

**Project:**  
**Project no:**  
**Author:**

## Project data

Project name  
Project number  
Author  
Description  
Date 2/6/2025  
Code AS

## Material

Steel STEEL\_1\_440\_320, STEEL\_1\_320\_250, 3678-250  
Concrete N25

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## Project item Node 1

### Design

Name Node 1  
Description 4-m20/125 hilti re500  
Analysis Stress, strain/ loads in equilibrium

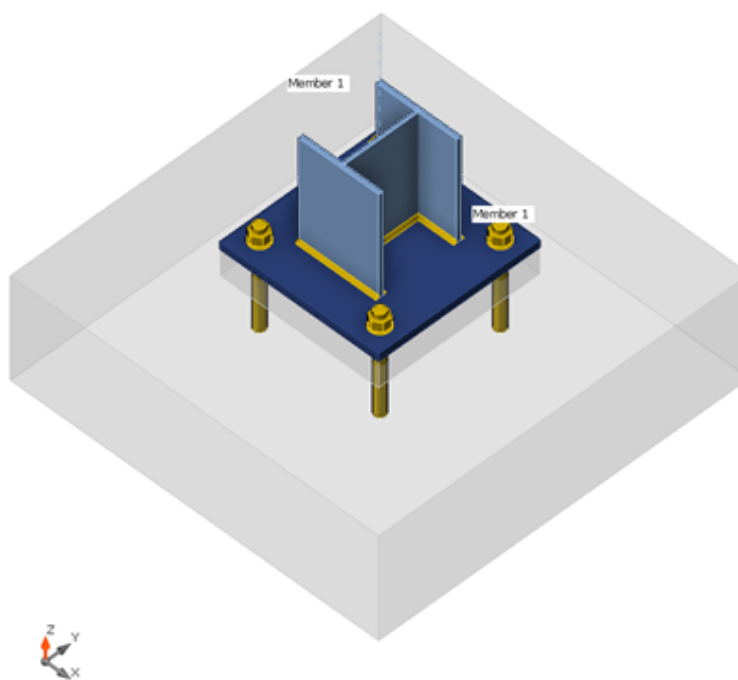
### Members

#### Geometry

Name	Cross-section	$\beta$ - Direction [°]	$\gamma$ - Pitch [°]	$\alpha$ - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]
Member 1	6 - 150 UC 30.0	0.0	90.0	-90.0	0.0	0.0	0.0

#### Supports and forces

Name	Support	Forces in	X [mm]
Member 1 / end		Position	0.0



### Cross-sections

Name	Material
6 - 150 UC 30.0	STEEL_1_440_320

### Anchors

Name	Diameter [mm]	$f_y$ [MPa]	$f_u$ [MPa]	Gross area [mm <sup>2</sup> ]
M20 4.6	20.0	240.0	400.0	314.0

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## Load effects (forces in equilibrium)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
Ult Services Extreme(1)	Member 1 / End	-12.0	14.8	2.2	-0.1	0.0	0.0
Service - No Crane + Wsx+(2)	Member 1 / End	-4.7	5.9	0.9	0.0	0.0	0.0

## Unbalanced forces

Name	X [kN]	Y [kN]	Z [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
Ult Services Extreme(1)	14.8	2.2	-12.0	0.0	0.0	-0.1
Service - No Crane + Wsx+(2)	5.9	0.9	-4.7	0.0	0.0	0.0

## Foundation block

Item	Value	Unit
<b>CB 1</b>		
Dimensions	703.0 x 708.0	mm
Depth	200.0	mm
Anchor	M20 4.6	
Anchoring length	100.0	mm
Shear force transfer	Anchors	
Mortar joint	50.0	mm

## Check

### Summary

Name	Value	Check status
Analysis	100.0%	OK
Plates	0.0 < 5.0%	OK
Anchors	83.2 < 100%	OK
Welds	7.5 < 100%	OK
Concrete block	0.6 < 100%	OK
Buckling	Not calculated	

## Plates

Name	Material	F <sub>y</sub> [MPa]	t <sub>p</sub> [mm]	Loads	σ <sub>Ed</sub> [MPa]	ε <sub>pl</sub> [%]	σ <sub>c,Ed</sub> [MPa]	Status
Member 1-bfl 1	STEEL_1_440_320	320.0	9.40	Ult Services Extreme(1)	43.7	0.0	0.0	OK
Member 1-tfl 1	STEEL_1_440_320	320.0	9.40	Ult Services Extreme(1)	37.2	0.0	0.0	OK
Member 1-w 1	STEEL_1_440_320	320.0	6.60	Ult Services Extreme(1)	8.0	0.0	0.0	OK
BP1	3678-250	250.0	15.00	Ult Services Extreme(1)	12.5	0.0	0.0	OK

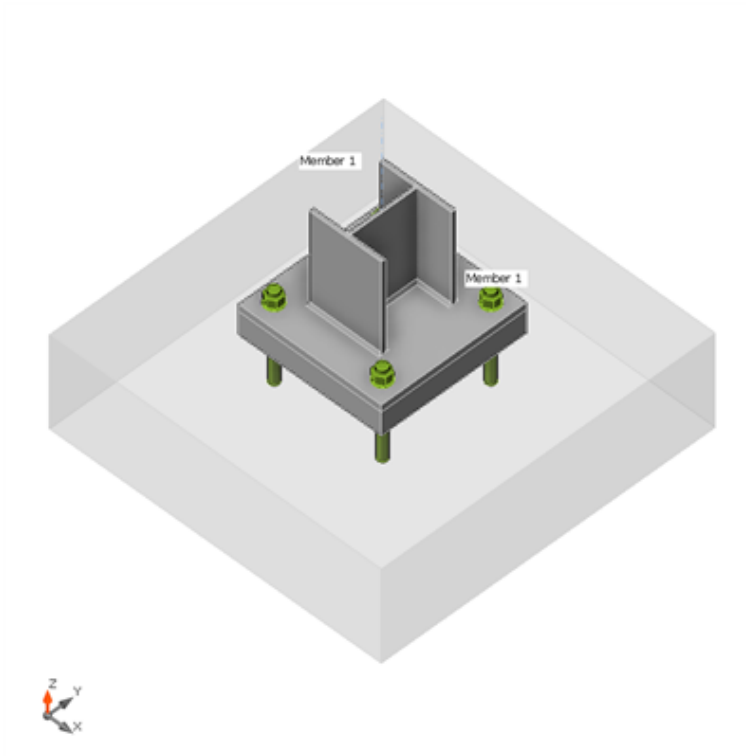
### Design data

Material	F <sub>y</sub> [MPa]	ε <sub>lim</sub> [%]
STEEL_1_440_320	320.0	5.0
3678-250	250.0	5.0

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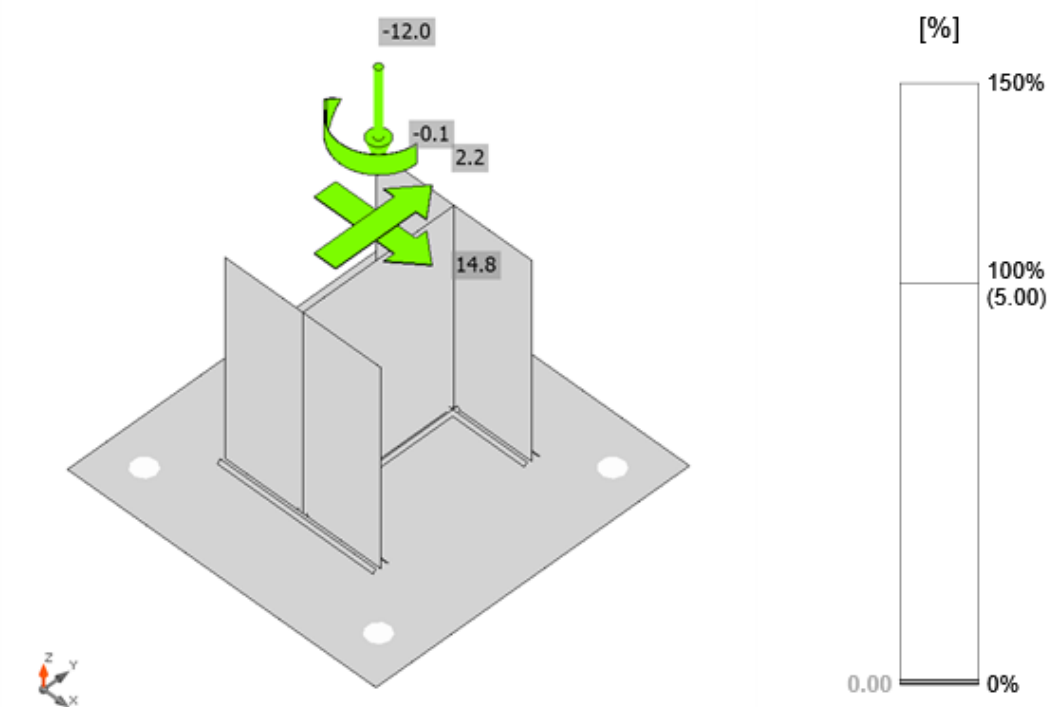
### Symbol explanation

$F_y$	Yield strength
$t_p$	Plate thickness
$\sigma_{Ed}$	Equivalent stress
$\epsilon_{pl}$	Plastic strain
$\sigma_{c,Ed}$	Contact stress
$\epsilon_{lim}$	Limit of plastic strain

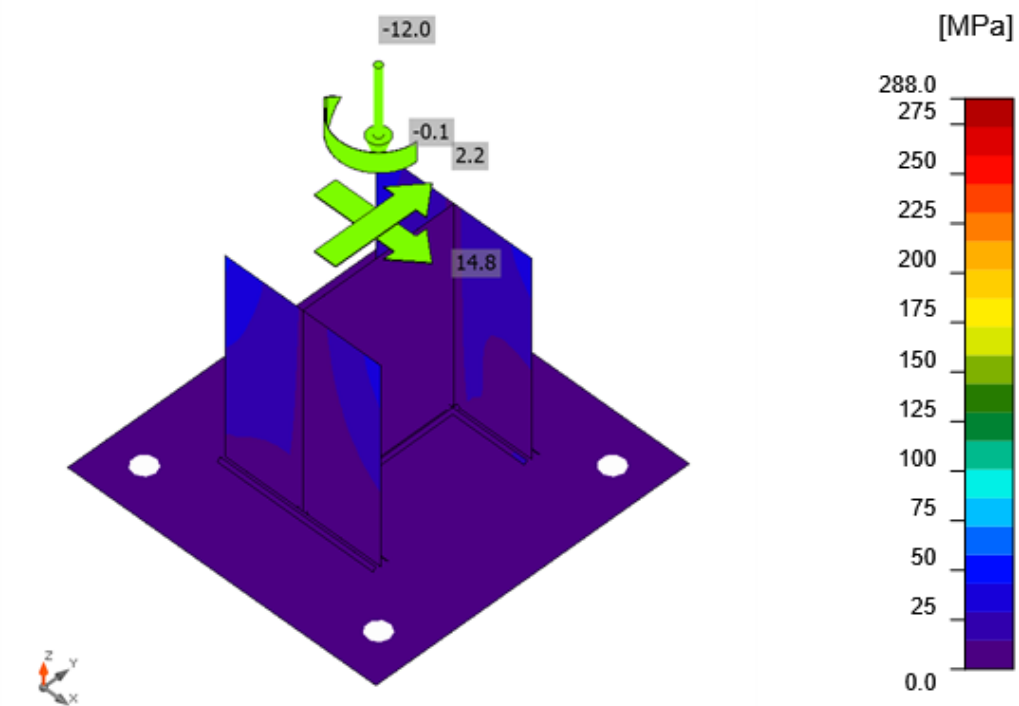


Overall check, Ult Services Extreme(1)

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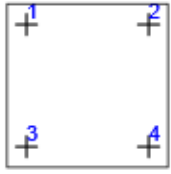
Strain check, Ult Services Extreme(1)



Equivalent stress, Ult Services Extreme(1)

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## Anchors

Shape	Item	Loads	$N_{tf}^*$ [kN]	$V^*$ [kN]	$\phi N_{Rk,c}$ [kN]	$\phi V_{Rk,s,M}$ [kN]	$\phi V_{Rk,c}$ [kN]	$\phi V_{Rk,cp}$ [kN]	$U_t$ [%]	$U_s$ [%]	$U_{ts}$ [%]	Detailing	Status
	A1	Ult Services Extreme(1)	0.1	3.8	39.7	4.6	25.2	161.0	0.4	82.3	17.0	OK	OK
	A2	Ult Services Extreme(1)	0.0	3.8	0.0	4.6	26.5	161.0	0.0	83.2	42.2	OK	OK
	A3	Ult Services Extreme(1)	0.0	3.7	0.0	4.6	0.0	161.0	0.1	80.0	2.8	OK	OK
	A4	Ult Services Extreme(1)	0.0	3.7	0.0	4.6	26.5	161.0	0.0	80.1	42.2	OK	OK

## Design data

Grade	$\phi N_{tf}$ [kN]
M20 4.6 - 1	49.0

## Symbol explanation

$N_{tf}^*$	Tension force
$V^*$	Resultant of bolt shear forces $V_y$ and $V_z$ in shear planes
$\phi N_{Rk,c}$	Concrete cone resistance - AS 5216:2018 – 6.2.3
$\phi V_{Rk,s,M}$	Anchor shear resistance - AS 5216:2018 – 7.2.2.3
$\phi V_{Rk,c}$	Concrete edge resistance - AS 5216:2018 – 7.2.3
$\phi V_{Rk,cp}$	Concrete pry-out resistance - AS 5216:2018 – 7.2.4
$U_t$	Utilization in tension
$U_s$	Utilization in shear
$U_{ts}$	Utilization in tension and shear
$\phi N_{tf}$	Anchor tensile resistance - AS 5216:2018 – 6.2.2

## Welds

Item	Edge	Loads	$f_{uw}$ [MPa]	$t_t$ [mm]	$t_w$ [mm]	$v_w^*$ [kN/m]	$\phi v_w$ [kN/m]	$U_t$ [%]	Detailing	Status
BP1	Member 1-bfl 1	Ult Services Extreme(1)	490.0	▲ 4.00 ▼	▲ 5.66 ▼	59.0	940.8	6.3	OK	OK
		Ult Services Extreme(1)	490.0	▲ 4.00 ▼	▲ 5.66 ▼	54.5	940.8	5.8	OK	OK
BP1	Member 1-tfl 1	Ult Services Extreme(1)	490.0	▲ 4.00 ▼	▲ 5.66 ▼	68.3	940.8	7.3	OK	OK
		Ult Services Extreme(1)	490.0	▲ 4.00 ▼	▲ 5.66 ▼	70.9	940.8	7.5	OK	OK
BP1	Member 1-w 1	Ult Services Extreme(1)	490.0	▲ 4.00 ▼	▲ 5.66 ▼	16.2	940.8	1.7	OK	OK
		Ult Services Extreme(1)	490.0	▲ 4.00 ▼	▲ 5.66 ▼	16.9	940.8	1.8	OK	OK

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### Symbol explanation

$f_{uw}$	Nominal tensile strength of weld metal
$t_t$	Throat thickness of weld
$t_w$	Leg size
$v_w^*$	Design force per unit length of weld
$\phi v_w$	Nominal capacity of a fillet weld per unit length
$U_t$	Utilization
▲	Fillet weld

### Concrete block

Item	Loads	$A_1$ [mm <sup>2</sup> ]	$A_2$ [mm <sup>2</sup> ]	$\sigma$ [MPa]	$\phi f_b$ [MPa]	$U_t$ [%]	Status
CB 1	Ult Services Extreme(1)	71711.7	418351.0	0.2	27.0	0.6	OK

### Symbol explanation

$A_1$	Loaded area
$A_2$	Supporting area
$\sigma$	Average stress in concrete
$\phi f_b$	Concrete block bearing resistance – AS 3600, Cl.12.6
$U_t$	Utilization

### Buckling

Buckling analysis was not calculated.

## Code settings

Item	Value	Unit	Reference
Coefficient of friction between steel and concrete	0.55	-	
Slip factor in friction-type connections	0.35	-	AS 4100:2020 – 9.2.3.2
Limit plastic strain	0.05	-	
Detailing	Yes		
Minimum bolt pitch [d]	2.50	-	AS 4100:2020 – 9.5.1
Minimum edge distance to a bolt [d]	1.25	-	AS 4100:2020 – 9.5.2
Concrete breakout resistance check	Both		
Cracked concrete	Yes		
Local deformation check	Yes		
Local deformation limit	0.03	-	CIDECT DG 1, 3 – 1.1
Geometrical nonlinearity (GMNA)	Yes		Analysis with large deformations for hollow section joints