Draft verification
Post installed rebar connection
WIT-PE 1000 + Reinforcement bar Ø12 + Ø12

Input data

Design method: DIN EN 1992-1-1/NA

Application: Slab to wall

Base material (Existing structure):

Concrete strength class: C20/25 (acc. EN206-1:2000 temperature of base material during installation: -10C° bis 40C° / temperature during service period: short term 80C° long term 50C°)

Condition of installation:

Drilling method: Hammer drilling with drilling aid

Type of cleaning: Standard

Existing structure:

Dimension components

Height: 2400 mm

Width: 1000 mm

Depth: 300 mm

Steel strength/grade: 500 N/mm²

	Top reinforcement	Bottom reinforcement
Clear spacing of bars	200 mm	200 mm
Distance bending-up	90 mm	90 mm
Diameter	Ø12	Ø12
Number	5	5
Bond area	good	good
Top concrete cover	25 mm	-
Bottom concrete cover	-	25 mm
Concrete cover at the face side	25 mm	25 mm
Concrete cover at the side	25 mm	25 mm
Shape of bars	Straight	Straight

New structure:

Dimension components

Height: 300 mm

Width: 1000 mm

Mortar type: WIT-PE 1000

Approval number / Validity: ETA-19/0543; valid from 17/04/2020

Steel strength/grade: 500 N/mm²

	Top reinforcement	Bottom reinforcement
Clear spacing of bars	200 mm	200 mm
Diameter	Ø12	Ø12

Number	5	5
Bond area	good	good
Top concrete cover	60 mm	-
Bottom concrete cover	-	60 mm
Concrete cover at the side	1000 mm	1000 mm
Type of support	Direct	Direct

Mortar / Adhesive:

Drill holes per meter length: n1 = 5.0 Ø 12 mm / n2 = 5.0 Ø 12 mm

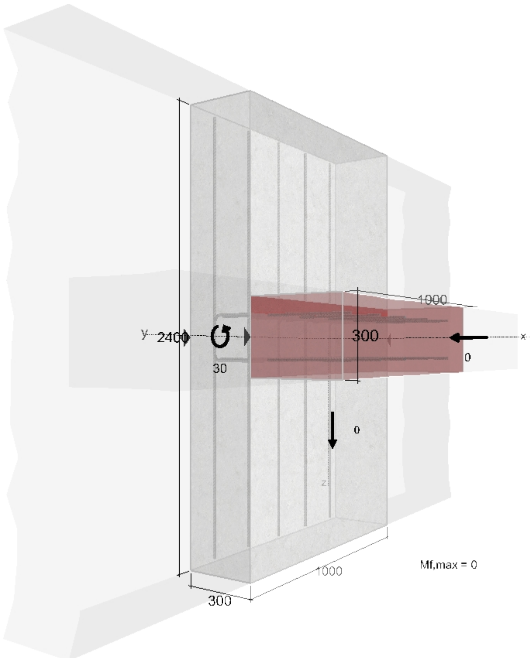
Mortar quantity per meter length: 258 ml

Item no.	Description	Number per meter length
5918 605 440	Bonded anchor WIT-PE 1000 in mortar cartridge 440 ml	1
5918 605 585	Bonded anchor WIT-PE 1000 in mortar cartridge 585 ml	1
5918 605 140	Bonded anchor WIT-PE 1000 in mortar cartridge 1400 ml	1

Accessories:

Item no.	Description	
0891 003 105	Manual dispensing gun 585 ml	
0891 015	Pneumatic dispensing gun 1400 ml	
0903 420 004	Extention of static mixer	
0903 488 121	Extention of static mixer	
0903 488 123	Extention of static mixer	
0891 017	Pneumatic dispensing gun 585 ml	
0539 112 22	Hose clamp	
0903 488 055	Injection adaptor	
0903 488 056	Injection adaptor	
0699 903 38	Sliding valve	
0699 903 7	Compressed air hose	

Sizes and loads



Loads:

Load case number	n_{Ed} [kN/m]	$v_{z,Ed}$ [kN/m]	$m_{y,Ed}$ [kNm/m]	Type of load
1	**0.00**	**0.00**	**30.00**	**Normal**

Remark: The design actions are user-defined inputs.

Maximum bending moment in adjacent field:

Mf,max : 0 kNm

Verifications

Summary load combinations

Load case number	Top			Bottom		
	Degree of capacity utilisation Steel [%]	Drill hole depth [mm]	Degree of capacity utilisation Resin Bonded Anchors [%]	Degree of capacity utilisation Steel [%]	Drill hole depth [mm]	Degree of capacity utilisation Resin Bonded Anchors [%]
1	**1.42**	**200**	**2.69**	**56.98**	**215**	**100.00**

Summary verifications

	Verification [%]	Lap length l_0 [mm]	Anchorage length l_b [mm]	Status
Top reinforcement				
Existing structure	1.42	-	-	**Design verified**
New	1.42	200	-	**Design verified**
Bottom reinforcement				
Existing structure	56.98	-	-	**Design verified**
New	56.98	215	-	**Design verified**

Verification successfully completed!

Remarks

- This is a draft verification and can be considered a recommendation. The product may not be installed with out verification and approval by the engineer in charge.
- The design is based on EN 1992-1-2:2010-12 NA and the appoval ETA-19/0543.
- There is no shear reinforcement shown in the engineer's drawings; acc. EN 1992-1-1 NA a shear reinforcement is required.
- The shear crossing between old and new concrete has to be verified acc. to EN 1992-1-1 NA.
- The information on setting time, minimum curing time and the maximum embedment depth are depended from the temperature of the drill hole and the mortar. Values are given in the approval ETA-19/0543.
- The selected concrete strength must be verified.
- The list of accessories is considered an information for the user. To ensure a reliable installation the product specific installation manual have to be considered.

Verifications: predominantly static loads

Resulting reactions

	$N_{Ed, (My,Ed + NEd)}$ [kN]	$\Delta N_{Ed, (Vz,Ed)}$ [kN]	**$N_{Ed,Total}$ [kN]**
Top reinforcement			
Existing structure	0.700	0.000	**0.700**
New	0.700	0.000	**0.700**
Bottom reinforcement			
Existing structure	28.018	0.000	**28.018**
New	28.018	0.000	**28.018**

Remark: The reaction forces apply to the rebar with the highest workload of each refinforcement layer.

Verification of steel

Top reinforcement

Existing structure

$\beta_{sb,1}$	=	$\sigma_{Ed} / \sigma_{Rd}$	Degree of capacity utilisation
N_{Ed}	=	0.7 kN	Design value of actions
Ø	=	12 mm	User-defined inputs
σ_{Ed}	=	$N_{Ed} / ((\pi / 4) \cdot Ø^2)$	Design value of actions
	=	$0.7\ kN / ((\pi / 4) \cdot (12\ mm)^2 = 6.19\ N/mm^2$	
σ_{Rd}	=	f_{yk} / γ_{Ms}	
f_{yk}	=	$500\ N/mm^2$	
γ_{Ms}	=	1.15	EN 1992-1-1: 2.4.2.4 (Table 2.1); NDP 2.1DE
σ_{Rd}	=	$500\ N/mm^2 / 1.15$	
	=	$434.78\ N/mm^2$	
$\beta_{sb,1}$	=	$6.19\ N/mm^2 / 434.78\ N/mm^2$	
	=	0.01	Degree of capacity utilisation

New structure

$\beta_{sb,1}$	=	$\sigma_{Ed} / \sigma_{Rd}$	Degree of capacity utilisation
N_{Ed}	=	0.7 kN	Design value of actions
Ø	=	12 mm	User-defined inputs
σ_{Ed}	=	$N_{Ed} / ((\pi / 4) \cdot Ø^2)$	Design value of actions
	=	$0.7\ kN / ((\pi / 4) \cdot (12\ mm)^2 = 6.19\ N/mm^2$	
σ_{Rd}	=	f_{yk} / γ_{Ms}	
f_{yk}	=	$500\ N/mm^2$	
γ_{Ms}	=	1.15	EN 1992-1-1: 2.4.2.4 (Table 2.1); NDP 2.1DE
σ_{Rd}	=	$500\ N/mm^2 / 1.15$	
	=	$434.78\ N/mm^2$	
$\beta_{sb,1}$	=	$6.19\ N/mm^2 / 434.78\ N/mm^2$	

	=	0.01	Degree of capacity utilisation

Bottom reinforcement

Existing structure

$\beta_{sb,2}$	=	$\sigma_{Ed} / \sigma_{Rd}$	Degree of capacity utilisation
N_{Ed}	=	28.02 kN	Design value of actions
Ø	=	12 mm	User-defined inputs
σ_{Ed}	=	N_{Ed} / ((π / 4) · Ø²)	Design value of actions
	=	28.02 kN / ((π / 4) · (12 mm)² = 247.73 N/mm²	
σ_{Rd}	=	f_{yk} / γ_{Ms}	
f_{yk}	=	500 N/mm²	
γ_{Ms}	=	1.15	EN 1992-1-1: 2.4.2.4 (Table 2.1); NDP 2.1DE
σ_{Rd}	=	500 N/mm² / 1.15	
	=	434.78 N/mm²	
$\beta_{sb,2}$	=	247.73 N/mm² / 434.78 N/mm²	
	=	0.57	Degree of capacity utilisation

New structure

$\beta_{sb,2}$	=	$\sigma_{Ed} / \sigma_{Rd}$	Degree of capacity utilisation
N_{Ed}	=	28.02 kN	Design value of actions
Ø	=	12 mm	User-defined inputs
σ_{Ed}	=	N_{Ed} / ((π / 4) · Ø²)	Design value of actions
	=	28.02 kN / ((π / 4) · (12 mm)² = 247.73 N/mm²	
σ_{Rd}	=	f_{yk} / γ_{Ms}	
f_{yk}	=	500 N/mm²	
γ_{Ms}	=	1.15	EN 1992-1-1: 2.4.2.4 (Table 2.1); NDP 2.1DE
σ_{Rd}	=	500 N/mm² / 1.15	
	=	434.78 N/mm²	
$\beta_{sb,2}$	=	247.73 N/mm² / 434.78 N/mm²	Degree of capacity utilisation
	=	0.57	Degree of capacity utilisation

Verification of concrete

Top reinforcement

Lap

Existing structure

$l_{0,i}$	=	$\max(\alpha_1 \cdot \alpha_2 \cdot \alpha_3 \cdot \alpha_5 \cdot \alpha_6 \cdot l_{b,rqd;}\ l_{0,min})$	EN 1992-1-1: 8.7.3 (8.10)
α_1	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_2	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_3	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_5	=	0.67	EN 1992-1-1: 8.4.4 (Table 8.2)

α_6	=	1.00	EN 1992-1-1: 8.7.3 (1) (Table 8.3); (Table 8.3DE)
$l_{b,rqd}$	=	$(Ø / 4) \cdot (\sigma_{Ed} / f_{bd})$	EN 1992-1-1: 8.4.3 (8.3)
Ø	=	12 mm	User-defined inputs
σ_{Ed}	=	$N_{Ed} / ((\pi / 4) \cdot Ø^2)$	Design value of actions
	=	$0.7 kN / ((\pi / 4) \cdot (12 mm)^2 = 6.19 N/mm^2$	
f_{bd}	=	$2.3209 N/mm^2$	EN 1992-1-1: 8.4.2 (8.2)
$l_{b,rqd}$	=	$(12 mm / 4) \cdot (6.1903 N/mm^2 / 2.3209 N/mm^2)$	
	=	8 mm	
$l_{0,min}$	=	$\max(0.3 \cdot \alpha_6 \cdot l_{b,rqd,min}\ ; 15 \cdot d; 200 mm)$	EN 1992-1-1: 8.7.3 (8.11)
$l_{b,rqd,min}$	=	$(Ø / 4) \cdot (f_{yd} / f_{bd})$	EN 1992-1-1: 8.4.3 (8.3); NCI 8.7.3 (1) 8.11
f_{yd}	=	f_{yk} / γ_{Ms}	
f_{yk}	=	$500 N/mm^2$	
γ_{Ms}	=	1.15	EN 1992-1-1: 2.4.2.4 (Table 2.1); NDP 2.1DE
f_{yd}	=	$500 N/mm^2 / 1.15$	
	=	$434.7826 N/mm^2$	
$l_{b,rqd,min}$	=	$(12 mm / 4) \cdot (434.7826 N/mm^2 / 2.3209 N/mm^2)$	EN 1992-1-1: 8.4.3 (8.3)
	=	562 mm	
$l_{0,min}$	=	$\max(0.3 \cdot 1.00 \cdot 562 mm\ ; 15 \cdot 12 mm; 200 mm)$	EN 1992-1-1: 8.7.3 (8.11)
	=	200 mm	
$l_{0,i}$	=	$\max(1.00 \cdot 1.00 \cdot 1.00 \cdot 0.67 \cdot 1.00 \cdot 8 mm; 200 mm)$	
	=	200 mm	

Existing structure

$l_{0,i}$	=	$\max(\alpha_1 \cdot \alpha_2 \cdot \alpha_3 \cdot \alpha_5 \cdot \alpha_6 \cdot l_{b,rqd;}\ l_{0,min})$	EN 1992-1-1: 8.7.3 (8.10)
α_1	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_2	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_3	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_5	=	0.67	EN 1992-1-1: 8.4.4 (Table 8.2)
α_6	=	1.00	EN 1992-1-1: 8.7.3 (1) (Table 8.3); (Table 8.3DE)
$l_{b,rqd}$	=	$(Ø / 4) \cdot (\sigma_{Ed} / f_{bd})$	EN 1992-1-1: 8.4.3 (8.3)
Ø	=	12 mm	User-defined inputs
σ_{Ed}	=	$N_{Ed} / ((\pi / 4) \cdot Ø^2)$	Design value of actions
	=	$0.7 kN / ((\pi / 4) \cdot (12 mm)^2 = 6.19 N/mm^2$	
f_{bd}	=	$2.3 N/mm^2$	EN 1992-1-1: 8.4.2 (8.2)
$l_{b,rqd}$	=	$(12 mm / 4) \cdot (6.1903 N/mm^2 / 2.3 N/mm^2)$	
	=	8 mm	
$l_{0,min}$	=	$\max(0.3 \cdot \alpha_6 \cdot l_{b,rqd,min}\ ; 15 \cdot d; 200 mm)$	EN 1992-1-1: 8.7.3 (8.11)
$l_{b,rqd,min}$	=	$(Ø / 4) \cdot (f_{yd} / f_{bd})$	EN 1992-1-1: 8.4.3 (8.3); NCI 8.7.3 (1) 8.11
f_{yd}	=	f_{yk} / γ_{Ms}	
f_{yk}	=	$500 N/mm^2$	
γ_{Ms}	=	1.15	EN 1992-1-1: 2.4.2.4 (Table 2.1); NDP 2.1DE
f_{yd}	=	$500 N/mm^2 / 1.15$	
		$434.7826 N/mm^2$	

	=		
$l_{b,rqd,min}$	=	(12 mm / 4) · (434.7826 N/mm² / 2.3 N/mm²)	EN 1992-1-1: 8.4.3 (8.3)
	=	567 mm	
$l_{0,min}$	=	max(0.3 · 1.00 · 567 mm ; 15 · 12 mm; 200 mm)	EN 1992-1-1: 8.7.3 (8.11)
	=	200 mm	
$l_{0,i}$	=	max(1.00 · 1.00 · 1.00 · 0.67 · 1.00 · 8 mm; 200 mm)	
	=	200 mm	
l_0	=	max($l_{0,i}$; $l_{0,j}$)	
l_0	=	max(200 mm ; 200 mm)	
	=	200 mm	
		Drill hole depth	
l_v	=	$l_0 + c_{Face}$	
c_{stirn}	=	25 mm	
l_v	=	200 mm + 25 mm	
	=	225 mm	

Bottom reinforcement

Lap

Existing structure			
$l_{0,i}$	=	max($\alpha_1 \cdot \alpha_2 \cdot \alpha_3 \cdot \alpha_5 \cdot \alpha_6 \cdot l_{b,rqd;}\ l_{0,min}$)	EN 1992-1-1: 8.7.3 (8.10)
α_1	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_2	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_3	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_5	=	0.67	EN 1992-1-1: 8.4.4 (Table 8.2)
α_6	=	1.00	EN 1992-1-1: 8.7.3 (1) (Table 8.3); (Table 8.3DE)
$l_{b,rqd}$	=	(Ø / 4) · (σ_{Ed} / f_{bd})	EN 1992-1-1: 8.4.3 (8.3)
Ø	=	12 mm	User-defined inputs
σ_{Ed}	=	N_{Ed} / ((π / 4) · Ø²)	Design value of actions
	=	28.02 kN / ((π / 4) · (12 mm)² = 247.73 N/mm²	
f_{bd}	=	2.3209 N/mm²	EN 1992-1-1: 8.4.2 (8.2)
$l_{b,rqd}$	=	(12 mm / 4) · (247.7316 N/mm² / 2.3209 N/mm²)	
	=	320 mm	
$l_{0,min}$	=	max(0.3 · α_6 · $l_{b,rqd,min}$; 15 · d; 200 mm)	EN 1992-1-1: 8.7.3 (8.11)
$l_{b,rqd,min}$	=	(Ø / 4) · (f_{yd} / f_{bd})	EN 1992-1-1: 8.4.3 (8.3); NCI 8.7.3 (1) 8.11
f_{yd}	=	f_{yk} / γ_{Ms}	
f_{yk}	=	500 N/mm²	
γ_{Ms}	=	1.15	EN 1992-1-1: 2.4.2.4 (Table 2.1); NDP 2.1DE
f_{yd}	=	500 N/mm² / 1.15	
	=	434.7826 N/mm²	
$l_{b,rqd,min}$	=	(12 mm / 4) · (434.7826 N/mm² / 2.3209 N/mm²)	EN 1992-1-1: 8.4.3 (8.3)
	=	562 mm	

$l_{0,min}$	=	max(0.3 · 1.00 · 562 mm ; 15 · 12 mm; 200 mm)	EN 1992-1-1: 8.7.3 (8.11)
	=	200 mm	
$l_{0,i}$	=	max(1.00 · 1.00 · 1.00 · 0.67 · 1.00 · 320 mm; 200 mm)	
	=	213 mm	

Existing structure

$l_{0,i}$	=	max($\alpha_1 \cdot \alpha_2 \cdot \alpha_3 \cdot \alpha_5 \cdot \alpha_6 \cdot l_{b,rqd;}\ l_{0,min}$)	EN 1992-1-1: 8.7.3 (8.10)
α_1	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_2	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_3	=	1.00	EN 1992-1-1: 8.4.4 (Table 8.2)
α_5	=	0.67	EN 1992-1-1: 8.4.4 (Table 8.2)
α_6	=	1.00	EN 1992-1-1: 8.7.3 (1) (Table 8.3); (Table 8.3DE)
$l_{b,rqd}$	=	(Ø / 4) · (σ_{Ed} / f_{bd})	EN 1992-1-1: 8.4.3 (8.3)
Ø	=	12 mm	User-defined inputs
σ_{Ed}	=	N_{Ed} / ((π / 4) · Ø²)	Design value of actions
	=	28.02 kN / ((π / 4) · (12 mm)² = 247.73 N/mm²	
f_{bd}	=	2.3 N/mm²	EN 1992-1-1: 8.4.2 (8.2)
$l_{b,rqd}$	=	(12 mm / 4) · (247.7316 N/mm² / 2.3 N/mm²)	
	=	323 mm	
$l_{0,min}$	=	max(0.3 · α_6 · $l_{b,rqd,min}$; 15 · d; 200 mm)	EN 1992-1-1: 8.7.3 (8.11)
$l_{b,rqd,min}$	=	(Ø / 4) · (f_{yd} / f_{bd})	EN 1992-1-1: 8.4.3 (8.3); NCI 8.7.3 (1) 8.11
f_{yd}	=	f_{yk} / γ_{Ms}	
f_{yk}	=	500 N/mm²	
γ_{Ms}	=	1.15	EN 1992-1-1: 2.4.2.4 (Table 2.1); NDP 2.1DE
f_{yd}	=	500 N/mm² / 1.15	
	=	434.7826 N/mm²	
$l_{b,rqd,min}$	=	(12 mm / 4) · (434.7826 N/mm² / 2.3 N/mm²)	EN 1992-1-1: 8.4.3 (8.3)
	=	567 mm	
$l_{0,min}$	=	max(0.3 · 1.00 · 567 mm ; 15 · 12 mm; 200 mm)	EN 1992-1-1: 8.7.3 (8.11)
	=	200 mm	
$l_{0,i}$	=	max(1.00 · 1.00 · 1.00 · 0.67 · 1.00 · 323 mm; 200 mm)	
	=	215 mm	
l_0	=	max($l_{0,i}$; $l_{0,j}$)	
l_0	=	max(213 mm ; 215 mm)	
	=	215 mm	
		Drill hole depth	
l_v	=	$l_0 + c_{Face}$	
c_{stirn}	=	25 mm	
l_v	=	215 mm + 25 mm	
	=	240 mm	

Remarks

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- The design is based on EN 1992-1-2:2010-12 NA and the appoval ETA-19/0543.
- There is no shear reinforcement shown in the engineer‘s drawings; acc. EN 1992-1-1 NA a shear reinforcement is required.
- The shear crossing between old and new concrete has to be verified acc. to EN 1992-1-1 NA.
- The information on setting time, minimum curing time and the maximum embedment depth are depended from the temperature of the drill hole and the mortar. Values are given in the approval ETA-19/0543.
- The selected concrete strength must be verified.
- The list of accessories is considered an information for the user. To ensure a reliable installation the product specific installation manual have to be considered.

Installation instruction

Condition of installation: Drilling method (Hammer drilling) ,Type of cleaning (Standard)

Selection of the mortar: Mortar type: WIT-PE 1000

<u>Top reinforcement</u>

Diameter: 12 mm

Lap length l_0: 200 mm

Drill hole depth l_v: 225 mm

Drill diameter d_0: 14 mm

<u>Bottom reinforcement</u>

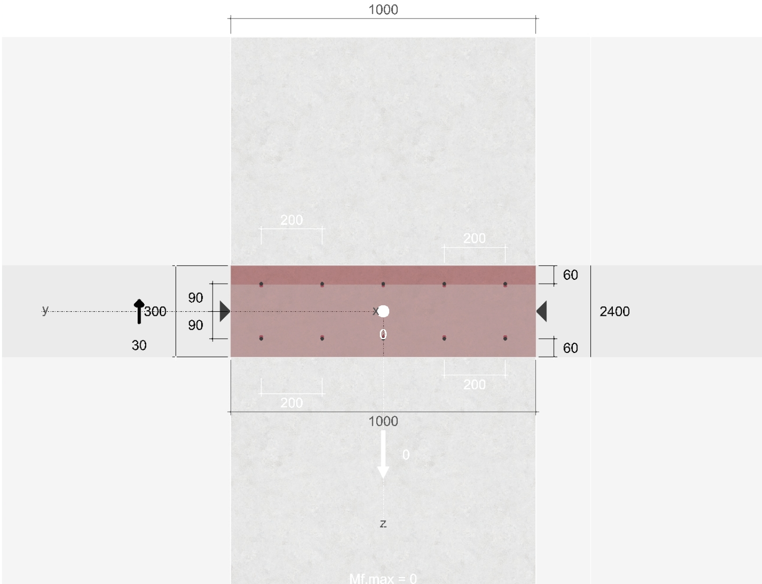
Diameter: 12 mm

Lap length l_0: 215 mm

Drill hole depth l_v: 240 mm

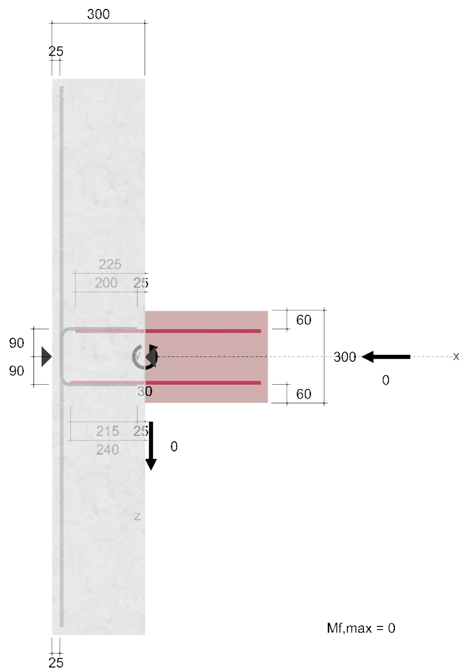
Drill diameter d_0: 14 mm

Cross section



(**Remark:** Drawing not to scale)

Longitudinal section



(**Remark:** Drawing not to scale)