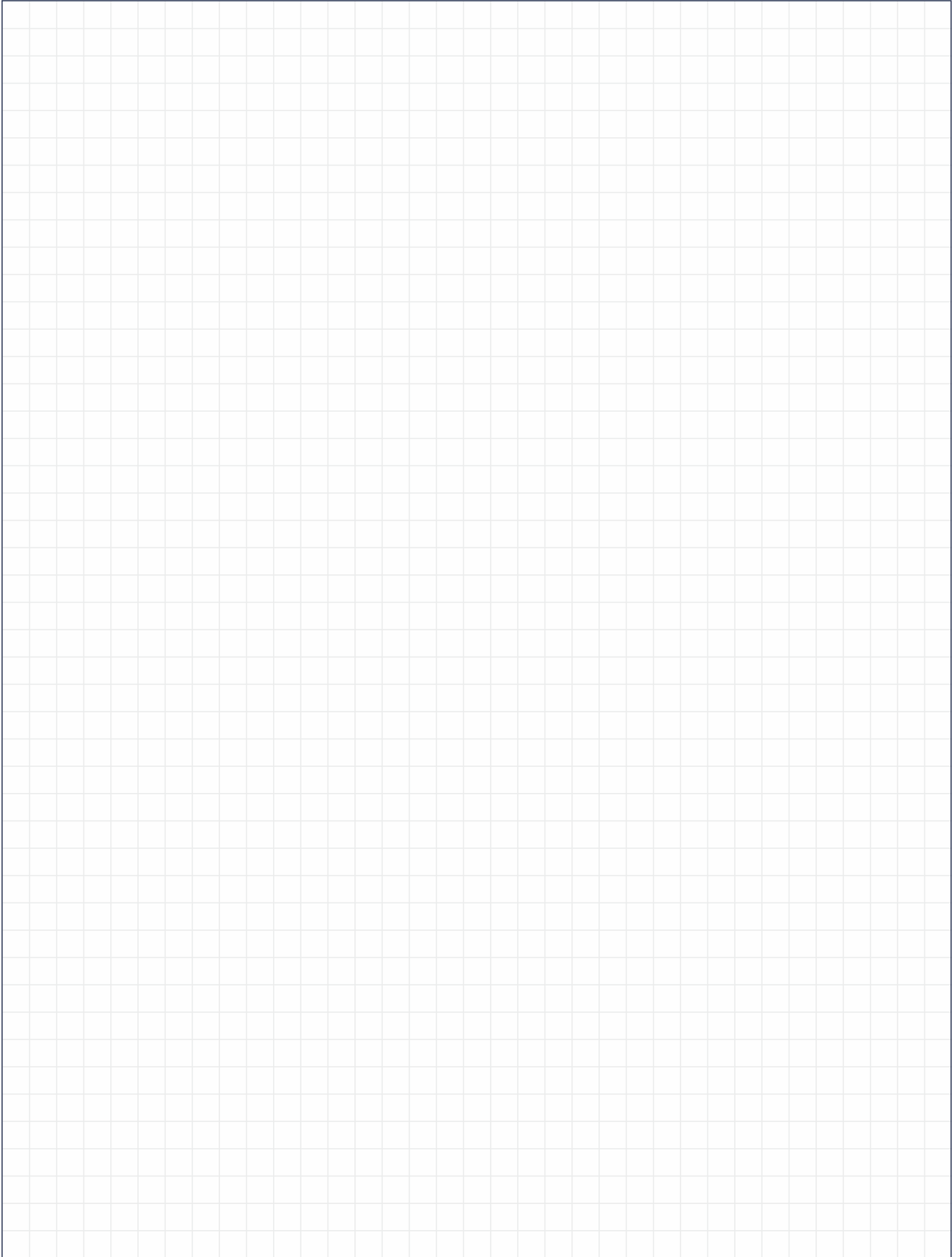
Agent
Remarks:

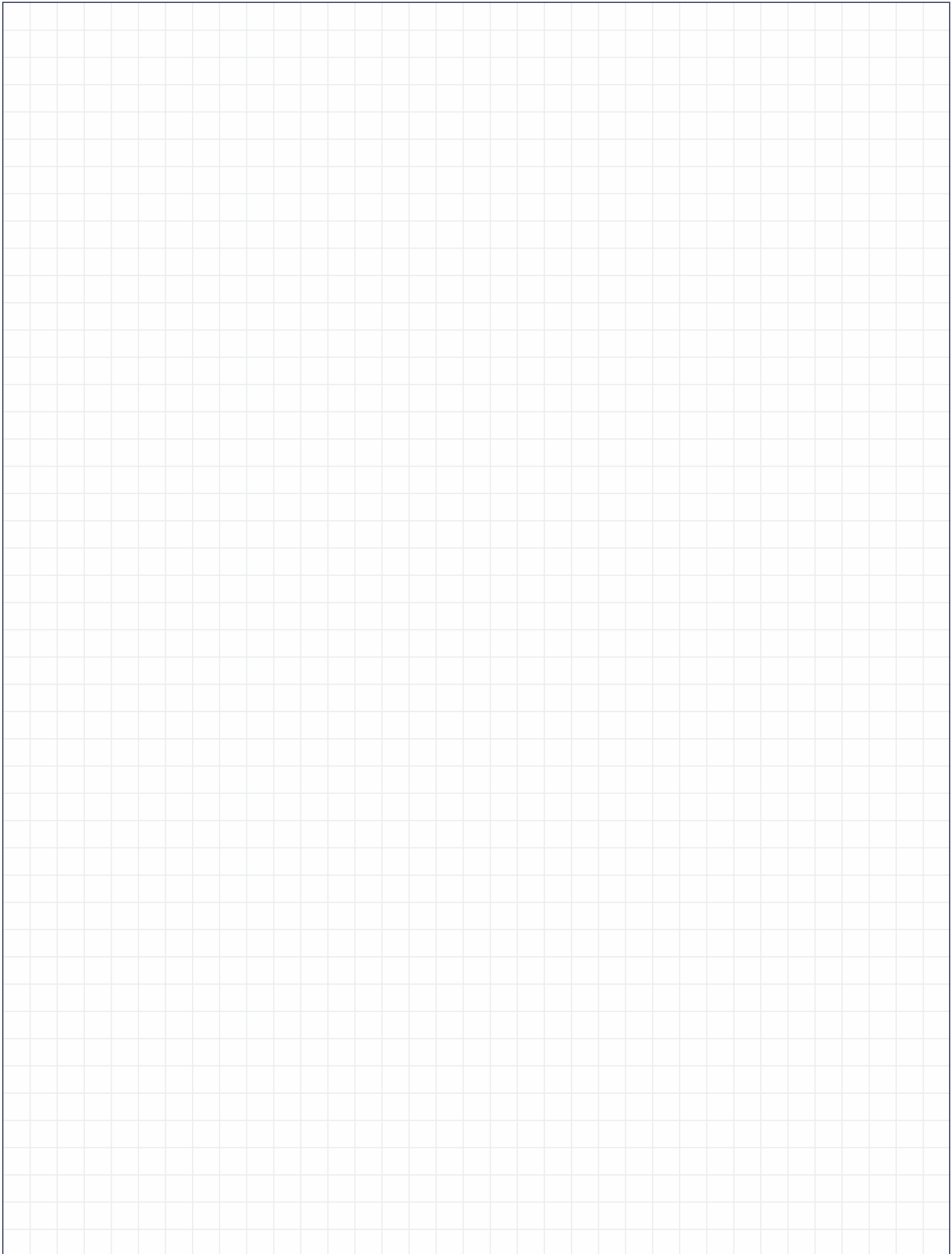
Delivery place: (recipient, address, city, post code, phone/fax)

L.P.	Boards type: termPIR [®] AL termPIR [®] AGRO AL termPIR [®] AGRO P termPIR [®] WS termPIR [®] WS GK termPIR [®] AL GK termPIR [®] BT termPIR [®] BWS termPIR [®] ETX termPIR [®] PK	Boards thickness [mm]: 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250	Quantity		Net price: Unit/value	
			dimensions [cm]	pcs.	EUR/m ²	EUR
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
In total:			[m²]:	[EUR]:		
Party's Signature Ordering:						









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The study should be treated as guidelines of the manufacturer concerning the correct application of the products manufactured by the Gór-Stal Company.

The document does not substitute technical and construction know-how and cannot constitute the basis to file any claims against Gór-Stal.

Update: 02.10.2019 r.



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