

FATRAFOL-HP waterproofing system

CONSTRUCTION AND TECHNOLOGICAL INSTRUCTIONS

for installation of injectable single-ply compartment system produced by Fatra, a.s.
Napajedla.

Waterproofing system is intended to protect below ground structures against water,
certain liquids and radon.

PN 5420/2015

FATRAFOL-HP

Name: Construction and technological instructions for the application of single-ply compartment system produced by Fatra a.s. Napajedla. System is intended to protect below ground structures against water, certain liquids and radon.

Prepared by: Studio of waterproofing services

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INTRODUCTION

The FATRAFOL-HP waterproofing system is defined using the following specified waterproofing membranes, additional and auxiliary materials, design principles and technological procedures. The construction and technological instructions (hereinafter only the CTI) establishes the principles for the design and for installation of injectable single-ply compartment system using FATRAFOL PVC-P membranes.

This instructions is part of the FATRAFOL-HP system and presents a summary of theoretical and practical experience and knowledge of existing verification, design, installation and use of injectable single-ply compartment system using waterproofing membranes produced by Fatra, a.s., Napajedla. All product requirements mentioned herein are fully justified, all recommended design solutions and methods of operation are prepared in full compliance with relevant technical standards. The FATRAFOL-HP CTI is based on the valid FATRAFOL-H CTI, it follows it conceptually and, wherever it is useful, it also refers to it.

Any changes motivated by economic, production or operational interests may only be made after a prior verification and approval by the CTI's author. The author accepts no responsibility for the design and implementation of waterproofing structure that is inconsistent with this CTI.

The information contained in this CTI is subject to special training of technicians and applicators, designers, etc., organized by Fatra, a.s., Napajedla.

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1. APPLICATION AND CHARACTERISTICS OF THE FATRAFOL-HP SYSTEM

1.1 Scope of application

The single-ply compartment system **FATRAFOL-HP** is intended to protect below ground structures against water, certain liquids and radon. Like the FATRAFOL-HD waterproofing system, it is used mainly for the structures exposed to water causing pressure and structures with high demands on reliability of waterproofing measures. Typically, these are structures of operationally used underground spaces. Typically buildings, where underground spaces are used for technologies as a server room and similar.

The system is designed to create waterproofing barriers for all types of buildings and certain types of civil engineering works. It is suitable for almost all types of environments with different kind of corrosion stress and temperatures in the minimum range from -20°C to +40°C.

1.2 Characteristic utility properties of the FATRAFOL-HP system

- waterproofing barrier consists of one layer of the PVC-P membrane of min. thickness of 1.5mm
- waterproofing membrane is divided by external waterstop bars into smaller, separate sectors
- a drainage layer is installed between PVC-P membrane and basement structure (reinforced concrete slab /wall) and is connected to the interior of the building via injection pipe system
- possibility to repair waterproofing barrier in case of leak by injection of special liquids into a drainage layer, i.e. a significant reduction in costs and time of repairs
- all joints of the waterproofing membrane are made by welds of high strength, water tightness and gas tightness
- recommended double-track welds of the waterproofing membrane allow overpressure test
- mechanical resistance to building structure movements and deformations without losing its functionality
- high load resistance and permanent compressive strength
- resistance to aggressive groundwater and leach from building materials
- effective anti-radon barrier
- possibility to install waterproofing barrier all year round, except for rain and snowfall, the membrane can be applied even on a wet substrate
- high functional reliability

2. Materials of the FATRAFOL-HP waterproofing system

Division of materials of the **FATRAFOL-HP** waterproofing system is the same as with the **FATRAFOL-H**. According to the function in the waterproofing construction, the materials are divided into:

- waterproofing membranes
- additional waterproofing materials
- auxiliary materials

Specific materials mentioned in the following text are for the given purposes directly produced by Fatra, a.s. or selected and verified from the production of other producers. When applying the **FATRAFOL-HP** system, specified waterproofing membranes and provided specific materials need to be considered interchangeable, their eventual substitution is possible with the prior assessment and written consent of the author of this CTI.

2.1 Waterproofing membranes

Waterproofing membranes are core material for creating single-ply waterproofing barrier. All detailed information on the membranes production, chemical resistance, strength characteristics, packaging, transportation, storage, labelling and safety regulations is contained in the valid master **FATRAFOL-H** CTI. PVC-P membranes with a yellow signal layer, such as **FATRAFOL 803/VS**, **803/VST** or **813/VS** are prioritized in **FATRAFOL-HP** system, especially when pressurized water is present.

2.1.1 **FATRAFOL 803/VS, 803/V, 803** waterproofing membranes

■ PRODUCT DESCRIPTION

FATRAFOL 803/VS, **803/V** and **803** are unreinforced membranes based on plasticized polyvinyl chloride (PVC-P), T type according to ČSN EN 13967:2005/A1:2007.

FATRAFOL 803/VS and **FATRAFOL 803/V** are produced by multiple extrusion. **FATRAFOL 803** is produced by rolling and laminating.



■ USE IN THE **FATRAFOL-HP** SYSTEM

- for waterproofing of structures against aggressive, pressure and seeping water
- to create a radon barrier

■ APPLICATION

Installation of membranes may only be performed by companies trained for this purpose.

Membranes are applied in accordance with the principles determined and described in this and other valid CTI.

Membranes can be mutually jointed by hot air or hot wedge welding. Membranes must be installed and jointed at ambient temperatures above -5°C.

■ PRODUCT INFORMATION

Table 1: Dimensions and basic information on packaging of FATRAFOL 803/VS, 803/V and 803 membranes

Thickness [mm]	Width [mm]	Areal weight *) [kg/m ²]	Roll length		Roll weight *) [kg]	Quantity per pallet		Palette weight *) [kg]
			[m]	[m ²]		Rolls	[m ²]	
FATRAFOL 803/VS								
1,50	2000	1,97	20	40	79	21	840	1660
2,00	2000	2,62	15	30	79	21	630	1650
FATRAFOL 803/V								
1,50	2000	1,97	15	30	60	21	630	1250
1,50	2000	1,97	20	40	79	21	840	1660
1,50	2000	1,97	25	50	99	21	1050	2140
2,00	2000	2,62	15	30	79	21	630	1650
FATRAFOL 803								
1,50	1300	1,97	20	26	52	19	494	980
2,00	1200	2,62	15	18	48	19	342	990

*) indicative values

■ Appearance and colour

- smooth membrane with a matte finish
- FATRAFOL 803/VS top side – yellow (signal layer)
lower side – black
100mm from the edge the membrane is marked with a printing with identification details
- FATRAFOL 803/V, 803 top side – standard colour – brown RAL 8025 *)
lower side – standard colour – brown RAL 8025 *)
100mm from the edge the membrane is marked with a printing with identification details

*) according to the RAL colour table, the shade may differ with some colours, up to the 3rd degree of the grey scale according to ČSN EN 20105-A02

Table 2: Technical parameters of FATRAFOL 803/VS, 803/V and 803 membranes – guaranteed values

Property	Testing standard	Guaranteed value for each product thickness	
		1,50mm	2,00mm
Water tightness	EN 1928/B	compliant	
Resistance to static load	EN 12730/B	bears 20kg	
Tensile strength	EN 12311-2	1050N/50mm	1400N/50mm
Tensibility	A method	≥ 250%	
Impact of artificial ageing on waterproofness	EN 1296, EN 1928	compliant	
Impact of chemicals on the waterproofness (Ca(OH) ₂ , 10% NaCl)	EN 1847, EN 1928	compliant	
Resistance to shock	EN 12691/A	compliant 1750mm	
	EN 12691/B	compliant 2000 mm	
Tear resistance	EN 12310-1	400N	600N
Reaction to fire	EN 13501-1	E class	
Bond strength	EN 12317-2	840N/50mm	1120N/50mm
Water vapour permeability – diffusion resistance factor μ	EN 1931	25000 ± 7000	
Straightness	EN 1848-2	compliant	

■ RELATED TECHNICAL DOCUMENTATION

- TL 5-1004-06 Technical data sheet, FATRAFOL 803 waterproofing membrane, issued by Fatra, a.s., Napajedla
- Production control system certificate No.1390-CPD-0022/06/Z issued by CSI, a. s., Prague, Zlín workplace for STAFOOL 914, EKOPLAST 806, AQUAPLAST 805, FATRAFOL 803 waterproofing membranes according to ČSN EN 13967:2005
- Production control system certificate No.1390-CPD-0546/08/Z, issued by CSI, a. s., Prague, Zlín workplace for FATRAFOL 803/V waterproofing membranes according to ČSN EN 13967:2005
- Measurement protocols – radon diffusion coefficient of FATRAFOL 803 and 803/V waterproofing membranes

Validity of documentation:

For the application of the membrane in a particular project, it is necessary to use the current applicable product documentation (Technical data sheet, Declaration of performance, Verifications, Certificates, etc.), which are available at the website www.fatrafol.cz.

SAP number: 31109781 – FATRAFOL 803/VS thickness 1.50mm

SAP number: 31109780 – FATRAFOL 803/VS thickness 2.00mm

SAP number: 31106303 – FATRAFOL 803/V thickness 1.50mm

SAP number: 31106304 – FATRAFOL 803/V thickness 2.00mm

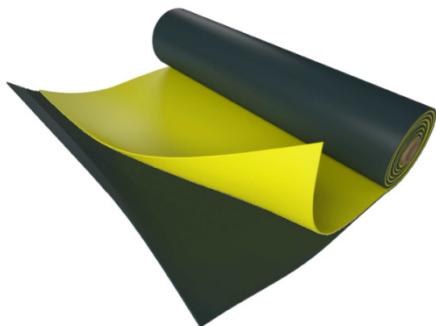
SAP number: 31102239 – FATRAFOL 803 thickness 1.50mm

SAP number: 31102230 – FATRAFOL 803 thickness 2.00mm

2.1.2 FATRAFOL 803/VST waterproofing membrane

■ PRODUCT DESCRIPTION

FATRAFOL 803/VST is unreinforced membrane based on plasticized polyvinyl chloride (PVC-P), produced by multiple extrusion. FATRAFOL 803/VST matches specification of ČSN EN 13491.



■ USE IN THE FATRAFOL-HP SYSTEM

- for waterproofing of structures against aggressive, pressure and seeping water
- to create a radon barrier
- for waterproofing of underground structures, which are parts of tunnels

■ APPLICATION

Installation of membranes may only be performed by companies trained for this purpose.

Membranes are applied in accordance with the principles determined and described in this and other valid CTIs.

Membranes can be mutually jointed by hot air or hot wedge welding. Membranes must be installed and jointed at ambient temperatures above -5°C.

■ PRODUCT INFORMATION

Table 3: Dimensions and basic information on packaging of FATRAFOL 803/VST

Thickness [mm]	Width [mm]	Areal weight *) [kg/m ²]	Roll lenght		Roll weight *) [kg]	Quantity per pallet		Palette weight *) [kg]
			[m]	[m ²]		Roll	[m ²]	
FATRAFOL 803/VST								
1,50	2000	1,97	20	40	79	21	840	1660
2,00	2000	2,62	15	30	79	21	630	1650

*) indicative values

■ Appearance and Colour

- smooth membrane with a matte finish
- FATRAFOL 803/VST top side – yellow (signal layer)
lower side – black
100mm from the edge the membrane is marked with a printing with identification details

* according to the RAL colour table, the shade may differ with some colours, up to the 3rd degree of the grey scale according to ČSN EN 20105-A02

■ RELATED TECHNICAL DOCUMENTATION

- TL 5-1033-16 Technical data sheet, FATRAFOL 803/VST waterproofing membrane, issued by Fatra, a.s., Napajedla
- TL 5-1035-16 Technical data sheet, FATRAFOL 803/VST waterproofing membrane, issued by Fatra, a.s., Napajedla

Validity of documentation:

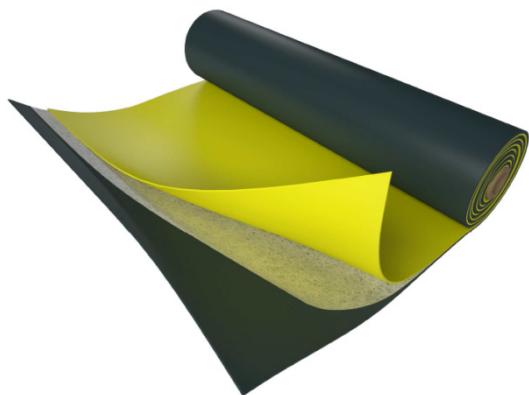
For the application of the membrane in a particular project, it is necessary to use the current applicable product documentation (Technical data sheet, Declaration of performance, Verifications, Certificates, etc.), which are available at the website www.fatrafol.cz.

2.1.3 FATRAFOL 813/VS waterproofing membrane

■ PRODUCT DESCRIPTION

FATRAFOL 813/VS is a waterproofing membrane on the basis of plasticized polyvinylchloride with built-in glass fleece, T type according to ČSN EN 13967:2005/A1:2007. The membrane is produced by multiple extrusion. It is provided with a signal top layer of yellow colour.

FATRAFOL 813/VS is also at higher temperatures dimensionally stable, has high strength and good chemical resistance to water polluted by oil. The signal layer allows easy detection of mechanical damage.



■ USE IN THE FATRAFOL-HP SYSTEM

For tight insulation of ground and underground structures against aggressive, pressure and seeping water. The membrane is particularly suitable for applications in extreme climatic conditions with high temperatures of surrounding air and for working on long vertical surfaces on which it is not sagged.

The membrane can be used in the environment which can be contaminated by oil substances, such as mineral oils and diesel fuel.

■ APPLICATION

The membrane is applied in accordance with the principles set out and described in this instructions.

Membranes can be joined by hot air or hot wedge welding. Laying and joining can be performed already at temperatures above -5°C.

■ PRODUCT INFORMATION

Table 4: Dimensions and basic information on packaging of the FATRAFOL 813/VS membrane

Thickness [mm]	Width [mm]	Areal weight *) [kg/m ²]	Winding on the coil		Coil weight *) [kg]	Quantity per pallet		Palette weight *) [kg]
			[m]	[m ²]		coil	[m ²]	
1,50	2050	1.93	20	41	80	21	861	1700
2,00	2050	2.58	15	30.75	80	21	645,75	1700

*) indicative values

■ Appearance and Colour

- smooth membrane with a matte finish
- FATRAFOL 813/VS top side – yellow (signal layer)
lower side – black
100mm from the edge the membrane is marked with a printing with identification details

Table 5: Technical parameters of the FATRAFOL 813/VS membrane – guaranteed values

Property	Testing standard	Guaranteed value for each product thickness	
		1,50mm	2,00mm
Water tightness	EN 1928/B	compliant	
Resistance to static load	EN 12730/B	bears 20kg	
Tensile strength	EN 12311-2	≥ 850N/50mm	≥ 1100N/50mm
Tensibility	A method	≥ 230 %	
Impact of artificial ageing on waterproofness	EN 1296, EN 1928	compliant	
Impact of chemicals on the waterproofness (Ca(OH) ₂ , 10% NaCl)	EN 1847, EN 1928	compliant	
Impact of chemicals on the water resistance (fuel, motor oil)	EN 1847, EN 1928	compliant	
Resistance to shock	EN 12691/A	equivalent to 1750mm	equivalent to 2000mm
	EN 12691/B	equivalent to 2000mm	
Tear resistance	EN 12310-1	≥ 450N	≥ 600 N
Reaction to fire	EN 13501-1	E class	
Bond strength	EN 12317-2	≥ 770 N/50mm	≥ 1000N/50mm
Water vapour permeability – diffusion resistance factor μ	EN 1931	25000 ± 7000	
Straightness	EN 1848-2	compliant	

■ RELATED TECHNICAL DOCUMENTATION

- TL 5-1020-10 Technical data sheet, FATRAFOL 813/VS waterproofing membrane, issued by Fatra, a.s., Napajedla

- Production control system certificate No. 1390-CPD-0068/10/Z for FATRAFOL 813/V and FATRAFOL 813/VS waterproofing membranes according to ČSN EN 13967:2005/A1:2007 and ČSN EN 14909:2006, issued by CSI, a. s., Prague, Zlín workplace
- Measurement protocol – radon diffusion coefficient of the FATRAFOL 813/VS membrane

Validity of documentation:

For the application of the membrane in a particular project, it is necessary to use the current applicable product documentation (Technical data sheet, Declaration of performance, Verifications, Certificates, etc.), which are available at the website www.fatrafol.cz.

SAP number: 31102307 – FATRAFOL 813/VS thickness 1,50mm
SAP number: 31102306 – FATRAFOL 813/VS thickness 2,00mm

2.2 Additional waterproofing and auxiliary materials

Additional waterproofing and auxiliary materials common for the FATRAFOL-H and **FATRAFOL-HP** systems are specified in detail in the valid master FATRAFOL-H CTI.

Over and above conventional materials listed in the FATRAFOL-H CTI, the **FATRAFOL-HP** system includes these supplementary and additional elements:

- PETEXDREN 900 drainage mat
- PVC external waterstop bar
- mechanical fasteners of induction welding system *isoweld* and other special fixing components
- polypropylene protective boards and tapes
- injection system

2.2.1 PETEXDREN 900 drainage mat

The mat made of the spatial structure from polyethylene fibres.

Colour: black

Dimensions/weight: width: 1500mm
 thickness at pressure of 0,2MPa: 3mm
 areal weight: 900g.m⁻²

Packaging: rolls with a diameter of ca. 500mm, length 35m

Application: to create a drainage layer between the PVC-P FATRAFOL membrane and load bearing basement structure

SAP number: 32100508



2.2.2 PVC external waterstop bar

PVC waterstop bar with 4 ribs or 6 ribs.

Colour: transparent

Dimensions/weight: width and number of ribs: 250mm, 4 ribs
 320 mm, 4 ribs
 600mm, 6 ribs

Packaging: 25m rolls

Application: for the creation of horizontal and vertical sectors

SAP number: 32102643 – width 250mm, 4 ribs

SAP number: 32102644 – width 320 mm, 4 ribs

SAP number: 32102645 – width 600mm, 6 ribs



2.2.3 Fasteners, special fixing components

2.2.3.1 FI-P-6,8-PVC steel plates of the *isoweld* system

The steel plates with a diameter of 80mm enabling induction welding of PVC-P membranes via the *isoweld* system.



Colour: steel plates has a special thin layer of the pink-purple colour substance

Dimensions/weight: external diameter: 80mm
diameter of the hole: 6.8mm

Packaging: 200 pieces per box

Application: for fixation of the FATRAFOL waterproofing membrane on vertical surfaces

SAP number: 32101906

2.2.3.2 Mechanical fasteners for concrete

Screws and spikes for fastening steel plates to concrete.

Dimensions/weight: SPIKE twister DT (SFS intec): 4.8x32 mm
TI-T25 6,3 (ISO-TAK): 6.3x32mm

TI-T25 6,3 (ISO-TAK): 6.3x50 mm

Packaging: SPIKES - 500 pieces per box
TI-T25-6,3 - 500 pieces per box



Application: for fastening *isoweld* plates to the concrete substrate

SAP number: 32102576 – **SPIKE twister DT 4.8x32**

SAP number: 32102539 – TI-T25 screw 6.3x32

SAP number: 32102540 – TI-T25 screw 6.3x50

2.2.3.3 HP-PVC fixing point

A special fixing point made of a circular patch from PVC-P FATRAFOL 803/VS, 803 or 803/V membrane and a pair of *isoweld* steel induction plates riveted together.

Colour: A PVC-P patch - yellow and black (upper surface yellow, bottom black) or brown both surfaces
A steel plate for induction welding of PP boards has a yellow-green colour.

Dimensions/weight: diameter: 200mm
total thickness: 12mm

Packaging: 120 pcs per box

Application: for fixing protective PP boards on vertical surfaces

SAP number: 32102661



2.2.3.4 HP Fixing plate (type 44)

A plate made of HDPE EKOTEN 915 membrane, thickness 1mm.

Colour: black

Dimensions/weight: diameter: 140mm
thickness: 1mm

Packaging: 50 pcs per bag, 12 bags per box

Application: to fix PETEXDREN 900 drainage mats to vertical surfaces. The shape of the plate allows its insertion into the HP-PVC fixing point.

SAP number: 31110800



2.2.3.5 The *isoweld* induction device

In the FATRAFOL-HP system, the *isoweld* device is needed for fixing the waterproofing membrane and protective PP boards, operating on the principle of electromagnetic induction. To work with *isoweld* induction plates, at least one piece, ideally two pieces of *isoweld* induction welding devices are needed at the construction site. Fatra, a.s. provides long-term lease against a refundable deposit in collaboration with their manufacturers. The rental conditions need to be individually arranged with business and technical representatives.

Isoweld machines are offered in versions for 230V and 110V. Required voltage must be specified before rental.

For more details see <https://www.youtube.com/watch?v=tyHxiiht178>



2.2.4 Protective PP boards

Large format technical boards made of polypropylene.



Colour:	dark
Dimensions/weight:	length: 3000mm width: 1500mm thickness: 5mm
Packaging:	boards are placed on wooden pallets and secured against sliding with straps
Application:	to form a hard protective layer of waterproofing barrier, boards are welded to HP-PVC fixing points by induction <i>isoweld</i>

SAP number: 32102497

2.2.5 ME 110 tape for taping polypropylene boards

A fully self-adhesive PmB tape (modified bitumen) made of adhesive bituminous mass applied to a HDPE carrier. Recommended for use in mild/normal outdoor temperatures. At high outside temperatures, we recommend using Polyflex 234 tape.



Colour:	black
Dimensions/weight:	length: 25m long roll width: 80mm thickness: 1mm
Package:	25m long roll, 5 rolls per box
Application:	for durable and flexible taping over joints between protective polypropylene boards, respectively, between boards and the edge of waterstop bar.

SAP number: 32102582

2.2.6 Polyflex 234 tape for taping polypropylene boards

A single-sided adhesive tape with a polyethylene carrier and synthetic rubber adhesive.



Colour:	black
Dimensions/weight:	length: 33m long roll width: 72mm thickness: 0,18mm
Package:	33m long roll, 16 roll per cardboard
Application:	for durable and flexible taping over joints between protective polypropylene boards, respectively, between boards and the edge of waterstop bar

SAP number: 32102751

2.2.7 Injection system

The injection system consists of:

- straight (side) injection ports
- injection pipes
- fittings for connecting and ending pipes



2.2.7.1 Injection port with a plug-in case - straight

A injection port is used to connect the injection pipe with a sector.

Colour: cream

Dimensions/weight: diameter 178mm
height 38mm

Package: 50 pcs per box

Application: to connect a sector with the injection pipe

SAP number: 32100408

2.2.7.2 15BPERT injection pipe

The injection pipe connects an injection port with the interior of the building.

Colour: white

Dimensions/weight: diameter 15mm

Package: in 200 or 600 m rolls

Application: to connect the injection port with injection packers or a simple connection of the injection port with the building interior



SAP number: 32101181 – 200m

SAP number: 32101174 – 600m

2.2.7.3 10BPEX-25C injection pipe

The 10BPEX-25C injection pipe connects the injection packer with the 15BPERT pipe via a direct reducing coupling.

Colour: white

Dimensions/weight: diameter 10mm

Package: 25m long rolls

Application: to connect the injection packer with the 15BPERT pipeline via reducing straight coupling

SAP number: 32102577



2.2.7.4 Fittings for connecting and ending pipes

Fittings are used to connect pipes, change direction, reduce the diameter or to end it.

Colour: white

Package: PE bag or box

Application: to connect pipes, change direction, reduce the diameter or to end it.

PEM221515W stem elbow: 10 pcs per bag, 80 pieces per box

SAP number: 32101170



PEM0315W equal elbow: 10 pcs/bag/box of 50 pieces

SAP number: 32101201



PEM 0415W direct connector: 10 pcs/bag/box of 60 pieces

SAP number: 32101180



15ESOT Shut-off valve: 5 pcs/bag/box of 40 pieces

SAP number: 32101654



PSM4615W pipe ending: 10 pcs/bag/box of 200 pieces

SAP number: 32101176



Direct reducing coupling PEM201510W: 10 pcs/bag/box of 80 pieces

SAP number: 32102578



Packer: 100 pcs/box

SAP number: 32102589



2.2.8 Other additional and auxiliary components

Other additional and auxiliary components are applied in the **FATRAFOL-HP** system and are specified in the master **FATRAFOL-H** and **FATRAFOL-S** CTIs. These include the following components:

Separation textile of 300g/m², 100% PP

SAP number: 32100504 or 32100359



Separation textile of 500 g/m², 100% PP

SAP number: 32100357 or 32100444

Separation textile of 300 g/m², combination of PA + PES

SAP number: 32100094



Separation textile of 500 g/m², combination of PA + PES

SAP number: 32100096



Triflex Prodetail 15kg (winter), including a catalyst

SAP number: 32101679



Triflex Profibre 10kg, including a catalyst

SAP number: 32101594



Cleaner Reiniger Triflex 1L (also 9L and 27L-package is available)

SAP number: 32101690



Triflex Steinklebeband 50mmx50

SAP number: 32102580



Triflex CrylPrimer 276 penetration for concrete surfaces

SAP number: 32101681



Fleece 200mm wide for Triflex Prodetail, 50m winding

SAP number: 32101684



Fleece 700 mm wide for Triflex Prodetail, 50m winding

SAP number: 32101688



FATRAPUR FC 25 PU Sealant, grey, 310ml Tube

SAP number: 32100449



PE membrane, thickness 0,2mm

SAP number: 32100569



LGA 347-5 adhesive tape

SAP number: 32102750



Internal corner

SAP number: 31100175



External corner

SAP number: 31100177



Plastic coated wall profile FATRANYL 70mm

SAP number: 32101802



3. Major construction principles

Principles of designing an injectable single-ply compartment system **FATRAFOL-HP** do not differ in essential principles from designing single-ply waterproofing barriers described in the valid FATRAFOL-H CTI. With respect to the fact that the **FATRAFOL-HP** system as well as the FATRAFOL-HD system is preferably used for structures stressed by pressure water or at structures with high demands on reliability of the waterproofing membrane, some different procedures are specified here when compared to the FATRAFOL-H system. A definition of stressing by pressure water is listed in the valid FATRAFOL-H CTI.

3.1 Substrate

Horizontal substrate of the waterproofing membrane is typically concrete. Vertical surface is in most cases reinforced concrete basement wall, leveled Milan wall or leveled pile wall.

The substrate must be bearing, solid and stable, free of cavities and sharp breaks and sharp sticking objects capable to damage waterproofing. Rounding of base structures in the corners is not recommended.

Subconcrete should be made in a minimum thickness of 100mm with steel or dispersed reinforcement, solid enough and with a surface quality corresponding to specified requirements.

Unless horizontal waterproofing membrane is mechanically fastened to the substrate, it can be laid on the uncured concrete (1-3 days from concreting). The substrate may not be completely dry, but there must not be any puddles of water, snow, ice and frost.

We do not recommend leveled and compacted soil as a horizontal substrate for the **FATRAFOL-HP** waterproofing system.

In particular, at hydro-physical stressing by pressure water, it is advisable to design objects without expansion joints, if possible. If expansion joints are needed, we recommend to design only simple straight shapes without bends and always away of corners. Dilation in the waterproofing membrane and substrate needs to be performed if the buildings are divided by expansion joints.

For pipe and similar objects, penetrating waterproofing barrier, steel fixed and loose flange system components must be used. In the horizontal substrate, protective sleeves as well as penetrating piping need to be installed prior to laying waterproofing barrier. In the vertical substrate only protective sleeves need to be installed before the waterproofing barrier is laid. Piping can be installed additionally. Materials penetrating structures should meet at least the same requirements for durability and reliability as a waterproof construction, particularly, with regard to the durability of the structure or on the prescribed renewal cycles.

Fixed flange of protective sleeve should not extend above the surface of the adjacent substructure. Waterproofing penetrations should be perpendicular to the plane of waterproofing and at least 250mm away from the edges and corners of the substructure and also among themselves.

Already in the design phase, it is necessary to design an appropriate substructure that will prevent or limit penetration of steel reinforcement through waterproofing barrier. Piles penetrations through the horizontal waterproofing, can be sealed with Triflex liquid waterproofing system, system of fixed and loose steel flange or according to specifications of a particular project documentation.

If the substructure lies beneath the level of underground water, this level needs to be lowered by pumping wells at least 500mm below the lowest point of horizontal waterproofing barrier until underground structure is structurally stable.

3.2 Typical waterproofing assembly

Unlike conventional single-layer waterproofing, in **FATRAFOL-HP** waterproofing system the membrane is divided into smaller sectors by waterstop bars. PETEXDREN 900 drainage mat, installed between waterstop bars enables easy injection of special liquids in case of leaks.

A typical horizontal assembly of **FATRAFOL-HP** system ([101HP Detail](#)) is as follows. The description is provided from the interior to the exterior.

- foundation slab
- protective concrete screed of thickness min. 50mm or cement screed of thickness min. 30mm. In cases where the injection pipes are installed on a horizontal waterproofing membrane surface, the recommended minimum thickness of concrete screed is about 60-70mm (concrete screed should effectively cover the entire horizontal injection system). The concrete screed must not cover the waterstop bar, i.e. that the ribs of the waterstop bars must be built into the foundation slab ([202HP Detail](#)).
- PE membrane of thickness of about 0,2mm
- drainage layer of the PETEXDREN 900 mat
- waterproofing layer of PVC-P FATRAFOL 803/VS, 803/VST or 813/VS membrane, thickness of min. 1,50mm – the membrane must be oriented yellow signal layer upward (into the structure)
- separation non-woven textile of 100% unorganic material of min. 300g.m⁻². In the case of rough surface, it is recommended to use textile with an areal weight of 500g.m⁻²
- horizontal substrate – see Par. 3.1.
- terrain / compacted gravel

The typical vertical assembly installed from inside ([102HP Detail](#)) is as follows. The description is provided from the exterior to the interior.

- terrain
- vertical substructure – see Par. 3.1.
- separation non-woven textile of 100% unorganic material of min. 300g.m⁻². In the case of rough surface, it is recommended to use textile with an areal weight of 500g.m⁻²
- waterproofing layer of PVC-P FATRAFOL 803/VS, 803/VST or 813/VS membrane, thickness of min. 1,50mm – the membrane needs to be applied towards the signal layer inside the building
- drainage layer of the PETEXDREN 900 mat
- protective polypropylene board of thickness of 5 mm
- load bearing basement wall

It is always recommended to install the vertical barrier from the inside.

The typical vertical composition of waterproofing barrier installed from outside (from the trench) connected by counter joints to horizontal part ([103HP Detail](#)) is as follows. The description is provided from the exterior to the interior.

- terrain
- compacted trench backfill
- protective polypropylene board of thickness of 5mm
- waterproofing layer of PVC-P FATRAFOL 803/VS, 803/VST or 813/VS membrane, thickness of min. 1,50 mm – the membrane needs to be applied towards a signal layer out of the structure, i.e. into the trench
- drainage layer of the PETEXDREN 900 mat
- load bearing basement wall – see Par. 3.1.

In the **FATRAFOL-HP** system the thickness of waterproofing membranes of 1,5mm is the minimum, meeting the requirements for stressing by pressure water.

In the cases where an increased mechanical stress of the waterproofing membrane is assumed, the thickness of the waterproofing membrane of 2,0mm is recommended.

3.3 Reinforcement of corners and edges

In the **FATRAFOL-HP** system, the waterproofing layer is reinforced in all horizontal and vertical corners and edges by the FATRAFOL 803/V, 803, 803/VS, 803/VST or 813/VS membrane stripe. Using the FATRAFOL 803/V or 803 membrane of a brown colour is preferred for the clear identification of conducted reinforcing. The stripe is hot air welded along the perimeters by a weld with the width of min. 30mm.

At the intersection of three planes, the waterproofing membrane is reinforced by fully welded internal and external corners (pre-shaped pieces) ([501HP Detail](#)). In case the pre-shaped pieces cannot be installed, use a patch of required shape and dimension made of FATRAFOL 803/V, 803 or 803/VS, 803/VST of the same thickness as the main waterproofing layer.

3.4 Fastening of separation, waterproofing, drainage and protective layers

Waterproofing membrane is either possible to fasten with flashing components FATRANYL or by *isoweld* induction system. The location of plates follows two basic rules:

- a) plates must be placed close, optimally, over the places where HP-PVC fixing points will be welded in the next step ([818HP Detail](#))
- b) plates must always be located away from the future joint of waterproofing membranes

Important warning: When using FATRANYL flashing components, leave the membrane edges unwelded at least 150-200 mm along the perimeter. Fully welded membrane to the FATRANYL components makes double-track welds impossible.

For fixation the protective polypropylene boards, HP-PVC fixing points are used. It is a round shaped patch of FATRAFOL 803/VS or 803/V membrane with the thickness of 1,5mm, to which a pair of mutually riveted isoweld plates are welded. To select the position of the HP-PVC fixing point, the following rules apply.

- a) The HP-PVC fixing point should be ideally located just below or directly at the place where the waterproofing membrane is fastened to the substrate.
- b) The fixing point is placed at the corners and approximately in the middle of subsequently installed protective polypropylene boards. Five pieces of HP-PVC fixing points are needed for one board with the dimension 3,0 x1,5m, which results in the fastening density 1,1 pcs/m². The typical location and spacing of fixing points is shown in ([818HP Detail](#)).

3.5 Division into sectors

Division of the whole waterproofing membrane into smaller, mutually separated and independent sectors is an essential feature of the **FATRAFOL-HP** waterproofing system. In the **FATRAFOL-HP** system vacuum testing of the whole sector is not possible as in the **FATRAFOL-HD** system, however, the division into sectors allows relatively easy location and repair of leaks.

The size of sectors is generally chosen with regard to the geometry of the insulated structure and placement options of PVC external waterstop bars. Selecting the sector size is dependent on the desired waterproofing safety. Creation of larger sectors result in more complicated localisation of a failure and more expensive repair. The usual size of horizontal sectors is up to ca. 250m² with a mainly rectangular or square shape. On vertical surfaces, in general, square or longer, noticeably rectangular sectors are made, not exceeding the area of about 150m². ([301HP Detail – 304HP Detail](#)).

The dimensions of sectors are in fact independent of the width of the membrane. Individual sectors are usually formed along dilation, lift shafts, piles or groups of piles etc..

3.6 Penetrating objects

In the **FATRAFOL-HP** waterproofing system penetrating object are sealed by protective sleeves which consists of steel fixed and loose flange ([401HP Detail](#), [402HP Detail](#), [403HP Detail](#)). Sleeves and flanges are usually made of stainless or carbon steel coated with at least 80µ hot-dip galvanizing. Minimum thickness of both the fixed and loose flange for the purposes of waterproofing against pressure water is 10mm and the usual width is 120mm. If the loose flange is assembled from parts, a gap between them must not exceed 2mm.

The membrane pressed between the fixed and loose flange, is reinforced by an additional patch of FATRAFOL 803/V, 803, 803/VST, 803/VS membrane. Apply PU or MS polymer sealant on contact surfaces of both fixed and loose flange.

In the exceptional cases, e.g. at spatially complicated details or details that are difficult to access and, in particular, in the penetration of a pile through horizontal waterproofing, where it is usually not possible to use a clamp joint, Triflex Prodetail and Profibre can be used ([404HP Detail](#) and [405HP Detail](#)).

Other than the solutions provided above are not allowed in the **FATRAFOL-HP** system.



3.7 Expansion joints

In the transition of the waterproofing membrane over the structural expansion joint filled with a flexible sealing strip, no major modification of the waterproofing membrane usually needs to be made. A danger of membrane puncture by the

movements of the structure is excluded by its elongation together with a loosely laid installation. The waterproofing membrane along the expansion joints is only reinforced with an additional membrane stripe of the same thickness with a width of at least 400mm. The membrane stripe is installed in the axis of expansion and hot air welded along the perimeter with a weld of a width of min. 30mm ([601HP Detail](#)).

At expansion joints not filled with the sealing stripe with the expected movements up to 10mm, the waterproofing membrane in the place of a joint must be underlaid with a solid support (e.g. PE or PP board) with one-sided fastening. The principle of reinforcement is however identical.

If structure movement in the expansion joint exceeds 10mm and stresses the waterproofing by shear, an elastic deformation zone of EPS/XPS boards needs to be created above and below waterproofing barrier ([601HP Detail](#)).

3.8 Connecting of waterproofing barrier in stages

If vertical waterproofing membrane is executed from the inside, it is in the first stage ended above the upper edge of foundation slab ([Detail 205HP](#)). The height of membrane level must enable a problem-free connection of vertical waterproofing in the second stage, especially with respect to the steel reinforcement of the concrete structure. On the vertical surface, the waterproofing membrane is mechanically fixed against slipping. The completion of the foundation slab is followed by the assembly of vertical waterproofing ([206HP Detail](#)).

Use counter joint when installing vertical waterproofing from outside (from the trench), ([203HP Detail](#), [204HP Detail](#)).

In the first stage the horizontal waterproofing will be ended with a sufficient width (usually about 500mm) behind a future foundation slab perimeter and will be covered with soft and hard protective layers. If the protective concrete screed is reinforced with steel reinforcement (e.g. reinforcing mesh), the reinforcement must not exceed the perimeter of the foundation slab.

After the completion of the foundation slab and basement reinforced concrete wall, all the protective layers are carefully removed and the connection of the vertical waterproofing to horizontal will be made using counter joint.

3.9 Ending of the FATRAFOL-HP system on the vertical structure

Above the level of the expected groundwater table **FATRAFOL-HP** system is usually changed for a conventional single-ply system without sectors or it is attached to another water-proof construction. Single-ply waterproofing membrane thickness above the level of the expected underground water level depends on the actual hydro-physical stress.

3.10 Ending the waterproofing membrane above the terrain

For alternatives of ending the waterproofing barrier above the terrain see ([701H Detail up to 706H Detail](#)). The definition of each type of hydro-physical stress is specified in detail in the valid master **FATRAFOL-H CTI**.

3.11 Pile penetrating through the horizontal waterproofing barrier

There are several methods solving pile penetration through waterproofing membrane. Using liquid Triflex on the PMMA base is preferred solution. Along the pile perimeter, on its head and on the waterproofing membrane, Triflex Prodetail is applied, reinforced by fleece. Triflex Profibre with dispersed reinforcement is applied on steel rods. ([404HP Detail](#)). Performing this type of detail places the waterproofing material between the concrete of a pile and the concrete of the slab or column and, therefore, it should be consulted with a structural engineer.

As an alternative to solution above use crystalline admixture in the pile head zone. This will typically result in pile concrete casting in two stages – body and head. A fixed flange is inserted into fresh concrete and the waterproofing membrane is clamped between fixed and loose flange ([406HP Detail](#)).

According to the project specifications and regional conventions, other methods are also possible, for example sealing the pile penetration using epoxy resin, adding injection hoses to working joints etc. ([406HP Detail](#)).

3.12 Injection system

The injection system connects sectors with the interior of the building. The system has two basic functions.

- it indicates sector leaks
- after the completion of the building it enables injection of only leaking sector, that results in significant cost reduction of the repair

The injection system consists of a direct injection port and injection pipes with fittings for their connection, change of directions, reduction and ending. The principle of sector repair is described in Paragraph 6 ([708HP Detail](#)).

Each sector should always have at least four direct or side injection ports. For larger sectors or if it is technically justified, also the fifth port is fitted roughly in the middle of the sector ([701HP Detail](#)). Injection ports are always placed in all the corners of the sector at a distance of 500 mm from its perimeter. Injection ports are placed on the horizontal waterproofing loosely, without being connected to a drainage layer. Before casting the protective concrete screed fix the ports in position by small concrete pile created around them. When the vertical waterproofing from outside (from trench) is executed, insert the ports into the formwork. Injection pipes are connected by a system of straight or angle fittings.

There are basically two options for completion of the injection pipes:

- Bringing down all the injection pipe into one, but in practice several collection locations, where the pipes are ended in the boxes concreted into the walls ([706HP Detail](#)) or via the concreted packers ([707HP Detail](#)). In the boxes, the injection pipe is closed by a shut-off valve and it is clearly indicated, for example by an identification plate, colour or in another permanent manner.
- The completion of the injection pipe at the internal surface of the structure using the packers recessed in concrete near the injection port. The piping of horizontal or possibly vertical sectors is ended in the foundation slab/floor ([709HP Detail](#), [710HP Detail](#)). The piping of vertical sectors is also possible to be terminated with a packer in the inner surface of the wall ([704HP Detail](#)).

4. TECHNICAL PREPARATION PROCEDURE OF WATERPROOFING WORKS

4.1 Documents for preparation

The preparation of project documentation needs to be based on the following documents:

- results of the hydro-geological and radon survey
- information from the territorial plan
- type of hydro-physical stress
- specification of the corrosive environment
- information on the operation in the protected environment
- information on the designed life cycle of the building and renewal cycles
- requirements for reliability of the waterproofing
- determining the accessibility of the waterproofing layer
- requirements of state administration authorities
- requirements of insurance company
- determining the optimal build-up (assembly)

The major document is the project documentation for execution of waterproofing works, made by designer. In the cases where the project documentation is not available the installing company is responsible for the design.

4.2 Preparatory work

Following consumption of materials needs to be determined prior to beginning of waterproofing works.

- for horizontal surface
- for vertical surface
- for strengthening of corners and edges
- for fastening
- for injection system
- for ending of the waterproofing on vertical structures
- for expansion joints
- for detailing
- for protective and separating layers

As a result of preparatory work following documents should be ready before installation of waterproofing starts.

- written technological instructions
- clear specification of materials
- clear description of assemblies
- drawing / sketches of construction details
- drawings of sectors including identification, location of injection ports, packers or boxes etc.
- price calculation

5. TECHNOLOGICAL PROCEDURES

5.1 Preparation of the site and working conditions

Requirements for site preparation and working conditions are specified in the valid FATRAFOL-H CTI.

5.2 Working procedures

5.2.1 Substrate preparation

Requirements on the final quality of the substrate and its possible modifications are specified in par. 3.1.

5.2.2 Laying and joining separation textile

Laying and joining the separation textile is described in the valid FATRAFOL-H CTI in Paragraph. 5.2.2.

5.2.3 Fastening of the membrane to the surface

It is possible to use flashing elements FATRANYL to fasten the vertical waterproofing membrane, however induction fastening *isoweld* is a preferred system. The holes are to be drilled to the surface through the installed vertical separation textile or the PETEXDREN 900 drainage mat. *Isoweld* steel plates are to be fastened with a suitable concrete screw or using a spike. The waterproofing membranes in the upper part are welded by induction to the plates, subsequently, they hang freely, straighten out and weld by induction to the remaining plates. The location of the plates follows two basic rules:

- a) plates must be placed close above the location or directly at the location where in the next step HP-PVC fixing points will be welded
- b) plates must always be located outside of the future double-track weld of waterproofing membranes

5.2.4 Technology of the *isoweld* induction welding

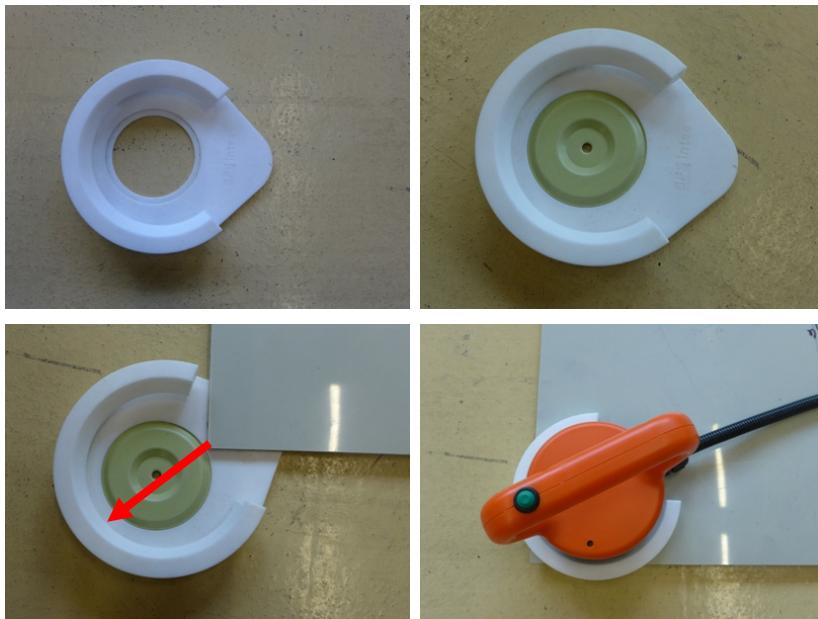
Technology of the *isoweld* induction welding of SFS intec (Switzerland) is based on the principle of microwave heating of a steel plates provided with a special layer, responsive to heat. The workflow of the induction welding of the PVC-P FATRAFOL membrane on FI-P-6,8-PVC induction plates is as follows:

- Remove the device from the shipping box, assemble and connect a manual inductor.
- Connect the device to a power source and turn it on.
- Before welding the PVC-P waterproofing membrane to the plates, use a plastic plates for calibration, place the FI-P-6,8-PVC and a blank of the PVC-P FATRAFOL membrane that will be used on the construction site in it. Place the device with one foot or via a manual inductor on a calibration plate. In the menu, select "PVC" membranes and specify the thickness of the membrane on the display. With arrows, select "CALIBRATION" in the menu and press "OK". Then calibrate the device by pressing "OK". The audio signal announces the successful calibration. Repeat calibration at every significant change of climatic conditions.
- Use the manual inductor for welding the PVC-P membrane to the plates, which needs to be placed approximately over the plate. After pressing the green button on the manual inductor seek the exact central position of the plate using acoustic navigation. Once the inductor reaches the ideal position for welding, the acoustic signal changes and the inductor begins welding automatically. Welding takes about 4 seconds and is again ended with the acoustic signal. Immediately afterwards remove the inductor and temporarily fix the membrane to the plate using a magnet, which is part of the instrumentation.
- **Before applying the manual inductor on the surface of the waterproofing membrane, always check and possibly clean the surface of any dirt, loose particles, like grains of sand and the like!**
- If the inductor does not find the plate in a set period of time, the acoustic signal indicates an error message, which will appear simultaneously on the display of the device. The device shall be in operation again by pressing the OK button.



Exactly the same workflow will be used for welding the polypropylene boards on the HP-PVC fixing points with the following differences.

- Before welding the polypropylene boards to the HP-PVC fixing points, use a plastic plate for calibration and insert the FI-P-6,8-TPO plate in it, which is part of the packaging of the HP-PVC fixing points. Insert a corner of the polypropylene board in the calibration plate. Place the device with one foot or via a manual inductor on the calibration plate.



- On the display, select from the menu “the TPO” membrane and enter the membrane thickness of “2.1 to 2.3m – **Figure No.1**. With arrow keys select from the menu “CALIBRATION”, press “OK” and calibrate the device **Figure No. 2**. The audio signal announces successful calibration – **Figure No.3**. Repeat calibration at every significant change of climatic conditions.



Figure No. 1



Figure No. 2



Figure No. 3

- For welding the polypropylene boards to the HP-PVC fixing points, use the manual inductor, which needs to be placed approximately above the fixing point. After pressing the green button on the manual inductor seek the exact central position of the fixing point using acoustic navigation. Once the inductor reaches the ideal position for welding, the acoustic signal changes and the inductor begins welding automatically. Welding takes about 4 seconds and is again ended with the acoustic signal. Immediately afterwards remove the inductor and temporarily fix using a magnet, which is part of the instrumentation.
- In the event of a repeated failure to find the HP-PVC plate within a limited period of time, press the “x2” button on the device before welding, the display shows “DOUBLE” instead of “SINGLE”. The “x2” button needs to be pressed before each welding of the fixing point.
- If the inductor does not find the HP-PVC fixing point in a set period of time, the acoustic signal indicates an error message, which will appear simultaneously on the display of the device. The device shall be in operation again by pressing the “OK” button.



5.2.5 Laying and joining waterproofing membranes, testing weld

The principles of laying and joining waterproofing membranes are described in the valid master FATRAFOL-H CTI in Paragraph 5.2.3. and 5.2.3.2. The following specifics apply to the **FATRAFOL-HP** system over and above FATRAFOL-H.

All the joints of the waterproofing membranes may be performed either with hot air or a hot wedge. Welding by another method, for example cold welding with the L-494 diluent, is not permitted in the **FATRAFOL-HP** system. The joints of the waterproofing membrane with preformed external and internal corners are performed only using hot air.

In the **FATRAFOL-HP** waterproofing system, the following types of double-track welds and welding methods are recommended:

- a double-track weld made by a hot wedge using a welding machine see par. 5.2.3.2.2, Figure No. 9, FATRAFOL-H CTI
- a double-track weld made by hot air using a welding machine see par. 5.2.3.2.1, Figure No. 7, FATRAFOL-H CTI

Where the use of a welding machine with a double-track weld is not possible, single-track welding by hot air or a wedge using a welding machine is performed. The details are performed entirely with a manual hot air welding machine. In the **FATRAFOL-HP** system, the following types of welds are possible:

- a single-track weld made by a hot wedge using a welding machine see par. 5.2.3.2.2, Figure No. 8, FATRAFOL-H CTI
- a single-track hot air weld performed by a welding machine see par. 5.2.3.2.1, Figure No. 6, FATRAFOL-H CTI
- a single-track hot air weld performed by a manual welding machine see par. 5.2.3.2.1, Figure No. 5, FATRAFOL-H CTI

Before actual welding, a testing weld in the length of about 1m is performed, in order to set the correct welding parameters depending on weather conditions. The set parameters will vary depending on the membrane thickness, air temperature, humidity, wind speed and direction, membrane exposure to solar radiation, etc. The welded stripes of two membranes are left to cool down, about 20-40mm wide stripes perpendicularly to the weld are cut from them and the construction peel test is carried out. The tests will be carried out with different settings so that at the selected setting the membrane would be torn off the weld during the peel test. The selected welding parameters will be recorded on the stored sample and in the site diary. Temperature resistance and the range of welding temperatures are described in detail in the FATRAFOL-S CTI in Paragraph. 2.1.2.

5.2.6 Reinforcement of corners and edges

Reinforcement of the waterproofing membrane in the lines of edges and corners is performed with a stripe of the FATRAFOL 803/V, 803 or 803/VS, 803/VST membrane with the width of min. 300mm. The membrane is first heated up by hot air, symmetrically positioned along the edges and corners and welded by the hot air weld of width min. 30mm.

Pre-shaped external and internal corners, or corners of the FATRAFOL 803/V, 803 or 803/VS, 803/VST made directly on the construction site are briefly warmed up with hot air, pushed in the centre to the contact point of three isolated planes and are fully welded to the membrane by hot air, pressing them with a roller.

5.2.7 HP-PVC fixing point installation

The HP-PVC fixing point is removed from the shipping container and **only on its periphery or just in spots**, it is hot air welded onto the already installed, tested and accepted vertical waterproofing membrane. For the typical position of the fixing points HP-PVC and the span between them see ([818HP Detail](#)).

5.2.8 Laying the PETEXDREN 900 drainage mat

After being removed from the shipping container, the stripes of the PETEXDREN 900 mat are unpacked and unrolled along each other. The stripes are laid among themselves with the overlap of min. 50mm, the edge-to-edge laying is also possible. They are laid on the entire surface of the sector, the edges are cut down by a knife along the blade at the place of the sector boundary, i.e. along the edge of the waterstop bar.

When performing the vertical waterproofing from the inside, the PETEXDREN 900 drainage mat is laid in stripes vertically from the top down. Cut a hole in the drainage mat with a knife where HP-PVC fixing points are located. The

hole should correspond roughly to the size of the metal part of the HP-PVC fixing point. The PETEXDREN 900 mat is fixed by inserting the HP fixing plate ([819HP Detail](#) and [820HP Detail](#)).



When performing vertical waterproofing from the outside (from the trench), the PETEXDREN 900 mat is laid directly on a vertical surface in stripes from top down. The PETEXDREN 900 mat is pressed by *isoweld* FI-P-6,8-PVC steel plate ([852HP Detail](#)). The rules for the position of plates are described in Paragraph 5.2.3.

5.2.9 Division into sectors

In the case that the vertical waterproofing will be performed from the outside (from the trench), a waterstop bar needs to be inserted in the formwork in advance. After removing the formwork flat surface of the waterstop bar will remain visible and available for welding the PVC-P FATRAFOL membrane in next step see ([850HP Detail](#)).

The installation of the external waterstop bar in the horizontal surface as well as the installation of the stripes on the vertical surface when performing waterproofing from the inside follows the same rules. The PVC waterstop bar can be installed only after a successful testing and hand over the waterproofing membrane or its part. The waterstop bar will be rolled out along the future border of the sector, straighten out and will be left for about 30 minutes to "level". The stripe will be welded by hot air to the waterproofing membrane along both sides. ([805HP Detail](#)). The end of the stripe needs to be left free for the connection of another stripe. Both connected faces of the stripes need to be cut up precisely perpendicular to the axis of the stripe and welded using a hot wedge. Only then the remaining stripe is welded to the waterproofing membrane.

5.2.10 Ground wire and pipe penetration etc.

System of loose and fixed flange attached to steel sleeve is in **FATRAFOL-HP** system recommended for typical details of ground wire and pipe penetration ([401HP Detail](#) to [403HP Detail](#)). A detailed description of the detail is listed in Paragraph 5.2.7.4 in the FATRAFOL-H CTI.

5.3 Pile penetration through the horizontal waterproofing

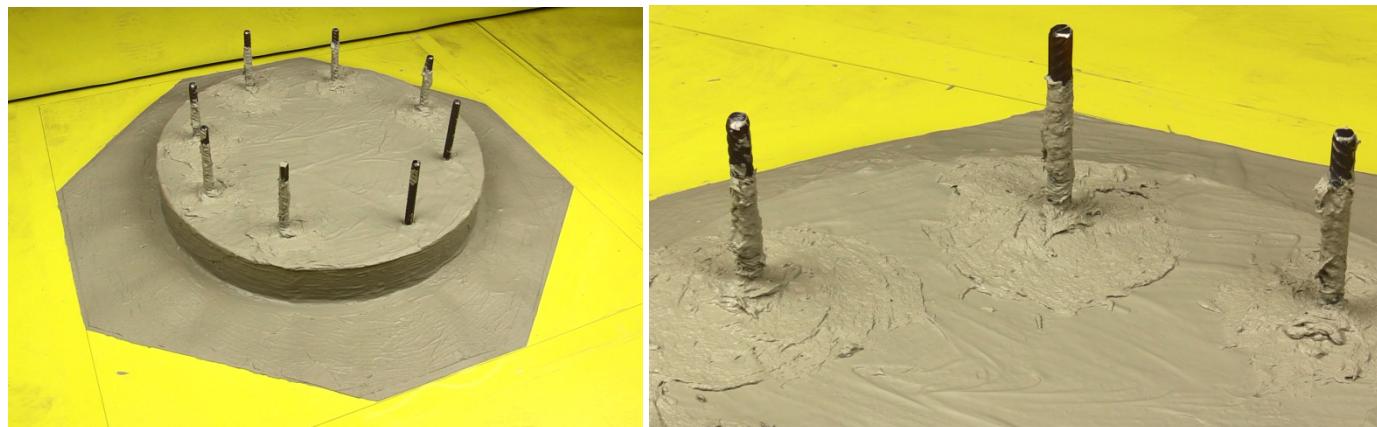
If liquid membrane Triflex is used for this detail, the lower separation textile is cut up close the pile head periphery and fastened at least by three induction plates. Alternatively, a stripe of flashing component FATRANYL can be used and fastened to horizontal substrate. The waterproofing membrane will also be cut up around the perimeter of the pile head and will be welded by induction to *isoweld* plates, if installed. The area around the pile will be bordered by a welded waterstop bar that will create a separate sector from each pile. At the higher concentrations of piles, it is economical to bring together a group of piles in one sector. The actual penetration of the pile through the waterproofing membrane is sealed by the TRIFLEX liquid membrane on the PMMA base. Along the perimeter of a pile, on its head and on the waterproofing membrane, Triflex Prodetail is applied, reinforced by fleece all over the surface. The Triflex Profibre with dispersed reinforcement is applied only on the steel rods ([404HP Detail](#)). The minimum overlap of Triflex Prodetail to the PVC-P membrane is 100mm. When applying the Triflex Profibre on the steel rods of a pile, sufficient sealing of the actual penetration of the reinforcement is crucial. The height of the Triflex Profibre application on the steel reinforcement is recommended about 100mm, but it is not critical.

See [\(406HP Detail\)](#) if system of a loose and fixed flange is used. In principal it is consistent with [401HP 403HP Details](#). A detailed description of the workflow is shown in Paragraph. 5.2.7.4 in the FATRAFOL-H CTI.

5.3.1 Application of the Triflex Prodetail and Triflex Profibre

The workflow is as follows.

- Prepare all the necessary components and equipment, prepare within reach of the place of application. We recommend that you have the scale for accurate measuring the amount of catalyst, a PE bucket, wooden spatula, foam rollers and a brush and sufficient amount of disposable rubber gloves.
- Clean the surface of the rods and the surface of a penetrating pile from rust mechanically using an angle grinder with a grinding wheel or manually using a steel brush. Remove the dust with a vacuum cleaner or just sweep it off. Clean the surface of the rods with the Triflex Reiniger cleaner.
- Surround the place where the Prodetail or Profibre will be applied with a crepe tape.
- In advance, prepare all the blanks of reinforcing fleece
- Cover the periphery of the pile in contact with the waterproofing membrane with the Triflex Steinklebeband dilatation tape with the width of 50mm. Any similar adhesive tape with the surface on the basis of polyethylene can be used. This creates an expansion connection between the pile and the membrane.
- Pour the required amount of the Prodetail into a bucket and pour the required quantity of the catalyst. Adjust the necessary amount of catalyst to the actual air temperature according to the table printed on the can. Note that the mass will not react with the smaller quantity of catalyst material. Mix the resulting mass thoroughly.
- In the Triflex Prodetail system, apply the first coat with the consumption of about 2kg/m^2 on the insulated surface using a roller or a brush. Apply the blanks of reinforcing fleece with the overlap of min. 50mm on the fresh coat and push into the applied material by moving the brush or roller. Immediately apply another coat by the wet-on-wet system so that the fleece would be completely drowned and could not be seen anywhere. The estimated total consumption should be about 3kg/m^2 . After completing the application, tear the crepe tape down already in wet state.
- When applying the liquid Triflex Profibre insulation, the consumption of approximately 3 kg/m^2 is applied in one working operation.



5.3.2 Expansion joints

To strengthen the waterproofing layer, prepare a blank of FATRAFOL 803/V, 803 or 803/VS, 803/VST waterproofing membrane with the width of 400mm. Unfold the blank and place it symmetrically along the axis of expansion joint. Weld the blank along its periphery by hot air to the surface of the membrane of the waterproofing layer while pressing a roller ([601HP Detail](#)).

5.3.3 Injection system

The workflow of the assembly of the injection system depends on the selected process of construction and installation of the vertical waterproofing. The process is different in the case of installing the vertical waterproofing from the inside and from the outside with counter joint.

5.3.4 Injection system of the horizontal waterproofing

5.3.4.1 Straight injection port

A straight injection port is installed **after** the prescribed tightness testing and hand over of waterproofing. After removing from the shipping container, the injection port is only freely placed in its position on the PETEXDREN 900 drainage mat and is connected with the elements of the injection piping ([701HP Detail](#) and [702HP Detail](#)).

5.3.4.2 Laying the horizontal injection pipes

The injection piping is usually installed **simultaneously** with the injection port. The injection piping will be uncoiled, cut to a desired length with the plumbing scissors. If pipes will be perpendicular to the horizontal waterproofing membrane with the termination on the surface of the foundation slab, the pipe will be terminated by reduction and a packer ([709 Detail](#) and [811HP Detail](#)). During the work on the foundation slab, the vertical pipe terminated by a packer is fixed to the reinforcement with plough wire.

On the contrary, if the injection system will be brought out into one or more collection points, first a stem elbow will be fitted into the plug-in case of injection port. ([702 Detail](#) and [812HP Detail](#)). If the piping needs to be prolonged, a direct connector will be used. If a change of the direction from horizontal to vertical needs to be made, an equal elbow will be used. The piping is conducted via the shortest path, if possible, towards the collection point.

The piping is terminated at the collection point, which usually consists of a steel or plastic box, cemented in the wall ([706HP Detail](#)). There the piping is provided with a shut-off valve. Each pipeline is clearly marked with an identification plate, colour identical for each sector or other suitable permanent method. Also the termination in the face of the wall using packers is possible ([707HP Detail](#)). For easier placing the packer on the 10BPEX-25C pipeline, we recommend to heat the pipeline in hot water or by hot air.

5.3.5 Injection system of the vertical waterproofing performed from the inside

5.3.5.1 Straight injection port

A hole with a diameter of about 30mm is drilled in the protective polypropylene boards at the place of the planned position of the straight injection port. The port is pushed freely with slight pressure into the hole so that the flange of the port would fit the PETEXDREN 900 drainage mat after pressing the protective polypropylene board. The installation of protective polypropylene boards will follow, see Paragraph 5.3.8.



5.3.5.2 Laying the injection pipeline

The injection pipeline or its vertical part can be installed **after** the completion of installing the protective polypropylene boards on the walls, in which the straight injection ports are inserted.

In principle, there are two alternative scenarios of assembling the vertical waterproofing. In the first case the vertical waterproofing will be installed only after the completion of concreting the foundation slab ([205HP Detail](#) and [206HP Detail](#)). In the second, the less common case, the vertical waterproofing is installed before concreting the foundation slab. The piping from the vertical sectors can be conducted and ended in different ways depending on the assembly of the vertical waterproofing.

- The pipeline is conducted into one or more collection points or is terminated in the upper face of the foundation slab/floor using a packer. If the vertical waterproofing is installed after the completed concreting of the foundation slab, the part of the piping of the vertical sectors is installed ahead of the concreting. The piping is run out by mounting and ended by pipe ending at the height of 100mm above the working joint slab x wall ([709HP Detail](#) and [710HP Detail](#)). After concreting the foundation slab, the piping is connected to the injection port. The piping must be adequately fixed to the rods (reinforcement) to prevent damage during concreting and compacting the concrete. If the vertical waterproofing and sectors are mounted before concreting the foundation slab, the injection piping is installed entire in one working operation.
- A short piping terminated by reduction and a packer is mounted on the inner face of the wall, i.e. into the injection port ([704HP Detail](#)). Subsequently, the pipeline is tied with the plough wire to the wall rods (reinforcement).

5.3.6 Injection system of the vertical waterproofing performed from the outside (from trench)

In the case of installation of the vertical waterproofing from the outside (from trench), mutual interaction and coordination of suppliers of the load bearing structure and waterproofing works is needed.

5.3.6.1 Straight injection port and injection piping

Performing the vertical waterproofing from the outside (from trench) means that generally the vertical substrate will be the load bearing basement wall. In the **FATRAFOL-HP** system, the direct injection port should be concreted in the wall, i.e. inserted in the formwork similarly as the waterstop bar ([705HP Detail](#) and [850HP Detail](#)). Recommended working procedure is as follows.

- A patch of around the diameter of the injection port or square of the size 200 x 200mm is cut from the 803/V/S, 803/VST, 803/V or 803 membrane. The patch is placed on the injection port and it is welded to it along its perimeter by hot air.

The port should be attached to inner face of the formwork and fastened with nails ([710HP Detail](#)) before concreting the wall. In the case of conventional formwork made of plywood, the supplier of the formwork or general contractor needs to be notified in advance and must approve it. Simultaneously, with the installation of the injection port, before concreting the wall, the injection piping is installed and connected with the port. In the case of steel formwork, this workflow is not possible, however, the port including the patch can be glued to the formwork with the ME 110 adhesive tape. When the mold release coatings is applied on the formwork, it must be removed and the surface degreased in area of port installation.

The nails must not be hammered in the full length, but they are bent at about half of the length. The aim is so that the nails would press the patch to the formwork surface but, concurrently, remain firm in the concrete during removing the formwork.

After the removal of the wall formwork, the projecting ends of the nails close to the concrete surface are cut away (cut off) carefully with the pliers or using the angular disc grinder. A patch is cut away with the insulation knife carefully and the injection port is revealed ([705HP Detail](#) and [710HP Detail](#)). The installation of the PETEXDREN 900 drainage mat follows.

5.3.7 Laying and joining the separation PE membrane

The principles of laying and joining the separation PE membrane is described in the valid master FATRAFOL-H CTI in Paragraph 5.2.5. In the **FATRAFOL-HP** waterproofing system, the PE membrane is laid only in the whole horizontal surface on the PETEXDREN 900 drainage mat. The PE membrane is designed to prevent the leakage of cement milk in the drainage and simultaneously injection system. The PE membrane is fixed in points to the PETEXDREN 900 layer using the PU sealant while it is sealed off along the waterstop bar with the sealant or adhesive tape. In no case the PE membrane may overlap the ribbing of the waterstop bar ([202HP Detail](#)).

5.3.8 Installing protective polypropylene boards

Protective polypropylene boards are mounted identically in both systems of the installation, i.e. when installing the vertical waterproofing from both the inside and outside. The boards can be shortened as needed, with standard hand tools, e.g. with a manual or electric circular or jig saw. A manual vacuum carrier can be used with the advantage for handling PP protective boards.

The boards are freely pressed on the vertical surface on the HP-PVC fixing points welded in advance. After that the boards are welded to HP-PVC fixing points by *isoweld* device.

When working with magnets, there is a risk of their falling and head injury, e.g. during further handling the board or catching on the magnet. Induction welding is therefore carried out first on two upper HP-PVC fixing points. After welding, the magnet is pressed immediately and it is left to be fixed for ca. 1 minute. Then the magnet is removed and the welding of other fixing points continues via the *isoweld* device, see Paragraph 5.2.4. The expansion joint of at least 30mm wide is recommended between the individual boards, which will be subsequently taped over with the one-sided adhesive tape. ([821HP Detail](#) and [859HP Detail](#)). Also the joint between the boards and the edge of the waterstop bar needs to be taped over with the same adhesive tape.





6. REPAIR OF THE LEAKING SECTOR

The installed and fully functional injection system allows the transport of the injection material all over the waterproofing membrane without drilling to load bearing structure.

The injection of special liquid chemicals can be used if moisture or water in the interior of the building, caused by the leaky **FATRAFOL-HP** waterproofing system occurs. Injection must be always carried out only by a specialized company with proven experience in doing this type of work. Prior to the injection works, a professional on-site visit and assessment of expert is always required. Injection material intended to be used must be compatible with the waterproofing membrane. Prior consultation and the written approval of the use of a specific injection material by the manufacturer of waterproofing membrane is recommended.

Usually two injection pipes receive packers and then pump hose is attached. If packers are already concreted, only screw the ending/hose endings of the injection pump. The injection is performed until the injection material appears in remaining open pipes. It is also an indication that the whole sector is full of injection material. Recommended injection pressure is up to 60 bar. When the injection material starts to run out of the remaining open piping, all the open pipes should be closed and about 1-2 kg more material is injected to produce a slight excess pressure. Around half an hour after injecting the whole sector, the injection packers and the hose from the pump can be removed.

7. SAFETY, HEALTH AND FIRE PROTECTION

The issue of safety, health and fire protection is prepared in detail in the valid FATRAFOL-H CTI in Paragraph 6.

8. SUPERVISION AND HAND OVER OF FATRAFOL-HP SYSTEM

8.1 General Principles

General principles for the supervision of the FATRAFOL-HP waterproofing system are specified in detail in the valid FATRAFOL-H CTI, in Paragraph 7.1.

8.2 On-site waterproofing tests

The rules for on-site testing of waterproofing tightness are specified in detail in the valid FATRAFOL-H CTI in Paragraph 7.2. The FATRAFOL-HP system is characterized by the implementation of double-track welds with creating a testing channel enabling overpressure testing. The principle of overpressure testing is described in the FATRAFOL-H CTI in Paragraph 7.2.2.3.

9. COMPETENCE AND EQUIPMENT OF INSTALLERS

Competence and equipment of installors is identical with the FATRAFOL-H system and is specified in detail in the FATRAFOL-H CTI in Paragraph 8.

Over and above conventional instrumentation, in the **FATRAFOL-HP** system, the following items should be available:

- welding machine with a hot wedge allowing to create the double-track welds – the recommended types: Mion Herz, Leister Twinny etc.
- machine for induction welding (the recommended type: SFS intec *isoweld*)
- scales to measure the amount of catalyst of Triflex liquid system

10. LIST OF REFERENCE STANDARDS

Standard Designation	Name (Czech)	Name (English)
ČSN 73 0250	Geometrická přesnost ve výstavbě. Navrhování geometrické přesnosti.	Geometric accuracy in building. Design geometrical accuracy.
ČSN 73 0212-3	Geometrická přesnost ve výstavbě. Kontrola přesnosti. Část 3: Pozemní stavební objekty	Geometric accuracy in building industry. Accuracy necking. Part 3: Building structures.
ČSN P 73 0600	Hydroizolace staveb – Základní ustanovení	Waterproofing of structures – Basic provisions
ČSN 73 0601	Ochrana staveb proti radonu z podloží	Protection of buildings against radon from the soil
ČSN P 73 0606	Hydroizolace staveb – Povlakové hydroizolace – Základní ustanovení	Waterproofing of buildings – Continuous sheet water proofing – Basic provisions
ČSN P 73 0610	Hydroizolace staveb – Sanace vlhkého zdiva – Základní ustanovení	Waterproofing of buildings – The rehabilitation of damp masonry and additional protection of buildings against moisture and against atmospheric water – Basic provision
ČSN 75 0905	Zkoušky vodotěsnosti vodárenských a kanalizačních nádrží	Water supply and sewerage tanks. Testing of water-tightness
EN 358	Osobní ochranné prostředky pro pracovní polohování a prevenci pádů z výšky – Pásy pro pracovní polohování a zadřžení a pracovní polohovací spojovací prostředky	Personal protective equipment for work positioning and prevention of falls from a height – Belts for work positioning and restraint and work positioning lanyards
EN 361	Osobní ochranné prostředky proti pádům z výšky – Zachycovací postroje	Personal protective equipment against falls from a height – Full body harnesses
EN 1593	Nedestruktivní zkoušení – Zkoušení těsnosti – Bublinková metoda	Non-destructive testing – Leak testing – Bubble emission techniques
EN 1990	Eurokód: Zásady navrhování konstrukcí	Eurocode: Basis of structural design
EN ISO 9712	Nedestruktivní zkoušení – Kvalifikace a certifikace pracovníků NDT.	Non-destructive testing – Qualification and certification of NDT personnel
EN 13967	Hydroizolační pásy a fólie – Plastové a pryžové pásy a fólie do izolace proti vlhkosti a plastové a pryžové pásy a fólie do izolace proti tlakové vodě – Definice a charakteristiky	Flexible sheets for waterproofing – Plastic and rubber damp proof sheets including plastic basement tanking sheet – Definitions and characteristics
EN 14909	Hydroizolační pásy a fólie – Plastové a pryžové pásy a fólie vkládané do stěnových konstrukcí – Definice a charakteristiky	Flexible sheets for waterproofing – Plastic and rubber damp proof courses – Definitions and characteristics
EN ISO 9001	Systémy managementu kvality – Požadavky	Quality management systems – Requirements
EN ISO 1043-1	Plasty – Značky a zkratky – Část 1: Základní polymery a jejich zvláštní charakteristiky	Plastics – Symbols and abbreviated terms – Part 1: Basic polymers and their special characteristics
EN ISO 14001	Systémy environmentálního managementu - Požadavky s návodem pro použití	Environmental management systems - Requirements with guidance for use
ÖNORM S 2076-1	-	Landfills – Sealing systems with flexible plastics liners. Part 1: Installation
DIN DVS 2225-2	-	Joining of lining membranes – Made of polymer materials in geotechnical and hydraulic engineering – Site testing

Comments:

11. CHARACTERISTIC DETAILS

11.1 Overview of details

11.1.1 Typical assemblies

- Detail 101HP Horizontal waterproofing layers
Detail 102HP Vertical waterproofing layers executed from inside
Detail 103HP Vertical waterproofing layers executed from outside (from trench)

11.1.2 Joints

- Detail 201HP Double track weld
Detail 202HP Horizontal sectors border created by waterstop bars
Detail 203HP Counter joint at concrete base level – PHASE 1
Detail 204HP Counter joint at concrete base level – PHASE 2
Detail 205HP Vertical waterproofing barrier joined to horizontal waterproofing barrier in stages – PHASE 1
Detail 206HP Vertical waterproofing barrier joined to horizontal waterproofing barrier in stages – PHASE 2

11.1.3 Division into sectors

- Detail 301HP FATRAFOL HP system typical horizontal sector schema
Detail 302HP FATRAFOL-HP system waterstop „angle“ shaped piece schema
Detail 303HP FATRAFOL-HP system waterstop „cross“ shaped piece schema
Detail 304HP FATRAFOL-HP system waterstop „T“ shaped piece schema
Detail 305HP FATRAFOL-HP system „space angle“ shaped piece schema

11.1.4 Penetrations through waterproofing barrier

- Detail 401HP Waterproofing ground wire penetration
Detail 402HP Waterproofing pipe penetration with fixed and loose flange
Detail 403HP Well with fixed and loose flange
Detail 404HP Pile penetration – system TRIFLEX
Detail 405HP Phase of pile head detailing in system FATRAFOL-HP
Detail 406HP Pile penetration with fixed and loose flange and crystalline admixture

11.1.5 Internal and external corners

- Detail 501HP Sealing of internal and external corners using pre shaped components

11.1.6 Expansion gap

- Detail 601HP Expansion gap

11.1.7 Injection system

- Detail 701HP Injection ports typical set up scheme in system FATRAFOL-HP
Detail 702HP Injection port in horizontal waterproofing barrier
Detail 703HP Injection port in vertical waterproofing barrier constructed from pit – alternative 1
Detail 704HP Injection port in vertical waterproofing barrier constructed from pit – alternative 2
Detail 705HP Injection port in vertical waterproofing barrier constructed from outside (from trench) – alternative 2
Detail 706HP Ending injection pipes in box
Detail 707HP Ending injection pipes with packers
Detail 708HP Repair of sector with liquid chemicals
Detail 709HP Vertical sectors injection pipes ended with packers in foundation slab, installation in stages, PHASE 1 and 2
Detail 710HP Vertical sectors injection pipes ended with packers in foundation slab, installation in stages, PHASE 3 and 4

11.1.8 Schematic installation of FATRAFOL-HP system from the inside

- Detail 801HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 1 – substrate checking and preparation
- Detail 802HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 2 – sep. textile installation and mechanical fastening to substrate
- Detail 803HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 3 – horizontal waterproofing membrane installation
- Detail 804HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 4 – additional membrane strips installation in corners
- Detail 805HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 5 – welding the waterstop bar along the sector perimeter
- Detail 806HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 6 - welding the fixing points HP-PVC
- Detail 807HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 7- drainage membrane PETEXDREN 900 installation
- Detail 808HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 1 – fixing plate HP installation
- Detail 809HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 9 – protective PP boards installation
- Detail 810HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 10 – PE membrane installation on horizontal waterproofing mem.
- Detail 811HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 11 - injection port installation – alternative 1
- Detail 812HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 12 - injection port installation – alternative 2
- Detail 813HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 13 - protective concrete screed installation
- Detail 814HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 14 - foundation slab installation
- Detail 815HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 15 – vertical waterproofing membrane installation
- Detail 816HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 16 – waterstop bar installation
- Detail 817HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 17 – fixing point HP-PVC installation
- Detail 818HP FATRAFOL-HP system fixing points HP-PVC schematic placement
- Detail 819HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 18 - drainage membrane PETEXDREN 900 installation
- Detail 820HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 19 – fixing plate HP installation
- Detail 821HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 20 - protective PP boards and injection ports installation
- Detail 822HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 21 – connecting injection pipes to injection ports – alternative 1
- Detail 823HP FATRAFOL-HP system installation from inside (from pit) 3D schema – PHASE 22 - connecting injection pipes to injection ports – alternative 2

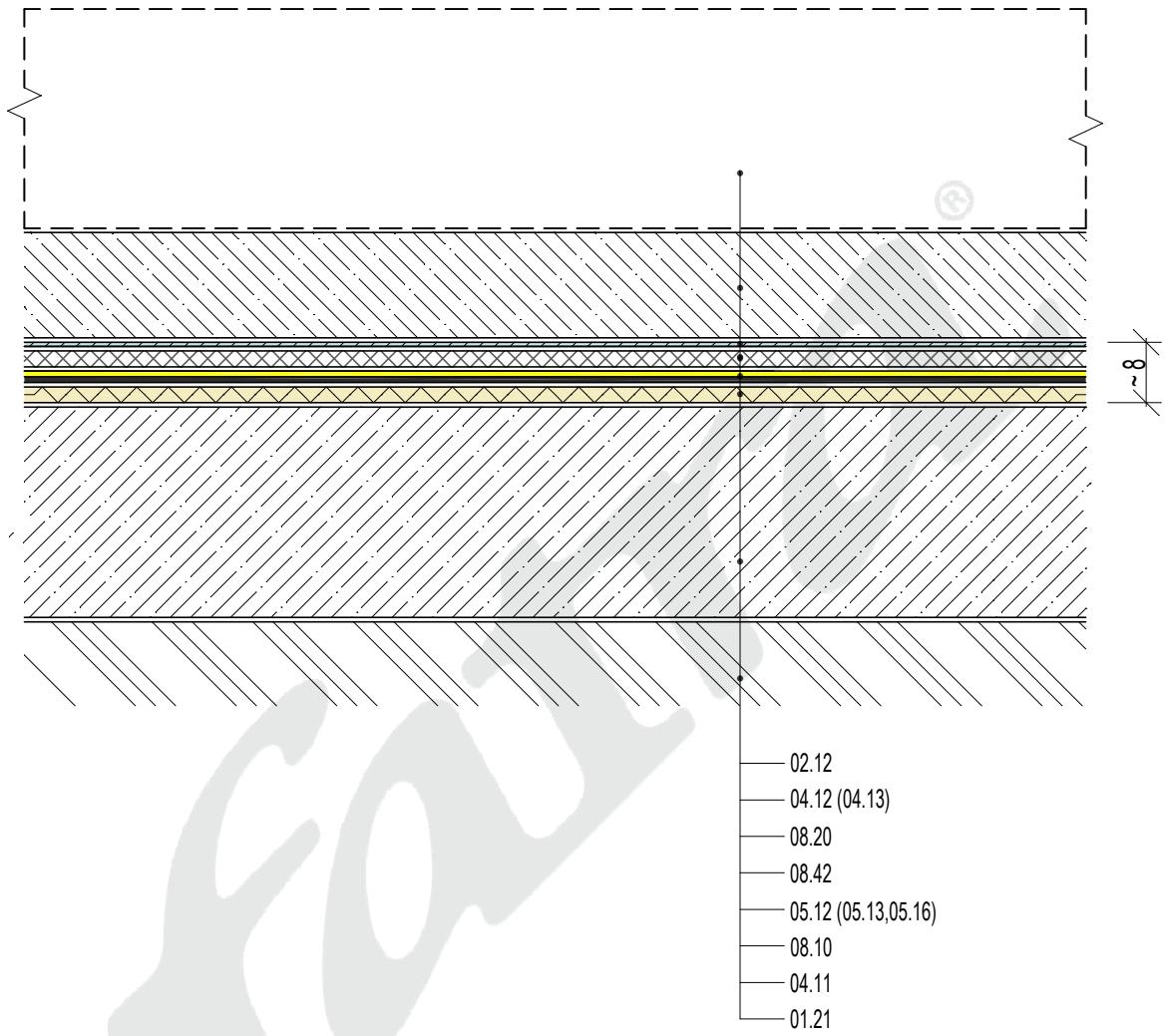
11.1.9 Schematic installation of FATRAFOL-HP system from the outside

- Detail 850HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 1 – substrate checking and preparation
- Detail 851HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 2 - drainage membrane PETEXDREN 900 installation
- Detail 852HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 3 - drainage membrane fixation to substrate
- Detail 853HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 4 – welding vertical waterproof. membrane to waterstop bar
- Detail 854HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 5 – horizontal waterproof. mem. installation to whole sector

- Detail 855HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 6 - horizontal waterproof. mem. installation to next sector
- Detail 856HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 7 – additional waterproof. mem. strips installation in corner
- Detail 857HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 8 – fixing points HP-PVC welding
- Detail 858HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 9 – sep. textile and PE mem. installation in counter joint area
- Detail 859HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 10 – protective PP boards installation
- Detail 860HP FATRAFOL-HP system installation from outside (from trench) 3D schema – PHASE 11 – concrete screed installation in counter joint area

11.2 Schematic details

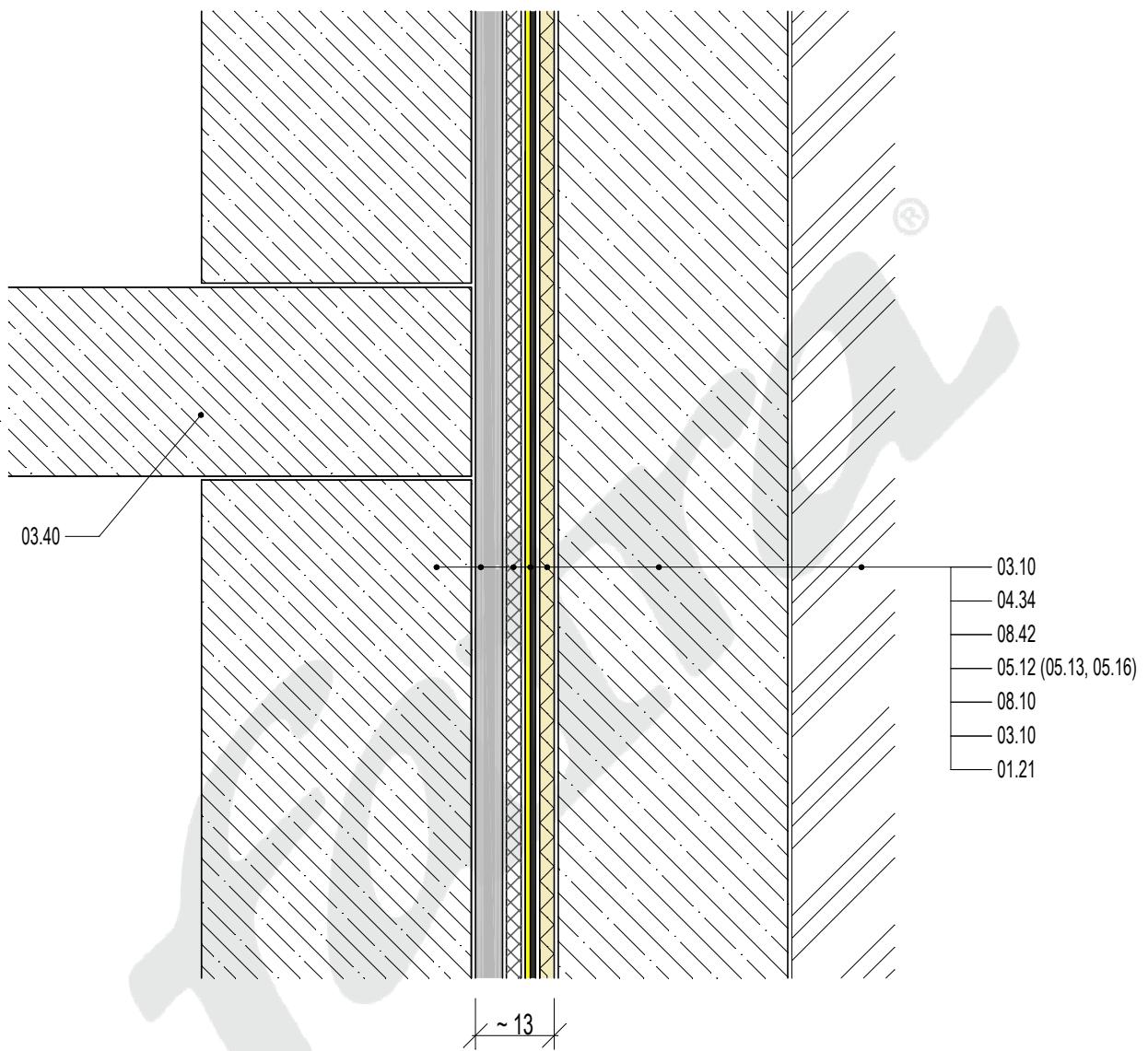
The following pictures show schematic standard details.



LEGEND

COMPOSITION

- 02.12 FOUNDATIONS (CONCRETE SLAB)
- 04.12 PROTECTIVE CONCRETE SCREED MIN. 50 MM OR
04.13 CEMENT SCREED MIN. 30 MM
- 08.20 PE MEMBRANE
- 08.42 PETEXDREN 900
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 04.11 REINFORCED CONCRETE BASE
- 01.21 SOIL



LEGEND

COMPOSITION

- 03.10 BASEMENT WALL
- 04.34 PROTECTIVE PP BOARD TH. 5 mm
- 08.42 PETEXDREN 900
- 05.12** WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 03.10 LEVELED SHORING WALL - MILAN WALL, PILE WALL
- 01.21 SOIL

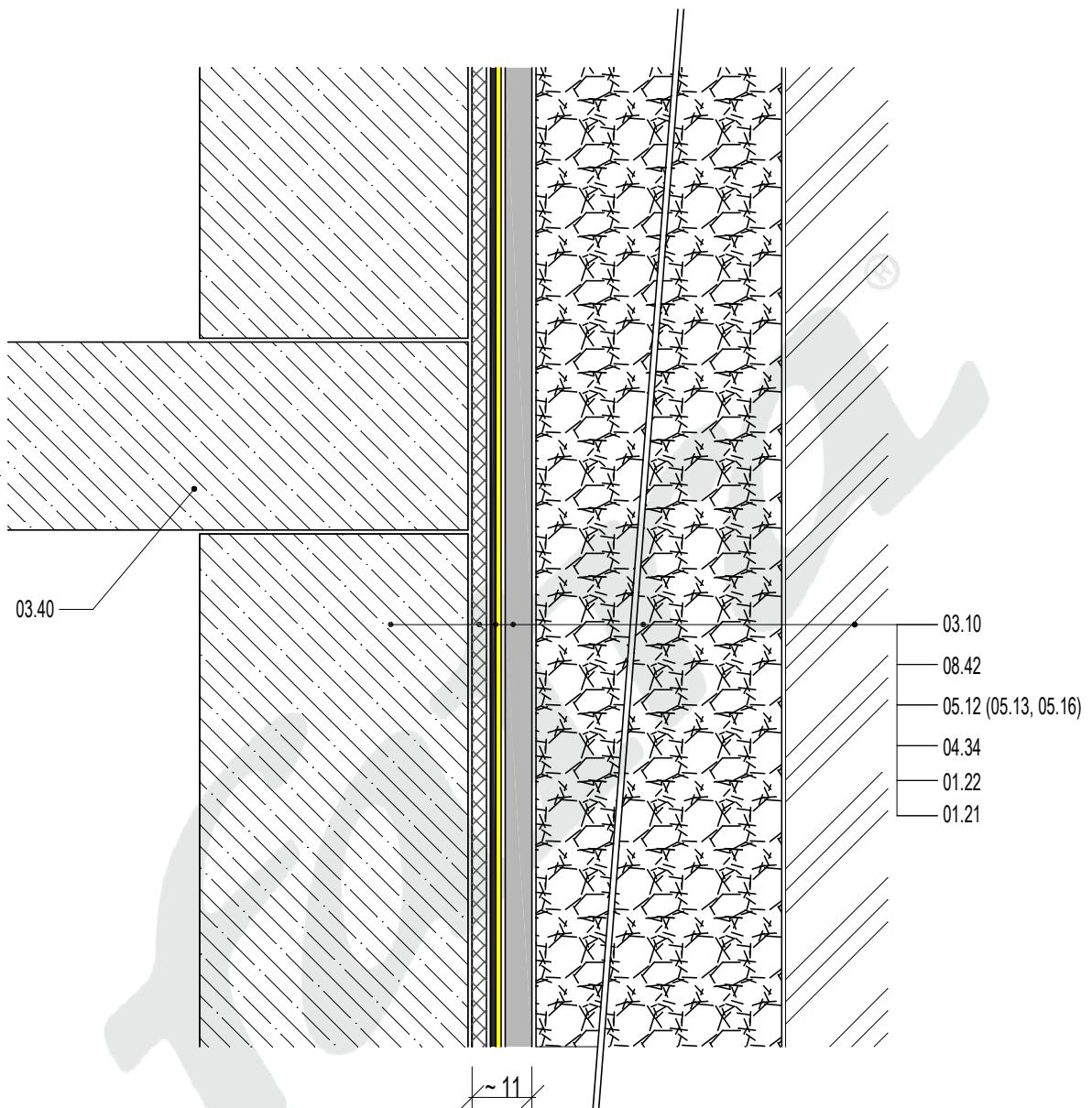
ACCESSORIES

- 03.40 CEILING SLAB

Vertical waterproofing layers executed from inside

DATE

3/2016



LEGEND

COMPOSITION

- 03.10 BASEMENT WALL
- 08.42 PETEXDREN 900
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 04.34 PROTECTIVE PP BOARD TH. 5 mm
- 01.22 COMPACTED TRENCH BACKFILL
- 01.21 SOIL

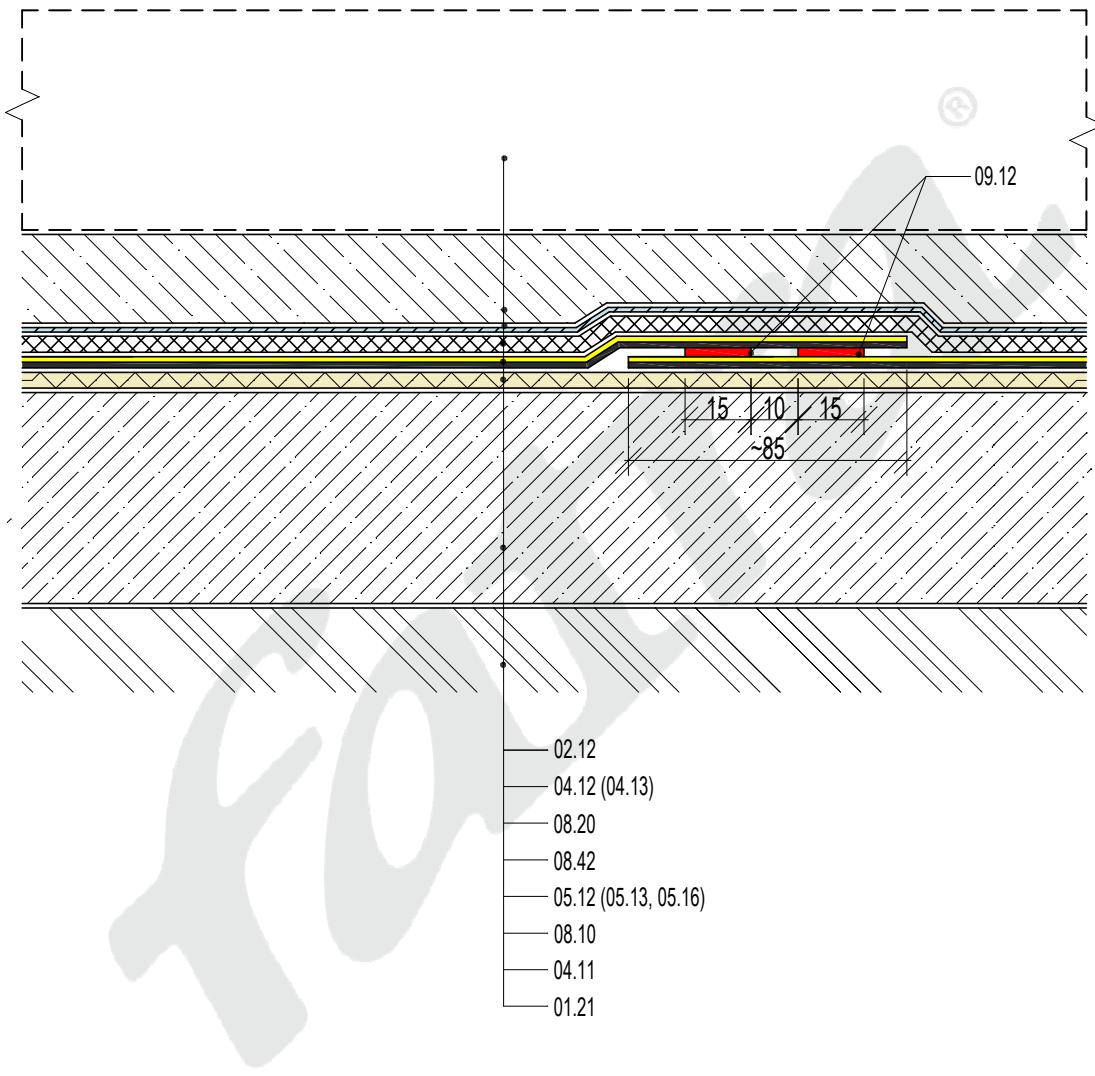
ACCESSORIES

- 03.40 CEILING SLAB

Vertical waterproofing layers executed from outside (from trench)

DATE

3/2016



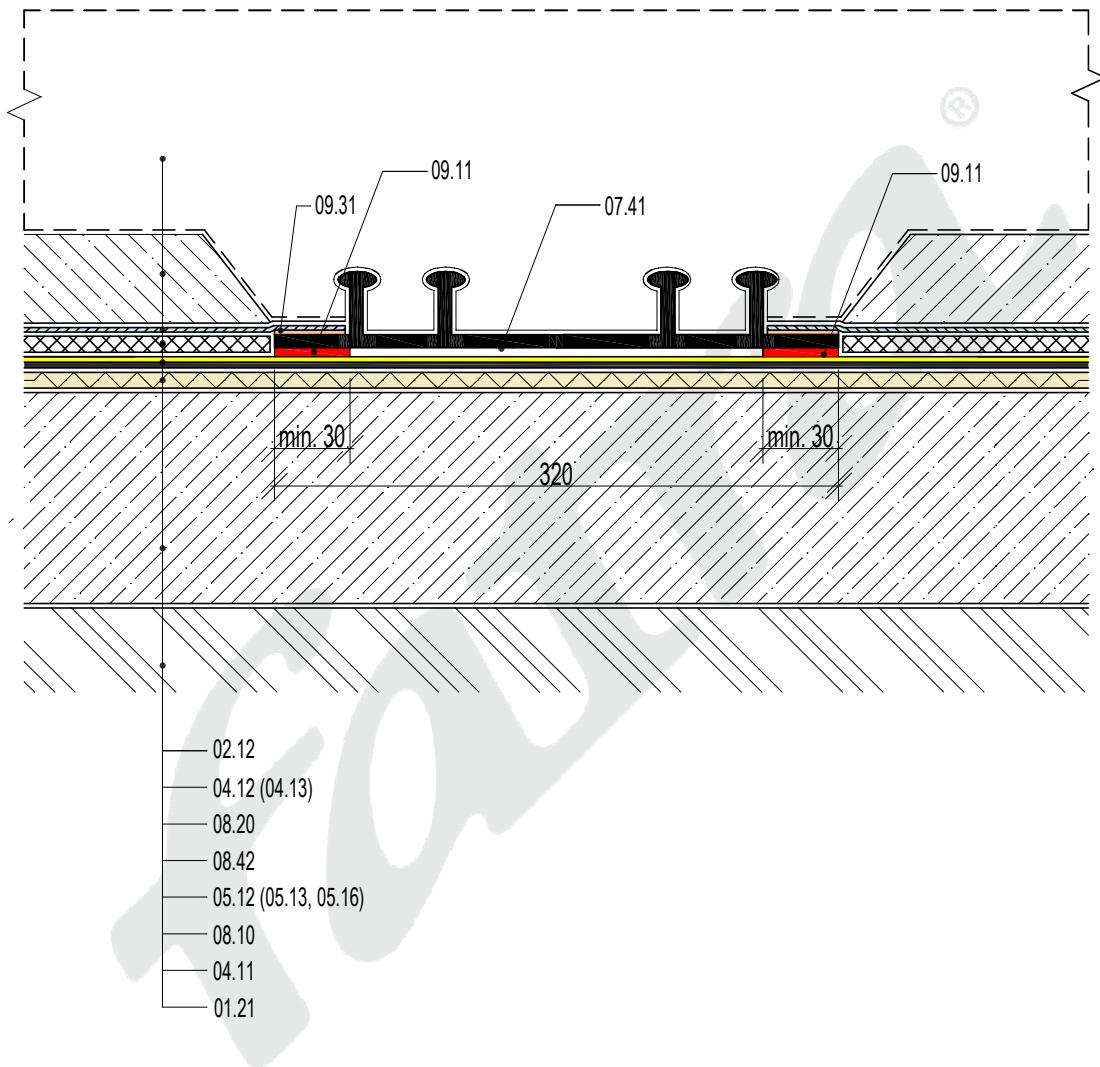
LEGEND

COMPOSITION

- 02.12 FOUNDATIONS (CONCRETE SLAB)
- 04.12 PROTECTIVE CONCRETE SCREED MIN. 50 MM OR
- 04.13 CEMENT SCREED MIN. 30 MM
- 08.20 PE MEMBRANE
- 08.42 PETEXDREN 900
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/V OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 04.11 REINFORCED CONCRETE BASE
- 01.21 SOIL

ACCESSORIES

- 09.12 DOUBLE TRACK WELD



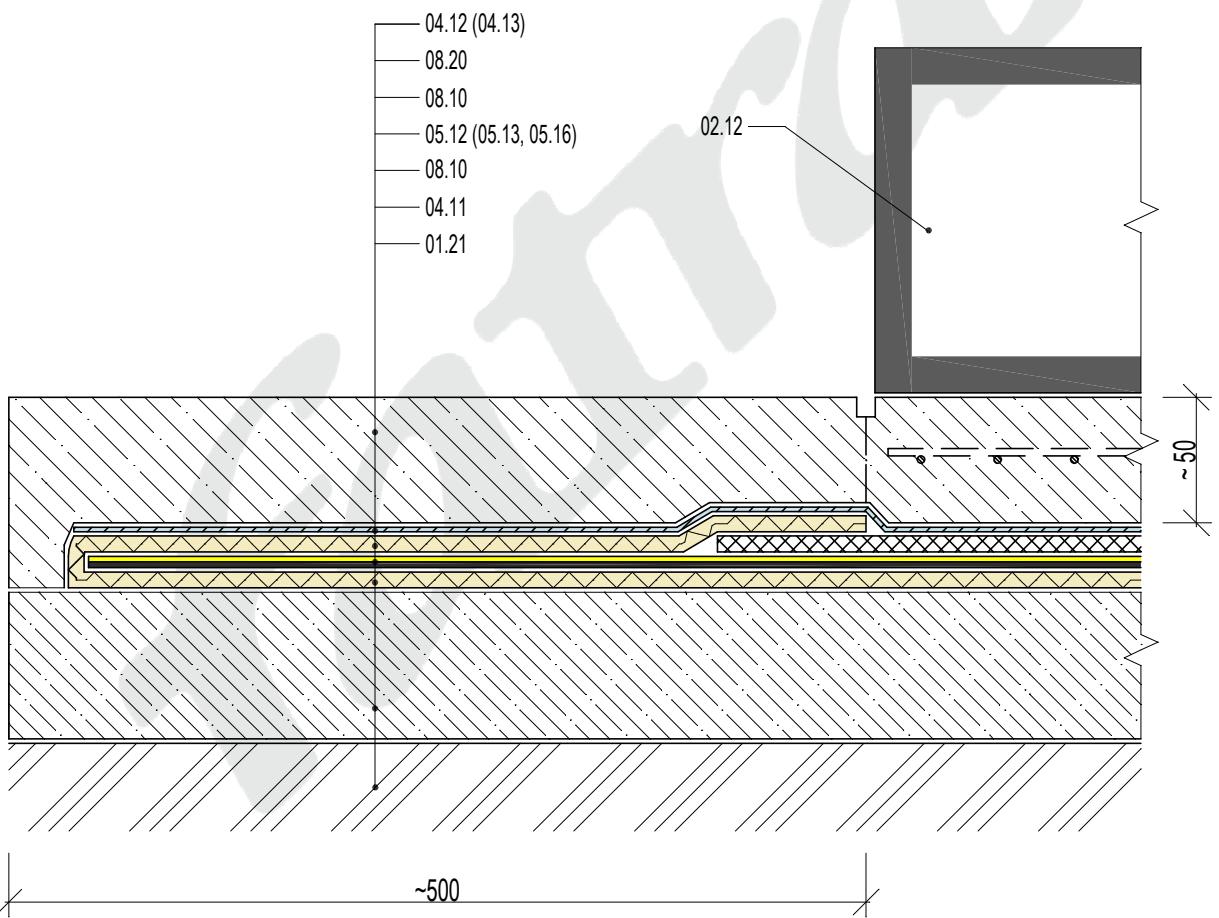
LEGEND

COMPOSITION

- 02.12 FOUNDATIONS (CONCRETE SLAB)
- 04.12 PROTECTIVE CONCRETE SCREED MIN. 50 MM OR
04.13 CEMENT SCREED MIN. 30 MM
- 08.20 PE MEMBRANE
- 08.42 PETEXDREN 900
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 04.11 REINFORCED CONCRETE BASE
- 01.21 SOIL

ACCESSORIES

- 07.41 EXTERNAL WATERSTOP BAR
- 09.11 HOT AIR WELD
- 09.31 PU SEALANT



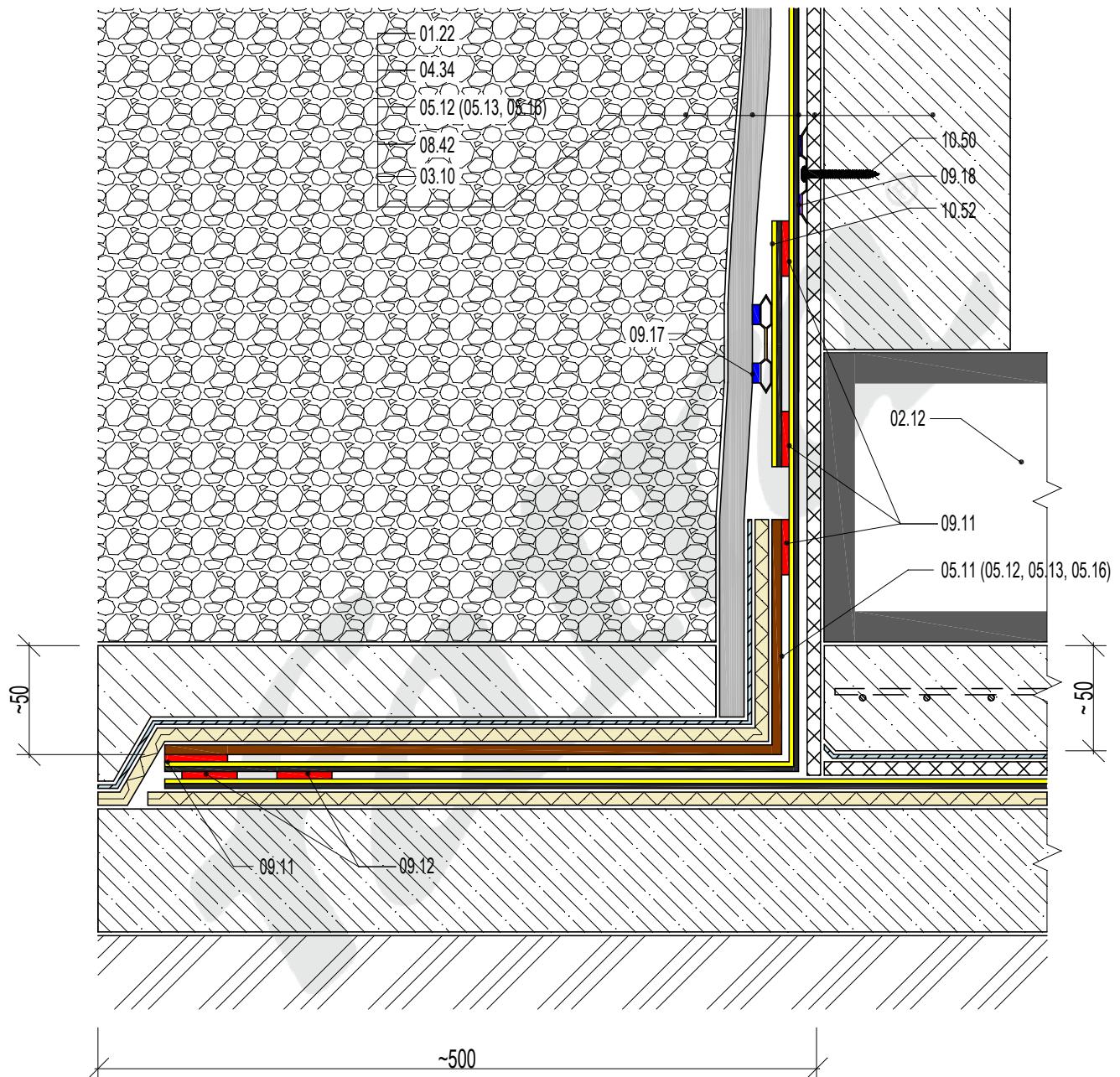
LEGEND

COMPOSITION

- 04.12 PROTECTIVE CONCRETE SCREED MIN. 50 MM OR
04.13 CEMENT SCREED MIN. 30 MM
- 08.20 PE MEMBRANE
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 04.11 REINFORCED CONCRETE BASE
- 01.21 SOIL

ACCESSORIES

- 02.12 FOUNDATIONS (CONCRETE SLAB)



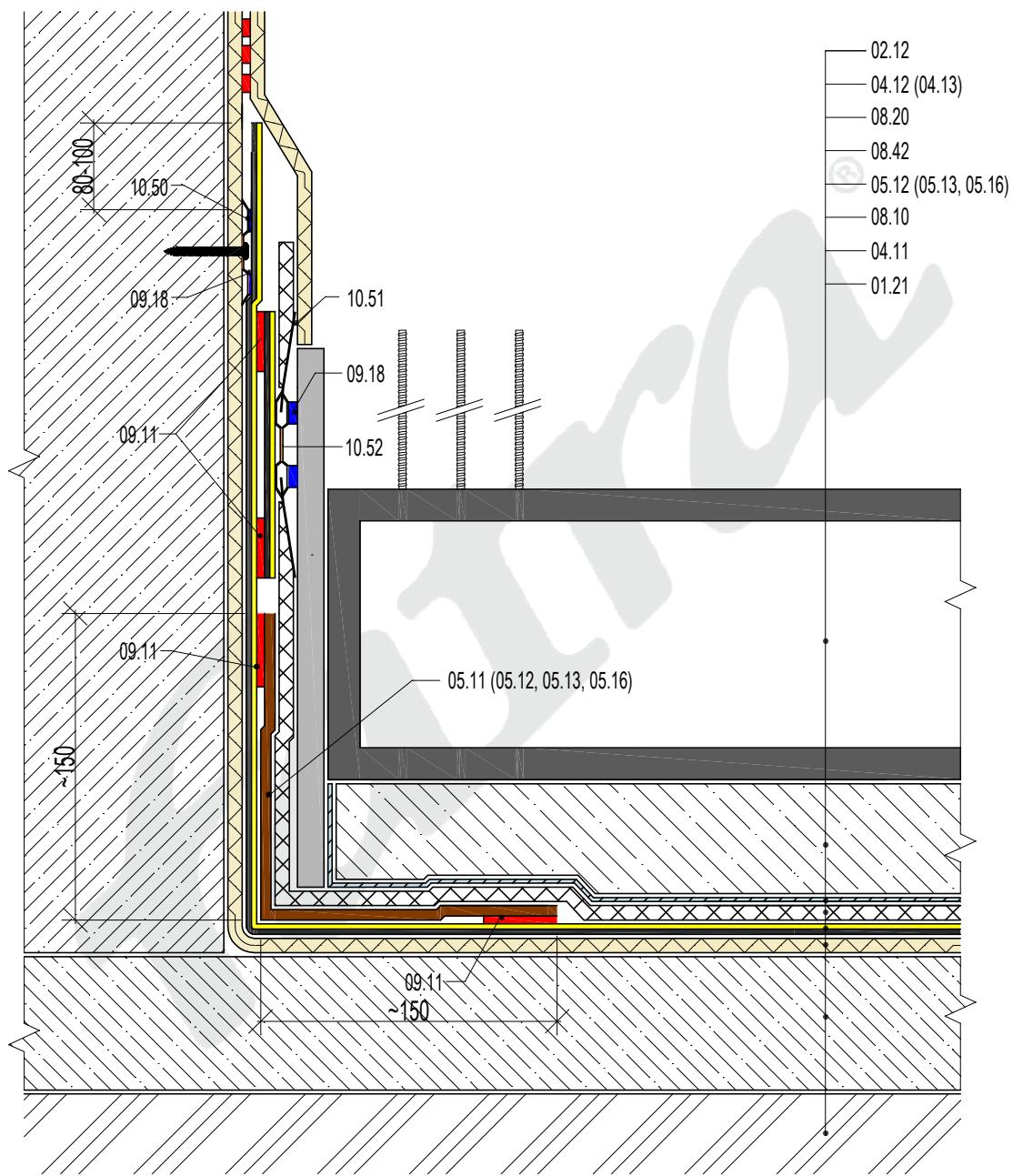
LEGEND

COMPOSITION

- 01.22 COMPACTED TRENCH BACKFILL
- 04.34 PROTECTIVE PP BOARD TH. 5 mm
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.42 PETEXDREN 900
- 03.10 BASEMENT WALL

ACCESSORIES

- 02.12 FOUNDATIONS (CONCRETE SLAB)
- 05.11 WATERPROOFING MEMBRANE FATRAFOL 803/V
- 09.11 HOT AIR WELD
- 09.12 DOUBLE TRACK WELD
- 09.18 INDUCTION WELD
- 10.50 INDUCTION PLATE PVC + FASTENER
- 10.52 FIXING POINT HP-PVC



LEGEND

COMPOSITION

02.12	FOUNDATIONS (CONCRETE SLAB)
04.12	PROTECTIVE CONCRETE SCREED MIN. 50 MM OR 04.13 CEMENT SCREED MIN. 30 MM
08.20	PE MEMBRANE
08.42	PETEXDREN 900
05.12	WATERPROOFING MEMBRANE FATRAFOL 803/VS OR 05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
08.10	SEPARATION FABRIC - NON WOVEN GEOTEXTILE
04.11	REINFORCED CONCRETE BASE
01.21	SOIL

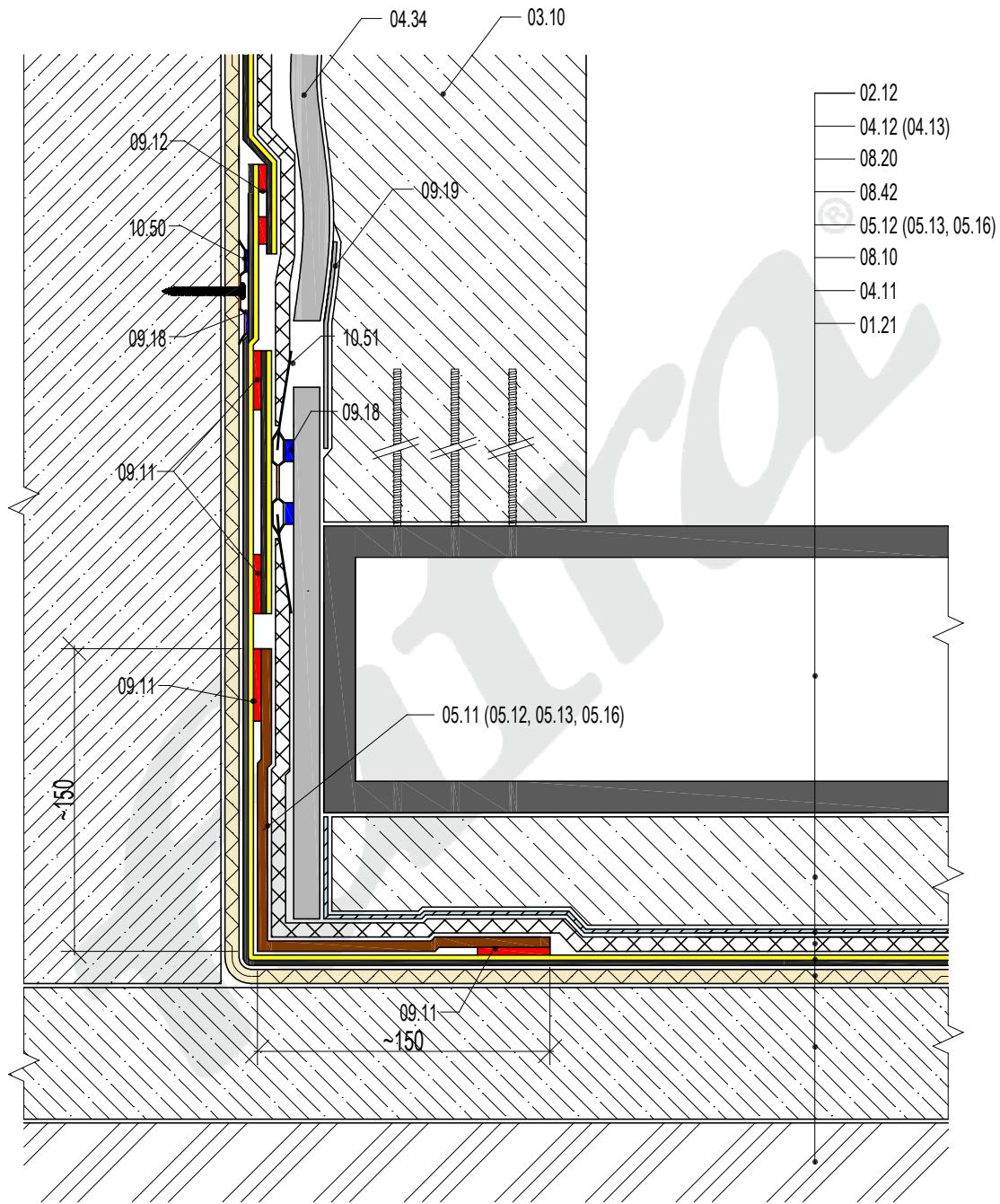
ACCESSORIES

05.11	WATERPROOFING MEMBRANE FATRAFOL 803 OR 05.13 FATRAFOL 803/V
09.11	HOT AIR WELD
09.12	DOUBLE TRACK WELD
09.18	INDUCTION WELD
10.50	INDUCTION PLATE PVC + FASTENER
10.51	FIXING PLATE HP
10.52	FIXING POINT HP-PVC

Vertical waterproofing barrier joined to horizontal waterproofing barrier in stages - PHASE 1

DATE

3/2016



LEGEND

COMPOSITION

- 02.12 FOUNDATIONS (CONCRETE SLAB)
- 04.12 PROTECTIVE CONCRETE SCREED MIN. 50 MM OR
04.13 CEMENT SCREED MIN. 30 MM
- 08.20 PE MEMBRANE
- 08.42 PETEXREN 900
- 05.12 **WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V**
- 08.10 SEPARATION FABRIC NON WOVEN GEOTEXTILE
- 04.11 REINFORCED CONCRETE BASE
- 01.21 SOIL

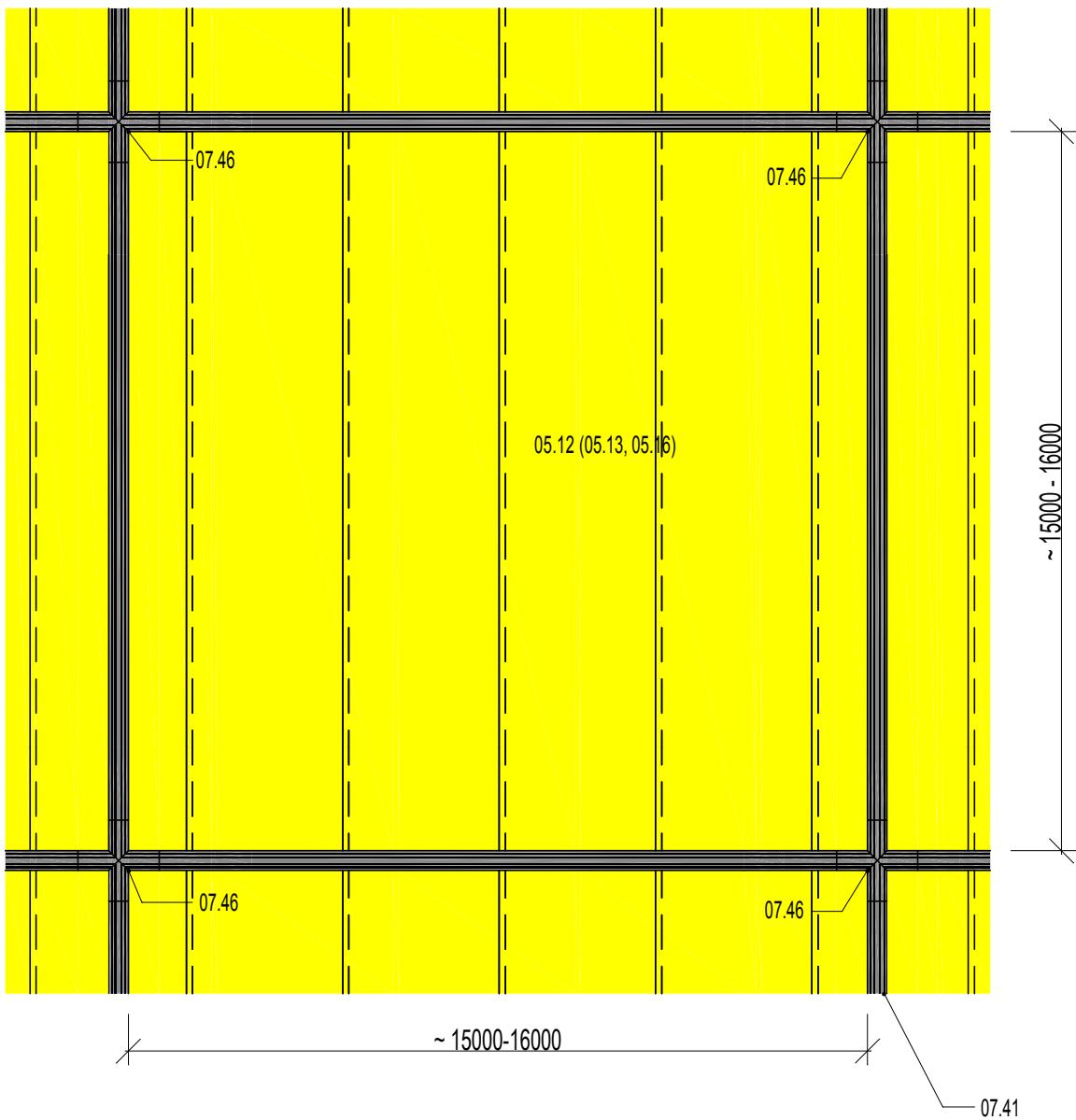
ACCESSORIES

- 03.10 BASEMENT WALL
- 04.34 PROTECTIVE PP BOARD TH. 5 mm
- 09.19 ADHESIVE TAPE FOR PP BOARDS
- 05.11 WATERPROOFING MEMBRANE FATRAFOL 803 OR
05.13 FATRAFOL 803/V
- 09.11 HOT AIR WELD
- 09.12 DOUBLE TRACK WELD
- 09.18 INDUCTION WELD
- 10.50 INDUCTION PLATE PVC + FASTENER
- 10.51 FIXING PLATE HP
- 10.52 FIXING POINT HP-PVC

Vertical waterproofing barrier joined to horizontal waterproofing barrier in stages - PHASE 2

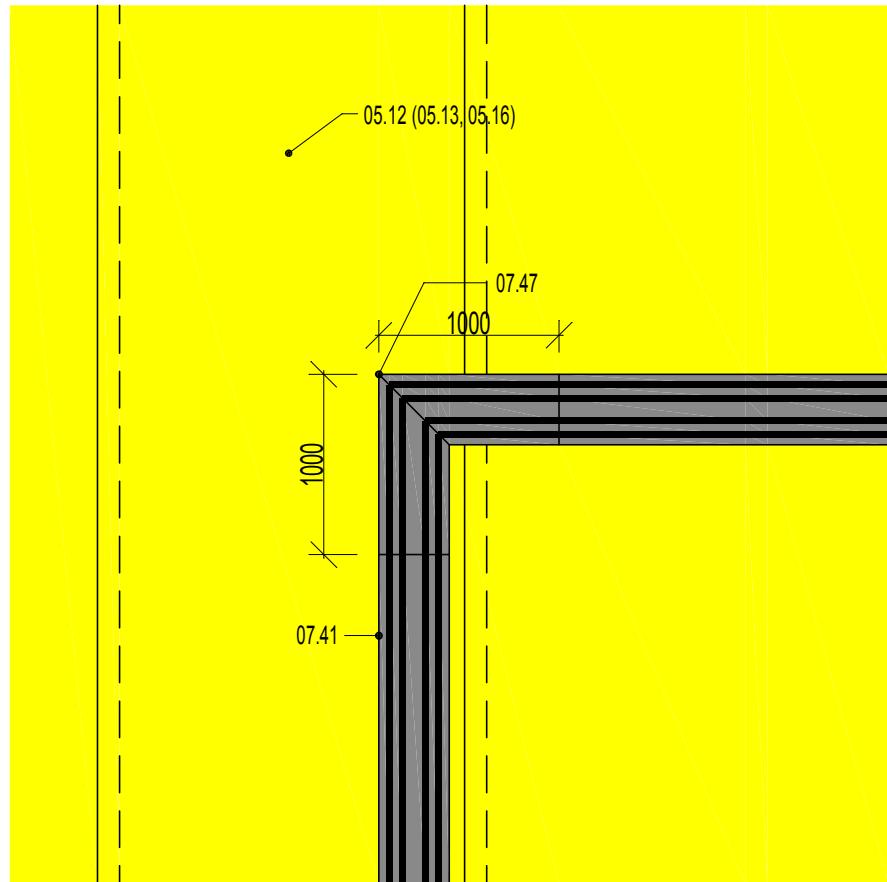
DATE

3/2016



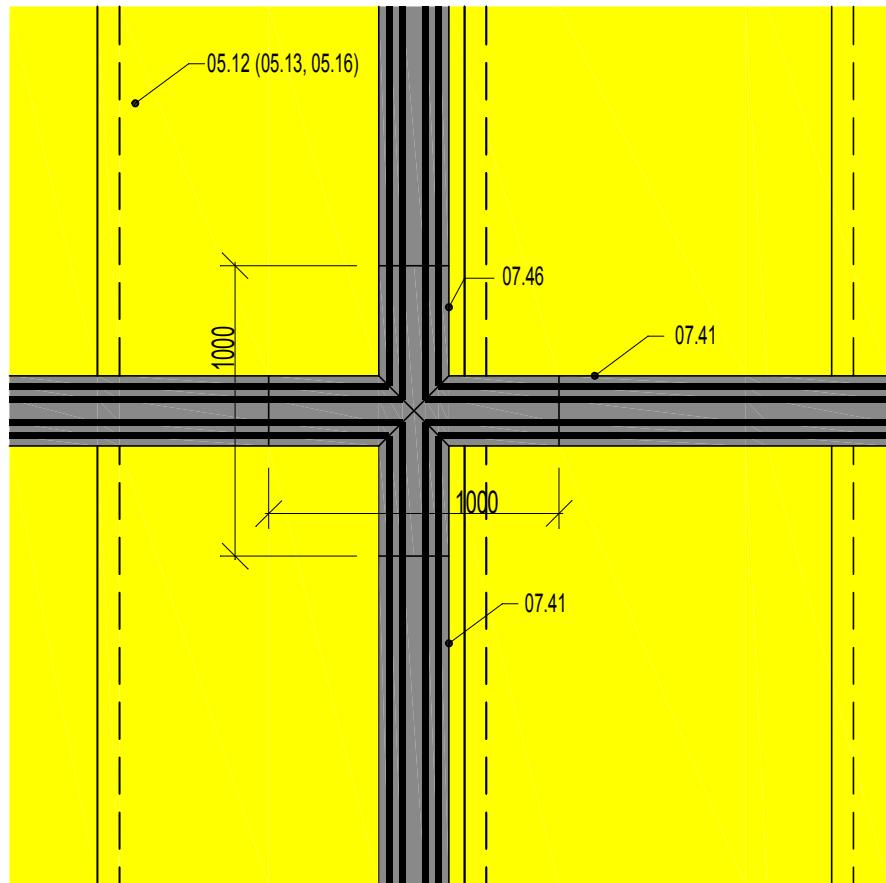
LEGEND

05.12	WATERPROOFING MEMBRANE FATRAFOL 803/VS OR 05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
07.41	EXTERNAL WATERSTOP BAR
07.46	SHAPED PIECE "CROSS" MADE OF EXTERNAL WATERSTOP BAR



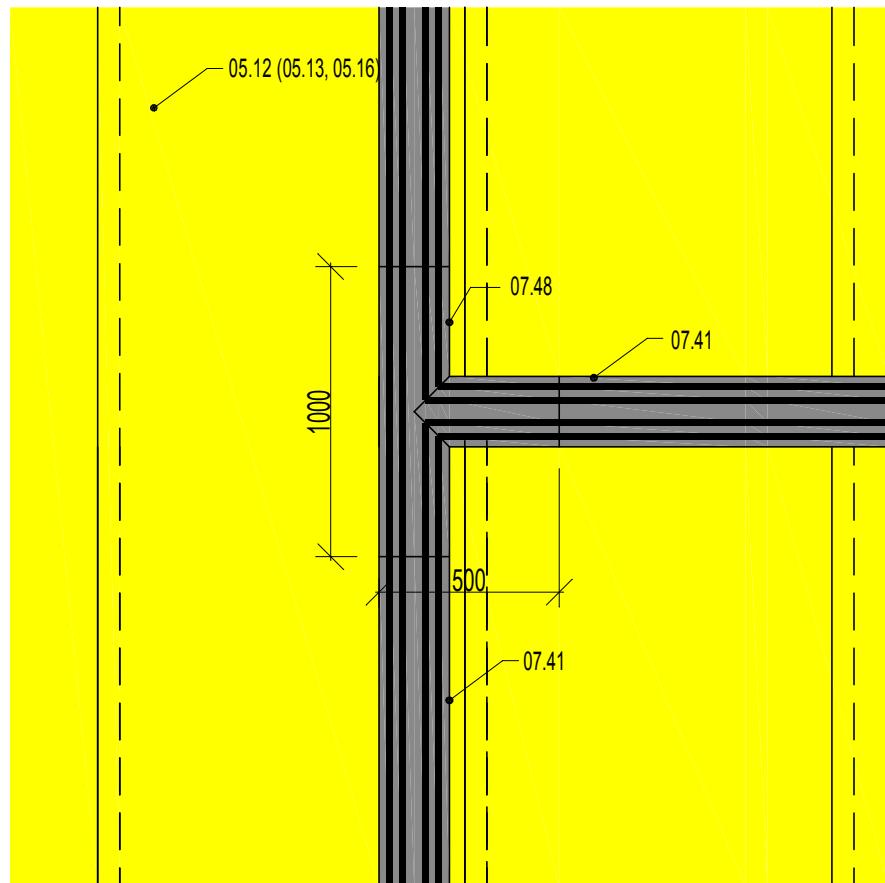
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- | | |
|-------|---|
| 05.12 | WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V |
| 07.41 | EXTERNAL WATERSTOP BAR |
| 07.47 | SHAPED PIECE "ANGLE" MADE OF EXTERNAL WATERSTOP BAR |



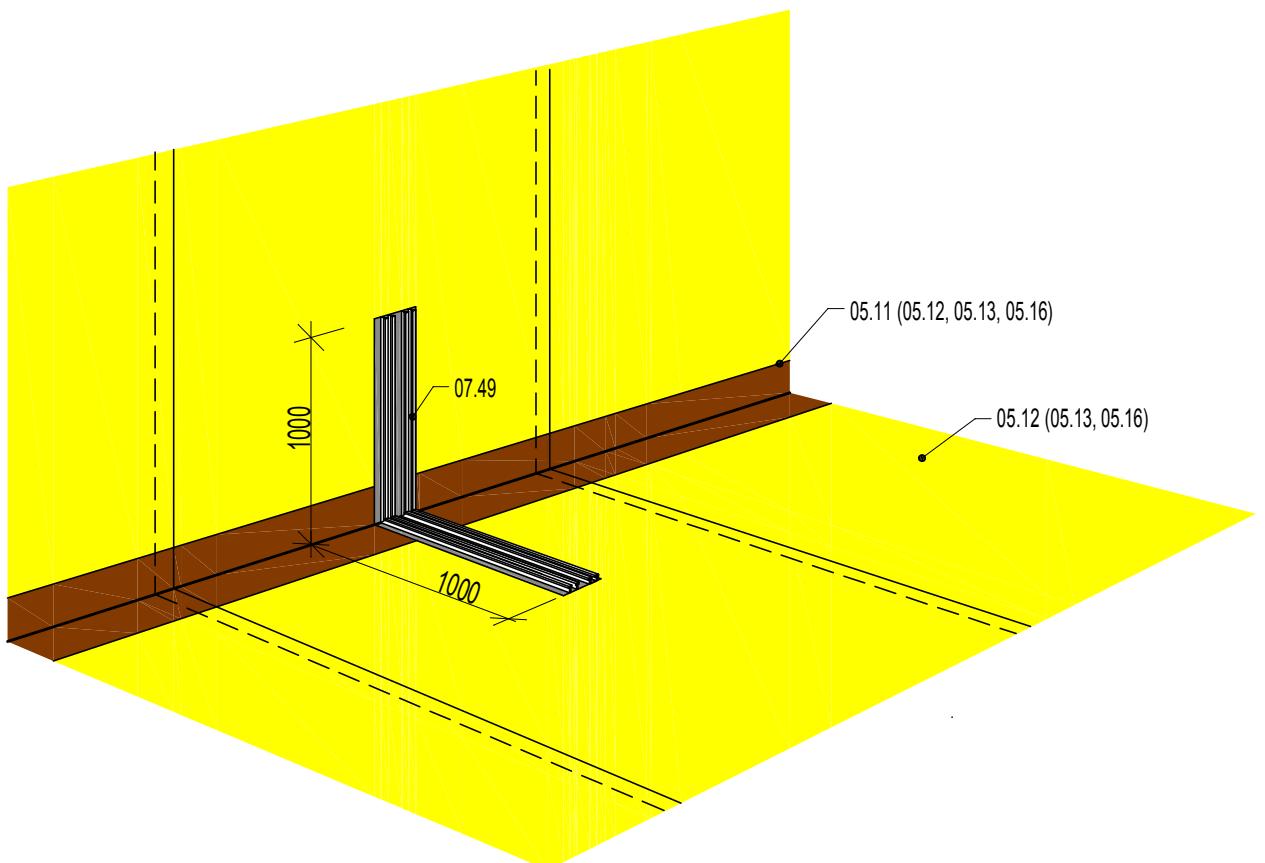
LEGEND

- | | |
|-------|---|
| 05.12 | WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V |
| 07.41 | EXTERNAL WATERSTOP BAR |
| 07.46 | SHAPED PIECE "CROSS" MADE OF EXTERNAL WATERSTOP BAR |



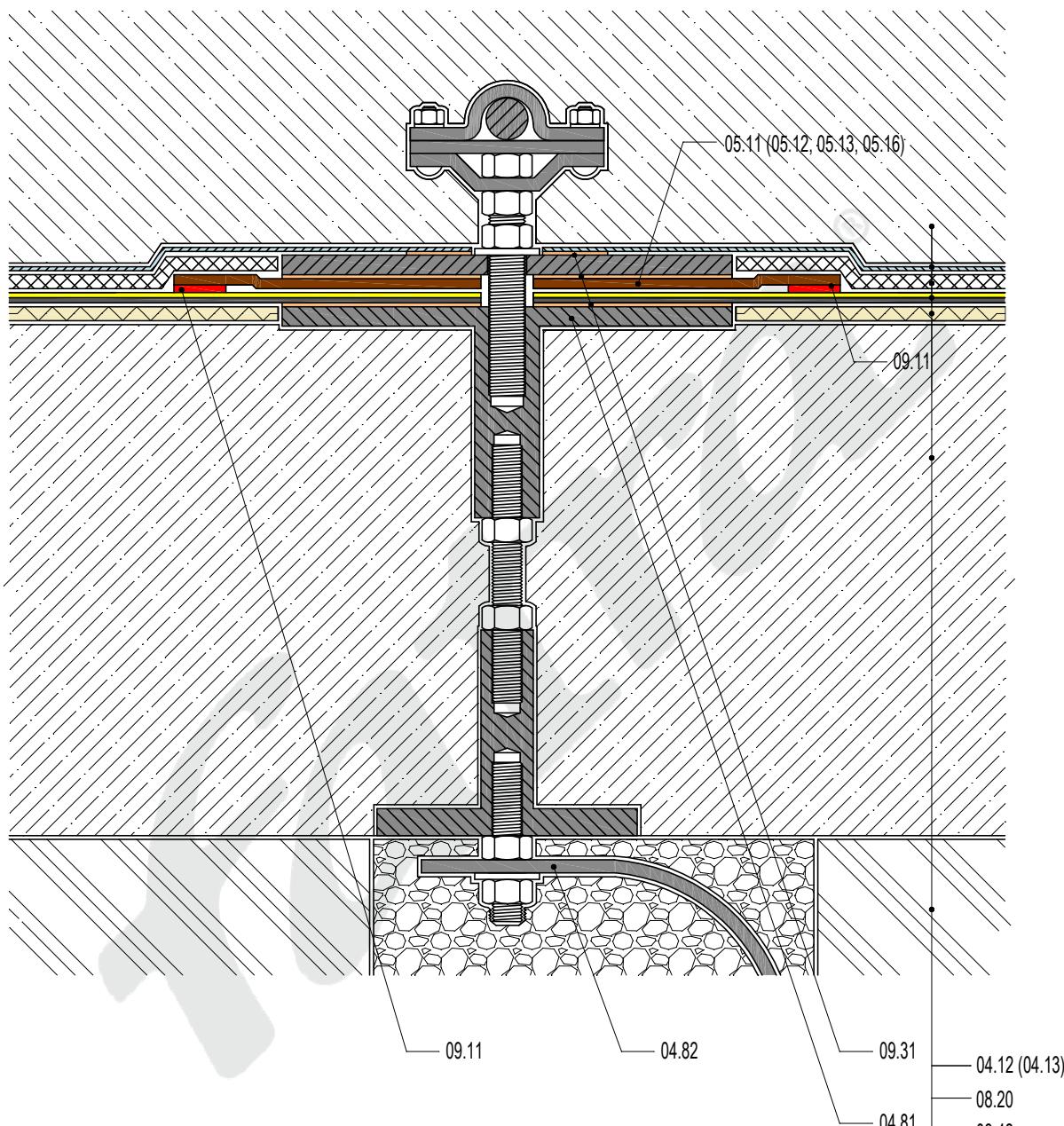
LEGEND

- | | |
|-------|---|
| 05.12 | WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V |
| 07.41 | EXTERNAL WATERSTOP BAR |
| 07.48 | SHAPED PIECE "T" MADE OF EXTERNAL WATERSTOP BAR |



LEGEND

- 05.11 WATERPROOFING MEMBRANE FATRAFOL 803
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/V OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 07.41 EXTERNAL WATERSTOP BAR
- 07.49 SHAPED PIECE "SPACE ANGLE" MADE OF EXTERNAL WATERSTOP BAR



LEGEND

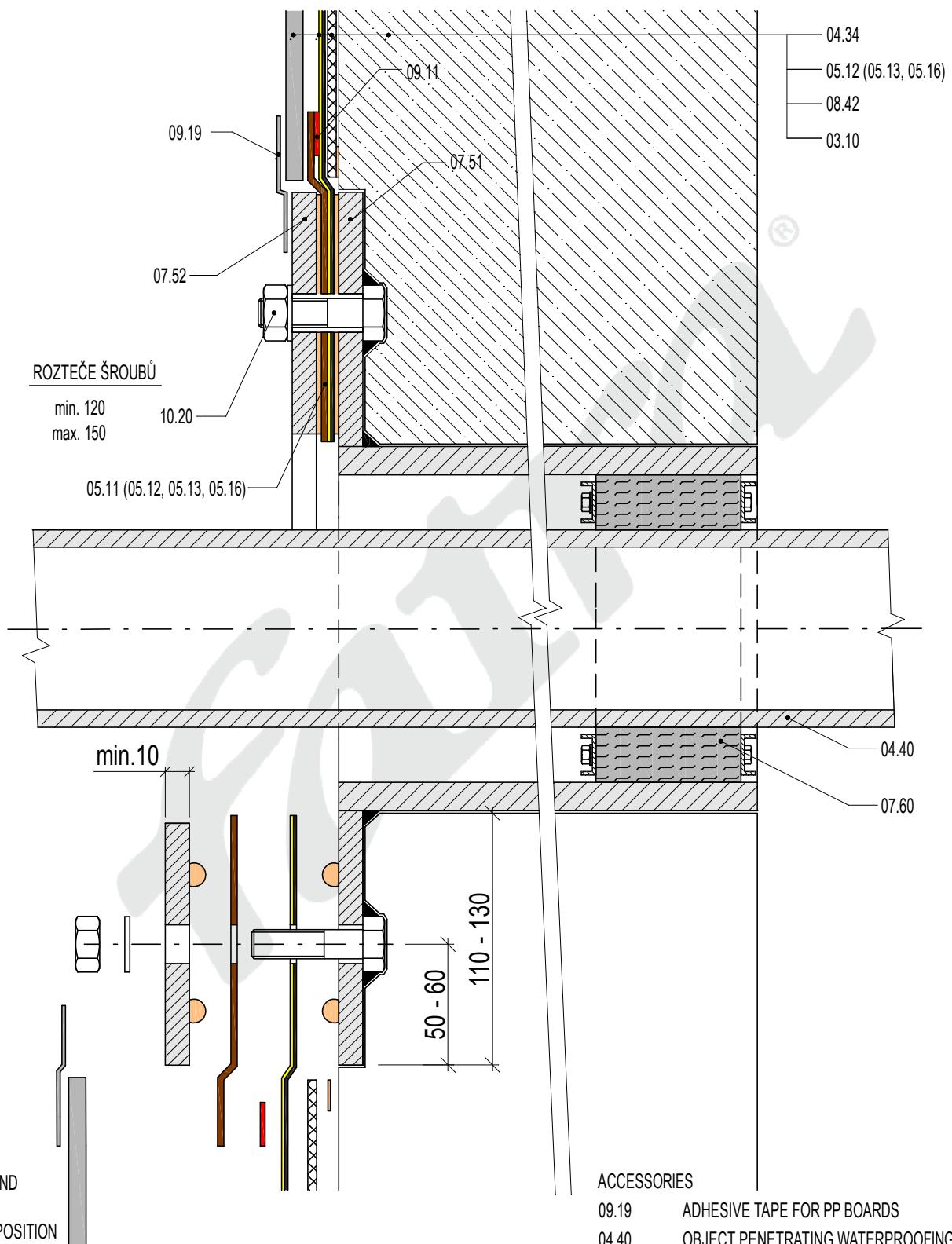
COMPOSITION

04.12	PROTECTIVE CONCRETE SCREED MIN. 50 MM OR 04.13 CEMENT SCREED MIN. 30 MM
08.20	PE MEMBRANE
08.42	PETEXDREN 900
05.12	WATERPROOFING MEMBRANE FATRAFOL 803/VS OR 05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
08.10	SEPARATION FABRIC - NON WOVEN GEOTEXTILE
04.11	REINFORCED CONCRETE BASE
01.21	SOIL

ACCESSORIES

04.81	FIXED AND LOOSE FLANGE
04.82	GROUND WIRE
05.11	WATERPROOFING MEMBRANE FATRAFOL 803 OR 05.13 FATRAFOL 803/V
09.11	HOT AIR WELD
09.31	PU SEALANT

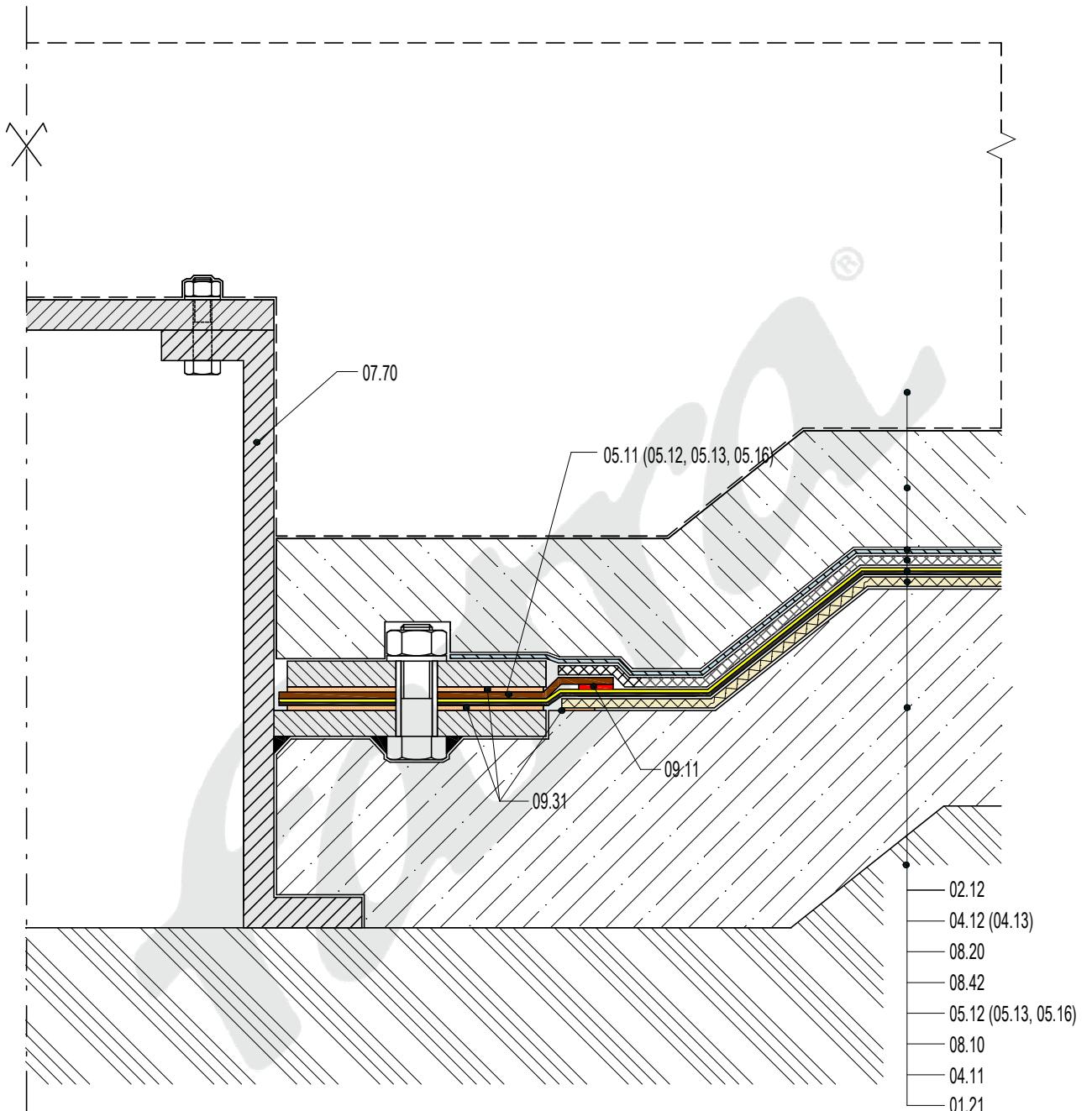
04.12 (04.13)
08.20
08.42
05.12 (05.13, 05.16)
08.10
04.11
01.21



04.34	PROTECTIVE PP BOARD TH. 5 mm
05.12	WATERPROOFING MEMBRANE FATRAFOL 803/VS OR 05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
08.42	PETEXDREN 900
03.10	LEVELED SHORING WALL - MILAN WALL, PILE WALL

ACCESSORIES

09.19	ADHESIVE TAPE FOR PP BOARDS
04.40	OBJECT PENETRATING WATERPROOFING MEMBRANE
05.11	WATERPROOFING MEMBRANE FATRAFOL 803 OR 05.13 FATRAFOL 803/V
07.51	FIXED STEEL FLANGE
07.52	LOOSE STEEL FLANGE
07.60	MODULAR (COMPACT) SEAL
09.11	HOT AIR WELD
09.31	PU SEALANT
10.20	JOINT FASTENER



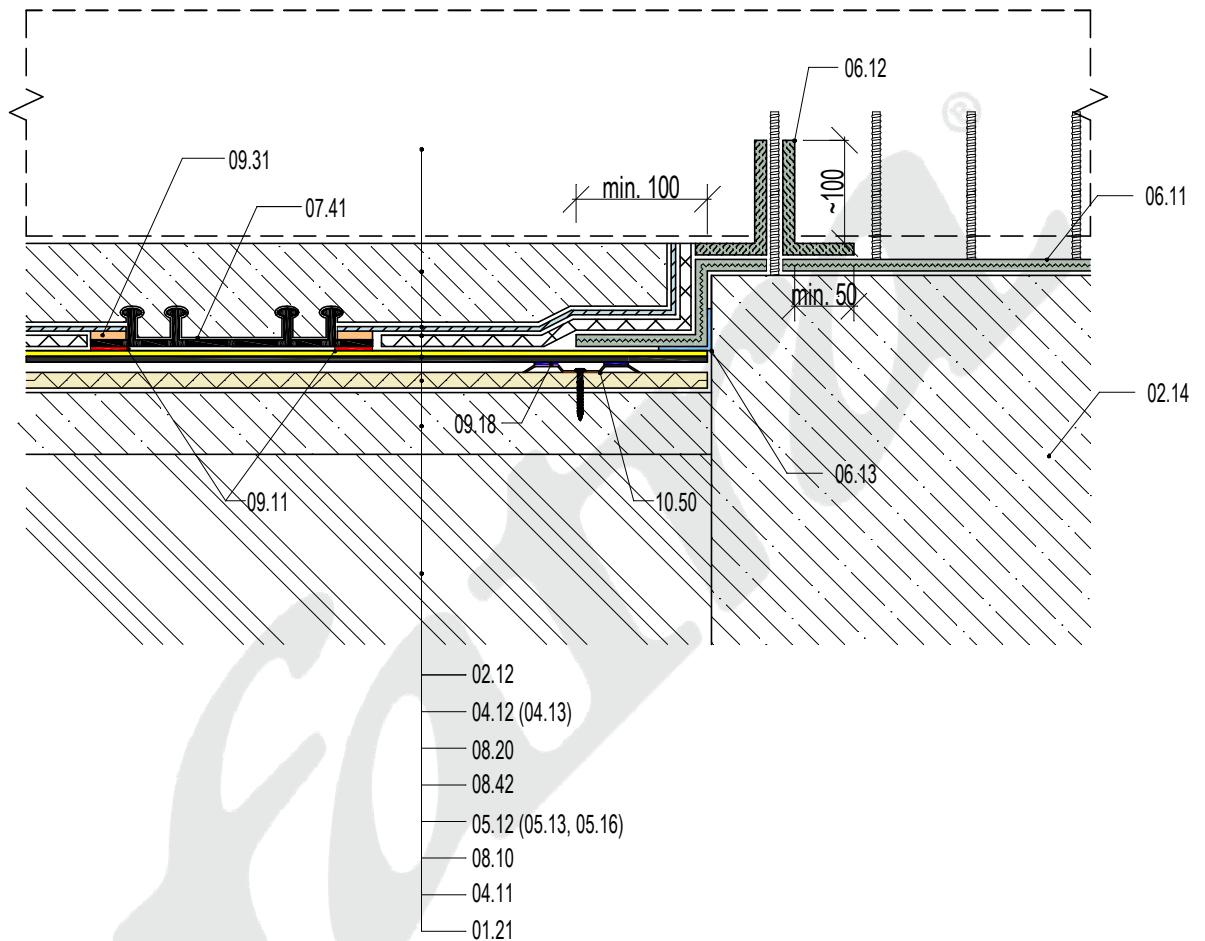
LEGEND

COMPOSITION

- 02.12 FOUNDATIONS (CONCRETE SLAB)
- 04.12 PROTECTIVE CONCRETE SCREED MIN. 50 MM OR
- 04.13 CEMENT SCREED MIN. 30 MM
- 08.20 PE MEMBRANE
- 08.42 PETEXDREN 900
- 05.12** WATERPROOFING MEMBRANE FATRAFOL 803/V
OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 04.11 REINFORCED CONCRETE BASE
- 01.21 SOIL

ACCESSORIES

- 05.11 WATERPROOFING MEMBRANE FATRAFOL 803
(05.12) FATRAFOL 803/V
- 07.70 WELL
- 09.11 HOT AIR WELD
- 09.31 PU SEALANT



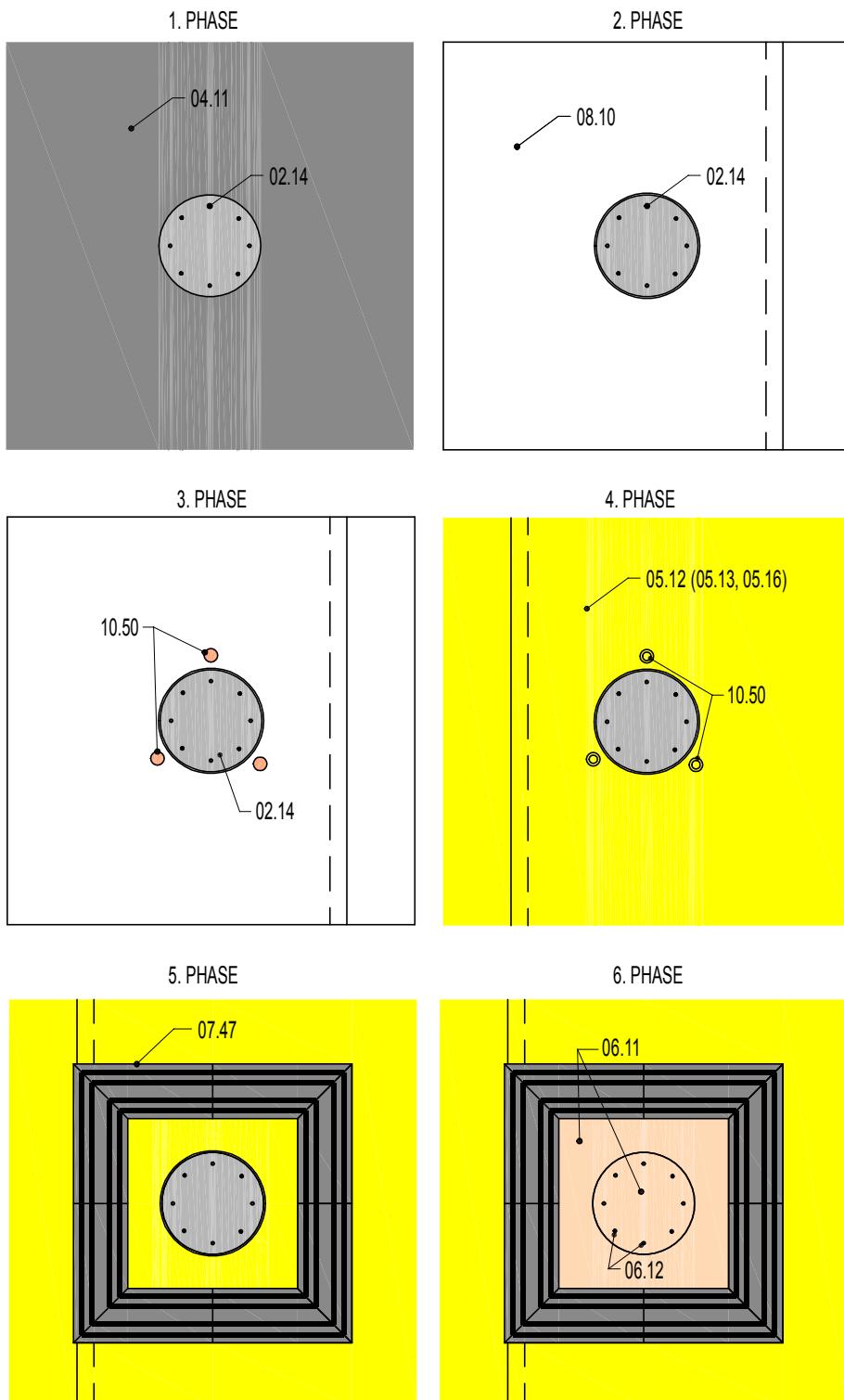
LEGEND

COMPOSITION

- 02.12 FOUNDATIONS (PILE)
- 04.12 PROTECTIVE CONCRETE SCREED MIN. 50 MM OR
04.13 CEMENT SCREED MIN. 30 MM
- 08.20 PE MEMBRANE
- 08.42 PETEXDREN 900
- 05.12 (05.13, 05.16) WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 04.11 REINFORCED CONCRETE BASE
- 01.21 SOIL

ACCESSORIES

- 02.14 FOUNDATIONS (CONCRETE SLAB)
- 04.11 TRIFLEX PRODETAIL
- 06.12 TRIFLEX PROFIBRE
- 06.13 TAPE STEINKLEBEBAND TRIFLEX
- 07.41 EXTERNAL WATERSTOP BAR
- 09.11 HOT AIR WELD
- 09.18 INDUCTION WELD
- 09.31 PU SEALANT
- 10.50 INDUCTION PLATE PVC + FASTENER



02.14 FOUNDATIONS (PILE)

04.11 REINFORCED CONCRETE BASE

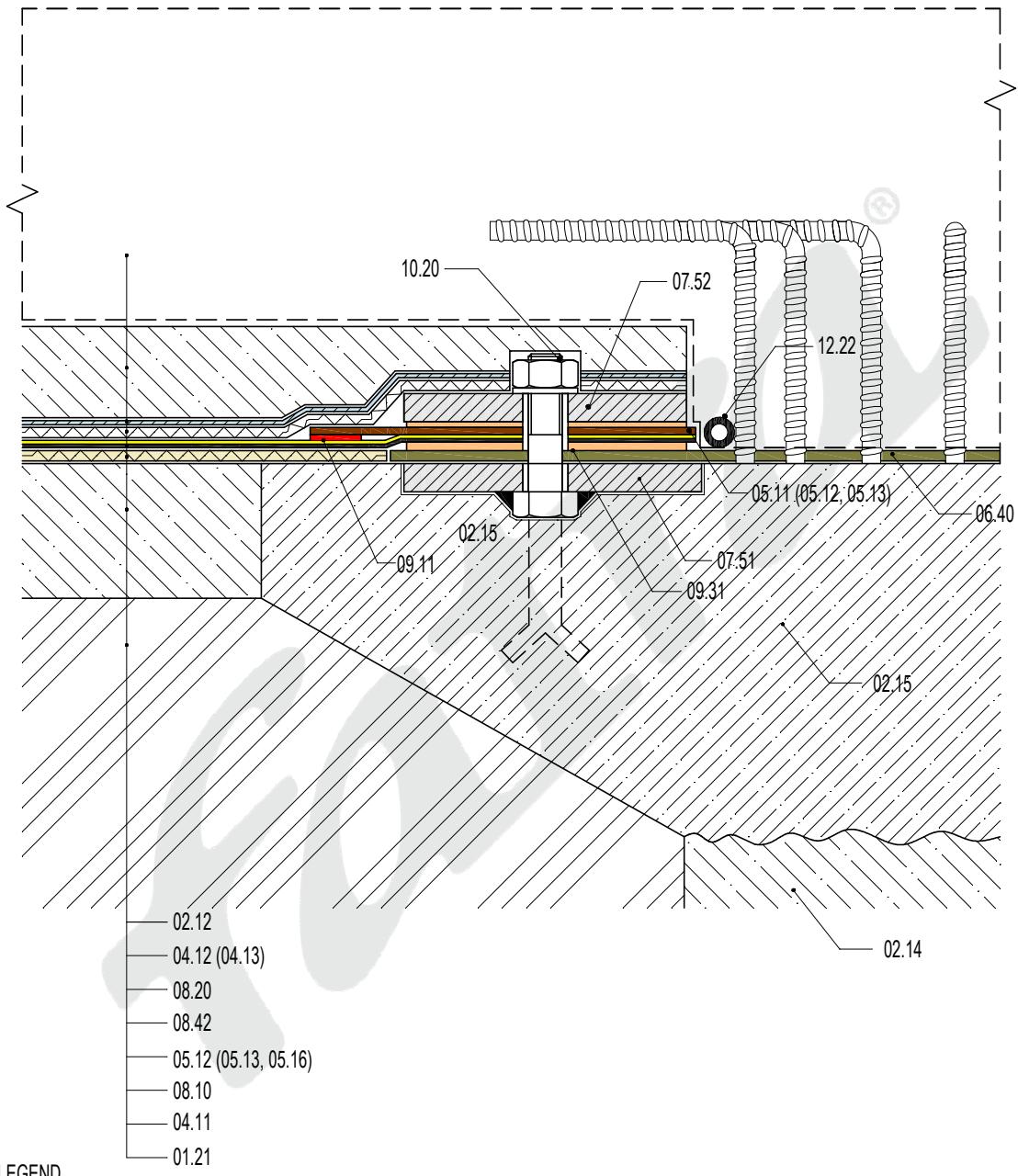
05.12 WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V

06.11 TRIFLEX PRODETAIL

06.12 TRIFLEX PROFIBRE

07.47 SHAPED PIECE "ANGLE" MADE OF EXTERNAL WATERSTOP BAR

08.10 SEPARATION FABRIC - NON WOVEN SEPARATION GEOTEXTILE
10.50 INDUCTION PLATE PVC + FASTENER



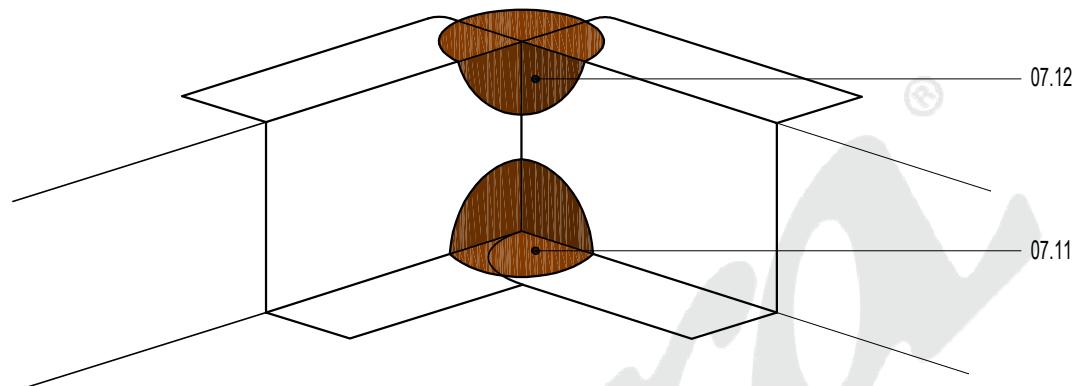
COMPOSITION

- 02.12 FOUNDATIONS (CONCRETE SLAB)
- 04.12 PROTECTIVE CONCRETE SCREED MIN. 50 MM OR
04.13 CEMENT SCREED MIN. 30 MM
- 08.20 PE MEMBRANE
- 08.42 PETEXDREN 900
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 04.11 REINFORCED CONCRETE BASE
- 01.21 SOIL

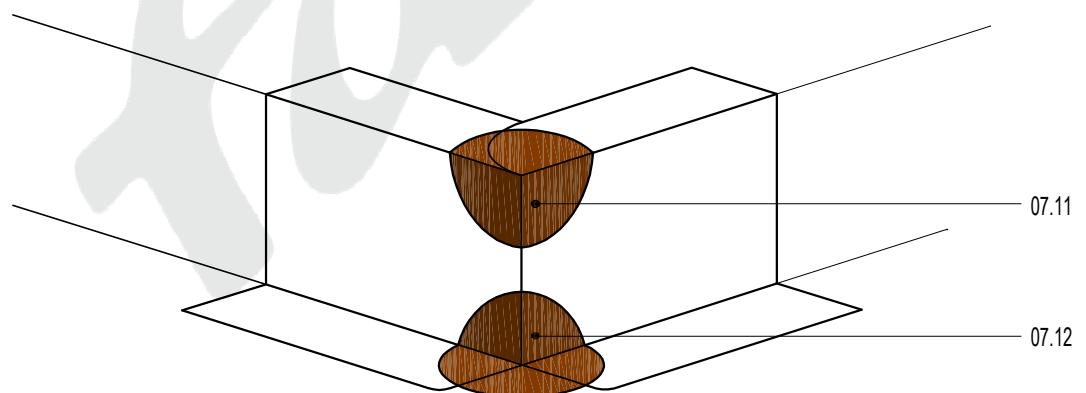
ACCESSORIES

- 02.14 FOUNDATIONS (PILE)
- 02.15 CONCRETE OF ENLARGED PILE HEAD AREA
WITH CRYSTALLINE ADMIXTURE
- 05.11 WATERPROOFING MEMBRANE FATRAFOL 803
- 06.40 EPOXY RESIN
- 07.51 FIXED STEEL FLANGE
- 07.52 LOOSE STEEL FLANGE
- 09.11 HOT AIR WELD
- 09.31 PU SEALANT
- 10.20 JOINT FASTENER
- 12.22 INJECTION HOSE FOR CONSTRUCTION JOINTS

INTERNAL CORNER

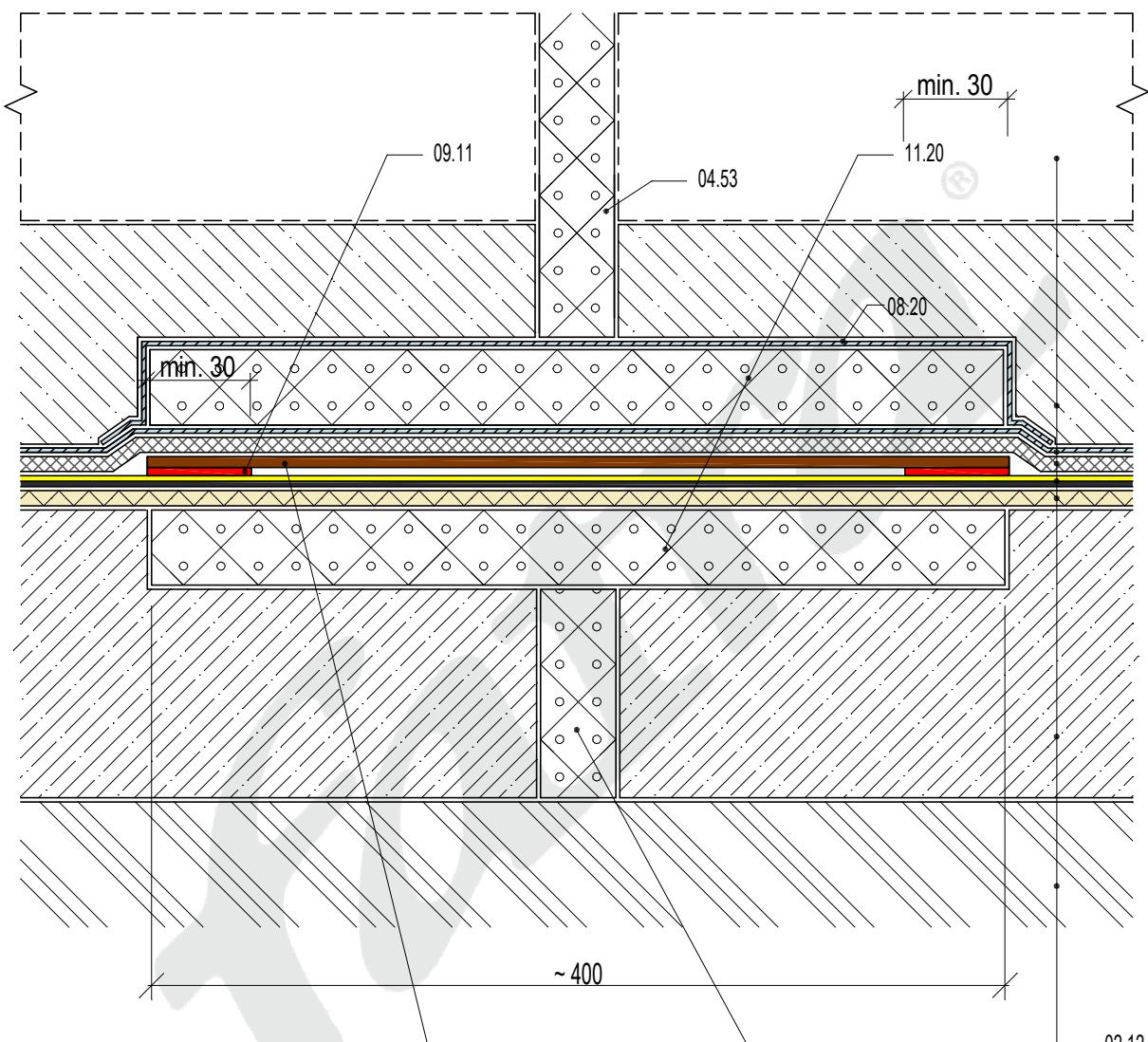


EXTERNAL CORNER



LEGEND

- 07.11 INTERNAL CORNER, TYPE 10
07.12 EXTERNAL CORNER, TYPE 11



LEGEND

COMPOSITION

- 02.12 FOUNDATIONS (CONCRETE SLAB)
- 04.12 PROTECTIVE CONCRETE SCREED MIN. 50 MM OR
04.13 CEMENT SCREED MIN. 30 MM
- 08.20 PE MEMBRANE
- 08.42 PETEXDREN 900
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/V/S OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 04.11 REINFORCED CONCRETE BASE
- 01.21 SOIL

ACCESSORIES

- 04.53 GAP FILLING
- 05.11 WATERPROOFING MEMBRANE FATRAFOL 803 OR
05.13 FATRAFOL 803/V
- 09.11 HOT AIR WELD
- 11.20 INSULATION

02.12
04.12 (04.13)
08.20
08.42
05.12 (05.13, 05.16)
08.10
04.11
01.21

Expansion gap

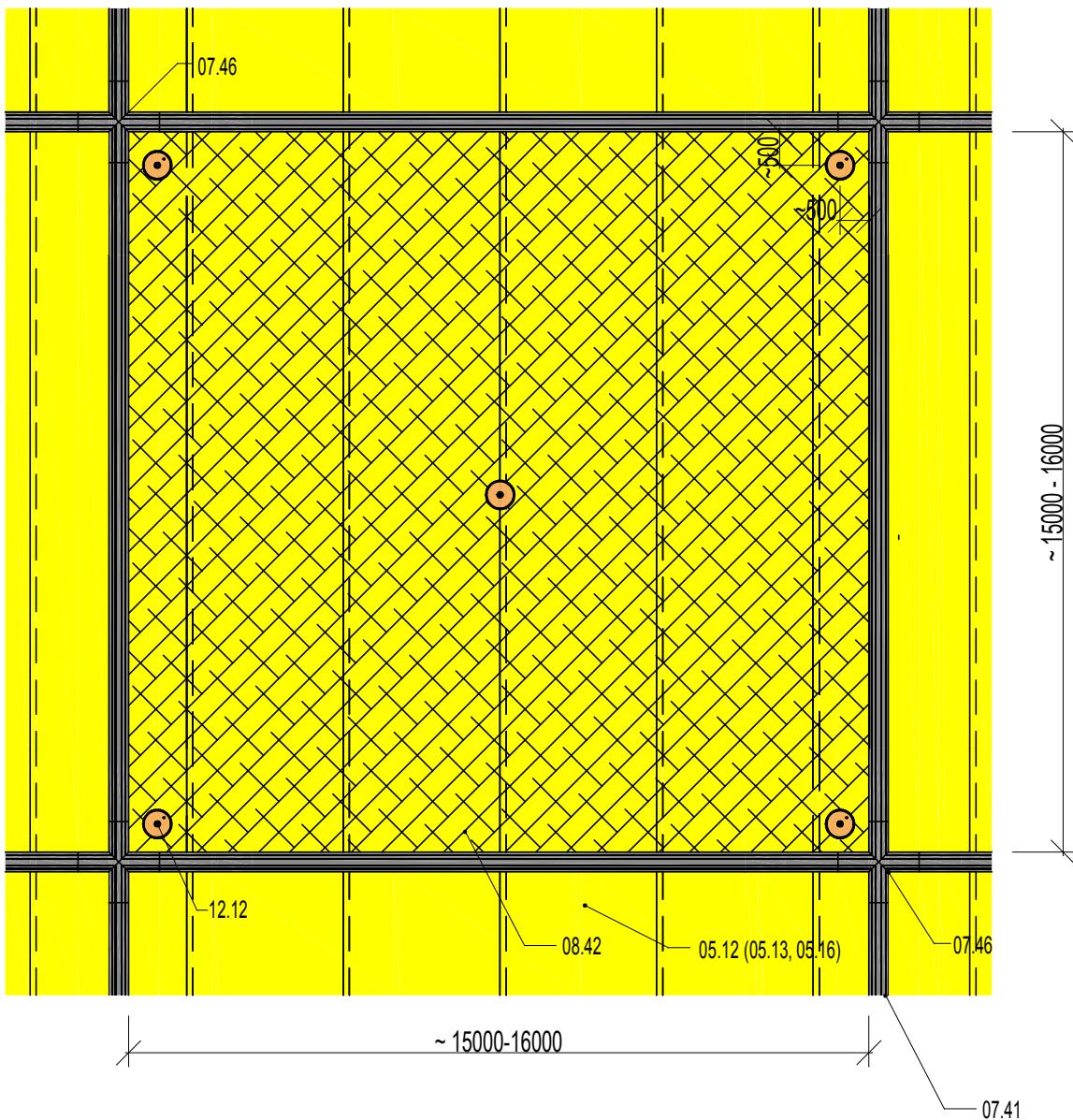
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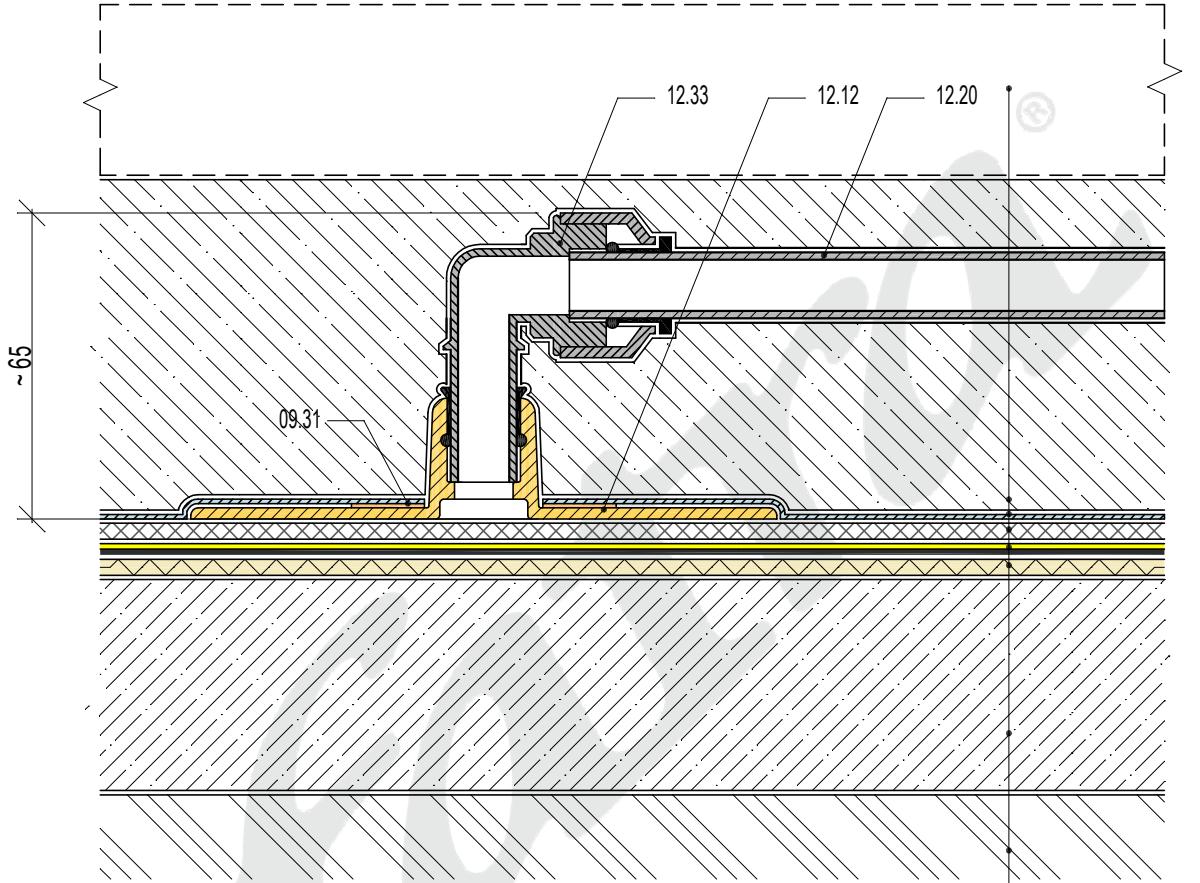
Fatra, a.s., třída Tomáše Bati 1541, 763 61 Napajedla, Czech Republic
tel. +420 577 501 111, fax. +420 577 502 555, e-mail: info@fatrafal.cz, www.fatrafal.cz

DETAIL 601 HP



LEGEND

- | | |
|-------|---|
| 05.12 | WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V |
| 07.41 | EXTERNAL WATERSTOP BAR |
| 07.46 | SHAPED PIECE "CROSS" MADE OF EXTERNAL WATERSTOP BAR |
| 08.42 | PETEXDREN 900 |
| 12.12 | INJECTION PORT |



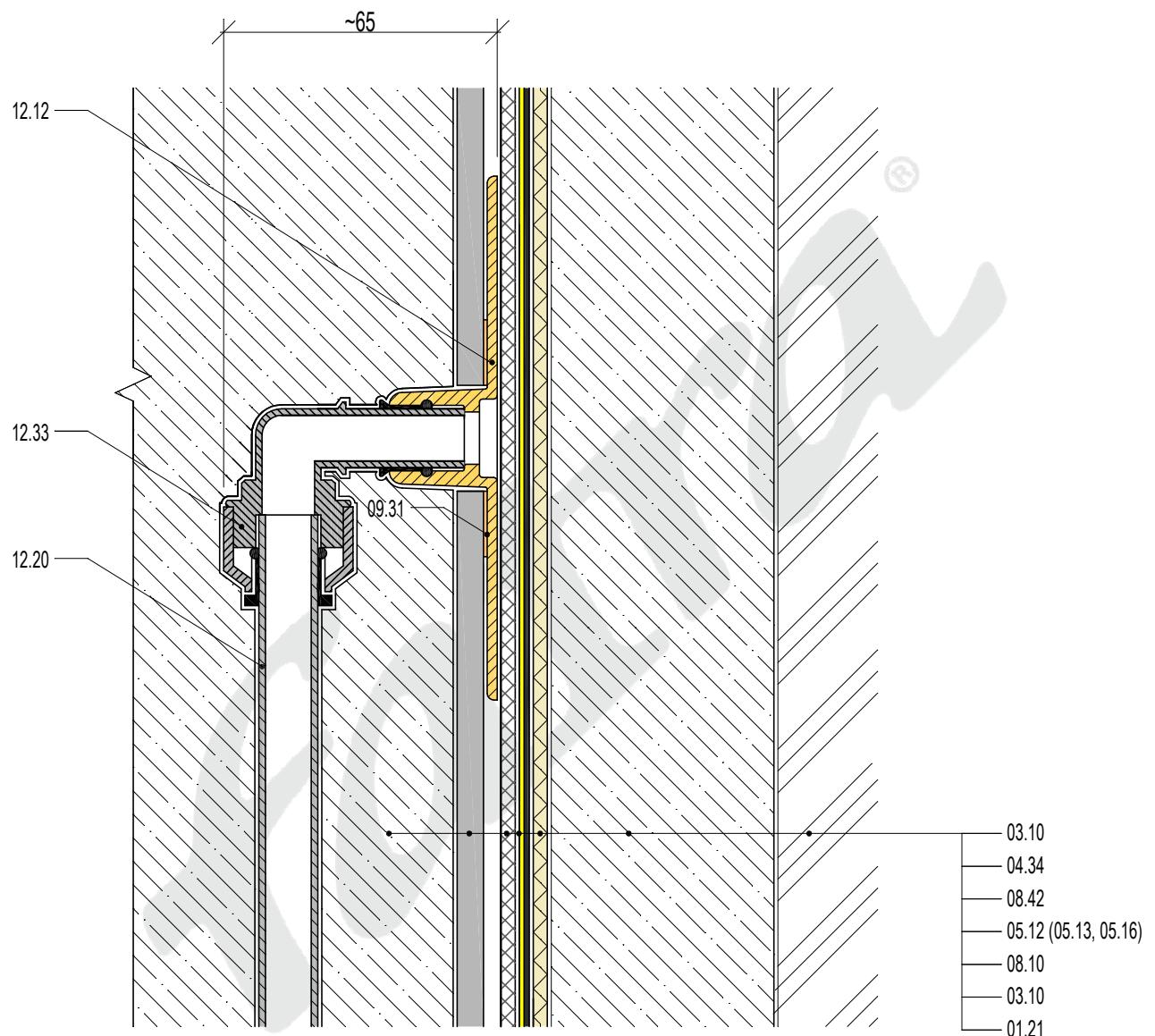
LEGEND

COMPOSITION

02.12	FOUNDATIONS (CONCRETE SLAB)
04.12	PROTECTIVE CONCRETE SCREED MIN. 50 MM OR
	04.13 CEMENT SCREED MIN. 30 MM
08.20	PE MEMBRANE
08.42	PETEXDREN 900
05.12	WATERPROOFING MEMBRANE FATRAFOL 803/VS OR 05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
08.10	SEPARATION FABRIC NON WOVEN GEOTEXTILE
04.11	REINFORCED CONCRETE BASE
01.21	SOIL

ACCESSORIES

02.12
04.12 (04.13)
08.20
08.42
05.12 (05.13, 05.16)
08.10
04.11
01.21



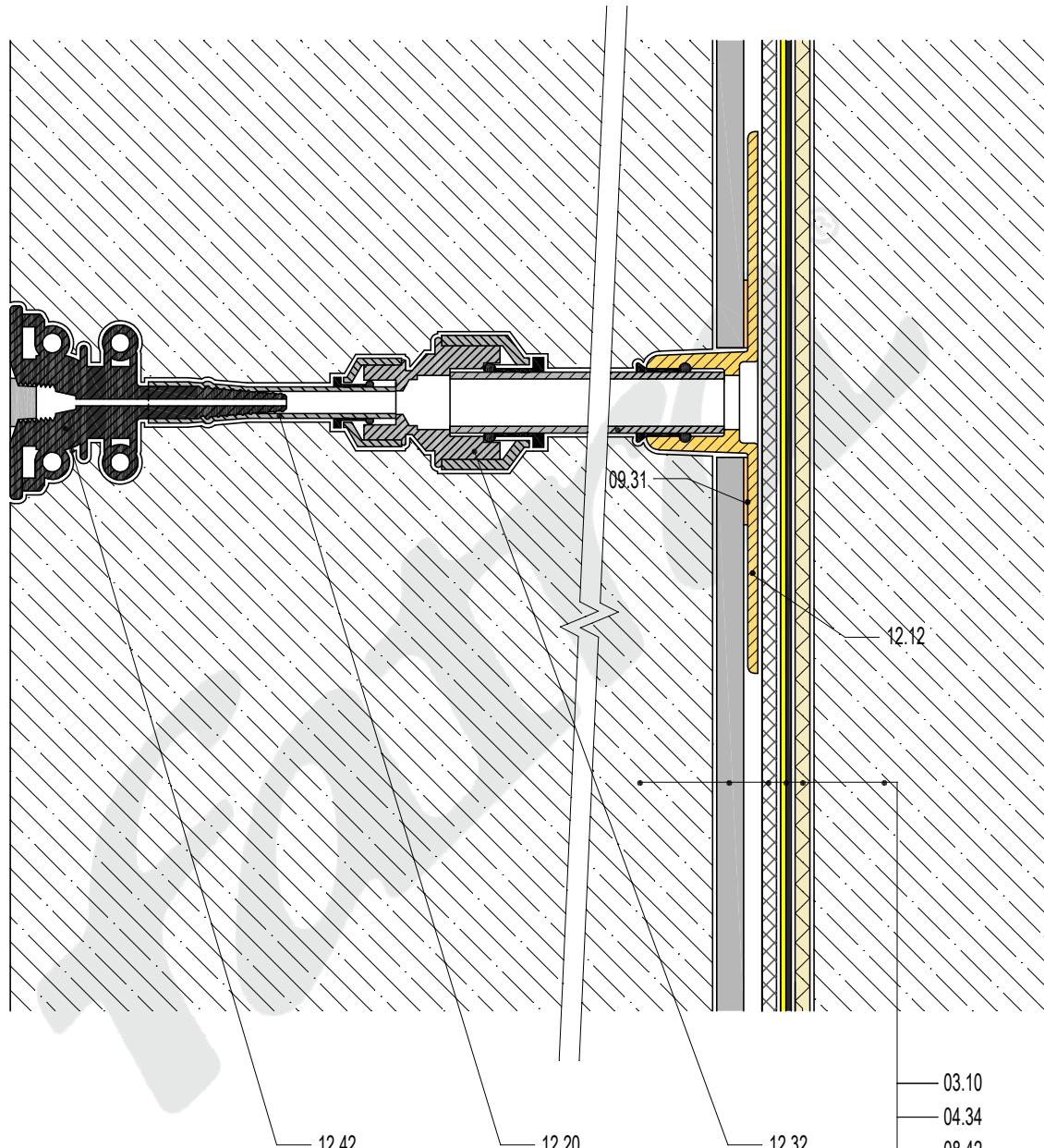
LEGEND

COMPOSITION

- 03.10 BASEMENT WALL
- 04.34 PROTECTIVE PP BOARD TH. 5 mm
- 08.42 PETEXDREN 900
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V**
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 03.10 LEVELED SHORING WALL - MILAN WALL, PILE WALL
- 01.21 SOIL

ACCESSORIES

- 09.31 PU SEALANT
- 12.12 INJECTION PORT
- 12.20 INJECTION PIPE 15BPERT
- 12.33 STEM ELBOW PEM 221515W



LEGEND

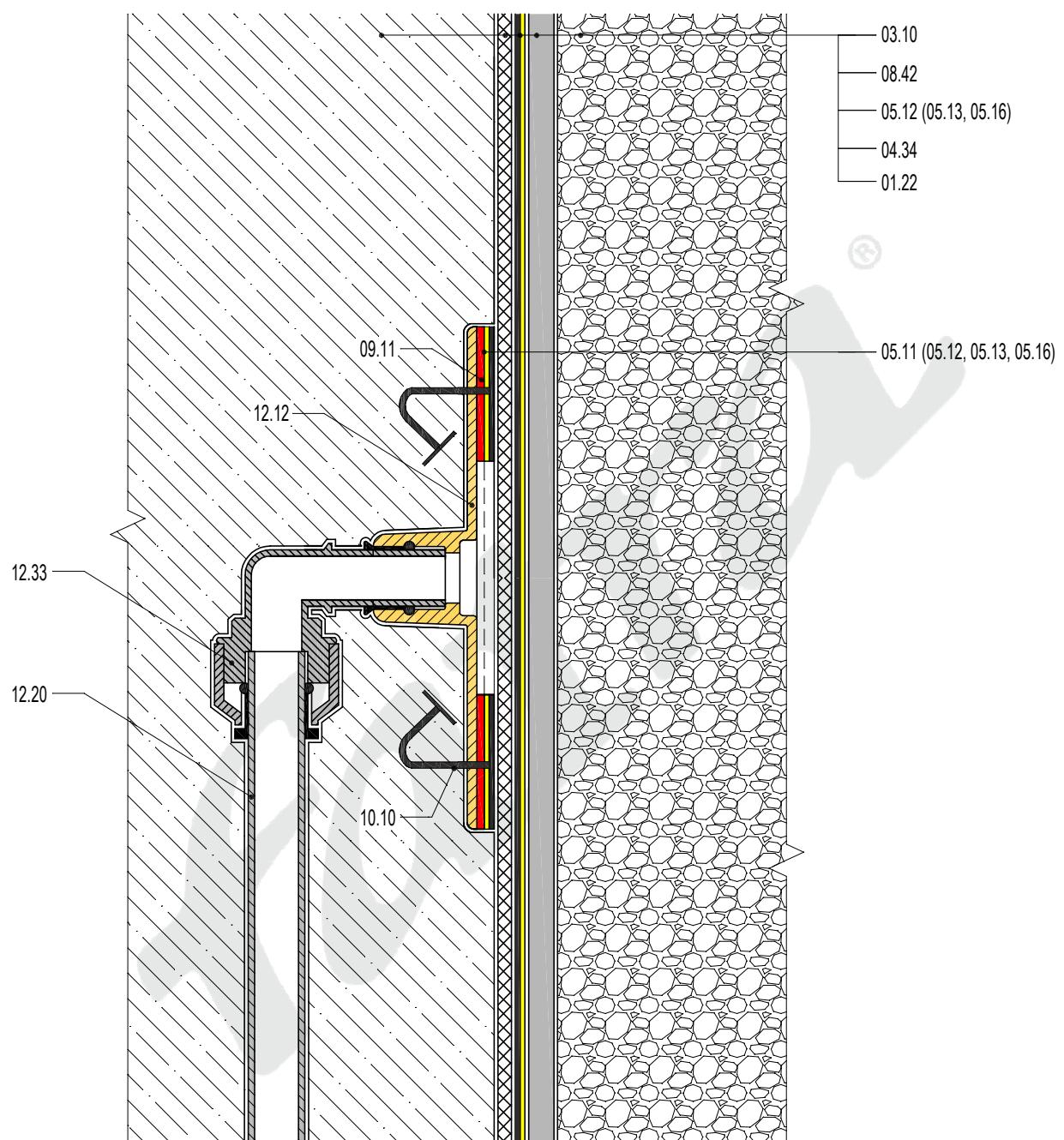
- 03.10
- 04.34
- 08.42
- 05.12 (05.13, 05.16)
- 08.10
- 03.10

COMPOSITION

- 03.10 BASEMENT WALL
- 04.34 PROTECTIVE PP BOARD TH. 5 mm
- 08.42 PETEXDREN 900
- 05.12 WATERPROOFING MEMBRANE FATRAFOL 803/VS OR
05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
- 08.10 SEPARATION FABRIC - NON WOVEN GEOTEXTILE
- 03.10 LEVELED SHORING WALL - MILAN WALL, PILE WALL

ACCESSORIES

- 09.31 PU SEALANT
- 12.12 INJECTION PORT
- 12.20 INJECTION PIPE 15BPERT
- 12.32 REDUCING STRAIGHT PEM 201510W
- 12.42 INJECTION PACKER



LEGEND

~65

COMPOSITION

03.10	BASEMENT WALL
08.42	PETEXDREN 900
05.12	WATERPROOFING MEMBRANE FATRAFOL 803/VS OR 05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
04.34	PROTECTIVE PP BOARD TH. 5 mm
01.22	COMPACTED TRENCH BACKFILL

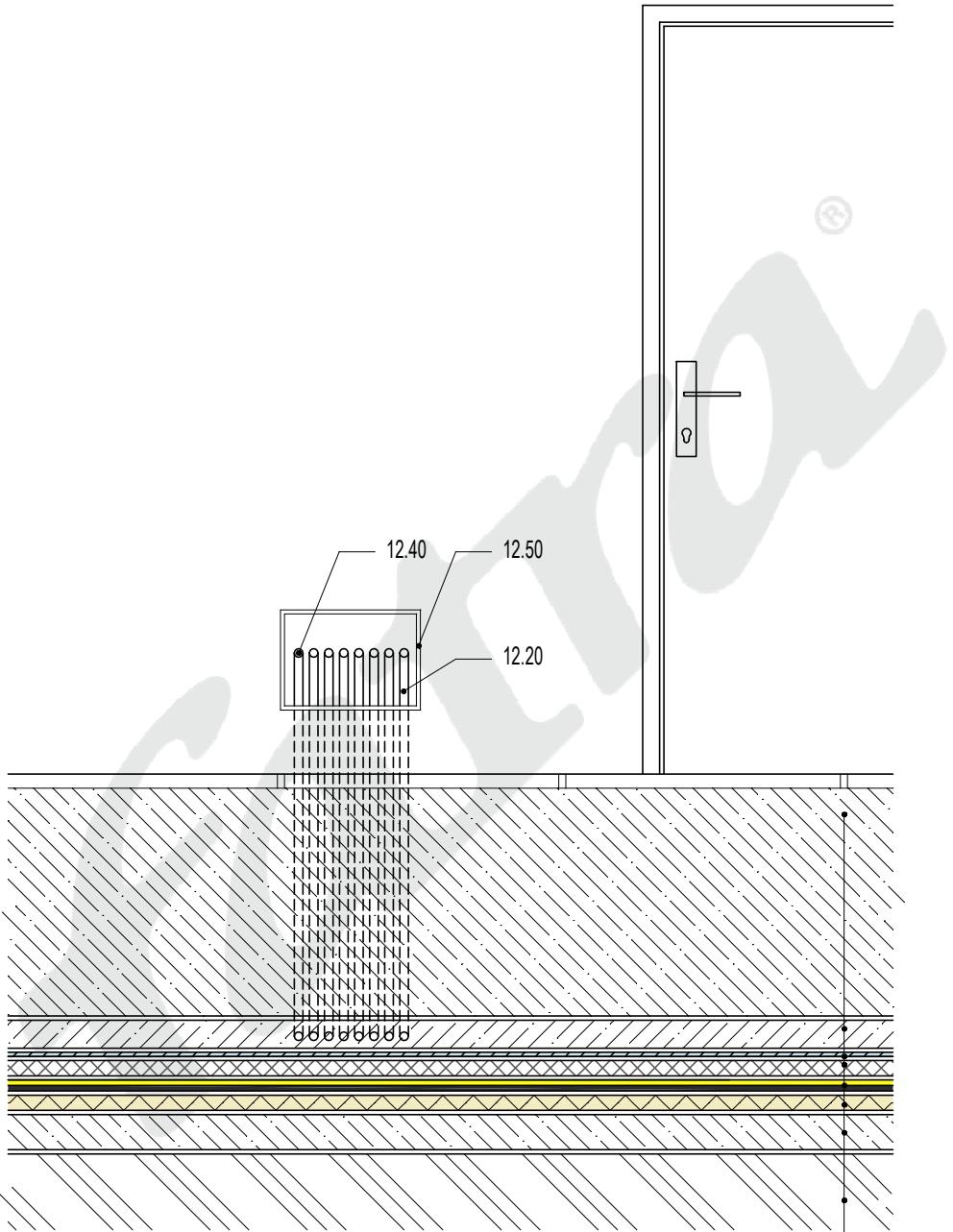
ACCESSORIES

05.11	WATERPROOFING MEMBRANE FATRAFOL 803 OR 05.13 FATRAFOL 803/V
09.11	HOT AIR WELD
10.10	FASTENER
12.12	INJECTION PORT
12.20	INJECTION PIPE15BPERT
12.33	STEM ELBOW PEM 221515W

Injection port in vertical waterproofing barrier constructed from outside (from trench)

DATE

3/2016



LEGEND

COMPOSITION

02.12	FOUNDATIONS (CONCRETE SLAB)
04.12	PROTECTIVE CONCRETE SCREED MIN. 50 MM OR 04.13 CEMENT SCREED MIN. 30 MM
08.20	PE MEMBRANE
08.42	PETEXDREN 900
05.12	WATERPROOFING MEMBRANE FATRAFOL 803/VS OR 05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
08.10	SEPARATION FABRIC NON WOVEN GEOTEXTILE
04.11	REINFORCED CONCRETE BASE
01.21	SOIL

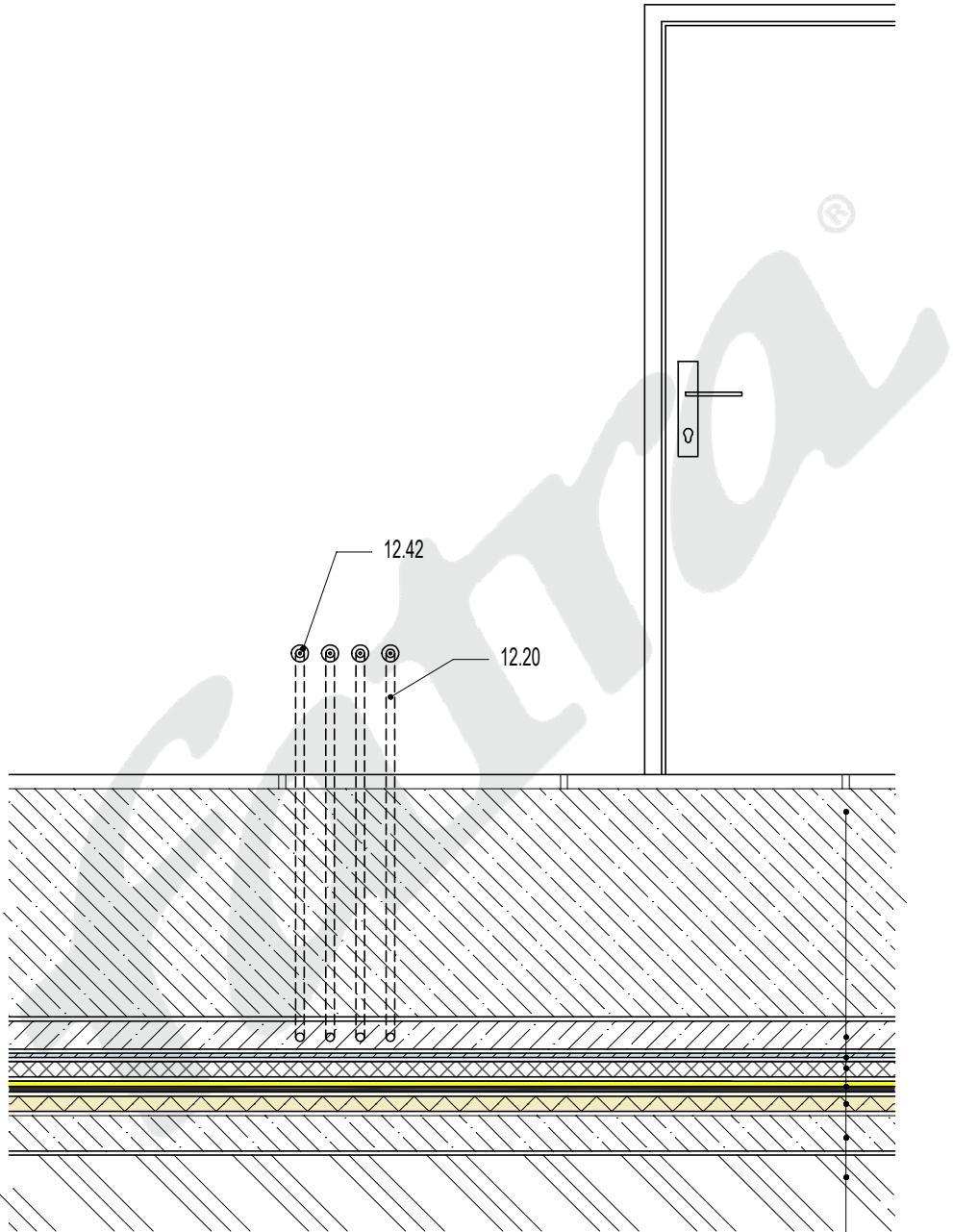
ACCESSORIES

12.20	INJECTION PIPE 15BPERT	02.12
12.40	EMERGENCY SHUT-OFF 15ESOT	04.12 (04.13)
12.50	PLASTIC BOX	08.20
		08.42
		05.12 (05.13, 05.16)
		08.10
		04.11
		01.21

Ending injection pipes in box

DATE

3/2016



LEGEND

COMPOSITION

02.12	FOUNDATIONS (CONCRETE SLAB)
04.12	PROTECTIVE CONCRETE SCREED MIN. 50 MM OR 04.13 CEMENT SCREED MIN. 30 MM
08.20	PE MEMBRANE
08.42	PETXDREN 900
05.12	WATERPROOFING MEMBRANE FATRAFOL 803/VS OR 05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V
08.10	SEPARATION FABRIC NON WOVEN GEOTEXTILE
04.11	REINFORCED CONCRETE BASE
01.21	SOIL

ACCESSORIES

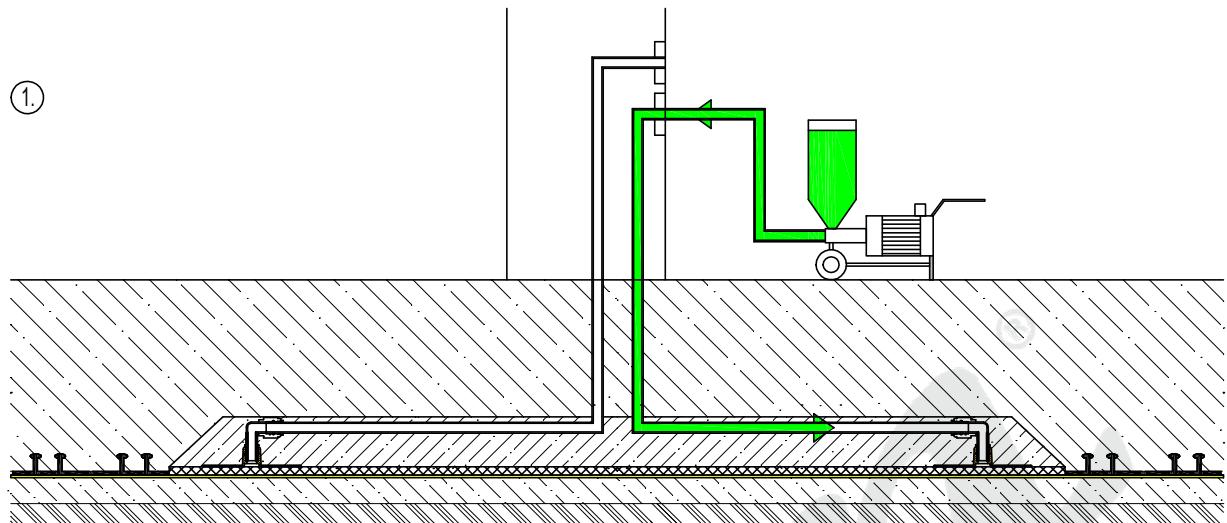
12.20	INJECTION PIPE 15BPERT	02.12
12.42	INJECTION PACKER	04.12 (04.13)
		08.20
		08.42
		05.12 (05.13, 05.16)
		08.10
		04.11
		01.21

Ending injection pipes with packers

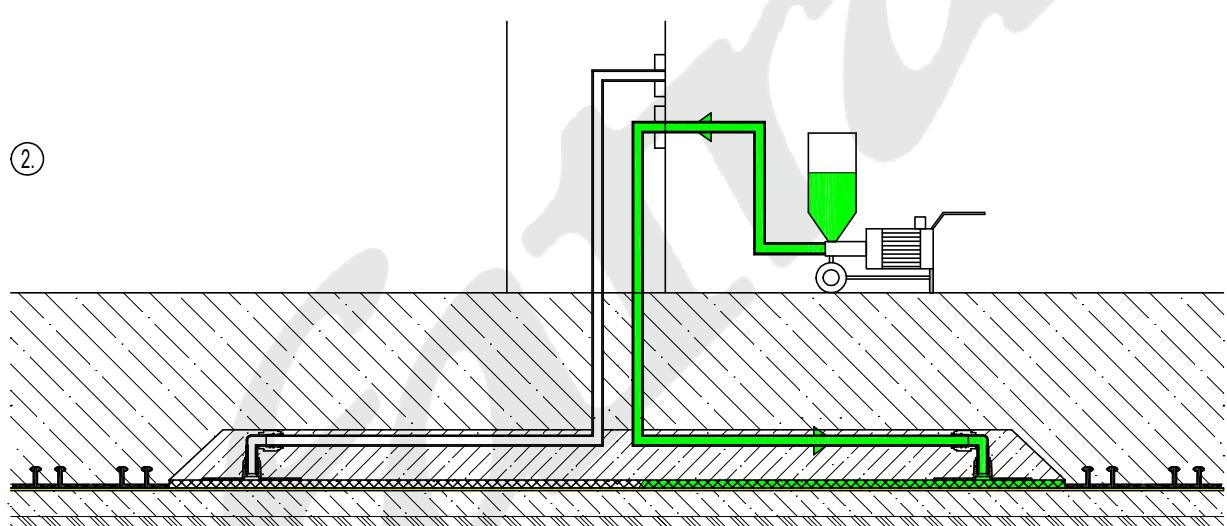
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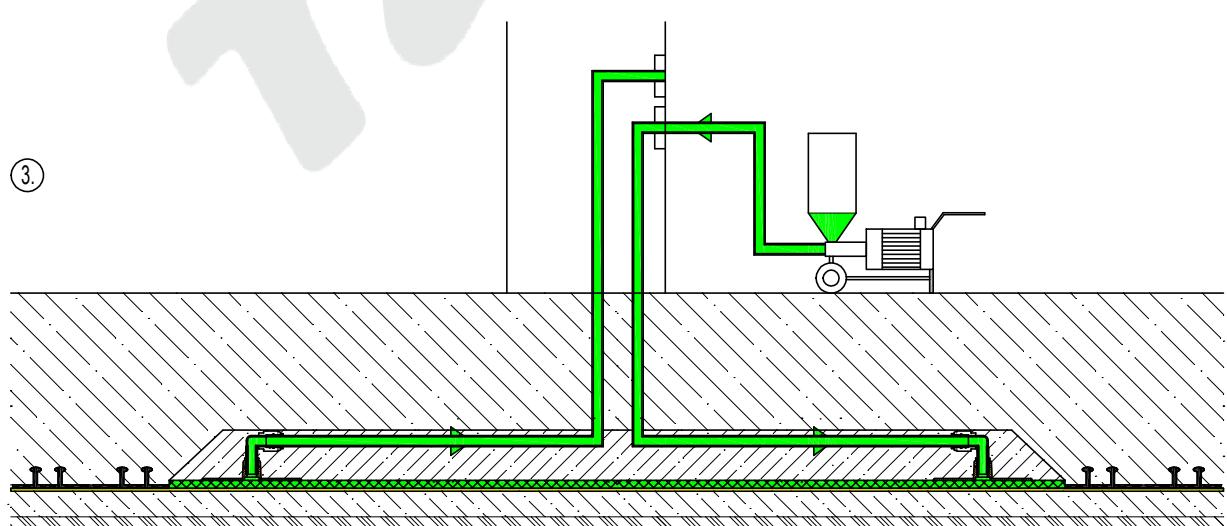
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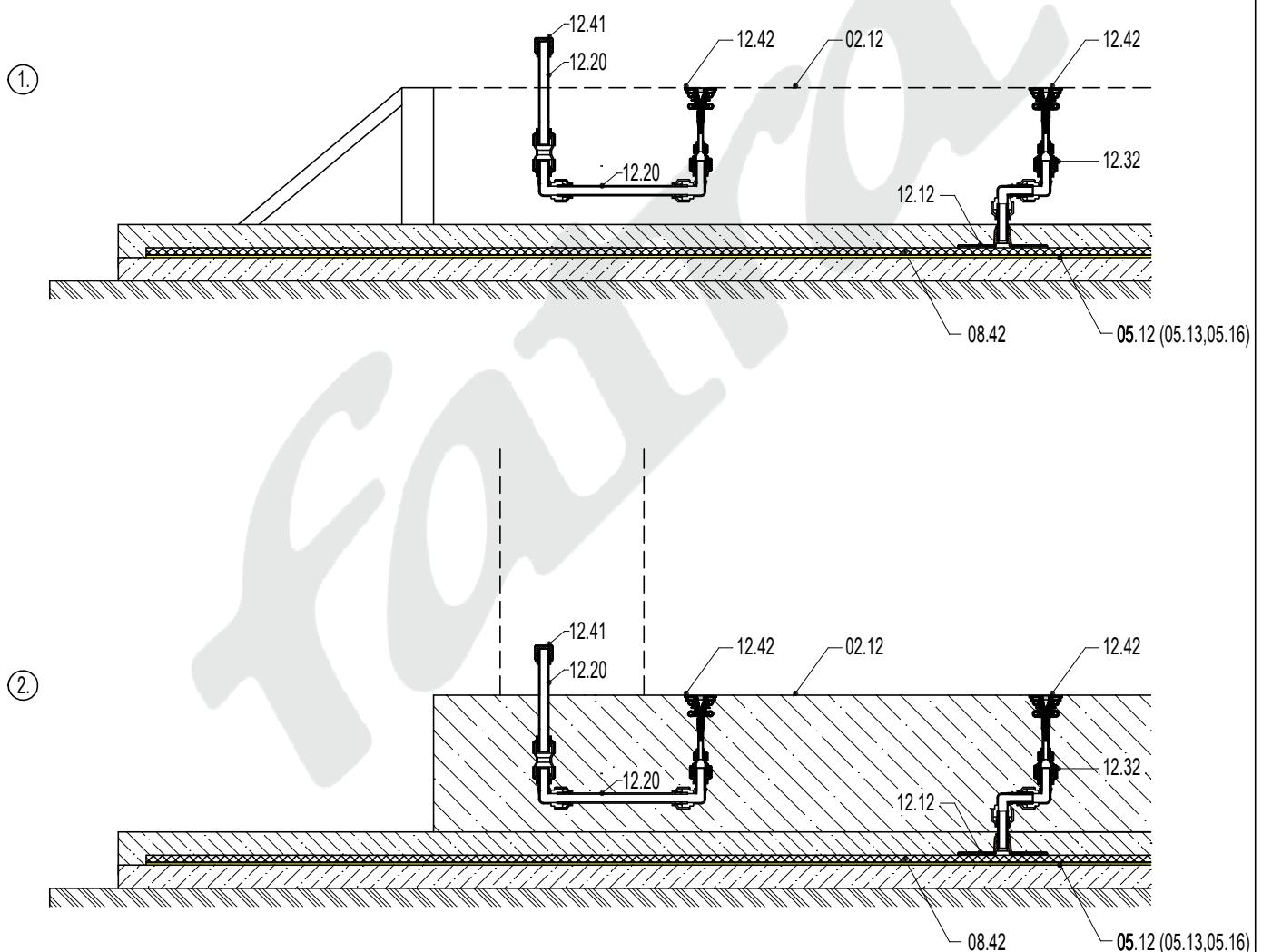
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LEGEND



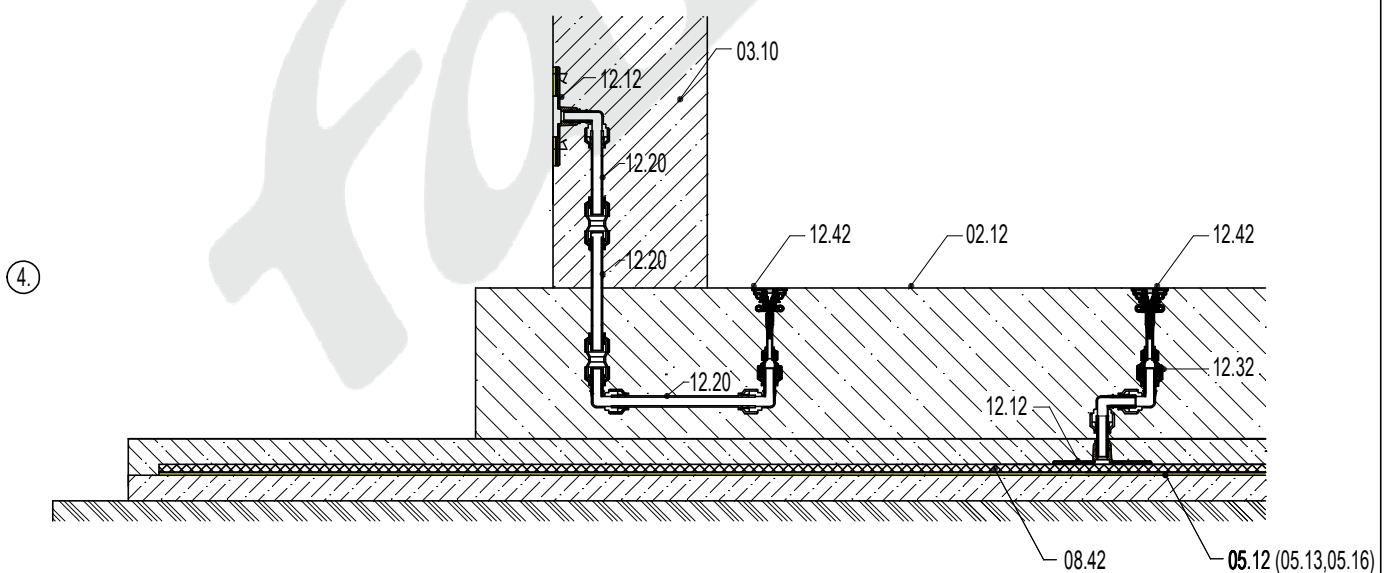
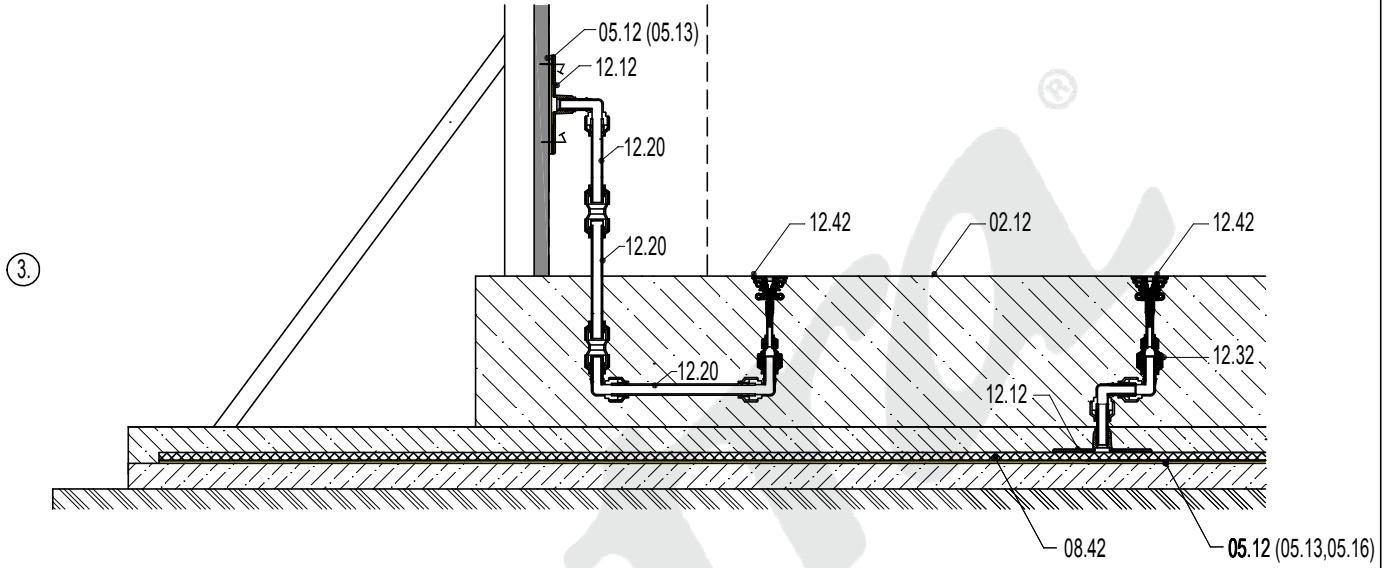
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02.12	FOUNDATIONS (CONCRETE SLAB)	12.32	REDUCING STRAIGHT PEM 201510W
03.10	BASEMENT WALL	12.41	STOP END PSM 4615W
05.12	WATERPROOFING MEMBRANE FATRAFOL 803/VS OR 05.16 FATRAFOL 803/VST OR 05.13 FATRAFOL 803/V	12.42	INJECTION PACKER
08.42	PETEXDREN 900		
12.12	INJECTION PORT		
12.20	INJECTION PIPE 15BPERT		

Vertical sectors injection pipes ended with packers in foundation slab, installation in stages - PHASE 1 and 2

DATE

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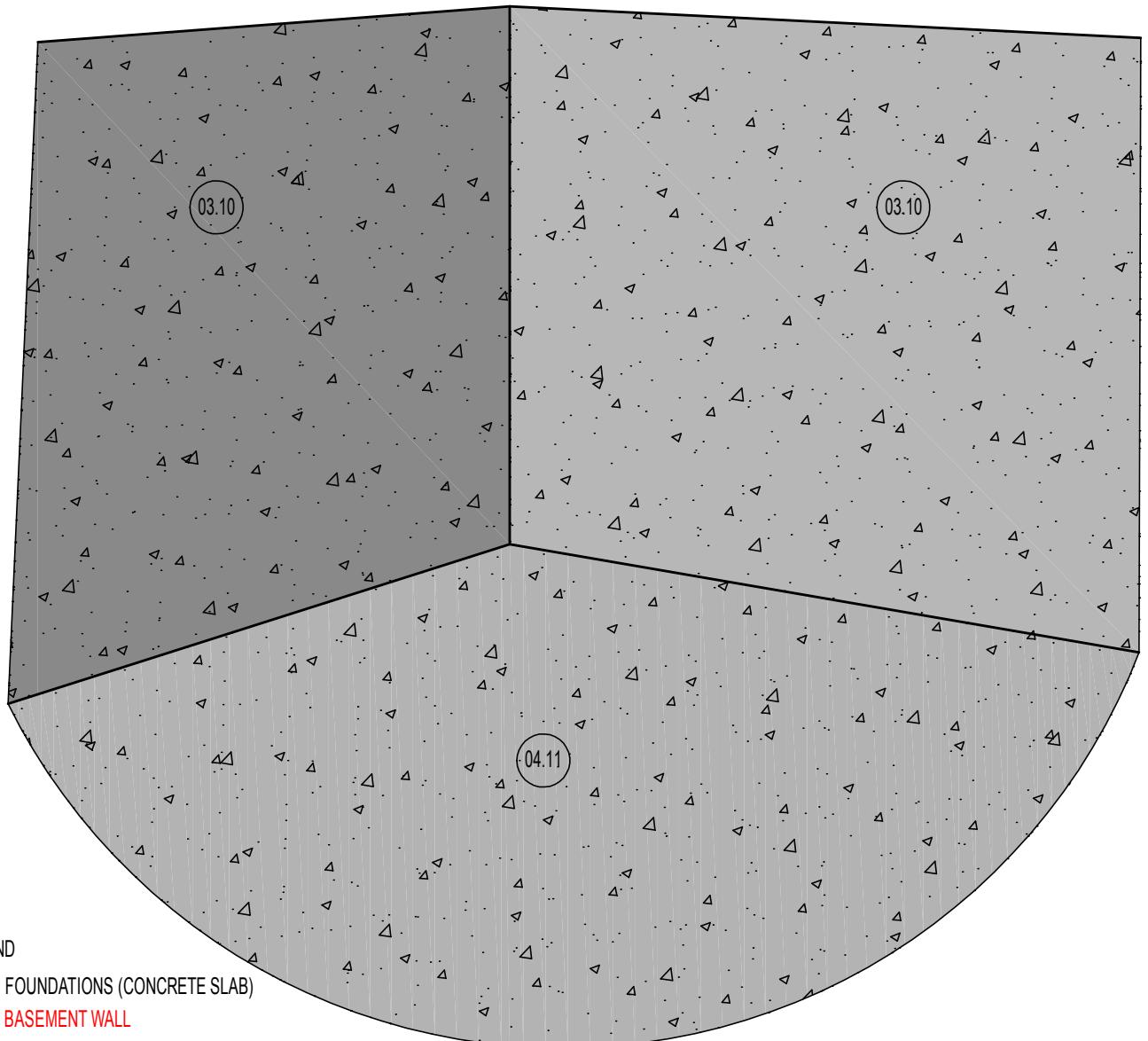
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02.12	FOUNDATIONS (CONCRETE SLAB)	12.32	REDUCING STRAIGHT PEM 201510W
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08.42	PETEXDREN 900		
12.12	INJECTION PORT		
12.20	INJECTION PIPE 15BPERT		

Vertical sectors injection pipes ended with packers in foundation slab, installation in stages - PHASE 3 and 4

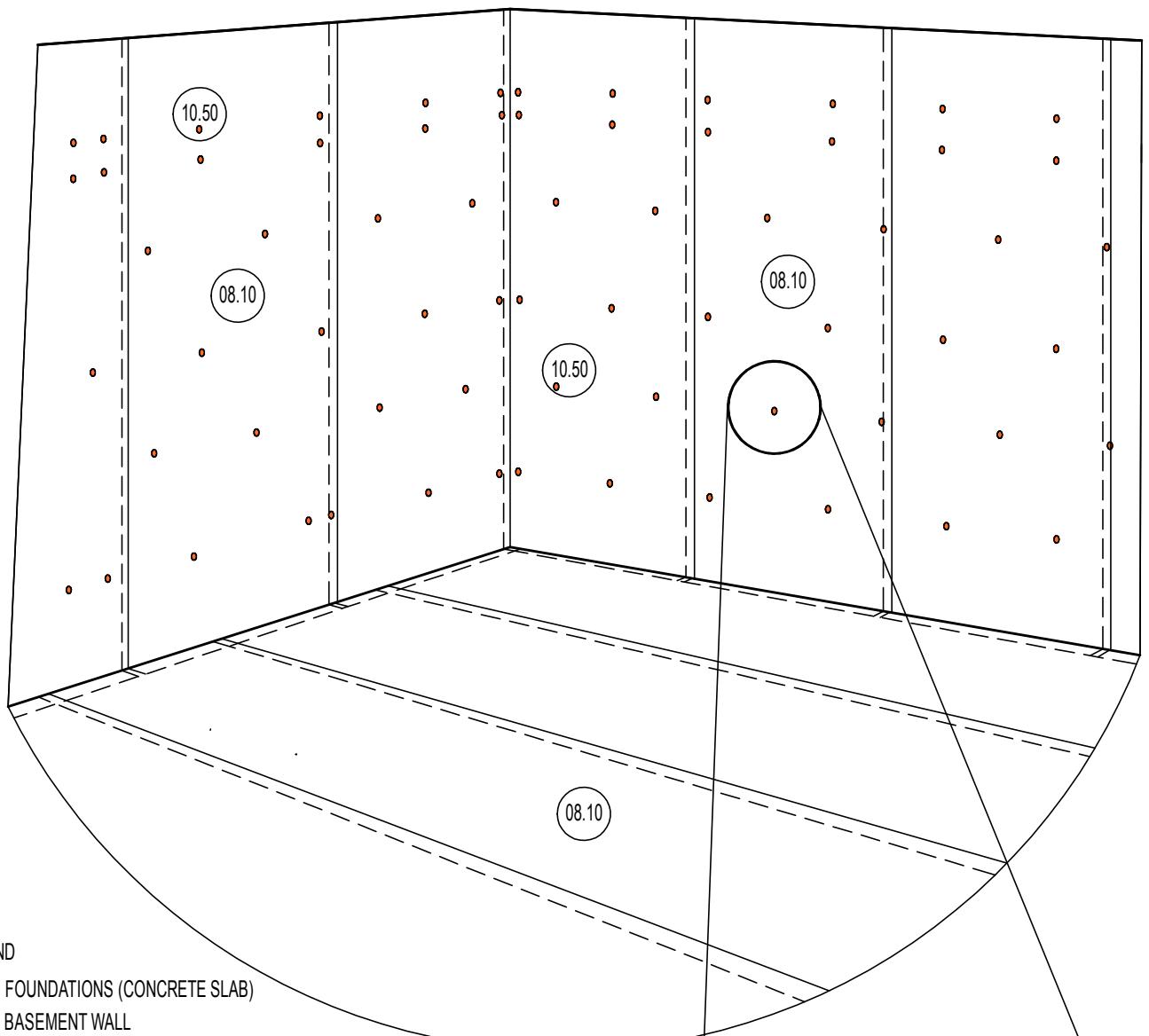
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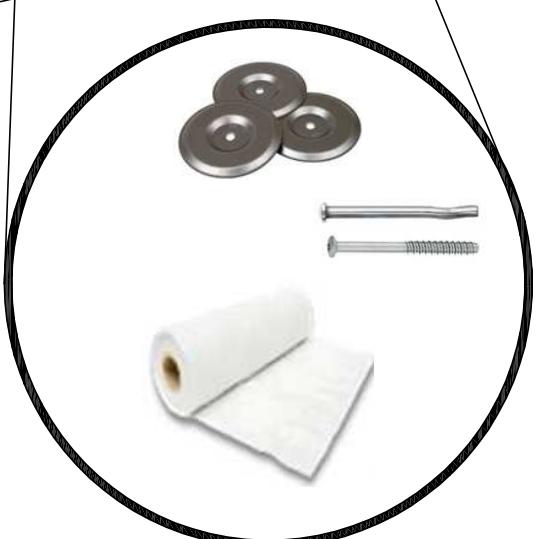
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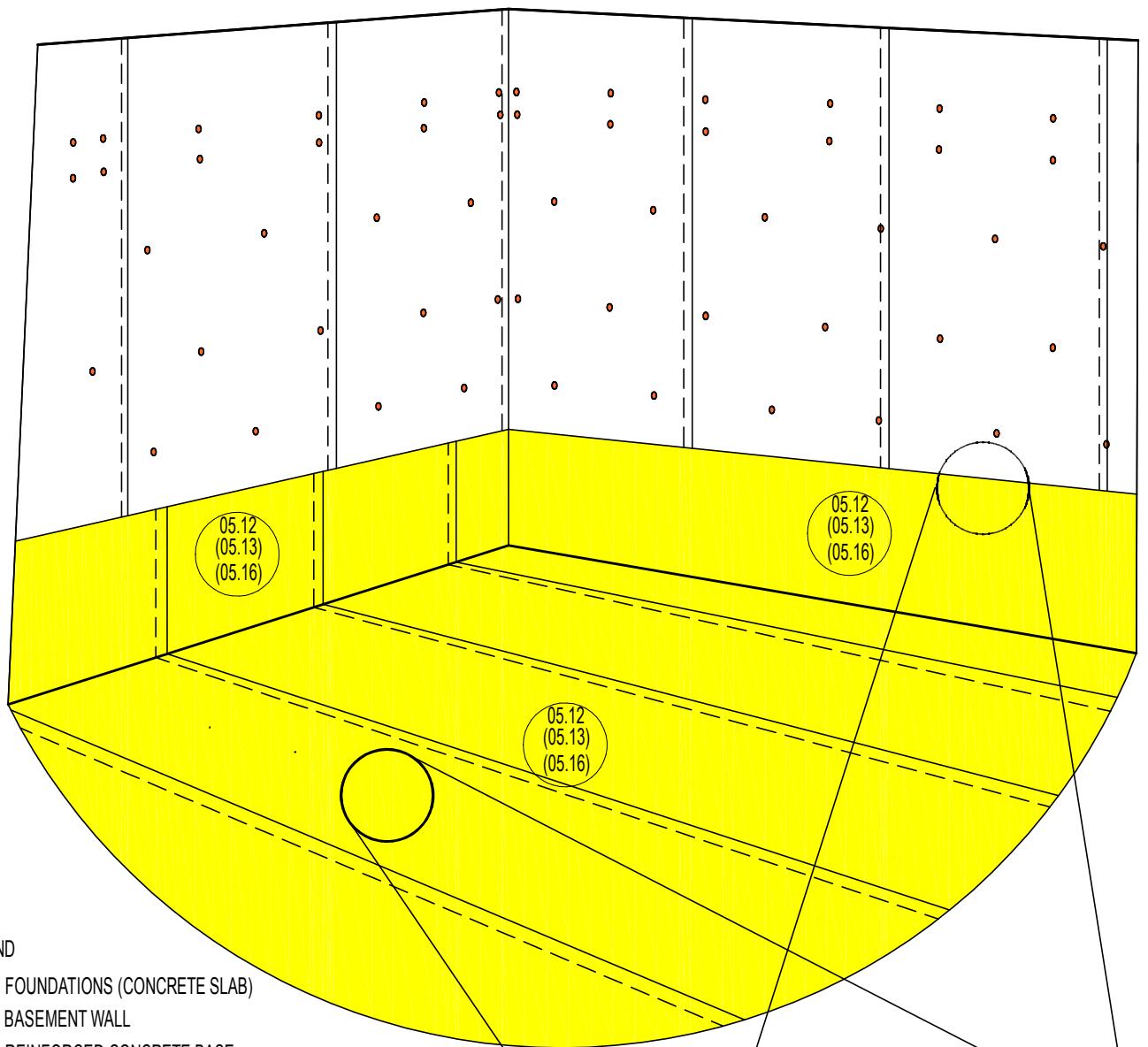
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- 05.13 MEMBRANE FATRAFOL 803/V 10.51 FIXING PLATE HP
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- 08.10 SEP. FABRIC NON WOVEN GEOTEXTILE 12.20 INJECTION PIPE 15BPERT
- 08.20 PE MEMBRANE 12.21 INJECTION PIPE 10BPEX-25C
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- 12.42 INJECTION PACKER

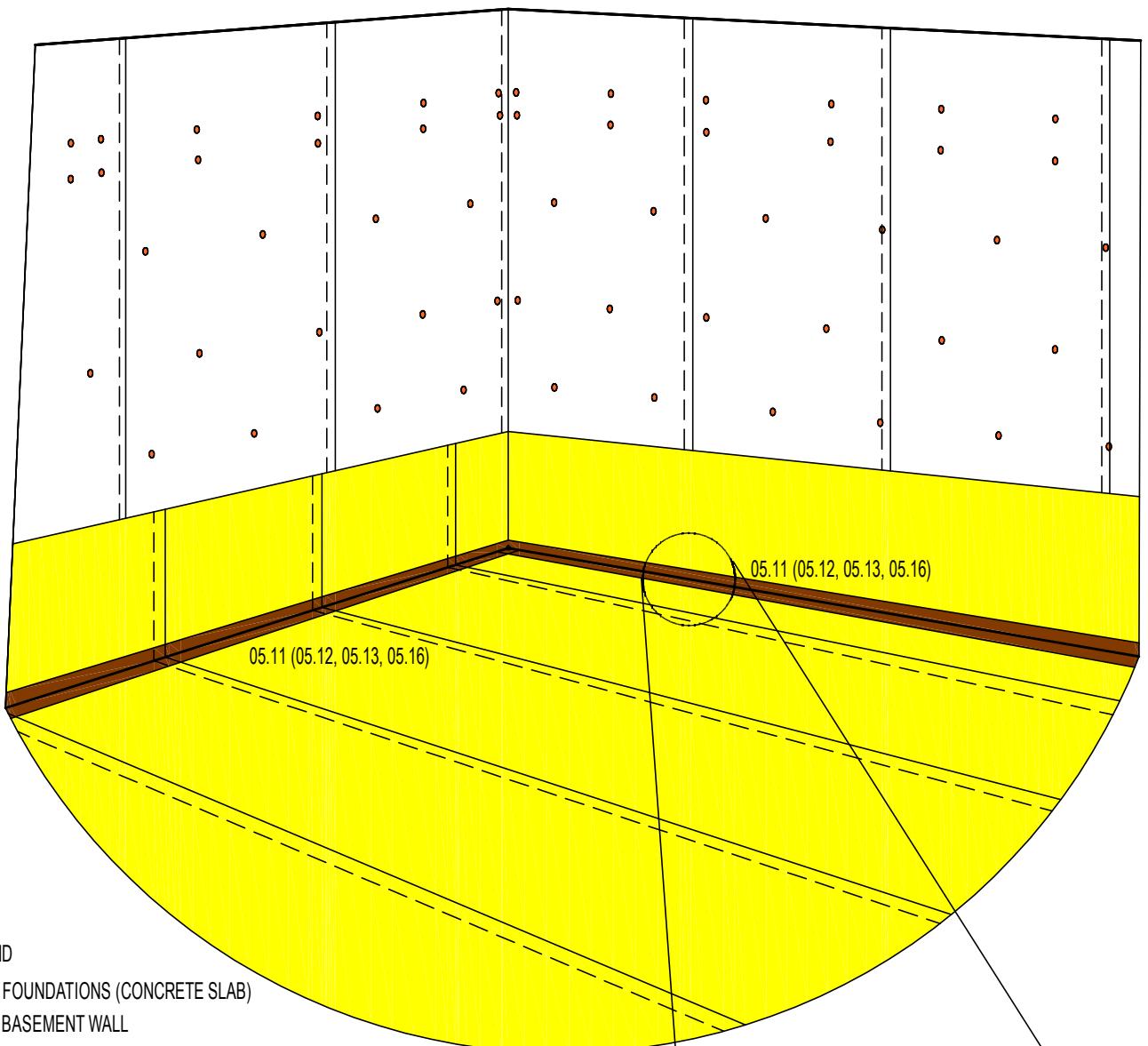




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FATRAFOL-HP system installation from inside (from pit) 3D schema - PHASE 4 - additional membrane strips installation in corners

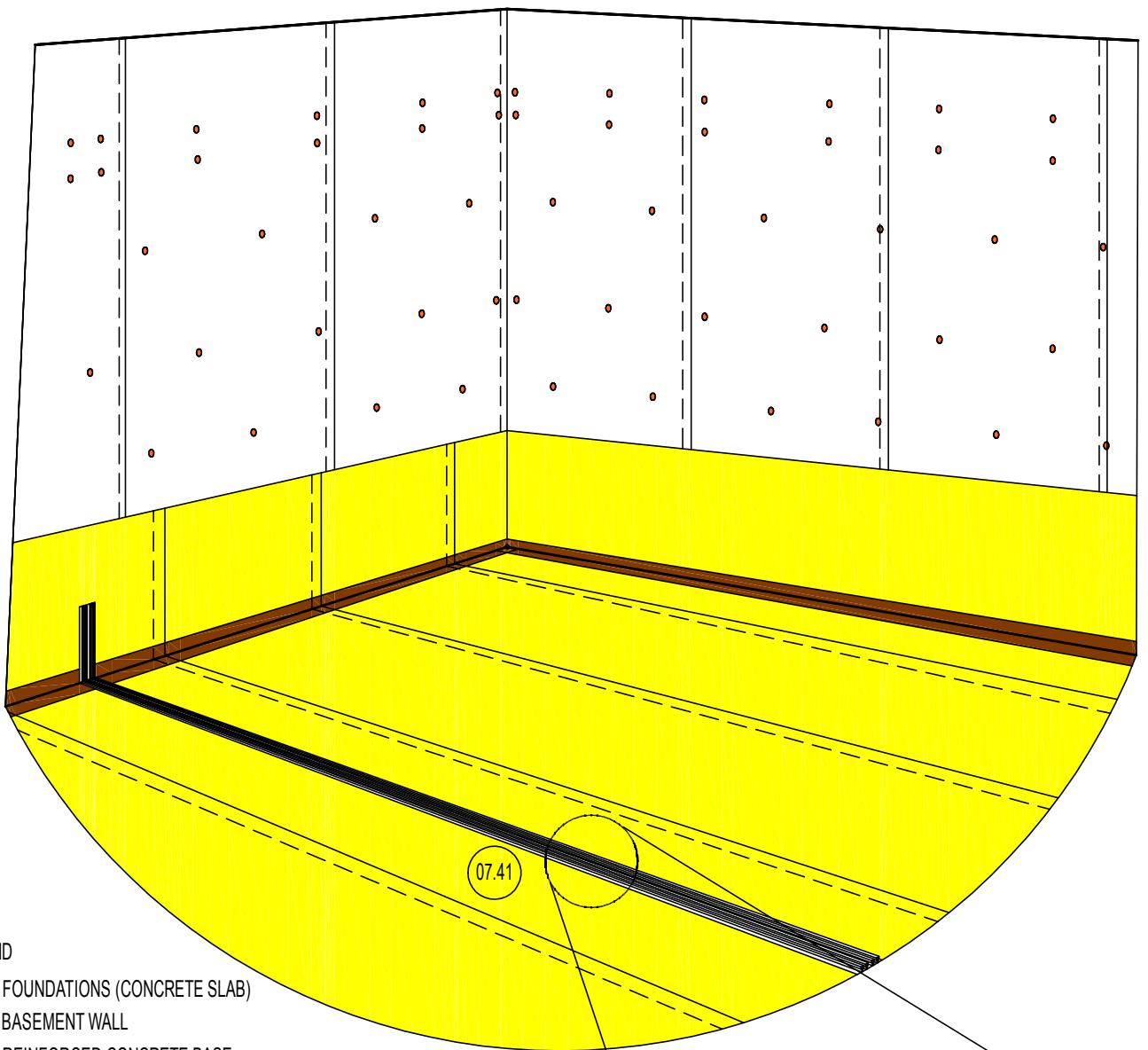
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tel. +420 577 501 111, fax. +420 577 502 555, e-mail: info@fatrafal.cz, www.fatrafal.cz

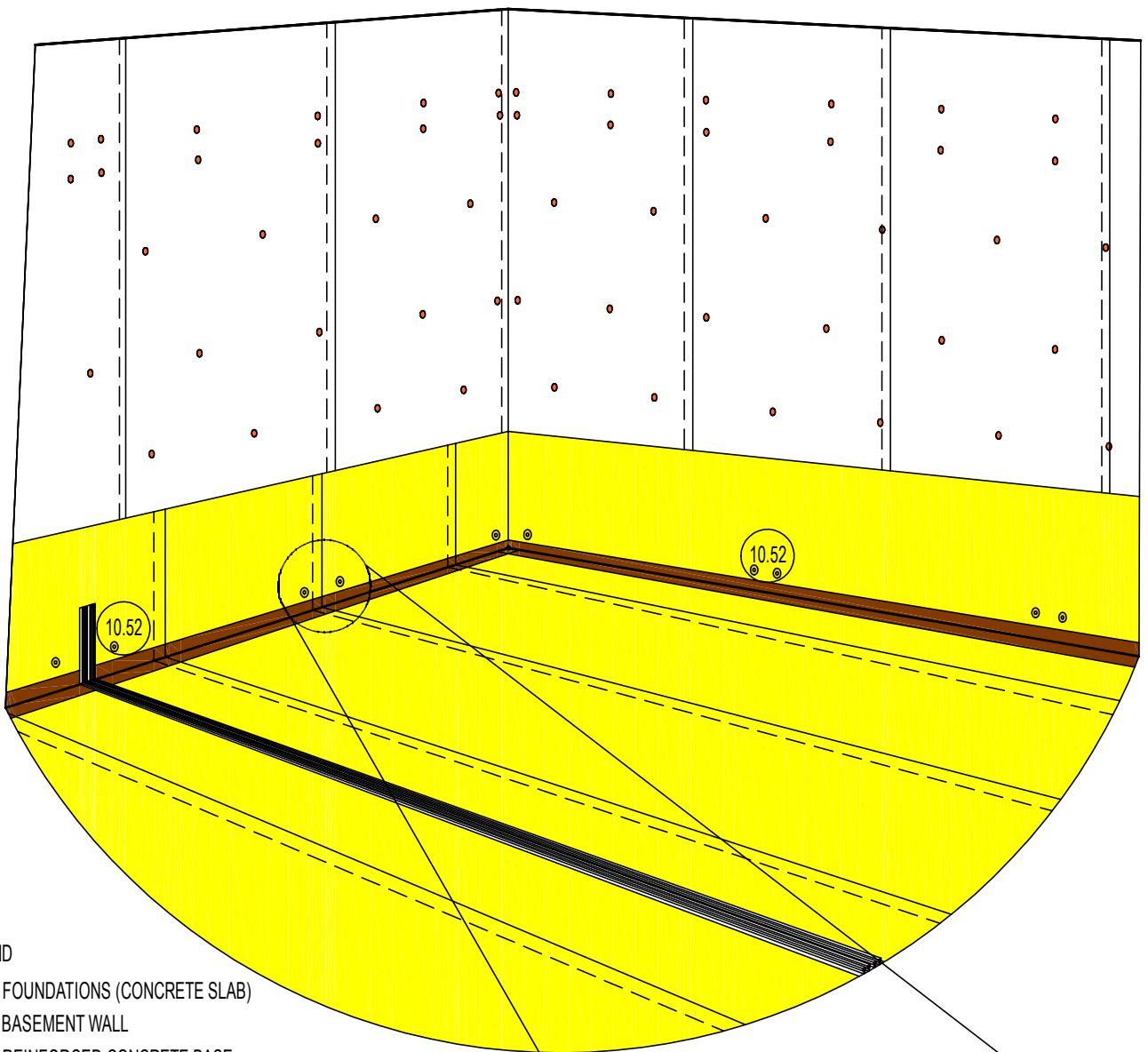
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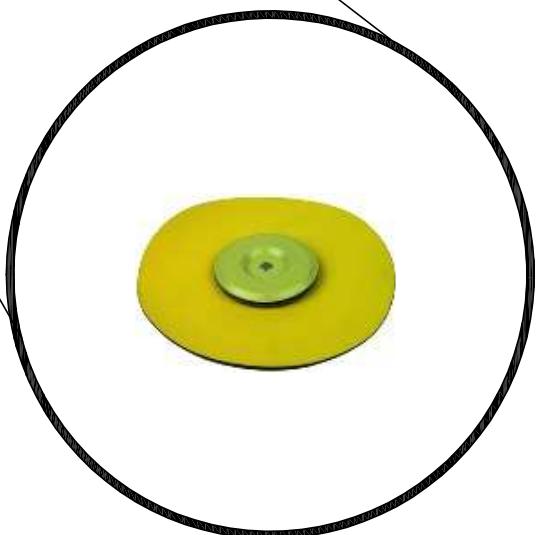
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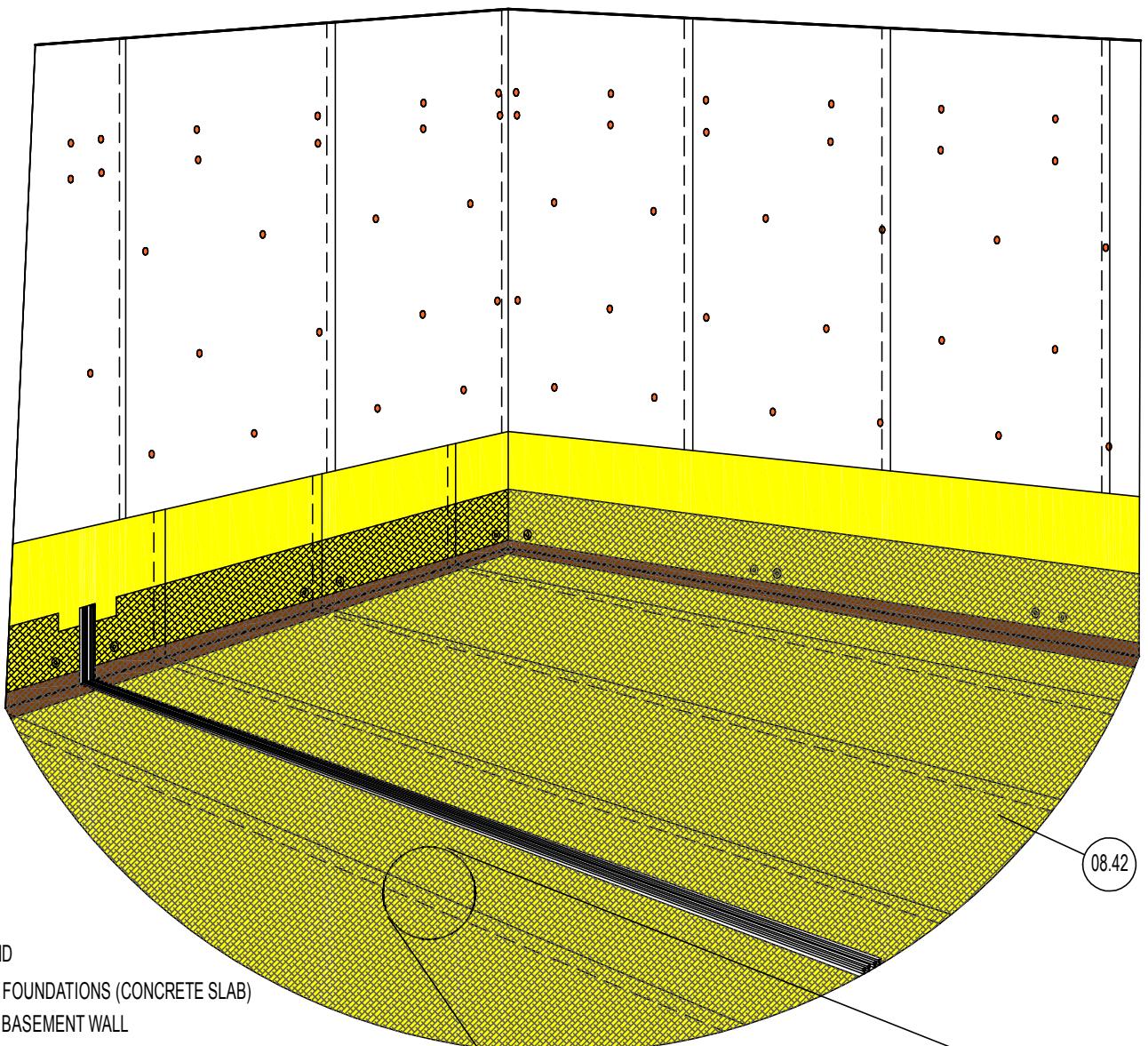




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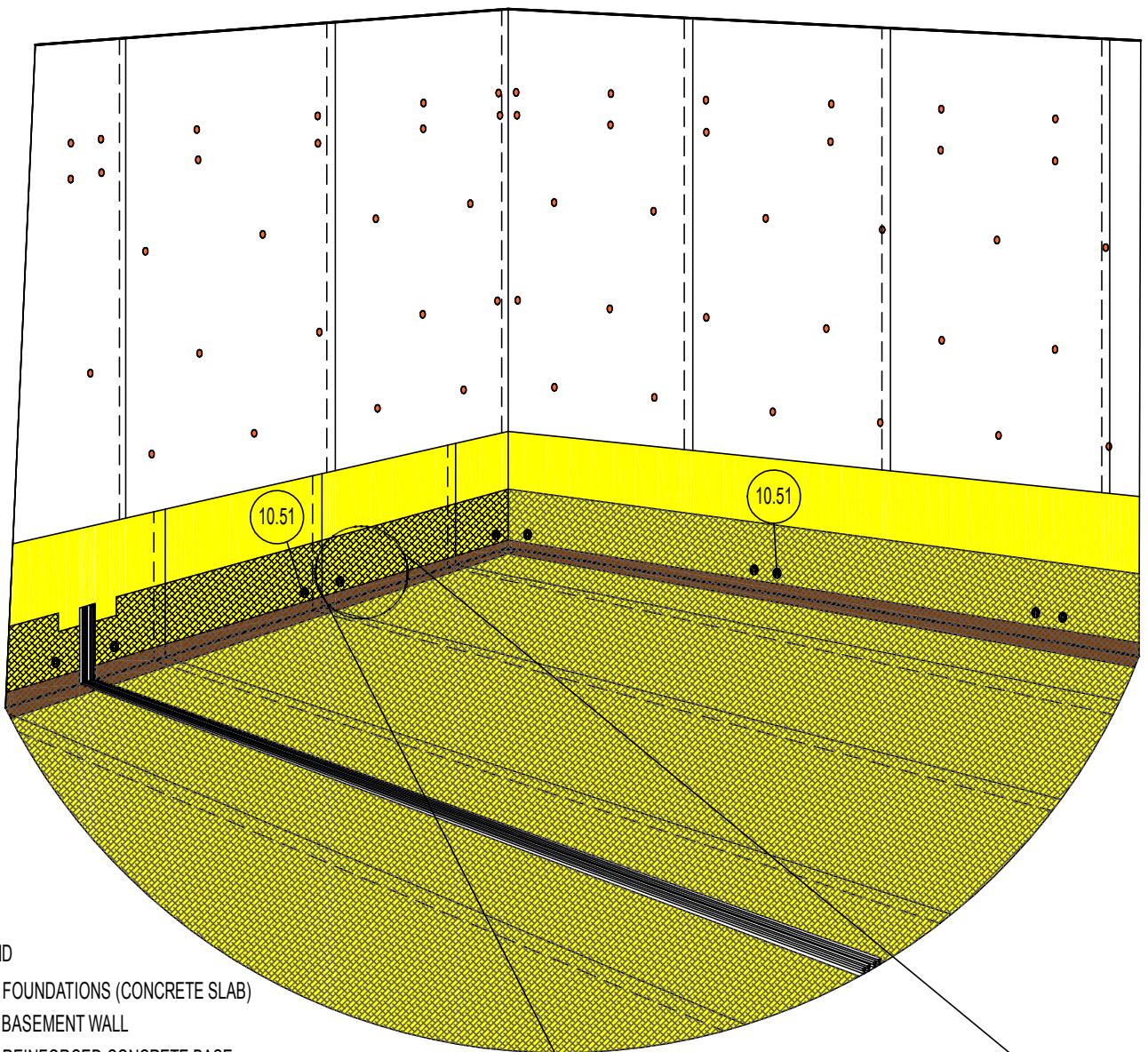




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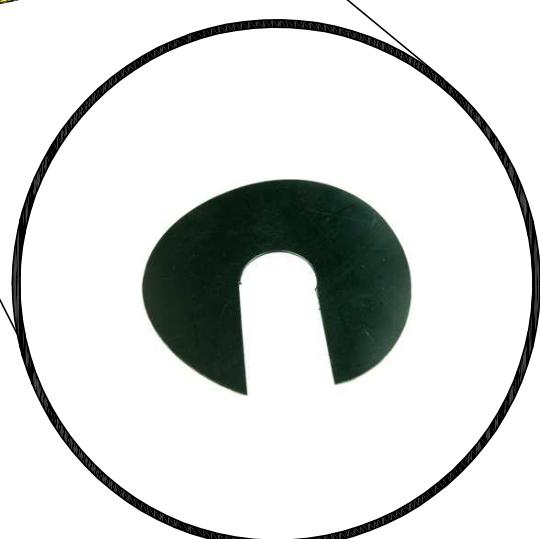
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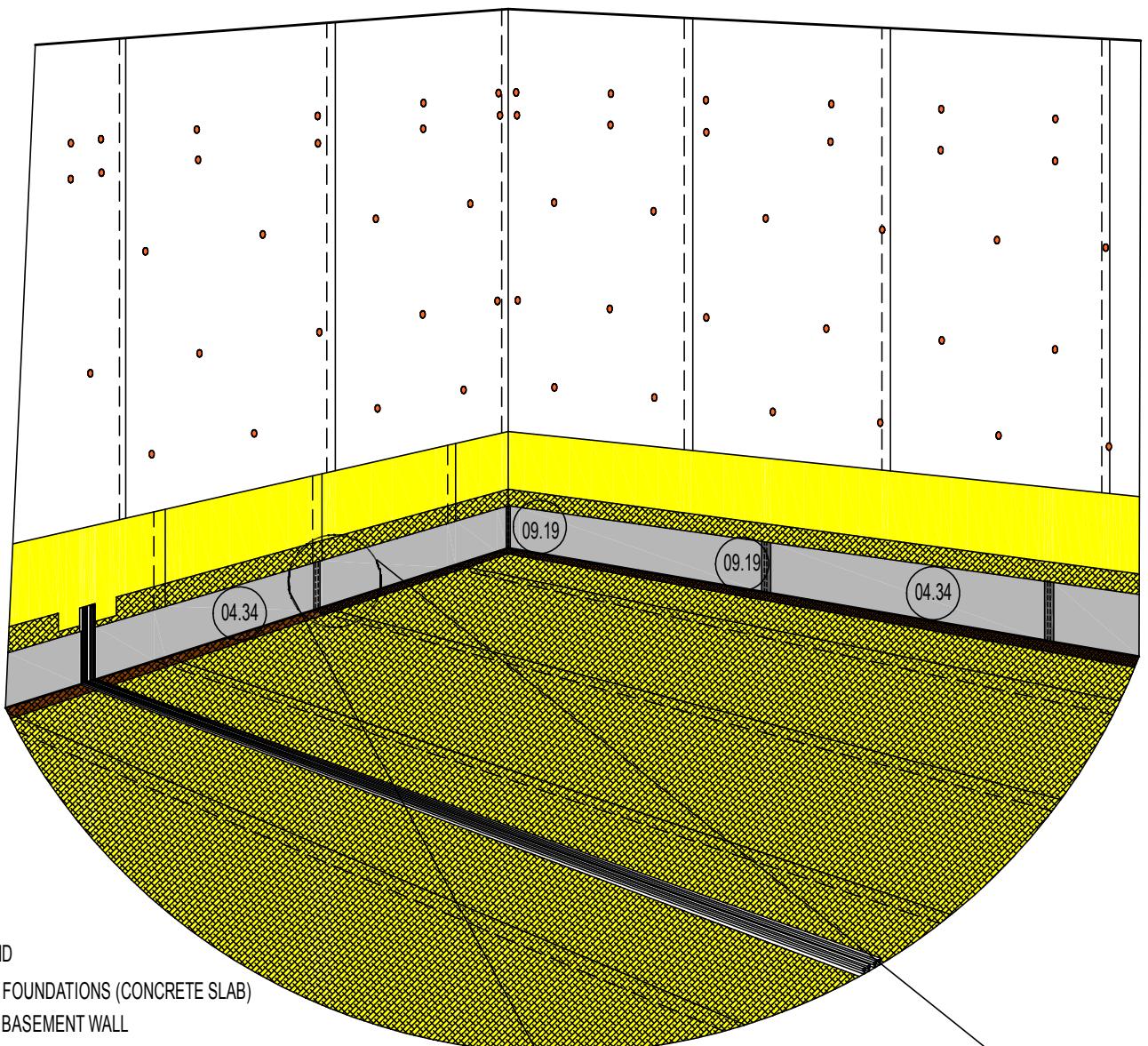




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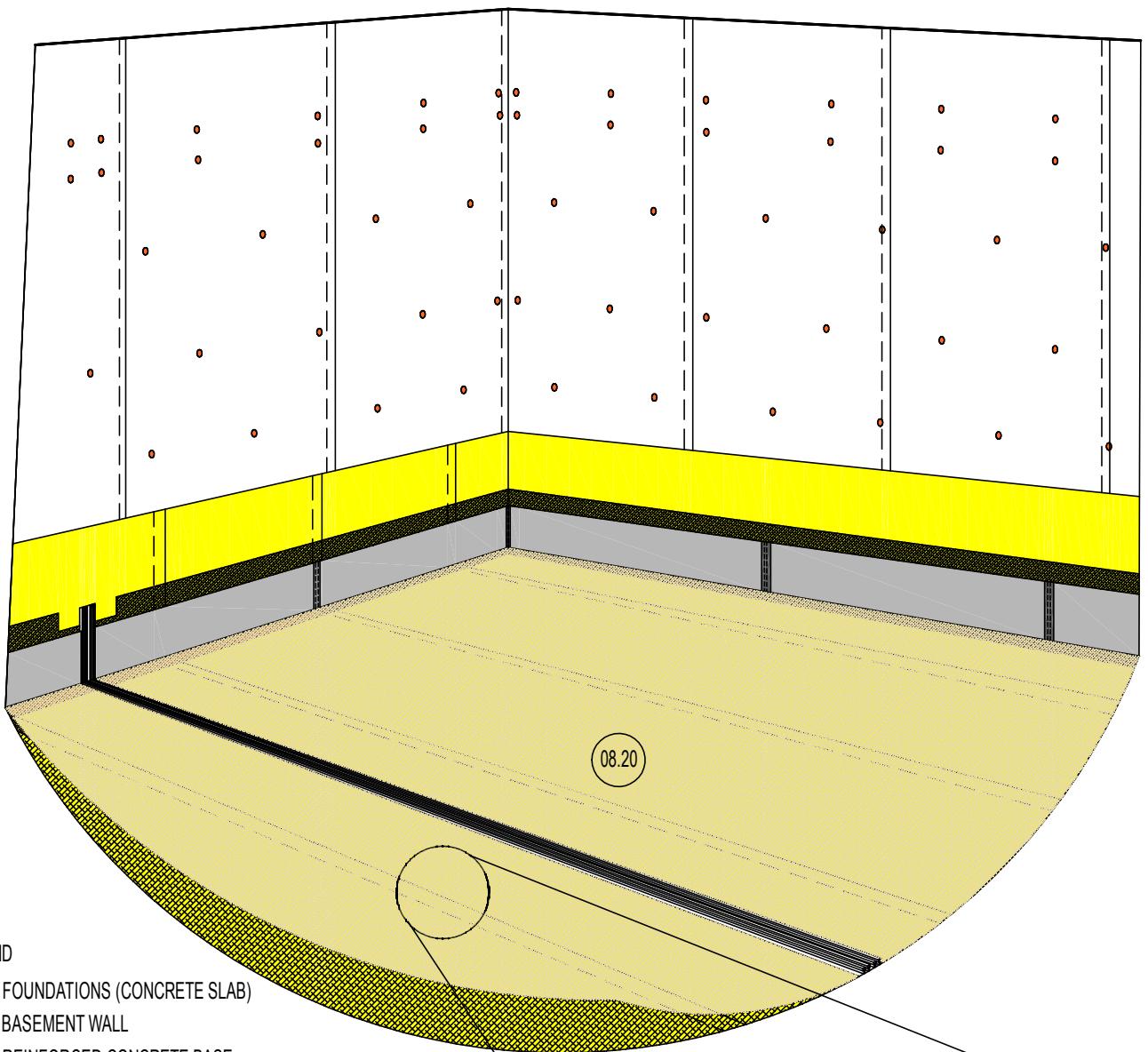




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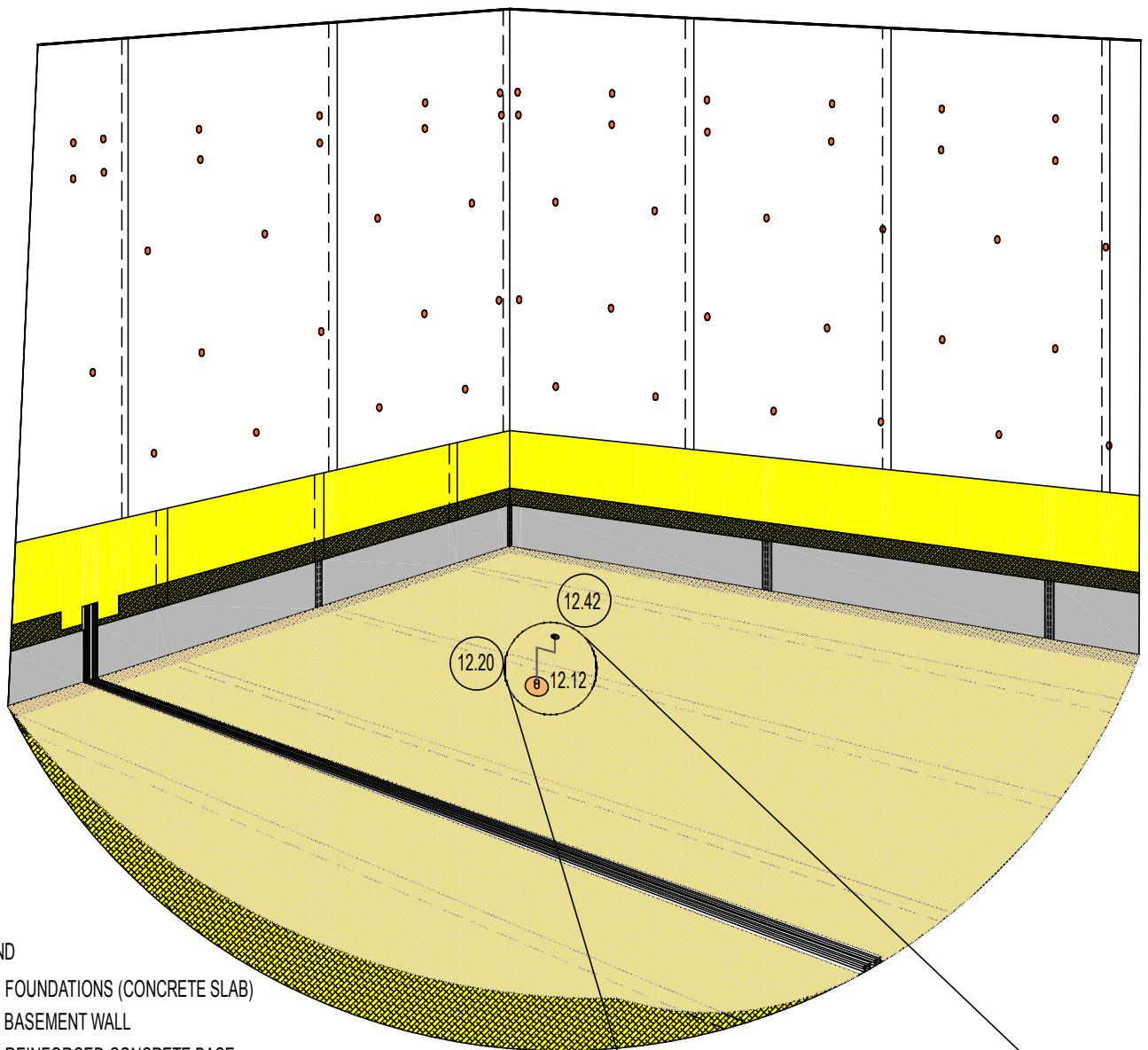




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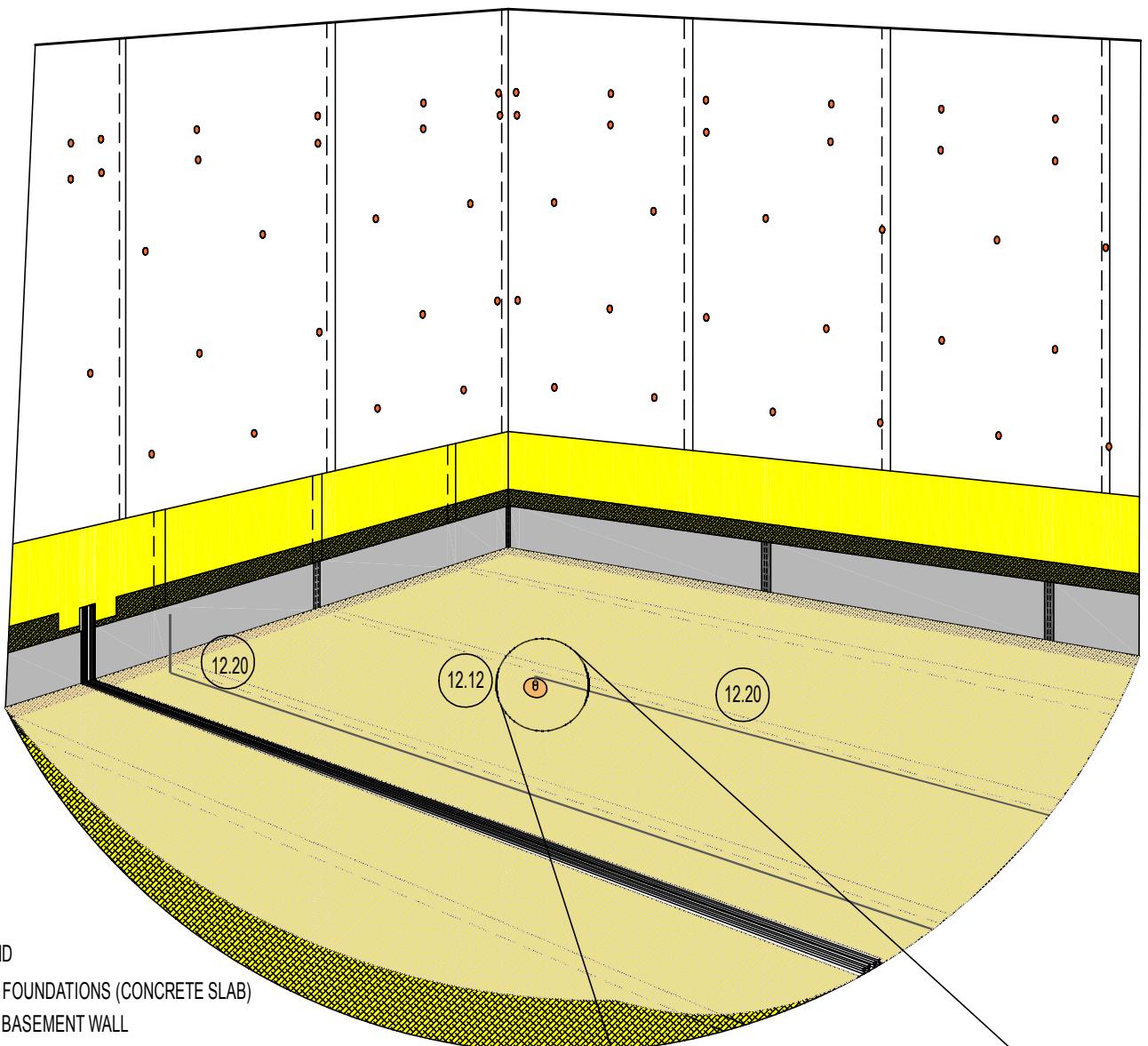




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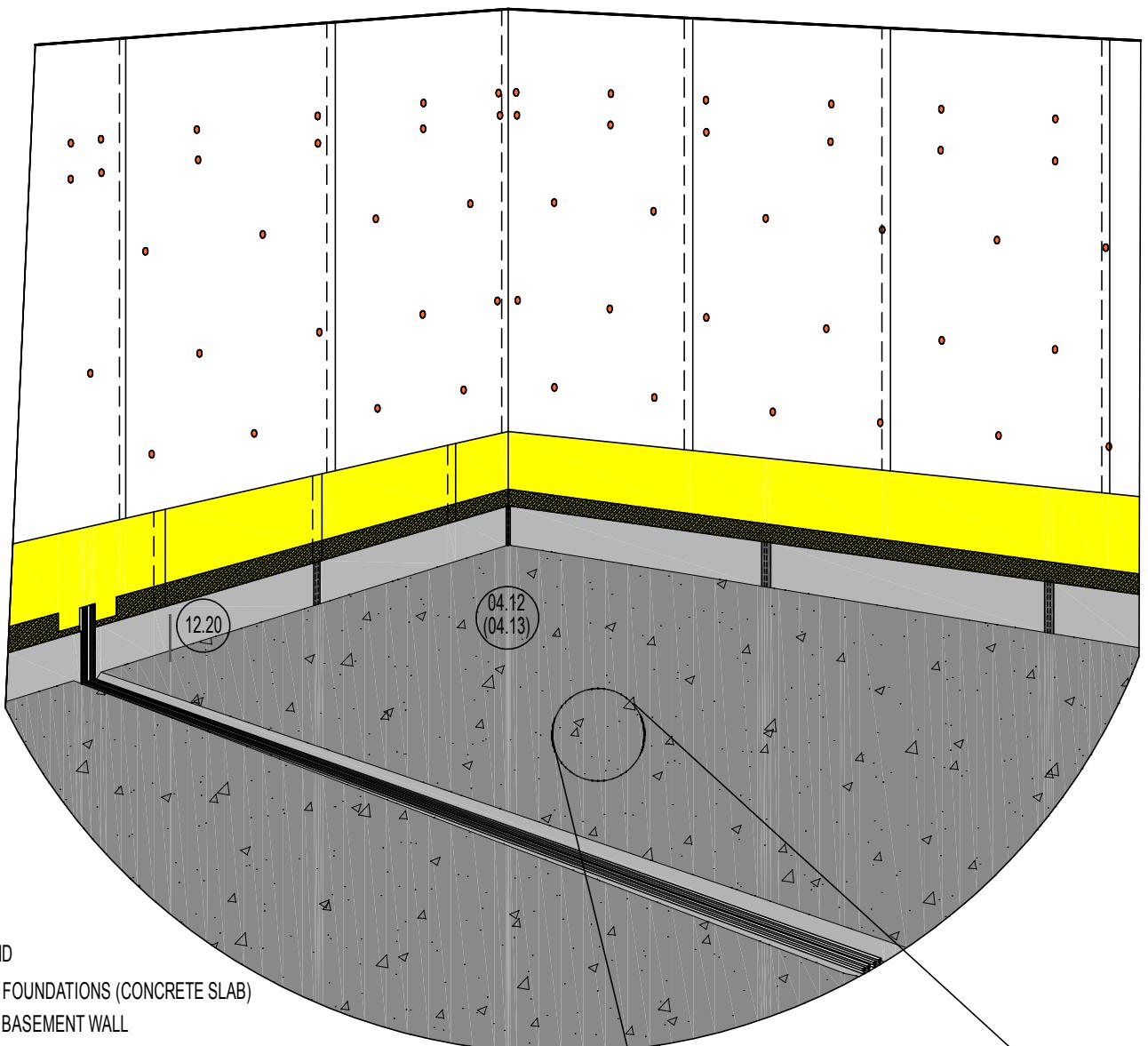




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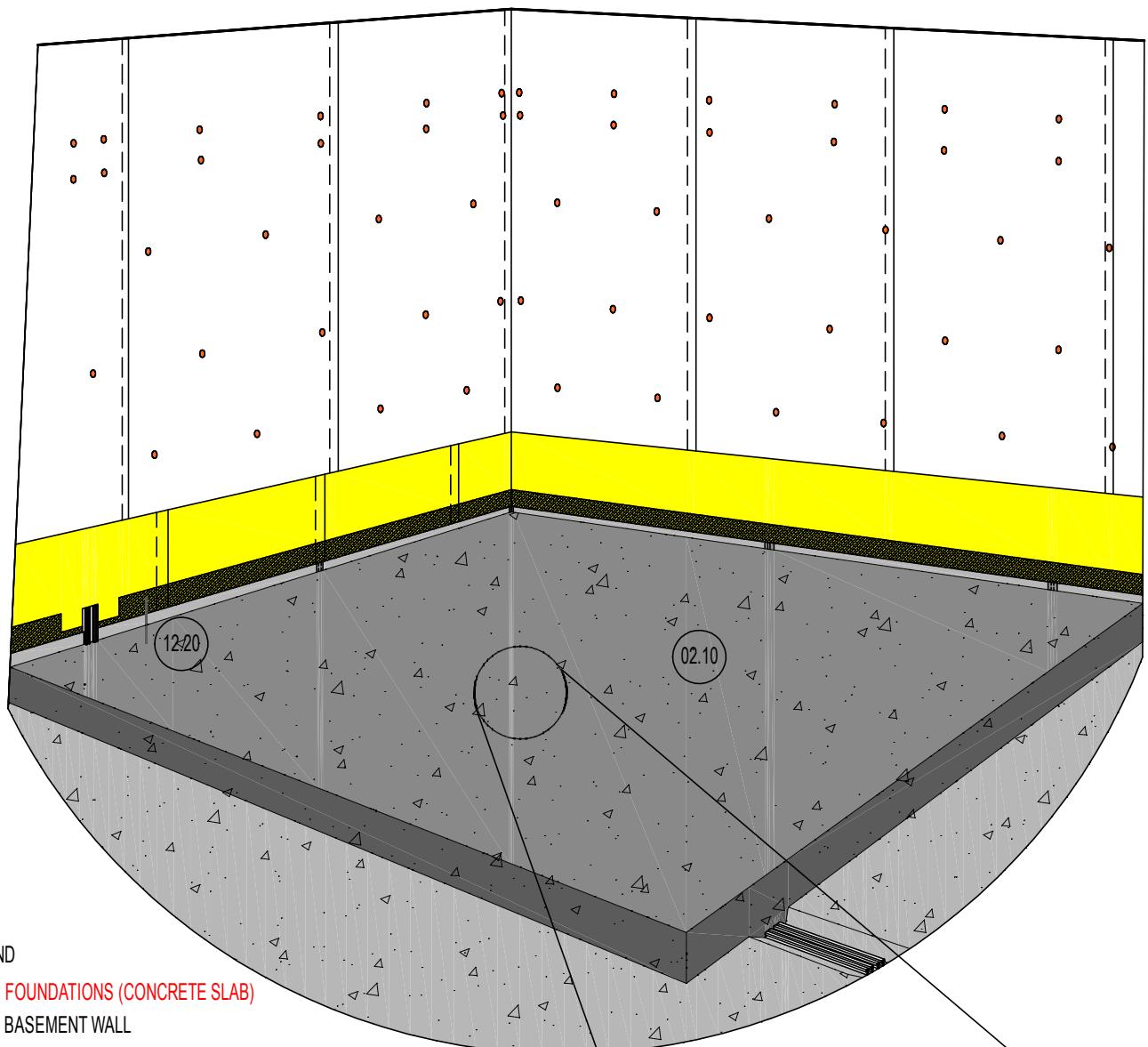




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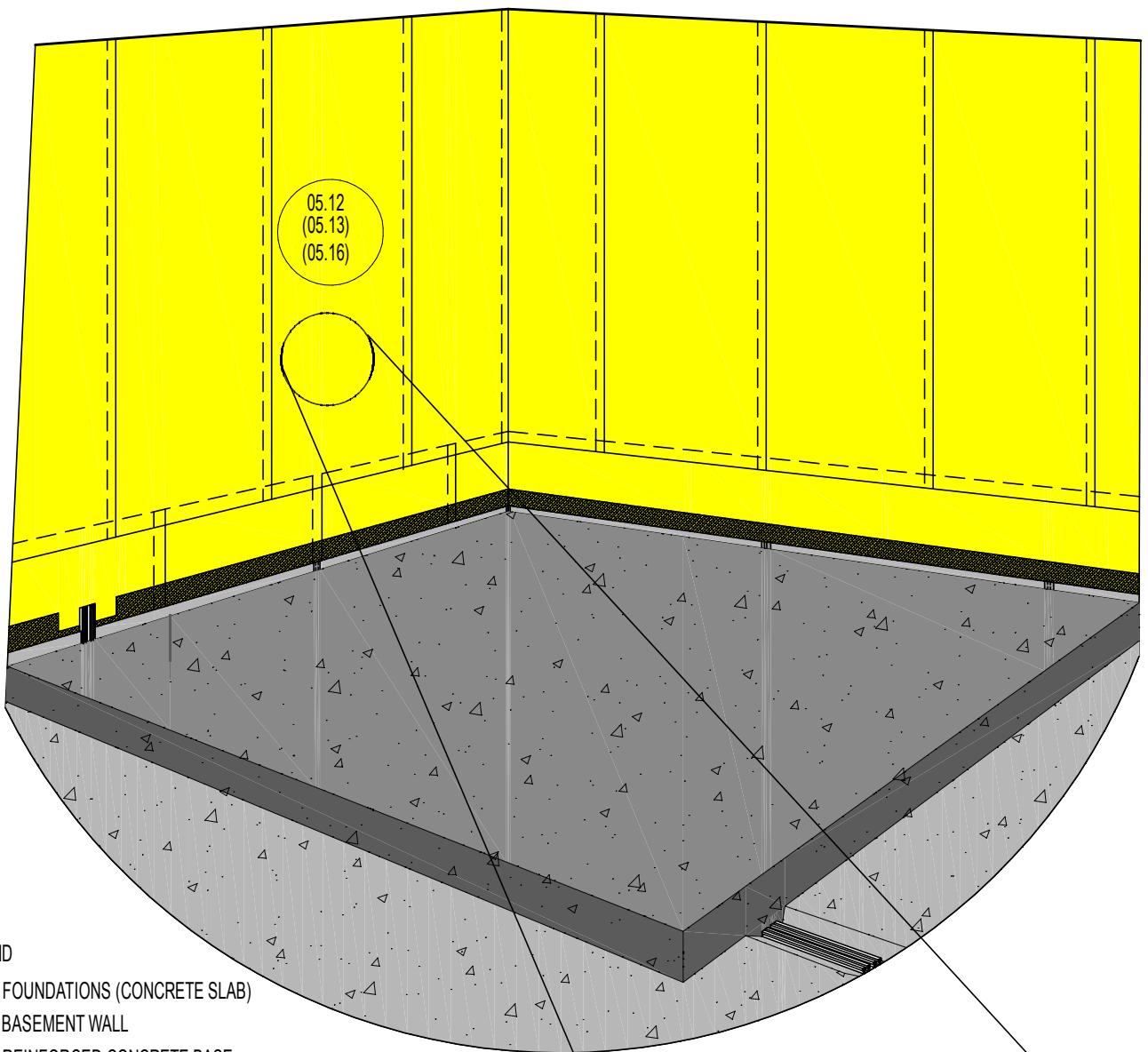




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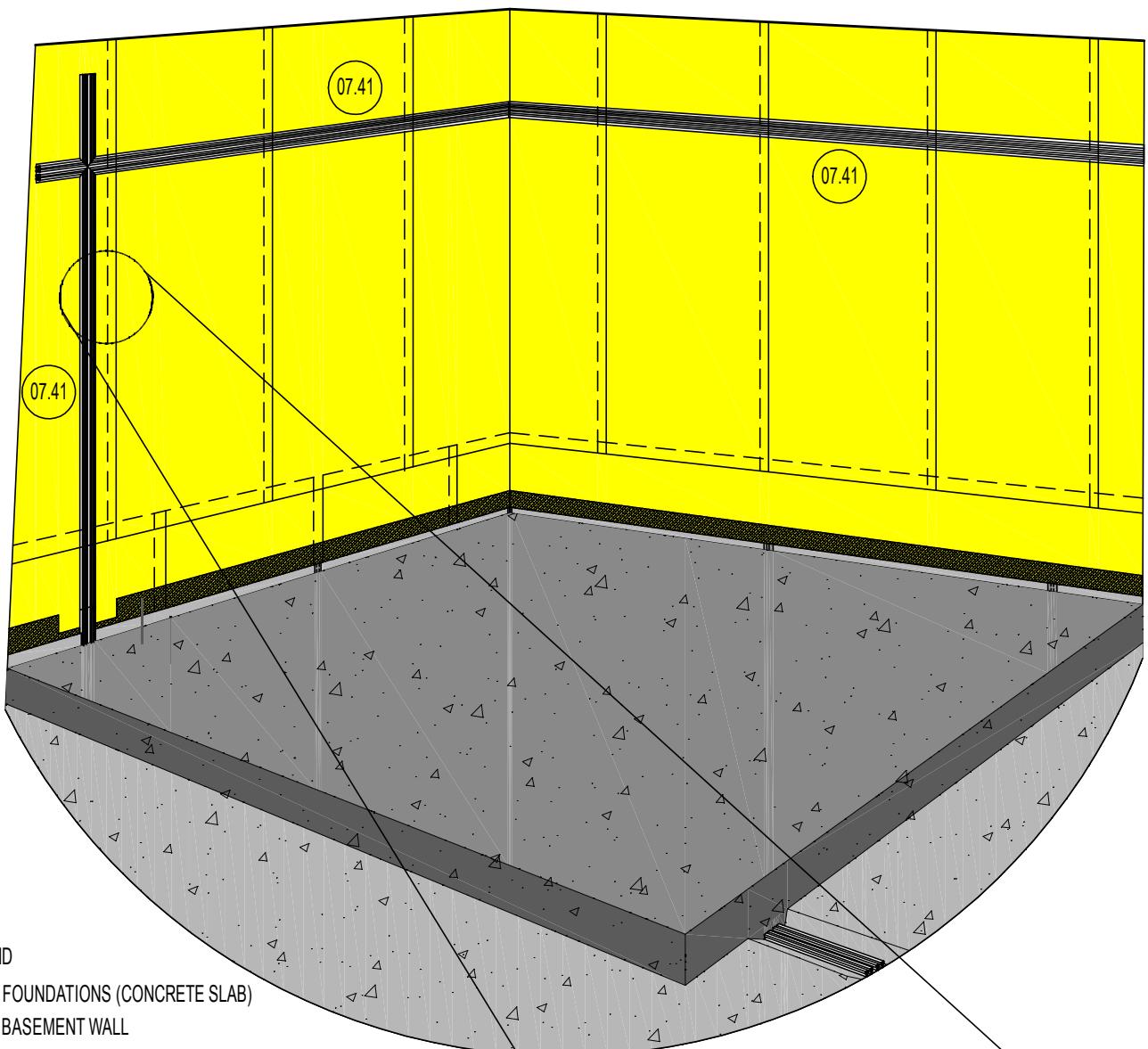




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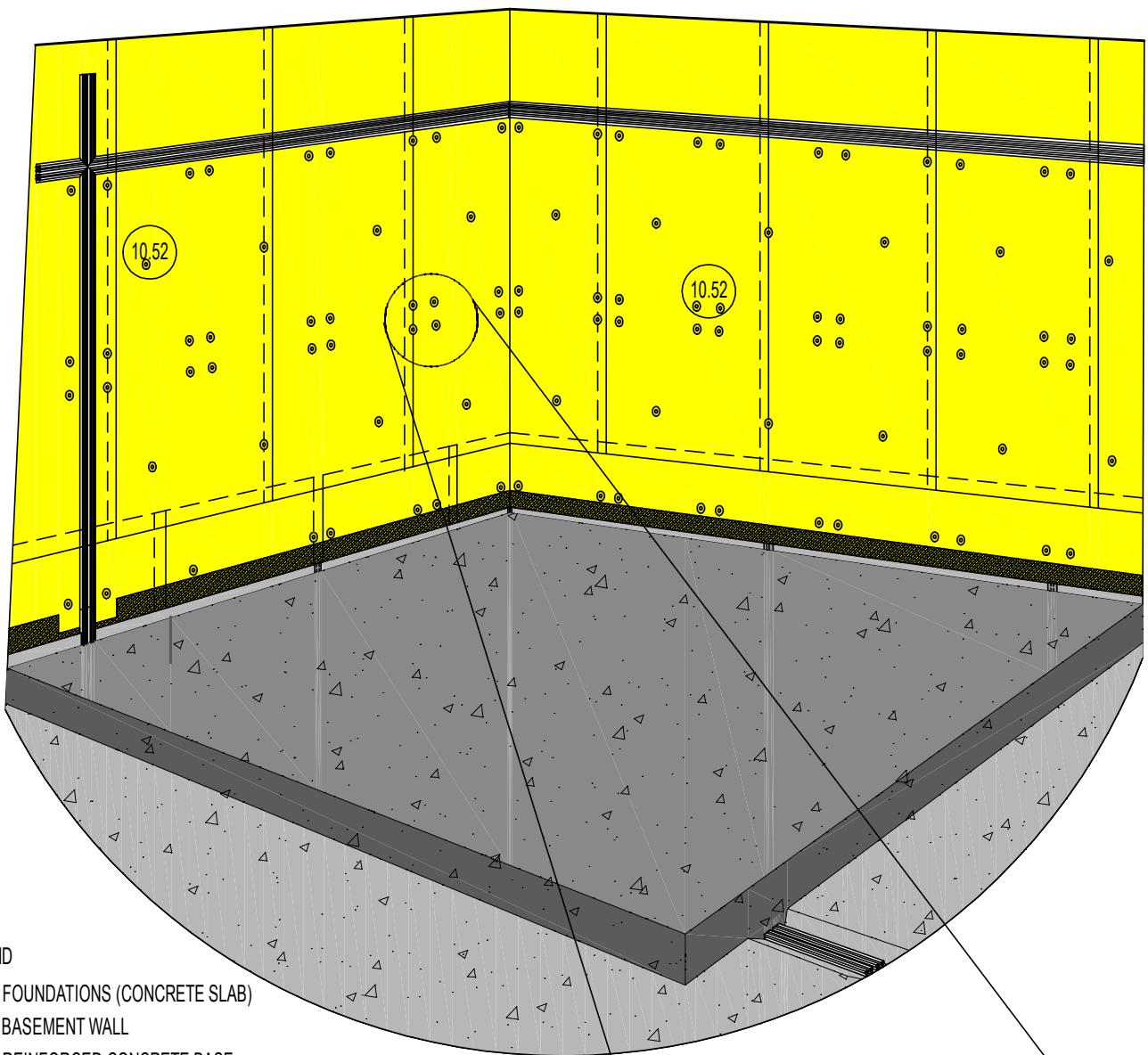




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- 08.42 PETEXDREN 900
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- 12.32 REDUCING STRAIGHT PEM 201510W
- 12.33 STEM ELBOW PEM 221515W
- 12.42 INJECTION PACKER

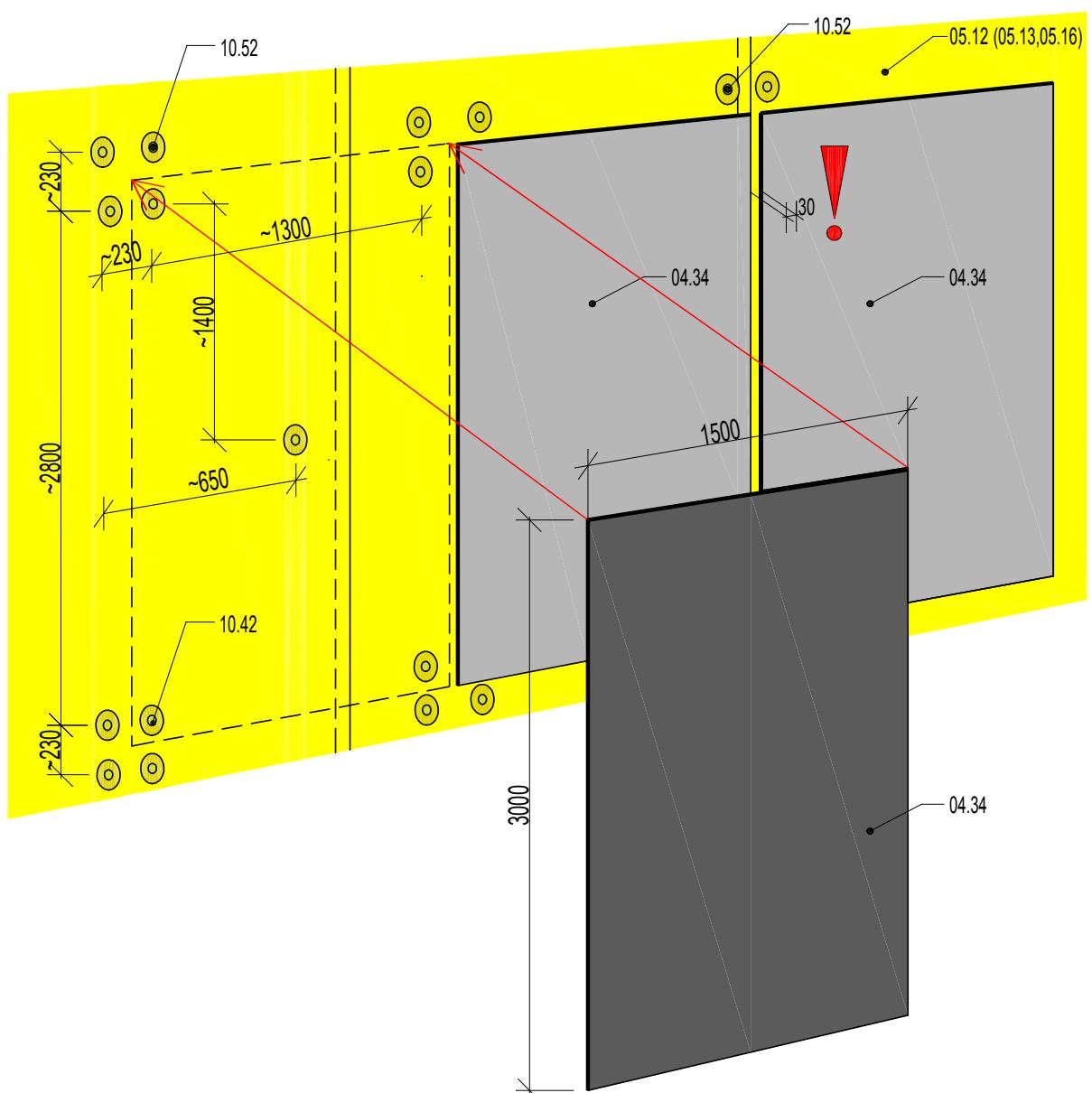




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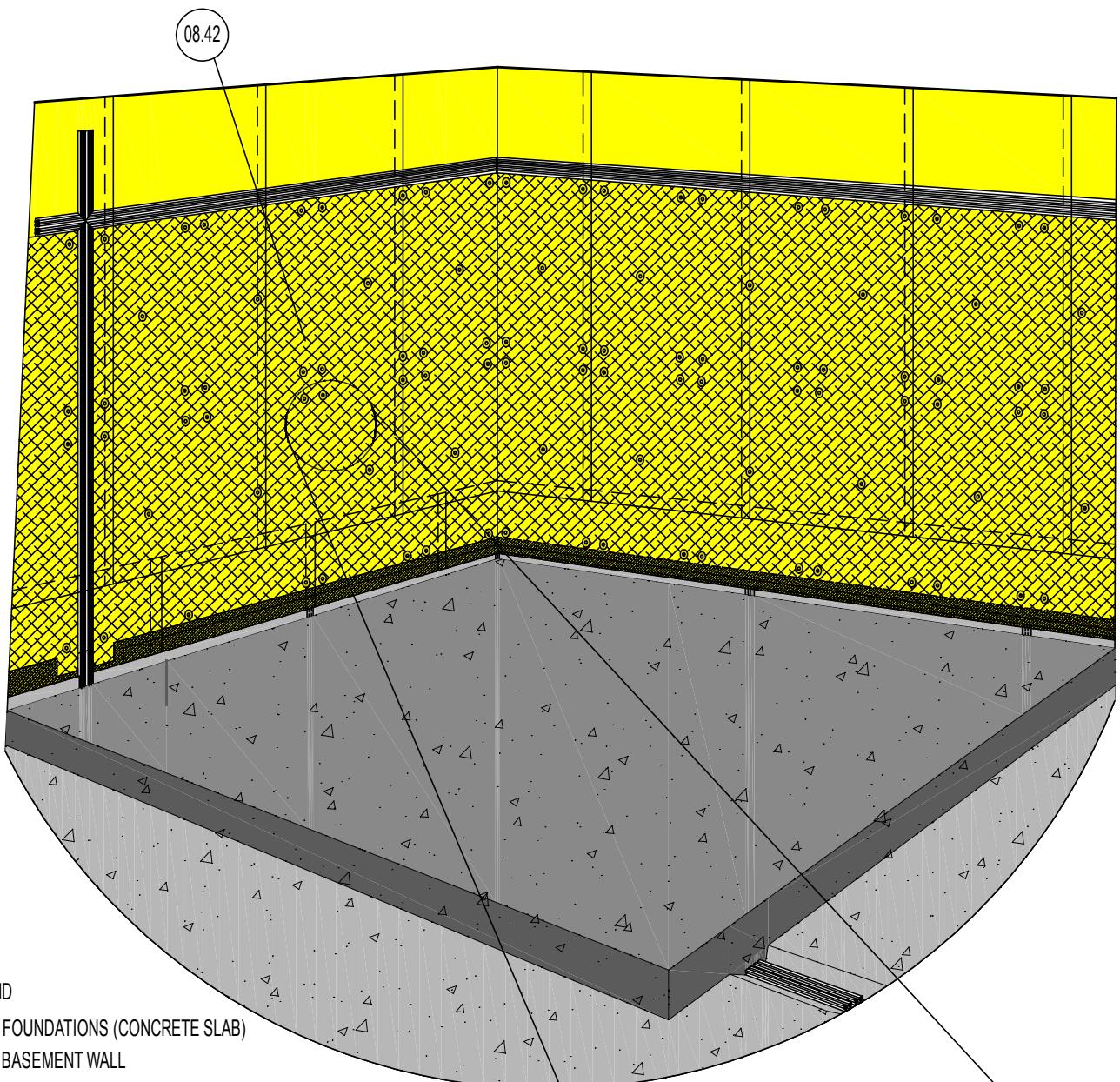
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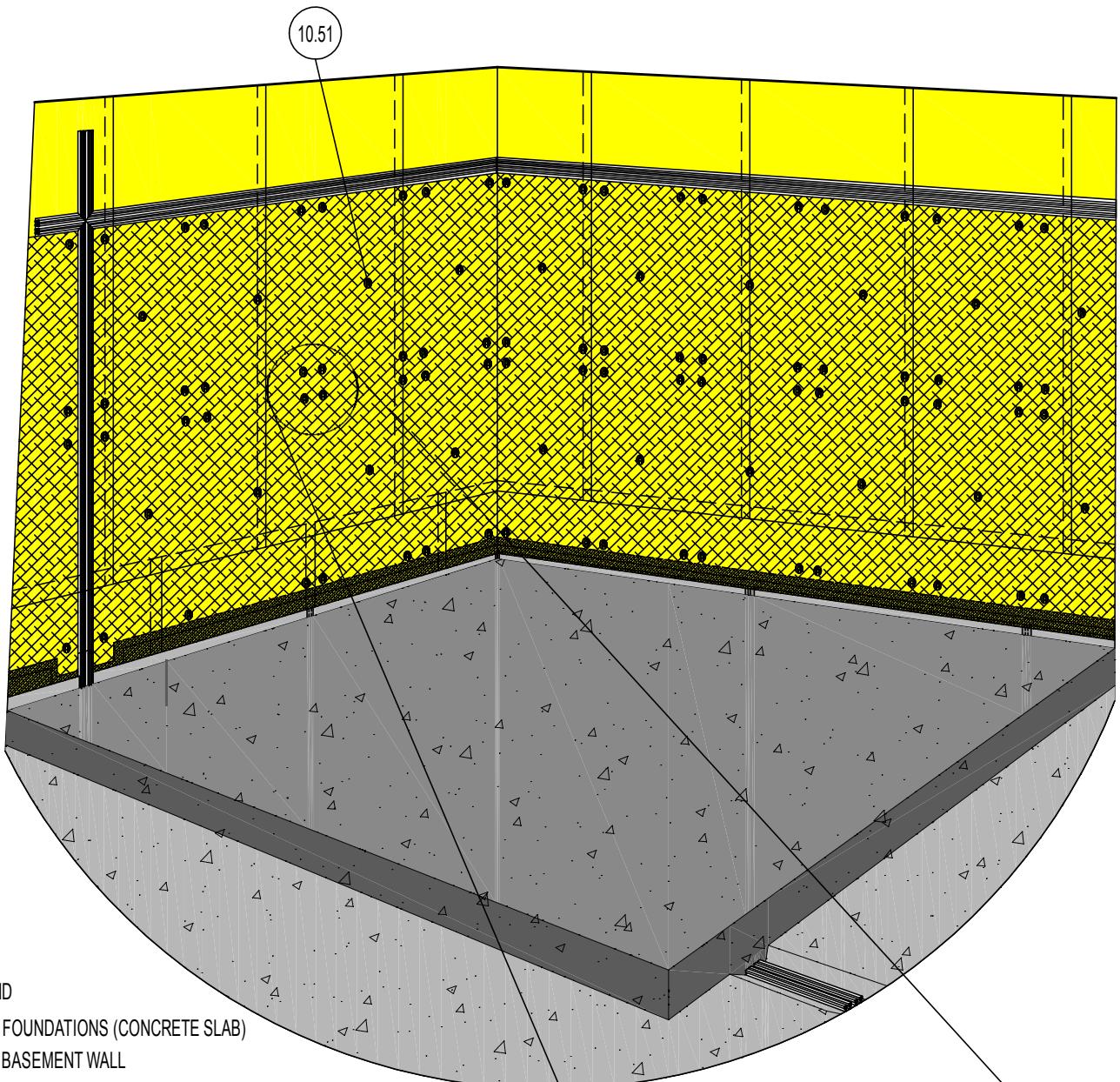
04.34	PROTECTIVE PP BOARD TH. 5 mm
05.12	WATERPROOFING MEMBRANE FATRAFOL 803/VS OR 05.13 FATRAFOL 803/V OR 05.16 FATRAFOL 803/VST
10.52	FIXING POINT HP-PVC



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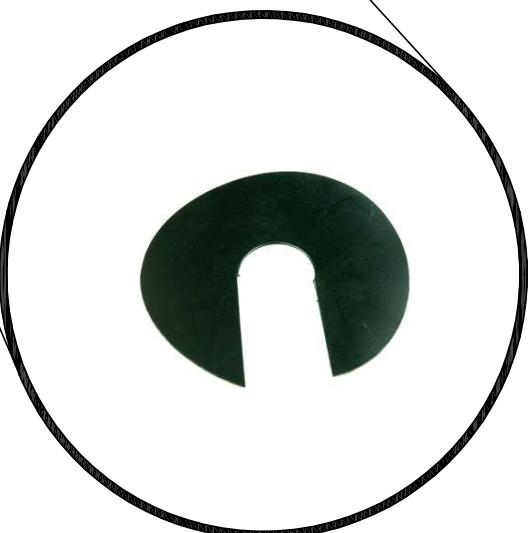
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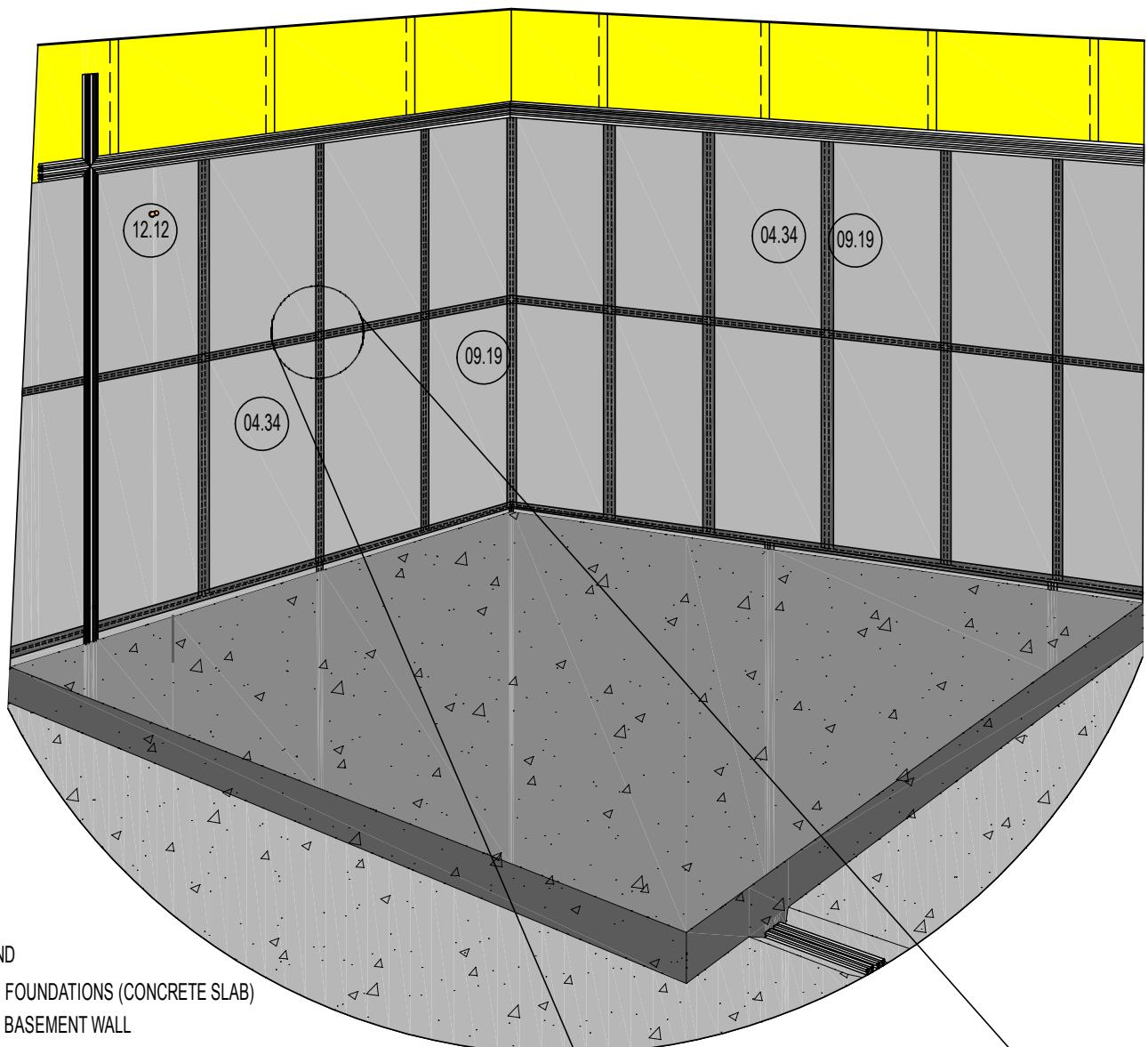




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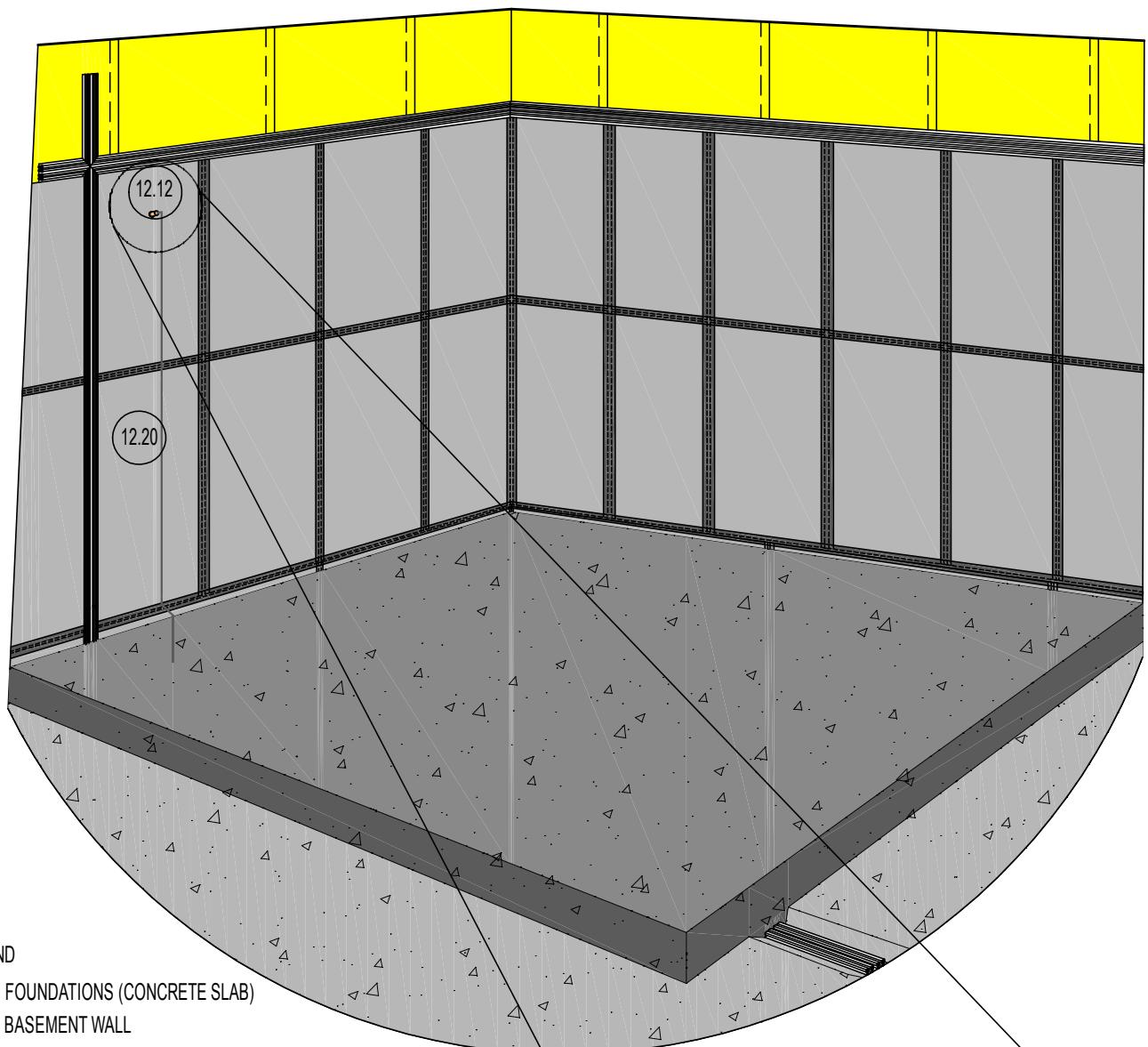




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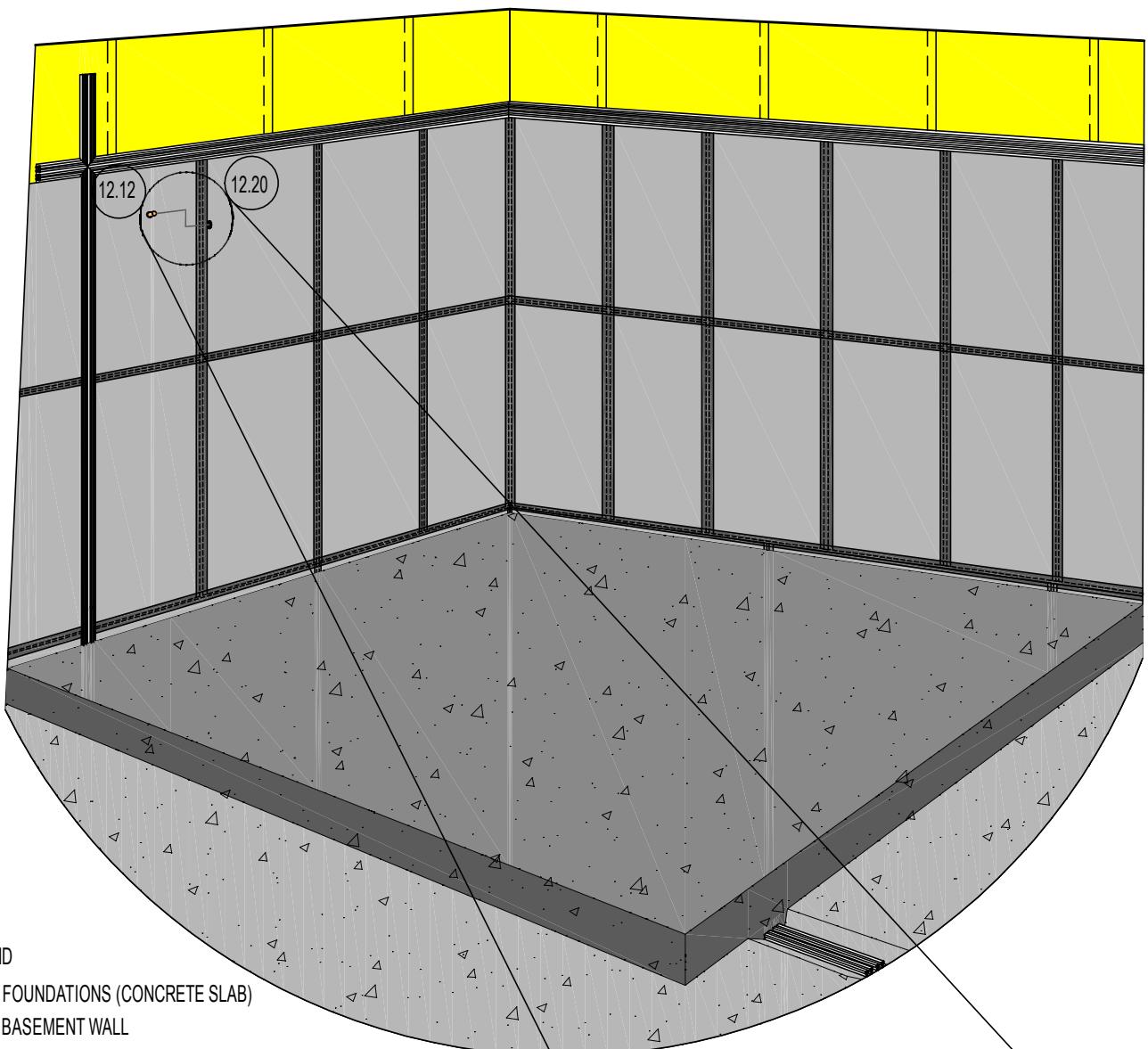




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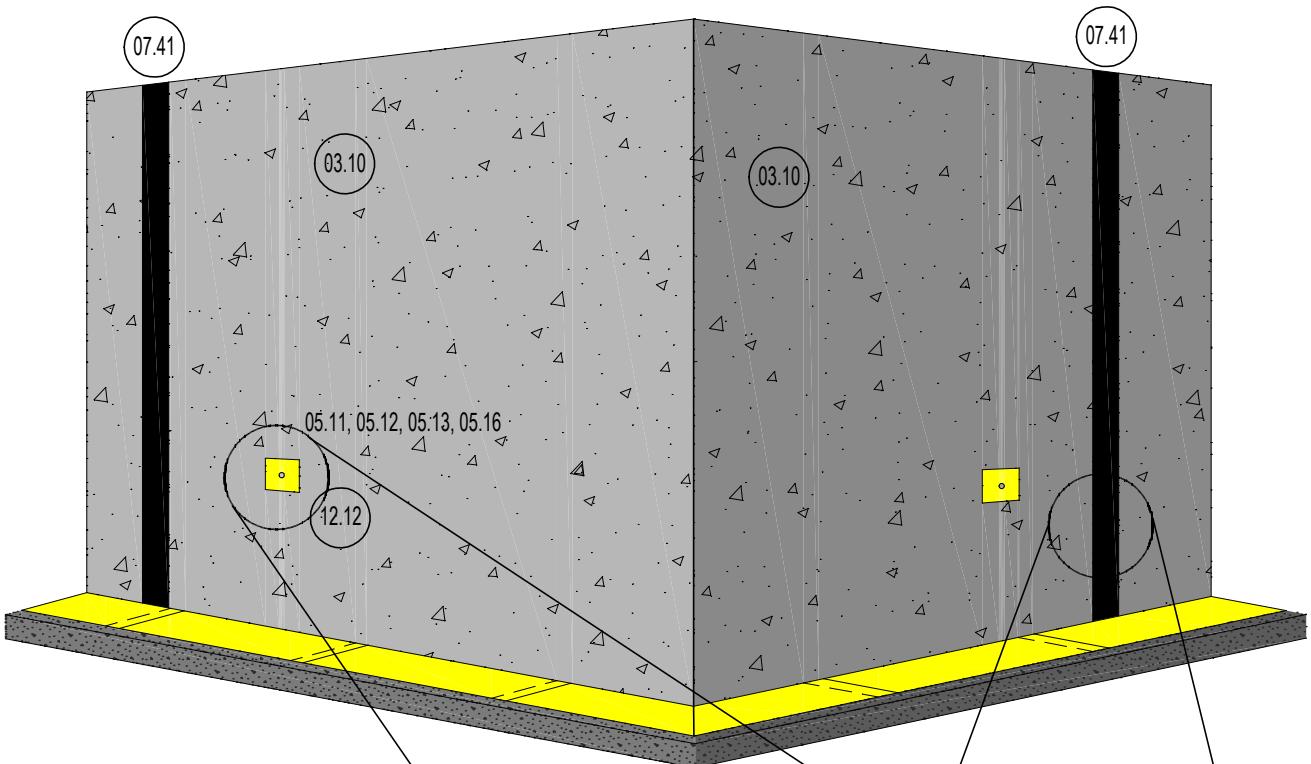




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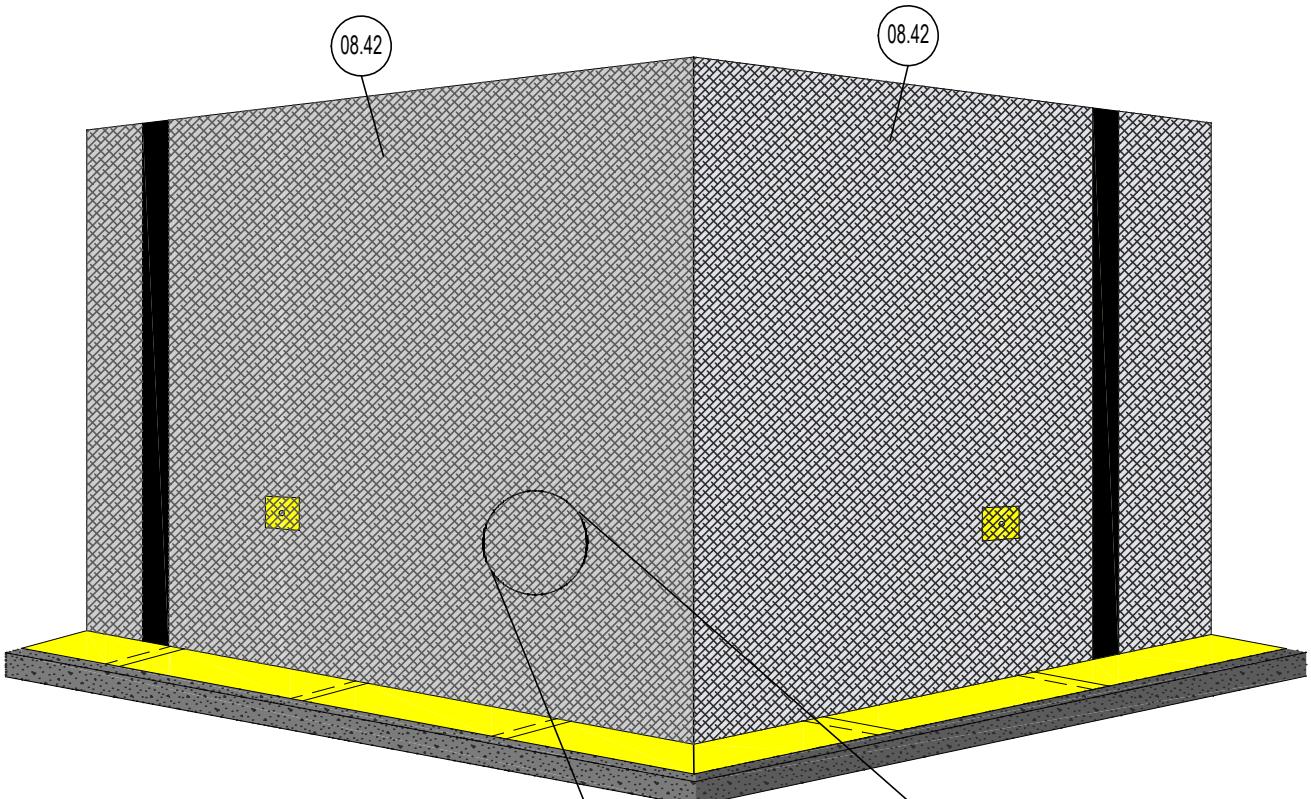




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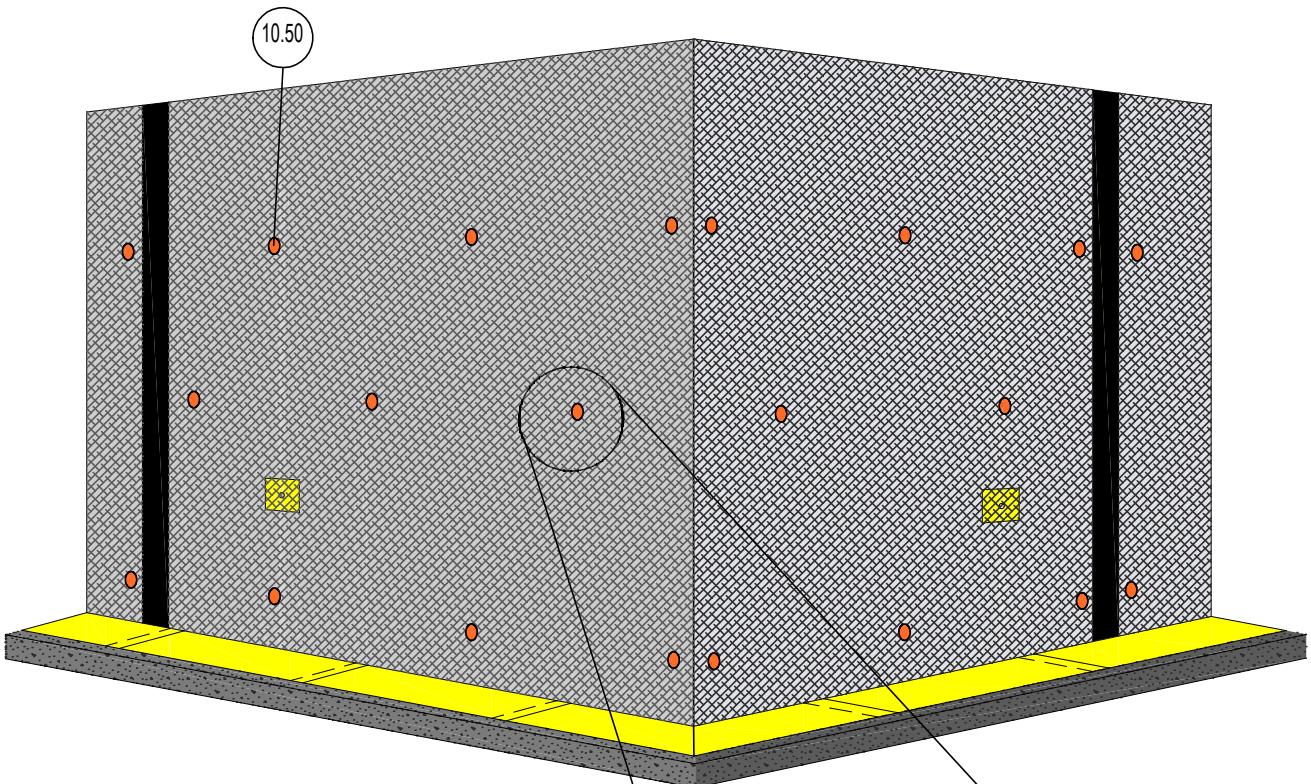




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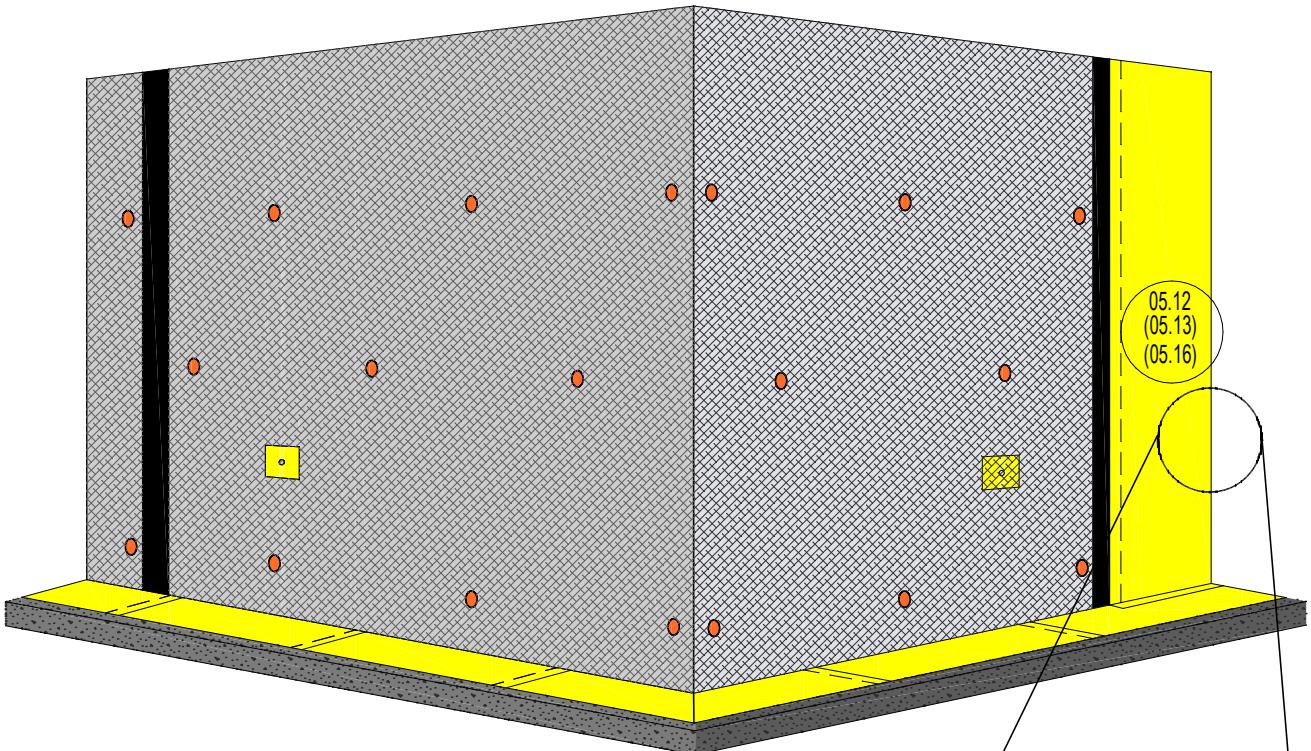




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FATRAFOL-HP system installation from outside (from trench) 3D schema - PHASE 4 - welding vertical waterproof. membrane to waterstop bar

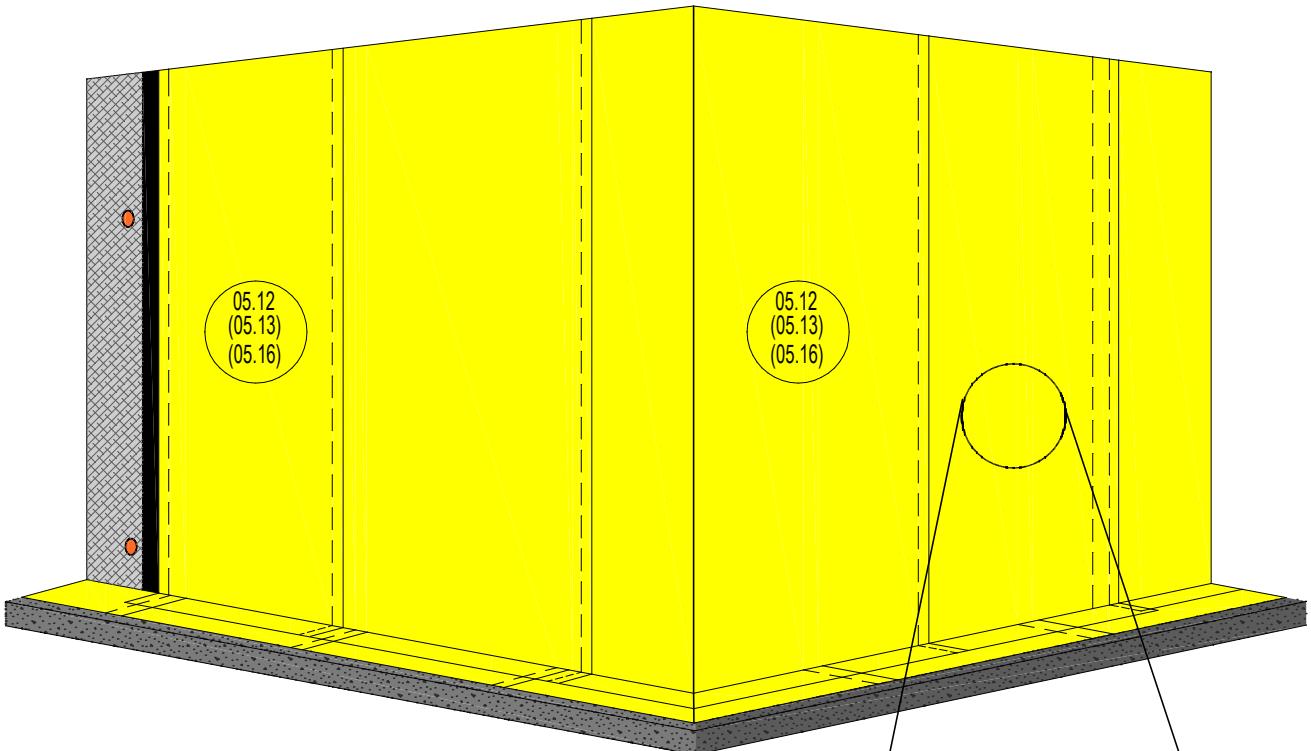
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3/2016

fatra

Fatra, a.s., třída Tomáše Bati 1541, 763 61 Napajedla, Czech Republic
tel. +420 577 501 111, fax. +420 577 502 555, e-mail: info@fatrafal.cz, www.fatrafal.cz

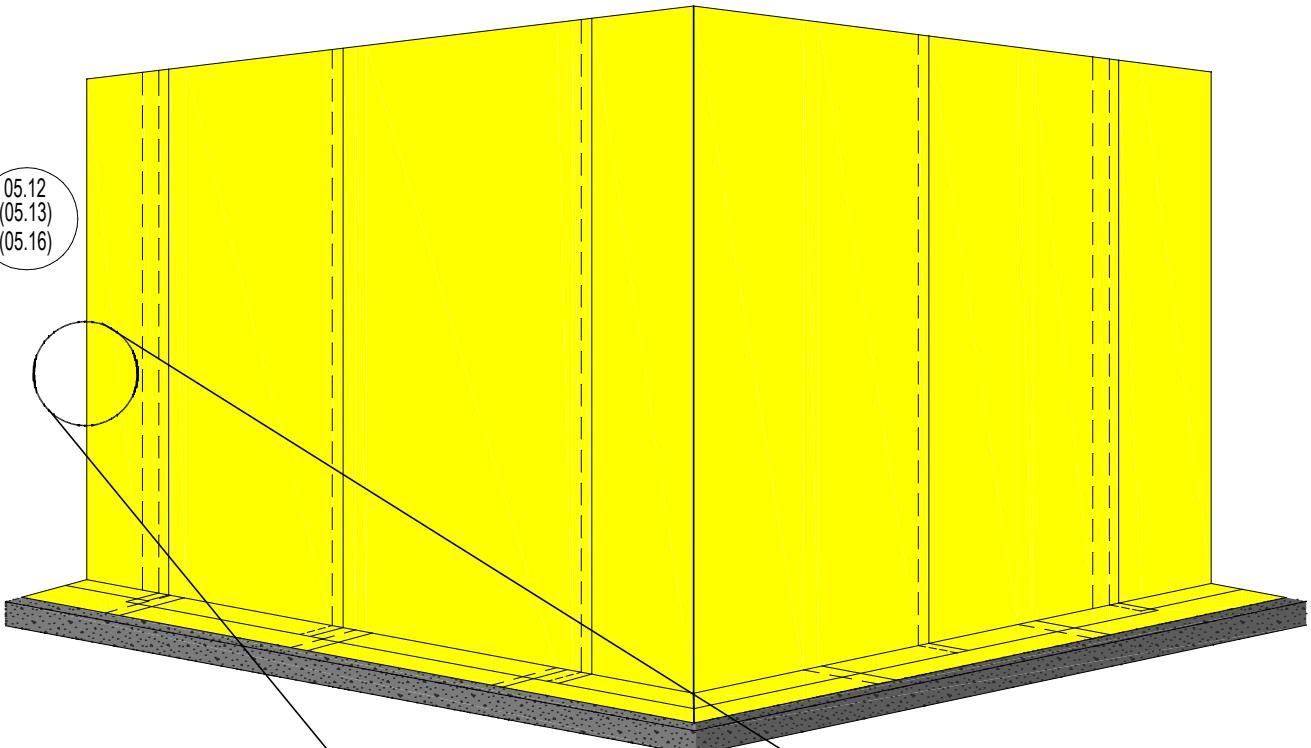
DETAIL 853 HP



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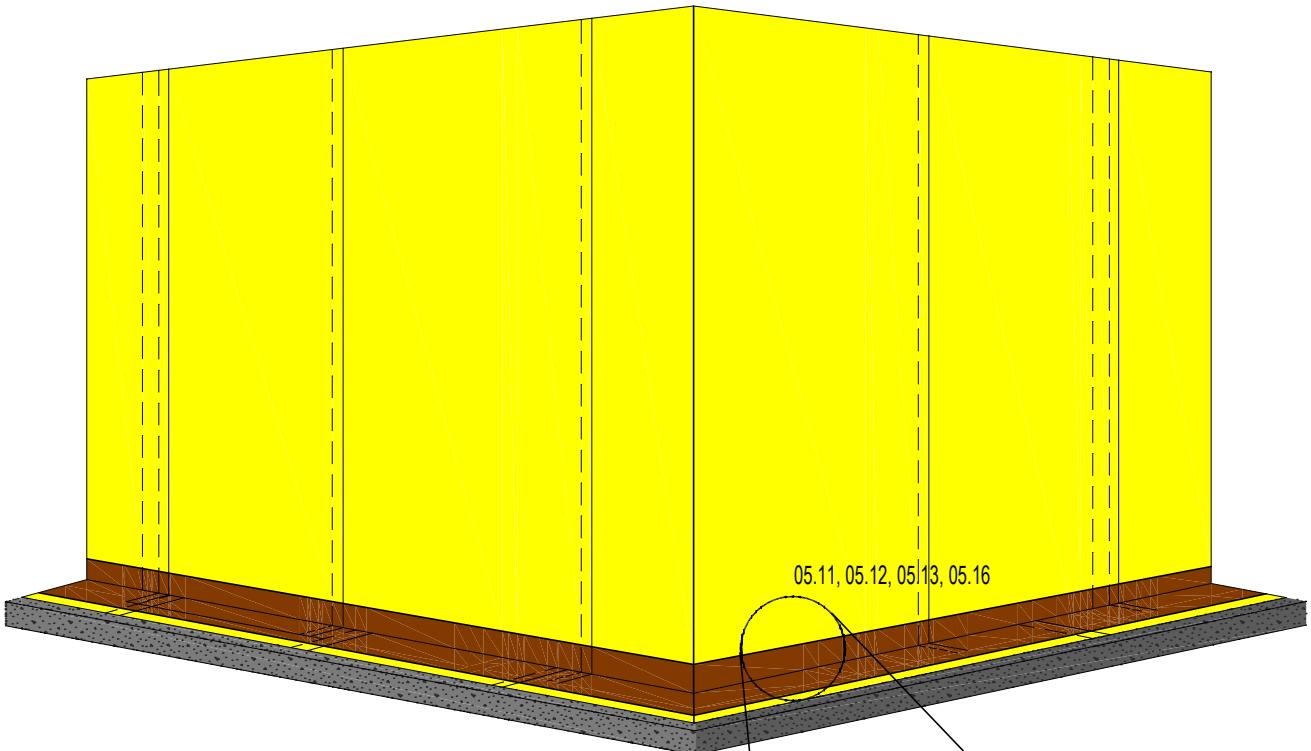




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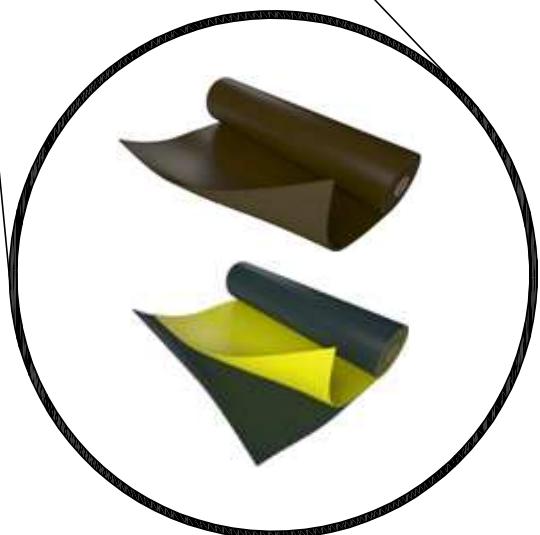
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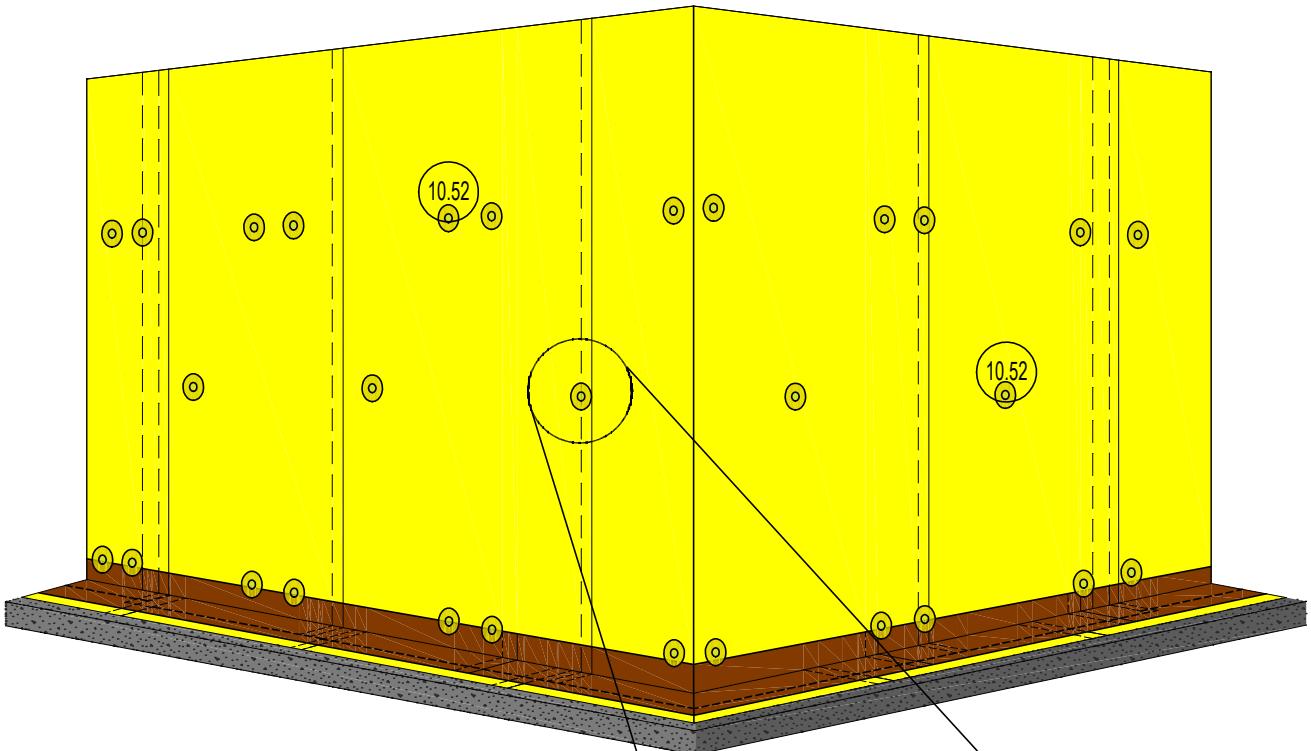




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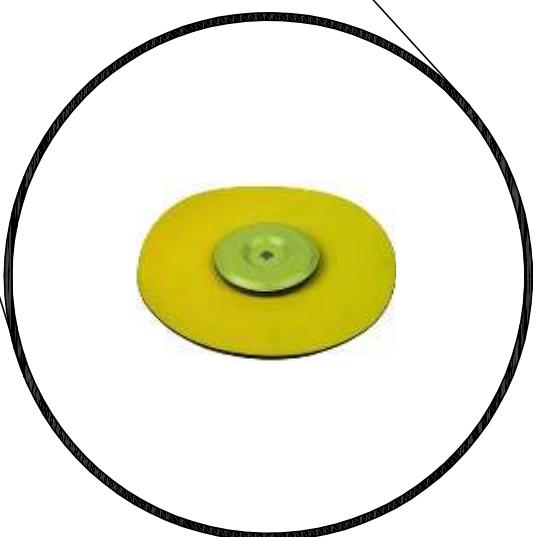
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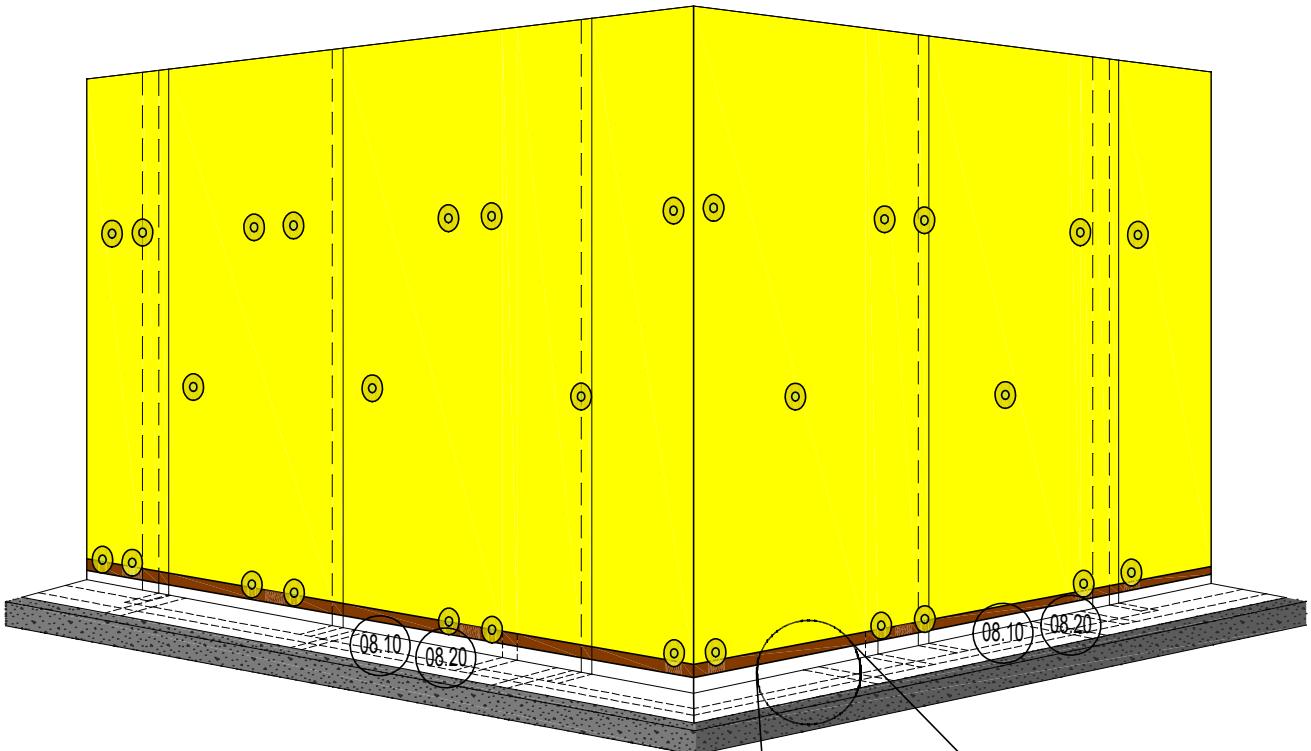




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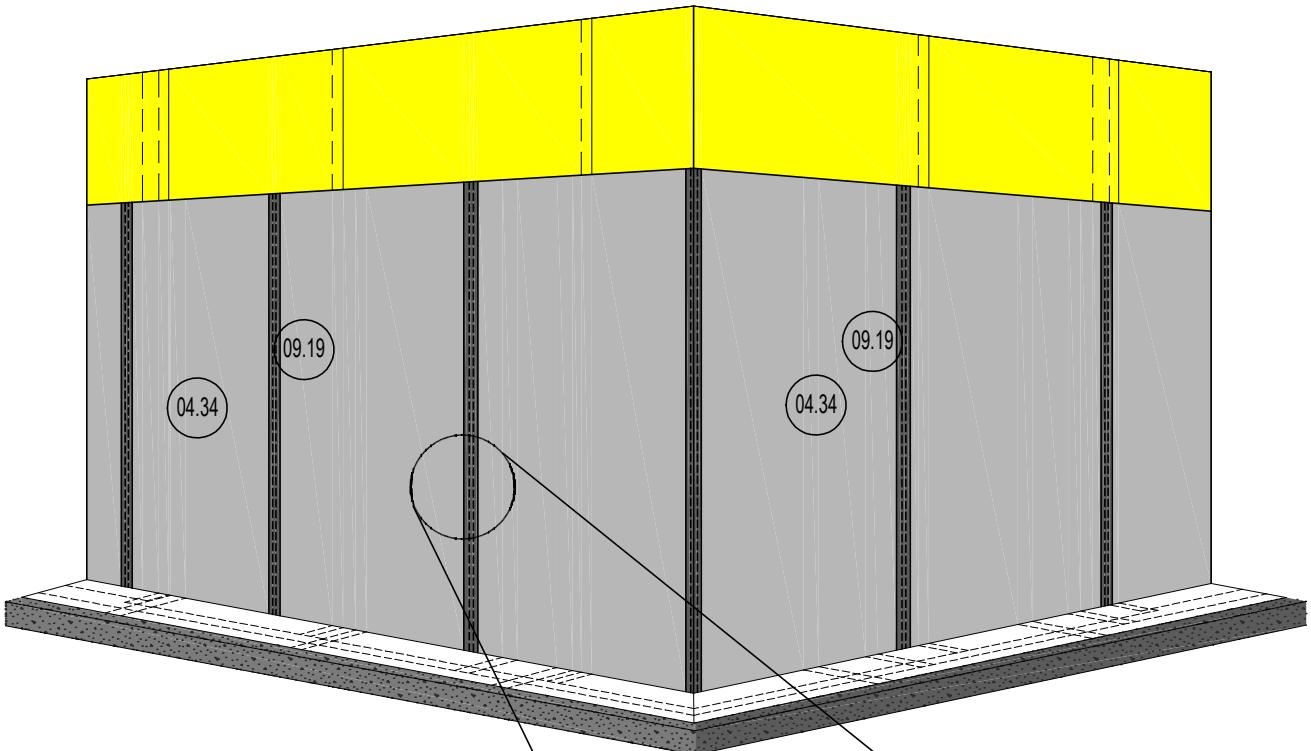




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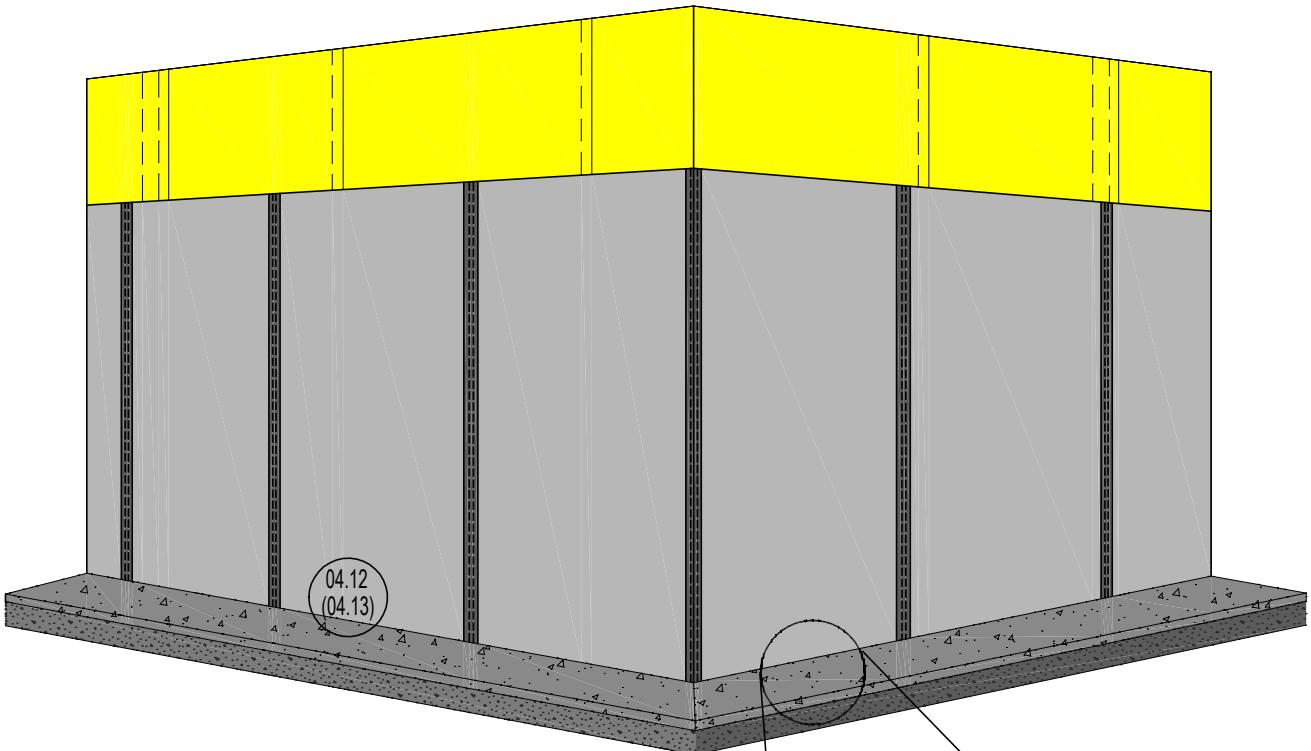
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- 12.20 INJECTION PIPE 15BPERT
- 12.21 INJECTION PIPE 10BPEX-25C
- 12.32 REDUCING STRAIGHT PEM 201510W
- 12.33 STEM ELBOW PEM 221515W
- 12.42 INJECTION PACKER



LEGEND

- 02.12 FOUNDATIONS (CONCRETE SLAB)
- 03.10 BASEMENT WALL
- 04.11 REINFORCED CONCRETE BASE
- 04.12 PROTECTIVE CONCRETE SCREED MIN. TH. 50 mm**
- 04.13 PROTECTIVE CEMENT SCREED MIN. TH. 30 mm**
- 04.34 PROTECTIVE PP BOARD TH. 5 mm
- 05.11 WATERPROOFING MEMBRANE FATRAFOL 803
- 05.12 MEMBRANE FATRAFOL 803/VS
- 05.13 MEMBRANE FATRAFOL 803/V
- 05.16 MEMBRANE FATRAFOL 803/VST
- 07.41 EXTERNAL WATERSTOP BAR
- 08.10 SEP. FABRIC NON WOVEN GEOTEXTILE
- 08.20 PE MEMBRANE
- 08.42 PETEXDREN 900
- 09.19 ADHESIVE TAPE FOR PP BOARDS
- 10.50 INDUCTION PLATE PVC + FASTENER
- 10.51 FIXING PLATE HP
- 10.52 FIXING POINT HP-PVC
- 12.12 INJECTION PORT
- 12.20 INJECTION PIPE 15BPERT
- 12.21 INJECTION PIPE 10BPEX-25C
- 12.32 REDUCING STRAIGHT PEM 201510W
- 12.33 STEM ELBOW PEM 221515W
- 12.42 INJECTION PACKER

